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Report No: ICR00005389

IMPLEMENTATION COMPLETION AND RESULTS REPORT

TF 19403

ON A

GRANT

IN THE AMOUNT OF US$ 16.88 MILLION

TO THE

United Mexican States

FOR THE

MEXICO Sustainable Energy Technologies Development for Climate Change

June 30, 2021

Energy & Extractives Global Practice
Latin America And the Caribbean Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective December 31, 2020)

Currency Unit	=	Mexican Peso
MX$19.89	=	US$1

FISCAL YEAR
January 1 - December 31

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ABBREVIATIONS AND ACRONYMS

ACE	Advanced Clean Energy
BANOBRAS	*Banco Nacional de Obras y Servicios Públicos* (National Bank for Works and Public Services)
CCEC	Collaborative clean energy commercialization
CDM	Clean Development Mechanism
CEMIE	*Centro Mexicano de Innovación en Energía* (Mexican Center of Energy Innovation)
CERIP	Clean Energy Regional Investment Plan
CONACyT	*Consejo Nacional de Ciencia y Tecnología* (National Science and Technology Council)
CPS	Country Partnership Strategy
CQS	Selection based on the consultant's qualifications
CRE	*Comisión Reguladora de Energía* (Energy Regulatory Commission)
CTCN	Climate Technology Center and Network
EBRD	European Bank for Reconstruction and Development
ENACC	*Estrategia Nacional de Cambio Climático* (National Climate Change Strategy)
ER	Emissions Reduction
ESMF	Environmental and Social Management Framework
FBS	Selection under fixed budget
FINTECC	Finance and Technology Transfer Centre for Climate Change
FIT	*Fondo Sectorial de Innovación Tecnológica* (Technology innovation fund)
FM	Financial Management
FOTEASE	*Fondo para la Transición Energética y el Aprovechamiento Sustentable de la Energía* (Energy Transition Fund)
FSE	*Fondo Sectorial CONACYT-SENER de Sustentabilidad Energética* (Sustainable Energy Fund)
GEF	Global Environment Facility
GHG	Greenhouse Gas
GoM	Government of Mexico
GPN	General Procurement Notice
IBRD	International Bank for Reconstruction and Development
IC	Investment Committee
ICB	International competitive bidding
IFR	Interim financial report
INADEM	*Instituto Nacional del Emprendedor* (National institute of the Entrepreneur)
IP/IPR	Intellectual property/Intellectual property rights
IT	Information Technology
LCS	Least-cost selection
M&E	Monitoring and evaluation
$MtCO_2e$	Million Tons Carbon Dioxide Equivalent
MTR	Mid-Term Review
MXN	Mexican Pesos
NAFIN	*Nacional Financiera* (National Financing Agency)
NCB	National competitive bidding
NDC	Nationally Determined Contributions
PDO	Project Development Objective
PIU	Project Implementation Unit
POM	Project Operational Manual

PRODETES	*Proyecto para el Desarrollo de Tecnologías de Energía Sustentable (*Sustainable Energy Technologies Development for Climate Change Project)
QAE	Quality at entry
QBS	Quality-based selection
QCBS	Quality- and cost-based selection
R&D	Research and development
RF	Results Framework
RNA	Regional needs assessment
SE	*Secretaría de Economía* (Secretary of Economy)
SEMARNAT	*Secretaría de Medio Ambiente y Recursos Naturales* (Secretary of Environment and Natural Resources)
SENER	*Secretaría de Energía* (Secretary of Energy)
SEPA	*Sistema de Ejecución de Planes de Adquisiciones* (Procurement Plan Execution System)
SFP	*Secretaría de la Función Pública* (Secretary of Public Administration)
SHCP	*Secretaría de Hacienda y Crédito Público* (Secretary of Finance and Public Credit)
SMEs	Small and medium enterprises
SSS	Single source selection
TA	Technical Assistance
UNFCCC	United Nations Framework Convention on Climate Change

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P145618	MEXICO Sustainable Energy Technologies Development for Climate Change
Country	**Financing Instrument**
Mexico	Investment Project Financing
Original EA Category	**Revised EA Category**
Partial Assessment (B)	Partial Assessment (B)

Organizations

Borrower	Implementing Agency
United Mexican States	SENER

Project Development Objective (PDO)

Original PDO

The objectives of the Project are to improve the institutional capacity of ACE technology institutions (both public and private)inthe territory of the recipient and to foster the commercialization of ACE technologies by providing financial incentives to the private sector, which together are expected to lead to GHG emissions reduction in the future.

FINANCING

	Original Amount (US$)	Revised Amount (US$)	Actual Disbursed (US$)
World Bank Financing			
TF-19403	16,880,734	13,399,083	13,399,083
Total	**16,880,734**	**13,399,083**	**13,399,083**
Non-World Bank Financing			
Borrower/Recipient	0	0	0
Total	**0**	**0**	**0**
Total Project Cost	**16,880,734**	**13,399,083**	**13,399,083**

KEY DATES

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
06-Mar-2015	21-Sep-2015	05-Mar-2018	31-Dec-2019	31-Dec-2020

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US$M)	Key Revisions
06-Dec-2016	.17	Change in Institutional Arrangements Other Change(s)
29-Aug-2018	3.54	Change in Results Framework
20-Nov-2019	8.19	Change in Loan Closing Date(s) Reallocation between Disbursement Categories

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Moderately Satisfactory	Moderately Satisfactory	Substantial

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US$M)
01	13-Dec-2015	Satisfactory	Satisfactory	0
02	29-Jun-2016	Satisfactory	Satisfactory	.08
03	22-Dec-2016	Satisfactory	Satisfactory	.42
04	29-Jun-2017	Moderately Satisfactory	Moderately Satisfactory	1.24
05	21-Dec-2017	Moderately Satisfactory	Moderately Satisfactory	1.37
06	28-Jun-2018	Moderately Satisfactory	Moderately Satisfactory	2.43
07	21-Dec-2018	Moderately Satisfactory	Moderately Satisfactory	4.13
08	07-Jun-2019	Moderately Satisfactory	Moderately Satisfactory	6.12
09	17-Oct-2019	Moderately Satisfactory	Moderately Satisfactory	7.33
10	22-Apr-2020	Moderately Satisfactory	Moderately Satisfactory	10.19
11	14-Dec-2020	Moderately Satisfactory	Moderately Satisfactory	12.12

SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Public Administration	**18**
Other Public Administration	18
Energy and Extractives	**82**
Other Energy and Extractives	82

Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)

Private Sector Development	**50**
Business Enabling Environment	50
Investment and Business Climate	50
Environment and Natural Resource Management	**50**
Climate change	50
Mitigation	50

ADM STAFF

Role	At Approval	At ICR
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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Context

1. **Government of Mexico (GoM) Reform Agenda.** At the time of appraisal**,** a reform agenda to raise productivity and unleash growth in the medium term, which included shifting economic activity toward higher value-added activities by improving productivity through innovation and the adaptation of technology, had been passed and was at early stages of implementation. Also, the GoM had made strong commitments to reduce its Green House Gas (GHG) emissions and to increase production of electricity from renewables, and had established a 'low-carbon' development program based on the principles that, in addition to contributing to the mitigation of climate change, it could spur economic growth, contribute to sustainable development, and provide other ancillary benefits such as stimulating the development of new technologies and improving productivity, where one of the priority areas for innovation was clean energy.

2. **Advanced Clean Technologies (ACE) in Mexico.** In order to achieve its productivity and climate change mitigation goals, Mexico needed to expand the development and commercialization of ACE technologies. While Mexico had significant research capabilities and the potential to expand ACE technologies, enterprise activity in the sector was limited. Government intervention in this sector was particularly important due to two market failures: (a) the environmental costs of polluting technologies were not internalized, which reduced the demand for clean alternatives, and (b) private investors were unable to determine the proper level of investment in new technologies due to lack of awareness, uncertainty of risks and rewards, and the incentive to piggy-back on early adopters.

3. **Innovation in the energy sector.** The innovation deficit was most evident in the energy sector**,** where lack of technology and innovation capacity had been one of the reasons for declining oil and gas production and where nearly all clean energy technologies were developed abroad and imported. Given these challenges, Mexico was developing a national innovation strategy for the energy sector with *Secretaría de Energía* (SENER) assuming a leading role. For clean energy technologies, SENER channeled public support for applied research and development (R&D) through the Sustainable Energy Fund (*Fondo Sectorial CONACYT-SENER de Sustentabilidad Energética* - FSE). SENER led the overall strategy to promote ACE in Mexico, which included five pillars: 1 - Advanced research and development for ACE technologies; 2 - Establishment of Mexican Centers of Energy Innovation (*Centros Mexicanos de Innovación en Energía* - CEMIEs) as virtual collaboration centers to stimulate the clean energy industry in Mexico; 3 - Institutional strengthening of academic and research institutions, private enterprises, and national and subnational government entities; 4 - Increased use of ACE technologies by the private sector; and 5 - Commercialization of ACE technologies by enterprises. The Project was to contribute to the above last three pillars of SENER strategy. Clean energy innovation was also supported through the Secretary of Economy-CONACYT Technology Innovation Fund (*Fondo de Innovación Tecnológica* - FIT) for small and medium private and public enterprises.

4. To overcome its innovation deficit in the clean energy sector, Mexico had to address both demand- and supply-side challenges. On the supply side, there was insufficient human capital in science and technology disciplines linked to clean energy; weak incentives and risk aversion among researchers to pursue entrepreneurship and commercialize their research; excessive public sector focus of the government's current innovation strategy for

clean energy; underdeveloped technical assistance (TA) services for science and technology (S&T) based entrepreneurs; and limited public/private financing for early-stage investment (prototyping and piloting). On the demand side, the market for ACE technologies had been constrained by the dominance of state-owned enterprises in both the electric power and hydrocarbons sectors, and weak industry demand for innovations coming from Mexican research and academic institutions. Among the most important challenges for clean energy development that Mexico faced was the lack of academia-industry collaboration.

5. **Rationale for Bank Involvement.** The Bank was seeking to contribute to advancing the commercialization of clean energy technologies in Mexico through the Project. The Bank brought global knowledge of clean energy markets and sector policies, experience with technology innovation programs globally and in Mexico, and a comparative advantage in designing and managing climate change funds. The Project was expected to contribute to overcoming the barriers to ACE technology development by supporting nationwide needs and capacity assessment and by piloting an ACE grant program to encourage private sector involvement and academia-industry collaboration in clean energy development. If successful, the latter program was expected to enable SENER to work more closely with the private sector on ACE technology innovation in the future.

6. The Project aimed at filling a gap in the existing financial instruments to support innovation in clean energy. While the FIT had a strong track record of funding innovation for small and medium private and public enterprises, its support was highly diffuse, it had relatively high co-financing requirements, and it did not provide mandatory TA. The FSE also had extensive experience and resources but could not support private enterprises and did not provide TA. The Project support to the ACE program was to address some of the gaps in the public sector early-stage financing landscape and boost the supply of resources so that more eligible firms could receive support.

7. **Project´s Impact and Sustainability.** SENER considered that up to $90 million from the FSE would be allocated to public and private entities (Mexican universities, research institutions and clean energy enterprises) for clean energies projects identified through the Project-financed Regional Needs Assessments (RNAs) and Clean Energies Regional Investment Plans (CERIPs) to be developed in Mexico's 32 States. SENER planned to engage the States to ratify and start implementing the RNAs/CERIPs. SENER was also disposed to assess the feasibility of opening the FSE eligibility to private firms for ACE projects.

Theory of Change (Results Chain)

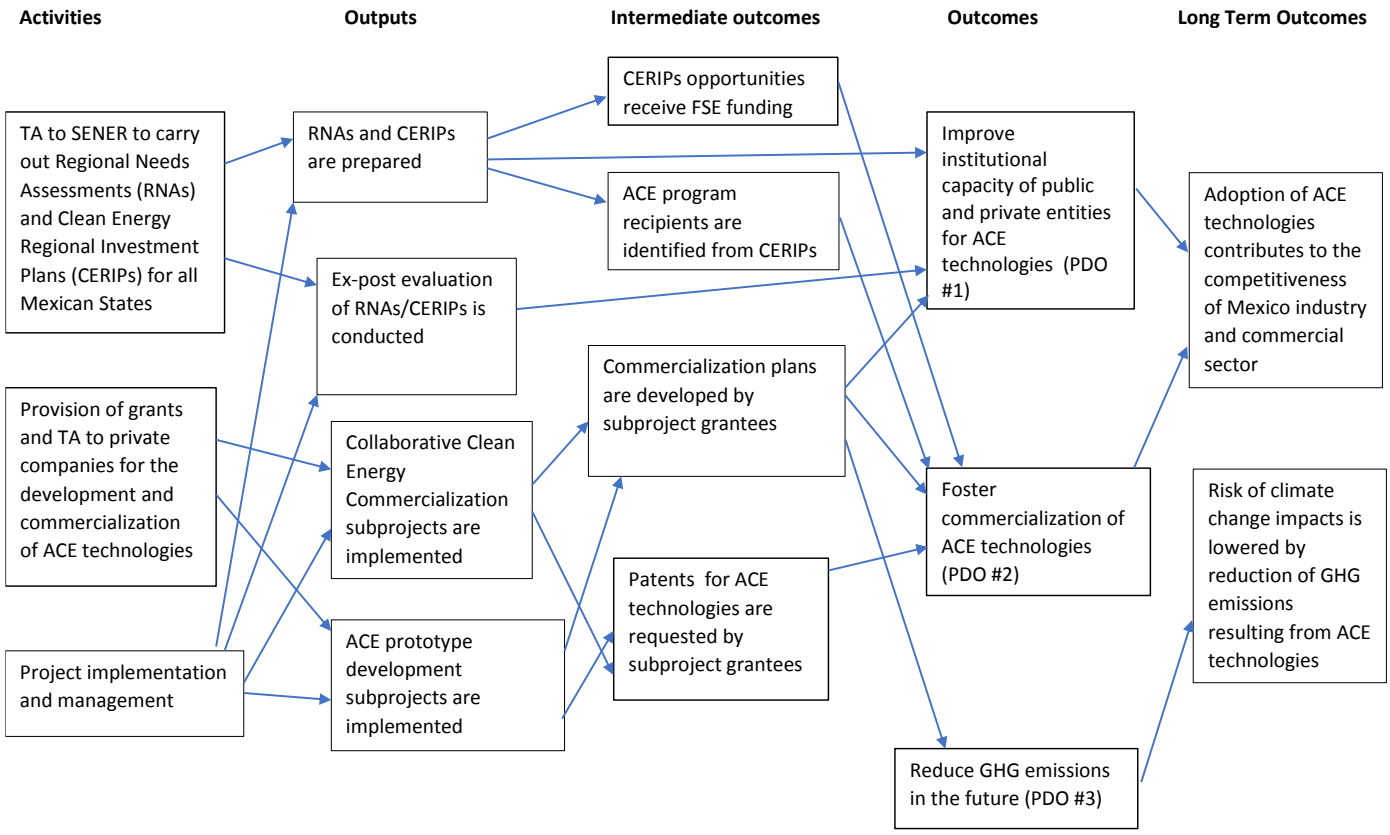
8. The Sustainable Energy Technologies Development for Climate Change Project (PRODETES in Spanish) sought intervention at three levels:

(i) working with the stakeholders in the 32 Mexican States to assess the potential and the opportunities to develop and commercialize ACE technologies;
(ii) supporting the collaboration of private enterprises and academic institutions towards the commercialization of ACE technologies (the Collaborative Clean Energy Commercialization projects – CCECs), as well as the development of prototype ACE technologies by private enterprises); and
(iii) strengthening SENER capacity to promote and manage ACE technologies projects.

