



Project Implementation Report

(1 July 2023 – 30 June 2024)

Project Title:	<i>Promoting Energy Efficiency in Industrial Heat Systems and High Energy-consuming (HEC) Equipment</i>
GEF ID:	<i>4866</i>
UNIDO ID:	<i>100283</i>
GEF Replenishment Cycle:	<i>GEF-5</i>
Country(ies):	<i>P.R.China</i>
Region:	<i>EAP - East Asia and Pacific</i>
GEF Focal Area:	<i>Climate Change Mitigation (CCM)</i>
Integrated Approach Pilot (IAP) Programs¹:	<i>N/A</i>
Stand-alone / Child Project:	<i>Stand-alone</i>
Implementing Department/Division:	<i>ENE / ETI</i>
Co-Implementing Agency:	<i>N/A</i>
Executing Agency(ies):	<i>Special Equipment Safety Supervision Bureau (SESA) of the State Administration for Market Regulation (SAMR)</i>
Project Type:	<i>Full-Sized Project (FSP)</i>
Project Duration:	<i>48 months</i>
Extension(s):	<i>30 months</i>
GEF Project Financing:	<i>5,995,000 USD</i>
Agency Fee:	<i>537,500 USD</i>
Co-financing Amount:	<i>40,500,000 USD</i>
Date of CEO Endorsement/Approval:	<i>10/14/2014</i>
UNIDO Approval Date:	<i>3/12/2014</i>
Actual Implementation Start:	<i>4/30/2018</i>
Cumulative disbursement as of 30 June 2024:	<i>5,137,292.44</i>
Mid-term Review (MTR) Date:	<i>8/7/2021</i>
Original Project Completion Date:	<i>1/31/2023</i>
Project Completion Date as reported in FY23:	<i>1/31/2024</i>
Current SAP Completion Date:	<i>7/31/2025</i>
Expected Project Completion Date:	<i>7/31/2025</i>

¹ Only for GEF-6 projects, if applicable

	<i>The next PSC meeting expected to be held in Sep 2024 will decide the expected project closure date</i>
Expected Terminal Evaluation (TE) Date:	6/1/2025
Expected Financial Closure Date:	6/1/2025
UNIDO Project Manager²:	<i>Sanjaya SHRESTHA</i>

I. Brief description of project and status overview

Project Objective		
<p>The Project is to promote energy efficiency in “high energy consuming” special equipment through the development of technical regulations; the establishment of national laboratories; the training of national experts; and the demonstration of new technologies at enterprise level.</p>		
Project Core Indicators		Expected at Endorsement/Approval stage
A	Incremental direct CO ₂ eq emission reductions (tons of CO ₂ eq)	Cumulative Direct emission reductions of 2,423 ktCO ₂ Cumulative post project direct emission reduction of 912,889 ktCO ₂
B	Incremental indirect CO ₂ eq emission reductions (tons of CO ₂ eq)	Indirect emission reduction of up to 2,339,723 ktCO ₂ (as a result of the wide implementation of the equipment standards)
C	Specific energy consumption of selected enterprises	Implementation of systems optimization and operational improvements in 50 enterprises (including equipment replacement in 5 of them) lead to annual fuel savings of 139 PJ and power savings of 1100 GWh
1	National technical regulations on energy efficiency for HEC special equipment are adopted	KPI have been identified for both equipment performance as well as systems efficiency; and the regulations have been revised to reflect these methods KPI have been identified for both equipment performance as well as systems efficiency; and the regulations have been revised to reflect these methods
2	A reporting system from in service boilers is available	A reporting system is created and database is populated
3	A dissemination campaign is conducted	Awareness has been raised amongst selected stakeholders
4	The analytical capacities of the HEC Special Equipment Energy Efficiency Testing Centre are upgraded	100 CSEI staff and regional inspectors are trained in the analysis of data collected from the enterprises (gender disaggregated)
5	6 national testing laboratories have the competencies to verify and test against the new technical regulations	The 6 laboratories are equipped, staffed and trained for testing the relevant parameters for Steam and Heat Recovery systems to implement the methods established in

² Person responsible for report content

		outcome 1	
6	Number of stakeholders with increased awareness of steam and heat recovery systems measures	1000 representatives of selected stakeholder groups have improved awareness 200 enterprises technical staff receive user training (gender disaggregated)	
7	Trained local practitioners in System Optimization active in industry	50 practitioners are trained (gender disaggregated)	
8	Training material available for SSO and HRSO	Training material are available in Chinese and localized web based platform has assisted them in the training	
9	Appropriate and active financial mechanisms to support industrial EE projects	100 enterprises to be trained	
10	In-depth system assessments of SSO and HRSO conducted	75 enterprises	
11	Systems optimization measures are implemented	50 of the companies adopt measures	
12	Replaced equipment	5 companies	

Baseline
<p>Industrial boilers in China are the most significant equipment employed in terms of energy conversion, with the majority being coal-fired. In 2010, the total coal production in China reached 3.24 billion tonnes, with boilers representing 70% (about 2.24 billion tons) of the consumption. The average operational efficiency of industrial boilers in China is only 65%, which is 15-20% lower than that of boilers in more technologically developed countries. Several previous projects have addressed the performance issues related to industrial boilers in recent years, perhaps most importantly the GEF-WB China Efficient-Industrial Boilers Project (GEF ID 97). Nevertheless, considerable potential for energy-saving remains to be realized.</p> <p>For heat exchangers research by the Chinese Special Equipment Institute (CSEI) shows that the expenditure on heat exchangers comprises 30% of the total capital expenditure on new equipment in the chemical industry, and around 40% in oil refineries. Improved heat recovery efficiency and the optimization of heat exchanger networks (HENs) would significantly contribute towards higher overall plant energy efficiency. These technologies have benefited from a growing realization of the effects of climate change. The consequent tightening of environmental regulations has prompted greater demand for energy saving equipment, in particular heat exchangers, as economically optimized heat recovery typically offers a 15-40% improvement in energy efficiency. An additional benefit to industrial enterprises is that manufacturing costs are significantly reduced, at better rates of return than other alternatives. Equipment manufacturers have responded to the resulting market demand with many new types of specialized heat exchanger designs for niche applications.</p>

Please refer to the explanatory note at the end of the document and select corresponding ratings for the current reporting period, i.e. FY24. Please also provide a short justification for the selected ratings for FY24.

