



**Technical Assistance Response Plan -
Terms of Reference**

Country	Thailand
Request ID#	2022000030
Title	Development of a national hydrogen strategy and action plan for accelerating Thailand's net-zero target
NDE	The Office of National Higher Education Science Research and Innovation Policy Council (NXPO) Dr. Surachai Sathitkunarut, Assistant to the President Address: 319 Chamchuri Square Building 14th Fl., Phayathai Rd., Patumwan, Bangkok 10330 Thailand
Proponent	Dr. Surachai Sathitkunarut, Assistant to the President, surachai@nxpo.or.th , norachai@nxpo.or.th Address: 319 Chamchuri Square Building 14th Fl., Phayathai Rd., Patumwan, Bangkok 10330 Thailand

Summary of the CTCN technical assistance

This technical assistance should focus on providing Thailand with a national strategy on green hydrogen for the government to develop necessary policies and to utilize green hydrogen technologies to achieve Thailand's Net-Zero goal.

The main tasks are as follows:

- Preparing the Assessment Report on the potential use of hydrogen in three key economic sectors in Thailand
- Identifying the suitable technological options to produce and transport hydrogen
- Drafting the National Strategy Vision Paper and the National Action Plan
- Providing capacity building for policymakers

Agreement:

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

**National Designated Entity to the UNFCCC
Technology Mechanism**

Name: Dr. Surachai Sathitkunarut
Title: Assistant to the President
Date:

Recoverable Signature
X

Signature: Signed by: a2b1370f-1cae-4673-a0e4-202cb93505

Proponent (signature of the Proponent is optional)

Name: Dr. Surachai Sathitkunarut
Title: Assistant to the President
Date:

Recoverable Signature
X

Signature: Signed by: a2b1370f-1cae-4673-a0e4-202cb93505

UNFCCC Climate Technology Centre and Network (CTCN)

Name: Rose Mwebaza
Title: CTCN Director
Date: 07/02/2023
Signature:



1. Background and context

Recently, Thailand just announced its ambition to achieve a net-zero emission target by 2065 and accelerate its resources contributing to the goal. Green hydrogen has huge potential not only to enable Thailand to achieve the net-zero goal but also to create economic activities. As of now, commercial hydrogen producers in Thailand consist of only 4 companies and the hydrogen use cases are still limited in certain industries. The hydrogen production in Thailand is still mostly grey hydrogen with gas pipelines, tube trailers, and cylinders/cylinders pack as a mode of transportation.

For Thailand to achieve its net-zero goal by 2065, Thailand needs to fully utilize the potential of green hydrogen in a wide range of sectors. To be able to do that, Thailand needs to quickly develop the fundamentals for such systematic change. Green hydrogen development in Thailand is still in its infant stage and needs a huge amount of support and resources. One uniqueness of Thailand is its wide use of bioresources as fuels (bioethanol, biogas, etc.). With available infrastructure, bioresources could have the potential for large-scale green hydrogen production in Thailand. This approach aligns with the current Thailand national policy on Bio-Circular-Green Economy (BCG) and could benefit large rural households in the agriculture sectors as well.

Considering recent development, past activities are still fragmented and need to accelerate to be able to serve the net-zero goal. Thailand still has not formulated its national strategies for hydrogen development yet and close collaboration between policymakers among ministries, academics, regulators, and private sectors is needed to do so. There is also expertise needs to properly assess the potential use of green hydrogen, its impact on social, economic, and greenhouse gas emissions, suitable production technologies, and transportation modes for Thailand. The analysis would be crucial for Thailand to develop national strategies and prepare the infrastructure and regulations required to support the development of a hydrogen economy. This masterplan along with continuous support on large-scale implementation demonstration projects, possibly on a regional level, could initiate rapid development of green hydrogen technologies in Thailand and attract further collaboration and funding needed in the later stage of development.

As such, guidance and assistance are needed from CTCN to develop national strategies on green hydrogen for the government to develop necessary policies and create a common understanding and clear goal for relevant stakeholders. And Thailand seeks further assistance in the pilot demonstration projects along with funding support, possibly GCF in the future.



