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TERMS OF REFERENCE (TOR)

Title: Tonga Circular Economy Project- Biogas Feasibility Study

CTCN request reference number 2019000026

Countries: Tonga

1 BACKGROUND INFORMATION

The Climate Technology Centre and Network (CTCN) is the operational arm of the United Nations Framework Convention on Climate Change (UNFCCC) Technology Mechanism and co-hosted by the United Nations Environment (UN Environment) in collaboration with the United Nations Industrial Development Organization (UNIDO) and supported by 11 partner institutions with expertise in climate technologies. The mission of the CTCN is to promote accelerated development and transfer of climate technologies at the request of developing countries for energy-efficient, low-carbon and climate-resilient development.

These requests for Technical Assistance (TA) are being submitted to the CTCN by the National Designated Entity (NDE) of the respective country. Eligible requests are processed by a group of selected experts who develop a Response Plan. The scope of services under these Terms of Reference shall be executed based on a restricted solicitation process where only accepted Members of the CTCN Network, are eligible to submit proposals.

In case you are not a CTCN network member yet, you may bid for implementation of the technical assistance, subject to the condition that you submit your completed application for CTCN Network membership before the last date of the bid closure and the same is acknowledged by the CTCN. Furthermore, the contract award – should your bid be selected – is conditional to your network membership application having been successfully approved by the Director of CTCN. The requirement to join the CTCN network is only relevant to the main bidder and no sub-contractors.

The maximum estimated budget for this contract is USD **179,100**.

2 PROJECT CONTEXT

Tonga is among the most vulnerable countries to the impacts of climate change yet continue to be increasingly dependent on imported fossil fuels that dominates its Greenhouse Gas emissions. To reduce its energy reliance on the imported fuel, Tonga has adopted an energy target under Tonga Energy Road map (TERM) of 70% renewable energy by 2030. The Nationally Determined Contribution of Tonga also reflect these targets, joining the global community to reduce GHG emission. Tonga's renewable energy development is so far based on solar and wind resources.



United Nations Industrial Development Organization

Hence, Tonga has made this CTCN request to explore the feasibility of generating base load energy at an industrial scale of 0.5 MW from the biogas to diversify the energy source and accelerating the renewable energy transition. Tonga's tropical climate also makes it favorable for biomass planting and biogas has been demonstrated to be used at household and institutional levels Tonga as well as in other Pacific Island Countries. While biogas is a promising resource to be used for generating base load energy at industrial scale, it also could have sustainable impacts both in positive and negative ways along the value chain of Bioeconomy. Land use change, creating competition for food, incremental usage of water and energy, generation of waste are some of these impacts. The request is designed to address such impacts through Circular Economy approach. Circular Economy is where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimized. Hence, it ensures best utilization of resources and least generation of wastes.

Besides NDE and the project proponent the relevant department in the ministry, local resources in the related field, farmer's federation and critical players along the value chain of the bio-economy value chain in Tonga will have important role in this project.

The request and other details can be accessed from the following link:

<https://www.ctc-n.org/technical-assistance/requests/tonga-circular-economy-project-biogas-feasibility-study>

3 AIM OF THE CONTRACT

The contractor is expected to take full responsibility for the satisfactory execution of the technical assistance described herein. All activities will be conducted under the close supervision of the CTCN Regional Manager in Copenhagen and with the National Designated Entity (NDE) in Tonga,

The objectives of the technical assistance project are:

- To conduct a feasibility study, which will aim to identify the viability of adding biogas to Tonga's portfolio of power generation sources by gaining an understanding of the circular economy approach to be consider for biogas;
- To support in preparing the proposals to request fund for implementation of biogas to energy plant and to support the procurement of technical resources;
- To conduct capacity development on the biogas technologies.

Scope and activities of the proposed contracted services

The Contractor is expected have thorough understanding of the requirements through this ToR, Signed Response Plan and the request to undertake the following activities in the timeline indicated:

Output 1: Planning and communication documents



United Nations Industrial Development Organization

Activity 1: Development of implementation planning and communication documents in CTCN templates

A 1.1: Kick off discussion on the project.

