Technical Assistance Response Plan – Terms of Reference

Country	**Kenya**
Request ID#	**2023000025**
Title	Development of a SF_6 Phase-out Roadmap and Pilot Projects
NDE	Ms. Gaudensia Owino Senior Research Scientist Email: gaudie.aomo@gmail.com, gaudensia.owino@kirdi.go.ke Environment Sustainability & Climate Change Research Centre (ESCC-RC) Kenya Industrial Research and Development Institute (KIRDI) Popo Road off Mombasa Road South C, P.O. Box 30650-00100 Nairobi, Kenya **Office Tel:** +254 20 23 88 216 or +254 20 23 93 466 **Website:** www.kirdi.go.ke
Proponent	State Department for Energy Kawi Complex, off Red Cross Road, P. O. Box 30582 – 00100 Nairobi Kenya Office Tel No: +254(0)20 4841000/6006014 Email: psenergy@energy.go.ke Website: www.energy.go.ke **Contact person:** Mr. Peter Rimba Maneno Senior Superintending Engineer Mobile: +254 721474835 Email: petermaneno2011@gmail.com

Summary of the CTCN technical assistance

The summary should provide a brief description of the problem (barrier to climate technology deployment) and how the technical assistance will address it (brief summary of outputs and activities). Please also briefly indicate national actors involved and the anticipated timeline. Please note this summary will be used for public communication purposes so it is important that it is well written. (maximum 1250 characters including spaces)

Sulfur hexafluoride (SF6) is the world's most potent greenhouse gas, and is used as an insulating medium in electrical equipment like circuit breakers and switchgears installed in transmission and distribution grids. SF6 is currently the main insulation gas deployed in switchgears in Kenya. The country currently operates a transmission network of about 9,011 km circuit length. Up to 2032, 38 new substations and 5,745 km of circuit length are planned to be established in the high-voltage segment alone.

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SF6-free technologies for medium and high voltage applications are increasingly available, being technically viable and financially competitive. However, SF6-free technologies haven't been adopted in Kenya so far. There is little awareness of SF6's impacts and the existence of alternatives amongst key stakeholders in Kenya. SF6 emissions aren't captured in Kenya's greenhouse gas (GHG) inventories and mitigation plans, baseline data on SF6 are lacking, there are no policies for an SF6 phase-out in place, and important capacities in terms of SF6 management are missing. This is putting Kenya on a trajectory of significantly increasing the electricity grid's carbon footprint.

This technical assistance aims to create an enabling environment for the transition to SF6-free technologies and the phase-out of SF6 in Kenya.

Agreement:

(If possible, please use electronic signatures in Microsoft Word file format)

National Designated Entity to the UNFCCC Technology Mechanism

Name: Gaudensia Owino
Title: Senior Research Scientist
Kenya Industrial Research & Development Institute (KIRDI), Kenya.
Date: 1st December, 2023

Signature:

Proponent (signature of the Proponent is optional)

Name: Peter Rimba Maneno
Title: Superintending Engineer
State Department of Energy
Ministry of Energy & Petroleum, Kenya.
Date: 1st December, 2023

Signature:

UNFCCC Climate Technology Centre and Network (CTCN)

Name: Rajiv Garg
Title: CTCN Director (a.i.)
Date: 4th December 2023
Signature:

1. Background and context

Please provide a brief description of the background and context for the CTCN Response Plan. Please include national and sectoral information using recognized and publicly available sources. (maximum 2500 characters including spaces).

The Paris Agreement is a legally binding international treaty on climate change which was adopted by 196 Parties at COP 21 in Paris on 12 December 2015 and entered into force on 4 November 2016. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. This requires the transition to net zero emission and environmentally friendly solutions. The use of electrical equipment containing sulfur hexafluoride (SF6) gas with a Global Warming Potential (GWP) of 25,200 is not compatible with the targets of the Paris Agreement.

Sulfur hexafluoride (SF6) is a potent greenhouse gas used as an insulating medium in electrical equipment like circuit breakers and switchgears installed in transmission and distribution grids. SF6 is currently the main insulation gas deployed in switchgears in Kenya. The country currently operates a transmission network of about 9,011 km circuit length. About 5,476 km is high-voltage, owned and operated by the Kenya Electricity Transmission Co. Ltd. (KETRACO). Most of the remaining network is medium-voltage and operated by Kenya Power & Lighting Company Plc. (KPLC). Despite maintenance efforts to limit SF6 leakage, a considerable amount of SF6 (best case scenario 0.5% per annum) is emitted from electrical equipment. Furthermore, infrastructure for end-of-life disposal has not been globally established yet. Though recycling of used SF6 is common practice globally, it is usually not destroyed because of the difficulty and cost associated with destruction.[1] Therefore, it can be expected that SF6 that exists now and that is produced in the future will persist for thousands of years, whether in electrical equipment or, ultimately, in the atmosphere.

SF6 emissions in Kenya, as in other countries, are increasing rapidly with grid expansion and modernization. As such, KETRACO's plan for the period 2023-2027 is the establishment of 13 new substations and 1,407 km of additional circuit length. Up to 2032, 38 new substations and 5,745 km of circuit length are planned to be established. KPLC also has ambitious extension plans (13 new substations) in the medium-voltage segment to satisfy urban energy demand and electrification of sectors such as mobility (electric vehicles and busses). Lastly, the Rural Electrification and Renewable Energy Corporation (REREC) is tasked with the extensive implementation of rural electrification and renewable energy projects requiring new grid infrastructure. Without action, this will lead to a significant increase in emissions in the Kenyan electricity grid. This is relevant as Kenya has committed to 100% renewable energy by 2030 and plans to decarbonize its grid.

SF6-free technologies for medium and high voltage applications are increasingly

[1] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/sf6/isor.pdf

available from companies like Siemens AG, Siemens Energy, ABB, Schneider Electric, Nuventura etc. which are extending their product portfolio across different voltage levels. Their equipment uses clean air instead of SF6. These solutions are increasingly being installed globally as they are technically viable and are said to be financially competitive from a total cost of ownership (TCO) perspective.

However, SF6-free technologies haven't been adopted in Kenya so far. This technical assistance aims to set the enabling environment for the transition to SF6-free technologies and phase-out of SF6 in Kenya.

