



Technical Assistance Closure Report Template

Objective of the technical assistance (TA) Closure Report:

- To communicate publicly in one document a summary of progress made and lessons learned during the TA towards the anticipated impact (sections 1-4).
- To document qualitative and quantitative data collected during TA, for use in donor and UN reporting (Annex 1).

Steps for completing the TA Closure report:

1. The lead TA implementer submits the closure report at the end of the technical assistance as a final deliverable. The TA closure report will capture outputs, outcomes and impacts of all activities conducted under the TA. Please copy and summarise relevant material from previous TA outputs/deliverables and the Response Plan, as relevant.
2. A CTCN Manager will review and revise the closure report before final approval by the CTCN Deputy Director.

Important note on public and internal use of the closure report:

Once approved by the CTCN Deputy Director, the TA closure report will be a public document available on the CTCN website www.ctc-n.org. Selected content will be used for targeted communication activities. Annex 2 is for internal use only and will not be publicly available.

Closure Report for CTCN Technical Assistance

1. Basic information

Title of response plan	Develop Capacity for Determining and Unlocking Untapped Demand-Side Potential in South Africa
Technical assistance reference number	2021000022
Country / countries	South Africa
NDE focal point and organisation	Department of Science and Innovation (DSI) Dr Henry Roman Director: Environmental Services and Technologies Henry.roman@dst.co.za 627 Meiring Naude Rd Brummeria Pretoria South Africa
Proponent focal point and organisation	Council for Scientific and Industrial Research (CSIR) Dr Peter Mukoma Principal Researcher: Energy Efficiency and Demand Response pmukoma@csir.co.za 627 Meiring Naude Rd Brummeria Pretoria

	South Africa
Designer of the response plan	National Renewable Energy Laboratory (NREL) Jal Desai, Dr Killian McKenna 15013 Denver West Parkway Golden, CO 80401 303-275-3000
Implementer(s) of technical assistance	<i>Instruction: Implementers and other partner organisations are defined as the people and institutions engaged in the implementation of the TA</i> National Renewable Energy Laboratory (NREL) Jal Desai, Dr Killian McKenna 15013 Denver West Parkway Golden, CO 80401 303-275-3000
Beneficiaries	<i>Instruction: Beneficiaries are defined as people and institutions benefitting from the TA</i> Council for Scientific and Industrial Research (CSIR) Dr Peter Mukoma Principal Researcher: Energy Efficiency and Demand Response pmukoma@csir.co.za 627 Meiring Naude Rd Brummeria Pretoria South Africa Also: Eskom, South African National Energy Development Institute,
Sector(s) addressed	<i>Energy Efficiency and Renewable Energy</i>
Technologies supported	<i>Instruction: Please indicate the type of technologies supported by this assistance. Technologies may be identified from the CTCN taxonomy of climate sectors and technologies (download in pdf format and choose from column C): https://www.ctc-n.org/resources/ctcn-taxonomy</i> <i>If technologies supported are not found in the taxonomy, please suggest.</i> <i>Identified:</i> <i>Energy efficiency – energy distribution – smart grid</i> <i>Energy efficiency – appliances and equipment – residential water heating</i> <i>Renewable energy – solar – solar water heater</i> <i>Suggested:</i> <i>Energy efficiency – energy distribution – demand side management</i> <i>Energy efficiency – energy distribution – resilient energy systems</i>



