



## Project Implementation Report

(1 July 2021 – 30 June 2022)

<b>Project Title:</b>	<i>Promoting Energy Efficiency in Industrial Heat Systems and High Energy-consuming (HEC) Equipment</i>
<b>GEF ID:</b>	4866
<b>UNIDO ID:</b>	100283
<b>GEF Replenishment Cycle:</b>	GEF-5
<b>Country(ies):</b>	<i>P.R. China</i>
<b>Region:</b>	<i>EAP - East Asia and Pacific</i>
<b>GEF Focal Area:</b>	<i>Climate Change Mitigation (CCM)</i>
<b>Integrated Approach Pilot (IAP) Programs<sup>1</sup>:</b>	<i>N/A</i>
<b>Stand-alone / Child Project:</b>	<i>Stand-alone</i>
<b>Implementing Department/Division:</b>	<i>ENE / ETI</i>
<b>Co-Implementing Agency:</b>	<i>N/A</i>
<b>Executing Agency(ies):</b>	<i>Special Equipment Safety Supervision Bureau (SESA) of the State Administration for Market Regulation (SAMR)</i>
<b>Project Type:</b>	<i>Full-Sized Project (FSP)</i>
<b>Project Duration:</b>	48
<b>Extension(s):</b>	<i>second extension (24 months)</i>
<b>GEF Project Financing:</b>	<i>USD 5,375,000</i>
<b>Agency Fee:</b>	<i>USD 537,500</i>
<b>Co-financing Amount:</b>	<i>USD 40,500,000</i>
<b>Date of CEO Endorsement/Approval:</b>	10/14/2014
<b>UNIDO Approval Date:</b>	3/12/2014
<b>Actual Implementation Start:</b>	8/12/2014
<b>Cumulative disbursement as of 30 June 2022:</b>	4,931,915.38
<b>Mid-term Review (MTR) Date:</b>	8/7/2021
<b>Original Project Completion Date:</b>	1/31/2023
<b>Project Completion Date as reported in FY21:</b>	1/31/2024
<b>Current SAP Completion Date:</b>	1/31/2024
<b>Expected Project Completion Date:</b>	1/31/2024

<sup>1</sup> Only for GEF-6 projects, if applicable

Expected Terminal Evaluation (TE) Date:	3/31/2024
Expected Financial Closure Date:	1/31/2025
UNIDO Project Manager <sup>2</sup> :	Sanjaya SHRESTHA

## I. Brief description of project and status overview

Project Objective		
<p><i>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.</i></p>		
Project Core Indicators		Expected at Endorsement/Approval stage
A	<i>Incremental direct CO<sub>2</sub>eq emission reductions (tons of CO<sub>2</sub>eq)</i>	<i>Cumulative Direct emission reductions of 2,423 ktCO<sub>2</sub> Cumulative post project direct emission reduction of 912,889 ktCO<sub>2</sub></i>
B	<i>Incremental indirect CO<sub>2</sub>eq emission reductions (tons of CO<sub>2</sub>eq)</i>	<i>Indirect emission reduction of up to 2,339,723 ktCO<sub>2</sub> (as a result of the wide implementation of the equipment standards)</i>
C	<i>Specific energy consumption of selected enterprises</i>	<i>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</i>
1	<i>National technical regulations on energy efficiency for HEC special equipment are adopted</i>	<i>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</i>
2	<i>A reporting system from in service boilers is available</i>	<i>A reporting system is created and database is populated</i>
3	<i>A dissemination campaign is conducted</i>	<i>Awareness has been raised amongst selected stakeholders</i>
4	<i>The analytical capacities of the HEC Special Equipment Energy Efficiency Testing Centre are upgraded</i>	<i>100 CSEI staff and regional inspectors are trained in the analysis of data collected from the enterprises (gender disaggregated)</i>
5	<i>6 national testing laboratories have the competencies to verify and test against the new technical regulations</i>	<i>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</i>
6	<i>Number of stakeholders with increased</i>	<i>1000 representatives of selected stakeholder</i>

<sup>2</sup> Person responsible for report content

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

#### **Baseline**

*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.*

*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 newtypes of specialized heat exchanger designs for niche applications.*

Please refer to the explanatory note at the end of the document and select corresponding ratings for the current reporting period, i.e. FY22. Please also provide a short justification for the selected ratings for FY22.

In view of the GEF Secretariat's intent to start following the ability of projects to adopt the concept of adaptive management<sup>3</sup>, 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 and circumstances or understanding. In order to facilitate with this assessment, please introduce the ratings as reported in the previous reporting cycle, i.e. FY21, in the last column.

<sup>3</sup> 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

Overall Ratings <sup>4</sup>	FY22	FY21
Global Environmental Objectives (GEOs) / Development Objectives (DOs) Rating	<i>Satisfactory (S)</i>	<i>Satisfactory (S)</i>
<i>The concluded Midterm Review of this project has categorically highlighted the importance and relevance of this project in spite of early delay in the project execution and also past two years disruption due to Covid-19. Therefore relevance of the project and GEOs /Dos rating is still satisfactory as reported in the past PIRs.</i>		
Implementation Progress (IP) Rating	<i>Satisfactory (S)</i>	<i>Moderately Satisfactory (MS)</i>
<p><i>Compare to past year when the China was heavily affected by the Covid-19 case, the implementation progress was relatedly better this year. This has happened due to effective control of the pandemic in China and project team's ability to work online. Therefore some progress were made in the formulation and revision of regulations and standards, and online personnel training of stakeholders.</i></p> <p><i>Still the situation in the country was far from ideal and spread of new waves throughout the reporting period has affected demonstration and testing activities. The travel restriction and stringent norm of quarantine and strict maintenance of social distancing has also affected scheduled work such as cross provincial testing and offline training programme.</i></p>		
Overall Risk Rating	<i>Moderate Risk (M)</i>	<i>Moderate Risk (M)</i>
<i>The risk for the project remains the same like past year i.e. Covid-19 and travel restriction that has affected the project execution for past two year.</i>		

