

NS-252 - Optimization of Power Generation and Energy Efficiency Program (OGE&EE for its acronym in Spanish)

Ecuador

NAMA Seeking Support for Implementation

A Overview		
A.1 Party	Ecuador	
A.2 Title of Mitigation Action	Optimization of Power Generation and Energy Efficiency Program (OGE&EE for its acronym in Spanish)	
A.3 Description of mitigation action	Since 2008, the Ecuadorian state-owned oil company, Petroamazonas EP, has been developing the project Optimization of Power Generation and Energy Efficiency (OGE&EE for its acronym in Spanish) for their oil production activities in the Ecuadorian Amazon region. This program involves the utilization of associated gas generation, as well as the use of hydro energy from the National grid (Sistema Nacional Interconectado in Spanish) which will be distributed to all production facilities of the Upgraded Oil Industry Electric Grid (SEIP-E for its acronym in Spanish). Currently, associated gas is considered a waste byproduct of crude oil extraction. It contains different amounts of the hydrocarbons such as carbon dioxide and methane that are usually burned on-site flares or vented. By producing energy from associated gas and by utilizing clean energy from the national grid in petroleum production systems, the current use of diesel and crude oil to generate electricity will be replaced. This program is considered a sustainable initiative for Ecuador, thanks to its emissions reductions of 1,86 MtCO₂e of per year reduction of noise associated with generators, improving the quality of life of surrounding communities. Economic and social co-benefits are associated with this project. Economically, the results show that the Ecuadorian state company will achieve significant savings in the use of diesel (310,125,749 gallons of diesel have not been used from the initial operations until 2016). On the other hand, the social benefits are related with the surrounding communities (reliable power, fiber optic connection, noise mitigation, jobs creation). These results have been achieved and reported through the Monitoring and Reporting System established for measuring the key performance indicators of the OGE&EE NAMA.	
A.4 Sector	☒ Energy supply ☐ Residential and Commercial buildings ☐ Agriculture ☐ Waste management ☐ Other	
A.5 Technology	☐ Bioenergy ☒ Energy Efficiency ☐ Hydropower ☐ Wind energy ☐ Carbon Capture and Storage ☐ Land fill gas collection ☐ Other	
A.6 Type of action	☐ National/ Sectoral goal ☐ Strategy ☐ National/Sectoral policy or program ☐ Other	
A.7 Greenhouse gases covered by the action	☒ CO ₂ ☒ N ₂ O ☐ PFCs ☐ Other	
B National Implementing Entity		
B.1.0	Name	Petroamazonas EP
B.1.1	Contact Person 1	Daniel Chiriboga
B.1.2	Address	Av. 6 de diciembre 4226 y Gaspar Cañero, Edificio Villafuerte, Piso 9
B.1.3	Phone	(593)(2)-299-3700 – Ext: 16213
B.1.4	Email	daniel_chiriboga@petroamazonas.ec
B.1.5	Contact Person 2	David Neira
B.1.6	Address	Av. 6 de diciembre 4226 y Gaspar Cañero, Edificio Villafuerte, Piso 9

B.1.7	Phone	(593)(2)-299-3700 – Ext: 16356
B.1.8	Email	david_neira@petroamazonas.ec
B.1.9	Contact Person 3	
B.1.10	Address	
B.1.11	Phone	
B.1.12	Email	
B.1.13	Comments	

[Add Additional Entity](#)

C Expected timeframe for the implementation of the mitigation action

C.1	Number of years for completion	14
C.2	Expected start year of implementation	2018