Implementation period and total duration in months	18 months contract (12 months for implementation)
Total budget for implementation	\$250,000
Description of delivered outputs and products as well as the activities undertaken to achieve them. In doing so, review the log frame of the original response plan and refer to it as appropriate	<p><i>The following activities were completed:</i></p> <p>Output 1: Development of implementation planning and communication documents</p> <p>Activity 1: Detailed Work Plan, CTCN Impact Description, Closure and Data Collection</p> <p>Deliverable 1: i) Detailed work plan, ii) Monitoring and evaluation plan, iii) CTCN Impact Description, iv) Closure and Data Collection report</p> <p>Output 2: Characterization of Load Sectors and End-Use in South Africa and Current DSM Programs</p> <p>Activity 2.1: Identifying DSM Programs currently established in South Africa</p> <p>Activity 2.2: Evaluation of the DSM Capacity required in South Africa</p> <p>Activity 2.3: Examining DSM Examples from around the World</p> <p>Deliverable 2: Report (5-10 pages) detailing characterization of load sectors and end-use in South Africa and current DSM programs</p> <p>Output 3: Identifying Untapped Potential and Applicable DSM Schemes for Under-Utilized Load Sectors</p> <p>Activity 3.1: Identifying Underutilized Load Sectors</p> <p>Activity 3.2: Identifying Underutilized Load Sector End-Use DR Potential</p> <p>Deliverable 3: Report (5-10 pages) Detailing Identifying Untapped Potential and Applicable DSM Schemes for Under-Utilized Load Sectors</p> <p>Output 4: Modeling and Characterizing Specific Demand Response Schemes, Identifying the Potential Available Capacity and Response</p> <p>Activity 4.1: Choosing 1-2 Maximum Benefit DR Opportunities</p> <p>Activity 4.2: Detailed Quantification and Modeling of 1-2 Maximum Benefit DR Opportunities</p> <p>Deliverable 4: 5-10 page Report Detailing Modeling and Characterizing Specific Demand Response Schemes, Identifying the Potential Available Capacity and Response</p> <p>Output 5: Establish High-Level Steps Required to Implement and Pilot Identified DR Program</p> <p>Activity 5.1: Examining High-Level Steps to Implement DR Pilot Program</p> <p>Activity 5.2: Capacity Building on DR Program</p> <p>Deliverable 5: 5-10 page Report Outlining High-Level Steps Required to Implement and Pilot Identified DR Program</p>
Methodologies applied to produce outputs and products	<p><i>Instruction: Examples of methodologies: E.g. cost-benefit analysis; surveys and structured interviews with key stakeholders etc.</i></p> <p><i>Analysis of Eskom load data, Time-series load sector and end-use modelling, stakeholder engagement discussions, literature reviews, DR modelling.</i></p>
Deviations	<p><i>Instruction: Please describe any deviations from the response plan against the actual implemented activities, outputs and products</i></p> <p>Only significant deviation from the response plan was a lack of participation from a municipality utility until the end of the project (i.e., in-country training and</p>

	<p>dissemination included municipality utility participation). Stakeholders were requested to bring a municipality to meetings but did not feel engagement was appropriate until project end. SANEDI and DMRE were included and participated as more regular stakeholders which was a positive development and not anticipated in the original response plan.</p>
<p>Anticipated follow-up activities and next steps</p>	<p><i>Instruction: Please describe planned follow-up activities after completion of technical assistance, including information on involved stakeholders and anticipated timelines.</i></p> <p>Sharing of reports with stakeholders and continued engagement with CSIR as they scope funding to achieve a pilot project of the identified DR program.</p>

2. Lessons learned

	Lessons learned	Recommendations
<p>Lessons learned from the CTCN TA process</p>	<p><i>Describe lessons learned from following the steps of the TA process and interacting with the CTCN Secretariat. What were the challenges and essential factors contributing to successful implementation</i></p> <ul style="list-style-type: none"> • Successful implementation was due to very high-levels of participation from stakeholders. 	<p><i>Recommendations include</i></p> <ul style="list-style-type: none"> • Steps which could be taken to improve the CTCN TA process • Considerations for increased success of similar efforts (i.e. regulatory, legal, stakeholders, communication, etc.) • Overall this project had excellent stakeholder engagement with regular participation from CSIR, Eskom, DMRE, and SANEDI. • More regular participation of the NDE throughout the project may have been beneficial.
<p>Lessons learned related to climate technology transfer</p>	<p><i>Describe lessons learned, opportunities, and barriers for the use and deployment of the technology or technologies supported by the TA. The objective is to identify specific success factors for technology transfer</i></p> <ul style="list-style-type: none"> • Barriers to implementing the TA included funding proposed pilot programs and participation of a municipal utility. 	<p><i>Recommendations include</i></p> <ul style="list-style-type: none"> • Risk mitigation measures • Identified opportunities for over-coming barriers • Long-term sustainability (e.g. building endogenous capacities, funding opportunities, etc.) • Identifying more direct personnel to benefit from capacity building and training in addition to CSIR. • Greater assistance from partners and CTCN in



		identifying partner follow-on funding.
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3. Illustration of the TA and photos

For communication purposes, please provide 2-4 Power Point slides, including illustrations or charts, describing barriers, opportunities, methodology, activities, outputs and achieved results. The illustrations must be copied into the TA Closure report but must also be delivered as power point files. Also, please provide at least five high-resolution pictures in jpg format, capturing technical assistance. The pictures should illustrate how the TA has impacted the lives of the beneficiaries in particular and the communities in general.