2. Problem statement

Founded on the national and sectoral context as detailed in the section above, please include a brief problem statement clarifying the main problems and barriers for climate change mitigation and/or adaptation in terms of climate technologies that the CTCN Response Plan will address and overcome. (maximum 1250 characters including spaces).

There is low awareness of SF6's environmental impacts and alternatives amongst key stakeholders in Kenya. SF6 emissions aren't captured in Kenya's greenhouse gas (GHG) inventories and mitigation plans, and baseline data on SF6 banks, quantities installed, and leakage rates are lacking. Without this transparency, effective policymaking to phase-out SF6 and structurally shift markets to SF6-free solutions is impossible. Furthermore, the lack of awareness and capacities in terms of SF6 leakage management, end-of-life disposal, and knowledge on SF6-free alternatives in utilities (KETRACO and KPLC) is a key barrier. Current procurement processes are fully focused on functionality and cost, without consideration of environmental sustainability. This is putting Kenya on a trajectory of significantly increasing the electricity grid's carbon footprint.

On the other hand, SF6-free solutions are still a novelty on the market. There is a lack of transparency and knowledge in terms of the voltage levels that are already covered, the technical comparability to SF6-based equipment, and the financial competitiveness of SF6-free equipment.

This technical assistance aims to address the above challenges and barriers through a comprehensive market assessment and SF6 inventory, a technical and financial review of SF6-free technology options, the development of regulatory recommendations and a phase-out roadmap, as well as the preparation of a pilot project to demonstrate the viability of SF6-free technologies in Kenya.

3. Logical Framework for the CTCN Technical Assistance:

(Guidance: Please note that multiple activities lead to one Output, and multiple Outputs lead to one Outcome. There can be several Outputs, but only one Outcome description capturing the CTCN technical assistance. Deliverables are the products or services to be delivered to the NDE/Proponent/CTCN based on the Activities and the Outputs.)

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
***Objective**: To establish the enabling environment for SF6-free technology uptake and the phase-out of SF6 in Kenya*												
Outcome: *The outcome of this technical assistance is an enhanced enabling environment in Kenya for SF6-free technology adoption and the phase-out of SF6 because of transparent SF6 inventories, a clear SF6-free technology landscape in terms of technical and financial viability, supportive regulatory measures, and an ambitious SF6 phase-out roadmap with pilot demonstration projects*												
Output 1: Development of implementation planning and communication documents												
Activity 1: *All implementers must undertake the following activities at the beginning and at the end of the CTCN technical assistance.* i) A detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organisations and detailed budget to implement the Response Plan. The detailed work plan and budget must be based directly on this Response Plan; ii) Based on the work plan, a monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used to monitor and evaluate the timeliness and appropriateness of the implementation. The monitoring and evaluation plan should apply selected indicators from the Closure and Data Collection report template and enable the lead implementer to complete the CTCN Closure and Data collection report at the end of the assignment (please refer to item iv below and section 14 in the Response Plan); iii) A two-page CTCN Impact Description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered (a template will be provided); iv) A Closure and Data Collection report completed at the end of the technical assistance (a template will be provided). v) A project webinar held at the end of the technical assistance that demonstrates the project outcomes to a larger stakeholder audience (the webinar will be hosted through the CTCN)												
Deliverable 1: i) Detailed work plan ii) Monitoring and evaluation plan iii) CTCN Impact Description	X X X											

iv) Closure and Data Collection report v) Project webinar	X											X X
Output 2: Introduction of a Project Steering Mechanism												
Activity 2.1: Introduce a project steering group (PSG) The project steering group (PSG) will be established containing key institutions relevant for this project. The PSG will be consulted on a regular basis to provide inputs, feedback and approval to/of deliverables. Based on a stakeholder mapping and in agreement with the Ministry of Energy and Petroleum, a list of maximum 10 members will be established and Terms of Reference for this PSG will be drafted. The members will be officially invited to the PSG. Special attention will be given to the gender balance (objective of at least 30% female representation) of the PSG.												
Activity 2.2: Regular PSG meetings A 2-day project kick-off meeting will be organized. The first day will target a larger audience and will serve to provide context on the impact of SF6 and mitigation measures, the relevance for Kenya, and the objectives of this project. The second day will be organized with PSG members only, to discuss project objectives, activities, implementation modalities and next steps. This 2-day project kick-off meeting will take place in person in Nairobi. The first day will host up to 50 participants and no DSA will be paid. Special attention will be given to the gender balance (objective of at least 30% female representation) at the first day of the kick-off meeting. The second day will be limited to the 10 PSG members, and travel costs of participants from outside Nairobi will be covered (approx. 100 USD / person), but no DSA will be paid. Thereafter, at least three (3) more PSG meetings will be held in month 5, month 8 and month 11. These will serve to receive inputs for the activities, as well as feedback on and approval of deliverables. One of those PSG meetings will include a site visit to familiarize with These PSG meetings will generally be held in a hybrid manner with national stakeholders and consultants meeting in person and international consultants joining virtually. In-person participation of international consultants will be decided on an ad-hoc basis, but is limited to a maximum of two (2) international missions. Travel costs for participants from outside Nairobi will be covered (approx. 100 USD / person), but no DSA will be paid to the participants of the PSG meetings.												

Deliverables: Deliverable 2.1: PSG list (disaggregated by institution and gender), ToRs, invitation and confirmation Deliverable 2.2: Project kick-off meeting and PSG meeting materials and reports (incl. list of participants disaggregated by institution and gender)	x	x			x			x			x	
Output 3: Establishment of an SF6 inventory and MRV Framework												
Activity 3.1: Establish an SF6 inventory and future emissions projections This activity aims to develop an SF6 baseline in Kenya. Data collection will be conducted on the SF6-containing equipment currently in use, including the stock/banks of utilities, to establish a national inventory of equipment and SF6 in Kenya. SF6 emissions will be calculated, including for production, leakage rates during operation, as well as end-of-life. Furthermore, future SF6 emissions projections will be estimated based on the grid renewal and extension plans of Kenyan utilities (KETRACO, KPLC), as well as the operational lifetime of currently installed infrastructure.												
Activity 3.2: Develop an SF6 Monitoring, Reporting and Verification (MRV) Framework Based on the methodology of the above SF6 inventory, a Monitoring, Reporting and Verification (MRV) Framework will be developed for tracking SF6 installations, banks, emissions and reductions. This MRV framework will define activities to be carried out by utilities as well as private DISCOs on a regular basis to track SF6 installations, banks, emissions and reductions. This MRV Framework may be made mandatory as part of the regulatory recommendations under Activity 6.3.												
Activity 3.3: Capacity building on inventory and MRV A 1-day capacity building workshop with private and public sector entities will be organized to introduce the SF6 inventory methodology and MRV framework. This capacity building workshop is particularly targeting GHG inventory experts from the Ministry of Energy and Petroleum, and the National Environmental Management Agency (NEMA), as well as KETRACO, KPLC and private DISCOs and will host a total of maximum 30												