D Currency

D.1	Used Currency	USD ▼
-----	---------------	-------

Conversion to USD: 1

E Cost

E.1.1	Estimated full cost of implementation	1,152,310,533
	Conversion to USD: 1,152,310,533	
E.1.2	Comments on full cost of implementation	Up to July 2016, unilaterally, Ecuador has invested USD 654,226,558 in this NAMA to put into operation the following facilities (according to the OGE&EE Dev 2013-2017): • Generation Facilities: 17 generating facilities with a combined nominal power capacity of 180,160 kW; i.e. 56% of the target set in the OGE&EE Development Plan 2017. • Distribution Facilities: 157.70 km of electric lines with capacities ranging from 13.8 kV to 69 kV; i.e. 30% of the target set in the OGE&EE Development Plan : • Capture, Transportation, and Handling of Associated Gas Facilities: - Phase 1 Gas Management System CPF. - Gas Accumulation System (Lung Gas) CPF. - Gas Management System EPF. - Repowering Gas Management System Secoya. - Interconnection Pipeline Sacha Norte-CIS and Limoncocha-CPF to increase the volume of gas in Block 15 CPF (pending commissioning). - Gas Management System Limoncocha. - Gas Management System Paka Sur. - Pipeline Drago-CIS (however, this project was suspended for lack of funds). This infrastructure have contributed to save 310,125,749 million of gallons of diesel and reduce 913,411 tons of CO₂.
E.2.1	Estimated incremental cost of implementation	506,227,301
	Conversion to USD: 506,227,301	
E.2.2	Comments on estimated incremental cost of implementation	

F Support required for the implementation the mitigation action

F.1.1	Amount of Financial support	506,227,301
	Conversion to USD: 506,227,301	
F.1.2	Type of required Financial support	☒ Grant ☐ Loan (sovereign) ☒ Loan (Private) ☐ Concessional loan ☐ Other ☒ Guarantee ☒ Equity ☒ Carbon finance
F.1.3	Comments on Financial support	Amount of financial support have been defined as the differential between the costs incurred by the Government of Ecuador detailed previously and the costs necessary for the project full implementation. For the OGE&EE NAMA, incremental cost includes investments for: • Generation facilities with a combined nominal power capacity of 31.29 MW (USD 61.2 millions, including MSAG pilot initiative described in F.2.1). • Distribution facilities: 519.7 km of electric lines with capacities ranging from 34.5 kV to 69 kV and Capture and Transportation Gas Facilities (USD 140 including capacity building described in F.3.1). • Transmission System of 138 kV for connecting the Upgraded Oil Industry Electric Grid (SEIP-E) to the National Grid (SNI) (USD 305 millions). The mitigation activities come mainly from the implementation of electricity generation facilities using the associated gas. However, since 2014, the OGE&EE suffered budget cuts that have limited the implementation of the activities planned in the OGE&EE Development Plan 2013-2017. For example, the budget for USD 276,667,021; however, only USD 70,000,000 were available. It is worth mentioning that by the end of 2014, USD 50,000,000 out of these USD 70,000,000 already secured through contractual instruments.

The OGE&EE Program has a financial mechanism used in large investments and it is based on: (i) the project's ability to generate cash flows to meet the repa loans; and (ii) contracts between various stakeholders to ensure the profitability of the project.

The main features of this mechanism are the following:

- An independent vehicle or legal entity is created as a financial instrument for the project, which in specialized literature is denominated "Special Purpose Veh
- The manager or project sponsor can provide most of the capital of the SPV, linking project funding to project management.
- The SPV holds contracts with various parties: manufacturers, suppliers, customers and financial institutions, among others.
- The SPV operates at a high level of debt to equity ratio, so that lenders have limited possibilities to claim in case of default.
- The demand in contracts of guarantee enables the project to be profitable, and thereby capable of satisfying the interests of the In addition, these requirements are higher in the initial phase of the project (design and construction). This is because the costs of are very high and the project does not generate income yet. As a counterpart, it is a common practice to take as collateral the con machinery construction and power purchase agreements, among others.

