INDEPENDENT EVALUATION DIVISION
OFFICE OF EVALUATION AND INTERNAL OVERSIGHT

INDEPENDENT TERMINAL EVALUATION

COLOMBIA

PROMOTION OF INDUSTRIAL ENERGY EFFICIENCY IN COLOMBIAN INDUSTRIES

UNIDO PROJECT ID: 140122
GEF PROJECT ID: 5828

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Abbreviations and acronyms

Abbreviation	Meaning
ANDI	National Business Association of Colombia
APR	Annual Project Review
ASOBANCARIA	Trade Association of Financial Institutions
Bancoldex	Colombian development bank
CAEM	Corporación Ambiental Empresarial
CO_2eq	Equivalent Carbon Dioxide
COLCIENCIAS	Administrative Department of Science, Technology and Innovation
CONPES	Colombian Strategy for Implementing the Sustainable Development Goals
DOE	Department of Energy, USA
EE	Energy Efficiency
EnMS	Energy Management System
ESCO	Energy Service Company
FENOGE	Fund for Renewable Energy and Energy Efficient Management
GEF	Global Environment Facility
GHG	Greenhouse Gases
ICA	International Copper Association
ICONTEC	Colombian Institute of Technical Standards
IEE	Industrial Energy Efficiency
IEEM	Industrial Energy Efficiency Methodology
ISID	Inclusive and Sustainable Industrial Development
IW	Inception Workshop
KPIs	Key Performance Indicators
MADS	Ministry of Environment and Sustainable Development
MinCIT	Ministry of Trade Industry and Tourism
MME	Ministry of Mines and Energy
M&E	Monitoring and Evaluation
M&V	Monitoring and Verification
MRV	Monitoring, Reporting and Verification
SO	System Optimization
NAMA	Nationally Appropriate Mitigation Action

Abbreviation	Meaning
NTC	National Technical Standard
NSC	National Steering Committee
OECD	Organization for Economic Co-operation and Development
ONAC	National Accreditation Body
ISO	International Standard Organization
PEVI	Industrial Evaluation Programme
PIF	Project Identification Form
PIRs	Project Implementation Reports
PMU	Project Management Unit
PRODOC	Project Document
PROURE	Program for the Rational and Efficient Use of Energy
RE	Renewable energy
RECIEE	Colombian Energy Efficiency Knowledge Network
RGST	General Regulation of Thermal Systems
ToC	Theory of Change
UPME	Mining and Energy Planning Unit
UNDP	Unit Nations Development Program

Glossary of evaluation-related terms

Term	Definition
Baseline	The situation, prior to an intervention, against which progress can be assessed.
Effect	Intended or unintended change due directly or indirectly to an intervention.
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved.
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.
Impact	Positive and negative, intended and non-intended, directly and indirectly, long term effects produced by a development intervention.
Indicator	Quantitative or qualitative factors that provide a means to measure the changes caused by an intervention.
Lessons learned	Generalizations based on evaluation experiences that abstract from the specific circumstances to broader situations.
Logframe (logical framework approach)	Management tool used to facilitate the planning, implementation and evaluation of an intervention. It involves identifying strategic elements (activities, outputs, outcome, impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results-based management) principles.
Outcome	The likely or achieved (short-term and/or medium-term) effects of an intervention's outputs.
Outputs	The products, capital goods and services which result from an intervention; may also include changes resulting from the intervention which are relevant to the achievement of outcomes.
Relevance	The extent to which the objectives of an intervention are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donor's policies.
Risks	Factors, normally outside the scope of an intervention, which may affect the achievement of an intervention's objectives.
Sustainability	The continuation of benefits from an intervention, after the development assistance has been completed.
Target groups	The specific individuals or organizations for whose benefit an intervention is undertaken.

Executive summary

C1. The objective-level targets were achieved by the project and some of them were exceeded according to the estimates of the PMU and the evaluation team. The direct energy savings identified were 2,573,994 GJ and the emission reduction identified was 175 ktCO2 in the period 2015-2017, exceeding the targets by 287% and 251%, respectively. These achievements were due in part to the effectiveness and usefulness of the EnMS and System Optimization trainings provided. In addition, an Industrial Assessment Program was piloted and included as an additional output of the project, which contributed to the reduction of emission of 10 kt CO2eq/yr. **Regarding the achievement of outcomes and outputs, 4 indicators of Outcomes 1, 3 and 4, and two outputs related to financing schemes to promote EE in industry were not achieved** mainly due to project design problems and the limited participation of industry.

C2. Even though the project design was based on clearly identified problems and clear target beneficiaries, there were limitations in the consultations made to relevant project partners (i.e. Asobancaria) during this phase, and important inconsistencies in the Project Results Framework and unrealistic indicators (i.e. lack of consistency between Outcome 1 and its indicators), which caused changes in 4 activities of Outcome 4 and non-compliance of indicators of outcomes and outputs. **Therefore, the project design has important shortcomings that affected the effectiveness of the project.**

C3. The project was fully in line with the political and institutional framework of the Colombian government, including previous and new plans and programs related to energy management and security, which promoted active participation of project partners and stakeholders. **The project also supported GEF-5 strategic objectives on climate change and the UNIDO's long-term strategy of Inclusive and Sustainable Industrial Development.**

C4. Given that some activities of Outcome 4 were modified and the new activities did not directly contribute to the achievement of the Outcome 4 and also considering that the monitoring tools on project progress were not developed despite the fact that there were resources to do so and the lack of information on the materialization of co-financing, **it is not possible to determine if the resources of the project were sufficient and if the activities were carried out with a good value for money**.

C5. The M&E is the weakest aspect of the project. The tools to monitor the project were not developed due to confusion with the M&E tools for EE measures, the adaptive measures implemented were not documented nor justified and the PIRs lack of important information such as the cumulative budget expenditures and the co-financing materialization. The PMU paid little attention to the Project Results Framework as two indicators of the project objective were not estimated or taking into account to measure project achievements.

C6. In accordance with evaluation team estimates, the project achieved an actual power saving of 43.6 GWh/year and fuel savings of 0.347 PJ/year for the period 2015-2017. These savings represent cumulative direct emissions reductions of 74.5 kt CO_2eq in the same period and cumulative post project direct emission reduction of 498.2 kt CO_2eq. Thus, **the project has already contributed to reducing emissions and, consequently, has collaborated to tackle climate change**. The main drivers identified to implement EE measures were to increase company competitiveness and obtain economic savings. The main barriers identified were the lack of tools and equipment, economic resources and support from senior management.

C7. Sustainability seems to be the strongest aspect of the project. There is an exit strategy that consists of the implementation of 5 PEVI Centers in universities that participated in the project. In addition, RECIEE will continue to provide its EE training programs. Therefore, the partnership amongst

University-Industry-Government will also continue. Financial risks are low due to the potential creation of a Certificate of Energy Efficiency in the short-term and the possible use of FENOGE resources to support the certificates. Institutional and government risks are also low due to the high level of ownership of the project by UPME and the programmatic and institutional framework that support its actions.

C8. The high performance of UNIDO and UPME was highly acknowledged by project partners and beneficiaries. The expertise of UNIDO staff and its technical materials and international consultants significantly contributed towards achieving project objective. The level of ownership of UPME and its active participation in the project also contributed to the project achievements and to the sustainability of its benefits. **The effective interaction amongst Universities-Industry-Government is also highlighted**. Notwithstanding, an agreement between the project and the NAMA project was necessary to accord on how to report the shared emission reductions obtained to the GEF, since there is a high risk of double accounting of emission reduction by the GEF. In addition, **a higher participation of the industry was expected.**

C9. The project made significant efforts to include the gender perspective during its design and implementation. The goal of reaching at least 20% of women participation in the training activities on EnMS was exceeded, reaching 27%. It is important to highlight the project had *per se* a limited direct influence over gender equality and/or women's empowerment.

Recommendations

Recommendation 1 to UNIDO and UPME: Since the Project Results Framework is based on a chain of results, any modification to it results in a change in its logic and, consequently, affects the achievement of objectives, outcomes, outputs or indicators. Therefore, it is suggested that for similar projects, before making any changes to the Project Results Framework, these changes be assessed in depth by the executing and implementing agencies to analyze its effect and make the necessary adjustments to maintain the logic of the results and the results itself. If changes to the Project Results Framework are significant (i.e. change of indicators or results), it will be necessary to inform the GEF and obtain its authorization.

Recommendation 2 to UNIDO: In order to avoid double counting in the emission reductions reported by the project and the NAMA Project, it is suggested that for the final report, UNIDO agrees with UNDP, the implementing agency of the NAMA project, on how to report to GEF the reduction of emissions achieved from the participating enterprises in the NAMA project.

Recommendation 3 to UNIDO: For similar projects, it is advisable to increase the level of awareness of UNIDO project implementers on the usefulness of a monitoring system and the need to use the Project Results Framework to manage projects. This is essential to identify, in early stages, potential risks or deviations of the project that may affect its performance, therefore, timely corrective actions can be undertaken, and also to ensure that all project objectives and indicators are met. In the same line, it is also recommendable to develop guidelines to conduct Internal Mid Term Reviews for project managers of medium-size projects who wish to conduct it in order to make her/his effort effective.

Recommendation 4 to UNIDO: According to the updated Co-financing Policy of the GEF (GEF, 2018), which increased the level of ambition for the overall GEF portfolio to reach a ratio of US 6 in co-financing for each dollar in GEF financing, a more detailed report of realized co-financing and investment mobilized at mid-term and project completion is required. Therefore, it is advisable that UNIDO enhance the monitoring of materialized co-financing during project implementation for future similar projects.

Recommendation 5 to GEF: To optimize resources and facilitate the report of CO_2 emission reductions to accomplish national and international climate change commitments, it is advisable that GEF states that the development of Monitoring, Reporting and Verification tools, as part of the outputs of IEE projects, are aligned with the National MRV, and where appropriate meet its guidelines.

Recommendation 6 to UPME: It is suggested that UPME, as part of the project exit strategy, provides follow-up to the participating enterprises in the EnMS training program to consolidate EnMS implementation and ensure energy savings identified, and also to obtain more successful cases than allows UPME to continue promoting EE in the industrial sector considering its skepticism in EE measures.

Lessons learned

Lesson 1: The development and enactment of legal instruments are political processes that are subject to the political will of relevant actors and external pressures, and depend largely on the current context. These processes could last for months or years and can hardly be controlled. Therefore, if a project decides to include them as an output or target of an indicator, it must include a high-level risk due to its possible non-compliance.

1. Evaluation objectives, scope, methodology and approach

1.1 Introduction and background on the terminal evaluation

An independent terminal evaluation of the UNIDO Project entitled "Promotion of Industrial Energy Efficiency in Colombian Industries" (Colombia IEE project) was conducted, following UNIDO Evaluation Policy and GEF Monitoring & Evaluation Policy. This report has been prepared as the Terminal Evaluation (TE) for the project, carried out during the period of August to December 2019 by an independent team including an international consultant (Mrs. Teresita Romero), who also acted as the team leader, and a national consultant (Mr. Humberto Rodríguez).

Colombia IEE project was launched on 9 September 2015 by UNIDO, and executed by two Colombian agencies: the Mining and Energy Planning Unit (UPME, Unidad de Planeación Minero Energética) of the Ministry of Energy and Mines, and the Department for Science, Technology and Innovation (Colciencias). The project was completed over a period of 4 years.

1.2 Objectives and scope of the terminal evaluation

The purpose of the evaluation is to independently assess the project to help UNIDO improve performance and results of ongoing and future programs and projects. The Terminal Evaluation (TE) covered the whole duration of the project from its starting date on 9th September 2015 to the completion date in September 30, 2019. The evaluation has two specific objectives:

- Assess the project performance in terms of relevance, effectiveness, efficiency, sustainability and progress to impact; and
- Develop a series of findings, lessons and recommendations for enhancing the design of new and implementation of ongoing projects by UNIDO.

Within the evaluation of project components 2 and 3, the evaluation also assessed the results and lessons learnt by the piloting of the UPME-UNIDO Industrial Assessment Centers (PEVI) program. The target audience of the TE are the GEF Operational Focal Point; project partners and beneficiaries; country, regional and HQ of UNIDO, and GEF Secretariat and GEF EO. The Terminal Evaluation provides lessons learned that could be valuable for UPME to adjust its corresponding EE programs and trainings, and for UNIDO and GEF to improve the design on new and ongoing projects.

a. What are the key drivers and barriers to achieve the long-term objectives? To what extent has the project helped put in place the conditions likely to address the drivers, overcome barriers and contribute to the long-term objectives?
b. How well has the project performed? Has the project done the right things? Has the project done things right, with good value for money?
c. What have been the project's key results (outputs, outcome and impact)? To what extent have the expected results been achieved or are likely to be achieved? To what extent the achieved results will sustain after the completion of the project?
d. What lessons can be drawn from the successful and unsuccessful practices in designing, implementing and managing the project?

Box 1: Key evaluation questions

The evaluation also assessed the likelihood of sustainability of the project results after the project completion. The assessment included the analysis of key risks (e.g. in terms of financial, socio-political, institutional and environmental risks).

1.3 Evaluation methodology

The TE was conducted in accordance with the UNIDO Evaluation Policy[1] and the UNIDO Guidelines for the Technical Cooperation Project and Project Cycle[2]. In addition, the GEF Guidelines for GEF Agencies in Conducting Terminal Evaluations, the GEF Monitoring and Evaluation Policy and the GEF Minimum Fiduciary Standards for GEF Implementing and Executing Agencies were applied.

The evaluation was carried out as an independent in-depth evaluation considering the Evaluation ToR (Annex 1) and using a participatory approach whereby all key parties associated with the project were informed and consulted throughout the evaluation. The evaluation used a theory of change approach and mixed methods to collect data and information from a range of sources and informants. It paid attention to triangulating the data and information collected before forming its assessment, which was essential to ensure an evidence-based and credible evaluation, with robust analytical underpinning.

Prior to the field mission, the evaluation team conducted desk reviews of project related documents, designed the methodology for data collection, reconstructed the Theory of Change of the project, conducted a stakeholder mapping and elaborated the Evaluation Matrix (Annex 2). These elements formed part of the team's Inception Report.

The evaluation methodology consisted of:

a. Desk reviews of over 61 documents, articles and presentations (see Annex 3 for the list of documents consulted);
b. Forty-two key informant interviews, 24% of whom were women (see Annex 4 for the list of interviewees). The number of persons interviewed by the evaluation team as part of the evaluation process are disaggregated by gender and category (institutional and company representatives) in Table 1. The interviews were carried out during the mission in Colombia, from 29 August to 9 September 2019, and Vienna from 12 to 13 September 2019.

Table 1: Stakeholders interviewed

Institutional Representatives		Company Representatives		Total	% Women
Men	Women	Men	Women		
13	6	19	4	42	24%

c. Online survey developed using the Survey Monkey® platform to obtain further information on project performance from the project participating enterprises. The survey was sent to 225 representatives of the enterprises: 122 persons that participated in the EnMS training program (71 persons of Phase 1 and 56 persons of Phase 2), 81 persons involved in the Optimization System training, and 17 persons that participated in PEVI program (phase 1 and phase 2). A total of 94 persons completed the online survey, representing 42% of the 222 circulated to participating enterprises, 16% of whom were women (Table 2). 42 submissions were received from people involved in EnMS training phase 1, 14 submissions were received from persons

[1] UNIDO. (2015). Director General's Bulletin: Evaluation Policy (UNIDO/DGB/(M).98/Rev.1).
[2] UNIDO. (2006). Director-General's Administrative Instruction No. 17/Rev.1: Guidelines for the Technical Cooperation Programme and Project Cycle (DGAI.17/Rev.1, 24 August 2006)

involved in phase 2; 33 submissions were from persons participating in SO training and 5 submissions were from PEVI Program participants.