participants. The capacity building workshop will be held in person in Nairobi. Travel costs for participants from outside Nairobi will be covered (approx. 100 USD / person), but no DSA will be paid to the participants of this capacity building workshop. Special attention will be given to the gender balance (objective of at least 30% female representation) for the workshop.												
Deliverable 3: - Deliverable 3.1: SF6 Inventory, Projections and Methodology - Deliverable 3.2: MRV Framework - Deliverable 3.3: Capacity building material and report (including list of participants disaggregated by institution and gender)												
Output 4: Introduction of safe management of technologies using SF6												
Activity 4.1: Develop a guideline on safe management and disposal practices for technologies using SF6 This activity aims to review and enhance safety and sustainability measures for the installation, management and disposal of technologies using SF6. In terms of safe management, current practices and equipment for installation, repair, filling and recover process, as well as leakage detection will be mapped. A safe and sustainable management guideline will be developed including potential recommendations on management equipment. Furthermore, safe and sustainable disposal measures will be identified at the end-of-life stage of equipment. This safety and sustainability guideline may be made mandatory as part of the regulatory recommendations under Activity 6.3.												
Activity 4.2: Capacity building workshops with technicians, industry and installation partners on SF6 and management measures A 1-day capacity building workshop will be organized to introduce safe and sustainable management and disposal practices. This workshop is particularly targeting technicians, industry and installation partners of SF6 equipment and will host a maximum of 30 participants. The capacity building workshop will be held in-person in												

Nairobi. Travel costs for participants from outside Nairobi will be covered (approx. 100 USD / person), but no DSA will be paid to the participants of this capacity building workshop. Special attention will be given to the gender balance (objective of at least 30% female representation) for the workshop.												
Deliverable 4: - Deliverable 4.1: SF6 Management Guidelines - Deliverable 4.2: Workshop material and report (including a list of participants disaggregated by gender and institution)				x	x							
Output 5: Evaluation of appropriate SF6-free equipment options												
Activity 5.1: Mapping of SF6-free technology alternatives for medium and high voltage segments This activity will map the available and announced SF6-free technology options for medium and high voltage segments. Details will be provided on application areas, technical details (voltage, setup, weight, dimensions, sensors, etc.), norms, safety requirements, delivery and installation procedures, costs and related services.												
Activity 5.2: Technical feasibility of SF6-free technology options for medium and high voltage segments Based on the technology mapping of Activity 5.1, a technical feasibility assessment will be done to identify those SF6-free technology options that are aligned with the requirements of Kenyan utilities (KETRACO, KPLC), in terms of application areas, technical details, norms, safety requirements, delivery and installation procedures, and related services.												
Activity 5.3: Financial assessment of SF6-free technology options for medium and high voltage segments A financial assessment will be conducted for SF6-free technology options that meet technical requirements of Kenyan utilities (KETRACO, KPLC). This will be done at the example of typical installation setups in the medium and high voltage segment in Kenya. The capital expenditure (CapEx), operational expenditure (OpEx), and total cost of ownership (TCO) of SF6-free technology options and comparative technologies using SF6 will be assessed. This should include scenarios on integrating potential rising costs for SF6, as well as carbon pricing.												

Based on that, the CapEx, OpEx and TCO of both technology options will be compared.												
Activity 5.4: Prioritization of SF6-free technology options for Kenya On the basis of the technical feasibility and financial assessment, suitable SF6-free technology options will be identified and prioritized.												
Deliverables 5: - Deliverable 5: Technical and financial feasibility study							x					
Output 6: Development of a national SF6 phase-out roadmap and policy recommendations												
Activity 6.1: Review of international best practices for SF6 phase-out International best practices in terms of coordinating, managing and regulating the phase-out of SF6 and transition to SF6-free technologies will be reviewed.												
Activity 6.2: Development of a national SF6 phase-out roadmap A national SF6 phase-out roadmap for Kenya will be developed that provides a clear pathway to gradually phase out SF6 from Kenya's transmission and distribution grid and to transition the national grid to SF6-free technologies. Based on the insights from previous outputs and activities, the SF6 phase-out roadmap will include the following elements: - Baseline information on SF6 emissions and projections, types of equipment, etc. - SF6 reduction targets, e.g. for 2030, 2040 and 2050, in alignment with other national targets, strategies and policies - SF6 phase-out and management strategy for existing transmission and distribution grid - SF6-free technology deployment plan (replacement or new installations, which might vary between medium and high voltage segment) - Policy recommendations (see Activity 5.2)												

- Monitoring plan - Budget plan (investment and operations) - Timeline of activities - Responsibilities of different stakeholders A draft national SF6 phase-out roadmap will be made available for a public consultation period of one (1) month. At conclusion, a consultation workshop will be organized with the PSG as part of the periodic meetings. Thereafter, a final version will be developed.												
Activity 6.3: Provision of policy recommendations In conjunction with the national SF6 phase-out roadmap, policy and regulatory recommendations will be developed. Policy recommendations may include: - Amendment of national decarbonization targets with SF6-specific targets - Introduction of international standards - Mandatory SF6 inventory and MRV procedures - Introduction of safety and sustainability management guidelines of SF6-containing equipment - Procurement guidelines with TCO approach and integration of sustainability requirements This should result in 2–3-page policy briefs per recommendation for consideration by regulators.												
Deliverable 6: - Deliverable 6.1: Report on international best practices - Deliverable 6.2a: Draft SF6 Phase-out Roadmap - Deliverable 6.2b: Public consultation report - Deliverable 6.2c: Final SF6 Phase-out Roadmap - Deliverable 6.2: Policy briefs									X	X	X X	
Output 7: Preparation of SF6-free technology pilots												
Activity 7.1: SF6-free technology pilot plans												