## 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 to-date
<b>Component 1 – Policy and market promotion</b>				
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	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	<b>Annex 1</b> 1.1.1: 1. Promulgated the industry standard "Industrial Boiler System Energy Utilization Efficiency Index and Classification" (NB/ T 47061-2017) 2. Promulgation of the national standard "Energy-saving management requirements for industrial boiler systems" (GB/T 38553-2020)

<sup>4</sup> 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

revised and improved through the implementation of innovative systemic approaches			reflect these methods	<p>1.1.4 Promulgate the technical specification "Boiler Energy-saving and Environmental Protection Technical Regulations" (TSG G91-2021)</p> <p>1.1.6 1. Promulgate the industry standard "Guidelines for Energy Efficiency Evaluation of Industrial Boiler Systems" (NB/T 47035-2013) 2. Formation of "Technical Guidelines for Cold Start-up and Commissioning of Industrial Boilers" (draft for approval)</p>
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	1.2.1 CSEI has commissioned relevant institutions to build a "platform for calculating and managing energy efficiency test data of industrial boilers", which has been put into use.
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	Beijing Beijia Ltd. was commissioned to develop and build the project website, which was officially put into use in late December 2021 and is hosted under the server of the CPASE. <a href="http://gef-hec.cpase.org.cn">http://gef-hec.cpase.org.cn</a>
<b>Component 2 – Capacity Building activities (Government)</b>				
Outcome 1: 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	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)	2.1.3 Completed procurement process for Planar Laser Induced Fluorescence detection system (PLIF)
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	2.2.2 - 2.2.6 Relying on the CSEI Shunyi base construction has been completed.
<b>Component 3 – Capacity Building activities (enterprises)</b>				
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,	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)	<p>3.1.1 Commissioned the China Chemical Industrial Equipment Association to carry out training on energy-saving knowledge for enterprise managers, 30 people will be trained in 2022.</p> <p>3.1.3 1. Commissioned Shanghai Junrui Information Technology Co., Ltd. to carry out pilot offline training work, with 300 people to be trained in 2022. 2. Shanghai Junrui Ltd. was commissioned to carry out pilot online training work, with a plan to train 600 people.</p>

enterprises, consultants)				<b>Kindly refer annex 2</b>
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)	3.2.2 Take the online training of output 3.1.3 as an opportunity to explore the direction and collect experience for the operation of the online training platform in the training. The output activities planned to be carried out in the future are planned to be mainly offline, and online training will be supplemented in case of special circumstances.
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	The energy efficiency and environmental protection testing activities of 8 advanced energy-saving products have been completed, and the relevant testing parties are waiting to submit test reports and other supporting materials. This year, it is planned to continue to carry out no less than 6 energy efficiency and environmental protection testing activities.
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	
<b>Component 4 – Demonstration of energy efficient equipment implementation and operation</b>				
Outcome 1: 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	
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	
<b>Component 5 – Monitoring and Evaluation</b>				
Outcome 1: 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	5.1.3 Commissioned Shenyang University of Chemical Technology and other units to carry out "research on carbon emission reduction through energy efficiency testing of boiler products" and "research on the impact and direction of dual carbon targets on industrial heating systems".
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.	

### 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	(i) Risk level FY21	(i) Risk level FY22	(i) Mitigation measures	(ii) Progress to-date	New defined risk <sup>5</sup>
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.	Taking the opportunity of the mid-term review, the PMU has conducted full interviews with the project partners and participants in collaboration with the review experts, and systematically compiled the feelings, experiences, and feedback of the partners' participation in the project.	<input type="checkbox"/>
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.	Through the two and a half years of the project's official implementation, combined with follow-up information dissemination and field visits, a large scale of attention to relevant training has been aroused within the Industry.	<input type="checkbox"/>
4	No immediate demand of services for trained experts	Medium risk	Medium 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.	The training of managers from important agency such as special equipment energy-conservation units has been successful in generating interest in the role played by the experts in the industry.	<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.	The training of managers of relevant special equipment energy-conservation units has been successful in generating interest in the role played by the accepted experts in the industry.	<input type="checkbox"/>
6	Demonstration projects are delayed,	Low Risk	Low Risk	The enterprises selected as demonstration sites for the expert-level training will be carefully screened for management support and implementation	In conjunction with the four testing activities to be completed by the end of	<input type="checkbox"/>

<sup>5</sup> New risk added in reporting period. Check only if applicable.



	limiting the opportunity to disseminate success stories and develop case studies			of the resulting recommendations. These factories are anticipated to provide the initial case studies and thus serve as examples for other factories.	2021 and the more than 50 in-depth testing activities to be conducted, the new technologies identified in the testing will be implemented as pilot companies at any time.	
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 conservation 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 intervention 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 indicate any implication of the **COVID-19** pandemic on the progress of the project.

*Covid 19's new waves in China had serious impact on the promotion of project activities. It has also derailed past year's quick revival plan to expedite project activities and reduce the project delayed targets.*

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

*The project's midterm review report proposed a no cost project extension till 1/31/2024. Assuming the situation will be normal from now onwards, the project would be successfully completed within the revised timeline however if the Covid-19 impacts (directly or indirectly) remain and continue affecting business, travel then the project may need further review.*

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

Some of the main finding and recommendations are mentioned below:

- Use outputs from the workshop to come up with a decision on project extension and inform stakeholders accordingly.
- The PMO should adjust the specific content of each output according to the current status of project advancement
- 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.
- PMO should focus on Gender mainstreaming as per project documents and engage a gender expert to include gender analysis in M&E work plan.
- 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.
- 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.