2. Problem statement

In the initial development stage of hydrogen technologies in Thailand, the main barriers can be summarized in two broad categories described below.

From the fact that Thailand does not have a national strategy related to hydrogen development yet, there are uncertainties among the government agencies and reluctance to act from the private sector. The main obstacle to developing such a comprehensive and clear national strategy is the lack of technical expertise to assess integrated information on in-depth technological aspects, socio-economic cost-benefits, and impact on greenhouse gas emission. Thailand needs to explore the potential use of hydrogen and a possible pathway to utilize that potential along with suitable technological options to produce and transport green hydrogen and a transitional path from current grey hydrogen production. Such analysis required technical assistance and wide national collaboration. On the capacity side, enhancing policy maker capacity to collaborate and develop cohesive policy support is important to develop and implement the national strategy as well.

Another barrier is related to the implementation side and the resources needed. The implementations from stakeholders (including academics, private sectors, regulators, etc.) involved in the development of hydrogen technologies for the net-zero target are still fragmented. This could be a consequence of lacking common understanding and direction, as mentioned in the first barrier above. Another important barrier to implementation is regulations that do not cover issues related to hydrogen development yet. The research in hydrogen-related technology is still in the early or pilot stage and needs assistance in the scaling-up stage. The recent collaboration of Hydrogen Thailand, which aim to develop demonstration projects still required external expertise and resource assistance, such projects need an advanced level of knowledge and experience which still lacking in Thailand. Such demonstration projects need to be large enough to address real conditions and bring together all relevant stakeholders, possibly on a regional level. Further assistance on advanced knowledge, experiences, and sizable financial resources are required for this kind of implementation which would benefit greatly the goal of global net zero.



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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 <i>(Title, role, estimated number of days)</i>	Input: Travel <i>(Purpose, national vs. international, number of days)</i>	Inputs: Meetings/events <i>(Meeting title, number of participants, number of days)</i>	Input: Equipment/Material <i>(Item, purpose, buy/rent, quantity)</i>	Estimated cost <i>Please accumulate the costing at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan</i>	
					Minimum	Maximum
Output 1: Development of implementation planning and communication documents	<i>IE1: 5 day IE2: 10 days IE3: 10 days</i>				<i>USD 9,500</i>	<i>USD 10,500</i>
Activity 1: Formulation of i) Detailed implementation plan, ii) Monitoring and evaluation plan, iii) CTCN Impact Description, iv) Closure and Data Collection report.	<i>IE1: 5 day IE2: 10 days IE3: 10 days</i>	<i>1 international trip to Korea for 2 representatives from the proponent to exchange, study and observe lessons from Korea (a 3-day program)</i>			<i>USD 9,500</i>	<i>USD 10,500</i>

Commented [SK5]: Incorporating the terms on a 3-day trip to Korea for 2 representatives



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Output 2: Assessments Report on the potential use of hydrogen in three key economic sub- sectors in Thailand	<i>IE1: 15 days IE2: 28 days IE3: 28 days NE1: 37 days NE2: 37 days</i>				USD 76,000	USD 84,000
Activity 2.1: Hold a kick-off meeting for the presentation of technical assistance with the different stakeholders	<i>IE1: 3 days IE2: 3 days IE3: 3 days NE1: 2 days NE2: 2 days</i>	<i>1 international trip to Thailand for IE1, IE2, and IE3</i>	<i>Kick-off meeting, 1 day, 10 additional participants</i>		<i>USD 29,500</i>	<i>USD 32,500</i>
Activity 2.2: Identify and Select key economic sub- sectors with the potential use of hydrogen	<i>IE1: 7 days IE2: 15 days IE3: 15 days NE1: 20 days NE2: 20 days</i>	<i>1 international trip to Thailand for IE2, and IE3 2 national trips for NE1, and NE2 for data collection</i>			<i>USD 29,500</i>	<i>USD 32,500</i>
Activity 2.3: Finalize and select 3 key economic sub- sectors	<i>IE1: 5 days IE2: 10 days IE3: 10 days NE1: 15 days NE2: 15 days</i>	<i>2 national trips for NE1, and NE2 for stakeholder interviews</i>			<i>USD 17,000</i>	<i>USD 19,000</i>
Output 3: Identify the suitable technological options to produce and transport hydrogen	<i>IE1: 15 days IE2: 35 days IE3: 35 days NE1: 40 days NE2: 40 days</i>				USD 53,000	USD 57,000