SF6-free technology pilots for the high and medium voltage segment are planned to demonstrate the feasibility of SF6-free equipment in Kenya to contribute to the transition away from SF6. For that purpose, two (2) SF6-free technology pilots will be identified and prepared. Upcoming infrastructure installation plans will be reviewed with KETRACO, KPLC and REREC in order to identify the two (2) suitable projects. Suitability will be evaluated based on alignment with the prioritized SF6-free technology options (Activity 5.4), the complexity of the project, as well as the timeline. For the financing of these pilot projects, it is agreed that a cost comparison between SF6-containing and SF6-free equipment will be conducted. The base CapEx that would arise for the procurement of the SF6-containing equipment will be covered by the utility (KETRACO, KPLC, REREC) as usual, and any additional CapEx that may arise for the procurement of the SF6-free equipment will be covered through an external financial mechanism. The two (2) SF6-free technology pilot plans will include: - Project overview - Technical details - Budget plan - Confirmation of funding arrangements - Timeline for preparation, procurement, installation and training - Monitoring plan												
Deliverable 7: - Deliverable 7: Two (2) SF6-free technology pilot plans												X

4. Resources required and itemized budget:

Please provide an indicative overview of the resources required and itemized budget required to implement the CTCN technical assistance, including for M&E-related activities, using the table below. Important to note that minimum 1% of the budget should explicitly target gender specific activities related to the technical assistance (please see section 10 for further information on gender). Once the Response Plan is completed, a Response Implementation

partner(s) will be selected by the Climate Technology Centre (CTC). A detailed activity-based budget for the CTCN assistance will be finalized by the CTCN and selected Implementer.

Activities and Outputs	**Input: Human Resources** *(Title, role, estimated number of days)*	**Input: Travel** *(Purpose, national vs. international, number of days)*	**Inputs: Meetings/events** *(Meeting title, number of participants, number of days)*	**Input: Equipment/Material** *(Item, purpose, buy/rent, quantity)*	**Estimated cost** *Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan*	
					Minimum	**Maximum**
Output 1: **Development of implementation planning and communication documents**	*IE1: 5 days* *NE1: 5 days*				***3,500 USD***	***3,850 USD***
Activity 1.1: Formulation of i) Detailed work plan, ii) Monitoring and evaluation plan, iii) CTCN Impact Description, iv) Closure and Data Collection report.						
Output 2: Introduction of a Project Steering Mechanism	IE1: 8 days IE2: 5 days IE3: 5 days NE1: 8 days				***45,500 USD***	***49,940 USD***

	NE2: 5 days NE3: 5 days NE5: 5 days					
Activity 2.1: Introduce a project steering group (PSG)					*2,500 USD*	*2,750 USD*
Activity 2.2: Regular PSG meetings		International travel for IE1, IE2 and IE3 for the 2-day Project and PSG kick-off meeting (3-4 days) and for a maximum of two (2) further PSG meetings (2-3 days). Local travel for meeting participants and PSG members who are not based in Nairobi (2 days for kick-off and 1 day for PSG meetings). One local travel of the PSG will be organized for a site visit to a substation. This will be assessed together with the project stakeholders during implementation.	A 2-day in-person Project and PSG kick-off meeting. The first day will host up to 50 participants. The second day will host only PSG members (up to 10 participants). Travel costs for participants from outside Nairobi will be covered (approx. 100 USD / person), but no DSA will be paid to the participants. Three (3) more in-person PSG meetings will be held with the PSG members (up to 10 participants). Travel costs for participants from outside Nairobi will be covered		*42,900 USD*	*47,190 USD*

			(approx. 100 USD / person), but no DSA will be paid to the participants. One PSG meeting will include a site visit to a substation for which travel needs to be covered (approx. 100 USD / person).			
Output 3: Establishment of an SF6 inventory and MRV Framework	*IE1: 12 days* *IE2: 25 days* *IE3: 10 days* *NE1: 35 days* *NE2: 15 days* *NE3: 15 days*				***41,600 USD***	***45,760 USD***
Activity 3.1: Establish an SF6 inventory and future emissions projections					*15,500 USD*	*17,050 USD*
Activity 3.2: Develop an SF6 Monitoring, Reporting and Verification (MRV) Framework					*10,000 USD*	*11,000 USD*
Activity 3.3: Capacity building on inventory and MRV		Local travel for meeting participants and PSG members who are not	A 1-day in-person capacity building workshop will be held		*16,100 USD*	*17,710 USD*

		based in Nairobi. This will be assessed together with the project stakeholders during implementation.	with up to 30 participants. Travel costs for participants from outside Nairobi will be covered (approx. 100 USD / person), but no DSA will be paid to the participants.			
Output 4: Introduction of safe management of technologies using SF6	*IE2: 15 days* *NE1: 20 days* *NE2: 5 days* *NE3 : 20 days*				***21,100 USD***	***23,210 USD***
Activity 4.1: Develop a guideline on safe management and disposal practices for technologies using SF6					*10,000 USD*	*11,000 USD*
Activity 4.2: Capacity building workshops with technicians, industry and installation partners on SF6 and management measures		Local travel for meeting participants and PSG members who are not based in Nairobi. This will be assessed together with the project stakeholders during implementation.	A 1-day in-person capacity building workshop will be held with up to 30 participants. Travel costs for participants from outside Nairobi will be covered (approx. 100 USD / person), but no DSA		*11,100 USD*	*12,210 USD*

			will be paid to the participants.			
Output 5: Evaluation of appropriate SF6-free equipment options	*IE1: 17 days* *IE2: 35 days* *IE4: 17 days* *NE1: 30 days* *NE2: 12 days*				***42,900 USD***	***47,190 USD***
Activity 5.1: Mapping of SF6-free technology alternatives for medium and high voltage segments					*8,500 USD*	*9,350 USD*
Activity 5.2: Technical feasibility of SF6-free technology options for medium and high voltage segments					*14,000 USD*	*15,400 USD*
Activity 5.3: Financial assessment of SF6-free technology options for medium and high voltage segments					*14,500 USD*	*15,950 USD*
Activity 5.4: Prioritization of SF6-free technology options for Kenya					*5,900 USD*	*6,490 USD*