Characterization of Load Sectors and End Use in South Africa and Current Demand-Side Management Programs

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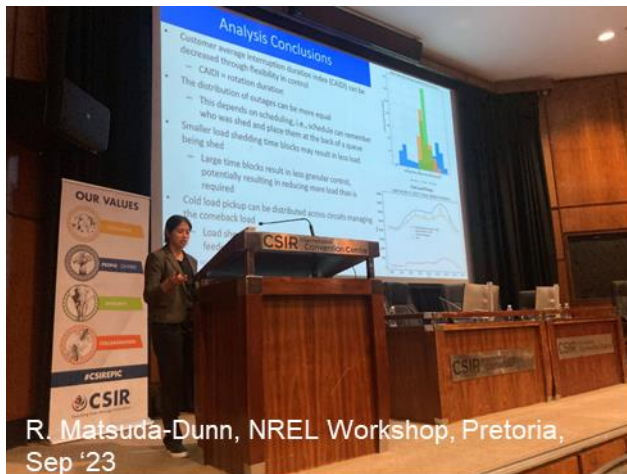
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R. Matsuda-Dunn, NREL Workshop, Pretoria, Sep '23

4. Impact Statement

The information in the table below will be used to communicate results and anticipated impacts of this technical assistance publicly. Please copy information from impact statement developed in the M&E Plan and update as relevant.

Challenge	Approx. 500 characters with spaces
CTCN Assistance	<p>2 to 4 bullet points. Approximately 450 characters with spaces</p> <ul style="list-style-type: none"> • South Africa is currently seeing electricity supply shortages and widespread load shedding and has implemented significant industrial demand-side management programs. • The National Renewable Energy Laboratory, provided technical assistance to the Council for Scientific and



	<p>Industrial Research to examine the potential benefits of untapped demand-side management.</p> <ul style="list-style-type: none"> • NREL identified end-uses and demand response programs suited to provide flexibility and reduce energy consumption.
<p>Anticipated impact</p>	<p><i>2 to 4 bullet points to summarise anticipated impact. Approximately 250 characters with spaces. As a minimum, please include at least one of the core impact indicators from the closure report Annex.</i></p> <ul style="list-style-type: none"> • This project helped • -quantify the value of residential and commercial DSM to alleviate the energy crisis • -and provide demand reductions in addition to help provide alleviation to capacity shortages from demand-side flexibility.
<p>Co-benefits: Achieved or anticipated co-benefits from the TA</p>	<p><i>Instruction: Please indicate expected co-benefits as described in the response plan and in the relevant deliverables</i></p> <ul style="list-style-type: none"> • DSM energy efficiency programs can help reduce energy consumption from carbon intensive coal-fired generation • DR can help reduce the economic impacts of load shedding and help keep critical infrastructure energized • Roll-out of AMI can help facilitate distributed generation (e.g., solar PV)
<p>Gender aspects of the TA</p>	<p><i>Instruction: Please indicate if technical assistance was supported by a gender analysis. Describe gender aspects identified and additional considerations taken to mainstream gender (e.g. equal participation in trainings, gathering of gender-disaggregated data, etc.).</i></p> <ul style="list-style-type: none"> • Gender impacts of current DSM programs and consideration of the proposed pilot were taken into consideration. • Gender-disaggregated data was not available.
<p>Anticipated contribution to NDC</p>	<p><i>2 to 4 bullet points. Approximately 350 characters with spaces</i></p> <ul style="list-style-type: none"> • Approximately 90% of South Africa’s electricity generation comes from coal-fired power plants that account of roughly 80% of the country’s total emissions. • Demand-side management that achieves energy efficiency will reduce emissions from this highly carbon intensive electricity generation mix. • Using DSM to flatten the load profile should also enable inefficient peaking generation to reduce.
<p>The narrative story</p>	<p><i>Approximately 1200 characters with spaces</i></p> <p><i>Please provide a brief description of the background and context for the technical assistance. Describe the main problems and barriers for</i></p>