*NB: The information provided in this section will be used by the GEF Secretariat to measure the project's ability to adopt an [adaptive management approach](#). This will be measured through the assignment of a [project-level proactivity index](#).*

#### 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	NA	NA	NA
(ii) New risks identified during project implementation (if not applicable, please insert 'NA' in each box)	NA	NA	NA

#### 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).

*The Covid19 has affected overall coordination structure and limited the regular monitoring or in person interactions. It has also affected proposed workshop and seminars and other possibilities to engage with stakeholders. However due to midterm review exercise which was initiated in the last PIR reporting and concluding during this reporting period has given a good opportunity to the PMU to interact and engage with all stakeholders. The project team was successful in engaging with all important stakeholders and facilitate scheduled several online meeting as and when requested by the international reviewer. The successful completion of the MTR on time report during the peak of pandemic show the goodwill and interest the project and PMU has among other stakeholders.*

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.).

NA

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



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4866\_Training  
site video 1.mp4



4866\_Training  
site video 2.mp4



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site video 3.mp4

## 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),.

*The project has no major gender streaming related activities during the reporting report.*

## VII. Knowledge Management

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

*During the pandemic time, the project website was designed and officially launched with the help of IT professionally. Though currently the site has limited contents but over the period of time it will be main database centre displaying all project activities and project related news. This site will act as custodian and, store all project information, articles, photo, videos and media coverage. It will improve transparency and allow easy and fast access of information to all stakeholders.*

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

<http://gef-hec.cpase.org.cn>

## 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.**

*During the reporting period following activities were initiated and advanced:*

*Component 1:*

- 1. Promulgated the industry standard "Industrial Boiler System Energy Utilization Efficiency Index and Classification" (NB/ T47061-2017)*
- 2. Promulgation of the national standard "Energy-saving management requirements for industrial boiler systems" (GB/T 38553-2020)*
- 3. Promulgate the technical specification "Boiler Energy-saving and Environmental Protection Technical Regulations" (TSG G91-2021)*
- 4. Promulgate the technical specification "Rules for Testing and Evaluation of Heat Exchanger Energy Efficiency" (TSG R0010-2019)*
- 5. Promulgation of the industry standard "Thermal Performance Test Method for Condensing Boilers" (NB/T 47066-2018)*
- 6. Promulgate the industry standard "Guidelines for Energy Efficiency Evaluation of Industrial Boiler Systems" (NB/T 47035-2013)*
- 7. Formation of "Technical Guidelines for Cold Start-up and Commissioning of Industrial Boilers" (draft for approval)*
- 8. CSEI has commissioned relevant institutions to build a "platform for calculating and managing energy efficiency test data of industrial boilers", which has been put into use.*
- 9. CSEI has commissioned relevant institutions to build a "boiler-type product energy efficiency information release platform", which has been put into use. <http://219.141.207.220/a/pub/Pub/list>*
- 10. Beijing Beijia Ltd. was commissioned to develop and build the project website, which was officially put into use in late December 2021 and is hosted under the server of the CPASE. <http://gef-hec.cpase.org.cn>*

*Component 2:*

- 1. The domestic bidding process has been completed in accordance with the Chinese Ministry of Finance, and the winning service provider has delivered a deposit to the European manufacturer. After the second allocation arrives, the project office will deliver US\$500,000 to the service provider, who will contact the European manufacturer to mail the equipment to China and install it*

*Component 3:*

- 1. Commissioned the China Chemical Industrial Equipment Association to carry out training on energy-saving knowledge for enterprise managers, 30 people have been completed in 2020 and 30 people will be trained in 2022.*
- 2. Commissioned CPASE to train a total of 300 boiler operator training instructors from 2017-2019 (100 per year).*
- 3. Commissioned the CPASE to carry out a training on boiler energy-saving knowledge in 2019, with a total of 200 people trained.*
- 4. Shanghai Junrui Ltd. was commissioned to carry out pilot online training work, with a plan to train 600 people.*
- 5. Conducted 8 in-depth system assessments of SSO and HRSO*

*Component 5:*

- 1. Commissioned Shenyang University of Chemical Technology and other units to carry out "research on carbon emission reduction through energy efficiency testing of boiler products" and "research on the impact and direction of dual carbon targets on industrial heating systems".*

*In the past year, most of the activities carried out were either related with documentation, knowledge materials or conducting online training. Due to Covid-19 and travelling restrictions impacted the project and was unable to make any significant progress in the demonstration work s. Similarly, any international event or knowledge sharing activities involving international experts and industry experts were missing and will remain challenging tasks till the return of complete normal situation.*

2. Please briefly elaborate on any **minor amendments**<sup>6</sup> 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 checked="" type="checkbox"/>	Implementation Schedule	Extension had been granted until 31 Jan 2024 in order to complete the activities delayed due to COVID
<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.


*Based on the project financial audit report the approved expenditure of the project this year was \$251,787. As of December 31, 2021, the cumulative approved expenditure of the project is \$466,466.*

*The UNIDO project delivery report is mentioned below. Two things worth noting here is that the new business model to empower executing agency and providing them complete control of project execution and expenditure in line with approved project document is showing some limitation at the time of execution at the ground. It also shows incorrect information about the project progress during reporting time and missed the standard correlation between project physical progress with the project's financial report or expenditure.*

*For clarity purpose here, under this project more than \$5 million GEF grant was obligated to the executing agency over the years 2016, 2017 and 2018. However, the actual disbursement and fund utilisation was*

<sup>6</sup> 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%.

less than US\$ 500,000. From January to June 2022, the PMU team has worked on this aspect and requested executing agency to provide all transactional details. The SAMR has submitted audited report and financial detail and also requested for the second tranche of disbursement in the tune of \$2.89 million from the obligated fund.

