CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

**CTCN Technical Assistance**
Response Plan

| | |
|---|---|
| **Country:** | Senegal |
| **Request Identification Number:** | 2015-021-SEN-01 |

| | |
|---|---|
| **Title:** | Development of energy efficiency in projects and industries and services |


**Summary of the CTCN Technical Assistance**

Energy demand in Senegal is steadily increasing due to population and economic growth, but supply is suffering from insufficient generation capacities, high energy costs from imported fossil fuels and import dependency. Also, uncontrolled peak demand causes grid instability.
The CTCN request focuses on co- and tri-generation for new and existing industries, as well as services such as big hospitals, hotels, universities and airports. In response the CTCN will develop a co- and tri-generation technology roadmap for Senegal discussing potential barriers and ways to overcome them, investment requirements and potential sources of financing, an implementation strategy, policy advice, capacity building needs and M&E tools.


## 1. Overview of the CTCN technical assistance

### 1.1 Technology aspects

This CTCN assistance focuses on co- and tri-generation technologies applied in industrial sectors and services to increase energy efficiency and reduce greenhouse gas emissions from fossil fuel combustion. The approach chosen to reach this outcome is the development of an energy technology roadmap. This tool will support Senegal to create a strategy to effectively deploy and disseminate co- and tri-generation technology throughout the country.

### 1.2 Objectives (outcomes)

The goal of the CTCN technical assistance is to make energy supply in Senegal more affordable and reliable with reduced greenhouse gas emissions on energy generation and consumption side. To achieve this decision makers will need the tools and information to set priorities, develop policies and make investment choices with regard to low-carbon energy systems. For this the CTCN will provide, as requested, technical assistance in the form of a roadmap aimed at supporting efforts in Senegal to introduce and disseminate mainly biomass-based co- and tri-generation (CCHP) technologies in industries and services. The overarching objective is to reduce greenhouse gas emissions, whilst increasing productivity, cost-competitiveness and reducing independence from fuel imports.

### 1.3 Results (outputs expected from CTCN assistance)

The co- and tri-generation technology roadmap will be based on the following elements carried out as part of the response:

1. Review of state-of-the-art in co- and tri-generation technology and adaptability and applicability to specific context, including technical, (socio-)economic and financial, regulatory and legislative aspects
2. Case assessments of two existing facilities, including assessment of challenges and opportunities
3. Roadmap for the deployment of co- and tri-generation technology, including key recommendations
4. Study development for implementation of co- and tri-generation systems in some services; improve the existing study for its implementation in industries;

5. Capacity building for the project management team and stakeholders in order to reinforce their abilities to conduct and implement the project activities;
6. Stakeholders engagement to facilitate the uptake of co- and tri-generation technology

### 1.4 Expected use of outputs

The information provided through the process of developing the Roadmap will equip relevant stakeholders with the information required to make informed decision related to the deployment of co- and tri-generation technology in Senegal.

## 2. Description of the Assistance

### 2.1 Activities

**Activity 1 – State-of-the-art**
Compile key documents and distill relevant information on co- and tri-generation technology, with a particular emphasis on applicability to the specific context and on economic, financial and technical barriers.

**Activity 1 – Deliverables**

| Deliverables | Delivery date |
|---|---|
| Literature review and best practice | Week 2 |

**Activity 2 – Interviews with stakeholders**
Ensure all relevant interest groups are included in the process and key information that may not be documented in writing considered.

**Activity 2.1**
Identify all relevant stakeholders from public and private sector, smallholders, etc.

**Activity 2.2**
Carry out stakeholder consultations to assess needs, risks and appetite for such technologies.

**Activity 2 – Deliverables**

| Deliverables | Delivery date |
|---|---|
| List of stakeholders | Week 8 |
| Complementary inputs received and included in report | Week 8 |

**Activity 3 – Assessment of existing plants**
The assessment of existing co- and tri-generation facilities is supposed to identify best-practices, lessons learnt, technical barriers and opportunities of the technology in the country.