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Activity 3.1: Identify resources for the production of hydrogen (solar, bioresources, etc.)	IE1: 5 days IE2: 10 days IE3: 10 days NE1: 15 days NE2: 15 days				USD 13,500	USD 14,500
Activity 3.2: Identify technologies for the production of hydrogen (electrolyzers etc.)	IE1: 5 days IE2: 10 days IE3: 10 days NE1: 15 days NE2: 15 days				USD 13,500	USD 14,500
Activity 3.3: Undertake Cost Estimation for production of hydrogen (electrolyzers etc.)	IE1: 5 days IE2: 15 days IE3: 15 days NE1: 10 days NE2: 10 days	1 international trip to Thailand for IE2, and IE3 1 national trip for NE1, and NE2			USD 26,000	USD 28,000
Output 4: Draft documents related to the National Hydrogen Strategy Vision	IE1: 8 days IE2: 25 days IE3: 25 days NE1: 35 days NE2: 35 days				USD 76,000	USD 84,000
Activity 4.1: Draft a National Action Plan and Technology Roadmaps	IE1: 5 days IE2: 15 days IE3: 15 days NE1: 20 days NE2: 20 days	1 international trip to Thailand for IE1, IE2, and IE3 1 national trip for NE1, and NE2			USD 49,500	USD 51,500
Activity 4.2: Draft a GCF Concept Note	IE1: 3 days IE2: 10 days IE3: 10 days	1 national trip for NE1, and NE2			USD 29,500	USD 32,500



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	<i>NE1: 15 days NE2: 15 days</i>					
Output 5: Provide Capacity Building for Policy Makers	<i>IE1: 3 days IE2: 5 days IE3: 5 days NE1: 3 days NE2: 3 days</i>				<i>USD 31,000</i>	<i>USD 39,000</i>
Activity 5.1: Hold a workshop for Policy makers including private sector engagement	<i>IE1: 3 days IE2: 5 days IE3: 5 days NE1: 3 days NE2: 3 days</i>	<i>1 international trip to Thailand for IE1, IE2, and IE3 1 national trip for NE1, and NE2</i>	<i>Capacity Building workshop, 2 days, 25 additional participants</i>		<i>USD 31,000</i>	<i>USD 39,000</i>
Estimated range of cost for the entire Response Plan					<i>245,500</i>	<i>274,500</i>



5. Profile and experience of experts

Experts required	Brief description of required profile
International Experts	
Team Leader and expert in climate change technology policy (IE1)	<ul style="list-style-type: none"> · A minimum of 10 years relevant work experience in the design, implementation, and evaluation of national policies related to climate change and climate technology, or similar. · At least 5 demonstrated experiences as a project manager/leader in the area of climate technology. · Experience in establishing strategy and action plan desirable. · Experience in the coordination of complex projects involving the management and the consultation of a range of actors. · Proficiency in written and communication skills in English.
Policy Expert (IE2)	<ul style="list-style-type: none"> · A minimum of 7 years relevant work experience in the design, implementation, and evaluation of national policies related to climate change and climate technology, or similar. · At least 3 demonstrated experiences in the area of climate technology. · Experience with public entities and international cooperation · Excellent abilities to interact with local stakeholders, collect and evaluate data and transform the information into high-quality documentation tangible to the target audience. · Excellent written and communication skills in English.
Energy Economics Expert (IE3)	<ul style="list-style-type: none"> · A minimum of 5 years relevant work experience in energy and resource economics, or similar. · At least 3 demonstrated experiences in the area of climate technology. · Experience in the systematization of processes and drafting highly complex reports involving the consultation of different types of actors. · Demonstrable knowledge in the context of the production, and transportation of hydrogen. · Proficiency in written and communication skills in English.
National Experts	
National Expert in Energy Policy (NE1)	<ul style="list-style-type: none"> · A minimum of 5 years of relevant work experience in drafting energy economics, climate technology-related policies, or similar. · Economist or engineer preferred, with postgraduate studies in sustainability, climate technology, renewable energy, or related fields. · Demonstrable knowledge and experience in the area of climate technology. · Proven experience in renewable energy sources or related industries will be valued. · Proven working experience and presence in Thailand are required. · Proficiency in written and communication skills both in English and Thai.
National Expert in Hydrogen Industry (NE2)	<ul style="list-style-type: none"> · A minimum of 5 years of relevant work experience in drafting energy economics, climate technology-related policies, or similar. · Economist or engineer preferred, with postgraduate studies in sustainability, climate technology, renewable energy, or related fields. · Demonstrable knowledge and experience in the area of climate technology. · Proven experience in renewable energy sources or related industries will be valued. · Proven working experience and presence in Thailand are required. · Proficiency in written and communication skills both in English and Thai.