In view of the GEF Secretariat's intent to start following the ability of projects to adopt the concept of adaptive management³, Agencies are expected to closely monitor changes that occur from year to year and demonstrate that they are not simply implementing plans but modifying them in response to developments

³ Adaptive management in the context of an intentional approach to decision-making and adjustments in response to new available information, evidence gathered from monitoring, evaluation or research, and experience acquired from implementation, to ensure that the goals of the activity are being reached efficiently

and circumstances or understanding. In order to facilitate with this assessment, please introduce the ratings as reported in the previous reporting cycle, i.e. FY23, in the last column.

Overall Ratings ⁴	FY24	FY23
Global Environmental Objectives (GEOs) / Development Objectives (DOs) Rating	<i>Satisfactory (S)</i>	<i>Satisfactory (S)</i>
Following the removal of Covid 19 restrictions, the project activities on the ground took momentum from the second half of 2023.		
Implementation Progress (IP) Rating	<i>Moderately Satisfactory (MS)</i>	<i>Moderately Satisfactory (MS)</i>
Following the removal of Covid 19 restrictions, the project activities on the ground took momentum from the second half of 2023.		
Overall Risk Rating	<i>Moderate Risk (M)</i>	<i>Moderate Risk (M)</i>
The demonstrations have not been initiated yet and therefore there is a moderate risk.		

II. Targeted results and progress to-date

Please describe the progress made in achieving the outputs against key performance indicator's targets in the project's **M&E Plan/Log-Frame at the time of CEO Endorsement/Approval**. Please expand the table as needed.

Please fill in the below table or make a reference to any supporting documents that may be submitted as annexes to this report.

Project Strategy	KPIs/Indicators	Baseline	Target level	Progress in FY24
Component 1 – Policy and market promotion				
Outcome 1: Enhanced regulatory framework that will enable HEC user to adopt energy efficiency measures and government institutions to monitor compliance, including a knowledge management tool				
Output 1.1: National technical regulations on energy efficiency for HEC special equipment (boilers and heat exchangers) are revised and improved through the implementation of innovative systemic approaches	1) National technical regulations on energy efficiency for HEC special equipment are adopted	Existing regulations do not include Key Performance Indicators (KPIs), and do not consider a systemic approach to steam or heat recovery systems as methods to improve performance	KPI have been identified for both equipment performance as well as systems efficiency; and the regulations have been revised to reflect these methods	A total of 5 research projects have been conducted: 1. Standard research on uncertainty evaluation of thermal performance test measurements for boilers 2. Survey on energy efficiency status of in-service boilers and research on coupled fuel boiler energy efficiency index system 3. Study on efficiency curves of boilers and steam systems 4. Research on efficiency evaluation methods and indicators of shell-and-tube heat exchangers 5. Research on characteristics of biomass fuels, gasification, and synergistic evaluation techniques for combustion
Output 1.2: A reporting system is designed and implemented to allow inspection agencies to collect data from in-service boilers systematically	2) A reporting system from in service boilers is available	Inspection data is not centralized, only collected at inspection agency level, and not systematically	A reporting system is created and database is populated	Commissioning universities to conduct research on the guide system for the promotion of energy efficiency in industrial heating systems and high-energy-consuming equipment, providing guidance for pilot demonstration projects of high-energy-consuming equipment construction.

⁴ Please refer to the explanatory note at the end of the document and assure that the indicated ratings correspond to the narrative of the report

Output 1.3: A national awareness raising and dissemination campaign is developed and implemented	3) A dissemination campaign is conducted	Inspection agencies and enterprises have limited knowledge of measures to improve equipment performance and energy efficiency	Awareness has been raised amongst selected stakeholders	
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Component 2 – Capacity Building activities (Government)

Outcome 2: The AQSIIQ (SAMR) has the capacities required to enforce the technical regulations, and testing capabilities are enhanced to facilitate the implementation of a systems optimization approach and the use of energy efficient equipment

Output 2.1: The capacities of the HEC Special Equipment Energy Efficiency Testing Centre are upgraded	The analytical capacities of the HEC Special Equipment Energy Efficiency Testing Centre are upgraded	Inspection agencies and CSEI staff have limited analytical capacities to collect and analyze data on steam and heat recovery systems	100 CSEI staff and regional inspectors are trained in the analysis of data collected from the enterprises (gender disaggregated)	The "National Boiler Energy Efficiency Testing Agency Capability Comparison" event was successfully held in Shunde, Guangdong in October 2023. A total of 102 participants were involved in the energy efficiency testing comparison activities.
Output 2.2: National testing laboratories are established and have the competencies to verify and test against the new technical regulations	6 national testing laboratories have the competencies to verify and test against the new technical regulations	The 6 national testing laboratories are to be established in 2015. Currently testing is conducted mostly on performance and safety parameters and there is need for testing/verification capacities to be established for the new technical regulations.	The 6 laboratories are equipped, staffed and trained for testing the relevant parameters for Steam and Heat Recovery systems to implement the methods established in outcome 1	The laser-induced fluorescence detection equipment purchased with project funds has arrived and been installed.

Component 3 – Capacity Building activities (enterprises)

Outcome 3: A cadre of highly specialized system optimization experts from public and private sectors are available as a long-term technical resource to industry and the country. Enterprises awareness on measures and new technologies and EE financing mechanisms is increased.

Output 3.1: Awareness on the concept of energy efficiency focused on optimization of steam systems and heat recovery systems is raised amongst 1000 representatives of selected stakeholder groups (inspection agencies, equipment manufacturers, enterprises, consultants)	Number of stakeholders with increased awareness of steam and heat recovery systems measures	Only a few large industries have energy management personnel; some industries have replaced or refurbished inefficient equipment yet there is limited awareness on energy efficiency and/or systems optimization measures	1000 representatives of selected stakeholder groups have improved awareness 200 enterprises technical staff receive user training (gender disaggregated)	Commissioned the China Boiler and Boiler Water Treatment Association to conduct energy efficiency knowledge training for 1300 enterprise and manufacturer management personnel. Through a competitive bidding process, the training task for a total of 10600 boiler operators has been allocated to implementation units in 14 provinces and municipalities directly under the central government. Currently, these implementation units have submitted training reports and verification materials totalling 5200 person-times.
Output 3.2: 50 candidates are trained to become national energy practitioners on steam and heat recovery systems optimization	Trained local practitioners in System Optimization active in industry	ESCOs are operating in the market, yet their focus is on replacing or refurbishing inefficient equipment	50 practitioners are trained (gender disaggregated)	Completed a 20-day professional training program in October 2023 for 60 international energy efficiency experts.
Output 3.3: 75 in-depth system assessments are completed in manufacturing facilities to identify energy conservations	Training material available for SSO and HRSO	SSO training package only available in English HRSO training package not developed	Training material are available in Chinese and localized web based platform has assisted them in the training	Five provincial-level inspection and testing units have been commissioned to conduct a total of 35 energy efficiency testing projects for high-energy-consuming equipment.
Output 3.4: 100 enterprises improve their capacities for the financial evaluation of industrial energy efficiency projects	Appropriate and active financial mechanisms to support industrial EE projects	Enterprises are lack of financial evaluation methods for this project	100 enterprises to be trained	