**Activity 3.1**
Carry out thorough assessment of existing plants and draw lessons from experience, including on the technology, financial and other aspects.

**Activity 3.2**

Consult with plant operators and owners and key challenges and opportunities, in conjunction with Activity 2.2.

**Activity 3 – Deliverables**

| Deliverables | Delivery date |
|---|---|
| Compilation of lessons learned | Week 8 |

**Activity 4 – Development of roadmap**

The roadmap will be a document of strategic guidance for Senegal to effectively implement co- and tri-generation technology.

**Activity 4.1**

Develop roadmap based on realistic medium-term goals established in collaboration with the request proponent and other key stakeholders. Articulate requirements in terms of policy and regulatory framework, investments, technology development/adaptation, and other critical parameters to work towards the preset goals. Develop a set of clear and actionable recommendations to promote the deployment of co- and tri-generation technology in Senegal. Also, analyze the possibility to use other type of fuel in case it is not possible to do it with biomass in some situations. Propose financial mechanisms for effective development and implementation of the project and design a pilot phase.

**Activity 4.2**

Carry out expert workshop to refine and validate the roadmap in terms of barriers identified, technologies and timelines; assess technologies against set goals and discuss implementation strategy.

**Activity 4 – Deliverables**

| Deliverables | Delivery date |
|---|---|
| Draft report | Week 8 |
| Workshop | Week 9 |
| Workshop minutes as input for report | Week 9 |
| Final report | Week 12 |

**Activity 5 – Development of implementation plan**

Building on the results of the case assessments (Activity 3) and the roadmap (Activity 4) this activity shall contextualize the previous results for the design of an implementation plan for co- and tri-generation facilities for selected services. Furthermore, it shall review and improve existing studies for implementation in industries.

**Activity 5 – Deliverables**

| Deliverables | Delivery date |
|---|---|
| Implementation plan | Week 10 |

**Activity 6 – Capacity building**

To ensure that the roadmap will be applied successfully the project management and key stakeholders need to be informed about the benefits and potentials as well as risks and barriers of the technology.

**Activity 6.1**
Assess capacity building activities needs of key stakeholder groups and the project management team.

**Activity 6.2**
Develop necessary capacity building activities.

**Activity 6 – Deliverables**

| Deliverables | Delivery date |
|---|---|
| Input for capacity building material preparation | Week 10 |
| Document on capacity building activities | Week 10 |

**Activity 7 – Capacity building event**
Carry out workshop, in conjunction with the expert workshop for the roadmap.

**Activity 7 – Deliverables**

| Deliverables | Delivery date |
|---|---|
| Workshop | Week 12 |

### 2.2 Synergies and Baseline Setting

This request is in synergy with the strategic axes of the government in the field of energy mix in the industrial sector and services. The promotion of energy efficient technologies is a key component of the "Plan Senegal Emergent (PSE)". This technical assistance can greatly contribute to achieving the objectives of rationalization of energy consumption in industries and services. The request has strong linkages with the development of integrated industrial existing industrial parks, such as Diamniadio and others ongoing initiatives of CHP/CCHP option in industries and application services.

Outcomes from the technical assistance will help to integrate CHP/CCHP technology and its advantages on energy independence, security of energy supply, and the reduction of energy losses in process of production in industries and services. It will be an opportunity to maximize the economic and environmental benefits of industrial activities and services as well as acceptance possibly among the industrial actors. The deployment of CHP/CCHP technology in Senegal is a good option in cement industries and others services in the satisfaction of constant needs of energy and heat in their process of production.