6. Intended contribution to impact over time

The development of a proper national action plan can stimulate the investment of relevant stakeholders in the hydrogen sector of Thailand. By representing the strong willingness of the Thailand government to achieve a hydrogen economy, the settlement and announcement of the national plan will fasten the expansion of the hydrogen market and further contribute to the achievement of the 2065 Net-Zero target.

By suggesting the draft of technology roadmaps, the government can get insights to efficiently manage the relevant stakeholders to achieve a hydrogen economy. Solid technology roadmaps can draw the blueprint of required technology development and enhance the efficiency of resource distribution by showing the detailed steps of technology development. The appropriate investment in hydrogen technology will provide the expansion of relevant industries and enable the smooth transition from the fossil fuel economy to the hydrogen economy.

Overall, the technical assistance will contribute to enhancing the technical capacity of the hydrogen economy and constructing the relevant infrastructure required for hydrogen production. It will suggest the political framework of hydrogen technology development including suitable production technology and site options, applicable economic sectors, and technology development pathways to achieve the Net-Zero target.

7. Relevance to NDCs and other national priorities

Nationally Determined Contribution (NDC)

- Thailand intends to reduce its greenhouse gas emissions by 20 percent from the projected business-as-usual (BAU) level by 2030

Thailand Mid-century, Long-term Low Greenhouse Gas Emission Development Strategy

- To achieve carbon neutrality by 2065, Thailand emphasizes the importance of innovation and RD&D, especially in the areas of low-carbon electricity generation, CCS, bioenergy with CCS and hydrogen economy, (p.44.)

NDC Action Plan (Energy Sector)

- Action plan 1.2.10 Development of New Clean Energy (p.19.)

8. Linkages to relevant parallel on-going activities:

The Office of Energy Policy and Planning in Thailand is investigating potential policy and strategy options to develop hydrogen for Thailand's renewable energy system and include the technologies related to hydrogen production in National Energy Plan 2022. As this technical assistance aims to design a national action plan for the application of hydrogen production technology and develop the following technology roadmaps, it can directly support the Thailand government in efficiently building National Energy Plan, especially the hydrogen-related section.

Also, Thailand is currently supporting hydrogen technology research consortiums and institutes,



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such as The Joint Graduate School of Energy and Environment(JGSEE) and the National Energy Technology Center(ENTEC). By expanding the consortium(called “Hydrogen Thailand”) to include leading private sectors, research institutes, and public sectors, Thailand aims to promote hydrogen technology to apply as a new alternative energy to reduce carbon emissions. By suggesting hydrogen technology road maps including detailed technologies and following steps to achieve sufficient technology level, this technical assistance can enhance the efficiency of resource investment for related research and clarify the future research direction for Hydrogen Thailand to acquire competitive hydrogen production technologies.