Table 2: Respondents to online survey

Men	Women	Total	% Women
79	15	33	16

d. Direct observation during site visits to enterprises in Colombia. The visits were carried out in Bogotá, Cucuta, Boyaca and Cali. A total of 12 enterprises were visited and representatives interviewed (See Annex 5 with Itinerary and Mission Agenda). In order to select the enterprises to be visited a matrix of selection was created with the following criteria:

- Enterprise with the highest level of reduction of CO2eq and the highest energy savings
- Enterprise with the lowest level of reduction of CO2eq and the lowest energy savings
- Enterprise that participated in Phase 1 of Component 2
- Enterprise that participated in Phase 2 of Component 2
- Enterprise that participated in PNUD-GEF and UNIDO-GEF projects
- Enterprise that participated only in UNIDO-GEF project
- Enterprise with particular contextual or geographical conditions that could influence on project implementation and results
- Enterprises that represented successful and unsuccessful cases.

A debriefing session was conducted at the end of the mission in Colombia on September 9, 2019 at the UPME offices to present the TE preliminary findings. Face to face participants included the Technical Leader of the Colombia IEE project (Government of Colombia) and the National Project Coordinator (NPC). A debriefing with UNIDO HQ in Vienna on preliminary mission findings was also conducted on September 12, 2019.

Limitations

The selected enterprises to be visited were based on predefined criteria, so there was an element of bias in the selection, which was necessary to have a representative sample of participating enterprises. However, the online survey was dispatched to all participating enterprises and responses were received from different persons that received the different trainings, which complemented the information compiled through interviews and site visits.

2. Country and project background

2.1 Country background

Energy intensity in the Colombian economy was 0.380 barrels of oil equivalent (boe) per USD 1,000. According to the Mining and Energy Planning Unit (UPME for its acronym in Spanish), in 2011 energy consumption was 1,100,042 terajoules (TJ), with the industrial sector representing 25.1% of the national energy consumption (UPME, 2012).

In an assessment of technical saving potentials, the main opportunities identified in the industrial sector were as follows: 25% savings for heat transfer, 27% for steam generation and 28% for electrical motors. The industrial subsectors with the highest energy consumption were food, beverage and tobacco, cement and chemicals. Energy uses and savings potentials were identified by in-depth assessments on energy use in the industrial sector conducted by UPME in 2013-2014.

During the four years (2010-2013) previous to project formulation (2014), Government agencies promoting Energy Efficiency (EE) in the industry focused on raising awareness and disseminating measures for increasing EE. In that regard, the national government has succeeded in raising awareness about the concept of Energy Management Systems (EnMS) as a necessary management tool, particularly for the industry sector. This programme was jointly executed by the Administrative Department of Science, Technology and Innovation (Colciencias), the Mining and Energy Planning Unit and financed by energy utilities. This programme is a key achievement of "Comprehensive Energy Management System" (CEMS) Programme, which has conducted extensive training but has had some limitations in its adoption by companies.

The national government had taken measures to promote EE. The Ministry of Mines and Energy adopted a 2010-2015 action plan for the Rational and Energy Efficient Use Programme (PROURE for its acronym in Spanish). The Colombian Low Carbon Development Strategy of (CLCDS) identified during 2013 that emissions reduction in the industrial sector was a priority area and called for the development of National Appropriate Mitigation Actions (NAMAs) for EE in the industry. Fiscal incentives were also established in the national fiscal policy (Law No. 223 from 1995 and administrative amendments) including Value Added Tax (VAT) exemption and income tax reduction on equipment and elements used for environmental monitoring and control, focusing on noxious pollutants to the environment. Furthermore, the 2014-2018 National Development Plan (PND for its acronym in Spanish) revised energy use targets for the period were based on the results of the previous four years (2010-2014). Considering a 4.5% average annual economic growth rate scenario for the industrial sector, energy savings targets ranged between 1.75% for 2015 and increased continuously to 6.91% for the year 2018. These targets were set for the industrial subsectors of beverages and tobacco, paper and printing, chemical, cement, steel, iron and non-ferrous ores, identified as the most energy-intensive. These industrial subsectors are present in the selected regions of the EEI project. The annual energy savings targets were to be achieved as a result of implementing measures concerning the following technologies:

- Efficiency improvement in gas or fuel fired steam boilers.
- Direct heat produced by decentralized units instead of the current heat supply based on steam, and
- Mandatory use of electric motors meeting minimum efficiency standards (and banning the use of inefficient motors).

The 2014-2018 PND (National Development Plan) included EE in many sections of the plan but those references needed to be translated into policy instruments or programmes. Technical regulations for steam boilers were identified as an urgent need not only from the safety point of view but also regarding energy efficiency. In addition to the regulatory challenges, the Colombian EEI project identified technical, institutional and financial barriers that needed to be addressed to promote the adoption of EE measures. In the absence of the proposed project, the adoption of EE measures in industry would have been delayed. Policies and programmes were adopted by the Government at a gradual rather than accelerated pace; there was limited coverage of technical training to certain regions; and limited financing options suitable to their specific needs. The project formulated intended to accelerate the penetration of EnMS and the adoption of EE measures in the industry sector. In addition to these measures, information and awareness on energy efficiency practices should be reinforced.

2.2 Project summary

The Colombia IEE project aimed at strengthening the technical and financial capacities of relevant stakeholders to enable the scale up of the energy efficiency (EE) measures, which have been piloted by nationally driven programs. The project consists of the following five components:

- Component 1: Standards and Technical Regulations. It was focused on strengthening targeted elements of the existing national regulatory framework, through the development of specific instruments such as a technical guide on boilers selection and a Monitoring and Evaluation (M&E) scheme.
- Component 2: Capacity development on Energy Management Systems (EnMS). It sought to scale up the program "Comprehensive Energy Management System" (CEMS) at national level through strengthening the existing University programs on EnMS and provide training to EE professionals, enterprises and financial managers, new universities, among others.
- Component 3: Transfer of system optimization technologies. It aimed to build technical capacities in selected enterprises on systems optimization measures for motors, pumps and steam systems.
- Component 4: Promotion of financial mechanism for investment at enterprise level. It sought to assess and strengthen a national financing scheme for the implementation of EE measures in the industrial sector and strengthen the financing institutions to assess EE projects.
- Component 5: Monitoring & Evaluation (M&E). It aimed to put in place a robust M&E mechanism to ensure the attainment of project outcomes.

This GEF project was implemented by UNIDO, and executed through two Colombian agencies: the Mining and Energy Planning Unit (UPME, Unidad de Planeación Minero Energética) of the Ministry of Energy and Mines, and the Department for Science, Technology and Innovation (Colciencias).
The project started in 2015 and received an extension to be finished in September 2019. The total project cost was USD 19,562,398 (USD 1,692,500 grant amount and USD 17,869,898 of co-financing). Additional general information of the project is presented in Table 3.

Table 3: General information on the Colombia IEE project

Project title	Promotion of Industrial Energy Efficiency in Colombian Industries
UNIDO ID	140122
GEF Project ID	5828
Region	Latin American and Caribbean (LAC)
Country(ies)	Colombia
Project donor(s)	GEF, Colombia
Project implementation start date	09 September 2019
Duration	48 months
Implementation end date	30 September 2019
GEF Focal Areas and Operational project	Climate Change CCM
Implementing agency(ies)	UNIDO
Executing Partners	Mining and Energy Planning Unit (UPME) Administrative Department for Science, Technology and Innovation (Colciencias)

Donor funding	USD 1,692,500
Project GEO CEO endorsement / approval date	14 July 2015
UNIDO input (USD)	300,000 (in-kind) 60,000 (cash)
Co-financing at CEO Endorsement, as applicable	USD17,869,898
Total project cost (USD), excluding support costs and PPG	USD 19,152,398
Mid-term review date	December 2017
Terminal evaluation date	August - December 2019

3. Project assessment

3.1 Project design

Overall Design

Previous efforts of the government to promote EE in the industry allowed project designers to identify clear problems and barriers that are slowing down the adoption of EE measures at enterprise level. Therefore, the project design was based on clearly identified problems and clear target beneficiaries, aiming at strengthening the capacities of the industrial sector and related stakeholders to scale up EE measures at company level. In particular, the project identified specific technical, institutional and financial barriers, which were adequately addressed by the project activities indicated in the PRODOC, which were focused on promoting the adoption of EnMS at enterprise level; filling specific regulatory gaps to provide guidance on EE measures for industrial equipment, and proposing financing options to facilitate the implementation of EE measures in the industry.

The project design also took advantage of the previous capacities developed in the universities, that are members of the Colombian Knowledge Network on Energy Efficiency (RECIEE, by its acronym in Spanish), to provide training on EnMS. The project would enhance these capabilities and expand the geographical coverage of training.

It is only observed that there were limitations to identify risks in the general design phase of the project. The lack of adoption of safety regulations for industrial boilers was established as a low-level risk in the PRODOC. This risk derived from the outcome 2, which indicated "The national institutions develop the mandatory regulations [….]." However, the development of mandatory regulations should not have been included as one of the project outcomes, since the implementing and executing agencies did not have the legal power to do so. Therefore, the lack of adoption of safety regulations for industrial boilers was in itself a fact and not a risk, which is explained in more detail in the next section. In addition, the proposed mitigation measure for this risk was inconsistent, as it did not contribute to the adoption of the regulation, but rather clarified that the expected outcome was the guidelines and not the regulation per se, which is inconsistent.

Project Results Framework

The Project Results Framework was assessed to revise the logic and clarity of the result-chain, and the consistence of the project objective and outcomes with their respective indicators and proposed

targets, as well as the pertinence of indicators. Regarding Outcome 1, the following inconsistences were found:

- As mentioned in the overall design assessment, the Outcome 1 "The national institutions develop the mandatory regulations, voluntary standards …" was partly out of reach of the executing partners and beyond the control of UNIDO. In accordance with the institutional regulatory framework, the Ministry of Mines and Energy of Colombia (MinMinas) is the only institution with legal competences to enact mandatory regulations on energy issues. MinMinas is a member of the NSC but not an executing partner, therefore this outcome should have centered on results whose achievement would be in the range of competences of UNIDO and project partners.
- In the same vein, the indicator 1 of Outcome 1 "National technical regulations on EE for boilers are adopted", was also inappropriate as it specified a result that project partners and UNIDO could not accomplish. Moreover, its target "A technical guide for selection of appropriate boilers and their energy efficient operation is available" is not relevant to the indicator as a technical guide is not a regulation. Moreover, the Outcome 1 was partly inconsistent with its outputs and activities, which did not include the development of a regulation.
- In addition, indicator 2 of Outcome 1 and its target were also inappropriate as they focused on raising awareness of a technical regulation that could not be developed by project implementers. This indicator and its target were based on a result that cannot be achieved due to it was beyond the competences of the project. In addition, the target does not specify the number of stakeholders that should be aware, the target is ambiguous. As a consequence, Outcome 1 was partly accomplished as the technical regulation on EE for boilers has not been issued.
- According to the PRODOC, Outcome 1 of the PIF was modified to replace the development of mandatory technical regulations by the development of a technical manual that would be used as a voluntary guide to support boiler selection. It seems that this adjustment did not include the review of the logic y consistence between Outcome 1 with its outputs and indicators and its targets.

Comparing the target of indicator 6 of Outcome 2, which stated "150 enterprises implement EnMS…" with the number of enterprises that implemented EnMS at the end of the project, which were 25 enterprises that received the first training, and 33 enterprises that received the limited-scope training, it seems that the target was disproportionate. The project designers explained that they expected that SGEn trainees could replicate the implementation in other companies; however, since most of the trainees were enterprise personnel it would seem illogic that these personnel could support EnMS implementation in other companies at the cost of their time. The assumptions were not realistic.

Outcome 3 "Demonstrated and measured energy savings in industrial entities through application of system assessment techniques by trained experts, leveraging additional energy savings as more industrial facilities will seek the implementation of systems optimization" as stated in the Project Results Framework, it was inconsistent with its outputs, activities and indicators, which were centered on the technical capacity development in System Optimization. The Outcome 3 should have been the same expected outcome indicated in the Project Framework stated in the first pages of the PRODOC, which is: "Strengthened technical capacities on audit and system optimization for energy end-use leading to measurable energy savings in industrial facilities".

Outcome 4 shows an important failure in its design. That is, there was no effective communication with financial institutions (i.e. Asobancaria, Bancoldex), since the short-term plans of these institutions were unknown by the project designers and the activities of Component 4 were not aligned with these plans. Since these consultations were not carried out, the recent initiatives of these banks related to training on EE and the creation of innovative financial instruments, caused that PMU

reformulated two outputs of Outcome 4: Output 4.1 "The existing national financing scheme for EE measures are evaluated" and Output 4.2 "At least 2 financing schemes for the Colombian industrial entities are redesigned, strengthening the tools used by the investment banks". As a consequence, 4 activities of Outcome 4 were changed during project implementation and the indicators of the Outcome 4 were not achieved. More details are provided in the Effectiveness and Partners Performance sections.

Theory of change

The project design and its Results Framework were re-examined using a Theory of Change (ToC). According to the ToC map (Fig. 1), the long-term impacts of the project would be "to contribute to improving the enterprise competitiveness and tackling climate change" as a result of the energy savings obtained from the adoption of the EnMS and system optimization measures. Energy savings would generate in turn a reduction of Greenhouse Gases (GHG) emissions. As a condition to contribute to this impact, it would be necessary for the project to support the scaling up of energy efficiency measures in selected enterprises, therefore, the objective of the project should have been "to enhance EnMS implementation and develop in-depth energy system assessments to scale up energy efficiency measures". In this logic, the outcomes to fulfill this objective would be to strength the technical capacities of the enterprises and the capacities of the financial institutions. Therefore, the objective of the project was very modest, although its indicators are strategic and provide a clear accountability of the savings reached and emissions reduced.

The assumptions of the project to achieve the proposed objective is that:

- Enterprises recognize the benefits of EE measures and are willing to implement the EnMS and the system optimization.
- Training and awareness raising are effective.
- Government continues to support and enhance the implementation of EE measures at enterprise level.

The assumptions of the project to achieve the proposed long-term impacts are:

- Legislation mandating EE is conducive to changing behavior of industries that increases interest and investment towards energy efficiency
- Energy efficiency leads to increased competitiveness of industries and scale-up of replication IEE investments

The rating for Design is ***Moderately Unsatisfactory***.