This request will work closely with on-going initiatives and pilot projects for generating electricity and heat from the CHP/CCHP technologies in industries and services in Senegal. Among these initiatives we have the pilot project coordinated by the THECOGAS Senegal Company at the slaughterhouse of Dakar. This THECOGAS CHP/CCHP plant uses the biogas from animal waste as fuel for the production of electricity and heat generation. This system produces 800Mwh / year of electrical energy and 1,600 MWh/year of thermal energy for the needs of the slaughterhouse of Dakar: electrical equipment, cleaning washing working tools of the slaughterhouse, preparation of pigs slaughtered.

Eventual synergies could be developed with sustainable energy financing initiatives in West Africa, for example the West African Green Investment Program SUNREF, the first green credit line AFD / SGBS deployed in Senegal in partnership with the "Bureau de Mise en Niveau" (BMN) since 2010

with a real success. The Green fund HAS SGBS allowed the bank financing at preferential rates for Senegalese contractors related: energy efficiency, renewable Energy.

West African Green Investment Program SUNREF combines financial instruments and a technical Assistance Program (AT) which could provide investment and technical expertise in energy efficiency and renewable energy during the project life cycle, especially in three phases hand: I) Development II) Construction III) Implementation.

There are also synergies to be exploited with another CTCN request for technical assistance from Senegal. Indeed, the CTCN in parallel provides support to promote green technologies and industrial symbiosis in selected industries as well as offering advice on eco-industrial parks.

### 2.3 Timeline

The project is expected to be successfully carried out within 3 months.

| Activity | Weeks | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **1 State-of-the-art** | | | | | | | | | | | | |
| **2 Interviews with key stakeholders** | | | | | | | | | | | | |
| 2.1 Stakeholder identification | | | | | | | | | | | | |
| 2.2 Consultations | | | | | | | | | | | | |
| **3 Plant assessments** | | | | | | | | | | | | |
| 3.1 On-site assessments | | | | | | | | | | | | |
| 3.2 Consultations | | | | | | | | | | | | |
| **4 Roadmap** | | | | | | | | | | | | |
| 4.1 Roadmap development | | | | | | | | | | | | |
| 4.2 Expert workshop | | | | | | | | | | | | |
| **5 Development of implementation plan** | | | | | | | | | | | | |
| **6 Capacity building** | | | | | | | | | | | | |
| 6.1 Assess needs | | | | | | | | | | | | |
| 6.2 Develop agenda | | | | | | | | | | | | |
| **7 Capacity building event** | | | | | | | | | | | | |

### 2.4 Expertise required

The following resources are required to carry out the aforementioned activities. It is assumed that all experts are fluent in French to be able to carry out stakeholder consultations without need for a translator.

**Expertise:**

Output 1
- Expertise in co- and tri-generation technology
- Expertise in complex cross-sectoral supply chains
- Expertise in resource economics, particularly in the agro-industry sector and biomass for energy production
- Expertise in energy policy and regulation (in the local context)

Output 2
- Expertise in co- and tri-generation technology
- Expertise and experience with industrial plant assessments

Output 3
- Expertise in co- and tri-generation technology
- Expertise with the technology roadmap methodology, and particular experience with the development of energy technology roadmaps

Output 4
- Expertise in communicating complex technical and economic context to a diverse audience
- Experience with conducting multi-stakeholder workshops

**Meetings:**
- Visits to two existing co- and tri-generation facilities
- Stakeholder meeting to present background analysis discuss open issues before roadmap development
- Capacity building workshop

### 2.5 Main partners

| Stakeholder | Role to support the implementation of the CTCN assistance |
|---|---|
| National Energy Efficiency Agency (AEME) | Request proponent; project design, implementation, monitoring and evaluation |
| The Centre for Study and Research in Renewable Energy (CEREER) | NDE |
| Senelec | Monitoring |
| DEEC | Project development assistance |
| MEDER | Monitoring and evaluation |
| Industries and services | Beneficiaries |
| Financial institutions | Fundraising |
| National Agency for Renewable Energy (ANER) | Stakeholders |
| Bureau de Mise à Niveau | Technical assistance, monitoring and evaluation |