Component 4 – Demonstration of energy efficient equipment implementation and operation				
Outcome 4: New efficient technologies are demonstrated at national level to serve as case studies for future investments				
Output 4.1: Systems optimization: 50 of the companies trained adopt measures to reduce their energy consumption	Systems optimization measures are implemented	Limited number of companies have implemented systems optimization measures	50 of the companies adopt measures	Eight provincial-level inspection and testing units have been commissioned to conduct 90 energy efficiency assessments and efficiency improvement projects for enterprises and high-energy-consuming equipment users.
Output 4.2: New technologies: at least 5 of the companies trained adopt measures and replace equipment with more efficient technologies	Replaced equipment	Industries need to improve efficiency through new system optimization measures	5 companies	Conduct research on energy-saving technology product evaluation methods for boilers and heat exchangers, and select and promote demonstration projects for 2023, laying the foundation for advanced pilot construction research methods and screening outstanding candidates.
Component 5 –Monitoring and Evaluation				
Outcome 5: A robust mechanism for the monitoring and evaluation is put in place to ensure the attainment of project outcomes				
Output 5.1: Project management methods	The project monitoring plan is designed and executed	The Project needs management methods to standardize the project management and fund use.	Complete the drafting and implementation of management measures	1. Conduct annual project audits, entrusting qualified accounting firms to audit project expenditures from July 2022 to January 2024. 2. Conduct energy saving and carbon reduction effect assessment, research and propose evaluation methods for energy saving and carbon reduction of boilers and heat exchangers, and formulate guidelines for evaluating energy saving and carbon reduction effects of boilers and heat exchangers.
Output 5.2: Mid-term and final project evaluations are conducted	Mid-term and final project evaluations	The Project needs to commission experts who have participated in GEF project in China to draft the mid-term assessment and evaluation method of the project.	Completing the mid-term evaluation work and carry out the evaluation.	MTR has been conducted in FY2021.

III. Project Risk Management

1. Please indicate the overall project-level risks and the related risk management measures: (i) as identified in the CEO Endorsement document, and (ii) progress to-date. Please expand the table as needed.

Describe in tabular form the risks observed and priority mitigation activities undertaken during the reporting period in line with the project document. Note that risks, risk level and mitigations measures should be consistent with the ones identified in the CEO Endorsement/Approval document. Please also consider the project's ability to adopt the adaptive management approach in remediating any of the risks that had been sub-optimally rated (H, S) in the previous reporting cycle.

	(i) Risks at CEO stage	(i) Risk level FY 23	(i) Risk level FY 24	(i) Mitigation measures	(ii) Progress to-date	New defined risk ⁵
1	Lack of effective coordination between various partners involved and with other EE programs	Low Risk	Low Risk	Proper coordination will be sought through the Project Steering Committee. Ad-hoc working groups per sector or theme can be set up as needed, bringing in other partners and beneficiaries.	After the second grant was disbursed, two project steering committees were convened. At the meeting, the work plan for the next grant was determined and several universities, testing units, and consulting work were invited as partners to join the project work	<input type="checkbox"/>

⁵ New risk added in reporting period. Check only if applicable.

2	Effectiveness of policy to promote the desired results	Low Risk	Low Risk	The regulations will be developed or revised during the project period are all in line with the issued laws and latest State Council Policy documents.	Regulations and standards are being revised in an orderly manner and according to plan	<input type="checkbox"/>
3	Limited number of candidates interested in training	Low Risk	Low Risk	Since the awareness raising with the project implementation, technical agencies and enterprises will involve into and take part in the detail training. However, engagement still needs to be addressed to maintain interest.	At present, bidding has been initiated and it is planned to entrust at least 8 provincial-level testing units as project partners to carry out provincial-level training work	<input type="checkbox"/>
4	No immediate demand of services for trained experts	Low risk	Low Risk	The integrated approach adopted by the project is expected to mitigate this risk by combining expert training with factory training designed to create interest in the services that the new national experts will provide.	In the training of international energy efficiency experts, we plan to provide teacher training for some of the outstanding students, and cultivate this group of trainees to become new teachers and invest them in relevant teaching work	<input type="checkbox"/>
5	Limited interests for experts from government or enterprise side	Low Risk	Low Risk	Following the project document content, expert training will be combine with equipment using enterprises assessment, and their interest will be enhanced after the good effect and newest regulation will also make relevant requirement.	With the large-scale implementation of project work (including training, testing, pilot demonstration) in each province, the project will have a wide impact on all parts of the country in succession	<input type="checkbox"/>
6	Demonstration projects are delayed, limiting the opportunity to disseminate success stories and develop case studies	Low Risk	Low Risk	The enterprises selected as demonstration sites for the expert-level training will be carefully screened for management support and implementation of the resulting recommendations. These factories are anticipated to provide the initial case studies and thus serve as examples for other factories.	At present, we have carried out the application work for the pilot demonstration of high energy consuming equipment. The demonstration case of high energy consuming equipment that has been submitted for application has been submitted to the relevant experts of the stakeholder for screening and evaluation	<input type="checkbox"/>
7	Incentives and financial support systems are insufficient, especially for technology transfer	Low Risk	Low Risk	Financial institutions will be encouraged to learn more about potential conservations resulting from industrial energy efficiency; and companies will be made aware of financing opportunities.		<input type="checkbox"/>
8	Vulnerability to climate events	Low Risk	Low Risk	The type of interventions to be undertaken in this project (standards and demonstration and diffusion measures) has negligible vulnerability to climatic events.		<input type="checkbox"/>

2. If the project received a **sub-optimal risk rating (H, S)** in the previous reporting period, please state the **actions taken** since then to mitigate the relevant risks and improve the related risk rating. Please also elaborate on reasons that may have impeded any of the sub-optimal risk ratings from improving in the current reporting cycle; please indicate actions planned for the next reporting cycle to remediate this.