9. These interventions were expected to result in the future reduction of GHG emissions from the subprojects supported by the Project, which is a 'Global Environment Objective' of the Global Environment Facility (GEF).

10. It was expected that the Project would lead to two long term outcomes: (i) the adoption of ACE technologies which would contribute to the competitiveness of Mexico industry and commercial sector; and (ii) the reduction of risk of climate change impacts through the reduction of GHG emissions resulting from ACE technologies. These expected long term outcomes were consistent with the Country Partnership Strategy (CPS) for FY14-19, in particular Pillar I: Unleashing Productivity by, among other things, facilitating access to finance and enhancing the competitiveness of the private sector; and Pillar IV: Promoting Green and Inclusive Growth, including scaling up renewable energy.

Figure 1. Theory of change for the Sustainable Energy Technologies Development for Climate Change project[1]



Note: Project's long-term outcomes as defined in the PAD

11. The critical assumptions and external factors that could affect or contribute to the outcomes, which were identified at appraisal, included the following:

(i) sufficient interest in the ACE program and subproject implementation capacity by private actors;
(ii) good coordination between the multiple stakeholders (SENER, NAFIN, beneficiaries, States, etc.);
(iii) adequate collaboration between academia and industry for ACE technologies development;
(iv) ownership of the RNAs/CERIPs by the States and other regional stakeholders;
(v) allocation of FSE funds to projects identified by the RNAs/CERIPs (for an estimated amount of $90 million);

[1] Constructed based on the information in the PAD

(vi) removal of private sector restrictions for FSE support; and
(vii) sustained GoM commitment to support ACE project development by private beneficiaries.

Project Development Objectives (PDOs)

12. The objectives of the Project are to improve the institutional capacity of ACE technology institutions (both public and private) in the territory of the recipient and to foster the commercialization of ACE technologies by providing financial incentives to the private sector, which together are expected to lead to GHG emissions reduction in the future.

Key Expected Outcomes and Outcome Indicators

- **PDO 1**: To improve the institutional capacity of ACE technology institutions (both public and private) in the territory of the recipient: Clean Energy Regional Investment Plans (CERIPS) designed and initiated[2] (number).
- **PDO 2**: To foster the commercialization of ACE technologies: Private capital mobilized[3] (US$ million).
- **PDO 3**: Future emission reductions from ACE technologies supported by the Project[4] (Million metric tons CO_2).

Components

Component 1. Regional Needs Assessments (RNAs) (estimated total costs US$94.58 million, including GEF US$4.58 million and SENER US$90 million; actual total costs US$2.27 million). The objectives of Component 1 were to (a) conduct RNAs to assess the capacity of academic and research institutions, private enterprises, and subnational government entities across Mexico to develop and commercialize ACE technologies; (b) prepare the CERIPs that were to boost institutional capabilities to produce clean energy technologies in order to broaden the currently concentrated energy R&D market in Mexico; and (c) identify promising initiatives that could be considered for financial support by the ACE program under the Project (Component 2) or the FSE.

Component 2. Incentives to the Private Sector for the Commercialization of ACE Technologies (estimated total costs US$13.35 million, including GEF US$ 11.50 million and private sector enterprises US$1.85 million; actual total costs US$11.93 million). The objective of Component 2 was to move promising innovative clean energy technologies in Mexico toward commercialization by providing subgrants and TA through the ACE program under the Project. The ACE program was to pilot a new approach to promote sustainable energy technology development by giving a leading role to private sector actors. If successful, this approach was expected to increase SENER's support for private sector led initiatives, an approach which was consistent with the energy transition underway in Mexico. Component 2 sought to fill a void in the current public and private financing landscape for early-stage technology commercialization and to incentivize industry-academia collaboration in technology development through a pilot grant program.

- ***Component 2.1. ACE Subgrants Program (estimated total costs US$12.35 million, including GEF US$10.50 million and private sector enterprises US$1.85 million; actual total costs US$9.89 million).*** The ACE

[2] With stakeholders to advance the commercialization of ACE technologies in Mexican States.
[3] Available to the private sector to develop and commercialize ACE technologies by the end of the Project.
[4] Based on an agreed-upon methodology and supplemented with real data collected during the Project; see Annex 4.

program was to provide subgrants to private sector enterprises for: (a) proof-of- concept stage development of ACE technologies; and, (b) collaborative clean energy commercialization (CCEC) targeting industry-academia collaboration for ACE technologies. In both cases, the subgrants were to target those ACE technologies with strong commercialization potential and were not to be provided to academic and research institutions which had other sources of support including the FSE. All applicants were to be required to contribute 15 percent of the total subproject cost as matching co-financing. The terms, eligibility criteria, maximum subgrant size, application procedures, procurement rules and processes, monitoring criteria, and other features of both the proof-of-concept and the CCEC subgrants were to be included in the Project Operations Manual (POM).

- ***Component 2.2. Technical Assistance* (*estimated total costs US$1 million, including GEF US$1 million; actual total costs US$0.20 million*).** Winning subproject proposals from Component 2.1 were to receive 'on-boarding' TA as part of their overall grant package and as a condition of their award. The TA was to cover topics such as business plans, intellectual property (IP) protection and monetization, marketing strategies, access to finance, and safeguards. In addition, SENER was to have the authority to allocate small (less than US$10,000) TA awards to proposals which were short-listed but did not receive a matching grant from the ACE program (Component 2.1). Such TA was to be awarded where it was believed that such assistance alone could advance the commercialization of ACE technologies. TA recipients were to be required to co-finance 10 percent of the costs of the TA award.

Component 3: Project Management (estimated total costs US$2.8 million, including GEF US$0.8 million and SENER US$2 million; actual total costs US$3.04 million). The Project was to use and strengthen the existing Project Implementation Unit (PIU) within SENER to coordinate and manage the Project. The additional workload of the Project was expected to require the addition of four new team members: a procurement specialist, a financial management specialist, and two project managers, one for Component 1 and another for Component 2. Additional support for screening grant applications under Component 2 was to be provided by SENER personnel or subcontractors. SENER was to provide an equivalent of US$2 million in cash or in-kind support for project management.

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

13. There were three project restructurings, namely on July 26, 2017, August 30, 2018, and November 20, 2019. The scope and rationale of the three restructurings are described in the following paragraphs.

14. **First restructuring.** Based on the request of the United Mexican States (official name of the country) dated September 20, 2016, the definition of the Project eligible beneficiaries was expanded retroactively to also include Research Centers and Higher Education institutions (public or private), in addition to private sector enterprises (the initial eligibility criteria allowed for the individual participation of researchers affiliated with public or private research institutions but always in collaboration with private enterprises). This "expanded" definition (private sector + Research Centers and Higher Education Institutions) was already in place in the POM and had already been used in the call for proposals for the first round of sub-grants under Component 2 of the Project, which accepted proposals from June 1, 2016, to September 30, 2016. The ultimate purpose of expanding the definition of eligible beneficiaries was to enhance the quality of the proposals through the increase of qualified bidders. It was applied retroactively to one public institution that had already received an award.

15. The first restructuring also removed the *Banco Nacional de Obras y Servicios Públicos* (BANOBRAS) as signatory of the sub grant agreements with the beneficiaries. BANOBRAS was the trustee of the Energy Transition Fund (*Fondo para la Transición Energética y el Aprovechamiento Sustentable de la Energía*, FOTEASE) and as such, it only executed payments as instructed by SENER and its signature was not required for subgrant agreements. Thereafter, the subgrant agreements were entered into between SENER and the beneficiaries of the sub-grants under Component 2.

16. **Second restructuring**. The second restructuring mainly resulted from the project´s Mid-Term Review (MTR), where the Government and the World Bank assessed Project progress, carried out a thorough review of the Project´s results framework, and defined the way forward towards closing. A summary of the changes to the Project´s Results Framework (RF) is presented in Table 1. These modifications reflected the Government's proactivity to adjust the RF to the achievements of the Project at the time of the MTR.

Table 1. Summary of changes to the RF

PDO / GEO Indicators	
Indicator	**Action**
1. CERIPs published.	Change in the definition: the original definition was "CERIPs designed and initiated".
2. Capital Mobilized for Government programs or initiatives aimed at fostering clean energy innovation (public and private).	Change in the definition: the original definition was "Private Capital Mobilized".
3. Future emission reductions from ACE technologies supported by the Project.	No change.
Intermediate Indicators	
Component 1	
Number of high-relevance investment opportunities identified in Component 1 that could be potentially supported by national and/or international sources of financing.	Change in the definition: the original definition was "Number of investment opportunities identified in Component 1 that receive funding through the FSE".
Number of ACE program recipients identified from Component 1.	Dropped.
Component 2	
Number of recipients of TA.	No change.
Number of patents or other industrial/intellectual property schemes for ACE technologies.	Change in the definition: the original definition was "Number of patents for ACE technologies".
Number of CCEC grants awarded.	Dropped.
Number of prototypes completed.	Dropped.
Number of female participants.	No change.
Web based platform developed.	New.
Number of incentives awarded, with at least 40% of them under the CCEC category.	New.
Number of Commercialization Plans developed.	New.
Number of jobs created by the ACE program beneficiaries.	New.
Number of safeguards follow-up plans developed and in place.	New.
Registered grievances satisfactorily resolved in line with the Grievance Redress Mechanism (GRM).	New.

17. The first outcome indicator was initially worded “CERIPs designed and initiated” (32 CERIPs), and it was modified to “CERIPs published”. SENER argued that the implementation of the CERIPs was beyond its control since it depended on the decision of autonomous States. As a result, the Project was restructured to finance only the preparation and publication of the targeted number of CERIPs, while their implementation was dropped from the scope of the Project. Consequently, the intermediate outcome indicator “Number of investment opportunities identified in Component 1 that received funding through the FSE” was changed to “Number of high-relevance investment opportunities identified in Component 1 that could be potentially supported by national and/or international sources of financing” (with the same target of 32).

18. The second outcome indicator was initially worded “Private capital mobilized” (for private enterprises), and it was modified to “Public and private capital mobilized for Government programs or initiatives aimed at fostering clean energy innovation“ (with the same target of $6 million). Since the FSE eligibility conditions were not modified to include private enterprises as envisaged in the PAD (due to the political difficulty of such a modification), SENER argued that the indicator measuring private capital mobilized (for private enterprises) should refer to public and private capital mobilized for Government programs or initiatives aimed at fostering clean energy innovation (i.e., whose objectives were similar to those of the Project), while the original purpose of this indicator was to measure efforts done by SENER towards supplementing GEF financing for private beneficiaries under the Project. In doing so, SENER recognized that it would be harder than anticipated to mobilize capital, in addtion to GEF funds, for ACE technologies implemented by private enterprises.

19. A number of changes in the definitions and targets of the intermediate outcome indicators was also made in the second restructuring. The intermediate outcome indicator “Number of ACE program recipients identified from Component 1” (with the target of 10) was dropped, to reflect SENER’s opinion that a direct selection would have introduced an unfair advantage for such projects compared to the projects selected through the competitive process that was mandated by the Project for Component 2 subprojects.

20. In addition, the intermediate outcome indicators “Number of CCEC grants awarded” and “Number of prototypes completed” were dropped and replaced by “Number of incentives awarded, with at least 40% of them under the CCEC category”. The associated target was reduced from the original 24 beneficiaries (including 12 under CCEC projects and 12 under prototype projects) to 15 beneficiaries. This revised target reflected the result of the three rounds of calls for proposals in 2016, 2017 and 2018 to select beneficiaries under Component 2.1, which were demand-driven and whose outcomes differed from initial estimations. The outcome of the three calls for proposals (or Premios PRODETES, as advertised by the Government) resulted in less ‘Bronze’ category awards than originally expected (the Bronze category awarded up to US$100,000 in the first two calls for proposals and up to US$250,000 in the third one, compared to the Gold and Silver categories which awarded up to US$2,000,000 and US$500,000, respectively); the Bronze category attracted less beneficiaries than expected due to its relatively small amount. The actual vs. expected allocation of sub grants per type of award, type of subproject and type of beneficiary is shown in Table 2 below.

Table 2. Number of subprojects by type of award, subproject and beneficiary for the three calls for proposals under the Project (Premios PRODETES 2016, 2017, and 2018)

	Expected (in POM)			Actual			
	Year 1	**Year 2**	**Total**	**2016**	**2017**	**2018**	**Total**
Gold	1	2	3	1	1	3	5
Silver	2	4	6	2	2	2	6
Bronze	5	10	15	2	1	1	4
Total	8	16	24	5	4	6	15
CCEC	12			9			
Prototype	12			6			
Total	24			15			
Private or Private/Public beneficiary	24 (as per the initial eligibility criteria)			13 (4 private and 9 private/public)			
Public beneficiary	0			2			

21. The following intermediate outcome indicators were introduced to better measure the results achieved under Component 2.1:

(i) web-based platform developed (yes/no).
(ii) number of commercialization plans developed (15).
(iii) number of Jobs created by the ACE program beneficiaries (15).
(iv) number of safeguards follow-up plans developed and in place (15).
(v) registered grievances satisfactorily resolved in line with the Grievance Redress Mechanism (GRM) (100%).