		<b>PROJECT DELIVERY REPORT</b>		Project:	100283 - PROMOTING ENERGY EFFICIENCY IN INDUSTRIAL HEAT SYSTEMS AND HIGH ENERGY-CONSUMING (HEC) EQUIPMENT	Project Manager:	Sanjaya Shrestha	Project Validity:	14.10.2014 - 31.01.2022	Assess
Reporting Period:	08.12.2014 - 30.06.2022	Project Theme:	Energy and Environment	Country:	China	Region:	Asia and Pacific			
Sponsor Nr:	Sponsor	Grant	Grant Description	Fund	Currency	Grant Status	Grant Validity			
400150	GEF - Global Environment Facility	2000002880	CPR - ENERGY EFFICIE	GF	USD	Authority to implement	08.12.2014 - 31.01.2022			

	Description	Released Budget Current Year (a)	Obligations Current Year (b)	Disbursements Current Year (c)	Expenditures Current Year (d=b+c)	Total Agreement Budget (e)	Released Budget (f)	Obligations + Disbursements (g)	Funds Available* (h=f-g)	Support Cost (i)	Total Expenditures (j=g+i)
2000002880		USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
100283-1-02-01	2.1 Capacities of Testing Center upgrade										
2100	Contractual Services	0.22	(382,290.00)	382,290.00	0.00	600,190.22	600,190.22	600,190.00	0.22	0.00	600,190.00
5100	Other Direct Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60,019.00	60,019.00
100283-1-02-01	Total	0.22	(382,290.00)	382,290.00	0.00	600,190.22	600,190.22	600,190.00	0.22	60,019.00	660,209.00
100283-1-04-01	3.1 Awareness on energy efficiency	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
2100	Contractual Services	0.00	(525,317.28)	525,317.28	0.00	525,317.28	525,317.28	525,317.28	0.00	0.00	525,317.28
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52,531.73	52,531.73
100283-1-04-01	Total	0.00	(525,317.28)	525,317.28	0.00	525,317.28	525,317.28	525,317.28	0.00	52,531.73	577,849.01
100283-1-04-02	3.2 50 candidates trained	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
2100	Contractual Services	0.50	(813,372.00)	813,372.00	0.00	813,372.50	813,372.50	813,372.00	0.50	0.00	813,372.00
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81,337.20	81,337.20
100283-1-04-02	Total	0.50	(813,372.00)	813,372.00	0.00	813,372.50	813,372.50	813,372.00	0.50	81,337.20	894,709.20
100283-1-04-03	3.3 75 in-depth system assessments	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
2100	Contractual Services	0.00	(321,850.00)	321,850.00	0.00	321,850.00	321,850.00	321,850.00	0.00	0.00	321,850.00
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32,185.00	32,185.00
100283-1-04-03	Total	0.00	(321,850.00)	321,850.00	0.00	321,850.00	321,850.00	321,850.00	0.00	32,185.00	354,035.00
100283-1-04-04	3.4 Capacities for financial evaluation	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
2100	Contractual Services	0.00	(40,770.00)	40,770.00	0.00	40,770.00	40,770.00	40,770.00	0.00	0.00	40,770.00
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,077.00	4,077.00
100283-1-04-04	Total	0.00	(40,770.00)	40,770.00	0.00	40,770.00	40,770.00	40,770.00	0.00	4,077.00	44,847.00

	Description	Released Budget Current Year (a)	Obligations Current Year (b)	Disbursements Current Year (c)	Expenditures Current Year (d=b+c)	Total Agreement Budget (e)	Released Budget (f)	Obligations + Disbursements (g)	Funds Available* (h=f-g)	Support Cost (i)	Total Expenditures (j=g+i)
100283-1-05-01	4.1 Systems optimization	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
2100	Contractual Services	0.00	(707,028.48)	707,028.48	0.00	1,000,000.00	1,000,000.00	1,000,000.00	0.00	0.00	1,000,000.00
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100,000.00	100,000.00
100283-1-05-01	Total	0.00	(707,028.48)	707,028.48	0.00	1,000,000.00	1,000,000.00	1,000,000.00	0.00	100,000.00	1,100,000.00
100283-1-05-02	4.2 New technologies: 5 of the companies	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
2100	Contractual Services	0.00	0.00	0.00	0.00	1,197,960.00	1,197,960.00	1,197,960.00	0.00	0.00	1,197,960.00
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	119,796.00	119,796.00
100283-1-05-02	Total	0.00	0.00	0.00	0.00	1,197,960.00	1,197,960.00	1,197,960.00	0.00	119,796.00	1,317,756.00
100283-1-06-01	5.1 Project monitoring plan designed	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
1100	Staff & Intern Consultants	49,940.50	0.00	0.00	0.00	89,815.16	89,815.16	39,874.66	49,940.50	0.00	39,874.66
1700	Nat Consult/Staff	99,347.99	0.00	0.00	0.00	115,665.00	115,665.00	16,317.01	99,347.99	0.00	16,317.01
2100	Contractual Services	99,700.70	(24,960.21)	24,960.21	0.00	135,535.91	135,535.91	35,835.21	99,700.70	0.00	35,835.21
3500	International Meetings	0.00	0.00	0.00	0.00	8,119.16	8,119.16	8,119.16	0.00	0.00	8,119.16
5100	Other Direct Costs	19.71	0.00	0.00	0.00	1,829.77	1,829.77	1,810.06	19.71	0.00	1,810.06
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10,195.61	10,195.61
100283-1-06-01	Total	249,008.90	(24,960.21)	24,960.21	0.00	350,965.00	350,965.00	101,956.10	249,008.90	10,195.61	112,151.71
100283-1-07-01	1.1 Technical regulations are revised	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
2100	Contractual Services	0.00	0.00	0.00	0.00	277,225.00	277,225.00	277,225.00	0.00	0.00	277,225.00
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27,722.50	27,722.50
100283-1-07-01	Total	0.00	0.00	0.00	0.00	277,225.00	277,225.00	277,225.00	0.00	27,722.50	304,947.50
100283-1-07-02	1.2 A reporting system is designed	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
2100	Contractual Services	0.00	(194,075.00)	0.00	(194,075.00)	194,075.00	194,075.00	0.00	194,075.00	0.00	0.00
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100283-1-07-02	Total	0.00	(194,075.00)	0.00	(194,075.00)	194,075.00	194,075.00	0.00	194,075.00	0.00	0.00