F.2.1 Amount of Technological support

3,600,000

F.2.2 Comments on Technological support

Given the nature of this Program, this also covers research and development in areas such as flexible fuel solutions, which are ca using associated gas, crude oil, condensates, or a combination of them. Developments will also cover Monetizing Stranded Asso (MSAG) by means of virtual pipelines, making it technically and economically viable to bring to the market small volumes of remot associated gas. Virtual pipelines is a technology that has been implemented before for natural gas but not for associated gas, with volumes at the source and high CO₂, heavier hydrocarbons and water content. Conceptual designs prepared in-house were alrea by an international company based in Norway with the support of the Interamerican Development Bank (IADB). The amount of te support will be invested in a pilot project in Pucuna; however, more than 20 sites have been identified to apply this technology, wh great potential for scaling up.

F.3.1 Amount of capacity building support

4,000,000

Conversion to USD: 4,000,000

F.3.2 Type of required capacity building support

☐ Individual level

☒ Institutional level

☒ Systemic level

☐ Other

F.3.3 Comments on Capacity Building support

The amount of capacity building support is needed to prepare key studies that are going to strength the capacity of our team, by the methodology "learning doin studies help us to structure to be part of a new Development Plan of the Program (an updated version of the OGE&EE Development Plan 2013 - 2017). So, P must formulate the following studies:

- An expansion plan of the Local Grid (SEIP-E).
- A whole validation of the study related to the availability of associated gas.
- An energy management analysis for the SEIP-E (energy dispacht criteria, operative, administrative and commercial terms, etc.)
- An upgrading of the current MRV System implemented.

G Estimated emission reductions

G.1 Amount

1.86

G.2 Unit

MtCO₂e/yr

G.3 Additional information (e.g. if available, information on the methodological approach followed)

For the calculation of emission reductions, the difference between emissions from the baseline scenario and the scenario with the implementation of OGE&EE was modeled. The Software Long-range Energy Alternatives Planning System (LEAP) has been used NAMA.

The baseline scenario is defined as the continuation of the operation of the existing oil and gas infrastructure without processing any recovered associated gas energy and without other significant changes. It is expected that without the project there will be 35.68 MtCO₂e emissions for the period 2016 - 2025 from the ci power generation.

The project emissions scenario is defined as the operation with the new oil and gas infrastructure capable of processing the associated gas and connection with from the national grid. It is expected that with the project there will be 21.56 MtCO₂e emissions for the period 20126- 2025 from the new energy power generati

The total emissions avoided with the project OGE&EE is 14.12 MtCO₂e from 2016 to 2025. A stabilization is reach in 2022 where t emissions reductions will not vary, representing 1.86 MtCO₂e per year. This annual reduction represent the complete implementati OGE&EE project.

H Other indicators

H.1 Other indicators of implementation

Petroamazonas manages a Monitoring and Reporting System named as "Sistema de Gestión de Indicadores de Eficiencia Energética (SGI-EE)" that measures daily, among others the following key energy efficiency indicators: volume of diesel fuel savings, volume of fuel savings (in Barrel Oil Equivalent – BOE), volume gas optimized for power generation, economic savings and CO₂ emissions reduction. However, it is still pending to include in this system other indicators design measure and report the co-benefits of the Program such as: energy delivered to communities, noise level mitigation and short-lived climate pollutants reduction carbon).

The SGI-EE includes a set of established goals which are compared to metered parameters to measure the performance of the OGE&EE Program.

I Other relevant information

I.1 Other relevant information including co-benefits for local sustainable development

(1) Co-Benefits:

Local stakeholders / communities: i) Reliable power, ii) fiber optic connection, iii) noise mitigation, iv) job creation, v) infrastructure for lasting development.

As a successful example in September 2014, the first power distribution project between an oil company and the Pañacocha community was implemented in energy for this community. Under the business as usual scenario, Petroamazonas would not have invested in this project and the community would have met its energy needs with stand alone diesel power generators. Under the OGE&EE NAMA scenario, the following infrastructure was developed: (i) an 13.8 kV power line constructed under the Napo River; and, (ii) two power substations at Napo Norte (35 kV) and Yanahurco (15 kV).

Since the beginning of operation, this project has delivered an average of 29,000 kWh per month generated with associated gas that was flared at the production area (EPF) in Block 12 before the project.