Output 6: Development of a national SF6 phase-out roadmap and policy recommendations	*IE1: 11 days* *IE2: 28 days* *IE3: 35 days* *IE4: 16 days* *NE1: 25 days* *NE2: 30 days* *NE4: 5 days*				***57,000 USD***	***62,700 USD***
Activity 6.1: Review of international best practices for SF6 phase-out					*7,000 USD*	*7,700 USD*
Activity 6.2: Development of a national SF6 phase-out roadmap					*33,000 USD*	*36,300 USD*
Activity 6.3: Provision of policy recommendations					*17,000 USD*	*18,700 USD*
Output 7: Preparation of SF6-free technology pilots	*IE1: 5 days* *IE2: 15 days* *IE4: 10 days* *NE1: 15 days*				***15,000 USD***	***16,500 USD***
Activity 7.1: SF6-free technology pilot plans					*15,000 USD*	*16,500 USD*
Estimated range of costing for the entire Response Plan					***226,500 USD***	***249,150 USD***

5. Profile and experience of experts

Based on the required Human Resources identified in section 4 (Resources required and itemized budget) please provide a description of the required profile of all involved experts for the implementation of the CTCN Response Plan.

Experts required	Brief description of required profile
International experts	
Project manager (IE1)	• Master's degree or higher in economics, project management, engineering, energy management or a related field • At least 10 years of experience in a lead role in implementing national and international development projects in the energy sector, such as grid infrastructure or renewable energy. • Experience with energy sector decarbonization, from research and energy/emissions modelling to decarbonization strategy development • Experience with coordinating and liaising with multiple national and international stakeholders • Experience in East Africa highly desirable
Energy specialist (IE2)	• Master's degree or higher in energy management, electrical engineering, or a related field • At least 10 years of experience with electricity grid (high and medium voltage) management and in particular electrical equipment using SF6 (switchgears, circuit breakers, etc.) • Experience with MRV, management and procurement desirable • Extensive knowledge of SF6-free technologies, prior involvement in the implementation of SF6-free technology projects is a plus • Prior experience in a developing country context is highly desirable
Policy expert (IE3)	• Master's degree or higher in political science, energy policy, climate change or a related field • At least 10 years of experience with energy policy development, in particular in the climate change context • Experience with the phase-out of environmental and climate-harming substances, in particular with F-gases / SF6 • Prior experience in a developing country context is highly desirable

Finance expert (IE4)	• Master's degree or higher in finance, economics or a related field • At least 10 years of experience with climate finance, in particular in the area of energy infrastructure • Experience in carrying out economic feasibility studies and developing financing mechanisms • Prior experience in a developing country context is highly desirable
National experts	
Energy specialist (NE1)	• Master's degree or higher in energy management, electrical engineering, or a related field • At least 7 years of experience with electricity grid (high and medium voltage) management and in particular electrical equipment using SF6 (switchgears, circuit breakers, etc.) • Experience with electricity grid management and procurement • Extensive knowledge about the energy sector in Kenya • Based in or close to Nairobi, Kenya
Policy expert (NE2)	• Master's degree or higher in political science, energy policy, climate change or a related field • At least 7 years of experience with energy policy development, in particular in the climate change context • Experience with the phase-out of environmental and climate-harming substances, in particular with F-gases • Extensive knowledge of regulatory environment in the Kenyan energy sector • Based in or close to Nairobi, Kenya
Capacity building expert (NE3)	• Bachelor's degree or higher in economics, energy management, social sciences or related fields • At least 7 years of experience in capacity building and skills development in the area of climate change • Experience with developing and leading technical trainings in the energy sector • Based in or close to Nairobi, Kenya
Project coordinator (NE4)	• Master's degree or higher in political science, energy policy, climate change or a related field • At least 7 years of experience in the area of climate change policy and management • Experience with coordinating multi-stakeholder projects and working with international organizations (such as UN) • Extensive knowledge of the energy sector stakeholder landscape in Kenya

	• Based in or close to Nairobi, Kenya

6. Intended contribution to impact over time

Please provide a brief description of the intended contribution to impact over time of the outcome and outputs provided by this technical assistance on resilience to climate change and/or carbon abatement. To the extent possible, please quantify the intended impact contribution, for example by indicated estimated number of people potentially impacted over time, GDP contribution of the focus sector, carbon emissions by the focus sector, etc. This intended contribution to impact is what will happen if the objective (as articulated in section 3) is met. Please ensure relevant complementarity with text in sections 7 to 12. (maximum 1250 characters including spaces)

As defined above, the objective of the technical assistance is to establish the enabling environment for SF6-free technology uptake and the phase-out of SF6 in Kenya. The enabling environment will be strengthened through transparent and frequent SF6 inventories, supportive regulatory measures and an ambitious SF6 phase-out roadmap with pilot demonstration projects.

Over time, this strengthened enabling environment will lead to the gradual phase-out of SF6 in Kenya. As SF6 is extensively used in a strongly growing electricity grid in Kenya, and SF6 being the most potent GHG with a global warming potential of 25,200, the phase-out will lead to a significant GHG emissions reduction and avoidance.

7. Relevance to NDCs and other national priorities

Please identify relevance and contribution from the technical assistance to the Nationally Intended Contributions (NDC) and other relevant national prioritized efforts (TNAs, TAPs, NAPs, NAMAs, etc.). (maximum 2500 characters including spaces)

The technical assistance contributes to Kenya's NDCs and key national plans and strategies as below:

Kenya's updated NDCs prioritize the following mitigation actions:

- Increasing of renewables in the electricity generation mix of the national grid
- Enhancement of energy and resource efficiency across the different sectors

Link: https://unfccc.int/sites/default/files/NDC/2022-06/Kenya%27s%20First%20%20NDC%20%28updated%20version%29.pdf

The 2013 TNA on mitigation prioritized renewable energy technologies, including solar home systems and solar dryers.

Link: https://tech-action.unepccc.org/wp-content/uploads/sites/2/2013/12/technologyneedsassessmentreport-mitigation-kenya-13.pdf

Kenya has the ambition to achieve 100% renewable power by 2030 and to fuel the green industries of the future by 2040.