22. **Third restructuring.** The third restructuring extended the Project closing date by 12 months from December 31, 2019 to December 31, 2020. The closing date needed to be extended to provide enough time to complete activities under Component 1 (notably, ex-post analysis of the RNAs and the CERIPs, which suffered procurement delays and in the end were cancelled[5]) and all sub-projects awarded under Component 2 (notably the subprojects that were

[5] The ex post analysis of RNAs and CERIPs was intended as: (a) a benchmarking exercise to assess the relative performance of states and other entities in implementation of the CERIPs; (b) an assessment of the amount of other resources (private, local government, and other federal agencies) leveraged by the proposed Project; and (c) a detailed accounting of the number of initiatives and subprojects identified for support by the ACE program and the FSE that applied for and/or received support.

awarded in 2018 through the third round of calls for proposal and could not be completed by December 2019)[6]. Reallocations of Grant proceeds were also made during the third restructuring between Categories 2, 3 and 4. Category 2 (Consultants' services and capacity building under Component 2.2) was reduced from $1 million to $500,000; Category 3 (Goods, non-consulting services, consultants' services and Project incremental costs under Component 2.1) was increased from $10.5 million to $10.6 million; and Category 4 (Consultants' services and Project incremental costs under Component 3) was increased from $803,844 to $1,203,844. The reallocation of proceeds allowed the PIU to operate during the additional 12 months of implementation using the additional resources that resulted from (i) depreciation of the Mexican Peso versus the US currency, and (ii) savings from competitive procurement processes under Component 1.

23. **Changes in component costs and financing.** The actual total Project costs amounted to $17.24 million compared to the estimated original costs of $110.73 million; this is due mainly to the fact that SENER's planned cofinancing of $90 million under Component 1 did not materialize. The GEF financing of component costs changed from $4.58 million to $2.27 million for Component 1, from $11.50 million to $10.10 million for Component 2, and from $0.8 million to $1.04 million for Component 3. Total GEF financing changed from the estimated $16.88 million to actual $13.41 million.

Implication of the Changes on the Original Theory of Change

24. The PDO was not revised. The targets of the three PDO outcome indicators remained unchanged, but the definition of the Outcome Targets 1 and 2 was changed to reflect the reality of the project compared to over optimistic expectations at appraisal (as explained above). For this reason, the ICR applies a split methodology to assess the Objective Outcome 1 and 2 (See Section II.D). Project components were not revised, but the scope of Component 1 was scaled down, as described above.

25. The non-implementation of the CERIPs and the lack of SENER cofinancing for the CERIPs projects, together with SENER's inability to mobilize capital for private beneficiaries in addition to the GEF grant resources, clearly affected the PDO to foster the commercialization of ACE technologies. The reduction in the number of subgrant beneficiaries did not affect the PDO to reduce the GHG emissions, as the supported projects with good commercialization prospectus not only met but passed the original target (which was not modified after the MTR). It had a minor impact on the PDO to improve the institutional capacity of public and private entities for ACE technologies (regarding regional public entities and potential public and private beneficiaries)[7].

[6] The World Bank approved the extension on November 20, 2019. The lockdown due to the COVID-19 pandemic started in March 2020 in Mexico and, while subsequent delays were observed, the World Bank and the Government agreed that there was no need for an additional extension request.
[7] As explained in paragraph 20, the reduction was the result of less-than-expected Bronze awards.

II. OUTCOME

A. RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating

26. Relevance of the project PDOs is rated **High**. The PDOs are well aligned with the 2020-2025 Country Partnership Framework[8], in particular its third focus area "Enabling sustainable infrastructure and climate action", including its Objective 7 "Support the Government in reaching its climate change goals" (through the reduction of GHG emissions) and Objective 6 "Provide more inclusive and sustainable infrastructure services" (through fostering the commercialization of clean energies technologies).The PDO statement formulated clear and relevant outcomes, which matched SENER's track record in terms of institutional capacity for implementing clean energy projects, and took into account the experience of the Bank in supporting the energy sector in Mexico and in providing GEF support, in particular for clean energies (wind and solar power) and energy efficiency[9].

27. The PDOs are also aligned with Mexico's 2016 National Climate Change Strategy – especially the focus area on climate change mitigation, which includes clean energy transition as one of the mitigation areas, and the strengthening of the regulatory and institutional framework and the use of economic instruments in order to harness clean energy sources and more efficient technologies, as a key action under this mitigation area. The development of clean energy sources is anchored in the Law of Energy Transition that was enacted in December 2015. Through the adaptation and mitigation components of the Nationally Determined Contributions (NDC) 2020 update, Mexico ratified its commitment to tackle climate change. The mitigation component of the NDC 2020 update establishes Mexico's unconditional commitment to reduce GHG emissions by 22% in 2030, i.e. a total 210 million tCO_2e in 2030. The Project represents a contribution, though very modest, to this commitment. The Project outcome of *reducing GHG emissions in the future* was one of the key objectives of the Government to reach its climate change goals at appraisal and remained as a key priority throughout implementation and closing.

28. The PDOs remained aligned over the project lifetime with the World Bank Group's Mexico Country Partnership Strategy (CPS, 2014-2019), the 2018 Systematic Country Diagnostic, the World Bank' Mexico Country Partnership Framework (CPF, 2020-2025) and Mexico's country economic and sector strategies.

[8] Report No. 137429-MX

[9] Including during the last two decades the 2016 Energy Efficiency in Public Facilities project, the 2010 GEF-financed Efficient Lighting and Appliances project, the 2010 Low-Carbon Development Policy Loan (to support policy and regulatory reforms in the energy, transport, housing and agriculture sectors to achieve Mexico's climate change mitigation targets), the 2008 Climate Change Development Policy Loan, the 2008 GEF-financed Integrated Energy Services project, the 2006 Wind Umbrella project, the 2006 GEF-financed Hybrid Solar Thermal Power Plant, the 2006 GEF-financed Large-scale Renewable Energy Development project, and the 2001 GEF-financed Methane Gas Capture and Use at a Landfill demonstration project.

B. ACHIEVEMENT OF PDOs (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

Objective outcome 1: Improve institutional capacity of public and private entities for ACE technologies
Original: Modest
Revised: Substantial

29. **Institutional strengthening was an important Project achievement**. The Project improved the institutional capacity of public and private entities for ACE technologies to a Substantial extent against the revised outcome target and to a modest extent against the original target.

30. **The consultative preparation of RNAs and CERIPs in all the 32 States raised the stakeholder awareness on issues and opportunities for ACE technologies development.** The ten RNAs[10] that were developed through workshops, interviews and surveys, mapped the resources and capacities of academic institutions and clean energy enterprises, identified existing clean energy projects and their development needs, assessed the regulatory framework and the financing instruments, and defined Clean Energy Regional Investment Plans that include strategic pillars, action lines and targets. Although the financing needs of the 847 existing clean energy projects identified by the RNAs/CERIPs in the 32 States were not specifically defined in the CERIPs, all these projects were informed about the third call for proposals for grant awards (Premio PRODETES 2018) under the Component 2 of the Project[11]. The RNAs and CERIPs were published (PDO 1 indicator) and are accessible on SENER interactive web-based Clean Energy Innovation Observatory[12], which constitutes an important database for further development of ACE technologies and will contribute to address the recognized market failure for clean energy innovation services and assets.

31. The RNAs and CERIPs led to the identification of 94 high relevance investment opportunities (included in the above mentioned 847 projects) that could be potentially supported by national and/or international sources of financing (intermediate outcome indicator under Component 1), which is significantly higher than the target of 32 investment opportunities.

32. **The grant beneficiaries' capacity to develop ACE technologies was significantly strengthened**. The grants were essential in supporting the development of commercialization plans and prototypes by the 15 beneficiaries, whereas the 40 firms that were shortlisted in the three calls for proposals under Component 2 participated in the information workshops organized by SENER (the target for the related intermediate outcome indicator "Number of recipients of TA" was exceeded with 55 recipients compared to the target of 15 recipients). Strengthened capacity was demonstrated in the quality of the beneficiaries' final reports and associated presentations to SENER and the World Bank team. Moreover, the CCEC scheme stimulated the efficient collaboration between private enterprises and academic institutions, and it maximized the comparative advantage of the partners; the lack of such collaboration in general is viewed as a key obstacle to technology transfer in Mexico. Another positive impact of the TA provided

[10] The RNAs aggregated several States (up to five) for reasons of procurement efficiency but they included individual CERIPs for each one of the 32 States.
[11] The RNAs/CERIPs did not allow to identify candidates for grant awards under Component 2, as foreseen in the PAD, in part because the RNAs/CERIPs were completed in 2017, after the launch of the first two calls for proposals under that Component.
[12] https://oel.energia.gob.mex

was the strengthening of all the beneficiaries' capacity to develop and implement safeguards action plans and monitoring frameworks according to international standards and in compliance with national legislation.

33. **SENER's institutional capacity was improved.** The preparation and conducting of the subprojects award process and the supervision of subprojects implementation by beneficiaries raised SENER's capacity to assess the benefits and prospects of clean energies projects. SENER also increased its understanding of the merits of private/public collaboration for the development of innovative clean energy projects. The clean energy observatory developed by SENER puts this institution in a good position for actively promoting clean energy development when FSE calls for proposals (or other similar initiatives) resume. The creation of suitable mechanisms to evaluate proposals in the field of clean energy innovation represented a challenge at the beginning of the project, but SENER overcame this initial barrier by creating a pre-selection Technical Committee and an Investment Committee consisting of independent experts in clean energy technologies. For these two committees, SENER successfully struck a balance between the number of committee members and their respective profile, experience, and expertise who provided highly specialized advice in the three calls for proposals. Such approach can easily be replicated in subsequent innovation projects or initiatives.

34. **The Project improved the institutional capacity of public and private entities for ACE technologies to a Modest extent against the original outcome target**. The non-implementation of the RNAs/CERIPS by the States (the original PDO 1 indicator: CERIPs designed and initiated) reduced the impact of the Project on improving the institutional capacity of regional entities for ACE technologies. Although State authorities were consulted for the preparation of the RNAs/CERIPs, the CERIPS were not officially validated by the States nor formally initiated. Although the FSE financed clean energy programs and projects in several States for the total amount of $203 million that were awarded between 2015-2018, none of the 94 programs and projects that were identified in the RNAs and CERIPs received any funding from the FSE (the original intermediate outcome indicator) compared to $90 million estimated at appraisal, as SENER counterpart financing under the Project's Component 1, neither were they financed under Component 2. Most of the RNAs/CERIPs were finalized in 2017 but the projects that they identified were not part of FSE's calls for proposals in 2018 and in subsequent years. As reported by SENER, FSE's calls for proposals for clean energy projects were suspended in 2019 and 2020, as FSE resources were directed towards other projects.

35. **Prospects of CERIPs' actual implementation could have benefitted from completion of ex-post analysis**. The ex-post analysis of the RNAs and CERIPs planned at appraisal was not conducted even though there were two attempts to recruit the consulting firms for this assignment. The first procurement process was cancelled before the award stage[13] and the second process was infructuous[14]. The ex-post analysis would have allowed to assess prospects for supporting projects identified in the RNAs/CERIPs through existing national financing mechanisms for renewable energy and energy efficiency or other external sources, as a continuation of the Project under SENER's ACE program. Nonetheless, the key outputs of the RNAs, i.e., the CERIPs, were successfully completed and constitute a valuable starting point for future clean energy innovation initiatives. Although the benchmarking exercise to assess the relative

[13] In March 2019, the PIU had completed the technical and financial evaluation of proposals received for nine ex-post evaluations (proposals received for the tenth ex-post evaluation were all below the minimum technical rating), but SENER deemed it necessary to revise and align the TOR of the ex-post evaluations with the 2029-2024 National Development Plan and with the 2019-2033 National Electrical System Development Program (PRODESEN) and to cancel the procurement process, and it subsequently decided to relaunch calls for proposals during the fourth quarter of 2019.

[14] The second process of call for proposals for the ex-post evaluations was declared infructuous in July 2020 because the proposals received for three ex-post evaluations were below the minimum technical rating required, while SENER considered that all 10 ex-post evaluations were required, and there was insufficient time to relaunch the process and finalize the ex-post evaluations before project closing.

performance of states and other entities in implementation of the CERIPs could not be carried out, an assessment of the amount of other resources (private, local government, and other federal agencies) utilized for programs/initiatives with objectives similar to those of the Project, as well as a detailed accounting of the number of initiatives and subprojects identified for potential support by the ACE program, the FSE, or other national/international sources of funding, were completed by the Government in preparation for the Borrower's Completion Report on the Project.

Objective outcome 2: Foster commercialization of ACE technologies
Original: Modest
Revised: Modest

36. **The Project fostered commercialization of ACE technologies to a Modest extent both against the original outcome targets and against the revised outcome targets**. The Project fell short of its target of mobilizing public and private resources to supplement the GEF Grant. There was a mobilization of public and private financing for the ACE program or for programs or funds with similar objectives (the original indicator) under implementation by small and medium-sized private enterprises in the amount equivalent to $1.25 million under the *Fondo Sectorial de Innovación Tecnológica* (FIT), although it should be noted that the mobilization of these funds followed its own dynamics and did not result from activities financed under the Project. SENER mobilized public funds from the FSE for Government clean energy innovation initiatives (the revised indicator) over the project implementation period in the amount of $18.9 million, which significantly exceeded the PAD target of $6 million, but the mobilization of FSE funds cannot clearly be attributed to the Project.

37. **There was significant private interest in the ACE grants (Premios PRODETES), which led to provision of TA and successful implementation of 15 projects[15], including a significant share with good commercialization prospects.** Fifteen firms or associations received an award, including nine (i.e. 60%) under a collaborative clean energy commercialization scheme (CCEC) and the other six under a prototype development scheme, surpassing the original target and achieving the formally revised target. Three patents were obtained by beneficiaries and six patents were requested by beneficiaries (awaiting approval as of the writing of this ICR) for a total of 9 beneficiaries, which is significantly higher than the initial target of 3 patents obtained or requested. A total of 304 entities[16] participated in the three rounds of calls for proposals, covering widely the range of existing ACE technologies[17]. All 15 beneficiaries but one successfully implemented their project and developed commercialization plans (see Table 3 below and Annex 7 for more details). The projects of five beneficiaries have good commercialization prospects. The World Bank has encouraged SENER to monitor the next phases of the development of beneficiaries' subprojects and to consider providing further support to the commercialization of the technologies.