100283-1-07-03	1.3 National awareness raising campaign	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD
2100	Contractual Services	0.00	(53,275.00)	53,275.00	0.00	53,275.00	53,275.00	53,275.00	0.00	0.00	53,275.00
9300	Support Cost IDC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5,327.50	5,327.50
100283-1-07-03	Total	0.00	(53,275.00)	53,275.00	0.00	53,275.00	53,275.00	53,275.00	0.00	5,327.50	58,602.50
2000002880	Total	249,009.62	(3,062,937.97)	2,868,862.97	(194,075.00)	5,375,000.00	5,375,000.00	4,931,915.38	443,084.62	493,191.54	5,425,106.92
100283	USD Total	249,009.62	(3,062,937.97)	2,868,862.97	(194,075.00)	5,375,000.00	5,375,000.00	4,931,915.38	443,084.62	493,191.54	5,425,106.92

## 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.

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	
<b>Component 1 – Policy and market promotion</b>													
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 1.1.1: An analytical study is conducted to define an energy efficiency indicator (EEI) for steam systems analysis	✓	✓	✓	✓	✓								\$60,000
Output 1.1.2: A key performance indicator (BPI) for in-service boiler's thermal efficiency is established through numerical analysis	✓	✓	✓	✓	✓	✓	✓	✓					\$80,000
Output 1.1.3: A testing method standard is drafted for condensing boilers					✓	✓	✓	✓					\$30,000
Output 1.1.4: Technical regulations are revised to include the new appraisal methods for boiler thermal efficiency (BPI - 1.1.1 condensing boiler and 1.1.2 non condensing boilers) and for steam systems (EEI - 1.1.3)	✓	✓	✓	✓	✓								\$90,000
Output 1.1.5: Technical committees are called by SAMR to review the necessary testing methods regulations					✓	✓	✓	✓	✓				\$30,000
Output 1.2.1: The regulatory reporting needs are assessed and a template reporting structure is designed	✓	✓	✓	✓									\$30,000
Output 1.2.2: An electronic based system is created for systematic data collection, leading to the creation of a heat equipment and system database	✓	✓	✓	✓									\$50,000
Output 1.2.3: The CSEI, jointly with the inspection agencies, shall collect data from enterprises, considering size, and type of boilers													Ongoing
Output 1.2.4: The database is used to conduct a detailed study to determine the steam systems energy efficiency supply curves	✓	✓	✓	✓	✓								\$50,000

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	
Output 1.3.1: Design a national information campaign on equipment performance improvements, systems optimization and EE regulation for equipment targeted at different beneficiary groups													Achieved
Output 1.3.2: Disseminate the results of the best case studies from Component 4	√	√	√	√	√	√	√	√					\$10,000
<b>Component 2 - Capacity Building activities (Government)</b>													
Outcome 2: The SAMR has the capacities required to enforce the technical regulations a knowledge management tool is available to users and facilitating the implementation of systems optimization and efficient equipment by improving testing capabilities													
Output 2.1.1: Improve the existing analytical capacities of the Center for testing the relevant parameters for Steam and Heat Recovery systems to implement the methods established in outcome 1 by training key staff					√	√							\$20,000
Output 2.1.2: Train staff and 100 inspectors from provincial agencies in the analysis of data collected from the enterprises	√	√	√	√									\$30,000
Output 2.1.3: Procure necessary equipment for verification of the key parameters identified in the testing methods			√										\$500,000
Output 2.1.4: Adopt and localize the software tools required to assess heat recovery systems					√	√	√	√	√				\$50,000
Output 2.2.1: Establish Boiler Energy Efficiency Test Research and Evaluation Laboratory													To be completed after the installation and commissioning of 2.1.3 purchased equipment.
Output 2.2.2: Establish Exchanger Components Energy Efficiency Evaluation Laboratory													Relying on the CSEI Shunyi base construction has been completed.
Output 2.2.3: Establish Heat Exchanger Product Energy Efficiency Evaluation Laboratory													Relying on the CSEI Shunyi base construction has been completed.
Output 2.2.4: Establish Oil and Gaseous Fuel Burners (OGFB) Testing Laboratory													Relying on the CSEI Shunyi base construction has been completed.
Output 2.2.5: Establish Boiler Energy Efficiency and Environmental Protection Evaluation Mobile Laboratory													Relying on the CSEI Shunyi base construction has been completed.
Output 2.2.6: Establish Fuel Analysis Laboratory													Relying on the CSEI Shunyi base construction has been completed.
<b>Component 3 - Capacity Building activities (enterprises)</b>													
Outcome 3: A cadre of highly specialized system optimization experts from the 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 has been increased													



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	
Output 3.1.1: Awareness and promotion workshop for 1000 managers and technical personnel of enterprises (0.5 days)	✓	✓	✓	✓	✓	✓	✓						\$60,000
Output 3.1.2: Training of 100 national trainers who will train operators in the user training steam systems optimization (SSO) and heat recovery system optimization (HRSO)													Achieved in 2019
Output 3.1.3: Training for 10,000 boiler operators (user)	✓	✓	✓	✓	✓	✓	✓	✓					\$920,000
Output 3.1.4: Dedicated training to 300 equipment manufacturers and vendors (0.5 days).	✓	✓	✓	✓	✓	✓	✓	✓	✓				\$145,000
Output 3.2: 50 candidates are trained to become national energy practitioners on steam and heat recovery systems optimization	✓	✓	✓	✓	✓								\$280,000
Output 3.3: 75 in-depth system assessments are completed in manufacturing facilities to identify energy savings	✓	✓	✓	✓	✓	✓	✓						\$150,000
Output 3.4: 100 enterprises improve their capacities for the financial evaluation of industrial energy efficiency projects								✓	✓				\$15,000
<b>Component 4 - Demonstration of energy efficient equipment implementation and operation</b>													
Outcome 4: New efficient technologies are demonstrated at national level to serve as case studies for future investments													
Output 4.1.1: 50 industries implement the systems optimization measures identified during the in-depth systems assessments.	✓	✓	✓	✓	✓	✓	✓						\$420,000
Output 4.2.1: Conceptual and/or basic engineering of selected technologies is completed	✓	✓	✓	✓	✓	✓	✓	✓	✓				\$680,000
Output 4.2.2: Bankable business plans are prepared					✓	✓	✓	✓					\$200,000
Output 4.2.3: Technology retrofits are conducted				✓	✓	✓	✓	✓					\$270,000
<b>Component 5 - Monitoring and Evaluation</b>													
Outcome 5: The working funds of the project management office to promote the implementation of the project													
Output 5.2.2: Independent terminal project evaluation.								✓	✓	✓			
Output 5.3.1: Follow-up actions are identified by the national counterparts to ensure long term project sustainability.								✓	✓	✓			\$40,000