Link: https://www.irena.org/News/pressreleases/2023/Sep/Kenya-Spearheads-Landmark-Renewable-Energy-Initiative-at-Africa-Climate-Summit#:~:text=At%20the%20launch%20event%2C%20President,make%20this%20ambition%20a%20reality

8. Linkages to relevant parallel on-going activities:

Please identify relevant previous and ongoing public and private sector initiatives, projects or programmes that the CTCN assistance will specifically build on and contribute to. To the extent possible, please add practical and operational details on the linkages between existing activities and the CTCN assistance. (maximum 2500 characters including spaces)

Kenya has set ambitious targets for decarbonizing the national energy sector, aiming to achieve 100 % renewable power by 2030. To reach this target, large scale grid infrastructure projects will be implemented in the coming years to connect new renewable energy sources to consumers. KETRACO's plan for the period 2023-2027 is the establishment of 13 new substations and 1,407 km of additional circuit length. Up to 2032, 38 new substations and 5,745 km of circuit length are planned to be established. KPLC also has ambitious extension plans (13 new substations) in the medium-voltage segment to satisfy urban energy demand and electrification of sectors such as mobility (electric vehicles and busses).

Emissions resulting from the use of SF6 in electricity grids have not been on the national monitor yet, and no SF6-free equipment has been installed so far. Kenya has participated in the CTCN capacity building workshop on SF6 in July 2023 in Berlin, Germany. Following the expression of interest of the Ministry of Energy and Petroleum, a stakeholder workshop was organized in Nairobi to raise awareness on the topic of SF6. Through this project, the enabling environment for SF6 phase-out will be established and the first SF6-free equipment pilot projects will be prepared.

9. Anticipated follow up activities after this technical assistance is completed:

Please describe the expected future use of the outputs and deliveries produced by this technical assistance, after the CTCN implementation is completed, towards contributing to the anticipated impacts over time articulated in section 6. For example, what organizations or stakeholders will use the outputs of the technical assistance after it is completed, for what purpose, at what scale and scope the outputs and deliveries will be applied, when and what will be the next steps undertaken, etc. (maximum 2500 characters including spaces)

Upon completion of the technical assistance, the following activities will need to be conducted:

- Finalization and adoption of regulatory recommendations to manage and phase-out SF6
- Operationalization of the MRV activities for SF6
- Regular SF6 emissions inventory and integration of SF6 in the national GHG emissions accounting
- Implementation of the SF6 phase-out roadmap
- Implementation of the two (2) SF6-free equipment pilot projects for medium and high voltage segments, including finalizing financing agreements, conducting procurement, infrastructure implementation, monitoring and reporting
- Adoption of new procurement protocols that integrate sustainability in procurement criteria
- Adoption of new safe and sustainable SF6 management practices
- Continuous capacity building and training on SF6 impacts, SF6 emissions reduction measures, and SF6-free equipment

10. Gender and co-benefits:

Imbedded in design of the activities:	*A gender mainstreaming analysis is mandatory to include for all technical assistances. A gender expert will be assigned to carry out an assessment and*

	evaluation regarding gender mainstreaming during the implementation of the TA. *In addition, please describe all support to gender aspects, women's equality and other co-benefits embedded into the Response Plan (please include a reference to the actual activities and outputs as described in section 3).* Throughout the technical assistance, gender mainstreaming will be embedded in the activities in the following way: - The Project Steering Group (PSG) will be composed considering gender balance (objective of 50% female representation) - The capacity building workshops on MRV as well as safety and sustainability management practices of SF6-containing equipment will aim for a gender balance amongst beneficiaries (objective of 50% female representation)
Gender and co-benefits intended as result of the activities:	*Please describe all gender aspects, women's equality and other co-benefits expected as a result of the CTCN technical assistance.* The results of this project will allow a low-carbon electricity grid management and development which will reduce overall GHG emissions. Even though there are no direct benefits for women's equality, there are significant climate impact and health benefits resulting from this technical assistance that have a positive impact on women and youth.

11. Main in-country stakeholders in implementation of the technical assistance activities:

Using the table below, please list and describe the role of in-country stakeholders, participants and beneficiaries who will be involved in or directly consulted during implementation of the assistance.

In country stakeholder	Role in implementation of the technical assistance
Kenya Industrial Research and Development Institute (KIRDI) ***CTCN National Designated Entity***	KIRDI will act as the main focal point in this technical assistance with the role to facilitate the implementation, support stakeholder engagement, facilitate data collection, and provide regular feedback on activities and deliverables.
Ministry of Energy and Petroleum (Request Applicant)	Project coordination support, stakeholder engagement facilitation, energy data provision, feedback on deliverables, custodian of SF6 phase-out roadmap and policy recommendations, recipient of capacity building
Energy and Petroleum Regulatory Authority	Custodian of regulations and policies resulting from the recommendations of this technical assistance
Kenya Electricity Transmission	Infrastructure data provision, feedback on

Company (KETRACO)	deliverables, pilot project partner, recipient of capacity building
Kenya Power and Lighting Company (KPLC)	Infrastructure data provision, feedback on deliverables, pilot project partner, recipient of capacity building
Rural Electrification and Renewable Energy Corporation (REREC)	Infrastructure data provision, feedback on deliverables, pilot project partner, recipient of capacity building
National Environmental Management Agency (NEMA)	Feedback on deliverables, recipient of capacity building
Kenya Electricity Generating Company Ltd. (KenGen)	Infrastructure data provision, feedback on deliverables, pilot project partner, recipient of capacity building
Private DISCOs	Infrastructure data provision, recipient of capacity building
Equipment installation and maintenance providers	Information provision on installation and maintenance, recipient of capacity building
Industrial companies	Infrastructure data provision, pilot project partner, recipient of capacity building

12. SDG Contributions:

*Instructions: Please complete the grey section below for **a maximum of three SDGs** that will be advanced through this TA. A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/.*

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	
3	Ensure healthy lives and promote well-being for all at all ages	
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	
5	Achieve gender equality and empower all women and girls	
6	Ensure availability and sustainable management of water and sanitation for all	
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	
	7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services	
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	
	7.3 - By 2030, double the global rate of improvement in energy efficiency	
	7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	The SF6 phase-out roadmap and pilot demonstration projects will significantly contribute to the promotion of investment in clean energy infrastructure.

	7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
10	Reduce inequality within and among countries	
11	Make cities and human settlements inclusive, safe, resilient and sustainable	
12	Ensure sustainable consumption and production patterns	
13	Take urgent action to combat climate change and its impacts	*All TAs should indicate relevance to Goal 13 and at least one target below (13.1 to 13.b).*
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	
	13.2 - Integrate climate change measures into national policies, strategies and planning	The SF6 phase-out roadmap will set ambitious targets of SF6 reduction which will lead to a low-carbon infrastructure planning of national utilities.
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	
	13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	
	13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	

13. Classification of technical assistance:

Please indicate primary type of technical assistance. Optional: If desired, indicate secondary type of technical assistance.