A 1.2: A work plan detailing activities, respective deliverables, outputs, timelines and responsible persons/organisations and detailed budget to implement the Response Plan, meeting the requirements of the Response Plan.

A 1.3: Monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used for timeliness and appropriateness of the implementation. The 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.

A 1.4: A two-page CTCN Impact Description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered based on the template provided by CTCN. The template will be provided by CTCN.

A 1.5: A Closure and Data Collection report is to be completed at the end of the technical assistance. The template will be provided by CTCN in the beginning of the activity.

Deliverables 1

D 1.1: Minutes of Kick off meeting discussion

D 1.2: Detailed work plan

D 1.3: Monitoring and evaluation plan

D 1.4: CTCN Impact Description

D 1.5: Closure and Data Collection template and report

Output 2: Baseline and resource assessment to support industry scale biogas plant in Tonga

A 2.1: Undertake studies and surveys to demonstrate the availability of sustainable resources along the bio-economy value chain¹ to use as input to the biogas plant

This assessment will provide detailed outlook on the availability of raw fuel resources from various potential sources, based on latest information available to generate biogas in Tonga. It will also assess the options for sustainable supply of the resources to operate these plants throughout their technical lifetime using circular economy approach applied² along the bio economy value chain in Tonga. While studying the availability of raw fuel resources, their sustainability will also be assessed through their potential

¹ Value chain here refers along food, feed, bio-based products and bioenergy

² The "Circular Bioeconomy" – Concepts, Opportunities and Limitations - European Commission



United Nations Industrial Development Organization

impacts on land, energy and water usage over baseline, competing use and food conflicts etc, if suggested to use for biogas production.

A 2.2: Analysis of existing biogas technologies relevant for Tonga

Identify demonstrated local and global technologies with broad technical specifications that can use the selected resources in Tonga (resources identified in Activity 2.1) to produce biogas to feed in the energy plants at industrial scale³.

Deliverables 2

D 2.1: Report on resource availability and sustainability

D 2.2: Report on biogas technologies

Output 3: Biogas technologies at industrial scale will be identified

A 3.1: Conduct feasibility studies on the biogas technologies

Develop a scoring tool based on criterion developed in collaboration with stakeholders for conducting pre-feasibility assessments of biogas technologies identified in Activity 2.2. This tool will be used to prioritize the biogas technologies and should consider, amongst other factors, the potential contribution of the technology to the achievement of Tonga's NDC targets. The factors for technology prioritization will include, but not limited to the nature of the available raw fuel and substrate for digestion to produce biogas and suitable reactor technologies like Anaerobic reactor, Up-flow Anaerobic Sludge Blanket Reactor, Fluidized Bed Reactor, Continuous Stirred Tank Reactor, Solid Concentrating reactor, Sequential batch reactor. This activity is applicable as envisaged to manage scenario where a long list of technologies identified.

Conduct the detailed feasibility analysis of the technology shortlisted. The feasibility analysis will be including but not limited to the following: Detailed technical description, operational parameters and challenges for biogas production and economic analysis using indicators like payback period, IRR, NPV and socio-environmental impacts. The analysis shall also consider the operational efficiency of biogas power plant as a distributed plant vis a vis connected to the regional/ central grid. The project is envisaged to request funding from GCF to support the implementation of the outcome of the feasibility study. Hence the requirements of GCF shall also be considered in the feasibility study like sustainable financing arrangements to upscale and replicate the project.

A 3.2: Conduct stakeholder consultation

Undertake a consultation workshop to receive the feedback on the outcome of the feasibility study. Relevant stakeholders like from Tonga's Joint National Action Plan (JNAP) and the requirements from the GCF perspective will be included in the consultation to review and provide feedback on the draft feasibility study and GCF proposal. Please see GCF related activity under Output 5.