## X. Synergies

### 1. Synergies achieved:

NA

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

NA

## EXPLANATORY NOTE

1. **Timing & duration:** Each report covers a twelve-month period, i.e. 1 July 2021 – 30 June 2022.
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	
<b>Highly Satisfactory (HS)</b>	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”.
<b>Satisfactory (S)</b>	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.
<b>Moderately Satisfactory (MS)</b>	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.
<b>Moderately Unsatisfactory (MU)</b>	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.
<b>Unsatisfactory (U)</b>	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.
<b>Highly Unsatisfactory (HU)</b>	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)	
<b>Highly Satisfactory (HS)</b>	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”.
<b>Satisfactory (S)</b>	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.
<b>Moderately Satisfactory (MS)</b>	Implementation of <u>some</u> components is in substantial compliance with the original/formally revised plan with some components requiring remedial action.
<b>Moderately Unsatisfactory (MU)</b>	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.
<b>Unsatisfactory (U)</b>	Implementation of <u>most</u> components is <u>not</u> in substantial compliance with the original/formally revised plan.
<b>Highly Unsatisfactory (HU)</b>	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:	
<b>High Risk (H)</b>	There is a probability of greater than <b>75%</b> that assumptions may fail to hold or materialize, and/or the project may face high risks.
<b>Substantial Risk (S)</b>	There is a probability of between <b>51%</b> and <b>75%</b> that assumptions may fail to hold or materialize, and/or the project may face substantial risks.
<b>Moderate Risk (M)</b>	There is a probability of between <b>26%</b> and <b>50%</b> that assumptions may fail to hold or materialize, and/or the project may face only moderate risk.
<b>Low Risk (L)</b>	There is a probability of up to <b>25%</b> that assumptions may fail to hold or materialize, and/or the project may face only low risks.

ICS 27.060.30  
J 98

**NB**

# 中华人民共和国能源行业标准

NB/T 47061—2017

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## 工业锅炉系统能源利用效率指标及分级

Energy efficiency index and grading of industrial boiler system

2017-12-27 发布

2018-06-01 实施

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NB

T47061-2017.pdf

国家能源局 发布

ICS 27.010  
F 01



# 中华人民共和国国家标准

GB/T 38553—2020

## 工业锅炉系统节能管理要求

Requirements for energy saving management of industrial boiler systems

2020-03-06 发布

2020-07-01 实施

国家市场监督管理总局  
国家标准化管理委员会 发布



GBT

38553-2020.pdf

**TSG** 特种设备安全技术规范

TSG 91—2021

# 锅炉节能环保技术规程

Regulation on Energy Conservation and Environmental  
Protection Technology for Boiler

国家市场监督管理总局发布

2021年12月30日



TSG  
G91-2021.pdf

ICS 27.060.30  
J 98

**NB**

# 中华人民共和国行业标准

NB/T 47035—2013

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## 工业锅炉系统能效评价导则

Energy performance assessment for industrial boilers system



2013-11-28 发布

2014-04-01 实施

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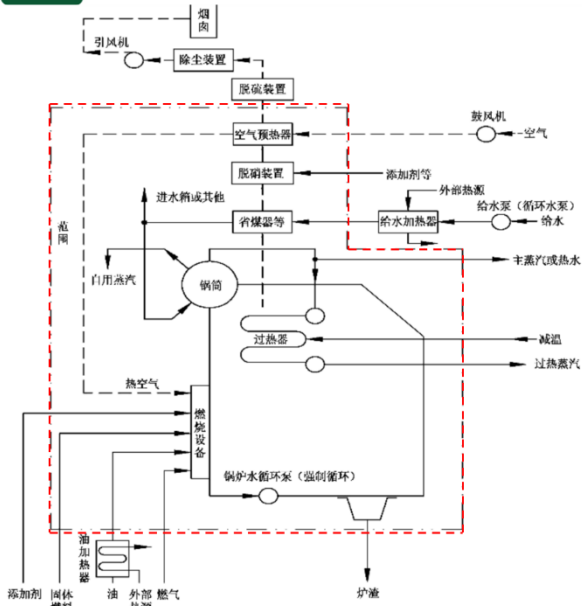
NB-T47035-2013  
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国家能源局 发布