N/A

3. Please clarify if the project is facing delays and is expected to request an **extension**.

In order to facilitate the project, discussions on the project extension were held during the Project Steering Committee meeting in January 2024. It was decided to extend the project implementation period until July 31, 2025. In the same month, the Special Equipment Bureau of the State Administration for Market Regulation of China formally submitted an extension request for the Global Environment Facility project to the UNIDO.

In March 2024, with active support from various executing agencies, a four-party online video conference was convened on March 5, 2024, involving Sanjaya Shrestha, project manager from UNIDO, the UNIDO Beijing Office, the International Cooperation Department of the Ministry of Finance of the People's Republic

of China, and the GEF Project Management Office. The meeting confirmed the extension of the project until July 31, 2025, addressing various matters including the extension period.

4. Please provide the **main findings and recommendations of completed MTR**, and elaborate on any actions taken towards the recommendations included in the report.

Findings on standardized review issues and questions

A. Project design assessment

1. Project Design

Original design is still highly relevant to the country context and has the potential to create awareness and capacity for implementing EE of HEC equipment. From today's perspective the project seems to be even more relevant (see also 'country context').

The project outputs and activities are in line with Chinese government and SAMR priorities as well as with UNIDO's focus on SDG 9 and GEF strategies on GHG reduction. All interviewed stakeholders have stressed the need for this kind of project. Project results can be used to support China's enhanced goals on GHG reduction and countries using Chinese technology and products.

The project has also shown flexibility and several components and activities have been adapted to actual needs (e.g. Covid restriction, selection of trainers).

2. Project Results Framework

Project components and activities are well-targeted, clear and consistent, but not all components are fully visible. The Project Results Framework, which includes objectively verifiable indicators, is well designed. Feasible indicators are provided for outputs; most of the targets provided are consistent with the activities described. The resulting chain from outputs, outcomes to impact is logical and SMART (Specific, Measurable, Attainable, Relevant and Time-bound).

For a few activities, proper indicators are missing, and means for verifications are not clear. For example, for output "1.3 Dissemination campaign" a SMART target is not given. For output 2.2

"6 national testing laboratories established" it is not clearly defined how monitoring can be done, as the project is only supporting specific test equipment for one of these labs. Other labs are directly funded by Chinese government.

Last but not least, the impact of revised standards to the "Chinese landscape of EE HEC equipment" cannot be completely evaluated. If the project is successful, many investments will happen without the knowledge of the project team.

Recommendations

- PMO has to prepare project Status (activity based)[During MTR RT has supported PMO to prepare project result framework and current status], financial reports and an updated workplan.
- With these documents a 2 days' workshop for UNIDO and PMO team with professional (external) moderation should be organized to:
 - solve project management issues, esp. financial reporting and pending payments
 - jointly 're-think' project design (intervention logic and detailed activities) and amend PRF (if needed) and activities
 - agree on a work plan with realistic time frame to achieve all objectives as planned (in project documents) or to achieve jointly revised objectives and indicators
 - use outputs from the workshop to come up with a decision on project extension and inform stakeholders accordingly.
- PMO should develop and implement effective project management and monitoring system, including the evaluation of co-finance, possibly with external support.
- PMO should immediately engage an expert to design the framework to calculate and monitor CO2 and GHG emission reductions. UNIDO has vast experience in doing this work and can support to find the right person or to develop the framework themselves.
- PMO should update the reporting system for in-service boiler to enable stakeholders to utilize information covered in database (Output 1.2). The data can be utilised to select specific industries for tailor-made trainings and/or awareness campaigning, and to support the marketing of EE HEC equipment. If quality data is provided and database is designed accordingly, it will enable and support the calculation of GHG reduction (indirect savings).
- PMO supported by UNIDO should immediately solve payment issues for procurement process for Oil and Gaseous Fuel Burners) Testing Laboratory, as further delays might lead to extra costs. UNIDO HQ could consider engaging UNIDO Beijing team to offer training and support to PMO staff on financial reporting and monitoring, this might help to foster a solution.

- PMO should review PRF and 'Detailed Project Activities' from Endorsement Document to ensure consistence of the targets and indicators. For example, targets for activity 3.1.3 (train 10.000 boiler operators and 3.1.4 training for 300 equipment manufacturers and vendors) are not reflected in PRF.
- PMO should refocus on steam system optimization. At the moment the project has a strong focus on EE technologies, while system optimization is ignored.
- PMO should review targets for Output 3.1 and expand training for enterprises.
- PMO should select '50 practitioners' (Output 3.2) accordingly and train them at the earliest, as their support is needed to work on output 3.3 and 4.1 and part of their practical trainings. If overseas travel is not possible, in-country and online trainings should be considered.
- PMO should clarify the need for training on "Improve capacities for the financial evaluation of industrial energy efficiency projects in 100 enterprises" and incorporate financial element (Output 3.4) in trainings targeting enterprises.
- PMO should review the target for Output 3.3 (75 in depth assessment) and accelerate the testing. They should also clarify the intervention logic between Output 3.3 and Output 4, i. e. how the test is linked to demonstration.
- PMO should clarify intervention logic and review the targets for Output 4 and accelerate the implementation of activities, with special focus on monitoring results including CO2 emission reduction.
- PMO should put a stronger focus on project marketing, e. g. designing project logo and website. This will be needed to support the dissemination campaign. If a project extension is given an internal communication and knowledge management strategy should also be developed and introduced.
- PMO should record, summarise and disseminate knowledge products, e. g. training materials, case studies and best practices. A web-based platform can support these activities.
- PMO should focus on Gender mainstreaming as per project documents and engage a gender expert to include gender analysis in M&E work plan (see endorsement document page 23).
- Robust communication channels should be established between UNIDO and PMO team. Both parties have to agree on communication protocols and frequency of online meetings.
- UNIDO should support the PMO to identify more opportunities to interact with international expertise through seminars and workshops. Several stakeholders mentioned the value of discussion with experts from abroad.
- PMO should make use of UNIDOs trainings and experts on SSO (see detailed activities 3.2.1.-3.2.5). UNIDO should provide necessary support.
- UNIDO GEF coordinator may play a more active role to clarify project issues, e.g. regarding the monitoring of in-kind contributions, materialization of co-finance and needed amendments for project execution.
- UNIDO should elaborate on accounting rules with SAMR and clarify the co-financing rules with GEF focal point. SAMR should start monitoring in-kind contributions and co-financing with support from UNIDO.
- To enable measuring savings from the demonstration project, collect a baseline before the start of implementation. After enterprises implement the energy-efficient measures for 6-12 months, final saving results can be collected and measured and the overall direct CO2 savings can be evaluated.
- Given that China is a major exporter of industrial boilers and HEC equipment, it will add value to the project if the PMO could consider how to ensure that boilers for exports also fulfil the new standards and to explore what kind of support and training producers and exporters will need.