	<p><i>climate change mitigation and/or adaptation in terms of climate technologies that the CTCN technical assistance will address</i></p> <p>South Africa is currently seeing electricity supply shortages that have resulted in widespread load shedding for the country. ESKOM, South Africa’s major public electricity utility, has already implemented significant capacity industrial demand-side management (DSM) programs that have helped provide peak load alleviation and flexible capacity. Beyond the current activities, DSM approaches have a high potential to provide flexibility to balance and reduce energy consumption.</p> <p>The CTCN through its Consortium Partner, the U.S. National Renewable Energy Laboratory (NREL), provided technical assistance to examine the potential benefits of demand-side management measures that could be provided by the commercial and residential load sectors. NREL identified end-uses and associated DR that are best suited to provided flexibility, reducing energy consumption and quantified the potential capacity of these commercial and residential DR. NREL also provided considerations for ESKOM and CSIR to implement a pilot project to demonstrate DR in the field. Training and capacity building at CSIR and ESKOM was provided in this project.</p>
<p>Contribution to SDGs</p> <p>A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/</p>	<p><i>To the extent possible, please describe contribution to approximately 3 SDGs, including SDG13, with a few sentences for each SDG concerned.</i></p> <ul style="list-style-type: none"> • (1) No Poverty: Reducing the impact of the current energy crisis will help electrification of impoverished communities in South Africa and improve economic output. • (10) Reduced Inequalities: Moving to a more distributed and equal in outcome load shedding paradigm could help reduce inequality in South Africa, where low-income communities may be load shed unequally. • (3) Good health and well-being: Targeted load shedding could help keep more critical infrastructure energized during periods of supply shortages. • (7) <i>Affordable and Clean Energy: Reformed load shedding will provide energy access.AMI will enable greater solar rooftop deployment</i>



Annex 1 Technical assistance data collection

Please add quantitative and qualitative values for the indicators selected in the M&E plan and monitored throughout the technical assistance in the tables below. Indicators which have been monitored in addition to the proposed indicators below may be added at the end of table A. Non-relevant indicators should be left blank.

A. Output and outcome indicators

Indicator	Quantitative value Value and unit	Qualitative description List the various elements corresponding to the quantitative value as well as timelines and responsible institutions
Please note indicators below highlighted as anticipated		
Number of communication and outreach activities conducted by proponents and implementing partners to showcase CTCN support	<i>Total number of communication and outreach activities</i> 1	<i>A total of a 5 days of meetings and training</i> <i>This excludes the bi-weekly meeting that the implementer had with the project proponent and various stakeholders for project updates and capacity building</i>
Number of participants in the events above	30	
a) Number of men	25	<i>Includes one male from NREL (implementing partners)</i>
b) Number of women	5	<i>Includes one female from NREL (implementing partners)</i>
Number of training sessions and capacity strengthening activities	Four (4) virtual training sessions plus two (2) full days of in-person training	<i>Virtual Training Sessions on tools; AMI use-cases, Battery Storage, SAM, and ReOpt. In-person training on SAM, ReOpt, NSRDB, RE Data Explorer, EnergyPlus, BeOpt, Modelica, ResStock, ComStock, and DSM</i>
Number of people who received the training		
a) Number of men	24	Excluding NREL trainer
b) Number of women	4	Excluding NREL trainer
Total number of institutions trained	7	
a) Number of research organisations, laboratories and universities	2	Council for Scientific and Industrial Research (CSIR), the South African National Energy Development Institute (SANEDI)
b) Number of private companies	-	-
c) Number of cities and local government	-	-
d) Number of communities	-	-
e) Number of ministries	2	Department of Mineral Resources and Energy (DMRE), and the