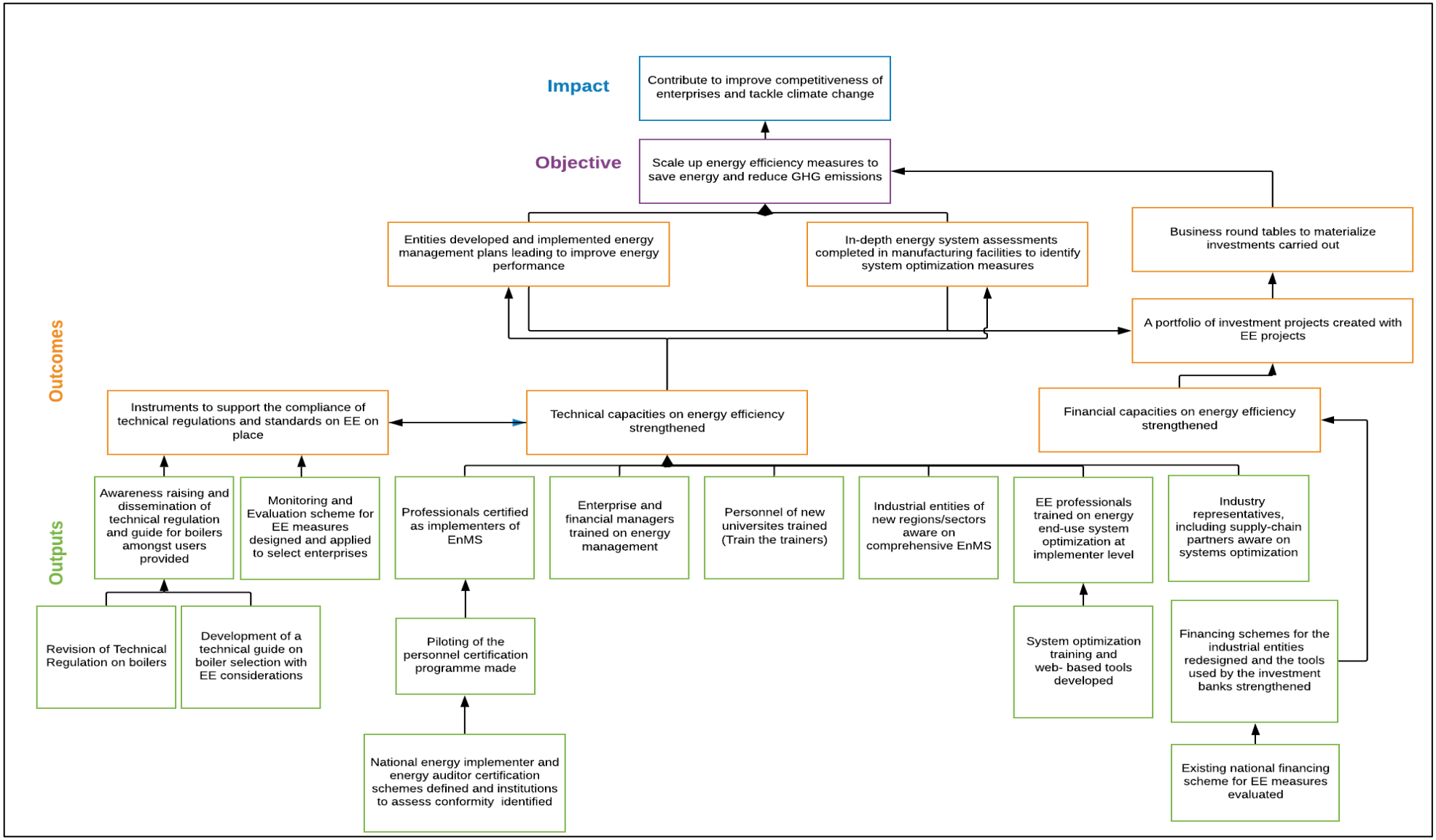


Figure 1: Theory of Change of the project reconstructed by the Evaluation Team.

3.2 Relevance

The project is highly relevant for the Colombian government as it is fully in line with the Bases of the National Development Plans 2014-2018 and 2018-2022 and specific programs. In particular, the project was aligned with the objective 1 of the Fifth Pillar of the Bases of the National Development Plan 2014-2018 of Colombia, which stated actions to contribute to the accomplishment of the Program for the Rational and Efficient Use of Energy (PROURE). These actions were focused on the establishment of policy guidelines and regulatory instruments that would be necessary to promote energy efficiency programs in the industrial and commerce sectors. It was expected to generate a common understanding that energy management and energy efficiency are tools that contribute to the competitiveness of these sectors by promoting the improvement of production processes, transfer and development of new technologies and the development of companies and new markets.

The basis of the National Development Plan 2018-2022 takes up the importance of ensuring the energy security for the productive development. It reaffirms to the industrial sector as the second energy consumer representing 26.39% of the national energy consumption with an energy saving potential of 30%. It also recognizes the low capacities of Colombian companies for technological adoption by indicating that only 0.4% of companies use the ISO 50001 and highlighting the lack of sufficient financial resources. In response to this diagnostic, it establishes strategies to increase company's productivity and their competitiveness through the transfer of knowledge and technology, facilitating the access to credits and establishing an interinstitutional strategy for energy management that also contributes to the reductions of GHG. Finally, it takes up the indicator *Energy Intensity* from the Colombian Strategy for Implementing the Sustainable Development Goals (CONPES, 2018)[3], which establishes to reduce the energy intensity from 3.43 TJ/one billion Colombian pesos of 2005 to 2.9 TJ/ one billion Colombian pesos of 2005.

The project is also aligned with the PROURE which promotes the implementation of energy efficiency measures throughout the energy supply chain, and its Action Plan 2017-2022 adopted in 2016. This Plan states a national target to save 9.05% of the national added projected energy consumption for the period 2017-2022, in which industry is expected to contribute with 1.71% of the total energy savings. Thus, the plan indicates action lines for the industrial sector that include measures to reduce the use of electric power and fuel consumption through the implementation of EnMS and EE measures, among other. The plan is also in line with the Colombian Low Carbon Development Strategy that identified during 2013 that GHG emission reductions in the industrial sector are a priority area. The Strategy also calls for the development of NAMAs for EE in industry.

The project also supports GEF-5 strategic objectives. In particular, the project was framed within Climate Change Objective 1 "Promote the demonstration, deployment, and transfer of innovative low-carbon technologies" and Climate Change Objective 2 "Promote market transformation for energy efficiency in industry and the building sector". The project contributes to these two objectives by filling out specific regulatory gaps, raising awareness and improving technical and financial capacities to implement EnMS and optimization systems at enterprise level, which bolster government initiatives to promote the adoption of EE measures in industry.

The project is also relevant to UNIDO's long-term strategy of Inclusive and Sustainable Industrial Development (ISID) adopted in 2013, aiming at harnessing the full potential of industry's contribution to the achievement of sustainable development. Particularly, UNIDO stresses the need to improve industrial energy efficiency by contributing to the transformation of markets for energy-efficient products and services. The organization has made significant contributions to the development of the ISO 50001 energy management system standard (EnMS) and promotion of system optimization

[3] https://colaboracion.dnp.gov.co/CDT/Conpes/Económicos/3918.pdf

practices. Thus, UNIDO's IEE project supports the adoption and implementation of EnMS and system optimization in the industrial sector, as a way to enact its ISID strategy. To date, the organization has developed and implemented similar IEE projects in 25 countries around the world, one in Ecuador, whose lessons learned has been considered during project implementation.

The rating for Relevance is ***Highly Satisfactory***.

3.3 Effectiveness

The effectiveness of the project was assessed by examining to what extent the expected results have been achieved or are likely to be achieved and what have been the project's key results (outputs, outcome and impact), which are part of the key evaluation questions.

The examination begins with the assessment of the status of achieving objective-level targets. Table 4 provides the level of achievement of the targets reported by the PMU and that estimated by the Evaluation Team. The PMU reports "identified" emission reductions and energy savings, which include actual reductions derived from energy savings achieved through the implementation of EE measures during project implementation, plus potential reductions corresponding to EE measures that would be implemented in the medium or long-term. The energy savings reported by PMU are based on the EE plans developed by 113 companies that participated in the EnMS training, and system optimization measures identified in the 44 in-depth energy system assessments carried out by enterprises that participated in the System Optimization training.

The Evaluation Team exclusively estimated the actual emission reductions based on the energy savings reported by 36 of the 113 enterprises, whose EnMS implementation was verified, plus 44 enterprises that participated in the System Optimization training. Therefore, energy savings were derived from the implementation of EE measures during project execution, which were verified by PMU through site visits.

Energy savings of the PMU reports concluded that electricity savings of 159,329 MWh/yr exceeded the target with a level of achievement of 332%. The Evaluation Team found actual electricity savings of 43.61 GWh/yr, which is higher than the target with a level of achievement of 164%. However, energy savings from reduced consumption of primary fuels (mainly natural gas, coal and diesel oil), estimated by PMU, were 1.29 PJ/yr reaching only 71% of the target. The evaluation team found actual fuel savings of 0.347 PJ/year that represents 19% of the target. In both cases, the target is not accomplished, but it is compensated by high savings of electricity.

These energy savings were converted into GHG emission reductions using official emission factors from UPME Resolution UPM 774 and Emission Calculator FECOC (2016) (Table 4). The cumulative direct emission reductions reported by PMU were 175 kt CO_2eq reduced annually during the years 2015-2017, a number considerably higher than the GHG emission reduction target of 70 kt CO_2eq/yr. The evaluation team calculated actual cumulative direct emission reductions of 74.5 kt CO_2eq, with a level of achievement of 106%. The cumulative post project direct emission reduction and the indirect emission reductions were not reported by PMU. However, the Evaluation Team did estimate them, finding a level of achievement of 106% for cumulative post project direct emission reduction (498.2 kt CO_2eq), and 107% of achievement for indirect emission reductions (2,242 kt CO_2eq). Thus, the level of achievement of the project objectives can be considered highly satisfactory.

Table 4: Level of achievement of project objective

Indicator	Target at end of Project	Achievement at end of Project reported by PMU (2015-2017)	Level of achievement (%)	Achievement at end of Project estimated by the Evaluation Team (2015-2017)	Level of achievement (%)
A) Incremental direct CO2eq emission reductions (tons of CO2eq)	Cumulative direct emissions reductions of 70 kt CO2eq	175 kt CO_2eq	251	74.5 kt CO_2eq	106
	Cumulative post project direct emission reduction of 468 kt CO_2eq	No reported	No reported	498.2 kt CO_2eq	106
B) Incremental indirect CO2eq emission reductions (tons of CO2eq)	Indirect emission reductions of up to 2,100	No reported	No reported	2,242 kt CO_2eq	107
C) Specific energy consumption of selected enterprises. Implementation of EnMS and systems optimization and operational improvements in enterprises lead to:	Annual fuel savings of 1.81 PJ/year	1.29 PJ/yr	71	0.347 PJ/yr	19.2
	Power savings of 26.6 GWh/yr	80 GWh/yr	301	43.61 GWh/yr	164

Source: Data reported by the PMU and calculations carried out by the evaluation team.

As will be described later, the project carried out a joint training on EnMS with the project "NAMA Pilot Implementation of Technology Transfer Projects in the Industrial Sector of the Cundinamarca-Bogotá Region" (GEF project ID 5841) (hereinafter NAMA project). This project is being implemented by the United Nations Development Program (UNDP) and executed by the Corporación Ambiental Empresarial (CAEM). A letter of intent was signed between CAEM and UNIDO to formalize collaboration and provide EnMS training to the enterprises participating in the NAMA project. 23 enterprises participating in the NAMA project received the EnMS training provided by the project. Since the project is accounting for the potential emission reductions of these 23 enterprises, and that the NAMA project will also report them as part of its emission reductions, the GEF has the risk of accounting for the same reductions twice, that is, there is a risk of double accounting.

Achievement by outcomes

Outcome 1: The national institutions develop the mandatory regulations, voluntary standards to support and M&V schemes to support the adoption of EE in industries

As mentioned in the project design assessment, Outcome 1 shows shortcomings in the design of indicators and targets, which affect the assessment of its effectiveness. The progress of indicator 1 (See Table 5) is reported, in the PIRs elaborated by PMU, in terms of the activities related to the elaboration of the Draft Technical Regulation of Boilers, even though the target is to have a technical guide for selection of appropriate boilers. Considering the target, indicator 1 has been accomplished satisfactorily as the *Technical guide for selection and operation of steam generators in Colombia - Energy Efficiency criteria*- was elaborated and published in the project and UPME websites.

However, Outcome 1 requires the development of mandatory regulations and voluntary standards, therefore, the guide is a relevant input for the regulation, but it is no *per se* a regulation. At the end of the project, the Technical Regulation of Boilers, which would be the mandatory regulation, has not been published as the MME decided to extent the scope of the regulation to a Comprehensive National Regulations for Thermal Systems. In this regulation, steam systems (boilers) will be one of four main sections.

Regarding voluntary standards, the project significantly contributed to the elaboration of the Colombian National Technical Standard on competencies of the EnMS implementer, which was approved as National Technical Standard NTC-6269 in 2019. This technical standard is under review by the International Standard Organization (ISO) to become an international standard, which shows the relevance and quality of the standard.

As indicated in the design assessment, indicator 2 of Outcome 1 have design problems. This indicator and its target were based on a result that cannot be accomplished due to it was beyond the competences of the project. Therefore, the target was not accomplished. The PMU only reported that 200 guidelines hard copies were printed, however, the copies has not been distributed yet, since the technical regulation has not been enacted. The guidelines have been only made available at the project and UPME website.

In regard to Indicator 3, a certification scheme of the National Technical Standard NTC-6269 aforementioned was piloted with 25 candidates, of which 15 professionals obtained certification (10 men and 5 women). Since the target was 30 professionals, the level of achievement of the target was 50%. From the beginning of the pilot, it was known that the target would not be met due to the small number of professionals selected. The PMU indicated the difficulties in finding professionals interested in this topic. Currently, the National Accreditation Body of Colombia is developing an accreditation service for this certification scheme.

Table 5: Indicators, targets and level of achievement of Outcome 1

Indicator	Target	Level of achievement
Indicator 1. National technical regulations on EE for boilers are adopted	A technical guide for selection of appropriate boilers and their energy efficient operation is available	100% The guide can be consulted at https://eeindustrial.co/servicios/reglamentos-tecnicos-y-estandares-de-eficiencia-energetica/6
Indicator 2. Number of stakeholders (female and male) aware of technical regulations and their implications	Stakeholders are aware of the exiting regulation and all institutions in the Quality Infrastructure are engaged to facilitate their enforcement	Since this indicator and its target have design problems, the target was not accomplished.
Indicator 3. Number of stakeholders (female and	30 professionals get national certification as implementers	50% 15 professionals obtained the

Indicator	Target	Level of achievement
male) who get certified under the new personnel certification schemes	of EnMS (sex disaggregated)	certification (5 women and 10 men)

This outcome also included the development of a Monitoring and Evaluation (M&E) scheme for EE measures. The scheme consisted of two tools. The fist tool was developed to gather information on energy consumption and the characteristics of the equipment used, as well as the EE measures identified and their plan of implementation at enterprise level. The tool allows enterprises to create annual reports on energy savings and emission reductions achieved. This information is shared with UPME. The second tool is fed with this information and is used by UPME. This tool allows UPME to have aggregate estimates on energy and emissions savings by industrial subsector, as well as estimates of energy and emissions savings in the long-term based on the implementation of the plans on EE of the enterprises. It also calculates indicators required by UPME to create or adjust the EE policy.

Regarding these tools, the evaluation team considers that greater effort should have been made to try to align these two tools with the Monitoring, Report and Verification (MRV) tool that is being developed by the Ministry of Environment and Sustainable Development. The MRV tool will be used to inform progress on the compliance with the GHG reductions committed by the country under the Paris Agreement on Climate Change.

The achievement of Outcome 1 is Moderately Unsatisfactory.

Outcome 2. The development of industry specific capacities is promoted, establishing a cadre of highly specialized energy management experts from the public and private sectors; which are available as a long-term technical resource to industry and the country.

This component sought to provide different levels of training on EnMS to enterprises' managers and professionals in the regions of Boyacá-Cundinamarca, Risaralda-Caldas, Santander and North of Santander, although Bogota was also included during project implementation. To do this, the project first strengthened the existing capacities of RECIEE to provide training on EnMS, and created new capacities in other universities that were invited to participate in the project to extend the geographical coverage of the training. Train the trainers sessions were given to homogenize the approach and knowledge among universities and a single shared training program on EnMS was developed with a strong practical orientation. These activities were time consuming and caused delays in the project plan implementation.