[15] This met the revised target of 15 beneficiaries, compared to the original target of 24 beneficiaries.
[16] Including private firms (66%), academic institutions (17%) and individuals (17%).
[17] It is important to note that the Project was seeking to support the customization or adaptation of established clean energy technologies (as opposed to totally new technologies), with a focus on technical areas that are a priority for Mexico (e.g. geothermal, wind, solar and energy efficiency) and where there is both regional demand and a comparative advantage for Mexico.

Table 3. Subprojects' key features (subprojects with good prospects are highlighted in grey)

Beneficiary	Type	Project type **	Project description	Project cost US$M	Patent ****	Commercial prospects *	Expected ERs *** (tCO2e)
Proftech Servicios/Centro de Tecnología Avanzada	Private/ Public	RE CCEC	1 MW power plant with supercritical CO2	2.352	O	A	
Universidad Autónoma de Sinaloa/Global Intrust Investments/IMP	Public/Private	RE CCEC	Biorefining of non-conventional energy crops	0.588		A	
Centro de Investigación y Desarrollo Tecnológico en Electroquímica	Public	RE Prototype	Fabrication of polycarbonate reflectors for solar concentrated power plant	0.588	R	A	
Comprimidos de Biomasa Todo Pellet	Private	RE Prototype	Mobile pellet-making with high efficiency burner	0.118	O	A	
Adrián Lozano Baeza (PMT Grupo Industrial)	Private	RE Prototype	Integrated system for thermal generation from solid residues	0.118		L	
Energías Alternas, Estudios y Proyectos/Universidad de Guanajuato	Private/ Public	RE CCEC	500 kW geothermal power plant for distributed generation	2.352	R	G	72 205
Módulo Solar/UNAM	Private/ Public	RE CCEC	Low and medium temperature solar collectors for thermal generation for industrial processes.	0.588	O	G	433 500
Stelagenomics	Private	RE Prototype	Technological platform to increase productivity and reduce cost of biodiesel production from microalgae	0.588		A	
Centro de Investigación en Materiales Avanzados	Public	RE Prototype	Cogeneration kit for integration to solar water heating systems	0.118	R	L	
PI Ingenera/UNAM	Private/ Public	RE CCEC	Geothermal system for food products dehydration	1.036		G	212 800
Potencia Industrial/UNAM	Private/ Public	EE CCEC	Development of batteries and power trains for electric commercial vehicles	1.705	R	G	1 903 814
Vehículos Urbanos Ultraligeros/UNAM	Private/ Public	EE CCEC	Development of an urban electric bicycle	1.100	R	A	
Laboratorio de Investigación en Control Reconfigurable/UASLP	Private/ Public	RE CCEC	Pilot photovoltaic power plant with smart inverters and cloud-based	0.589	R	A	
Potencia, Electricidad y Sistemas	Private	EE Prototype	Development of a fault detection system for wind turbines and electrical sub-stations	0.273		G	1 551 984
Gadgets & Design/UNAM	Private/ Public	RE CCEC	Mini-heliostats for solar industrial heat	0.244		A	

* G: good A: average L: low ** RE: renewable energy EE: energy efficiency CCEC: Collaborative Clean Energy Commercialization
*** Expected ERs were estimated only for projects with good commercialization prospects. See Annex 4. **** O; obtained R: requested

Objective outcome 3: Reduce GHG emissions in the future (**High**)

38. **The five ACE grant beneficiaries' projects with good commercialization prospects are expected to generate GHG emissions reductions (ERs) that significantly exceed the target.** ERs from the five projects with good commercialization prospects were estimated on the basis of a conservative methodology[18], over twenty years for renewable energy project and eight years for energy efficiency projects, including direct benefits from the projects' expansion investments and indirect benefits from investments by other firms in the same technology (see details in Annex 4). Direct and indirect ERs of technologies developed by the five beneficiaries would each amount to 2.1 million tCO2e, for a total expected ERs of 4.2 million tCO_2e (see Table 3 above with estimates for the highlighted five projects), which is significantly higher than the PAD target of 2.4 million tCO2e, even though these total expected ERs are estimated conservatively. This will contribute to Mexico's NDC as part of its national climate change strategy.

Justification of Overall Efficacy Rating

39. Based on the above evidence, the overall Efficacy rating of the **original PDOs** is rated '**Modest'**, whereas the efficacy of the **revised PDOs** is rated '**Substantial**.' These ratings are justified given the significant institutional strengthening achieved by the Project under the revised objective (while 'Modest for the original objective'), the good commercialization prospects of ACE technologies supported by the Project and implemented by private firms, and the expected GHG emissions reductions that exceed the Project target.

C. EFFICIENCY

Assessment of Efficiency and Rating

40. Efficiency is rated **Substantial**. Part of the Project economic analysis in the PAD consisted of the assessment of the economic benefits resulting from the expected reduction of GHG emissions in the future that would be achieved from the projects supported under Component 2. Direct and indirect ERs of technologies developed by the five subprojects with good commercialization prospects are estimated conservatively to amount to 4.2 million tCO_2e, which is significantly higher than the PAD target of 2.4 million tCO2e. On the basis of the Project's actual GEF disbursed funds amounting to $13.41 million, the Projects' estimated GHG emissions reductions of 4.2 million tCO_2e are achieved at an overall cost of US$3.20 per tCO_2e , which is better than the cost estimated at Project appraisal (US$7 per tCO_2e , with ERs of 2.4 million tCO_2e and GEF investment of $16.88 million - see Annex 4).

41. The Bank's flexibility and approval of the Project extension ramped up disbursements. The Bank allowed SENER to conduct the third round of call for proposals under the ACE subgrant awards (as the total number of beneficiaries from the first two rounds was short of the Project target), although it would have been difficult for the third round beneficiaries to finalize their projects before the original Grant closing date. The extension of the closing date by one year significantly increased disbursements from the GEF Grant: over 45% of total disbursements occurred during the one-year extension (including disbursements after closing during the grace period). Accumulated savings from competitive procurement processes under Component 1 (the RNAs aggregated several States -up to five- for reasons

[18] GEF, Manual for Calculating GHG Benefits of GEF Proposed Projects: Energy Efficiency and Renewable Energy Proposed Projects (2008).

of procurement efficiency but they included individual CERIPs for each one of the 32 States), and additional resources from currency variations permitted the operation of the PIU for twelve additional months.

42. There was adequate capacity and continuity of SENER staff during Project implementation. Despite overall efficient fiduciary and safeguard management, there were some shortcomings in project implementation, notably the failure to recruit the RNAs/CERIPS ex-post evaluations. Some aspects of design, such as the expectation that SENER would reform the FSE to make it eligible to private firms for clean energy development projects and mobilize the States for the implementation of the RNAs/CERIPs, did not yield financing for clean energy projects by private firms in addition to GEF resources, nor for public and private projects identified in the RNAs/CERIPS. There were limited delays in Project implementation, which were due in part to the change of Government administration and also to the complexity of the selection and implementation of the subprojects under Component 2. Implementation delays were addressed through a reasonable extension of Project closing date, with an overall implementation period of less than six years. The COVID19 outbreak resulted in further delays by projects from the third call for proposals under Component 2 (Premios PRODETES 2018), but the 12-month extension that was granted through the third project restructuring allowed for completion of all 2018 subprojects.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

43. Taking into account the split evaluation of the PDO 1 and 2 as described above, the outcome rating of the original project is 'Moderately Unsatisfactory,' the outcome rating of the revised project is 'Moderately Satisfactory,' and the weighted overall outcome rating is **Moderately Satisfactory** (see Table 4 below). The weighting method is based on the disbursement level at the approval of the second restructuring, which amounted to $3.5 million, i.e. 26% of the final amount disbursed ($13.4 million). The weighing of the outcome ratings against the original and revised project outcome indicators is summarized in Table 4 below.

Table 4. Split evaluation of the outcomes

	Original	Revised
Relevance	H	
Overall efficacy	M	S
PDO 1	M	S
PDO 2	M	M
PDO 3	H	
Efficiency	S	
Overall outcome rating	MU (3)	MS (4)
Weighing	0.78 = 3*3.5/13.4	2.95 = 4*9.9/13.4
Combined overall outcome rating	3.73 = MS	

E. OTHER OUTCOMES AND IMPACTS (IF ANY)

Gender

44. Women's participation was effective to achieve results under the Project's Component 2. All 15 project beneficiaries have at least one woman in a managerial position in the technical, financial or administrative fields.

Job creation

45. The grant beneficiaries created employment for the implementation of their subprojects. In total, 101 jobs were created as reported by the beneficiaries and recorded by SENER in the M&E system. This is much higher than the 15 jobs that were expected to be created, as established in the revised outcome indicators at Project restructuring.

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

A. KEY FACTORS DURING PREPARATION

46. **Consistent government support and experiences under other projects worldwide strengthened the Project's rationale and design.** The Project was aligned with the Secretary of Energy's (SENER) strategy for sector development, particularly with SENER program to promote the use of ACE technologies, as well as with the GoM National Climate Change Strategy, through its objectives to foster the commercialization of clean energies technologies. The Project design built on SENER's experience with clean energies and benefitted from experiences elsewhere, in particular the EBRD-financed Finance and Technology Transfer Centre for Climate Change (FINTECC), which helps companies implement innovative climate technologies.

47. **Some factors linked to the Project Quality at Entry (QAE) caused the reduction of the scope of the outcomes.** SENER was not able to obtain commitment of the regional governments to endorse the RNAs/CERIPs, preventing the implementation of the CERIPs as originally envisaged in Project documents. SENER had limitations in obtaining commitment of the regional governments to endorse and implement the RNAs/CERIPs because the implementation depended on the decision of autonomous States. Reforming the FSE to make it eligible to private firms for clean energy development projects faced political difficulties. It was envisaged at Project appraisal that FSE eligibility rules would be expanded to private actors (subject to significant private cofinancing), but the FSE was not reformed accordingly. The RNAs/CERIPs were not completed before the launch of the first two call for proposals under Component 2 (competitive allocation of subgrants for ACE projects), which prevented the projects identified in the CERIPs to participate in these calls for proposals.

B. KEY FACTORS DURING IMPLEMENTATION

Factors subject to government and/or implementing entities' control:

48. **The high level of inter-institutional coordination and SENER's commitment contributed to the achievement of positive clean energy outcomes.** The Project brought multiple parties to the table, including national institutions (SENER, CONACyT, NAFIN), subnational public and private parties in the 32 States, and the 15 beneficiaries of Component 2 subgrants. These organizations brought specialized technical staff to carry out discussions and technical

workshops for designing the RNAs/CERIPs and implementing the ACE subgrants. SENER's coordination and orientation role was instrumental to the Project success. The significant experience of these entities in financial management of similar projects resulted in a very efficient and smooth implementation.

49. **Dedicated Project staff with little turnover was an asset to the SENER's PIU and NAFIN throughout the Project's lifetime**. Staff dedicated to the PIU were critical to the success of the Project over its six-year cycle and institutional memory was retained due to the fact that there was hardly any turnover. The staff selected for the Project at SENER were of high caliber with technical expertise in clean energy technologies and in fiduciary and safeguards aspects. NAFIN's staff efficiently managed the flow of financial resources and the review of procurement and financial management in compliance with World Bank guidelines and procedures.

50. **Competitive selection of subproject proposals and beneficiary cofinancing for selected proposals enhanced quality and ownership of the subprojects.** SENER widely advertised three rounds of calls for proposals, which resulted in a high participation rate[19], and created a dedicated website, with extensive information on the process including selection criteria[20]. The evaluation of proposals was carried out by a pre-selected technical committee and an Investment Committee consisting of independent experts in clean energy technologies. Beneficiaries financed at least 15% of total project costs. All (with the exception of one) beneficiaries completed their projects successfully, five of which were deemed to have good commercialization prospects, as assessed by SENER and the World Bank.

51. **The implementing capacity of the subgrants beneficiaries was crucial in achieving timely completion of their projects**. Despite the high number of procurement processes and associated approvals, all but one[21] beneficiaries completed their projects per their implementation schedule and ahead of the Project closing. SENER played an important role at the projects' onset by providing information and training workshops for the beneficiaries on procurement, financial management and environmental management framework.

52. **Project implementation was delayed as a result of the change of Government administration in December 2018.** During the first trimester of 2019, the adjustments made in SENER management and operations slowed down Project implementation. There was also a misunderstanding on the applicability of a Directive (*Circular Uno*) that prohibited the allocation of public resources to social, trade union, civil or citizen movement organizations. SENER authorities deemed it necessary to confirm officially that the allocation of funds under the Project was in compliance with the Directive. In the meantime, Project implementation was suspended during almost six months, which justified in part the extension of the Grant closing date.

53. **The change of Government administration affected the overall ACE program**. Since 2019, there has not been any call for proposals of innovative clean energy projects for financing under the FSE. Prospects for reforming the FSE to open it to private beneficiaries seem remote. However, the commitment of the new administration to clean energy development is very clear in the 2020 update of Mexico NDC.

[19] The three rounds attracted respectively 102, 124 and 78 proposals, with a success ratio of 1:20.
[20] Main selection criteria included: eligibility, innovation potential, technical viability, economic viability, market potential, management capacity, and cofinancing level.
[21] The beneficiary Proftech Servicios is expected to complete its project in June 2021, due to technical difficulties in the testing phase.

Factors subject to World Bank control:

54. **The Bank's flexibility and approval of the Project extension ramped up disbursements.** As discussed in Section II.C above, over 45% of total disbursements occurred during the one-year extension (including disbursements after closing during the grace period).

Factors outside the control of the Government and/or implementing entities:

55. **Exchange rate fluctuations and procurement outcomes reduced Project costs without significant impact on the revised Project outcomes.** The Project was able to meet or exceed most of its intended revised outcomes despite spending less than the full GEF Grant amount[22], in part as a result of the depreciation of the Mexican peso against the USD, because beneficiary grants were in USD at a fixed exchange rate at the date of contract signature. The Mexican Peso depreciation reduced GEF disbursements under Component 2. In addition, the competitive procurement of services for the preparation of RNAs and CERIPS led to much lower costs than the PAD estimate, and the RNAs/CERIPs ex-post evaluations could not be recruited due to lack of acceptable proposals.