		Department of Science and Innovation
f) Number of specialised governmental institutions	1	Eskom (Utility)
g) Number of non-profit organisations	2	Municipal utilities (City of Johannesburg and Nelson Mandela Bay Municipal)
Percentage of participants reporting satisfaction with CTCN training (from CTCN training feedback form)	The project proponent was very happy with the deliverables and in-person training workshop.	<i>Satisfied= 3+ on 5-pt scale</i> <i>Indicate breakdown of categories here based on the results of the CTCN training feedback forms</i>
Percentage of participants reporting increased knowledge, capacity and/or understanding as a result of CTCN training (from CTCN training feedback form)		<i>Increased knowledge, capacity and/or understanding= 3+ on 5-pt scale</i> <i>Indicate breakdown of categories here based on the results of the CTCN training feedback forms</i>
a) Number of men		
b) Number of women		
Total number of deliverables produced during the assistance (excluding mission, progress and internal reports)	5	
a) Number of tools and technical documents strengthened, revised or developed	1	Program code that was developed as part of this implementation
b) Number of other information materials strengthened, revised or created (For example training and workshop reports, Power Points, exercise docs etc.)	4	<i>a.Characterization of load sectors and end-use in South Africa and Current DSM projects</i> <i>b. Identifying untapped potential and applicable DSM schemes for under-utilized load sectors</i> <i>c. Modeling and characterizing specific demand response schemes, identifying the potential available capacity and response</i> <i>d. High-level steps required to implement and pilot identified DR programs</i>
Total number of policies, strategies, plans, laws, agreements or regulations supported by the assistance	1	
a) Adaptation related		
b) Mitigation related	1	Eskom's Demand Side Management Plan
c) Both adaptation- and mitigation related		
Anticipated number of policies, strategies, plans, laws, agreements or regulations proposed, adopted or implemented as a result of the TA		
a) Adaptation related		



b) Mitigation related	1	Eksom's Demand Side Management Plan
c) Both adaptation- and mitigation related		
Anticipated number of technologies transferred or deployed as a result of CTCN support	3	<p><i>Instruction: Please indicate the type of technologies supported by this assistance. Technologies may be identified from the CTCN taxonomy of climate sectors and technologies (download in pdf format and choose from column C): https://www.ctcn.org/resources/ctcn-taxonomy</i></p> <p><i>Identified:</i> Energy efficiency – energy distribution – smart grid Energy efficiency – appliances and equipment – residential water heating Renewable energy – solar – solar water heater</p> <p><i>Suggested:</i> Energy efficiency – energy distribution – demand side management Energy efficiency – energy distribution – resilient energy systems</p>
Number of South-South collaborations enabled during or through CTCN TA support	-	List the names of the organisations (excluding the CTCN or TA implementers)
Number of climate technology RD&D related outreach activities	-	
Number of participants in climate technology RD&D related workshops and events	-	Disaggregate by country
a) Number of men	-	
b) Number of women	-	
Anticipated number of cooperative research, development, and demonstration programmes facilitated as a result of CTCN TA		
Number of countries with strengthened National System of Innovation as a result of CTCN support	1	South Africa
Number of organisations engaged through CTCN support	4	Council for Scientific and Industrial Research (CSIR), the South African National Energy Development Institute (SANEDI) Department of Mineral Resources and Energy (DMRE), and the Department of Science and Innovation (DSI), and Eskom
Insert any additional indicators here		

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B. Core impact indicators

Please fill in the tables for anticipated impacts of the CTCN assistance. Every technical assistance should contribute to at least one of the indicators below. For guidance on how to report on core indicators see the [‘M&E Guidance Document for TA Implementers’](#).

Core indicator 1	Anticipated metric tons of CO ₂ equivalent (CO ₂ e) emissions reduced or avoided as a result of CTCN TA	
	Anticipated metric tons of CO ₂ , equivalent emissions reduced or avoided as a result of the TA on annual basis	Anticipated metric tons of CO ₂ , equivalent emissions reduced or avoided as a result of the TA in total
Quantitative value	<i>Total number (numerals only, no rounding or abbreviations)</i>	<i>Total number (numerals only, no rounding or abbreviations)</i>
Unit	tCO ₂ e	tCO ₂ e
Methodology Explain the method or process of verifying the indicator and how data was gathered	<i>Not Calculated</i>	<i>Not Calculated</i>
GHG assessment boundary Identify expected post-TA activities, associated effects and assess boundary for quantification of GHG emission reductions	<i>Not Calculated</i>	<i>Not Calculated</i>
Baseline candidates Define alternative technologies or practises used in baseline calculation to represent possible alternatives to the project activities	<i>N/A</i>	<i>N/A</i>
Baseline emissions Describe baseline scenario and emissions calculated	<i>N/A</i>	<i>N/A</i>
Assumptions Describe assumptions made during calculation and quantification of GHG reductions	<i>Total number (numerals only, no rounding or abbreviations)</i>	<i>Total number (numerals only, no rounding or abbreviations)</i>