³ With a capacity of 0.5 MW and above- Request Document from Tonga



United Nations Industrial Development Organization

Deliverables 3

D 3.1.1: Report on biogas technology prioritization

D 3.1.2: Draft feasibility study report

D 3.2: Report on stakeholder consultation (Detailed minutes and synthesized version)

D 3.1.3: Final feasibility report

Output 4: Capacity Development on biogas technologies

A 4.1: Design and conduct a program for an industrial study trip and experience sharing to visit the industrial scale biogas plants that are relevant for Tonga as the outcome of the feasibility study.

The TA may cover the support for the study trips designed within the region like countries in Pacific Island, Australia or New Zealand or else for the trip to any other country the program designed under this activity can be used as a proposal to be considered under other financial mechanisms.

A 4.2: Design and conduct appropriate training pre/post-industrial trips in discussion with MEIDECC to enhance capacity of Tonga Government on the outcome of the feasibility study

This will comprise, but not limited to, the study materials, training manuals and a training program to enhance capacity of Tonga Government. While these training and study resources will be inspired by the existing successful cases from other countries and regions, the requirements in local context will also be considered in designing.

Deliverables 4:

D 4.1: Report on the training (the chapters/ presentations, manuals and toolkits developed will be annexed to this report)

D 4.2.1: Report on the study trip program

D 4.2.2: Report on the findings of the study trips after completion (if applicable)

Output 5: Support provided for GCF proposal development

A 5.1: Prepare a draft proposal to apply for the implementation of the biogas project under other international funding mechanisms. The draft feasibility report will provide relevant input to the GCF proposal which should be elaborated in close collaboration with the NDE and NDA. The GCF proposal will undergo consultation conducted under Output 3.

A 5.2: Design technical specifications as the part of the Request for Proposal to support the procurement of the biogas plant. Design technical specifications as the part of the Request for Proposal to support the procurement of the biogas plant.

Deliverables 5:

D 5.1.1: Draft GCF proposals for JNAP and NDA review



United Nations Industrial Development Organization

D 5.1.2: Revised GCF proposals for NDA consideration

D 5.2.1: Draft specifications for Request for Proposal

D 5.2.2: Final specifications for Request for Proposal

Once this contract is signed, the CTCN will organize a kick-off call among all relevant parties involved in the request to introduce the Contractor to the NDEs and Proponent, to present the activities, their timeline and clarify roles and responsibilities.

It is mandatory for the implementer(s) to allocate at least 1% of the budget to integrate a gender-approach to the activities. Please refer to the CTCN Gender Mainstreaming Tool for Response Plan Development for guidance at <https://www.ctc-n.org/technologies/ctcn-gender-mainstreaming-tool-response-plan-development>.

4 GENERAL TIME SCHEDULE

The activities under this contract should follow the timeline presented for each deliverable and are expected to be completed within a period of twelve (12) months from the award of contract. However, the bidder has the option of proposing a customized duration of the activities under this contract.

5 QUALIFICATION REQUIREMENTS AND EVALUATION CRITERIA

The bidder shall demonstrate experience in the field of biogas plant development, as well as circular economy aspects for agricultural value chains.

The bidder shall as a minimum present the following qualifications of the team. Please note the requirement to have national expert(s) in the team. Additional qualifications and experts may be added to the proposal.

Qualification requirements (technical aspects required)	Evaluation criteria
Senior Biogas Expert (International) The expert shall have: <ul style="list-style-type: none">- an engineering qualification- at least 7 years work experience in conducting feasibility studies and designing, implementing and operating grid connected biogas	The Senior Biogas Expert shall have the following expertise and experience: <ul style="list-style-type: none">• to energy plants of industrial scale.• shall have demonstrated experience in assessing climate impacts along bio-energy supply value chain• Prior experience of working in the energy sector in Pacific Island countries and understanding of circular economy is an advantage• have demonstrated experience of writing technical proposals for international development projects such as GCF, GEF• have proficiency in reading, writing and speaking