56. **The impact of the COVID19 pandemic was low, as it slowed down Project implementation and impacted Project supervision in 2020 and ICR preparation in 2021 but did not affect Project results.** The pandemic had severe health impacts and caused serious limitations of economic and social activities in Mexico starting in March 2020, in application of the Sanitary Alert System established by the authorities. As a result, several beneficiaries had to slow down or temporarily suspend their Project implementation activities, although all 15 beneficiaries (except for one) managed to finalize their activities[23] by the Project closing on December 31, 2020. The pandemic also affected Project supervision and the ICR preparation. Starting in April 2020, supervision was conducted virtually and more frequently than regular in person supervision missions[24]. The joint review by SENER and the World Bank of the results achieved by the beneficiaries' subprojects in the field could not be conducted as planned in those States where there were travel restrictions, although at the time of SENER final report (April 2021), SENER had been able to conduct field visits to thirteen subprojects. The ICR mission had to be conducted virtually due to travel restrictions, which limited the depth of exchanges with the implementing entities and the Project beneficiaries.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

57. **The design of the monitoring and evaluation (M&E) system was overall appropriate, with some shortcomings.** Results indicators were clearly defined and objectively measurable, including outcome indicators and underlying intermediate outcome indicators. However, the GHG emission reduction indicator was based on a proxy methodology that entailed considerable uncertainty, since the projects that would be financed from the subgrants

[22] Although it should also be noted that the number of subgrants beneficiaries was revised to 15, down from the initial 24, due to lower-than-expected demand/qualifications for Bronze awards.
[23] With the exception of Proftech Servicios that faced technical difficulties in the final test phase, which however are expected to be resolved by June 2021.
[24] Sixteen VCs were held between April 2020 and February 2021, compared to only one supervision mission in 2016, 2018 and 2019, and 2 supervision missions in 2017 (the year when the project was restructured).

program were not identified yet, and with a target for **FUTURE** ERs from ACE technologies supported by the Project after, i.e., ERs to be accounted for after Project closing. The CERIPs indicator was assuming that SENER would obtain the commitment of the States towards CERIPs' actual implementation, which could have been anticipated as being beyond SENER's control. The targets of the other indicators were reasonable and reachable. An appropriate M&E system was set up within SENER.

M&E Implementation

58. **The implementation of the M&E system by SENER was satisfactory**. SENER established a well-designed and functioning dedicated web site for the Project, as well as a procurement management system and a financial management system, and a clean energy database (https://oel.energia.gob.mx/) that is (and is expected to remain) operational after Project closing. The clean energy observatory database provides useful information for the design and implementation of clean energy technologies by subnational public and private actors, including existing projects, actors and regulations related to clean energy development in each State. In coordination with the World Bank, SENER and NAFIN established a color-based monitoring system to assess the progress and performance of the subprojects regarding procurement, disbursement, technical and safeguards aspects. M&E were performed continuously by SENER under the guidance of the PIU Coordinator, and the findings were reported in the semiannual progress reports prepared by SENER and validated by NAFIN, including implementation progress, commitments/disbursements, issues and progress towards results indicators. These reports contained outputs of the procurement management and financial management systems. The intermediate outcome indicators were complemented through Project restructuring to better measure achievements against development outcome indicators. A modification made in one intermediate outcome indicator reduced the objectivity of the measurement of this indicator[25].

M&E Utilization

59. The M&E system was properly utilized. Data generated through the system was utilized as an input to ISRs, aide memoires, bi-annual Project progress reports, bi-annual interim unaudited financial reports, Project financial statements, the ICR and the Borrower Completion Report. The Project website was extensively used by the subgrant candidates and beneficiaries and other Project stakeholders. In early 2021, the clean energy observatory faced some IT-related issues that limited its interactive features (although basic consultation features remain operational), which SENER intends to resolve swiftly.

Justification of Overall Rating of Quality of M&E

60. Overall quality of M&E is rated as **Substantial** based on the above analysis of M&E design, implementation and utilization.

[25] "Investment opportunities that could be potentially supported by sources of financing" is at risk of subjectivity, compared to the initial definition "Investment opportunities that received funding from FSE".

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

61. The Project complied with triggered safeguards policies (OP/BP 4.01), as well as with all applicable procurement and financial management policies.

Environmental and social compliance

62. **The Project has put in place adequate due diligence to safeguard against social and environmental risks.** The Project triggered Environmental Assessment (OP/BP 4.01). Since the nature and location of the ACE subprojects were not known, the Project developed an Environmental and Social Management Framework (ESMF) to conduct screening of potential subprojects for their environmental impacts and categorize them according to the World Bank's Environmental Risk categories. No Category A subprojects were supported by the Project. Subgrants did not have any impacts on forests, natural habitats, and physical cultural resources, nor did they require any use of pesticides. All subprojects provided evidence throughout implementation of compliance with all necessary environmental permits and certifications. All subprojects developed work plans in application of the ESMF for the implementation of their projects, including aspects such as water use, waste management, air emissions, and occupational health and security. Starting in April 2020, all subprojects also prepared a COVID19 contingency plan. As part of the closing of the subprojects, all beneficiaries prepared environmental and social follow-up action plans, which were reviewed by the Bank team.[26]

63. **Appropriate guidance was provided to SENER on safeguards policies application.** The Bank provided training on the proper application of safeguards practices for the Project, to key personnel within SENER and the Investment Committee on the following : (i) to screen potential subprojects for environmental and social risks and impacts; (ii) to ensure that subgrant recipients carry out environmental and social assessment for their respective subprojects; and (iii) to verify that subprojects comply with local laws and Bank safeguards policies.

64. **The capacity of the beneficiaries to manage the environmental and labor risks of their subprojects has improved substantially.** The Project has been relevant for building capacity of the beneficiaries related to environmental management and occupational safety. The beneficiaries have learned about the environmental legislation applicable to their projects, have received advice, and have developed work plans to comply with the requirements established in said regulations in an organized, systematic manner. In some cases, the knowledge and fulfillment of the environmental obligations of the subprojects has added value to the operations of the beneficiaries, who have been able to improve their designs, processes, and facilities. The addition of a dedicated environmental safeguards specialist to the PIU took longer than expected, with the specialist only hired towards the end of Project implementation. However, guidance and advice from this expert was key to preparing the final beneficiaries' reports.

Fiduciary Compliance

65. **Procurement**. Despite the considerable amount of procurement tasks that SENER had to manage or oversee, and that the beneficiaries had to conduct, the Project procurement performance was consistently rated 'Satisfactory,' except during the brief suspension of Project activities in 2019 due to budget restrictions for the entire Public Federal Administration. Post procurement reviews conducted by the Bank yielded satisfactory results. The only procurement

[26] At Project closing, the Bank had approved the follow up plans of seven beneficiaries, and the approval of the other eight beneficiaries' work plans was pending. As of May 1, 2021, the Bank had approved an additional six work plans. Please notice that at project closing, one of the subprojects had already been completed and its follow up plan had already been approved. Thus, the approval of only one follow up plan was pending by May 1, 2021.

shortcoming was the failure to recruit consulting firms for the ex-post evaluation of the RNAs/CERIPs as it was impossible to complete these services before Project closing (see details in paragraph 35). Procurement activities were properly documented and publicly disclosed. SENER procurement staff was highly qualified and had developed a system to supervise procurement planning and execution under subprojects, identifying bottlenecks and priorities. Procurement methods were selected adequately and took into account the market capacity and technological challenges. The Bank's procurement team participated in the continuous supervision missions, conducted annual procurement training for those managing the World Bank portfolio (SENER as well as other implementing agencies in other sectors) as well as hands on training to SENER procurement team. NAFIN dedicated three procurement staff to review procurement processes to ascertain their compliance to the procedures and guidelines defined in the Project Operations Manual.

66. **Financial management.** Financial management capacity and practices of SENER were adequate, with a Project-financed specialist and efficient oversight by NAFIN. The management of funds through FOTEASE functioned properly and allowed for timely allocation of funds for Project activities, which contributed to achieving the Project's results. Throughout the Project life cycle, there were no significant financial management-related bottlenecks, and financial management was consistently rated 'Satisfactory,' except during the brief suspension of Project activities in 2019 due to budget restrictions for the entire Public Federal Administration. Reconciliation of accounts were made on time, and unaudited interim financial reports were submitted by the agreed timeline with quality acceptable to the World Bank. The Project used an accounting software to record financial transactions and produce financial information to prepare unaudited interim financial reports acceptable to the World Bank. External audits on annual financial statements were submitted to the World Bank within six months of the end of each fiscal year. In Audit reports, the financial statements were certified without qualifications, and all the internal control recommendations made by the auditors[27] were satisfactorily addressed and implemented by SENER to the Bank's satisfaction. Disbursements accelerated significantly during the Project extension year. The undisbursed balance of GEF Grant funds resulted from the depreciation of the Mexican Peso, but despite this underuse of funds, the Project's revised results were all achieved or exceeded.

C. BANK PERFORMANCE

Quality at Entry

67. Key elements for assessing the Quality at Entry are as follows:

68. **Relevant PDO.** The PDO of the Project was highly relevant to the development agenda of the country and priorities of the World Bank and remained so throughout the Project life cycle. The PDO formulation, components, short and long-term outcomes, and targeting were well designed and explained in the PAD.

69. **Appropriate Project design**. The Project was designed based on best practices in terms of technology innovation and clean energy development. It built on EBRD's experience with the FINTECC program, as well as on the strategy, achievements, and opportunities of SENER's ACE program. The design of the Project was based on the recognized capacity and performance of SENER, notably in the implementation of its ongoing ACE program, while providing targeted support for the implementation of this Project. While complex, financial management implementation arrangements were similar to those used in a number of other projects financed by the World Bank for which

[27] The auditor was SENER's Internal Control Entity, as agreed between the WB and the GoM

the implementing agency is SENER, with FOTEASE as the financing mechanism and NAFIN as the financial agent. Five additional specialists[28] were hired and financed under the Grant.

70. **Risk assessment was overall adequate.** The World Bank team correctly singled out stakeholder coordination, implementation capacity of beneficiaries, complexity of flow of funds, and public relative reluctance to private sector participation in the energy sector, as the major risks for the Project success, and it designed appropriate risk mitigation measures. The risk of inflexion in the Government policy regarding clean energy development (as a result of a possible change in Government administration) was not identified.

71. Three shortcomings in project design limited the impact of the Project in achieving the PDO: (i) SENER's limitations in obtaining commitment of the regional governments to actually endorse and implement the RNAs/CERIPs; (ii) the political difficulty of reforming the FSE to make it eligible to private firms for clean energy development projects, and (iii) inappropriate sequencing between the RNAs/CERIPs under Component 1 and the calls for proposal under Component 2.

Quality of Supervision

72. Key elements for assessing the Quality of Supervision are as follows:

73. **Proactive supervision.** A comprehensive World Bank team continuously supported the Project to find solutions to implementation issues. There were annual missions despite the relatively limited supervision budget allocated by GEF, and the Implementation Status Reports (ISRs) were updated twice a year. The continuity of the World Bank team leader almost from Project implementation start is also noteworthy, as well as his location in Mexico, which allowed closer and continuous support to SENER and Project stakeholders. During the COVID19 pandemic, the World Bank team carried out two formal virtual missions and numerous weekly/biweekly coordination videoconferences.

74. **Detailed and candid Aide Memoires and ISRs.** Reflecting effective monitoring during supervision, Aide Memoires and ISRs detailed out key implementation challenges every six months and the World Bank team consistently followed up on the issues raised. Changes in ratings were used effectively to flag important issues that required management attention and urgent actions.

75. **Effective Mid-Term Review (MTR).** The Project's MTR was carried out in March 2018, with a thorough review of the Project progress, and several key constraints and corrective measures were identified to accelerate Project implementation and Grant disbursements. The MTR also led to Project restructuring (second restructuring) and improvements in the Results Matrix with supplemental indicators.

76. **Effective Project restructurings**. The Bank responded to circumstances that proved to be different from the assumptions at appraisal and based on better information on the realities on the ground and restructured the Project three times to better reflect the reality of the Project throughout implementation: (i) the first restructuring contributed to ensure better quality in the calls for proposals as the eligibility criteria under Component 2.1 was widened to include Research Centers and Higher Education institutions (public or private); (ii) the second restructuring introduced improvements in the Results Matrix; and (iii) the third restructuring extended the closing

[28] Including: General Coordinator, Project Leader Component 1, Project Leader Component 2, Procurement Specialist, Administrative and Financial specialist.

date to allow for the completion of subprojects from the 2018 calls for proposals (the third and last edition of Premio PRODETES).

77. **Continuous follow-up and training on fiduciary and safeguard risks and processes.** The World Bank team provided effective fiduciary and safeguards supervision and advice. Training workshops were organized with SENER on procurement, financial management and safeguards aspects to increase stakeholder awareness and compliance with World Bank guidelines. Such capacity strengthening allowed to accelerate procurement processes, maintain financial transparency, and correct some deficiencies in the beneficiaries' safeguard management practices. When the review of the environmental and social action plans of some subgrant beneficiaries revealed some deficiencies, SENER recruited additional support on safeguards and the World Bank specialist provided guidance and advice to allow these beneficiaries to revise their safeguards action plans satisfactorily.

78. **There were minor shortcomings in supervision.** The expanded definition of eligible beneficiaries after the first Project restructuring resulted in two out of the fifteen beneficiaries being public entities, which, in theory, could have been supported by other financing sources, such as the FSE (it should be noted that the calls for proposals for FSE were suspended in 2018). Although this provision was contrary to the original intention of supporting private sector enterprises, it responded to market reality as the calls for proposals under Component 2 of the Project were demand driven. Also, the changes in the scope or formulation of some Project indicators requested by the Government, and approved by the World Bank, had an impact on the original expected Project outcomes: (i) the indicator on financing mobilized for clean energy projects to be implemented by private entities or private-public associations was widened to projects implemented also by public entities, which departed from the initial objective of reconstituting funds for clean energy projects implemented by private entities after the full use of the GEF Grant; and (ii) the indicator on CERIPs completion and initiation of implementation was reduced to only the publication of CERIPs - a modest objective – since CERIPs implementation was out of the scope of SENER's mandate and the FSE had not been reformed to accept private sector proposals. As mentioned in Paragraph 76 above, these changes were applied to better reflect the reality of the Project, including external factors that were not under SENER's direct control. The restructured Project was implemented satisfactorily.

Justification of Overall Rating of Bank Performance

79. Bank performance is rated **Moderately Satisfactory** due to the observed shortcomings in QAE and some minor shortcomings in Quality of Supervision, which are offset by the Bank's flexibility to respond to the country's evolving circumstances.

D. RISK TO DEVELOPMENT OUTCOME

80. The risk to development outcome is assessed as '**Substantial**,' for the reasons explained below.

81. **A significant part of sub-grant beneficiaries' projects was found to have good commercialization prospects, but their actual success remains uncertain (as expected, since success rate for innovation projects is around 1:10).** These beneficiaries might face difficulties in mobilizing financing for the investments required to develop their business plan or in securing their target market or in striking business alliances, which are all key conditions for the development and sustainability of these projects. As a result, the GHG emissions reductions outcome would be significantly reduced, compared to expectations.