### 2.6 Indicative budget

The total budget for this intervention is estimated at USD 49,600. Further details on the indicative budget are outlined in Annex 2.

| Activities | Estimated Budget (USD) |
|---|---|
| Activity 1 State-of-the-art | 7,600 |
| Activity 2 Interviews with key stakeholders | 1,500 |
| Activity 3 Assessment of existing plants | 8,500 |
| Activity 4 Development of roadmap | 20,000 |
| Activity 5 Development of implementation plan | 2,000 |
| Activity 6 Capacity building | 2,400 |
| Activity 7 Capacity building event | 7,600 |
| **Total** | **49,600** |

### 2.7 Gender considerations

The intervention under this request, although not having a particular emphasis on gender issues, will be gender-sensitive, which is a prerequisite in all CTCN technical assistance interventions. This intervention is expected to have overall limited direct influence over gender equality and/or women's empowerment in the countries. CTCN recognizes that women and men are expected to be affected differently in terms of their rights, needs, roles, opportunities, etc..

The CTCN intervention will make sure to not only include women in all related activities, but to give them an equal voice. It is important to ensure that gender relations do not become invisible under assumptions of neutrality especially in projects related to climate technologies. Should unexpected gender impacts be identified during implementation the implementer will allow post-adjustments to the planned activities to accommodate for the changes.

### 2.8 Risk identification and risk mitigation

| Risk | Consequence | Probability | Mitigation measure |
|---|---|---|---|
| Existing plants not replicable in the country | Moderate prospect for uptake of the technology | M | Consider aspects of geographic location, distance to and connection with major industrial hub, business model. |
| Key stakeholders not engaging during roadmap development | Roadmap misses out the interests of vulnerable groups | M | Ensure smallholders and anyone affected by and involved in the bioenergy supply chain are involved during roadmap development and communicate to more powerful stakeholders that inclusiveness is beneficial to everyone. |
| Lack of appetite from key stakeholders for such technology | High resistance to engage | H | Ensure that the case of this technology is well articulated and explained. |
| First investment for proposed technologies not affordable for industries and services | Low implementation possibilities | H | Define appropriate financials mechanism |

## 3. Long-term impacts of the assistance

### 3.1 Expected climate change-related benefits

*Please describe the impacts (i.e. anticipated long-term effects) that are foreseen to be produced by the CTCN assistance, including its contribution towards mitigating and adapting to climate change. If possible, identify specific targets. Indicate in the table below how the CTCN assistance will contribute to one or more of the core CTCN climate technology impacts. (Note that the list of CTCN climate technology impacts as set out in the table below is not definitive and subject to refinement/change).*

| | CTCN climate technology impact | Anticipated contribution from CTCN assistance |
|---|---|---|
| 1 | Climate technologies adapted to national context are identified and prioritized to enable their deployment and/or transfer in the requesting countries | The roadmap developed in this assistance will facilitate the effective dissemination of co- and tri-generation technology in the country |
| 2 | New national Technology Needs Assessment (TNA) and Technology Action Plan (TAP) as a result of the response | |
| 3 | Progress made against mitigation objectives (i.e. energy and carbon intensity reduction) as a result of the response | Co- and tri-generation technology in Senegal will allow for a more efficient use of energy and therefore reduce primary energy demand and associated greenhouse gas emissions. Aside from this, biomass-fired plants will displace fossil fuels and hence also mitigate climate change. |
| 4 | Progress made against adaptation or resilience objectives (e.g. climate vulnerability index improvement) as a result of the response | |
| 5 | New mitigation or adaptation technology projects/initiatives implemented as a result of the response | |
| 6 | New or strengthened policies/ laws developed, approved and enacted as a result of the response | |
| 7 | New policies/laws where climate change was mainstreamed as a result of the response | The roadmap and capacity building activities will improve understanding of the potentials of co- and tri-generation technologies and may incentivise policy adjustments. |
| 8 | Country integrating climate change mitigation and/or adaptation issues into its planning and policies as a result of the | |

| | | |
|---|---|---|
| | response | |
| **9** | New or strengthened Public-Private Partnerships (PPP) created directly as a result of the response | |
| **10** | New or strengthened twinning arrangement created as a result of the response | |
| **11** | Capacities to access and attract public and private finance increase to enable financing of technology deployment | |
| **12** | Post-response intervention funding attributable to the response. | |
| **13** | Framework and analysis of local production developed to enable deployment of national production of climate technologies | |