Country: i) Decrease dependence on imported diesel, ii) increase oil revenues, iii) optimize usage of clean hydropower, iv) reduce capital requirements.

Oil Companies: i) Improve availability and reliability of power, ii) Reduce capital requirements (by increasing utilization factor of power generation facilities) and operating cost.

(2) Innovative Approach:

Project Clustering: Develop a cluster project approach beyond the traditional project boundaries integrating different oil blocks and operators with the objective of a Win / Win solution for all.

Barrel Oil Equivalent (BOE): Translate an energy efficiency / power program into increasing net barrel oil equivalent (BOE) volumes, thereby allowing it to be compared with traditional oil enhancement projects.

Win / Win Approach: By means of the program contribute to a lasting prosperous development of a mayor part of the country. By means of this approach stakeholders perceive a direct benefit of the oil industry activities.

Uniqueness: Based on the studies performed it is apparent that the Project Cluster and Win / Win approach developed by Petroamazonas through the OGE&EE Program is the "first of its kind" on a world wide scale.

J Relevant National Policies strategies, plans and programmes and/or other mitigation action

J.1 Relevant National Policies The OGE&EE Program is aligned with the national policy through the National Plan for Good Living 2013-2017 and the National Strategy for Climate Change 2012-2025. Firstly, the Program contributes to sustainability in the Amazon Region by integrating an efficient energy system that promotes local development (cf. Objective 7: "Ensuring the rights of nature and promoting environmental sustainability"). Secondly, the construction of the SEIP-E ensures the energy sovereignty and energy efficiency as it integrates a greater participation of renewable energies through the integration with the SNI (cf. Objective 11: "Ensuring the sovereignty and efficiency of the strategic sectors for industrial and technological transformation"). For these reasons, this program strengthens the restructuring of the oil energy matrix by reducing diesel consumption, optimizing associated gas and interconnecting the SEIP-E to SNI to take advantage of the hydropower surplus (cf. Objective 10: "Promoting the transformation of the productive matrix").

The use of associated gas is also a pollution prevention action and a climate change mitigation measure because it reduces flaring and greenhouse gas emissions by eliminating the combustion of associated gases such as Carbon Dioxide (CO₂) and Methane (CH₄) (cf. Policy 7.7: "Promoting efficiency and the increased participation of sustainable renewable energies as a means of preventing environmental pollution". Policy 7.10: "Implementing mitigation and adaptation actions in relation to climate change to reduce the economic and environmental vulnerability, with emphasis on vulnerable groups").

Keeping in mind the energy policy and planning of this sector on the long term, the National Energy Agenda 2016 - 2040 (Agenda Nacional de Energía 2016-2040) released in October 2016, displays the main characteristics of the Ecuadorian energy sector summarized into five strategic goals. Under the second Strategic Goal "A Diversified, Renewable and Sustainable Energy Matrix", the associated gas flaring reduction is considered as a key guideline and action to be undertaken in Ecuador in the oil & gas sector.

J.2 Link to other NAMAs

(none)

K Attachments

K Attachments	Title	Description
	In Ecuador Innovation Leads to Significant CO2 Reduction.html	(3) Article titled: "In Ecuador, Innovation Leads to Significant CO ₂ Reduction" (March 2014)
	NAMA OGE and EE Ecuador.pdf	Presentation of the NAMA OGE&EE held in the NAMA Market Place Session at the Latinamerican Carbon Forum in Panama (September 2014)
	rtcc2014 RESPOND MAGAZINE OGE and ee.pdf	Responding To Climate Change RTCC Magazine, RESPOND COP21 Paris, Article titled: "Walking the Talk: It's Time to Back Climate Action" (November - December 2014)

K.1 Attachment description

K.2 File

No file chosen

L Support received

L.1	Outside the Registry	Technical Cooperation from: Low Emission Capacity Building Programme (LECB), the Interamerican Development Bank (IADB), the World Bank/Global Gas Reduction (GGFR) Partnership.				
L.2	Within the Registry	Support provided	SupportType	Amount	Comment	Date
No records to display.						