The training began with awareness raising seminars on Energy Management aimed at enterprise managers and financial managers. The target was to train 200 managers, however, the PMU indicated that it was difficult to involve managers in training, therefore, the participation of managers was very low, despite the PMU efforts to increase managers participation[4]. According to the attendance lists, around 20% of the people who participated in the seminars were managers. The rest of the participants had different positions in the enterprises (i.e. operational and maintenance staff and environmental and project leaders, among others). Thus, the PMU reported 196 professionals, instead of managers, who participated in the awareness raising representing to 122 enterprises. This level of participation caused concern in the PMU and a second round of awareness raising seminars was offered to 53 additional professionals representing the same number of enterprises. This second round of training was known as "the second phase". In total, 259 professionals were aware on energy

4 For example, PMU hosted a breakfast for managers to facilitate/motivate its participation in the seminars in the region of Pereira.

management, however, the number of managers that participated in the trainings, as aforementioned, was low. Therefore, the target of the Indicator 1 "Number of managers trained on energy management" cannot be considered reached.

A specialized training was provided to guide the implementation of EnMS at enterprise level (implementer level) in four regions during 2017-2018. It was a 100-hour training that lasted 18 months. As indicated above, a "second phase" of training had to be implemented due to the low level of enterprise participation and the risk of having a low number of EnMS implemented in the enterprises. Thus, a 40-hour training on EnMS at implementer level was additionally provided in the Cundinamarca-Bogota region from August 2018 to February 2019. This second phase involved a formal collaboration with the NAMA project; thus, 23 enterprises participating in the NAMA project received a 40-hour training that is limited in scope compared to the training provided in phase 1.

In particular, the target of the indicator 2 (Table 6) was to have 50 EE professionals trained on EnMS at implementer level, which was achieved in the first phase of training, since 57 enterprises employees completed the EnMS training. In the second training phase, 33 employees completed a limited-scope EnMS training. Since the training provided in EnMS in phase 1 and 2 differed in the level of depth of the training, it is not possible to add the number of employees who completed the course in each phase.

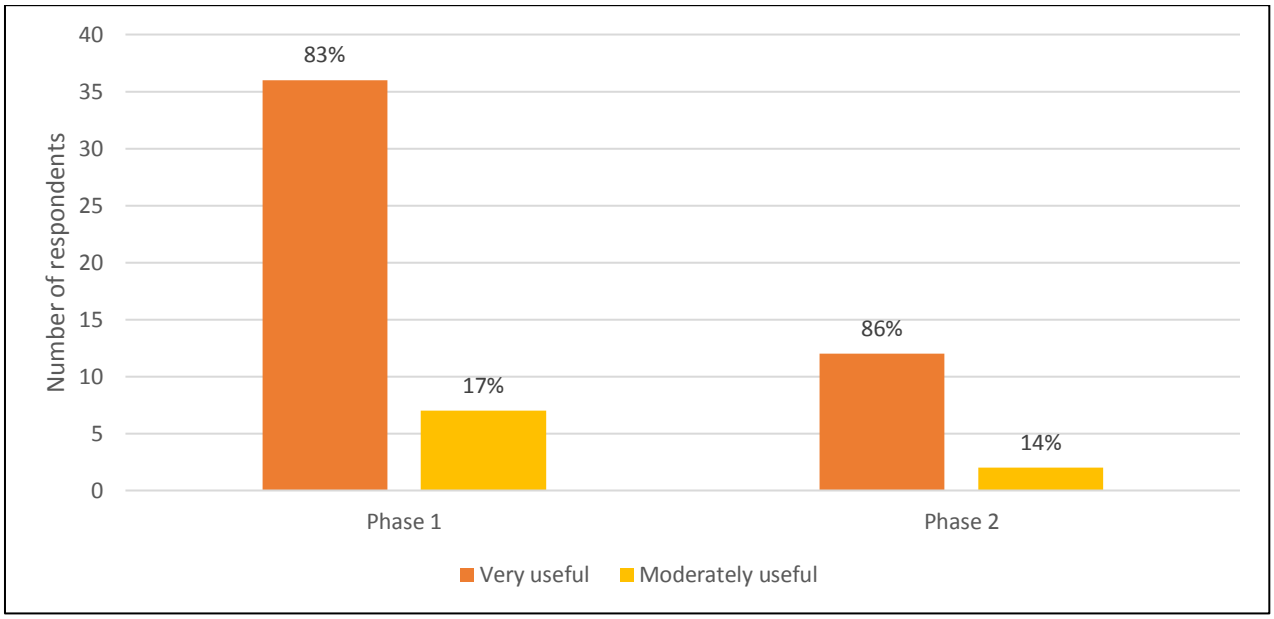
Table 6: Indicators, targets and level of achievement of Outcome 2

Indicator	Target	Level of achievement
1. Number of managers trained energy management	200 enterprise managers and financial managers are trained (sex disaggregated)	Professionals trained: In Phase 1: 196 In Phase 2: 53. In total, 249 professionals were trained but few of them were managers.
2. Number of EE professionals trained at energy management implementer level	50 EE professionals received EnMS implementer level training (sex disaggregated, with at least 20% females)	100% Phase 1: 57 enterprises employees completed the full EnMS training. Phase 2: 33 enterprises employees completed a limited-scope EnMS implementation.
3. Number of enterprises which develop and implement EnMS (female-led/ male led)	150 enterprises implement EnMS as a result of the practical training to EE trainees (% female/male-led enterprises)	22% During phase 1: out of the 63 enterprises completing the EnMS training, only 25 demonstrated effective EnMS implementation During phase 2, 16 enterprises demonstrated effective EnMS implementation. Verification visits were completed in September 2019.

The interviews and the results of the survey showed a high level of satisfaction of the participants with the EnMS training in both phases (Figure 2). Of 42 persons, who completed the training at implementer level in phase 1 and responded to the survey, 36 respondents (83%) said the training was very useful since it has created or consolidated their knowledge on energy management (half of

the respondents had previous knowledge on EE). The training also contributed to decrease production costs and optimize energy use and it has allowed participants to implement the EnMS. The rest of the respondents (17% or 6 persons) said that training was moderately useful due to energy consumption is low in the enterprise or there was a lack of interest at the managerial level. For phase 2, 12 of 14 respondents said the training was very useful (86%) providing similar opinions to the respondents in phase 1. 2 respondents said the training was moderately useful due to the course time was very short and very theoretical. In both phases, the level of knowledge and professionalism of the instructors was recognized.

Figure 2: Level of usefulness of the EnMS training at implementer level (phases 1 and 2) according to survey results.

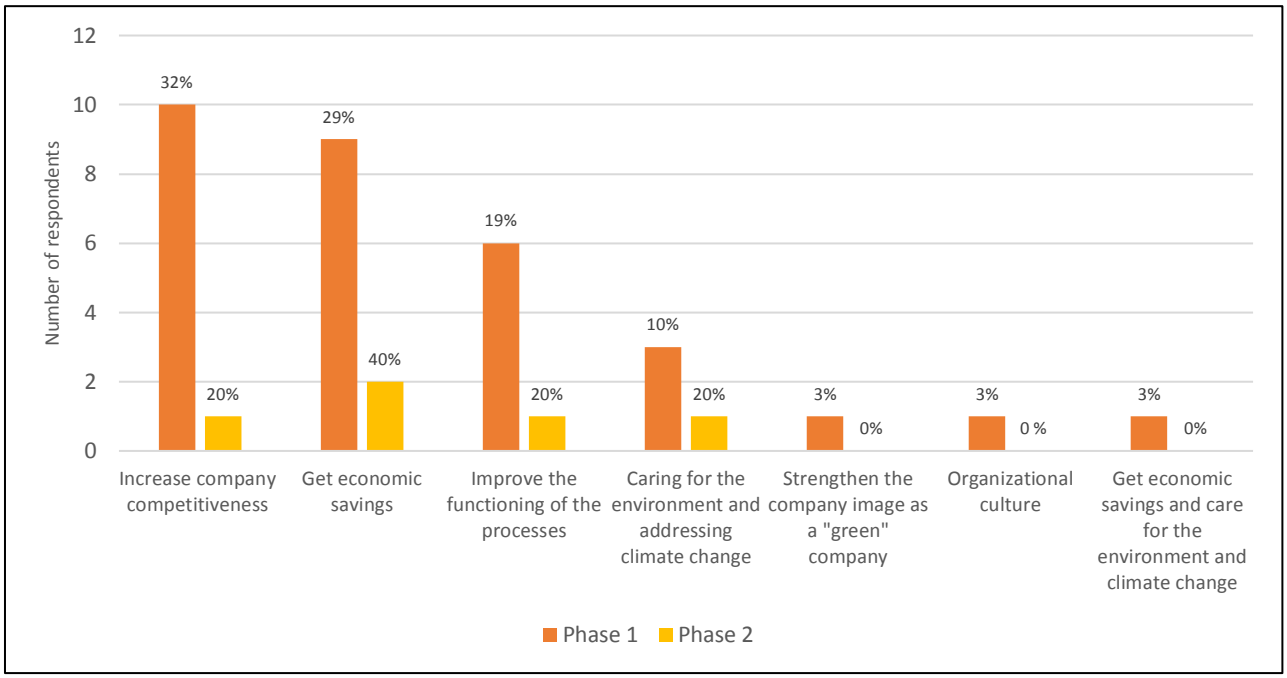


The most relevant output of this outcome is the development and implementation of energy management plans, which would lead to improve energy performance in the enterprises. 150 enterprises were expected to implement EnMS as a result of practical training for EE trainees (Indicator 3, Table 6). During phase 1, only 25 enterprises demonstrated an effective EnMS implementation.

During phase 2, 23 enterprises received 40-hour training in EnMS, but only 16 enterprises demonstrated effective EnMS implementation. The PMU conducted verification visits to confirm the implementation, which were completed in September 2019. Despite the implementation of the second phase, the target of indicator 3 (Table 6) was far from being accomplished. As mentioned in the design section, the assumptions to reach this target were unrealistic, since they implied that enterprises trainees would support the implementation of EnMS in other enterprises.

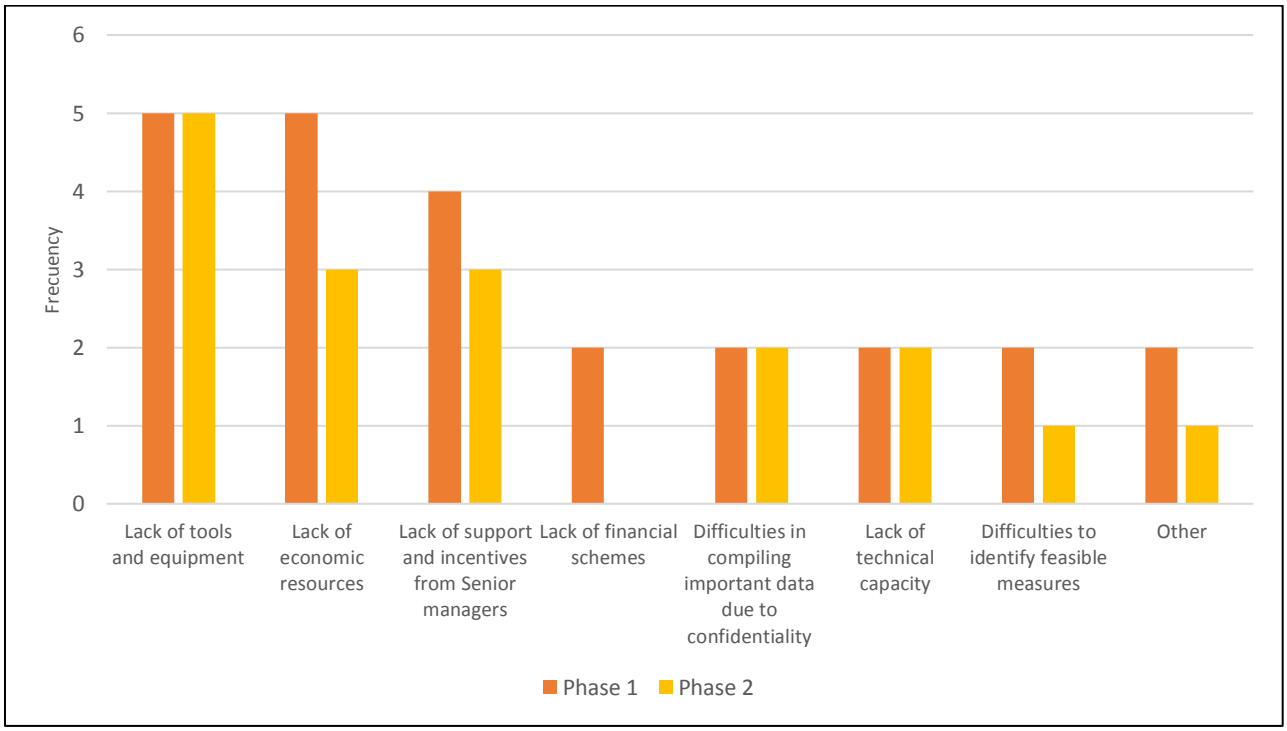
According to the survey, 31 of 42 respondents implemented the EnMS during phase 1, and 23 of 31 have already implemented EE measures in their enterprises. The energy savings recorded by the PMU of the enterprises that implemented EnMS contributed greatly to achieve the project objectives in terms of energy savings, a total of 2,140,453 GJ were recorded by the PMU for Outcome 2. The main drivers that respondents have identified to implement the EnMS are to increase the competitiveness of their enterprises (24%), obtain economic savings (21%) and also improve the functioning of processes (14%). Regarding phase 2, 5 of 12 respondents implemented the EnMS (42%) being the main driver the economic savings (Figure 3).

Figure 3: Main drivers identified to implement EnMS at enterprise level in phase 1 and 2



Eleven of 42 respondents did not implement the EnMS in phase 1. They found as the main barriers to not doing so the lack of: tools and equipment, economic resources and support and incentives from senior managers (Figure 4). In phase 2, 7 of 12 respondents (58%) had not implemented the EnMS due to lack of tools and equipment and economic resources.

Figure 4: Main barriers identified to implement EnMS at enterprise level



The achievement of Outcome 2 is Moderately Satisfactory.

Outcome 3: Demonstrated and measured energy savings in industries through application of system assessment techniques by trained experts, leveraging additional energy savings as more industrial facilities will seek the implementation of systems optimization

This outcome was focused on building technical capacities in enterprises on optimization measures for motors, pumps and steam systems. These systems showed the main potentials for energy savings according to the characterization of energy consumption of the industrial sector carried out by UPME in 2014. International and national consultants provided training on energy system optimization at implementer level. UNIDO Guidelines in pumping, electrical motors and industrial steam systems were used to provide the training.

The first two guidelines (pumping and electrical motors) were translated into Spanish since the guidelines on steam systems were already translated for their use in Ecuador. The training also made available software tools for steam, motors and pumping systems developed by the United States Department of Energy. However, according to interviews with the PMU and the professors of the participating universities, there were difficulties in hiring the universities again to provide the training, since the administrative process takes a long time. Therefore, the universities did not organize these trainings, only university instructors were trained. As a result, a consolidated training plan was not implemented in all RECIEE universities. Thus, the objective of indicator 1 was not achieved (Table 7).

Regarding indicator 2 (Table 7), a total of 78 professionals received training on energy system optimization at implementer level (104% of the target), but only 44 passed the final exam (41 men and 3 women). In relation to indicator 3, 87 supply chain partners were also trained, exceeding the target of 75 trainees.

Indicator 4 reports on the fulfilment of one of the most important output of this outcome, which are in-depth energy system assessments in manufacturing facilities. These assessments allow enterprises to identify system optimization measures, which would generate energy savings that would contribute to the achievement of project objectives. As a result of the training, 44 enterprises carried out assessments that represent 433,540.62 GJ of energy savings, of which 38 enterprises reported savings by using the M&E tool developed by the project, achieving 84% of the target (indicator 6, Table 7).