82. **The significant annual financing mobilized by SENER through the FSE for ACE technologies was allocated exclusively to public actors.** It was envisaged at Project appraisal that FSE eligibility rules would be extended to private actors (subject to their significant cofinancing), but the FSE was not reformed. Private actors are only eligible for financing from the FIT for small and medium-sized enterprises, which has traditionally been limited for ACE technologies ($1.2 million over the period 2015-2020). As a result, the continuation of public support to the development of ACE technologies by private companies is uncertain and will hinge essentially on the feasibility of reforming the FSE, or on the mobilization of alternative sources of financing.

83. **The changes in the conducive environment towards the end of project implementation affected the sustainability of the Project.** Allocation of FSE funds for clean energy projects is currently halted, and the opening of the FSE eligibility to private enterprises or the mobilization of other resources for clean energy development by private enterprises is currently not on SENER's agenda. Yet, despite the challenging political environment for innovation and clean energy development by private enterprises, the increased institutional capacity for ACE technologies development that was achieved by the Project in terms of knowledge and know-how, will allow SENER to quickly react to changing conditions and resume the efforts supported by the Project.

84. **The actual use of the clean energy observatory is limited, but with basic consultation features still operational and with access to all information produced by the RNAs, including the CERIPs.** The observatory is facing technical difficulties regarding its interactive part, which SENER is planning to address by the third quarter of 2021. Actual use of the observatory by the general public, when the site will be fully functional, will hinge in part on the appropriate promotion of the site and the usefulness of the information it contains, which in turn will depend on the continuous update and complement by SENER of this information.

V. LESSONS AND RECOMMENDATIONS

85. **Development of ACE technologies is a risky business requiring significant commitment and investment by public and private parties.** Difficulties faced by the Proftech subproject[29], including technical issues at the testing stage, are an evidence of the risks associated to development of ACE technologies. Several subprojects have good commercialization prospects, but additional public/private financing would be decisive for them to reach the commercial stage.

86. **Relatively small financial support can make a difference when designed and targeted appropriately.** Despite the limited scope of the Project, the competitively awarded ACE subgrants were instrumental in bringing the projects of a significant number of beneficiaries close to the commercialization phase, and contributed to removing some of the barriers associated with innovation (such as lack of awareness, risk allocation and mitigation, and positive impact of public-private collaboration, among others), through its demonstration effects. SENER web-based clean energy observatory established a promising platform to share experiences and opportunities and to promote clean energy development in Mexico, by facilitating information exchange between potential investment opportunities and financiers.

[29] This subproject in particular successfully managed to design and manufacture the pieces of equipment financed by the subgrant, but has had a number of technical issues, mostly due to higher-than-expected temperatures of the working fluid, when assembling the entire system.

87. **Apparently complex mechanisms for the flow of project funds can work efficiently.** The flow of funds for the Project entailed several entities including SHCP, SENER, NAFIN, BANOBRAS and the FOTEASE, resulting in coordination risks. However, this was in application of Mexican law, and the significant experience of these entities in financial management of similar projects minimized the risks and allowed a very efficient and smooth process for the Project. Trying to simplify the mechanism might have been counterproductive, in addition to its political difficulty.

88. **Specific international lessons on the design of innovation grant funds have been confirmed by the Project experience**. These include the need for an IC consisting of qualified individuals with a proven track record of identifying businesses with commercial potential; the need to ensure independent decision making in the allocation of grant awards; the need to provide TA in parallel with the innovation grant to ensure that recipients are able to absorb and deploy the funds effectively; and the need for recipient co-financing to ensure that they assume some of the risk.

89. **Private beneficiaries require extra guidance on World Bank fiduciary and safeguard policies.** Private beneficiaries were not at all familiar with Bank procurement and financial management guidelines, neither with Bank safeguards guidelines. The Project, through SENER and World Bank fiduciary and safeguards specialists, provided significant guidance to beneficiaries (candidates and awardees) during the subprojects' selection and implementation phases. This support improved the timeliness and transparency of the procurement and financial management activities, which allowed to finalize the fourteen out of fifteen subprojects before Project closing. It also strengthened the beneficiaries' capacity and performance for the appropriate design and implementation of environmental and social management action plans, which improved the subprojects quality and compliance with national directives. The environmental and social action plans include a number of lessons learned themselves that can be used for supporting the design of future innovation projects in Mexico and elsewhere.

90. **Encouraging collaboration between private and public actors can potentiate project results.** There was a strong collaboration between private firms and solid academic/research institutions for the design and implementation of the majority of subprojects (nine in total), which became clear during the presentations made by the beneficiaries to SENER and World Bank teams. This collaboration maximized the comparative advantage of each party and was a key factor in the success of the beneficiaries' subprojects, in particular by strengthening the enabling environment for clean energy entrepreneurship within academics/research institutions.

91. **A realistic assessment at entry is important to fully achieve expected project outcomes, including ascertaining interest and commitment of subnational authorities that would benefit from the Project.** The Project undermined SENER's limitations in obtaining commitment of the regional governments to actually endorse and implement the RNAs/CERIPs and did not fully consider the political difficulty of reforming the FSE to make it eligible to private firms for clean energy development projects. Project-financed TA might have been useful to assess the conditions and impacts of widening the FSE eligibility to private firms, and piloting CERIP's implementation in a small number of targeted States could have provided lessons for rolling out the program to other States. The risk of change in the clean energy conducive environment should have been assessed, with corresponding mitigating measures, including anchoring project outcomes to national targets/commitments, such as NDCs, in addition to sectorial policies.

ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: To improve the institutional capacity of ACE institutions in Mexico

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
CERIPs published.	Number	0.00 06-Mar-2015	32.00 06-Mar-2015		32.00 31-Dec-2020

Comments (achievements against targets):

Achieved: CERIPs were prepared for all 32 States, as well as ten Regional Needs Assessments (RNAs). All RNAs and CERIPs are posted on SENER web site for the project (see corresponding intermediate indicator below).

The original definition of this indicator was “CERIPs published and initiated”, which was amended to the above wording at project restructuring. The CERIPS were not officially validated by the States nor formally initiated. Although the FSE financed clean energy programs and projects in several States for the total amount of $203 million, none of the programs and projects that were identified in the RNAs and CERIPs received any funding from the FES, which was the definition established in the PAD and Project Operational Manual for SENER counterpart financing under Component 1, neither were funded under Component 2.

Objective/Outcome: To foster the commercialization of ACE technologies by providing financial incentives

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Capital Mobilized for Government programs or initiatives aimed at fostering clean energy innovation (public and private)	Amount(USD)	0.00 06-Mar-2015	6000000.00 06-Mar-2015		18,930,000.00 31-Dec-2020

Comments (achievements against targets):

Exceeded: Public funds mobilized for Government clean energy innovation initiatives over the project implementation period totaled $18.93 million, which exceeded the PAD target of $6 million.

The above amount of $18.93 million consisted of public funds for projects implemented by public entities. Yet, the original definition of this indicator "Private capital mobilized" was referring to public and private financing mobilized for the ACE program or for programs or funds with similar objectives, under implementation by private sector participants (as defined in the explanation of indicators included in Annex 1 of the PAD). As per information provided by SENER, funds were mobilized in the amount equivalent to $1.25 million under the *Fondo Sectorial de Innovación Tecnológica* (FIT) for ACE programs or programs similar to ACE that were implemented by small and medium-sized private enterprises. This fell significantly short of the initial target of $6 million. In addition, neither the FSE projects summing up $18.93 million nor the FIT projects summing up $1.25 million can be directly attributed to the Project, since they did not result from dedicated activities by the Project.

Objective/Outcome: GHG emissions reductions in the future

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Future emission reductions	Metric ton	0.00	2400000.00		4,177,303.00

from ACE technologies supported by the Project		06-Mar-2015	06-Mar-2015		31-Dec-2020

Comments (achievements against targets):
Exceeded: The estimated emission reductions from the 5 ACE projects financed by the GEF grant with good commercialization prospects amounted to 4 177 303 tCO2e, including direct and indirect ERs, compared to the target of 2 400 000 tCO2. See Annex 4 for details.

A.2 Intermediate Results Indicators

Component: Component 1. Regional Needs Assessments (RNAs)

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of high-relevance investment opportunities identified in Component 1 that could be potentially supported by national and/or international sources of financing	Number	0.00 06-Mar-2015	32.00 06-Mar-2015		94.00 31-Dec-2020

Comments (achievements against targets):
Exceeded: The RNAs/CERIPs identified 94 investment opportunities that could be potentially supported by national and/or international sources of financing, which is significantly higher than the target of 32 investment opportunities (of the 847 existing clean energy projects identified in the RNAs/CERIPs).

The original definition of this indicator was “Number of high-relevance investment opportunities identified in Component 1 that received funding through the FSE”. Although the FSE did finance clean energy programs and projects in several States for the total amount of $203 million that were awarded between 2015-2018, none of the investment opportunities identified by the RNAs/CERIPs in Component 1 received any funding from the FSE while the FSE was estimated to provide $90 million of SENER counterpart financing for projects that were identified in the RNAs and CERIPs, neither were these projects financed under Component 2.

Component: Component 2. Incentives for the Commercialization of ACE Technologies

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of recipients of TA	Number	0.00 06-Mar-2015	24.00 06-Mar-2015		55.00 31-Dec-2020

Comments (achievements against targets):

Exceeded: There were 55 recipients of Technical Assistance under Component 2.2 (including the 15 sub grant beneficiaries and 40 additional firms that were shortlisted and participated in the information workshops during the three calls for proposals under Component 2.2 – as described in the definition of this indicator in the PAD), which exceeded the target of 24 recipients.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of patents or other	Number	0.00	3.00		9.00

industrial/intellectual property schemes for ACE technologies		06-Mar-2015	06-Mar-2015		31-Dec-2020

Comments (achievements against targets):
Exceeded: Three patents were obtained by beneficiaries and six patents were requested by beneficiaries (awaiting approval as of March 31, 2021) for a total of 9 beneficiaries under Component 2.1, which is significantly higher than the initial target of 3 patents obtained or requested.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of female participants	Number	0.00 06-Mar-2015	5.00 06-Mar-2015		15.00 31-Dec-2020

Comments (achievements against targets):
Exceeded: All 15 beneficiaries include one woman in a legal, technical or administrative decision-making position, which significantly exceeds the initial target of 5 women.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Web based platform developed	Yes/No	No 29-Aug-2018	Y 29-Aug-2018	Yes 29-Aug-2018	Yes 31-Dec-2020

Comments (achievements against targets):

Achieved: The web-based platform for the project has been developed and is published on SENER Web site (https://oel.energia.gob.mx/). The platform includes all 10 RNAs and 32 CERIPs, the final reports of the 15 beneficiaries under Component 2.1, and other relevant information.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of incentives awarded, with at least 40% of them under the CCEC category.	Number	0.00 06-Mar-2015	12.00 06-Mar-2015	15.00 29-Aug-2018	15.00 31-Dec-2020

Comments (achievements against targets):

Achieved: Fifteen firms or associations received an award under Component 2.1, including nine (i.e. 60%) under a collaborative clean energy commercialization scheme (CCEC) and the other six under a prototype development scheme.

The initial indicators (that were replaced by this indicator) were 12 CCEC awards and 12 prototype awards for a total 24 awards under Component 2.1, instead of the target of 15 awards in total, as revised downwards at project restructuring.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of	Number	0.00	15.00		15.00

Commercialization Plans developed.		29-Aug-2018	29-Aug-2018		31-Dec-2020

Comments (achievements against targets):
Achieved: The fifteen beneficiaries under Component 2.1 developed a commercialization plan for their project, although the depth of the commercialization plans vary greatly.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of jobs created by the ACE program beneficiaries.	Number	0.00 29-Aug-2018	15.00 29-Aug-2018		101.00 31-Dec-2020

Comments (achievements against targets):
Exceeded: The number of direct and indirect jobs created by the 15 beneficiaries is 101 which exceeds by far the initial target of 15 jobs.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of safeguards follow-up plans developed and in place.	Number	0.00 29-Aug-2018	15.00 29-Aug-2018		15.00 31-Dec-2020

Comments (achievements against targets):

Partially achieved: All 15 beneficiaries from Component 2.1 developed a safeguard follow-up plan that was reviewed by the World Bank. At project closing, only 8 plans had been approved by World Bank. However, the other 7 plans were approved by the World Bank in May 2021.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Registered grievances satisfactorily resolved in line with the Grievance Redress Mechanism (GRM)	Percentage	0.00 29-Aug-2018	100.00 29-Aug-2018		100.00 31-Dec-2020

Comments (achievements against targets):

Achieved: 100% of the 228 complaints or requests for information received by SENER were satisfactorily resolved through the GRM established by SENER.