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

The future national plan of Thailand will be directly affected by the activities addressed in this response plan. As Thailand NDE plans to utilize the suggested draft of the national action plan and hydrogen technology roadmaps as the infrastructure of their upcoming policy structure, this technical assistance can be connected to the actual national strategy to introduce hydrogen as a valuable resource to Thailand's economic sectors. Thailand NDE can further develop the draft of the national action plan and technology roadmaps in the form of an actual national strategy with local professionals to enhance the efficiency of upcoming management.

Also, various demonstration projects will proceed following the guideline suggested by the outcomes of this technical assistance. Based on the scenario analysis of relevant infrastructure and technology options, this technical assistance will suggest the potential options applicable to Thailand. Considering the suggested options, the Thailand government may design a demonstration project to materialize anticipated scenarios for efficient hydrogen introduction. The government can also apply for financial support programs such as Green Climate Fund by developing the GCF concept note draft, one of the outcomes of this technical assistance.

10. Gender and co-benefits:

Imbedded in design of the activities:	The technical assistance can contribute to gender equality by offering appropriate workshops and suggesting proper training programs. As the capacity enhancement of relevant stakeholders is one of the necessary activities for hydrogen development, this technical assistance also includes workshops for Thailand policymakers. The workshop will emphasize that it is important to foster women scientists and researchers. Similarly, this point will be addressed in a national action plan. The national action plan will contain a training program to secure proper human resources including scientists and researchers. In this plan, the sub-program for female researchers and scientists will be designed. Overall, this technical assistance can contribute to gender equality by suggesting the framework of relevant training programs fostering woman scientists.
Gender and co-benefits intended as result of the activities:	<i>Please describe all gender aspects, women's equality and other co-benefits expected as a result of the CTCN technical assistance.</i> The technical assistance is expected to increase the share of women



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researchers in Thailand. Also, it can evoke economic development in overall sectors by stimulating the expansion of hydrogen-related industries. By suggesting well-organized guidelines to materialize the hydrogen economy, it can contribute to Just Transition in Thailand.

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
Office of National Higher Education Science Research and Innovation Policy Council	Responsible for research, innovation, and technology development policy
Hydrogen Thailand Group	Group of stakeholders promoting hydrogen development and demonstration projects
Relevant private sectors	Data provider
Office of Natural Resources and Environmental Policy and Planning	National focal point of UNFCCC and responsible for policy development
Office of Energy Policy and Planning	National energy policy and planning: resolving energy issues under the National Energy Committee
Department of Alternative Energy Development and Efficiency	Develops and promotes renewable energies, biofuel, energy- efficiency, and energy-saving strategies
Electricity Generating Authority of Thailand	State enterprise, managed by the Ministry of Energy, responsible for electric power generation
National Science and Technology Development Agency - National Energy Technology Center (ENTEC)	A leading organization & a focal point for Thailand's energy technology development
The Joint Graduate School of Energy and Environment(JGSEE) and relevant research institutes and universities	Information providers

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	



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	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	The objective of the technical assistance (TA) is to utilize green hydrogen produced based on renewable energy.
	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	
	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	The TA will contribute to enhancing the technical capacity of the hydrogen economy and constructing the relevant infrastructure required for hydrogen production
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	<i>All TAs should indicate relevance to Goal 13 and at least one target below (13.1 to 13.b).</i>
	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	A national hydrogen strategy and action plan will promote development pathways to achieve the Net-Zero target of Thailand.
	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
<input type="checkbox"/> 1. Decision-making tools and/or information provision	X	<input type="checkbox"/>
<input type="checkbox"/> 2. Sectoral roadmaps and strategies	X	<input type="checkbox"/>



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<input type="checkbox"/> 3. Recommendations for law, policy and regulations	<input type="checkbox"/>	X
<input type="checkbox"/> 4. Financing facilitation	<input type="checkbox"/>	X
<input type="checkbox"/> 5. Private sector engagement and market creation	<input type="checkbox"/>	X
<input type="checkbox"/> 6. Research and development of technologies	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 7. Feasibility of technology options	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 8. Piloting and deployment of technologies in local conditions	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 9. Technology identification and prioritisation	X	<input type="checkbox"/>

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.