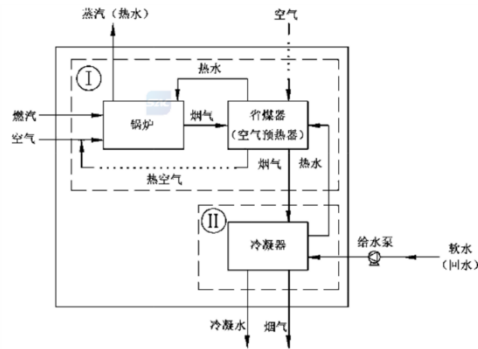


01

## 能效边界

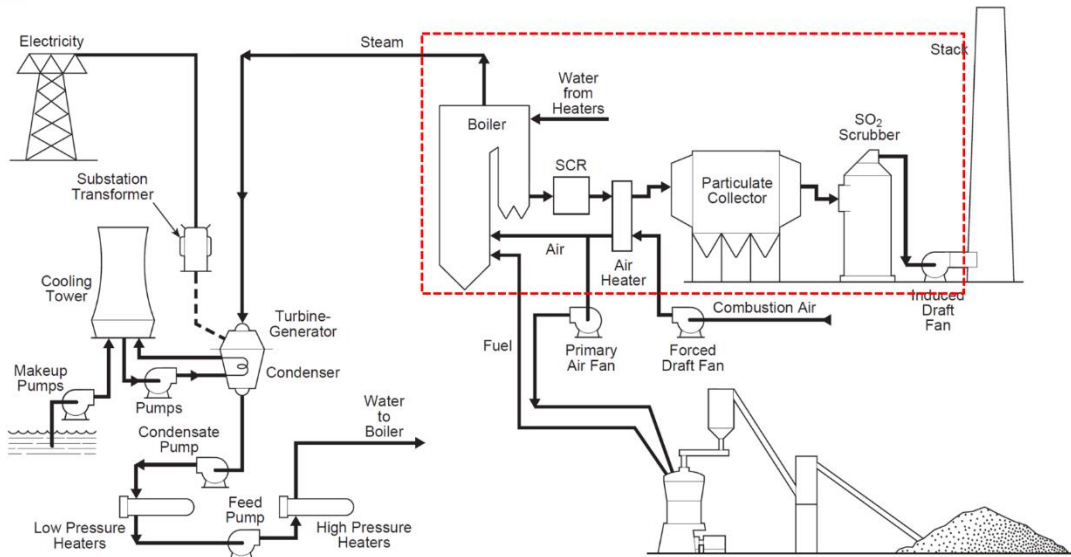


能效边界包括了锅炉本体范围、省煤器和空预器的余热回收也回到了锅炉内。  
冷凝回收余热在边界内也要计算到能效里。  
没有考虑尾部的环保设施能耗



01

## 污染物排放控制设施

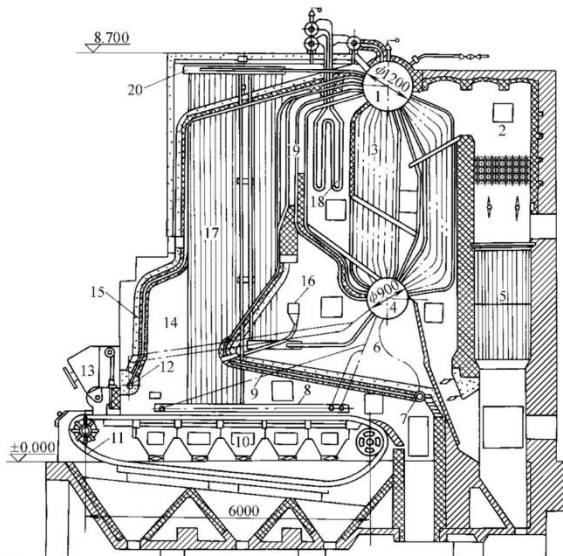
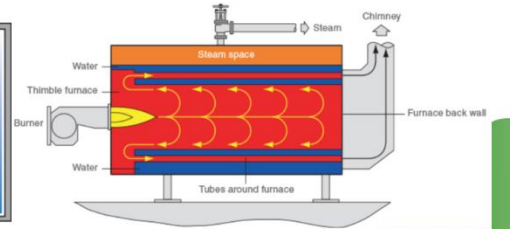
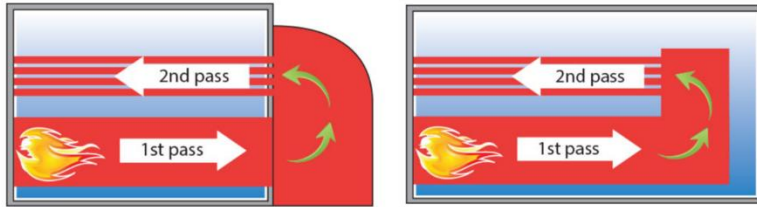
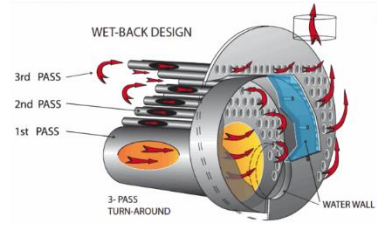




1、干背式锅炉 (Dry Back Boiler)：回燃室的后管板不在锅壳内部，而是用耐火材料砌筑的，没有水冷层冷却；

2、湿背式锅炉 (Wet Back Boiler)：回燃室在锅壳内部，回燃室的后管板和锅壳后管板之间存在水夹层；

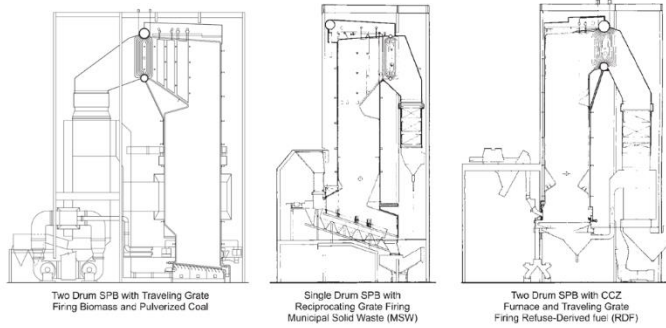
3、中心回燃式锅炉 (Reversal Chamber Boiler)：结构简单，制造工艺简单。炉胆空间大，有效辐射受热面积大，温度分布均匀，烟管管束为单回程，烟气阻力低。