According to the survey results, 100% of respondents (33 persons who received the system optimization training) considered that the training was very useful due to the new knowledge and skills acquired, the possibility of improving EE in their enterprises and the relevance of the motors, pumps and steam systems for their manufacturing processes. 30 respondents (91%) have already implemented system optimization measures in their enterprises.

The main drivers for implementation were economic savings (43%) and increased competitiveness of the company (33%) (Figure 5). 3 respondents answered that they had not implemented any measure yet, mainly due to lack of economic resources and incentives, and difficulties in obtaining support from the administrative area and senior managers (Figure 6)

Figure 5: Main drivers identified to implement system optimization measures at enterprise level

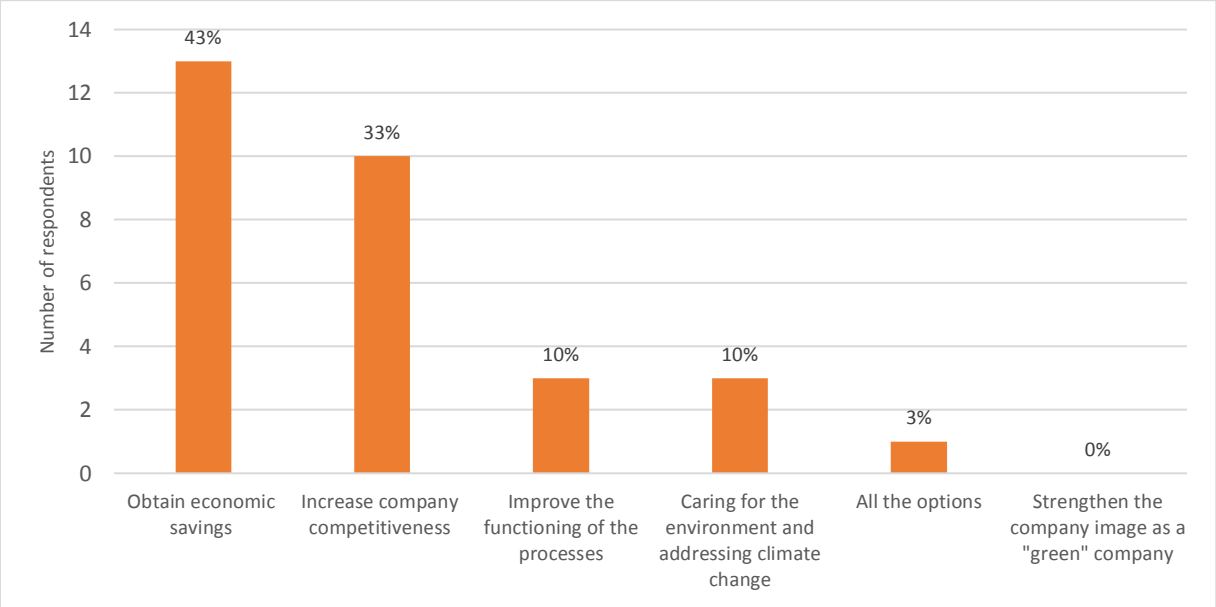


Figure 6: Main barriers identified to implement system optimization measures at enterprise level

Table 7: Indicators, targets and level of achievement of outcome 3

Indicator	Target	Level of achievement
1. Training materials available for all systems optimization training modules	A consolidated training plan is rolled out in all Universities under the National Network for EE	0% University instructors were trained on system optimization but there was no a consolidated training plan implemented in RECIEE universities.
2. Number of (female and male) EE professionals trained at energy system	75 EE professionals received energy systems optimization implementer level training (25	104% Steam System Optimization (SSO): 23 trainees (9 approved, all men)

Indicator	Target	Level of achievement
optimization implementer level	for each type of system: motors, steam and pumps) (sex disaggregated, with at least 20% females)	Motor System Optimization (MSO): 26 trainees (20 approved, 2 women, 18 men) Pump System Optimization (PSO): 29 trainees (15 approved, 1 woman, 14 men)
3. Number of (female and male) industry staff with awareness raised on system optimization	325 industry staff with awareness raised (sex disaggregated)	93% 303 industry staff with awareness raised
4. Number of (female and male) supply chain partners with awareness raised on system optimization	75 equipment vendors with awareness raised (25 for each type of system: motors, steam and pumps) (sex disaggregated)	116% 87 supply chain partners trained, (4 women y 83 men): SSO: 15 (2 women, 13 men) MSO:48 (8 women, 40 men) PSO: 24 (2 women, 22 men)
5. Number of enterprises (female led /male led) which complete in depth assessment	45 enterprises conduct detailed energy assessments (% female/male-led enterprises)	98% 44 enterprises (3 women, 41 men)
6. Number of enterprises that report through the newly established M&V system	45 selected enterprises which conduct detailed energy assessments adopt M&V system (% female/male-led enterprises)	84% 38 enterprises

The achievement of Outcome 3 is Moderately Satisfactory.

Outcome 4: A national scheme for financing EE Measures is designed and piloted.

Interviews with the PMU and project manager informed to the evaluation team that some activities of Component 4 had been changed due to recent initiatives implemented by banks to provide financial support for green projects. However, no interviewee was clear to specify exactly which activities in Component 4 had changed. At the Second Meeting of the NSC, held in December 2016, it was reported that the national financial landscape had changed in the last year, since the National Bank Association (Asobancaria, for its acronym in Spanish) and its members have already started to build their own capacity to improve their knowledge and understanding of national requirements to implement renewable energy and EE projects. They had also progressed in the creation of innovative financial products. It was also mentioned that Bancoldex had launched a credit line on the matter. Therefore, the NSC decided that "…the focus of the financial product review activity will revolve around other mechanisms to promote EE, such as the green certificate market, ESCOs, and the development of other sources such as the Fund for Renewable Energy and Energy Efficient Management (FENOGE)." However, the NSC did not specify what activities in Component 4 would change.

Subsequently, it was reported in the PIR 2017 that the "project team" had decided to redefine the scope of activities for the output 4.1 and that a preliminary study would be carried out to assess the feasibility of creating an EE-certificate market in Colombia. In accordance with the Terms of Reference of the consultant who conducted that study, this decision was made in order to accomplish a measure indicated in the PROURE Plan 2017-2021 related to the creation of an EE-market scheme. Thus, the project funded three studies.

The first study proposed a scheme to implement a Certificate of Energy Efficiency in the short-term (a non-refundable economic incentive) and then to migrate to an Energy Efficiency Obligation scheme in the medium or long-term. In response to this proposal, UPME has included in its workplan "to understand the process to create a fund, as a base element for the creation and operation of an EE-certificate trading market". The second study assessed the capabilities that an EE-oriented fund should have in order to issue and manage EE-certificates, including the analysis of the FENOGE and the possible roles of the Energy Service Companies (ESCO) in this kind of market. The third study consisted of the development of a pilot of the EE-certificate market, in which three ESCO worked with three enterprises, through a shared savings contract, to provide their services to identify and implement EE measures with economic support of the project as a simulation of an EE-certificate. The consultancy had not finished when this final evaluation was conducted, however, interviews with representatives of the participating ESCO indicated that the pilot has been positive in showing how FENOGE resources could be used. They highlighted that the participation of UNIDO as an interlocutor has been essential as the industry is very skeptical and UNIDO provided confidence to companies. Attention was drawn to the limited participation of ESCO in the pilot, thus, it should be investigated what barriers ESCO encountered to participate in the exercise. Different opportunities were also identified to improve the technical capabilities of the participating ESCO, such as how to select the most efficient equipment considering the productive process.

While EE-certificate is an instrument that promotes EE in the industry by providing economic support in response to the EE measures implemented and the energy savings obtained, the outputs described in the previous paragraph do not contribute to the achievement of indicator targets of Outcome 4 (Table 8). The PMU did not assess the impact of the change of activities on the indicators established in the Project Results Framework and did not discuss the possibility of changing the indicators. According to the targets of these indicators, it was expected to carry out three sectorial feasibility studies for EE investment, and design and pilot a new instrument for rapid financial evaluation investment mechanisms. In this regard, Outputs 4.1 and 4.2 were not accomplished, since there was no an evaluation of the existing national financing scheme for EE measures, and instruments for rapid assessment of projects were not designed and piloted. As mentioned earlier, limitations in the design of the project caused this breach.

Regarding Output 4.3, a matrix of 84 potential projects was elaborated, which includes financial options and tax incentives for each project. This information was an input to organize a business roundtable, held on May, 8 2019, in which 18 entities that require EE projects (i.e. enterprises) and 16 entities that offer this kind of projects (i.e. banks, UPME, etc.) participated. As a result of the roundtable, 129 to 139 appointments were planned to continue discussing potential business opportunities. According to a satisfaction survey conducted at the end of the event, the level of satisfaction of the participants was good. An additional survey was designed to track recorded appointments, but the results were not available.

Table 8: Indicators, targets and level of achievement of Outcome 4

Indicator	Target	Level of achievement
1) Sectorial feasibility studies for EE investment	Studies for the 3 most promising industrial subsectors (winning sectors) are completed and contain social/gender dimension	0%
2) New instruments for quick financial evaluation investment mechanisms are designed	New instrument is available	0%

The achievement of Outcome 4 is Moderately Unsatisfactory.

Industrial Assessment Program

The Industrial Assessment Program (PEVI, by its abbreviation in Spanish) is a program designed by UPME and UNIDO[5], and implemented as additional activities to the project. According to the PMU, PEVI aims to contribute to the sustainability of the project through keeping cooperation among universities, industry and UPME. In particular, the capacities created in universities during the project implementation are used to carry out energy audits of small and medium-sized enterprises interested in improving their energy use. A short-term training on EE measures is also provided by the universities to them. Working groups, known as PEVI Centres, are being formed within the universities. At the time of the evaluation, four universities were working on the creation of PEVI Centres, namely Universidad del Atlántico, Universidad del Valle, Universidad Autónoma de Occidente and Universidad Autónoma de Bucaramanga. In a first phase of the program, 12 enterprises from different industrial/service sectors (i.e. textiles, hotels, agrochemicals and food products) participated in the program, which are located in the industrial corridors of Barranquilla, Cali and Bucaramanga. According to the Impact Document prepared and shared by the PMU, a total of 42 GWh/yr was identified as energy saving potential in the 12 enterprises, representing a potential for reducing emissions of 10 kt CO_2eq/yr.

The PEVI manager sent the survey developed by the evaluation team to enterprises that participated in phase 1 and 2[6] of PEVI, the survey was sent to 17 people in total, of which 5 people responded the survey. 3 of 5 respondents said they had a prior knowledge on EE before PEVI started. 4 of 5 respondents said that the training was very useful as it allowed them to have a better knowledge about the current energy use in the enterprise, identify strategies to reduce energy consumption in productive activities and know all the benefits of EE. One person responded that PEVI in general was of little use to the enterprise due to the energy diagnostic was not in-depth, the methodologies used had deficiencies, and the measuring instruments used had also technical limitations or were not enough, mainly those used to measure thermal efficiency. 3 of 5 respondents said that energy diagnostic and recommendations delivered to improve EE were very useful. 4 of 5 respondents said that they have already implemented the EE measures recommended mainly due to the economic savings represented by the measures. Among the measures implemented are: implementation of controls in the compressors, optimization in the purchase of motors, improvement of the use of compressors according to their capacity and the replacement of light bulbs. One of the respondents said that the enterprise has not implemented the EE measures since they have had problems to identify feasible measures and due to the lack of tools and equipment. Only one interview was conducted with a representative of a participating PEVI enterprise, which confirmed the usefulness of the program and explained the EE measures already implemented and the energy savings obtained, although the interviewee indicated that, at the present, energy savings are very small.

The rating for Effectiveness is ***Moderately Satisfactory***.

3.4 Efficiency (including co-financing)

The total project budget was USD 19,587,398, of which GEF contributed USD 1,692,500, with a co-financing of USD 17,869,898. The main budget was allocated in Component 2 and 3, which include the training activities that would generate energy savings and consequently emission reductions. This budget was expanded during project implementation with a donation of UPME of USD 202,627.85 used to implement PEVI (Table 9).

As of August, 21 2019, 93% of the GEF resources or USD 1,581,716.16 was expended over 46 months for undertaking project activities (Table 9). PIRs 2017 and 2018 prepared for the project did not

[5] The creation of PEVI was inspired in the US Department of Energy Industrial Assessment Center (IACs) Program.
[6] Phase 2 implied the implementation of same activities as phase 1.

report cumulative expenditures of the GEF funds. While the original project duration was 36 months, it was completed in 47 months with its terminal date of 30 September 2019. There are still pending payments mainly in Component 4, which has a level of execution of 69%. However, there will be surplus resources, which will be used to reprint EE guidelines, disseminate results, elaborate communication material, purchase equipment to be donated to four universities to consolidate PEVI activities, reprint case study cards, translate cards into English and prepare PEVI impact document and its translation into English.

Table 9: Budget and expenditure up to 21 August 2019

Component	Released Budget (USD)	Expenditure (USD)	Funds Available (USD)	Level of execution (%)
1. Standards and technical regulations	190,000.00	181,714.35	8,285.65	96
2. Scale up EnMS programme	521,902.18	509,640.00	12,262.18	98
3. System optimization technologies	639,000.00	600,149.18	38,850.82	94
4. Promotion of financial mechanism	150,000.00	103,685.04	46,314.96	69
5. Monitoring & Evaluation	58,010.32	55,258.59	2,751.73	95
6. Project Management	133,587.50	131,269.00	2,318.50	98
Total GEF Grant	**1,692,500.00**	**1,581,716.16**	**110,783.84**	**93**
PEVI funds (UPME donation)	202,627.85	201,202.00	1,425.85	99
Total (with additional funds)	1,895,127.85	1,782,918.16	112,209.69	94

Project delays stemmed from a greater investment of time in Component 2, since the capabilities of the universities had to be homogenized before starting the training and also due to the low level of participation of enterprises, which implied the implementation of a second phase of training. These delays were originated, in part, due to project design problems. The project extension was carried out at no additional cost.

Since 4 of 7 activities of Outcome 4 (Component 4) were replaced by new activities not budgeted in the PRODOC, which had to be adapted to the available budget, and also the lack of implementation of some project activities, such as the implementation of the tools to track project progress, it is not possible to determine if the project budget was adequate to achieve the expected outcomes. Although it is important to reiterate that the objectives of the project were achieved and that the additional resources provided by UPME to implement PEVI will contribute to the sustainability of some of the benefits of the project.

Co-financing

The materialized co-financing is unknown at the end of the project. The co-financing reported in the Internal Mid-Term Review, up to June 2017, was USD 478,500, representing 3% of the amount confirmed at CEO endorsement (Table 10). After this date there is no updated figure on this matter. As

will be mentioned in the Monitoring and Evaluation section, there was no periodic monitoring of co-financing. Therefore, there is no evidence to support the co-financing materialization by project partners. Only Colciencias informed through a letter sent to the former Project Coordinator about the resources invested to support the consolidation of RECIEE and the development of projects to promote innovation in advanced combustion for industrial use. However, it did not report whether it had achieved the co-financing committed to assist the participation of Colciencias staff in the NSC and other project activities. No project partner, including UNIDO and UPME, kept a record of the co-financing provided to the project even Bancoldex that would provide 70% of the total co-financing. The need to keep a record of materialized co-financing was mentioned at the second NSC meeting; however, no action was undertaken.