IV. Environmental and Social Safeguards (ESS)

1. As part of the requirements for **projects from GEF-6 onwards**, and based on the screening as per the UNIDO Environmental and Social Safeguards Policies and Procedures (ESSPP), which category is the project?

Category A project

Category B project

Category C project

(By selecting Category C, I confirm that the E&S risks of the project have not escalated to Category A or B).

Notes on new risks:

- If new risks have been identified during implementation due to changes in, i.e. project design or context, these should also be listed in (ii) below.
- If these new/additional risks are related to Operational Safeguards # 2, 3, 5, 6, or 8, please consult with UNIDO GEF Coordination to discuss next steps.
- Please refer to the UNIDO [Environmental and Social Safeguards Policies and Procedures \(ESSPP\)](#) on how to report on E&S issues.

Please expand the table as needed.

	E&S risk	Mitigation measures undertaken during the reporting period	Monitoring methods and procedures used in the reporting period
(i) Risks identified in ESMP at time of CEO Endorsement			
(ii) New risks identified during project implementation (if not applicable, please insert 'NA' in each box)			

V. Stakeholder Engagement

1. Using the previous reporting period as a basis, please provide information on **progress, challenges and outcomes** regarding engagement of stakeholders in the project (based on the Stakeholder Engagement Plan or equivalent document submitted at CEO Endorsement/Approval).

Project Steering Committee (PSC)' s members include MOF, SAMR, UNIDO, CSEI and CPASE.

Besides hosting the PMO, CSEI has assumed multi-functional role in the delivery of technical activities, including standard development, lab building, training and testing. It also provides technical advice to SAMR. CSEI, with a strong network of testing and enforcement agencies, has organised several training for these audiences and some project meetings.

With the large-scale promotion of the project, we have also invited many previously collaborated and newly added stakeholders as our partners.

The China Promotion Association for Special Equipment Safety and Energy-Saving(CPASE) and the China Boiler and Boiler and Water Treatment Association are national, industrial, and non-profit social organizations voluntarily formed by units and individuals in the field of special equipment, playing a key role in the field of special equipment in China. At present, the project office utilizes these associations' platforms to release various publicly available information, solicitation notices, and other information related to the national industry. Given their extensive training experience in the field of special equipment industry, we have also entrusted them with organizing some standard research activities and training activities.

Stakeholders for Research and development of regulations and standards:

Harbin Institute of Technology, Xi'an Jiaotong University, Shandong University, Shenyang University of Chemical Technology, and China Jiliang University. Harbin Institute of Technology and Xi'an Jiaotong University are top research institutions in China in the industrial sector and undertake advanced research tasks related to high-energy-consuming equipment. In the project, we have also commissioned them to handle tasks such as the evaluation methods and indicators for shell-and-tube heat exchangers, as well as research on efficiency curves for boilers and steam systems. Shenyang University of Chemical Technology and Shandong University are also leading institutions in the field of high-energy-consuming equipment

research in China. We have tasked them for research on indicators for operating boilers and biomass boilers. Given the authority of China Jiliang University in relevant domestic fields, we have commissioned them to develop a guideline system for industrial heating systems and high-energy-consuming equipment efficiency promotion projects, providing guidance for the pilot demonstration construction of the project.

Stakeholders for Boiler Operator training and high energy consuming equipment user enterprises testing & improvement activities:

1. Shunde Testing Institute of Guangdong Special Equipment Testing Research Institute: Responsible for training 2,200 boiler operators in Guangdong and Fujian provinces, and performing energy-saving and environmental protection tests and energy efficiency improvement for 25 energy-consuming units. ***Given the institute's demonstrated experience and strength in current projects, the project office plans to collaborate with this institute for the first batch of pilot demonstration construction work.**

2. Jiangsu Special Equipment Safety Supervision and Inspection Research Institute: Responsible for training 1,000 boiler operators in Jiangsu Province and performing energy-saving and environmental protection tests and energy efficiency improvement for 10 energy-consuming units.

3. Zhejiang Special Equipment Research Institute: Responsible for training 1,000 boiler operators in Zhejiang Province and performing energy-saving and environmental protection tests and energy efficiency improvement for 15 energy-consuming units.

***Considering that Jiangsu and Zhejiang are economically strong provinces and major users of high-energy-consuming equipment, the strong capabilities of these provincial special equipment institutions make them suitable for pilot demonstration construction activities.**

4. Sichuan Special Equipment Inspection Research Institute: Responsible for training 1,000 boiler operators in Sichuan Province and performing energy-saving and environmental protection tests and energy efficiency improvement for 15 energy-consuming units.

5. Shaanxi Special Equipment Inspection and Testing Research Institute: Responsible for training 500 boiler operators in Shaanxi Province and performing energy-saving and environmental protection tests and energy efficiency improvement for 10 energy-consuming units.

6. Hubei Special Equipment Inspection and Testing Research Institute: Responsible for training 600 boiler operators in Hubei Province and performing energy-saving and environmental protection tests and energy efficiency improvement for 5 energy-consuming units.

7. Hebei Special Equipment Supervision and Inspection Research Institute: Responsible for training 1,000 boiler operators in Hebei Province and performing energy-saving and environmental protection tests and energy efficiency improvement for 10 energy-consuming units.

8. Qingdao Special Equipment Inspection Research Institute: Responsible for training 600 boiler operators in Shandong Province and performing energy-saving and environmental protection tests and energy efficiency improvement for 7 energy-consuming units.