### 3.2 Co-benefits

*Please describe the anticipated economic, social, and environmental co-benefits of the CTCN assistance. Indicate in the table below how the CTCN assistance will contribute to one or more of the Sustainable Development Goals (SDG)*[1].

| | **Sustainable Development Goal** | **Contribution from CTCN assistance** |
|---|---|---|
| **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 | The dissemination of co- and tri-generation technology will reduce the need for expensive fossil fuel imports that are subject to fluctuating prices and supply and cause GHG emissions |
| **8** | Promote sustained, inclusive and sustainable economic growth, full and productive | Affordable and reliable energy generation is essential for industrial competitiveness, |

[1] Please note that the SDGs as listed here reflect their current status and may be subject to change.

| | | |
|---|---|---|
| | employment and decent work for all | sustainable economic development and job creation |
| **9** | Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation | Technology upgrading and innovation allow industries to strive |
| **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 | Substitution of fossil fuels and reduction of GHG emissions |
| **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 | |

### 3.3. Post-assistance plans and actions

*Please provide an indication of any specific post-CTCN assistance plans and actions that could be implemented in order to maximize the in-country and sector-based ownership and use of the outputs and outcomes produced by the CTCN assistance in achieving the expected climate change related and co-benefits as described above.*

The key output of this technical assistance is the co- and tri-generation roadmap. The purpose of this technical assistance, in order to achieve the envisaged outcome (section 1.2), is the subsequent implementation of the roadmap. Implementation of the roadmap will open multiple channels to successfully bring forward energy efficient technologies. Firstly, the policy advice should be applied to develop a regulatory framework that facilitates the deployment and dissemination of aforementioned technologies in the country. A strong focus of this should be creating economic incentives for investors to invest in the installation of energy efficient facilities rather than fossil fuel based alternatives. At the same time industrial energy consumers should be encouraged to retrofit existing facilities and switch to energy efficient and renewable resource based technologies.

The lessons learnt, best practices and risk analyses drawn from stakeholder consultations and the plant assessments will support the successful deployment of new technologies and should give investors further confidence. Furthermore, the capacity building workshop carried out as the final activity of the

CTCN assistance will enable and motivate stakeholders to bring co- and tri-generation technologies forward. This resource should be harnessed and follow up meetings among stakeholder groups organized in due time to reduce the risk of time passing creating a shift in priorities.

Finally, there is a possibility to link the outputs of this assistance with the outputs of another CTCN assistance in Senegal titled "Green technology deployment in industrial zones". The two projects have sound potential for synergies and touch upon similar technologies. To finance such an intervention funds from the Global Environment Facility (GEF) could be made available.