Table 10: Project co-financing reported in the Internal Mid-Term Review

Sources of Co-financing	Name of Co-financer	Type of Co-financing	Amount Confirmed at CEO endorsement /approval (USD)	Amount Materialized at Mid Term Review (USD)
National government	Mining and Energy Planning Unit (UPME)	Cash	4,600,000	233,000
		In kind	40,000	20,000
National government	Administrative Department for Science, Technology and Innovation (Colciencias)	In kind	17,007	10,000
National government (Academia)	Colombian Knowledge Network on Energy Efficiency (RECIEE)	In kind	97,789	80,000
Private Sector	Colombian Entrepreneurial Development Bank (Bancoldex)	In kind	12,725,102	Not reported
Private Sector	International Copper Association (ICA) Latin America	Cash	30,000	15,000
GEF Agency	UNIDO	Cash	60,000	20,500
		In kind	300,000	100,000
		Total	17,869,898	478,500

The rating for Efficiency is ***Moderately Unsatisfactory***.

3.5 Monitoring and Evaluation

M&E Design and Implementation

The PRODOC includes the M&E system plan aiming at establishing a solid mechanism to ensure the achievement of the project objectives. The design of the M&E plan included key elements and activities to effectively monitor the project progress in accordance with the GEF and UNIDO requirements. The detailed costs of M&E activities are also outlined in the PRODOC with a GEF budget of USD60,000 and a co-financing budget of USD30,000. Table 11 outlines the M&E activities and its implementation.

Table 11: . M&E activities of the project and its level of achievement

Element/activity	Level of achievement
Project Inception Workshop (IW)	The activity was accomplished. The workshop was held on February 2, 2016. The IW report included the presentation slides and the conclusions of an interactive exercise with the participants to explore their possible role in the project. It did not include an adequate summary of the discussions and agreements of the workshop.
Follow up to Key Performance Indicators (KPIs)	The PIRs 2017 and 2018 included, as inserted documents, Project Progress Update Reports to track progress and the achievement of KPI targets. However, the reports do not indicate and assess the level of achievement of outcomes and targets, therefore, they are not completely useful to inform the project progress.
Semi-annual review	These reviews were not elaborated.
Annual Project Review (APR)	Three PIRs were prepared for years 2017 (1 July 2016-30 June 2017), 2018 (1 July 2017-30 June 2018) and a preliminary version for 2019 (1 July 2018-30 June 2019). All PIRs did not include co-financing reports and lessons learned. The PIRs 2017 and 2018 did not include expenditure reports. The preliminary version of PIR 2019 reports the progress to achieve outputs but does not indicate the progress in outputs 1.4 and 1.5 and shows a confusion between the M&E scheme for EE measures and the M&E of project progress.
Internal Mid-term Review	It was conducted in December 2017.
Final Evaluation	In progress.
Learning and knowledge sharing	Project brochures were prepared. A paper on the project results was published in the magazine Semana Sostenible and successful case-studies were printed for dissemination by UPME and UNIDO.
Monitoring plan and tools	They were not elaborated as established in activity 5.1.2 of the PRODOC.

As indicated in Table 11, the implementation of M&E activities had shortcomings. The M&E plan and tools to track project implementation and the achievement of the outputs and outcomes (activity 5.1.2) was confused with the M&E scheme for EE measures (Activity 1.5.2). The preliminary version of PIR 2019 informs the progress in activity 1.5.2 in the output 5.1. According to the desk review, interviews, NSC minutes and PIRs, the M&E scheme for EE measures was only developed by the project. Therefore, the monitoring plan and tools to collect and record data on a regular basis on project activities, implementation progress, co-financing level, as well as materialized risks and implemented adaptive measures were not developed. In line with the interviews, the first Project Manager had a personal spreadsheet to track project activities but it was not a proper monitoring system based on the Project Results Framework. The PMU did not use the Project Results Framework to implement the project and track and review its progress on a regular basis. They mainly used the detailed description of the project components to guide the implementation of activities, and a table of the PRODOC that indicates the Global Environmental Benefits to measure the achievement of the project objectives. In addition, the updated annual progress reports and PIRs did not provide a critical assessment of the level of achievement of outcome and outputs, and semi-annual reviews were not carried out.

The lack of this monitoring system did not facilitate timely analysis of the project progress to identify risks or emerging situations and make decisions and apply corrective measures accordingly in the early stages. One of the main consequences is that the level of co-financing materialization is unknown. The PMU did not provide the project partners with a format or guideline to keep record of the resources used to support project activities. Thus, all the interviewed partners did not keep a regular record of the resources used for the project.

Another important consequence is the lack of documentation that explains the rationale to implement adaptive measures in response to emerging situations, and describes the measures implemented, which may have an important effect on the achievement of project objectives. According to the PIRs and the minutes of NSC the most important adaptive measures implemented were the following:

- Redefinition of the scope of activities of outputs 4.1 and 4.2 as they were no longer relevant due to the recent initiatives of Asobancaria and Bancoldex to support projects related to EE and renewable energy. As mentioned in the effectiveness section, there was no clarity in the new or adjusted activities nor a discussion about the impact of these changes on the achievement of Outcome 4 and its indicators. There is no a document that reports the adjusted activities in order to assess their effect on the Project Results Framework. The mid-term internal review did not assess this issue and mostly presents the same information reported in PIR 2017.
- A new output was included in the project that involved the design and piloting of PEVI. UPME transferred US 202,627.85 of its annual budget to UNIDO to do so. This inclusion was not explained in the PIRs as an important contribution to the project sustainability nor in the Project Progress Reports of KPIs. This inclusion was reported mainly in the mid-term internal review report and vaguely at the 4th NSC meeting, but a clear definition of activities and results were not documented.
- The project had to be extended twice. The NSC approved a first extension of the project as a result of the delays experienced during fiscal year 2017 and fiscal year 2018 in components 2 and 3, and the inclusion of the output to pilot the Industrial Evaluation Centers. UPME and UNIDO presented the project extension proposal to the NSC at its meeting on November 30, 2018 to extend the project until June 2019 with a relocation of the budget from Component 3 to Components 1, 2 and 5. This is reported at the PIR 2018 and at the 4th NSC meeting. However, the project was extended again until September 2019, but PIR 2019 did not inform it, even though it was clear that the objectives, outcomes and outputs could not be fully met at the end June 2019.
- New trainings on EnMS were provided in other geographical areas of the country in order to accomplish activity 2.5.1, since the number of enterprises that implemented EnMS was far from the target. This second phase of trainings was less ambitious, although the differences in the training of the first and the second phase were not reported. That is, the strategy implemented was not documented even though it implied the sign of a letter of intent with the NAMA project.

Risk identification and management

New risks identification and management were limited. At the second meeting of the NSC, held in December 2016, the replication of the implementation of the SGEn in other companies was considered a challenge. This replication was crucial to achieve the target of indicator 6: "150 enterprises implement EnMS as a result of the practical training to EE trainees". Despite this concern, the PMU did not consider the possibility of not reaching the target as a risk and, therefore, an early mitigation measure was not proposed. As a consequence, the target was not achieved despite the measures implemented which involved two project extensions to provide additional trainings on EnMS to enterprises that were participating in the NAMA project.

Mid-term Internal Review

Since the GEF does not require a Mid-Term Review for medium-sized projects, an Internal Review was conducted, which covered from October 2015 to June 2017. The review sought to assess the relevance, design, effectiveness, efficiency, coordination and management of the project. However, the review was not supported by a clear and robust methodology. It had important conceptual limitations and a confusing structure. The evaluation looks more like a progress report on the project. Therefore, the conclusions lack robustness and the recommendations were rather conclusions. However, it is worth mentioning that there was a recognized effort to inform materialized co-financing, which is unknown at this final stage of the project.

The rating for M&E is ***Moderately Unsatisfactory***.

3.6 Sustainability of project outcomes

Sustainability has been assessed as "Likely" due to:

a. The project has an exit strategy that consists of the implementation of 5 PEVI Centers in universities that participated in the project. As mentioned in the effectiveness section, PEVI was piloted during project implementation and lessons learned were obtained, which are being used by UPME to design a standardized methodology for the operation of the Centers. UPME is also looking for resources to finance the program for two years. PEVI would take advantage of the capacities created in project participating universities and continue the partnership amongst University-Industry-Government. The program would support the implementation of EE measures through conducting an energy audit and providing a brief training to new enterprises.
b. However, a strategy to reinforce the capacities of the participating industries in the project seems to be necessary. According to the survey results, 20 of 33 respondents (61%), who implemented the EnMS in phases 1 and 2, said that they would need additional technical and economic support to consolidate the EnMS after the project is over. This request is supported by a professor who provided EnMS training, since PEVI does not include assistance to enterprises trained on EnMS. In addition, it is also necessary to monitor energy savings of the enterprises that would contribute to achieving the long-term project goals.
c. The potential creation of a Certificate of Energy Efficiency in the short-term and the possible use of FENOGE resources to support the certificates decreases the financial risks to continue promoting EE in the industry.[7]
d. The high level of ownership of the project by UPME and the commitment established in the Indicative Plan of PROURE to promote EE in the industry indicates that institutional framework and government risks can be low.
e. The capacities of the participating universities to provide training on ENMS and system optimization were strengthened and expanded. According to interviews with professors that provided training, their universities will continue to provide the training programs as a diploma or through optional or core subject in their curricula.

The rating for Sustainability is ***Probable***.

[7] FENOGE was created by the 1715 law of 2014, and its rules and regulations have been continuously updated and completed via several bills, decrees and resolutions during 2017 and 2018.

3.7 Progress to impact

According to the Theory of Change reconstructed for the project as illustrated in Figure 1, the expected impact is to contribute to improving competitiveness of enterprises and tackle climate change, which is aligned with the global environmental benefits of the project focused on energy savings and GHG emission savings. In accordance with evaluation team estimates, the project achieved an actual power saving of 43.6 GWh/year and fuel savings of 0.347 PJ/year for the period 2015-2017. These savings represent cumulative direct emissions reductions of 74.5 kt CO_2eq in the same period and cumulative post project direct emission reduction of 498.2 kt CO_2eq. Thus, the project has already contributed to reducing emissions and, consequently, has collaborated to tackle climate change. According to PMU estimates, project emission reductions contributed 4.8% to the accomplishment of the goal of reducing industry emissions by 1.53% through the implementation of EE measures, as stated in the Indicative Plan of PROURE 2017-2022.

If the economic savings reported by some enterprises that have already implemented EE measures are well managed, they could also contribute to improving enterprise competitiveness. During the interviews, some enterprises reported economic savings in the range of USD 3,000-240,000.

On the other hand, the implementation of the EnMS involved the definition and implementation of an EE policy in the enterprises, which facilitates the mainstreaming of the EE into the industry. The survey results show that 68% (19 of 28) of respondents who implemented the EnMS in phase 1 indicated a high probability of continuing to implement the EnMS when the project is finished, due to the tangible benefits obtained. Some of the reasons provided by the respondents were: “knowing how energy is being used became a permanent necessity [of the company]”, “Energy efficiency became the company's DNA” and "Senior managers follow up to the energy indicators”. 32% of the respondents said that the probability was medium, the main reasons provided were the lack of human resources and the high investment of time required to implement the EnMS. In addition, 61% of respondents said that the probability of obtaining the certification 5001 was medium, 21% said the probability was low and 18% said probability was high.

Regarding the replicability, 46% of respondents (13 of 28) said there is a high probability of implementing the EnMS in other process or facilities due to the need to seek efficiency in other types of energy and processes considering the benefits already obtained. 29% of the respondents said that probability is low since they do not have other facilities or other processes to implement the EnMS. 25% of the respondents said that probability is medium since more human and economic resources are needed or that the company is small thus there is no other process to implement the EnMS.

As illustrated in figures 4 and 6, the main barriers reported by the respondents to implement the EnMS and EE measures to system optimization were the lack of economic resources, tools, equipment and incentives. These barriers were also identified in the PIF and addressed by the project through Component 4. The EE certification, piloted by the project to support the implementation of EE measures with economic resources, seems to be an adequate way to overcome these barriers in the short-term, although UPME is still analyzing the instrument and no final decision has been made to implement it using the resources of FENOGE. The project identified regulation gaps as another barrier, which was partially overcome, since a Colombian National Technical Standard on competencies of the EnMS implementer was approved as National Technical Standard NTC-6269, however, a mandatory regulation was not issued as indicated in the Outcome 2.

The effectiveness and usefulness of training on EnMs and system optimization generated economic savings and promoted enterprise competitiveness, which were identified as the main drivers for promoting the implementation of EE measures. Therefore, the project enhanced the drivers.

The rating for Progress to Impact is ***Satisfactory***.

3.8 Partners performance

UNIDO was entrusted by the Government of Colombia and by the GEF with the mandate to implement the project and to achieve its objectives, outcomes and outputs within its budget and time frame. UNIDO maintained the oversight on the project implementation, managed the overall project budget, supervised the project execution, as well as organized planned evaluations. UNIDO's performance in carrying out these responsibilities responded in an adequate manner to the requests and needs of the PMU, Government of Colombia and Colombian industrial stakeholders.

The expertise of UNIDO staff and its technical materials and international consultants significantly contributed towards achieving project objective. All stakeholders interviewed acknowledged UNIDO participation, as it facilitated the engagement of the enterprises and ensured the quality of the training program and project activities.

UPME had an active participation in the project. It held weekly meetings to organize project activities and follow up its progress with the Technical Coordinator of the project hired by UNIDO and also donated USD 200,000 to support PEVI piloting. Therefore, the interaction between UNIDO and UPME is recognized. They planned together the exit strategy through the implementation of PEVI centers.

Opportunities were found to improve the performance of UNIDO-UPME in the design of the project, since there was a lack of effective communication with financing institutions (i.e. Asobancaria, Bancoldex) to know their plans in the short term and ensure that these plans were aligned with project activities of Component 4. As a consequence, 4 activities of Outcome 4 were changed and targets of indicators of the Outcome 4 were not achieved. In addition, the Project Results Framework showed inconsistences which were already addressed in the design assessment.

The effective interaction amongst Universities-Industry-Government is also acknowledged, this interaction strengthened the capacities of each partner. Although it is important to mention that administrative processes with the National University of Colombia were challenging since it took a long time to formalize its collaboration with UNIDO. Likewise, greater industry participation was expected and a more selective process was required to recruit potential candidates.

A more effective interaction between the PMU and the Ministry of Environment and Sustainable Development (MADS) was also necessary to ensure that the M&V tool, developed by the project to compile and manage data on the emission reductions, was aligned with the Monitoring, Report and Verification (MRV) tool that MADS is developing. This alignment would have facilitated the incorporation of the emission reductions achieved by the project to the reports carried out by MADS to inform on progress in accomplishing national and international commitments on climate change.

GEF approved the project NAMA Pilot Implementation of Technology Transfer Projects in the Industrial Sector of the Cundinamarca-Bogotá Region also in 2015, which has converging themes with the UNIDO-UPME project. The NAMA project has a component for capacity building, in which energy efficiency is addressed as a sub-theme of a training program for relevant stakeholders including enterprises. Given these similarities and the need of PMU to increase the participation of enterprises, a Letter of Intent was signed between CAEM and UNIDO to collaborate together to provide a limited-scope EnMS training to enterprises participating in the NAMA project. The NAMA project also includes the design of financial models that contain various strategies and mechanisms for financing structured technology transfer pilot projects (i.e. preferential credit lines), and the development of a system that allows monitoring, reporting and verification (MRV system) that would include data on consumption and energy savings.

Two enterprises that participated in both projects said, through the survey and one interview, that the interaction of both projects was positive and that the activities were complementary. However, there

is a risk of double accounting of the emission reductions since both projects would independently report their reductions despite the fact that the reductions are shared. There was no agreement between them on how to report them to the GEF.

The rating for Partners Performance is ***Satisfactory***.

3.9 Gender mainstreaming

A comprehensive gender assessment was conducted in line with UNIDO guidelines for gender mainstreaming in energy and climate change projects in 2016. The analysis allowed the PMU to identify the gender dimensions for each outcome and output, which facilitated the inclusion of the gender perspective in the project. It is important to mention that the UNIDO Gender Focal Point classified the project as with "limited gender dimensions", which means that the project has limited direct influence over gender equality and/or women's empowerment in the country.