- 燃烧系统：煤斗、炉排、炉排传动装置
- 受热面：水冷壁、过热器、省煤器、空预器
- 水系统：前后水冷壁、两侧水冷壁、下降管、汽水引出管、上下锅筒、对流管束



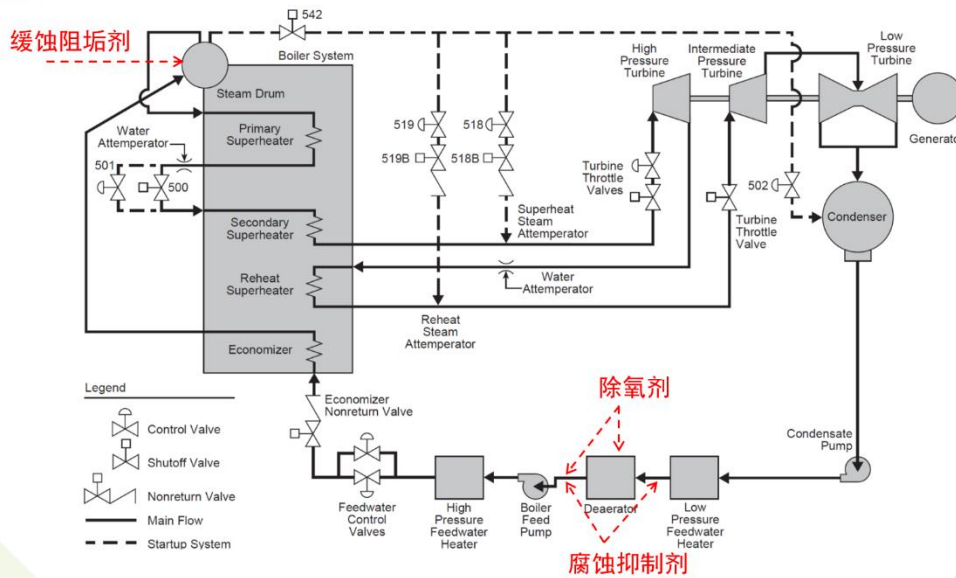
- 层状燃烧：将燃料置于固定或移动的炉排上，形成均匀的、有一定厚度的料层，空气从炉排底部通入，通过燃料层进行燃烧反应，采用层状燃烧的锅炉叫层燃炉。
- 层燃炉根据炉排形式不同又分为：手烧炉、机械加煤炉，其中机械加煤炉有固定炉排炉、链条炉排炉、抛煤机炉、往复炉排炉及振动炉排炉等。

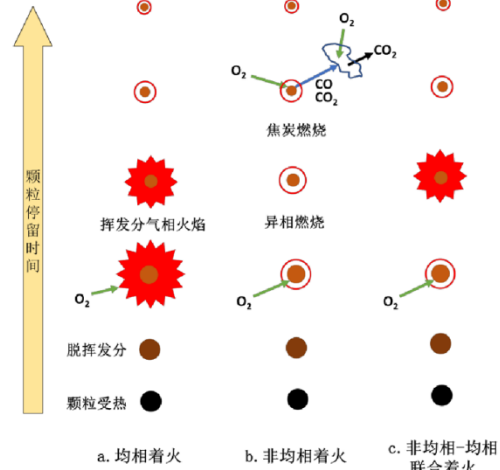
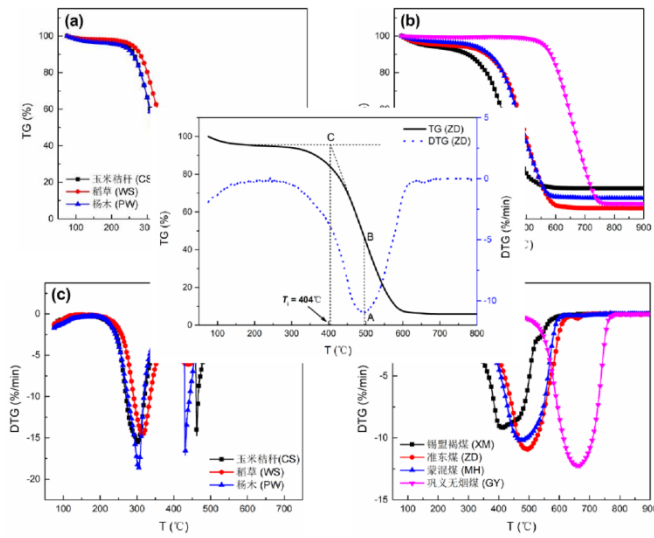


Two Drum SPB with Traveling Gate  
Firing Biomass and Pulverized Coal

Single Drum SPB with  
Reciprocating Gate Firing  
Municipal Solid Waste (MSW)

Two Drum SPB with CCZ  
Furnace and Traveling Gate  
Firing Refuse-Derived fuel (RDF)

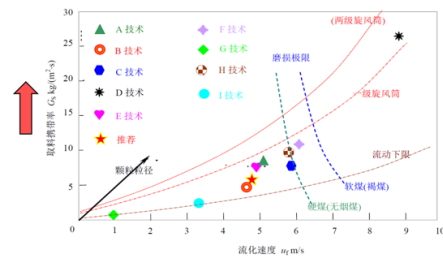
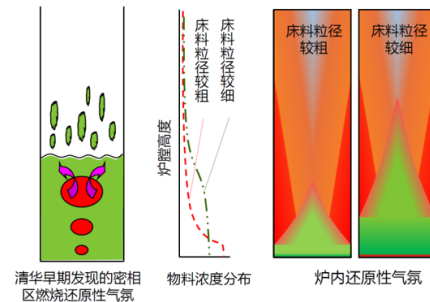




循环流化床燃烧技术具有**强化传热、燃烧效率高、燃料适应性广和排放污染物少**等特点。

以清华大学为代表的团队不断对循环流化床技术进行创新，开发出循环流化床锅炉流态设计图谱，研制出**基于流态重构的节能型循环流化床锅炉和超低排放循环流化床燃烧技术**（炉内脱硫+低氮燃烧）。降低石灰石粒度，提高比表面积，改善脱硫；扩展、强化还原性气氛，降低 $\text{NO}_x$ 排放。

对中低含硫的贫煤、无烟煤可以直接采用超低排放CFB技术，无需其他控制设备；对高硫烟煤宜采用超低排放CFB+SNCR+半干法增湿活化（无需石灰乳，仅喷水）。该技术路线，投入少、运行成本低，没有 $\text{PM}_{2.5}$ 问题。直接解决重金属排放。







4866\_Training  
Agenda.xlsx



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attendance recor