United Nations Industrial Development Organization

Qualification requirements (technical aspects required)	Evaluation criteria
	English and must be able to communicate with stakeholders effectively.
<ul style="list-style-type: none"> • Project Manager (national/international) - A postgraduate degree in project management, business or related qualification - At least 5 years of relevant work experience 	<p>The project manager shall have the following expertise and experience:</p> <ul style="list-style-type: none"> • demonstrated experience of leading, managing and delivering biomass/ biogas to energy projects including the procurement of biomass/biogas technologies • The project manager shall have experience of managing and delivering surveys, stakeholder engagements, capacity development programs and financial proposals. • Prior experience of working on energy sector in Pacific Island countries and understanding of circular economy will be an added advantage • The project manager shall have experience of working with government and international organizations • The project manager shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.
<ul style="list-style-type: none"> - Biomass/ Agriculture Expert (national) A bachelor's degree in agricultural sciences, biological science or related discipline - At least 5 years of relevant experience - Fluency in local language 	<p>Biomass Expert shall have the following expertise and experience:</p> <ul style="list-style-type: none"> • prior work experience of conducting biomass survey in Pacific Island Countries, preferably in Tonga. • demonstrated experience of conducting Life cycle Assessment for food, feed, bioenergy and bio-products and its value chain including farming, processing and consumption of bio resources. • experience of undertaking surveys, capacity development programs and stakeholder consultations. • proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.
<ul style="list-style-type: none"> • Gender Expert (national/international) • a postgraduate university degree in Social or Natural Sciences or 	<p>The Gender Experts shall have the following expertise and experience:</p>



United Nations Industrial Development Organization

Qualification requirements (technical aspects required)	Evaluation criteria
<p>another relevant discipline, preferably with a specialization in gender, project cycle management and/or energy.</p> <ul style="list-style-type: none"> A minimum of five years' practical experience in the field of gender equality and gender mainstreaming. 	<ul style="list-style-type: none"> Formal training in gender analysis and gender planning and demonstrated expertise in mainstreaming gender in projects and programmes, especially in the energy sector, including renewable energy systems; in farming, processing and consumption of bio resources. The Gender Expert shall have proficiency in reading, writing and speaking English and must be able to communicate with stakeholders effectively.

6 LANGUAGE REQUIREMENTS

The working language for the purposes of this project is English, thus an excellent command of English is required of the proposed personnel. The final deliverables must be submitted in English. The technical and financial proposal under this tender must also be submitted in English.

All delivered documents must be of such a quality that no further editing will be required.

7 DELIVERABLES SCHEDULE

The table below details the indicative schedule for this assistance.

Deliverables	Delivery date
D 1.1: Minutes of Kick off meeting discussion	As soon as after signing the contract
D 1.2: Detailed work plan	Within 1 month after Kick off meeting
D 1.3: Monitoring and evaluation plan	Within 1 month after Kick off meeting
D 1.4: CTCN Impact Description	Within 1 month after Kick off meeting
D 1.5: Closure and Data Collection template and report	12 months after Kick off meeting
D 2.1: Report on resource availability and sustainability	3 months after Kick off meeting
D 2.2: Report on biogas technologies	3 months after Kick off meeting
D 3.1.1: Report on biogas technology prioritization	4 months after Kick off meeting
D 3.1.2: Draft feasibility study report	5 months after Kick off meeting



United Nations Industrial Development Organization

Deliverables	Delivery date
D 3.2: Report on stakeholder consultation (Detailed minutes and synthesized version)	5-6 months after Kick off meeting
D 3.1.3: Final feasibility report	6 months after Kick off meeting
D 4.1: Report on the training (the chapters/ presentations, manuals and toolkits developed will be annexed to this report)	8 months after Kick off meeting
D 4.2.1: Report on the study trip program	8 months after Kick off meeting
D 4.2.2: Report on the findings of the study trips after completion (if applicable)	9 months after signing contract
D 5.1.1: Draft GCF proposals for JNAP and NDA review	5 months after Kick off meeting
D 5.1.2: Final GCF proposals for final NDA submission	6 months after Kick off meeting
D 5.2.1: Draft specifications for Request for Proposal	11 months after Kick off meeting
D 5.2.2: Final specifications for Request for Proposal	12 months after Kick off meeting