9. Jiangxi Boiler Pressure Vessel Inspection and Testing Research Institute: Responsible for training 600 boiler operators in Jiangxi Province and performing energy-saving and environmental protection tests and energy efficiency improvement for 7 energy-consuming units.

10. Guangxi Zhuang Autonomous Region Special Equipment Inspection Research Institute: Responsible for training 600 boiler operators in Guangxi Zhuang Autonomous Region and performing energy-saving and environmental protection tests and energy efficiency improvement for 7 energy-consuming units.

11. Shanghai Special Equipment Supervision and Inspection Technology Research Institute: Responsible for training 600 boiler operators in Shanghai and performing energy-saving and environmental protection tests and energy efficiency improvement for 7 energy-consuming units.

12. Chongqing Special Equipment Testing Research Institute: Responsible for training 600 boiler operators in Chongqing and performing energy-saving and environmental protection tests and energy efficiency improvement for 7 energy-consuming units.

13. Xinjiang Uyghur Autonomous Region Special Equipment Inspection Research Institute: Responsible for training 300 boiler operators in Xinjiang Uyghur Autonomous Region.

2. Please provide any feedback submitted by national counterparts, GEF OFP, co-financiers, and other partners/stakeholders of the project (e.g. private sector, CSOs, NGOs, etc.).

N/A

3. Please provide any **relevant stakeholder consultation** documents.

The documents which will be submitted in addition to the report.:

- 4866_ PSC Meeting Minutes
- 4866_ GEF Enterprise Management and Technical Personnel Training Project with Boiler Manufacturing Enterprises
- 4866_ Fujian Boiler Operator Training Report
- 4866_ Guangdong Boiler Operator Training Report
- 4866_ Jiangsu Boiler Operator Training Report
- 4866_ Shaanxi Boiler Operator Training Report

VI. Gender Mainstreaming

1. Using the previous reporting period as a basis, please report on the **progress achieved on implementing gender-responsive measures and using gender-sensitive indicators**, as documented at CEO Endorsement/Approval (in the project results framework, gender action plan or equivalent),.

In China, there is a significant disparity in the proportion of men and women engaged in the field of special equipment engineering, but the project office still strives to contribute to the industry on the issue of gender equality as much as possible.

1. During the international energy efficiency expert training for 60 industry leaders from across the country, we actively encouraged female participation in the training. Out of the 60 participants, there were 8 women. While this represents a relatively low overall proportion, considering the ratio of female practitioners in the entire high-energy-consuming industrial equipment sector in China, the participation of women in this training session represents a relatively high level.

2. During the project execution process, we also actively welcomed women to join the project team, either as project experts or stakeholders, to contribute to the advancement of the project. Dr. Liu continues to serve as the project's procurement expert, actively coordinating efforts related to enhancing laboratory capabilities for Project Output 2.

VII. Knowledge Management and Communication

1. Using the previous reporting period as a basis, please elaborate on any **knowledge management and communication activities / products**, as documented at CEO Endorsement / Approval.

1. (Chinese)Template for Boiler Operator training report (see attachments)

Considering the large-scale of the operator training(over 10,000 people), the PMO design this template for every training organizers to collect datas include Overview of work, training plan, training implementation process, course preparation, on-site arrangements, personnel schedule, attendance sheet, feedback records, on-site media materials, and other aspects. Every officially confirmed training report will be collected by the PMO for review and translate, and submit to the UNIDO.

2. Please list any **relevant knowledge management and communication mechanisms / tools** that the project has generated.

Please list the relevant knowledge management and communication covimechanisms/tools and any documents that will be submitted in addition to the report, e.g.:

- *online information exchange/sharing platforms*
- *relevant technical reports*

- *Link to project websites, videos, publications*
- *flyers, etc.*

All attachments are to be named as per the GEF required format, i.e.: "GEFID_Document Title", e.g. 9714_Flyer.

VIII. Implementation progress

1. Using the previous reporting period as a basis, please provide information on **progress, challenges and outcomes achieved/observed** with regards to project implementation.

Component 1

Building on the foundation of the previous regulatory standard work, efforts continue to advance the development of the national standard "Uncertainty of Boiler Energy Efficiency Testing." A draft for public consultation has been formulated. Additionally, a series of group standards revision tasks have been arranged to further enhance China's regulatory framework for energy efficiency in special equipment. Under UNIDO's guidance, projects have been entrusted to institutions such as Harbin Institute of Technology, Xi'an Jiaotong University, Shandong University, Shenyang University of Chemical Technology, and China University of Metrology to promote the development of energy efficiency indicators for boilers and shell-and-tube heat exchangers, as well as guidelines for the application of energy-saving technology products. This includes proposing energy efficiency curve models for boilers and steam systems to guide energy-using units in optimizing the operation of their equipment systems.

Component 2

Firstly, the procurement and installation of the Laser-Induced Fluorescence Testing System (PLIF) have been completed. This will fully support the China Special Equipment Inspection and Research Institute in conducting boiler combustion testing research according to project requirements.

Secondly, the China Special Equipment Safety and Energy Conservation Promotion Association was commissioned to conduct a capability comparison among boiler energy efficiency testing institutions starting October 2023. This involved testing the institutions' proficiency in boiler energy efficiency knowledge, simulation of testing activities, and issuance of evaluation reports to identify existing issues. The goal was to further enhance their service capabilities. The event attracted approximately 110 technical representatives from over 30 boiler energy efficiency testing institutions nationwide and achieved positive outcomes.

Component 3

For training personnel in boiler manufacturing enterprises and user units, the China Boiler and Boiler Water Treatment Association has been entrusted with conducting energy-saving knowledge training for no fewer than 1300 technical personnel. As of now, five training sessions have been conducted in locations such as Changchun, Jilin; Wuxi, Jiangsu; Zhoukou, Henan; and Xi'an, Shaanxi, training approximately 600 individuals. Additionally, energy-saving knowledge training for boiler operators involved a bidding process that commissioned relevant inspection agencies in 14 regions including Hebei, Jiangsu, Zhejiang, Fujian, Guangdong, Shaanxi, Sichuan, Hubei, Xinjiang, Guangxi, Jiangxi, Shanghai, Chongqing, and Shandong, training over 10,600 boiler operators. International energy efficiency expert training was also conducted, with the China Special Equipment Safety and Energy Conservation Promotion Association organizing concentrated lectures for 60 registered participants from national inspection agencies, manufacturing enterprises, and energy-saving service companies in late August to early September 2023. This initiative included onsite lectures by academicians, Changjiang Scholars, outstanding young scientists, and foreign experts to further enhance the working capabilities and comprehensive qualities of the participants, forming a new generation of experts in China and enhancing the technical support capabilities of technical institutions.