B. KEY OUTPUTS BY COMPONENT

Objective/Outcome 1	
Outcome Indicators	Original: CERIPs designed and initiated: 0 (0% of the target) Revised: CERIPs designed and published: 32 (100% of target)
Intermediate Results Indicators	1. Number of high relevance investment opportunities identified in Component 1 that could be potentially supported by national and/or international sources of financing: 94 (294% of target)
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	1. RNAs and CERIPs are prepared
Objective/Outcome 2	
Outcome Indicators	Original: Private capital mobilized: $1.25 million (20% of the target) Revised: Capital mobilized for Government programs or initiatives aimed at fostering clean energy innovation (public and private) $10.25 million (171% of target)
Intermediate Results Indicators	1. Number of patents or other industrial/intellectual property schemes for ACE technologies: 9 (300% of target) 2. Web-based platform developed: yes (100% of target)

Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	1. Grants are awarded to CCEC projects 2. Grants are awarded to prototype projects 3.TA is awarded to beneficiaries 4. Web-based platform on ACE technologies is designed by SENER
Objective/Outcome 3	
Outcome Indicators	Future emission reductions from ACE technologies supported by the Project: 4,177,303 tCO2e (174% of target)
Intermediate Results Indicators	1. Number of incentives awarded, with at least 40% of them under the CCEC category: 15 (100% of target) 2. Number of commercialization plans developed: 15 (100% of target) 3. Number of recipients of TA: 15 (63%)
Key Outputs by Component (linked to the achievement of the Objective/Outcome 3)	1. Grants are awarded to CCEC projects 2. Grants are awarded to prototype projects 3.TA is awarded to beneficiaries 4. Commercialization plans prepared by project beneficiaries

ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Todd M. Johnson	Task Team Leader(s)
Gabriel Penaloza	Procurement Specialist(s)
Juan Carlos Serrano-Machorro	Financial Management Specialist
Alonso Zarzar Casis	Social Specialist
Jose Luis Calderon Bartheneuf	Social Specialist
Supervision/ICR	
Guillermo Hernandez Gonzalez	Task Team Leader
Gabriela Elizondo Azuela	Task Team Leader
Francisco Rodriguez, Joao Guilherme Morais de Queiroz	Procurement Specialist(s)
Luis Barajas Gonzalez	Financial Management Specialist
Luis M. Vaca-Soto	Team Member
Angelica Calderon	Procurement Team
Nancy Montes de Oca	Procurement Team
Gabriel Penaloza	Procurement Team
Tuuli Johanna Bernardini	Social Specialist
Diacono Raul Vera Hernandez	Environmental Specialist
Irati Jimenez	Team Member

B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US$ (including travel and consultant costs)
Preparation		
FY14	31.953	178,823.19
FY15	21.055	94,490.95
Total	**53.01**	**273,314.14**
Supervision/ICR		
FY15	0	3,400.00
FY16	3.925	28,487.37
FY17	11.197	58,254.24
FY18	4.400	29,283.41
FY19	4.640	35,262.76
FY20	5.352	29,018.39
Total	**29.51**	**183,706.17**

ANNEX 3. PROJECT COST BY COMPONENT

Components	Amount at Approval (US$M)	Actual at Project Closing (US$M)	Percentage of Approval %
Regional Needs Assessments for ACE technologies and Clean Energy Regional Investment Plans (CERIPs)	94.58	2.27	2.42
Grants and technical assistance for private enterprises in the ACE sector	13.35	11.93	89.4
Project Management	2.80	3.04	108.5
Total	**110.73**	**17.24**	**15.6**

Table 5. Project cost and financing (US$ million)

Project component	**Costs**		**Cofinancing**		**GEF financing**			**% GEF financing**	
	PAD	**Actual**	**PAD**	**Actual**	**PAD**	**Amended**	**Actual**	**PAD**	**Actual**
1. RNAs and CERIPs	94.58	2.27	90	0*	4.58	4.58	2.27	4.8%	100%
2 Grants and TA to private firms	13.35	11.93	1.85	1.83	11.50	11.10	10.10	86.1%	84.7%
3. Project management	2.80	3.04	2	2 **	0.8	1.20	1.04	28.6%	34.2%
Total	**110.73**	**17.24**	**93.85**	**3.83**	**16.88**	**16.88**	**13.41**	**15.2%**	**77.8%**

* Although $203.2 million were allocated from the FSE to clean energies projects, none of the projects identified in the RNAs/CERIPs received any FSE funding (see details in paragraph 34)

**SENER's contract with the firm *Ingeniería en Sistemas Energéticos y Ambientales* for support on procurement and safeguards aspects

ANNEX 4. EFFICIENCY ANALYSIS

1. As was done in the PAD, the Project efficiency analysis is limited to the assessment of the economic benefits associated to the expected reduction of GHG emissions that would result from ACE technology subprojects financed under the Project. However, the methodology to assess these GHG emissions was adjusted to account for GHG emissions reduction prospects from actual projects financed under the Project (at appraisal it was solely based on an ER ratio per USD invested in either renewable energy or energy efficiency projects).

Summary of the PAD approach

2. Together, the grants allocated under Component 2 are expected to generate financial and direct and indirect economic benefits. The quantification of the Project's overall direct benefits (including co-financing and leveraged investment emanating from the successfully commercialized clean energy technology)—and potentially more important post-project indirect benefits (through the assumed continuation of the fund after full disbursement of GEF funds)—will depend on the successful future adoption and diffusion of some of the specific clean energy proposals and technologies selected for support, which are very difficult to estimate, ex ante, with a high degree of rigor and accuracy. Nonetheless, at the outset, it was estimated that the total amount of investments leveraged by the allocation of grants in Component 2 would lead to about US$60 million (including $36 million for energy efficiency projects and $24 million for renewable energy projects), taking into account amounts of co-financing, a leverage ratio of 50:1, and a project conservative success rate of 10 percent. A summary of the assumptions for obtaining GHG ERs estimations at appraisal is presented in Table 6 below:

Table 6. Assumptions for obtaining GHG ERs estimations at appraisal

Assumptions		Comments
Amount of grants	10,500,000	
Amount allocated to renewable energy + co-financing	4,830,000	40% of total amount of grants + 15% co-financing
Amount allocated to energy efficiency + co-financing	7,245,000	60% of total amount of grants + 15% co-financing
Lifespan of each subproject investment	8 years for energy efficiency and 20 years for renewable energy	Used for estimating GHG emissions from energy efficiency and renewable energy investments
Success rate	10%	1 in 10 subgrants will become a commercial success. Estimate by task team, based on empirical evidence on success rate at stage of pre-commercialization of technologies that will be targeted by the proposed Project.
Total amount of renewable energy investments (including leveraging and assumed success rate of 10%)	24,150,000	50:1 in follow-up capital investment in the firm/technology
Total amount of energy efficiency investments (including leveraging and assumed success rate of 10%)	36,225,000	50:1 in follow-up capital investment in the firm/technology

3. At appraisal, emission reductions were estimated based on the potential dissemination of technologies that would receive an investment through the ACE program. However, it is important to recognize that the Project was also expected to stimulate positive spillover GHG emission reductions as a result of successful partnerships leading to commercialization and diffusion of more clean technologies to be fostered through the activities supported under Component 1. These positive spillover emission reductions are difficult to rigorously estimate with a reasonable level of certainty but could be significant.

4. The estimates of GHG emission reductions resulting from the expected investments at appraisal were based on calculations for renewable energy projects and for energy efficiency projects for which grants would be allocated (a very generic allocation as there was no clarity about the projects/technologies that would eventually be supported). Both direct GHG reductions (emissions reduction directly generated and those leveraged by the subprojects funded by GEF grants during the Project's supervised implementation period), and indirect GHG reductions (positive spillover GHG emission reductions)[30] were estimated to provide an overall assessment of the estimated GHG emission reductions benefits associated with the Project.

[30] GEF, Manual for Calculating GHG Benefits of GEF Proposed Projects: Energy Efficiency and Renewable Energy Proposed Projects (2008)

5. In energy efficiency projects, the direct emission reductions can mostly be calculated directly from the energy savings of the project as measured in kWh, by multiplying them by the corresponding emission factor[31]:

$$CO_2 \text{ direct} = E * c$$

where
CO_2 direct = direct GHG emission savings of successful project implementation in tonnes of CO2 eq.
E = cumulative energy saved or substituted, e.g., in kWh, across all technologies that are affected by the intervention, and cumulated over the lifetime of the respective investments
c = CO2 emission factor of the marginal technology, or of the national power generation portfolio as applicable, in g/kWh.

6. The replication/indirect GHG emission reductions from energy efficiency projects are calculated as follows (bottom up approach)[32]:

$$CO2 \text{ indirect BU} = CO2 \text{ direct}* RF$$

where
CO_2 indirect BU = emissions saved with investments after the project, as estimated using the bottom up approach, in tonnes of CO_2 eq
RF = replication factor
CO_2 direct = estimate for direct and direct post-project emission reductions, in tonnes of CO_2 eq

7. The calculation of the direct emission reductions for renewable energy projects is based on the marginal technology in the project country[33]:

$$CO_2 \text{ direct} = E * c$$

where
CO_2 direct = direct GHG emission savings of successful project implementation in tonnes of CO_2 eq
E = cumulative energy produced by renewable energy, e.g., in MWh; $E = \Sigma_l e$

8. The replication/indirect GHG emission reductions for renewable projects are calculated as follows (bottom up approach)[34]:

$$CO_2 \text{ indirect BU} = CO2 \text{ direct}* RF$$

where
CO_2 indirect BU = emissions saved with investments after the project, as estimated using the bottom up approach, in tonnes CO_2 eq

[31] Ibid
[32] Ibid
[33] Ibid
[34] Ibid

RF = replication factor
CO_2 direct = estimate for direct and direct post-project emission reduction, in tonnes CO2 eq

9. For the Project, the calculation methodology and some of the assumptions largely derive from those used in other GEF projects[35]. The emission factor was derived from the grid emission factors used for Clean Development Mechanism (CDM) projects in Mexico. The methodology to derive the emission factor is based on a 'combined margin' which is calculated based on (a) the emissions from the plants supplying the grid (the 'operating margin') and (b) the emissions associated with most recent plants built (the 'build margin'). In 2015 the emission factor of Mexico's power system was 0.5309 tCO2e/MWh. The ratio of USD/MW for renewable energy was based on Mexican cost estimates, while energy efficiency costs were based on IBRD estimates. As a result, the Project, through the grants allocated in Component 2, was estimated to lead to direct emission reductions in the order of 0.6 $MtCO_2e$, and indirect emission reductions on the order of 1.8 $MtCO_2e$, for a combined total of 2.4 $MtCO_2e$. In terms of cost-effectiveness (considering only GEF funds allocated to the Project), it was calculated that the Project's estimated GHG emissions reductions were achieved at an overall cost of US$7.01 per ton of CO_2 equivalent (total cost of US$16.88 million from the GEF Grant to avoid 2.4 $MtCO_2e$).

Revised methodology for the estimation of expected GHG emissions reductions

10. Since the beneficiaries/technologies from Component 2 of the Project are known, it is now possible to estimate the GHG emissions reductions that could be expected from these beneficiaries' projects.

11. The 15 projects that received financing under Component 2 were reviewed to assess their commercialization prospects. This was done on the basis of the final report produced by the beneficiaries (including actual results vs. objectives and a commercialization plan), as well as on the basis of the monitoring of the implementation of these projects that was conducted by SENER and the World Bank team over 2017-2020. The commercialization prospects of these 15 projects were rated between low, average and good.

12. The rationale for the commercialization prospects ranking is as follows:

Low (2 projects: Adrián Lozano Baeza and Centro de Investigación en Materiales Avanzados):
Projects that haven't reached technological maturity. These two projects consisted of a prototype and received limited GEF financing ($100.000 each). In the case of CIMAV, the prototype results did not evidence a financially attractive technology. In the case of Adrian Lozano Baeza, the prototype requires further development.

Average (8 projects: Proftech Servicios, UAS, CIDETEQ, Todo Pellet, Stelagenomics, Vehículos Urbanos Ultraligeros, Laboratorio de Investigación en Control Reconfigurable, and Gadgets & Design):
Technically viable projects but with uncertain/doubtful financial viability.

Good (5 projects: ENAL, Módulo Solar, PI Ingenera, Potencia Industrial and PES).
Technology successfully applied by beneficiaries at pre-commercial or commercial level.

[35] "Finance and Technology Transfer Centre for Climate Change (FIN-TeCC)", Proposed Project Document (2013), as well as the "Climate Technology Transfer Mechanisms and Networks in Latin America and the Caribbean", Proposed Project Identification Form (2011).

13. Although all beneficiaries provided an estimation of GHG ERs from their subprojects/technologies, only those subprojects with good commercialization prospects (five out of fifteen) were retained for the assessment of their expected GHG ERs, since subprojects with an average or low rating stand a limited chance of reaching a commercial phase. The five beneficiaries are the following (without ranking in terms of commercial prospects):

1/ Energía Alternas, Estudios y Proyectos: 500 KW geothermal plant for distributed generation (renewable energy category).
2/ Módulo Solar: thermal solar collectors for industrial processes (renewable energy category).
3/ PI Ingenera: geothermal energy for food products dehydration (renewable energy category.
4/ Potencia Industrial: development of batteries and power trains for electric vehicles (energy efficiency category).
5/ Potencia, Electricidad y Sistemas: fault detection system for wind turbines and power substations (energy efficiency category).

14. The above first four subprojects fall under the Collaborative Clean Energy Commercialization (CCEC) category. Although the fifth subproject falls under the prototype development category, it has good commercialization prospects both within the Mexico and regional energy generation markets (renewable power plants and associated substations), as evidenced by PES ongoing marketing strategy.

15. The five subprojects' expected ERs were computed over a 20-year period for renewable energy projects and over 8 years for energy efficiency projects (as was done in the PAD).

16. The assessment of expected GHG emissions reductions used the data provided by the beneficiaries and reviewed by SENER, including three elements:

1/ expected ERs from the subprojects implemented by the five beneficiaries, on the basis of i/ renewable energy for power generation or improved energy availability in MWh/year converted to tCO_2e/year with the emission factor of the Mexico power system in 2019 (0.505 tCO2e/MWh); or ii/ the equivalent in tCO_2e of thermal energy (diesel, natural gas, etc.) substituted by the projects' energy production.

2/ the expected multiplication of the initial project ERs, on the basis of reasonable commercialization projections defined by the five beneficiaries[36] for sales or additional projects only during the period 2021-2025 (in a conservative approach), which constitute the direct benefits that could be expected from investments over that period by the five beneficiaries.

3/ the indirect benefits (i.e. the above-described spillover benefits), which were estimated using a replication factor of 1, which is conservative, as the PAD considered a replication factor of 3 for this type of projects worldwide.

17. The results are shown in Table 7 below. Direct and indirect ERs of the technologies developed by the five beneficiaries would amount to 2.1 million tCO2e each, for a total expected ERs of 4.2 million tCO2e, which is significantly higher than the PAD target of 2.4 million tCO2e, even though these total expected ERs were estimated conservatively as noted above. On the basis of the Project's actual disbursements under the GEF amounting to $13.41

[36] It should be noted that the above first four beneficiaries assessed the financial viability of their projects to support the formulation of their commercialization plan. Regarding the fifth beneficiary (*Potencia, Electricidad y Sistemas*), the financial viability of the fault detection system developed is clear as the benefits of additional power generation from fault resolving exceed by far the costs of the associated fault detection services.

million, it is calculated that the Projects' estimated GHG emissions reductions are achieved at an overall cost of US$3.2 per ton of CO2 equivalent.

18. It should also be noted that if expected ERs from one of the two largest contributors (*Potencia Industrial* and *Potencia, Electricidad y Sistemas*) were falling significantly short of the estimates below, total ERs would still remain higher than or very close to the PAD estimate.

Table 7. Estimation of GHG ERs from beneficiaries with good commercialization prospects.