Core indicator 2	Anticipated increased economic, health, well-being, infrastructure and built environment, and ecosystems resilience to climate change impacts as a result of technical assistance <i>Please provide a qualitative description of the anticipated impacts on the categories below</i>
Infrastructure and built environment Anticipated increased infrastructure resilience (avoided/mitigated climate induced damages and strengthened physical assets)	Anticipated roll-out of advanced metering infrastructure which will further multiple energy efficiency programs, enable remuneration of distributed solar PV, and enable demand response programs.
Ecosystems and biodiversity Anticipated increased ecosystem resilience (areas with increased resistance to climate-induced disturbances and with improved recovery rates)	-
Economic Anticipated increased economic resilience (e.g. less reliance on vulnerable economic sectors or diversification of livelihood)	Proposed DR scheme can: <ul style="list-style-type: none"> Reduce long consecutive load shedding if implemented. Significant economic gains as load shedding impacts increase with duration. Much critical infrastructure cannot be isolated currently. Current load shedding practices has been estimated to cost South Africa over \$1.6 trillion rand in lost economic activity¹.
Health and wellbeing Anticipated increased health and wellbeing of target group (e.g. improved basic health, water and food security)	Proposed DR scheme can: <ul style="list-style-type: none"> Help isolate critical electrical infrastructure (e.g., medical facilities not currently load shed exempt [i.e., large hospitals are already load shed exempt]), and improve health and wellbeing by reducing load shed duration.

Core indicator 3	Anticipated number of direct and indirect beneficiaries as a result of the TA		
	Direct beneficiaries	Indirect beneficiaries	Means of verification
Adaptation related	NA	NA	<i>Describe calculation methods and assumptions made</i>
Mitigation related	NA	NA	<i>Describe calculation methods and assumptions made</i>
Both adaptation-and mitigation related	30	150 (minimum)	<i>Describe calculation methods and assumptions made</i>

¹Business Insider South Africa, 2023 <https://businesstech.co.za/news/energy/710636/south-africas-r1-6-trillion-load-shedding-bill/>

			<p>NREL gave direct training to 30 energy sector personnel in South Africa across 7 institutions. If each personnel passes information on to 5 personnel indirect beneficiaries are 150.</p> <p>NREL is making the final report public, this will increase indirect beneficiaries.</p> <p>If Eskom and other distribution entities take actions in this report, indirect beneficiaries will be the whole country with reduce load shedding impacts.</p>
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Core indicator 4	Amount of funding/investment leveraged (USD) as a result of TA (disaggregated by public, private, national, and international sources, as well as between anticipated/confirmed funding)		
	Quantitative value Value and currency	Qualitative description List the various elements corresponding to the quantitative value as well as expected timelines and responsible institutions	Methods Describe method use for quantification of funds leveraged including assumptions made and attention paid to causality, attribution and avoidance of double-counting
Total anticipated amount of funding/investment mobilised or leveraged (USD) as a result of the TA	-	-	-
Anticipated amount of public funding mobilised from national sources (USD)	-	-	-
Anticipated amount of public funding mobilised from international and regional sources as a result of the TA	-	-	-
Anticipated amount of private investment mobilised (in USD) from national sources as a result of the TA	-	-	-
Anticipated amount of private investment mobilised (in USD) from international	-	-	-



and regional sources as a result of the TA			
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Annex 2 (for internal use – to be filled in by the CTCN)

CTCN evaluation

This section will be completed by the relevant CTCN Technology Manager.

- Evaluation of the timeliness of the TA implementation as measured against the timeline included in the response plan;
- Evaluation of TA quality as defined in the response plan;
- Overall performance of the Implementers;
- Overall engagement of the NDE and Proponent;
- Lessons learned on the CTCN process and steps taken by the CTCN to improve.