As part of the activities to raise awareness on gender equality among project participants, training on this issue was provided to PMU, government counterparts, members of the NSC and technical consultants at the beginning of project implementation. During the training, the project staff responsible for identifying beneficiaries were briefed about the inclusive character that the technical training courses should have, and the national and international experts were made aware and explicitly asked to avoid any inequitable or biased remarks during their presentations and training.

Regarding the promotion of gender balance in the people that participated in the project, efforts were made to provide the conditions that could prevent women participating in the technical training. In particular, the PMU arranged a child care room during whole-day training sessions to support pregnant or nursing women. However, these care rooms were not used since there were no women who needed them. Some limitations of the promotion is that the brochures developed to advertise the training on EnMS did not incorporate inclusive language and did not explicitly promote the participation of women in the training. In addition, there was no specific call to promote the participation of women in the project activities.

Nevertheless, the goal of reaching at least 20% of women participation in the training activities of Component 2, was exceeded, reaching 27%. This goal was modest considering that this field is dominated by men. During the field work, 18 people from companies that participated in the project were interviewed, only 3 persons from the total were women. This situation was also reflected in the hired consultants, who were mainly men since there are a limited number of women participating in this field. Similarly, the technical products developed, such as the guidelines to select boilers in the industry or the new financing schemes, did not include a gender section due to their technical nature.

In order to highlight the participation of women in the project, a panel named "IEE project and gender equality" was organized at the closing event of the project. Three women participated in the panel by sharing their experiences on the EnMS training and the adoption of measures to reduce energy consumption in their companies. The sex-disaggregated statistics collected by the project were also presented during the event.

The rating for Gender Mainstreaming is ***Satisfactory***.

3.10 Summary of findings and ratings by evaluation criteria

Criterion	Summarized Assessment of the Findings	Rating
Design	The Project Results Framework shows several inconsistencies among outcomes, outputs and indicators and its targets. In addition, the lack of effective communication with financial institutions caused the modification of activities of Outcome 4, thus 2 outputs and 4 activities were not accomplished.	Moderately Unsatisfactory
Relevance	The project continues being relevant for the Colombian government as it is fully in line with the Bases of the National Development Plan 2018-2022; PROURE Action Plan 2017-2022 and the Colombian Low Carbon Development Strategy.	Highly Satisfactory
Effectiveness	The objective-level targets were achieved by the project and some of them were exceeded. However, 4 indicators of Outcomes 1, 3 and 4, and two outputs related to financing schemes to promote EE in industry were not achieved.	Moderately Satisfactory
Efficiency (including co-financing)	it is not possible to determine if the resources of the project were sufficient and if the activities were carried out with good value for money, since some activities were not carried out and other were modified and the co-financing realized is unknown.	Moderately Unsatisfactory
Monitoring and Evaluation	The tools to monitor the project were not developed due to a confusion with the M&E tools for EE measures. The PMU paid little attention to the Project Results Framework as two indicators of the project objective were not estimated nor taking into account to measure project achievements.	Moderately Unsatisfactory
Sustainability	There is an exit strategy that consists of the implementation of 5 PEVI Centers in universities that participated in the project. The partnership amongst University-Industry-Government will also continue. Financial risks are low due to the potential creation of a Certificate of Energy Efficiency in the short-term and the possible use of FENOGE resources to support the certificates. Institutional and government risks are also low due to the high level of ownership of the project by UPME and the programmatic and institutional framework that support its actions.	Likely
Progress to Impact	The project achieved cumulative direct emissions reductions of 74.5 kt CO_2eq in the period 2015-2017. Therefore, the project has already contributed to reducing emissions and, consequently, has collaborated to tackle climate change	Satisfactory
Partners Performance	The high performance of UNIDO and UPME was highly acknowledged by project partners and beneficiaries in relation to the level of involvement and quality of trainings. The effective interaction amongst Universities-Industry-Government was also highlighted. However, an agreement between the UNIDO and UNDP (implementing agency of the	Satisfactory

Criterion	Summarized Assessment of the Findings	Rating
	NAMA project) was necessary to accord on how to report the shared emission reductions obtained to the GEF and a higher participation of the industry was expected.	
Gender mainstreaming	The goal of reaching at least 20% of women participation in the training activities on EnMS was exceeded, reaching 27%. The project made significant efforts to include the gender perspective during its design and implementation, although it was clear from the beginning that its direct influence over gender equality was limited.	Satisfactory
Overall rating		Moderately Satisfactory

4. Conclusions, recommendations and lessons learned

4.1 Conclusions

C1. The objective-level targets were achieved by the project and some of them were exceeded according to the estimates of the PMU and the evaluation team. The direct energy savings identified were 2,573,994 GJ and the emission reduction identified was 175 ktCO2 in the period 2015-2017, exceeding the targets by 287% and 251%, respectively. These achievements were due in part to the effectiveness and usefulness of the EnMS and System Optimization trainings provided. In addition, an Industrial Assessment Program was piloted and included as an additional output of the project, which contributed to the reduction of emission of 10 kt CO2eq/yr. **Regarding the achievement of outcomes and outputs, 4 indicators of Outcomes 1, 3 and 4, and two outputs related to financing schemes to promote EE in industry were not achieved** mainly due to project design problems and the limited participation of industry.

C2. Even though the project design was based on clearly identified problems and clear target beneficiaries, there were limitations in the consultations made to relevant project partners (i.e. Asobancaria) during this phase, and important inconsistencies in the Project Results Framework and unrealistic indicators (i.e. lack of consistency between Outcome 1 and its indicators), which caused changes in 4 activities of Outcome 4 and non-compliance of indicators of outcomes and outputs. **Therefore, the project design has important shortcomings that affected the effectiveness of the project.**

C3. The project was fully in line with the political and institutional framework of the Colombian government, including previous and new plans and programs related to energy management and security, which promoted active participation of project partners and stakeholders. **The project also supported GEF-5 strategic objectives on climate change and the UNIDO's long-term strategy of Inclusive and Sustainable Industrial Development.**

C4. Given that some activities of Outcome 4 were modified and the new activities did not directly contribute to the achievement of the Outcome 4 and also considering that the monitoring tools on project progress were not developed despite the fact that there were resources to do so and the lack of information on the materialization of co-financing, **it is not possible to determine if the**

resources of the project were sufficient and if the activities were carried out with a good value for money.

C5. The M&E is the weakest aspect of the project. The tools to monitor the project were not developed due to a confusion with the M&E tools for EE measures, the adaptive measures implemented were not documented nor justified and the PIRs lack of important information such as the cumulative budget expenditures and the co-financing materialization. The PMU paid little attention to the Project Results Framework as two indicators of the project objective were not estimated nor taking into account to measure project achievements.

C6. In accordance with evaluation team estimates, the project achieved an actual power saving of 43.6 GWh/year and fuel savings of 0.347 PJ/year for the period 2015-2017. These savings represent cumulative direct emissions reductions of 74.5 kt CO_2eq in the same period and cumulative post project direct emission reduction of 498.2 kt CO_2eq. Thus, **the project has already contributed to reducing emissions and, consequently, has collaborated to tackle climate change**. The main drivers identified to implement EE measures were to increase company competitiveness and obtain economic savings. The main barriers identified were the lack of tools and equipment, economic resources and support from senior management.

C7. Sustainability seems to be the strongest aspect of the project. There is an exit strategy that consists of the implementation of 5 PEVI Centers in universities that participated in the project. In addition, RECIEE will continue to provide its EE training programs. Therefore, the partnership amongst University-Industry-Government will also continue. Financial risks are low due to the potential creation of a Certificate of Energy Efficiency in the short-term and the possible use of FENOGE resources to support the certificates. Institutional and government risks are also low due to the high level of ownership of the project by UPME and the programmatic and institutional framework that support its actions.

C8. The high performance of UNIDO and UPME was highly acknowledged by project partners and beneficiaries. The expertise of UNIDO staff and its technical materials and international consultants significantly contributed towards achieving project objective. The level of ownership of UPME and its active participation in the project also contributed to the project achievements and to the sustainability of its benefits. **The effective interaction amongst Universities-Industry-Government is also highlighted**. Notwithstanding, an agreement between the project and the NAMA project was necessary to accord on how to report the shared emission reductions obtained to the GEF, since there is a high risk of double accounting of emission reduction by the GEF. In addition, **a higher participation of the industry was expected.**

C9. The project made significant efforts to include the gender perspective during its design and implementation. The goal of reaching at least 20% of women participation in the training activities on EnMS was exceeded, reaching 27%. It is important to highlight the project had *per se* a limited direct influence over gender equality and/or women's empowerment.

4.2 Recommendations

Recommendation 1 to UNIDO and UPME. Since the Project Results Framework is based on a chain of results, any modification to it results in a change in its logic and, consequently, affects the achievement of objectives, outcomes, outputs or indicators. Therefore, it is suggested that for similar projects, before making any changes to the Project Results Framework, these changes be assessed in depth by the executing and implementing agencies to analyze its effect and make the necessary adjustments to maintain the logic of the results and the results itself. If changes to the Project Results Framework are significant (i.e. change of indicators or results), it will be necessary to inform the GEF and obtain its authorization.

Recommendation 2 to UNIDO. In order to avoid double counting in the emission reductions reported by the project and the NAMA Project, it is suggested that for the final report, UNIDO agrees with UNDP, the implementing agency of the NAMA project, on how to report to GEF the reduction of emissions achieved from the participating enterprises in the NAMA project.

Recommendation 3 to UNIDO. For similar projects, it is advisable to increase the level of awareness of UNIDO project implementers on the usefulness of a monitoring system and the need to use the Project Results Framework to manage projects. This is essential to identify, in early stages, potential risks or deviations of the project that may affect its performance, therefore, timely corrective actions can be undertaken, and also to ensure that all project objectives and indicators are met. In the same line, it is also recommendable to develop guidelines to conduct Internal Mid Term Reviews for project managers of medium-size projects who wish to conduct it in order to make her/his effort effective.

Recommendation 4 to UNIDO. According to the updated Co-financing Policy of the GEF (GEF, 2018), which increased the level of ambition for the overall GEF portfolio to reach a ratio of US 6 in co-financing for each dollar in GEF financing, a more detailed report of realized co-financing and investment mobilized at mid-term and project completion is required. Therefore, it is advisable that UNIDO enhance the monitoring of materialized co-financing during project implementation for future similar projects.

Recommendation 5 to GEF. To optimize resources and facilitate the report of CO_2 emission reductions to accomplish national and international climate change commitments, it is advisable that GEF states that the development of Monitoring, Reporting and Verification tools, as part of the outputs of IEE projects, are aligned with the National MRV, and where appropriate meet its guidelines.

Recommendation 6 to UPME. It is suggested that UPME, as part of the project exit strategy, provides follow-up to the participating enterprises in the EnMS training program to consolidate EnMS implementation and ensure energy savings identified, and also to obtain more successful cases than allows UPME to continue promoting EE in the industrial sector considering its skepticism in EE measures.

4.3 Lessons learned

Lesson 1. The development and enactment of legal instruments are political processes that are subject to the political will of relevant actors and external pressures, and depend largely on the current context. These processes could last for months or years and can hardly be controlled. Therefore, if a project decides to include them as an output or target of an indicator, it must include a high-level risk due to its possible non-compliance.

Annexes

Annex I. Evaluation ToR

(Electronic file)

Annex 2. Evaluation matrix

Evaluation Criteria	Key questions	Sub-questions[1]	Indicators	Data collection methods	Information sources
Progress to impact	• What are the key drivers and barriers to achieve the long-term objectives?	• What drivers and barriers have the enterprises collaborating in the project faced to adopt the EnMS and EOS, and to apply to financial incentives for implementing EE measures? • What drivers and barriers have the UPME and other governmental institutions and the banks identified to continue promoting the adoption of EnMS and EOS?	• Number of drivers and barriers identified in enterprises, governmental institutions and banks	Interviews to enterprises that finalized the trainings and adopted the EnMS or the EOS and enterprises that dropped out training or adoption Interviews to UPME and banks, desk review and survey	PIRs, testimonies of enterprises, UPME and banks, technical reports from the M&V system and PIRs.
	• To what extent has the project helped put in place the conditions likely to address the drivers, overcome barriers and contribute to the long-term objectives?	• To what extent were the barriers identified in the PRODOC overcome by the project? • To what extent were the drivers identified in the project addressed by the project? • To what extent has the project's results contributed to improve enterprises competitiveness and tackle climate change?	• Number of economic benefits obtained by the enterprises due to the project • Level of reduction of GHG emissions • Level of energy savings in the enterprises due to the project		
Design	• Was the project design adequate to address the problem at hand?	• Were the objectives, outcomes and outputs adequate to address the limited adoption of EE measures by the enterprises?	• Level of congruence among objectives, outcomes and outputs with the problem addressed by the project	Desk review, interviews to key stakeholders that participated in the project design	PRODOC and key stakeholders

Evaluation Criteria	Key questions	Sub-questions[1]	Indicators	Data collection methods	Information sources
	• Is the expected result-chain (impact, outcomes and outputs) clear and logical?	• Do outcomes describe change in enterprises/authorities behavior/performance?	• Level of logic of the result chain		
Relevance	• To what extent is the project aligned with country priorities and with the UNIDO and GEF strategies?		• Level of alignment of the project with country priorities and with UNIDO and GEF strategies? •	Desk review and interviews	National Development Plan, UNIDO and GEF priorities and policies
Effectiveness	• How well has the project performed?		• Level of accomplishment of project´s objective	Desk review, interviews to representatives from enterprises, governmental institutions and universities, visits to enterprises	PIRs, Mid-Term Review, testimonies from representatives of enterprises, governmental institutions and universities
	• What have been the project's key results (outputs, outcome and impact)?		• Number of key results accomplished		
	• To what extent have the expected results been achieved or are likely to be achieved?		• Level of achievement of project´s results		
	• Has the project done the right activities?		• Level of satisfaction of the beneficiaries		

Evaluation Criteria	Key questions	Sub-questions[1]	Indicators	Data collection methods	Information sources
Efficiency	• Has the project done things right, with good value for money?	• Are the results being achieved at an acceptable cost? • Would alternative approaches accomplish the same results at less cost?	• Level of satisfaction of partners and beneficiaries (enterprises, universities, banks) on results achieved considering the total project cost	Desk review, interviews to representatives from enterprises, governmental institutions, banks and universities, and visits to enterprises	Financial reports, PIRs, testimonies from representatives of enterprises, governmental institutions, banks and universities
Sustainability of benefits	• To what extent the achieved results will sustain after the completion of the project?	• Does the implementation of EnMS by the selected enterprises will continue after the project is over? • What is the probability that enterprises can implement the EOS after the project has finished? • What is the probability that enterprises can apply to financial incentives provided by banks to implement EE measures? • What is the probability that all selected universities will continue providing training on EnMS? • To what extent have the outputs and results been institutionalized?	• Level of commitment of beneficiaries to continue with the activities after the project is over • Number of institutionalized processes derived from the project?	Interviews to representatives from enterprises, governmental institutions, banks and universities, and desk review	National Development Plan and testimonies from representatives of enterprises, governmental institutions, banks and universities
	• Are there financial, socio-political, institutional and environmental	• If there are risks, which are and how may affect the continuation of results after the project ends?	• Level of perception of risks that may affect project sustainability		