### 3.4 Monitoring and Reporting of technical assistance results and impacts

| **Performance indicators of CTCN Assistance** | | | | |
|---|---|---|---|---|
| **Response output** *(linking to sec 1.2)* | **How output will be used to ensure creation of result** | **Expected result** | **Expected outcome of result** *(linking to sec 1.1)* | **Anticipated impact that outcome will produce** *(linking to section 3)* |
| *1.* **Technology review** | The request implementer will use the information as a baseline to inform stakeholders and develop the roadmap | Status of and barriers to co- and tri-generation technology identified and compiled in structured document | Improved access to relevant information to stakeholders and decision makers | Multiple investments made and policies designed in favor of energy efficient technologies and their respective supply chains |
| *2.* **Plant assessments** | The request implementer will incorporate the best practice and barriers identified in the roadmap | Experience with the technology in Senegal shared and further barriers and potentials identified | Increased energy efficiency in the assessed plants | Lessons learnt up scaled and shared with other plants |
| *3.* **Roadmap** | The roadmap will help the National Energy Efficiency Agency and other decision makers in Senegal to bring forward co- and tri-generation technology in an effective and sustainable way | Decision makers informed to facilitate sound strategy development and investments in energy efficient technologies for industries and services | Major investments in co- and tri-generation technologies substituting investments in fossil fuel intensive energy generation technologies | Increased share of energy efficient technologies in the Senegalese industries and Services sectors |
| *4.* **Stakeholder engagement** | The capacity building workshop will educate stakeholders about the results of the intervention and enable them to make sure they are transformed into meaningful outcomes | Stakeholders educated and enabled to contribute to the deployment, dissemination and maintenance of co- and tri-generation technology | Knowledge about energy efficient technologies well distributed among key stakeholders in the country and installed systems running in an efficiently and sustainably | The country is able to educate experts on its own to maintain and further develop energy efficient technologies |

## 4. Signatures

**Signatures of the requesting country**

| **NDE** | **Request Proponent** |
|---|---|
| Name: CEREER | Name: AEME |
| Represented by : Issakha Youm | Represented by: Biram Faye |
| Title: Director | Title: General Director |
| Date: 08 MAR 2016 | Date: |
| Signature: | Signature: |

Pr. Issakha YOUM

Université Cheikh Anta Diop de Dakar – Centre d'Etudes et de Recherches sur les Energies Renouvelables – C.E.R.E.R – Le Directeur

Agence pour l'Economie et la Maîtrise de l'Energie – Le Directeur General

Biram FAYE

**Signatures of the CTCN**

| **CTCN Director** | **Climate Technology Manager** |
|---|---|
| Name: Jukka Uosukainen | Name: Patrick Nussbaumer |
| Title: CTCN Director | Title: Climate Technology Manager |
| Date: | Date: 9 March 2016 |
| Signature: | Signature: |

## Annex 1: Response Logframe

| **Activity** *(link to sec 2)* | **Description of sub-activities conducted by the CTCN** | **Output/ Deliverable** *(link to sec 2.9)* | **Expected Outcome** *(link to sec 3)* | **Main national partners involved** | **Objectively Verifiable Indicator** *(see Annex 5 guidance)* | **Means of Verification** (data source, method of collection, responsibility and periodicity) |
|---|---|---|---|---|---|---|
| **Activity 1:** State-of-the-art | **Sub-activity 1.1:** Compile key documents and distill relevant information on co- and tri-generation technology, with a particular emphasis on applicability to the specific context | Literature review and best practice | Quality and significance of the roadmap ensured | AEME, ANER, BMN | Draft report written | Reports from government agencies, collected in collaboration with government stakeholders, once during the first two weeks of implementation, by the implementer |
| **Activity 2:** Interviews with key stakeholders | **Sub-activity 2.1:** Identify all relevant stakeholders from public and private sector, smallholders, etc.<br>**Sub-activity 2.2:** Carry out stakeholder consultations to assess needs, risks and appetite for such technologies | List of stakeholders<br><br>Complementary inputs received and included in report | Comprehensiveness and applicability of the roadmap increased and key stakeholders informed | ANER, Representatives from industries and services, other stakeholders | Number of Stakeholders interviewed;<br>Final report | Representatives and reports from the sector, direct exchange, once, by the implementer |
| **Activity 3:** Assessment of existing plants | **Sub-activity 3.1:** Carry out thorough assessment of existing plants and draw lessons from experience, including on the technology, financial | Compilation of lessons learned | Lessons learnt utilized and risks mitigated in relation to co- and tri-generation technology | Representatives from industries and services | Assessment report submitted | Reports from the plants and observations during plant visit, exchange with plant management, once, by implementer |