Component 4

Firstly, specialized technical institutions were commissioned to conduct no fewer than 125 boiler and heat exchanger energy efficiency testing and evaluation activities in Hebei, Jiangsu, Zhejiang, Fujian, Guangdong, Shaanxi, Sichuan, and Hubei. These activities aimed to provide technical support such as energy-saving diagnosis and confirmation of retrofitting effects for enterprises, guiding them to enhance their operational management capabilities and identify potentially scalable energy-saving technologies.

Secondly, China Energy Conservation Consulting Co., Ltd. was commissioned to research and develop energy-saving technology promotion plans for projects, organizing experts to review relevant technical products. Currently, screening has been completed for over 40 technologies, with 9 technologies identified as key focuses for future work. Thirdly, the commissioning of specialized technical institutions continues in Guangxi, Jiangxi, Shanghai, Chongqing, and Shandong to conduct 35 boiler and heat exchanger energy efficiency testing and evaluation activities based on feedback from UNIDO project managers and national policy requirements.


2. Please briefly elaborate on any **minor amendments**⁶ to the approved project that may have been introduced during the implementation period or indicate as not applicable (NA).

Please tick each category for which a change has occurred and provide a description of the change in the related textbox. You may attach supporting documentation, as appropriate.

<input type="checkbox"/>	Results Framework	
<input type="checkbox"/>	Components and Cost	
<input type="checkbox"/>	Institutional and Implementation Arrangements	
<input type="checkbox"/>	Financial Management	
<input type="checkbox"/>	Implementation Schedule	
<input type="checkbox"/>	Executing Entity	
<input type="checkbox"/>	Executing Entity Category	
<input type="checkbox"/>	Minor Project Objective Change	
<input type="checkbox"/>	Safeguards	
<input type="checkbox"/>	Risk Analysis	
<input type="checkbox"/>	Increase of GEF Project Financing Up to 5%	
<input type="checkbox"/>	Co-Financing	
<input type="checkbox"/>	Location of Project Activities	
<input type="checkbox"/>	Others	

3. Please provide progress related to the **financial implementation** of the project.

⁶ As described in Annex 9 of the *GEF Project and Program Cycle Policy Guidelines*, **minor amendments** are changes to the project design or implementation that do not have significant impact on the project objectives or scope, or an increase of the GEF project financing up to 5%.

 Grant Delivery Report	Sponsor	400150 - GEF - Global Environment Facility	Fund	GF	Reporting Period	08.12.2014 - 30.06.2024
	Grant	2000002880	Grant Status	Authority to implement	Grant Validity	08.12.2014 - 31.07.2025
	Other Reference	4866-U3-PJ-FS-GR-01	Currency	USD	Prepared on	22.07.2024
	Project	100283	PROMOTING ENERGY EFFICIENCY IN INDUSTRIAL HEAT SYSTEMS AND HIGH ENERGY-CONSUMING (HEC) EQUIPMENT			

Project	Budget Line	Description	Total Budget (a)	Released Budget (b)	Obligations (c)	Disbursements (d)	Expenditures (e=c+d)	Funds Available* (f=b-e)	Support Cost (g)	Total Expenditures (h=e+g)
100283	1100	Staff & Intern Consultants	36,000.00	36,000.00	0.00	0.00	0.00	36,000.00	0.00	0.00
	1500	Local Travel	60,000.00	60,000.00	0.00	0.00	0.00	60,000.00	0.00	0.00
	1700	Nat. Consult./Staff	(35,000.00)	(35,000.00)	0.00	8,541.54	8,541.54	(43,541.54)	0.00	8,541.54
	2100	Contractual Services	(65,728.30)	(65,728.30)	0.00	0.00	0.00	(65,728.30)	0.00	0.00
	5100	Other Direct Costs	4,728.30	4,728.30	(16.08)	38.56	22.48	4,705.82	0.00	22.48
	9300	Support Cost	0.00	0.00	0.00	0.00	0.00	0.00	856.42	856.42
100283			(0.00)	(0.00)	(16.08)	8,580.10	8,564.02	(8,564.02)	856.42	9,420.44
Grant Total			(0.00)	(0.00)	(16.08)	8,580.10	8,564.02	(8,564.02)	856.42	9,420.44

* Does not include Unapproved Obligations

IX. Work Plan and Budget

1. Please provide an **updated project work plan and budget** for the remaining duration of the project, as per last approved project extension. Please expand/modify the table as needed.

Please fill in the below table or make a reference to a file, in case it is submitted as an annex to the report.

Outputs by Project Component	Year 1				Year 2				Year 3				GEF Grant Budget Available (US\$)	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Component 1 –Policy and market promotion														
Outcome: Enhanced regulatory framework that will enable HEC user to adopt energy efficiency measures and government institutions to monitor compliance, including a knowledge management tool														
Output 1.1: National technical regulations on energy efficiency for HEC special equipment (boilers and heat exchangers) are revised and improved through the implementation of innovative systemic approaches			√	√	√	√	√	√	√	√				150,000
Output 1.2: A reporting system is designed and implemented to allow inspection agencies to collect data from service boilers systematically			√	√	√	√	√	√	√	√				
Output 1.3 A national awareness raising and dissemination campaign is developed and implemented			√	√	√	√	√	√	√	√				10,000
Component 2 –Capacity Building activities (Government)														
Outcome: The AQSIQ (SAMR) has the capacities required to enforce the technical regulations, and testing capabilities are enhanced to facilitate the implementation of a systems optimization approach and the use of energy efficient equipment														
Output 2.1: The capacities of the HEC Special Equipment Energy Efficiency Testing Centre are upgraded							√	√	√	√				40,000
Output 2.2: National testing														