Evaluation Criteria	Key questions	Sub-questions[1]	Indicators	Data collection methods	Information sources
	risks that could affect the project sustainability?				
Gender mainstreaming	• Did the project design adequately consider the gender dimensions in its interventions ?	• To what extent did women have the same opportunities to participate in the trainings and the overall project?	• Number of project interventions that consider gender dimensions	Desk review and interviews to women, representatives from enterprises and team project	Record of participants in trainings and project activities, PIRs, PRODOC, testimonies of women
	• To what extent did women have the same opportunities to participate in the trainings and the overall project?	• How gender-balanced was the composition of beneficiaries and participants in the project?	• Level of participation of women in the overall project		
M&E	• Was an M&E system in place and did it facilitate timely tracking of progress toward project results?	What were the elements of the M&E system?	• Number of elements of M&E system that were effectively implemented according to the planned system	Desk review and interviews to project team members and members of Project Steering Committee (PSC)	PIRs, PRODOC, Minutes of PSC, testimonies from project team members and members of PSC
	• Did project team and manager make decisions and corrective actions based on analysis from M&E system and based	What were the adaptive measures implemented?	• Number of adaptive measures implemented in response to changing conditions that affected the project		

Evaluation Criteria	Key questions	Sub-questions[1]	Indicators	Data collection methods	Information sources
	on results achieved?				
Results-based Management (RBM)	• To what extent the logframe was modified since project start?	What were the changes done?	• Number of changes made to the logframe	Desk review and interviews to all key stakeholders	PIRs, PRODOC, Minutes of PSC, testimonies from key stakeholders
	• What lessons can be drawn from the successful and unsuccessful practices in designing, implementing and managing the project?	What were the lessons learnt?	• Number of lessons learnt derived from the successful and unsuccessful practices in designing, implementing and managing the project		
Performance of partners	• To what extent was the performance of UNIDO, National counterparts and Donors adequate?	• To what extent the executing agency and partners delivered effectively the resources and streamline administrative process? • To what extent the risks were identified and managed appropriately? • Was the use of funds, procurement and contracting of goods and services appropriate? • Were the technical assistance and communication with partners and stakeholders adequate?	• Level of satisfaction of beneficiaries, donors and counterparts	Desk review and interviews to beneficiaries (enterprises, banks, universities), UPME, Colciencias, GEF	PIRs, PRODOC, testimonies from beneficiaries (enterprises, banks, universities), UPME, Colciencias, GEF
Cofinancing	• To what extent was the expected		• Percentage of materialized co-	Desk review and interviews to	Letters of co-financing

Evaluation Criteria	Key questions	Sub-questions[1]	Indicators	Data collection methods	Information sources
	co-financing materialized?		financing versus planned co-financing • Level of initial and final leverage of the project.	project team members	commitments, reports of co-financing, financial reports, PRODOC
	• How the co-financing affected project results (in capacity size, in opportunity)?				
Environmental and social safeguards	• Were appropriate environmental and social safeguards addressed in the project's design and implementation?		• Number of possible impacts, regarding an overload of work, on trainees from enterprises	Interviews to participants in the trainings	Testimonies of participants
	• Were there preventive or mitigation measures for any foreseeable adverse effects and/or harm to environment or to any stakeholder?				

Annex 3. List of documents reviewed

File	Sub-file - 1st level	Document	Type	Number of documents	Number of Sub-files - 2nd level
EnMS - industries contacts	phase 1	Base de datos SGEn II	xls	1	
EnMS training material	Modulo 1	Presentations 1 a 3	ppt	3	
	Modulo 2	Presentations 1 a 3	ppt	3	
	Modulo 3	Presentations 1 a 4	ppt	3	
	Guía Práctica para SGE		pdf	1	
Difussion material		7 Success cases	pdf	7	
PIR	01_PIR 2018	PSC meeting minutes', Project Progress Update, Workplan July 2017, NTC 6269, other	pdf	12	
	O2_PIR 2017	Inception workshop 2016, Executive committee minutes, Brochures, workplan, other	pdf, doc	11	
	PIR 2019	Progress report 01 July 2018-30 June 2019	doc	1	
PRODOC - English & Spanish		Prodoc, Annexes, Prodoc Resubmission, GEF UNIDO Tracking tool	pdf, xls	4	
Project Steering Committee	CDN 1 Oct 2015	POA 2015	pdf	1	
	CDN 2	List of participants	pdf	1	
		Meeting minutes - Dec 2016		1	
	CDN 3	Third Steering Committee Minutes 9 Oct 2017	pdf	1	
		List of participants		2	
	CDN 4	Fourth Steering Committee Minutes 30 Nov 2018	pdf	1	
		Advisory Committee Survey	pdf	1	
System Optimization		System Optimization Contacts - Data base	xls	1	
	Pumping	Pumps tools - file	file		1

File	Sub-file - 1st level	Document	Type	Number of documents	Number of Sub-files - 2nd level
		UNIDO - Manual de optimización de sistemas industriales de bombeo	pdf	1	
	Motors	Motor tools - file	file		1
		UNIDO - Manual de optimización de sistemas de motores electricos industriales	pdf	1	
	Steam	Steam tools - file	file		1
		UNIDO - Manual de optimización de sistemas de vapor industria	pdf	1	
Technical consultancies ToR and reports	Component 1 - Standards and regulations	Guia de calderas para reglamento - 3 files	pdf, doc		3
		Norma de competencia laborales - 4 files	pdf		4
	Component 2 EnMS capacity building	Phase 1 - Contract with National University - 1 file			1
		Phase 2 - Groups Barranquila, Bogotá an Cali . 3 files			3
	Component 3 Energy systems optimization	Final report	doc	1	
	Component 4 Financial mechanism	EE Certificates - file			1
		Bussiness conference - file			1
	Int'l Experts ToR and deliverables	Five expert - five files			5
PEVI Contacts			xls	1	
Mid-term Review			pdf	1	
		Totals		61	21

Annex 4. List of interviewees

Name	Designation	Institution	Location
Ricardo Baquero Vergara	Coordinador Técnico Nacional del Proyecto	UNIDO	Bogota
Elkin Ramirez Prieto	Consultor PEVI	UNIDO	Bogota
Jorge Andrés Arcieri Cabrera	Director de Departamento de Negocios Especiales	Bancoldex	Bogota
Yezid Ojeda	Asesor del Programa Nacional de Ciencia Teconologia e Innovacion y Energía y Míneria	Colciencias	Bogota
Diana Montaña	Profesional	Colciencias	Bogota
Nidia Chaparro	Contratista Cambio Climatico en sector energía	Ministerio de Ambiente y Desarrollo Sostenible	Bogota
Jaiza Vegarano	Asuntos Internacionales	Ministerio de Ambiente y Desarrollo Sostenible	Bogota
Jonathan Sanchez	Enlace Min Ambiente y Energía	PNUD	Bogota
Eduardo Cruz González	Profesional de Normalización	ICONTEC	Bogota
Daniel Trillos	Jefe de Normalización	ICONTEC	Bogota
Jaime Restrepo	Gestor de Proyectos de Normalización	ICONTEC	Bogota
Omar Prias	Profesor y Director de la Red Colombiana de Conocimiento en Eficiencia Energética	Universidad Nacional de Colombia	Bogota
Fredy Niño	Jefe de Mantenimiento de Planta Muña	Gerdau Diaco	Bogota
Antonio José Plazas Santa	Jefe de Servicios Industriales	Colombina Planta 1	Cali
Daniel Prado	Coordinador de Innovacion y Eficiencia Energética	Siderúrgica del Occidente	Cali
Juan Calos Garía	Gerente de Operaciones	Siderúrgica del Occidente	Cali
Victor Benavides Jimenez	Director Administrativo y Financiero	La Despensa Natural -Programa PEVI	Cali
Jose Israel Rubio	Gerente	La Despensa Natural -Programa PEVI	Cali
Juan Ricardo Vidal	Invsetigador del grupo GIEN y Director de Especialización en EE y asociado	Universidad Autonomona de Occidente	Cali
Enrique Quispe	Profesor Tittual y Director de Investigación en Energía	Universidad Autonomona de Occidente	Cali

Name	Designation	Institution	Location
Luis Eduardo Carabali	Electricista	Vincorte	Cali
Edagar Cordoba Sizssa	Jefe de Mantenimiento	Vincorte	Cali
Olga González	Technical Leader (Government)	UPME	Bogota
Carlos García	Subdirector	UPME	Bogota
Juan Carlos Campos	Profesor, capacitador	E2	Bogota
Lised Chaves Acosta	Oficina de Asuntos Regulatorios	Ministerio de Minas y Energía	Bogota
Luis Fernando Lopez Pineda	Coordinador de Politica y Reglamentación	Ministerio de Minas y Energía	Bogota
Luis Andres Montioya	Profesional de Mantenimiento	Argos Cemento	Bogota
Mario Garcia Gacia	Presidente	Garper Energy Solutions	Bogota
Marco Mateini	Gerente del Proyecto	UNIDO	Bogota
Yovany Pereira	Lider de Innovación de Proyectos Tecnológicos	Cerámica Italia	Cucuta
Byron Medina Delgado	Decano de la Facultad de Ingeniería	Universidad Francisdo de Paula de Santander	Cucuta
Carlos Alberto Martinez Montes	Gerente Propietario	Pasabocas de Chic	Cucuta
William Correa Dominquez	Gerente de proyectos	Italcol Funza	Bogota
Francisco Javier Sanchez Valenzuela	Coordinador de Proyectos	Acerias Paz del Rio	Sogamoso
Nelvi Pulido	Directora de Promocion y Desarrollo	Camara de comercio Sogamoso	Sogamoso
Wilmer Andres Correa	Director de Planeacion y Automatización	Fosfatos de Boyacá	Sogamoso
Erika Liliana Rodriguez Serrano	Administrativa y de Calidad	Vitroalum	Sogamoso
Lizeth Alvaréz	Ingeniera	Genovas Santafereñas	Cundinamarca
Patricia Lozano	Gerente	Genovas Santafereñas	Cundinamarca
Javier Guarnizo	Director of Evaluation Office	UNIDO HQ	Viena
Bettina Schreck	Former Project Manager	UNIDO HQ	Viena

Annex 5. Mission agenda

a) Mission Agenda: Colombia

Date	Hour	Names	Institution	Position	Place
29-Aug	13:00	Ricardo Baquero	UNIDO Bogota	National Technical Coordinator EEI	Bogota
29-Aug	14:00	Elkin Ramirez	PEVI	Consultant	
29-Aug	16:30	Jorge Arcieri	Bancoldex - Special Bussiness Department	Director	Bogota
30-Aug	7:30	Yezid Ojeda / Diana Montaña	Science and Tech- Colciencias	Energy Programm Advisor/ Assistant	Bogota
30-Aug	8:30	David Felipe Olarte / Laura Bermúdez/ Jonathan Sanchez/ Yaisa Bejarano	Ministry of Environment and Sustainable Development / Climate Change and International Affairs	Officials	Bogota
30-Aug	14:00	Eduardo Cruz /Daniel Trillos / Jaime Restrepo	Colombian Institute of Standardization	Director of Standardization / Standardization Professionals	Bogota
30-Aug	15:30	Omar Prias	National University	Professor and RECIEE Coordinator	Bogota
31-Aug	9:00	Freddy Niño	Gerdau Diaco -Planta Muña Bogota	Maintenance manager	Bogota
1-Sep	**15:17**	**AV9205**	**FLIGHT TO CALI**		
2-Sep	6:00		Travel to La Paila		
2-Sep	9:00	Antonio Jose Plazas	Colombina – Plant 1 (La Paila – Valle)	Head of Industrial Services	Cali - La Paila
2-Sep	15:00	Daniel Prado / Juan Carlos García	Siderúrgica de Occidente (Cali)	Innovation and Energy Efficiency Coordinator / Operations Manager	Cali
3-Sep	12:00	Juan Ricardo Vidal / Enrique Quispe	Universidad Autónoma de Occidente	Researcher of the GIEN group and Director of Specialization in EE / Research Director on EE	Cali

Date	Hour	Names	Institution	Position	Place
3-Sep	10:00	Victor Benavidez / José Israel Rubio	La Despensa - PEVI	Administrative and Financial Director / Manager	Cali
3-Sep	15:00	Edgar Cordoba / Luis Eduardo Caraballi	Vinos de la Corte	Maintenance Manager / Electric Technician	Cali - Santander Quilichao
3-Sep	20:07	**AV9210**	**FLIGHT TO BOGOTA**		
4-Sep	7:00		**Project Closing Session**		
4-Sep	7:00	Carlos Garcia / Olga González	Upme - Demand Sub-Division	Director / Technical Leader EEI Colombia	Bogota
29-Aug	10:00	Lised Chavez / Luis Fernando Lopez	Ministry of Mines and Energy. Technical Regulation Office / Policy Coordination	Professional / Coordinator	Bogota
4-Sep	11:00	Juan Carlos Campos	Universidad del Atlantico /E2	Professor & Unido Consultant / CEO	Bogota
4-Sep	11:30	Mario Garcia	Garper Energy Solutions	President	Bogota
4-Sep	12:00	Luis Andrés Montoya	Argos Cement Company	Maintenance Professional	Bogota
4-Sep	14:00	Marco Matteini	UNIDO Vienna	EEI Project Manager	Bogota
5-Sep	**5:38**	**AV9450**	**FLIGHT TO CUCUTA**		
5-Sep	9:00	Giovanni Pereira	Cerámica Italia (Cúcuta)	Technology Projects Innovation Leader	Cucuta
5-Sep	11:30	Byron Medina	Univ FP Santander	Dean of the Faculty of Engineering	Cucuta
5-Sep	14:30	Carlos Alberto Martinez Montes	Pasabocas D´Chips (Cúcuta)/ Sede UDES	President , Owner	Cucuta
5-Sep	**20:01**	**AV 9453**	**FLIGHT TO BOGOTA**		
6-Sep	9:00	William Fdo Correa	Italcol – Planta Funza (Funza -Bogotá)	Project Manager	Bogota - Funza
6-Sep	11:00		**TRAVEL BY CAR TO SOGAMOSO**		
6-Sep	15:00	Francisco Santos	Acerias Paz del Río (Boyacá)	Project Coordinator	Boyaca

Date	Hour	Names	Institution	Position	Place
6-Sep	16:00	Liseth Alvarez / Patricia	Génovas Santafereñas (Madrid/Bogotá)	Maintenance Director / Manager	Bogota - Madrid
6-Sep	16:30	Nelby Pulido	Municipal Commerce Chamber (Sogamoso)	Promotion and Development Director	Sogamoso
7-Sep	9:00	Wilder Correa/Juan D Gonzalez	Fosfatos de Boyacá (Pesca - Boyacá)	Planning and Automation Director	Boyaca
7-Sep	13:00	Erika Rodriguez	Vitralum (Paipa – Boyacá)	Administrative and Quality Supervisor	Boyaca
7-Sep			**TRAVEL BY CAR TO BOGOTA**		
9-Sep	10:30	Olga González / Ricardo Baquero	**UPME / UNIDO PRELIMINARY FINDINGS PRESENTATION**	Technical Leader EEI Colombia / National Technical Coordinator EEI	

b) Mission Agenda: UNIDO headquarters

Day 1 – Wednesday, 11 September	
	Arrival in Vienna
Day 2 – Thursday, 12 September	
10:30 – 11:30 - Room D1717	Meeting with Marco Matteini, Energy Systems and Infrastructure Division
14:30 – 16:00. - Room D1582	Presentation and discussion of the findings from Terminal Evaluation with: - Energy Systems and Infrastructure Division colleagues, - Independent Evaluation Division colleagues.
Day 3 – Friday, 13 September	
11:30 – 12:30 - Room D1717	Meeting with Marco Matteini, Energy Systems and Infrastructure Division
14:30 – 15:30 - Room D1710	Meeting with Bettina Schreck, Climate Policy and Partnership Division.
Day 4 – Saturday, 14 September	
	Departure from Vienna