| | | | | | | |
|---|---|---|---|---|---|---|
| | and other aspects<br>**Sub-activity 3.2:** Consult with plant operators and owners and key challenges and opportunities, in conjunction with Activity 2.2 | | application | | | |
| **Activity 4:** Development of roadmap | **Sub-activity 4.1:** Develop roadmap based on realistic medium-term goals established in collaboration with the request proponent and other key stakeholders. Articulate requirements in terms of policy and regulatory framework, investments, technology development/adaptation, and other critical parameters to work towards the preset goals. Develop a set of clear and actionable recommendations to promote the deployment of co- and tri-generation technology in Senegal. Also, analyze the possibility to use other | Draft report<br>Workshop<br>Workshop minutes<br>Final report | Roadmap implemented and appropriate investments in energy efficient technologies made and policies designed | AEME, ANER, BMN | Roadmap delivered | Reports from the government and energy sector, collection via key stakeholders, throughout the roadmap development phase by the implementer |

| | | | | | | |
|---|---|---|---|---|---|---|
| | type of fuel in case it is not possible to do it with biomass in some situations. Propose financial mechanisms for effective development and implementation of the project and design a pilot phase.<br>**Sub-activity 4.2:** Carry out expert workshop to refine and validate the roadmap in terms of barriers identified, technologies and timelines; assess technologies against set goals and discuss implementation strategy | | | | | |
| **Activity 5:** Development of implementation plan | **Sub-Activity 5.1:** Building on the results of the case assessments (Activity 3) and the roadmap (Activity 4) this activity shall contextualize the previous results for the design of an implementation plan for co- and tri-generation facilities for selected | Implementation plan | Energy and resource efficiency in two existing plants increased | Representatives from industries and services, BMN | Report delivered | Reports on plant assessments, data available from previous activities, collected, thus collection not necessary, once |

| | | | | | | |
|---|---|---|---|---|---|---|
| | services. Furthermore, it shall review and improve existing studies for implementation in industries. | | | | | |
| **Activity 6:** Capacity building | **Sub-activity 6.1:** Assess capacity building activities needs of key stakeholder groups<br>**Sub-activity 6.2:** Develop necessary capacity building activities | Input for capacity building material preparation<br><br>Document on capacity building activities | Capacities of key stakeholders extended in a constructive and beneficial way | AEME, ANER, BMN | Capacity building agenda delivered | Barrier reports and stakeholder consultations, collection via key stakeholders, two weeks before capacity building workshop by implementer |
| **Activity 7:** Capacity building event | **Sub-activity 7.1:** Carry out workshop, in conjunction with the expert workshop for the roadmap | Workshop | All stakeholders qualified to support and promote the successful deployment and dissemination of co- and tri-generation technology | Representatives from key stakeholder groups | Number of Participants educated | Barrier reports and roadmap, collection not necessary because data available from previous activities, once to finalize implementation phase by implementer |

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Response Plan

## Annex 2: Response Budget

*The budget template is based on the format required for legal agreements with the CTCN. This is only indicative. The activity-based budget will be finalized by the Response Implementer, in collaboration with the CTC, based on the resources and needs listed in this response plan.*