Beneficiary	Project type	Benefits period (years)	Project expected ERs (tCO2e)	Basis	Mutiplier over next 5 years	Basis	Direct ERs (tCO2e)	Replication factor	Indirect ERs (tCO2e)	Total expected ERs (tCO2e)
Energías Alternas, Estudios y Proyectos, S.A de C.V.	RE	20	37,602	500 kW geothermal plant	1	No additional plant	37,602	1	37,602	75,205
Módulo Solar, S.A de C.V.	RE	20	375	81.5m2 of solar collectors	578	47075 m2 of solar collectors	216,750	1	216,750	433,500
PI Ingenera, S.A de C.V.	RE	20	16,800	1 geothermal food dehydrating unit with 3 modules	6	19 modules installed	106,400	1	106,400	212,800
Potencia Industrial, S.A de C.V.	EE	8	69	1 vehicle	13740	13740 vehicles sold in Mexico	951,907	1	951,907	1,903,814
Potencia, Electricidad y Sistemas, S.A de C.V.	EE	8	13,857	A total 27.44 GWh saved in five faulty nodes	56	280 faulty nodes detected	775,992	1	775,992	1,551,984
TOTAL			**68,704**				**2,088,652**		**2,088,652**	**4,177,303**

Notes on assumptions for the calculation of unit ERs of the above five projects:

1/ Energías Alternas, Estudios y Proyectos: the 500 kW geotermal plant with a plant factor of 85% generates 3723 MWh/year, which is equivalent to 1880 tCO2e/year with a grid emission factor of 0.505 tCO2e/MWh.

2/ The heat produced by the 81.5 m2 solar collector substitutes 6.2 tons of LPG per year, which is equivalent to 18.75 tCO2e/year with a conversion factor of 3 kg of CO2 per kg of LPG.

3/ the 500 kW geothermal unit (with three dehydrating modules) will substitute 279 tons of LPG per year, which is equivalent to 840 tCO2e/year with a conversion factor of 3 kg of CO2 per kg of LPG.

4/ The electric vehicle substitutes a thermal combustion vehicle driven 100 km/day during 300 days per year, with an efficiency of 7 km/lt. This would represent 8.66 tCO2e/year with a conversion factor of 2.02 kg CO2/lt of fuel, after deduction of 0.2 kg CO2e / kWh for electricity generation.

5/ The fault detection system saved 27.44 GWh in five wind generation units, which is equivalent to 13.86 tCO2e with a grid emission factor of 0.505 tCO2e/MWh.

ANNEX 5. BORROWER, CO-FINANCIER AND OTHER PARTNER/STAKEHOLDER COMMENTS

1. The Borrower prepared a Project Completion Report in March 2021, which information was used for the preparation of the ICR.

2. The Borrower reviewed the draft ICR (the version discussed at the Decision Meeting) and provided comments and edits that were incorporated in the final document. Comments and suggestions were the following:

i/ The value of the intermediate indicator "Number of recipients of TA" should be 55 instead of 15. The definition of this indicator in the PAD was "TA received by successful proposals to the ACE Fund as well as TA awarded to short-listed firms based on the decision of the IC". Training was provided by SENER to the 15 subgrants beneficiaries and to an additional 40 firms that were shortlisted in the calls for proposals for the subgrants.

ii/ The Moderately Unsatisfactory rating of the original Project does not seem to be consistent with the Project ratings during the supervision missions, which were either Satisfactory or Moderately Satisfactory.

iii/ The ICR should indicate that cofinancing by the subproject beneficiaries amounted to at least 15% of the subproject total cost, since some beneficiaries provided more than 15%.

iv/ The impact of the exchange rate variation (Mexican Peso vs. USD) was not positive from the perspective of GEF disbursements, as it resulted in a lower-than-expected disbursement of GEF funds because the contracts for the GEF subgrants were signed in USD but at a fixed exchange on the contracts signature dates.

v/ The ICR should mention that SENER, NAFIN and the World Bank decided to establish a traffic light monitoring system with technical, procurement, financial management and safeguards indicators to monitor the subprojects' implementation progress.

vi/ The audits of the Project's annual financial statements were conducted by SENER's internal control department, as agreed with the World Bank.

3. The GEF reviewed the draft ICR (the version that incorporated the guidance received at the Decision Meeting) and provided the following comments:

i/ Thank you very much for sharing with us the MX PRODETES (P145618) ICR. We take note of the successful completion of this project, including its estimated GHG emissions reductions, which exceeded the target, as well as of the lessons and recommendations for the support of cleantech development and innovation. We have no comments to add. Please proceed. Looking forward to collaborating again in the future.

ANNEX 6. SUPPORTING DOCUMENTS

WORLD BANK DOCUMENTS:
Grant Agreement
Restructuring Papers
Implementation Supervision Reports (ISR)
Supervision Aide Memoires
Financial Management Supervision Reports
Audit Reports
Country Partnership Strategy (CPS) 2014-2019
Systematic Country Diagnostic (SCD) 2018
Country Partnership Framework (CPF) 2020-2025
Bank Guidance, Implementation Completion and Results Report for Investment Project Financing Operations, March 2020

STUDIES/REPORTS
Mexico's Climate Change Mid-Century Strategy, November 2016
Mexico Nationally Determined Contributions – 2020 Update
Project Operations Manual, SENER
Semester progress reports, SENER
Project completion report, SENER
Regional Needs Assessments, 10 reports
Clean Energy Regional Investment Plans, 32 reports
Beneficiaries' final reports, 15 reports

ANNEX 7. SUBPROJECTS DESCRIPTIONS AND RESULTS

1. Proftech Servicios/Centro de Tecnología Avanzada (CIATEQ)

Location: Querétaro
Award: Gold (2016)
Project cost: $2.35 millions
Project type: CCEC

Description: 1 MW power plant with supercritical CO2

Results:
The generating plant was completed in December 2019, with a 3MW expander unit. Proftech then proceeded with the testing phase, but it faced difficulties with the bearings of the expander unit. Testing was suspended due to constraints resulting from the Covid 19 pandemic and was reinitiated in October 2020, with the same difficulties. Proftech expects to resolve these technical issues by June 2021.

2. **Universidad Autónoma de Sinaloa/Global Intrust Investments/Instituto Mexicano del Petróleo**

Location: Sinaloa
Award: Silver (2016)
Project cost: $0.59 million
Project type: CCEC

Description: Biorefining of non-conventional energy crops (Jathropha)

Results: Plantation of 25 hectares of Jathropha (15 hectares were destroyed by hurricane in 2018) and manufacturing of a biodiesel production plant. The plant was tested with recycled oil, while waiting for the Jathropha crop. Testing was successful and UAS applied with SENER for an authorization to produce biodiesel. The authorization is pending.

3. **Centro de Investigación y Desarrollo Tecnológico en Electroquímica**

Location: Querátaro
Award: Silver (2016)
Project cost: $0.59 million
Project type: Prototype

Description: Automated fabrication of polycarbonate reflectors for solar concentrated power plant

Results: The beneficiary successfully manufactured an automated arm system to apply silver coating on solar reflectors. Testing was successful after some initial issues and 100 solar reflectors were produced in December 2020.

4. **Comprimidos de Biomasa Todo Pellet Gadgets & Design/Universidad Nacional Autónoma de México**

Location: Guanajuato
Award: Bronze (2016)
Project cost: $0.12 million
Project type: Prototype

Description: Mobile pellet-making with high efficiency burner

Results: The beneficiary successfully manufactured and tested a mobile pellet-making unit, which can be used in small and medium enterprises. Due to the Covid 19 contingency, fabrication of pellets was transferred to a commercial partner in the State of Durango where the final testing took place and one unit was installed in a small tannery (*El pequeño curtidor de León*). Fabrication of the units was transferred to another commercial partner.

5. **Adrián Lozano Baeza (PMT Grupo Industrial)**

Location: Ciudad de México
Award: Bronze (2016)
Project cost: $0.12 million
Project type: Prototype

Description: Integrated system for thermal generation from solid residues

Results: The beneficiary successfully manufactured and tested a biomass burner and heat recovery system, which can be used in intensive heat-using industries such as plastic, paper, furniture, drinks, tanneries, etc. Commercial contacts were made with a vegetable-tanned leather factory and with a plastic factory, for the intermittent use of biomass residues when available.

6. **Energías Alternas, Estudios y Proyectos/Universidad de Guanajuato**

Location: Querétaro-Guanjuato
Award: Gold (2017)
Project cost: $2.35 million
Project type: CCEC

Description: 500 kW geothermal power plant for distributed generation.

Results: A 500 kW geothermal power plant was manufactured and installed at the Celaya geothermal producing field. Testing was finalized successfully in March 2020. The plant can produce 3723MWh/year. A power generation license was requested. Energy will be sold to the Carso Energy group at US$90/MWh. The project could be replicated at the Aeropuerto II geothermal field.

7. **Módulo Solar/Universidad Nacional Autónoma de México**

Location: Morelos
Award: Silver (2017)
Project cost: $0.59 million
Project type: Prototype

Description: Low and medium temperature solar collectors for thermal generation for industrial processes.

Results: The beneficiary designed and manufactured high efficiency solar water heaters and solar air heaters with storage capacity, for use in industrial processes. A basil dehydration pilot unit with solar air heaters was also designed and installed. Testing of both types of solar collectors and the dehydration unit was successfully completed in July 2020.

8. **Stelagenomics**

Location: Guanajuato
Award: Silver (2017)
Project cost: $0.59 million
Project type: Prototype

Description: Technological platform to increase productivity and reduce cost of biodiesel production from microalgae

Results: The beneficiary designed and installed three microalgae (*Chlorella*) efficient producing ponds with a 5000 lt. capacity and conducted a feasibility study for the production of biodiesel from microalgae, as well as a business plan, and identified possible markets and commercial partners.

9. **Centro de Investigación en Materiales Avanzados**

Location: Chihuahua
Award: Bronze (2017)
Project cost: $0.12 million
Project type: Prototype

Description: Cogeneration kit for integration to solar water heating systems

Results: The beneficiary designed and tested successfully a 250W cogeneration kit associated to solar water heaters for domestic use.

10. **PI Ingenera/Universidad Nacional Autónoma de México**

Location: Nayarit
Award: Gold (2018)
Project cost: $1.04 million
Project type: CCEC

Description: Geothermal system for food products dehydration

Results: The beneficiary developed and tested successfully a geothermal-based system for food products dehydration, with a 4.5 thermal MW/day capacity and three dehydration modules. The system was successfully tested for mango drying and a brand was created.

11. **Potencia Industrial/Universidad Nacional Autónoma de México**

Location: Ciudad de México
Award: Gold (2018)
Project cost: $1.71million
Project type: CCEC

Description: Development of batteries and power trains for electric commercial vehicles

Results: The beneficiary developed batteries (50 kWH) and an efficient power train for an electric commercial vehicle and assembled one unit. It also developed a battery testing system. The beneficiary is working on establishing a joint venture with a car assembling company in Mexico to produce electric vehicles with the efficient technology developed by the beneficiary.

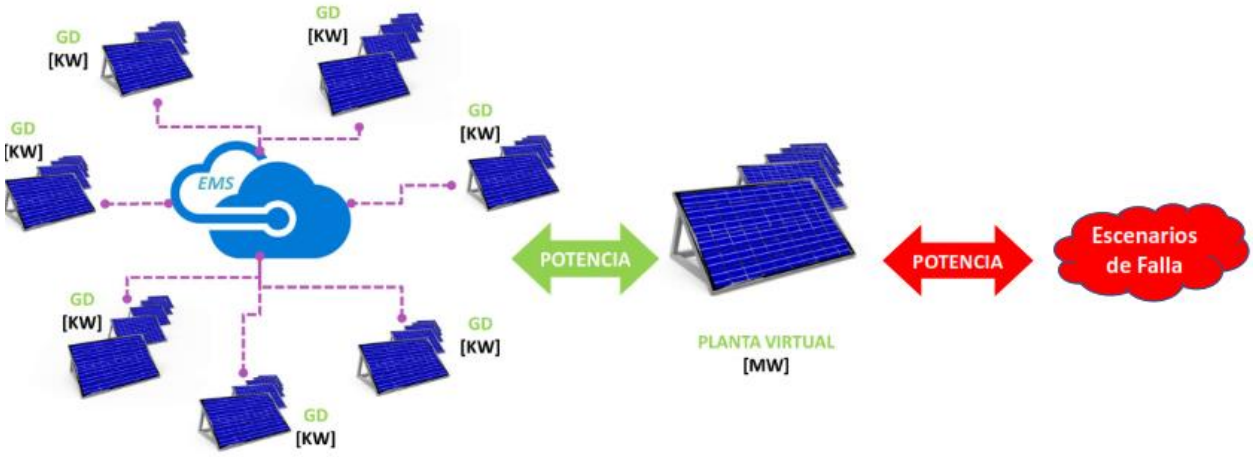
12. **Vehículos Urbanos Ultraligeros/Universidad Nacional Autónoma de México**

Location: Querétaro / Ciudad de México
Award: Gold (2018)
Project cost: $1.1million
Project type: CCEC

Description: Development of an urban electric bicycle

Results: The beneficiary successfully manufactured three units of an efficient urban electric bicycle, including development of suspension, drive train, fairing, and controller.

13. **Laboratorio de Investigación en Control Reconfigurable/Universidad Autónoma de San Luis Potosí**



Location: Querétaro
Award: Silver (2018)
Project cost: $0.59 million
Project type: CCEC

Description: Pilot photovoltaic power plant with smart inverters and cloud-based

Results: The beneficiary developed a virtual PV plant and a cloud-based energy management system, with a smart inverter and a 5KW converter for the distributed generation market in the residential sector.

14. **Potencia, Electricidad y Sistemas**

Location: Morelos
Award: Silver (2018)
Project cost: $0.27 million
Project type: Prototype

Description: Development of a fault detection system for wind turbines and electrical sub-stations

Results: The beneficiary successfully developed and requested a patent for an innovative fault detection system (PD Sentinel). The system was tested in 4 wind power plants and prevented fault occurrence for the equivalent of 27 GWh. The beneficiary has developed a commercialization plan for the use of its highly financially viable system in renewable power plants, as well as for substations and conventional power plants, in Mexico and in the region.

15. **Gadgets & Design/Universidad Nacional Autónoma de México**

Location: Morelos
Award: Bronze (2018)
Project cost: $0.24 million
Project type: CCEC

Description: Mini heliostats for solar industrial heat

Results: The beneficiary developed and successfully tested a pilot project with small solar reflectors, an automated tracking system and a heat receptor, for heat use in industries.