laboratories are established and have the competencies to verify and test against the new technical regulations														
Component 3 –Capacity Building activities (enterprises)														
Outcome: A cadre of highly specialized system optimization experts from public and private sectors are available as a long term technical resource to industry and the country. Enterprises awareness on measures and new technologies and EE financing mechanisms is increased.														
Output 3.1: Awareness on the concept of energy efficiency focused on optimization of steam systems and heat recovery systems is raised amongst 1000 representatives of selected stakeholder groups (inspection agencies, equipment manufacturers, enterprises, consultants)	√	√	√	√	√	√	√	√	√	√				525,000
Output 3.2: 50 candidates are trained to become national energy practitioners on steam and heat recovery systems optimization	√	√	√	√										
Output 3.3: 75 in-depth system assessments are completed in manufacturing facilities to identify energy conservations					√	√	√	√	√	√				75,000
Output 3.4: Awareness and promotion workshop for 1000 managers and technical personnel of enterprises (0.5 days). Training of 100 national trainers who will train operators in the user training steam systems optimization (SSO) and heat recovery system optimization (HRSO). Training for 10,000 boiler operators (user). Dedicated training to 300 equipment manufacturers and vendors (0.5 days).					√	√	√	√	√	√				15,000
Component 4 –Demonstration of energy efficient equipment implementation and operation														
Outcome: New efficient technologies are demonstrated at national level to serve as case studies for future investments														
Output4.1 : New technologies: at least 5 of the companies trained adopt measures and replace equipment with more efficient technologies	√	√	√	√	√	√	√	√	√	√				210,000
Output4.2 : Industries implement the systems optimization measures identified during the in depth systems assessments					√	√	√	√	√	√				740,000
Component 5 –Monitoring and Evaluation														
Outcome: A robust mechanism for the monitoring and evaluation is put in place to ensure the attainment of project outcomes														
Output 5.1: Project monitoring plan is designed														234,000
Output 5.2: Mid-term and final project evaluations are conducted			√	√										
Output 5.3: As part of the terminal evaluation follow-up actions recommendation are determined for long term project sustainability									√	√	√	√		

X. Synergies

1. **Synergies** achieved:

N/A

3. **Stories to be shared** (Optional)

N/A

XI. GEO LOCATION INFORMATION

The Location Name, Latitude and Longitude are required fields insofar as an Agency chooses to enter a project location under the set format. The Geo Name ID is required in instances where the location is not exact, such as in the case of a city, as opposed to the exact site of a physical infrastructure. The Location & Activity Description fields are optional. Project longitude and latitude must follow the Decimal Degrees WGS84 format and Agencies are encouraged to use at least four decimal points for greater accuracy. Users may add as many locations as appropriate. Web mapping applications such as [OpenStreetMap](#) or [GeoNames](#) use this format. Consider using a conversion tool as needed, such as: <https://coordinates-converter.com> Please see the Geocoding User Guide by clicking [here](#)

Location Name	Latitude	Longitude	Geo Name ID	Location and Activity Description
State Administration of Marketing Regulation	39.971338	116.37238		
China Special Equipment Institute	39.966159	116.408923		
CPASE	39.967426	116.408762		

Please provide any further geo-referenced information and map where the project interventions is taking place as appropriate.

EXPLANATORY NOTE

1. **Timing & duration:** Each report covers a twelve-month period, i.e. 1 July 2023 – 30 June 2024.
2. **Responsibility:** The responsibility for preparing the report lies with the project manager in consultation with the Division Chief and Director.
3. **Evaluation:** For the report to be used effectively as a tool for annual self-evaluation, project counterparts need to be fully involved. The (main) counterpart can provide any additional information considered essential, including a simple rating of project progress.
4. **Results-based management:** The annual project/programme progress reports are required by the RBM programme component focal points to obtain information on outcomes observed.

Global Environmental Objectives (GEOs) / Development Objectives (DOs) ratings	
Highly Satisfactory (HS)	Project is expected to achieve or exceed <u>all</u> its major global environmental objectives, and yield substantial global environmental benefits, without major shortcomings. The project can be presented as "good practice".
Satisfactory (S)	Project is expected to <u>achieve most</u> of its <u>major</u> global environmental objectives, and yields satisfactory global environmental benefits, with only minor shortcomings.
Moderately Satisfactory (MS)	Project is expected to <u>achieve most</u> of its major <u>relevant</u> objectives but with either significant shortcomings or modes overall relevance. Project is expected not to achieve some of its major global environmental objectives or yield some of the expected global environmental benefits.
Moderately Unsatisfactory (MU)	Project is expected to achieve <u>some</u> of its major global environmental objectives with major shortcomings or is expected to <u>achieve only some</u> of its major global environmental objectives.
Unsatisfactory (U)	Project is expected <u>not</u> to achieve <u>most</u> of its major global environmental objectives or to yield any satisfactory global environmental benefits.
Highly Unsatisfactory (HU)	The project has failed to achieve, and is not expected to achieve, <u>any</u> of its major global environmental objectives with no worthwhile benefits.

Implementation Progress (IP)	
Highly Satisfactory (HS)	Implementation of <u>all</u> components is in substantial compliance with the original/formally revised implementation plan for the project. The project can be presented as "good practice".
Satisfactory (S)	Implementation of <u>most</u> components is in substantial compliance with the original/formally revised plan except for only few that are subject to remedial action.
Moderately Satisfactory (MS)	Implementation of <u>some</u> components is in substantial compliance with the original/formally revised plan with some components requiring remedial action.
Moderately Unsatisfactory (MU)	Implementation of <u>some</u> components is <u>not</u> in substantial compliance with the original/formally revised plan with most components requiring remedial action.
Unsatisfactory (U)	Implementation of <u>most</u> components in <u>not</u> in substantial compliance with the original/formally revised plan.
Highly Unsatisfactory (HU)	Implementation of <u>none</u> of the components is in substantial compliance with the original/formally revised plan.

Risk ratings	
Risk ratings will assess the overall risk of factors internal or external to the project which may affect implementation or prospects for achieving project objectives. Risk of projects should be rated on the following scale:	
High Risk (H)	There is a probability of greater than 75% that assumptions may fail to hold or materialize, and/or the project may face high risks.
Substantial Risk (S)	There is a probability of between 51% and 75% that assumptions may fail to hold or materialize, and/or the project may face substantial risks.
Moderate Risk (M)	There is a probability of between 26% and 50% that assumptions may fail to hold or materialize, and/or the project may face only moderate risk.
Low Risk (L)	There is a probability of up to 25% that assumptions may fail to hold or materialize, and/or the project may face only low risks.