| Activity | Description | Quantity | Unit | Unit Cost ($) | Cost 2016 | Cost 2017 | Total Cost ($) |
|---|---|---|---|---|---|---|---|
| **Activity 1 : State-of-the-art** | | | | | | | |
| **Personnel** | | | | | | | |
| *Senior expert* | *Expert from implementer will review documents and liaise with stakeholders* | *7* | Person days | 500 | 3500 | | 3500 |
| *Local consultant* | *Review documents and liaise with stakeholders* | *7* | Person days | 300 | 2100 | | 2100 |
| **Component sub-total activity 1** | | | | | | | 5600 |
| **Travel** | | | | | | | |
| *Senior expert* | *Ticket for senior expert* | *1* | *Ticket* | *2000* | *2000* | | 2000 |
| **Component sub-total activity 1** | | | | | | | 2000 |
| ***Sub-total activity 1*** | | | | | | | **7600** |
| **Activity 2 : Interviews with key stakeholders** | | | | | | | |
| **Personnel** | | | | | | | |
| *Senior expert* | *Prepare and carry out stakeholder interviews* | *3* | Person days | 500 | 1500 | | 1500 |
| **Component sub-total activity 2** | | | | | | | 1500 |
| ***Sub-Total Activity 2*** | | | | | | | **1500** |
| **Activity 3 : Assessment of existing plants** | | | | | | | |
| **Personnel** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Senior expert* | *Assess plants (5 days per plant) and write report* | *10* | Person days | 500 | 5000 | | 5000 |
| *Local consultant* | *support senior expert* | *10* | Person days | 300 | 3000 | | 3000 |
| **Component sub-total activity 3** | | | | | | | 8000 |
| **Travel** | | | | | | | |
| *Local travel* | *Transport between accommodation and plants (Taxi)* | *10* | *Ticket* | *50* | *500* | | 500 |
| **Component sub-total activity 3** | | | | | | | 500 |
| ***Sub-Total Activity 3*** | | | | | | | **8500** |
| **Activity 4 : Development of road map** | | | | | | | |
| **Personnel** | | | | | | | |
| *Senior expert 1* | *Will focus on technical components* | *14* | Person days | 500 | 7000 | | 7000 |
| *Senior expert 2* | *Will focus on economical components* | *14* | Person days | 500 | 7000 | | 7000 |
| **Component sub-total activity 4** | | | | | | | 14000 |
| **Travel** | | | | | | | |
| *Travel support for stakeholders* | *Support stakeholders who cannot afford travel* | *20* | *Ticket* | *50* | *1000* | | 1000 |
| *Workshop* | *Mid-term expert workshop* | *2* | *Day* | *2500* | *5000* | | 5000 |
| **Component sub-total activity 4** | | | | | | | 6000 |
| ***Sub-Total Activity 4*** | | | | | | | **20000** |
| **Activity 5 : Development of implementation plan** | | | | | | | |
| **Personnel** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Senior expert* | *Design implementation plan based on plant assessments and roadmap* | *4* | Person days | 500 | 2000 | | 2000 |
| **Component sub-total activity 5** | | | | | | | 2000 |
| ***Sub-Total Activity 5*** | | | | | | | **2000** |
| **Activity 6 : Capacity building** | | | | | | | |
| **Personnel** | | | | | | | |
| *Senior expert* | *Liaise with stakeholders and develop agenda* | *3* | Person days | 500 | 1500 | | 1500 |
| *Local consultant* | *Support senior expert* | *3* | Person days | 300 | 900 | | 900 |
| **Component sub-total activity 5** | | | | | | | 2400 |
| ***Sub-Total Activity 5*** | | | | | | | **2400** |
| **Activity 7 : Capacity building event** | | | | | | | |
| **Personnel** | | | | | | | |
| *Senior expert* | *Host workshop* | *2* | Person days | 500 | 1000 | | 1000 |
| *Local consultant* | *Co-host workshop* | *2* | Person days | 300 | 600 | | 600 |
| **Component sub-total activity 6** | | | | | | | 1600 |
| **Travel** | | | | | | | |
| *Travel support for stakeholders* | *Support stakeholders who cannot afford travel* | *20* | *Ticket* | *50* | *1000* | | 1000 |
| *Workshop* | *Capacity building workshop* | *2* | *Day* | *2500* | *5000* | | 5000 |
| **Component sub-total activity 6** | | | | | | | 6000 |
| ***Sub-Total Activity 6*** | | | | | | | **7600** |
| **TOTAL BUDGET** | | | | | | | **49600** |