Please tick off the relevant boxes below	*Primary*	*Secondary*
☐ 1. Decision-making tools and/or information provision	☐	☐
☐ 2. Sectoral roadmaps and strategies	x	☐
☐ 3. Recommendations for law, policy and regulations	☐	☐
☐ 4. Financing facilitation	☐	x
☐ 5. Private sector engagement and market creation	☐	x
☐ 6. Research and development of technologies	☐	☐
☐ 7. Feasibility of technology options	☐	x
☐ 8. Piloting and deployment of technologies in local conditions	☐	x
☐ 9. Technology identification and prioritisation	☐	☐

Please note that all CTCN technical assistance contributes to strengthening the capacity of in country actors.

14. Monitoring and Evaluation process

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance; and (iii) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.

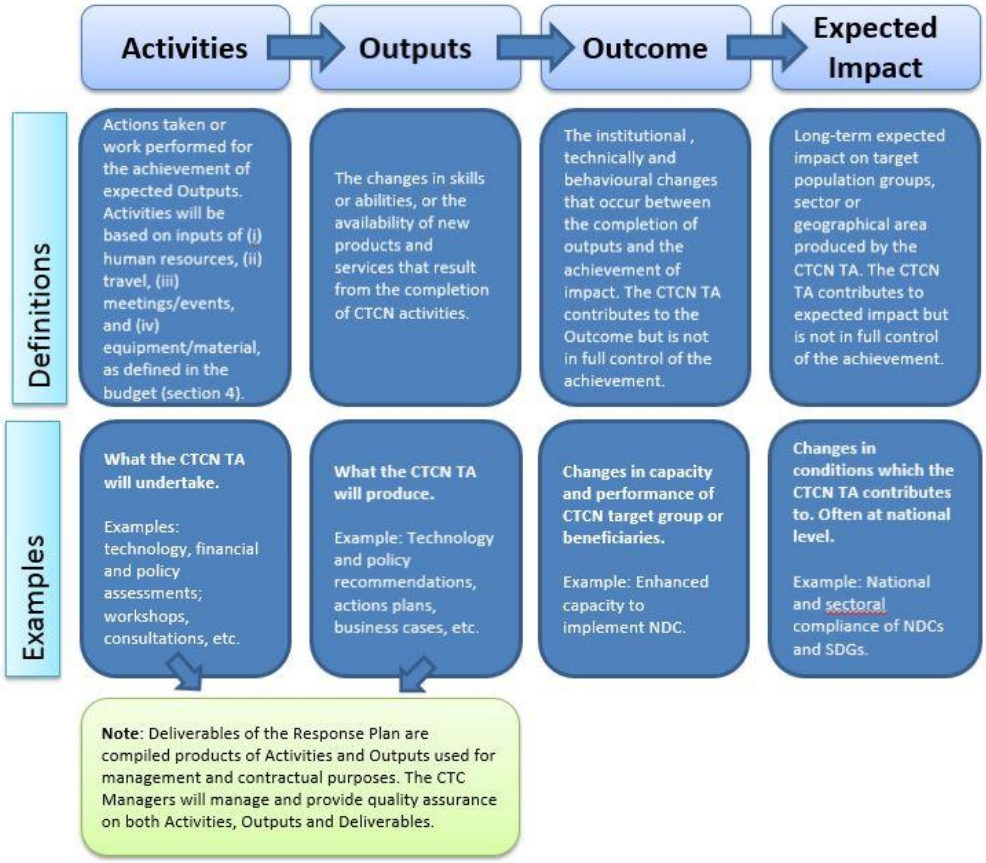
Annex 1: Guidance note for designing a Response Plan (to be deleted when submitting the Response Plan)

1. Objective of the Response Plan

The Response Plan is developed by CTCN specialists in response to a country request for technical assistance. It constitutes the Terms of Reference of the CTCN technical assistance that will be provided to the country and it provides the formulation of and subsequent basis for the monitoring and evaluation of the Response Plan implementation, as well as its expected outcomes and anticipated impacts.

2. Results chain and Logical Framework Approach to be defined in the CTCN Response Plan

The result chain is the causal sequence that stipulates the necessary flow of actions and processes to achieve desired objectives and results – beginning with inputs, moving through activities and outputs, and culminating in individual outcomes. The outcome will contribute to the desired impact in the society. The Logical Framework Approach is an analytical process used to support objectives-oriented project planning and management. It provides a set of pre-defined concepts which are used as part of an iterative process to aid structured and systematic analysis and management of the CTCN technical assistance.



3. Role of the Response Planning Design Team

The Response Planning Design Team is selected by the Climate Technology Centre (CTC). The composition of the team depends on each particular request but may include the National Designated Entity (NDE), the request Proponent, Climate Technology Manager of the CTCN, experts from the CTCN Consortium, UNIDO and UNEP experts from regional offices and other experts as needed.

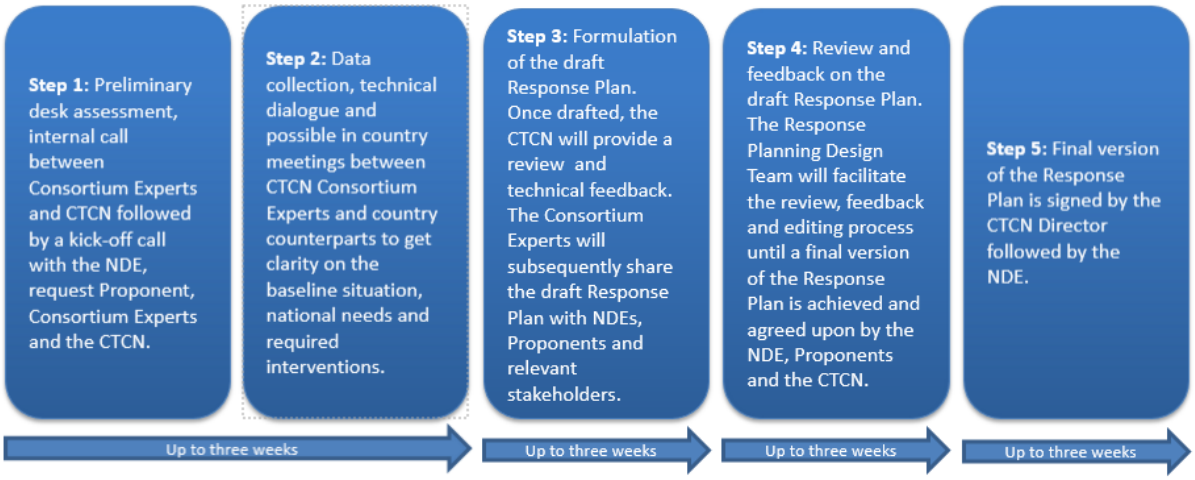
The role of CTCN Consortium experts is to lead the design of the Response Plan. The NDE will provide overall guidance on national context and priorities whereas the request Proponent will provide more detailed information on the sector, barriers and requested assistance. The Climate Technology Manager of the CTCN will provide quality assurance of timeliness and appropriateness of the Response Plan.

The Response Planning Design Team will draft all sections of the Response Plan template building on the information contained in the CTCN Request, based on expertise on the given topic and potentially further data collection, as required. This will be done by the CTCN Consortium Experts in consultation with the NDE, request Proponent and relevant stakeholders. The Response Plan has to be agreed to and approved by the NDE and the CTCN Director. This Response Plan will serve as the basis to identify, select and engage an expert institution from the Climate Technology Network or Consortium to lead the implementation of the CTCN Response Plan in the requesting country.

To the extent possible, staff from UNEP and UNIDO Regional, Sub-Regional and/or National Offices should be involve in all stages of formulation of the Response Plan to maximize synergies and avoid overlap with ongoing initiatives, as well as ensure relevance to regional and national context.

4. Process for designing the Response Plan

The Response Planning process should be completed over a period of up to 60 working days (12 weeks). Indicative steps and related timelines are laid out below:



5. Design Considerations

Annex 1. Guidance Note for the Response Plan template

In order to maximize the impact of the technical assistance provided by the CTCN and provide an effective M&E process, the Response Plan should integrate as much as possible the considerations below:

Climate Technology focus: The Response Plan should have a clear focus on climate technologies, and identify activities that enable the identification, development, deployment or diffusion of one or several specific technologies (including equipment, techniques, knowledge and skills).

Barrier removal / Problem solving: The activities should contribute to address the specific problem statement identified in the Request. The barriers identified should be those hampering the identification, development, deployment or diffusion of one or several climate technologies or climate actions. Therefore, it may be necessary to limit the CTCN Response Plan to a set of activities for technical assistance commonly agreed with the NDE (and Proponent when needed) compared to the original request submitted. The CTCN will liaise with NDEs and Proponent in case the scope of the technical assistance deviates from the original request.

Use of the CTCN assistance by stakeholders: The Response Plan should identify clearly how the products of the CTCN assistance will be used in the short term once support is delivered, by who and when, to ensure it will lead to specific impacts in the country. The activities should engage the stakeholders that will use the concrete results of the assistance to deploy the technologies, including from the private sector, the public sector, research institutions, etc.

Within the scope of CTCN resources: The cost of the technical assistance provided by the CTCN cannot exceed USD 250,000 per Response Plan. Therefore, it may be necessary to prioritize activities and limit the CTCN Response Plan to a set of priority activities commonly agreed with the Proponent and the NDE to remain under this value. Under section 4 of the Response Plan template, an indicative activity based budget should be presented. The proposed budget is indicative and should present an estimated costing range per activity, output as well as a total costing range for the delivery of the Response Plan. Once the Response Plan is finalised and published for tendering, interested parties will provide competitive offer against the indicative budget.

CTCN activities and outputs should be linkable to monitoring and evaluation indicators: All proposed activities and outputs must be linkable to monitoring and evaluation indicators that are specific, measurable, achievable, relevant, and time-bound. The monitoring and evaluation process and corresponding indicators will be developed by the Lead Implementer as part of the work plan and will allow the CTCN technology Manager to monitor the timeliness and appropriateness of the implementation.

Synergies with existing efforts: The Response Plan should focus on activities that are not already being fully supported or that are in the process of being fully supported by another national, regional or international organization. Synergies and complementarity also require that the CTCN assistance is not duplicating past activities. It is possible in the Response Plan to indicate co-financing from the government, the Proponent or another stakeholder, that will maximize the effectiveness of the CTCN assistance.

Gender mainstreaming: The CTCN mission is to build or strengthen developing countries' capacities to identify technology needs, to facilitate the preparation and implementation of technology projects and strategies taking into account gender considerations. The Response Plan must therefore describe how gender considerations will be included and monitored within the proposed activities, and any gender co-benefits that will be gained as a result of implementing the CTCN technical assistance.

Comments.

i. We agree with the Response plan in general and feel that it covers the aspirations of the project.

ii. Gender;

- The Constitution of Kenya has a representativeness threshold which states that not more than 70% of representatives should be of one gender
- The 50% gender representation requirement might be hard to enforce as it may mean asking the agencies to appoint women to the committee. We however commit to encourage the participation of women and ensure where an organization nominates more than one person, then adequate gender representation is maintained
- Does the 50% women requirement also apply to the experts (IE and NE) who will be procured to support the assignment or only to Kenyans
- The proposed constitution of the PSG. 50% women would entail specifically asking some agencies to nominate women

Agency	**Representatives**
1) MoEP	3
2) KPLC	2
3) KETRACO	2
4) EPRA	1
5) NEMA	1
6) KIRDI or KEBS	1
Total	**10**

iii. Project Steering Group (PSG)

Meetings; All the PSG meetings are proposed to be held in Nairobi. We'd like to propose that these meetings are held in various regions across the country so that they also serve as familiarization capacity building events for the PSG. Each meeting can take 3 days (including travel days).

Meeting	**Dates**	**Venue**	**Features**
Kick-off		Nairobi	Theory and Workplan finalization
Meeting 1		Eastern Region	Transmission Infrastructure
Meeting 2		Coast Region	Renewable Energy Infrastructure
Meeting 3		Western Region	Distribution Infrastructure Solar minigrid

Each organization could sponsor its staff with DSA while CTCN caters for transport and venues.

iv. –: