



Training of Boiler Operators and Boilers, Heat Exchangers Energy-saving Technology Product Testing and Evaluation Project Summary of Boiler Operator Training

Project Name: Training of Boiler Operators and Boilers,
Heat Exchanger Energy-saving



Technical Product Testing and Evaluation

Work

Project Number: GEF-2023-22

Implementing Unit: Shaanxi Special Equipment

Inspection and Testing Research Institute

Implementation Date: September 2023 to December
2023

December 2023



Summary of Boiler Operator Training

Project Name	Training of Boiler Operators and Boilers, Heat Exchanger Energy-saving Technology Product Testing and Evaluation Work	
Project Number	GEF-2023-22	
Implementing Unit	Shaanxi Special Equipment Inspection and Testing Research Institute	
Project Overview	To strengthen the energy-saving work of high-energy-consuming special equipment such as boilers and heat exchangers, commissioned by the Global Environment Fund "Industrial Heating Systems and High Energy-consuming Equipment Energy Efficiency Improvement" project management office, the Shaanxi Special Equipment Inspection and Testing Research Institute carried out the project of training boiler operators and boilers, heat exchanger energy-saving technology product testing and evaluation work across the province. This project mainly includes two parts: (1) energy-saving training for boiler operators; (2) testing and evaluation of energy-saving technology products for boilers and heat exchangers. To promote the progress of the first part of the project, the Shaanxi Special Equipment Inspection and Testing Research Institute conducted training	
Implementation Status	As of December 31, 2023, a total of 1 training session for power station boiler operators was held across the province, with a total of 85 trainees. It is planned to hold 2 training sessions for industrial boiler operators across the province in February 2024, with a total of 415 trainees expected.	
Report Preparation		(Seal of Evaluation Agency or
Report Proofreading		

Commented [MOU1]: Check Table



Report Review		Official Seal)	
Report Approval		December 29, 2023	



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I. Project Introduction

1.1 Background

The Global Environment Facility (GEF) is an experimental project established by the World Bank in 1990, aimed at supporting environmentally friendly projects. It is an international cooperative organization composed of 183 countries and regions, with the purpose of collaborating with international institutions, social groups, and the private sector to address environmental issues.

Since 1991, the GEF has provided \$12.5 billion in grants and \$58 billion in co-financing for 3,690 projects in 165 developing countries. Over the past 23 years, developed and developing countries have used these funds to support environmental protection activities in areas such as biodiversity, climate change, international waters, land degradation, chemicals, and waste, implementing relevant projects and plans.

1.2 Project Overview

To strengthen energy-saving work for high-energy-consuming special equipment such as boilers and heat exchangers, the Shaanxi Special Equipment Inspection and Testing Research Institute was commissioned by the Global Environment Fund's "Industrial Heating Systems and High Energy-Consuming Equipment Energy Efficiency Improvement" project management office to carry out boiler operator training and energy-saving technology product testing and evaluation work projects across the province.

The project mainly includes two aspects:

- (1) Energy-saving training for boiler operators
- (2) Testing and evaluation of energy-saving technology products for boilers and heat exchangers



To promote the progress of the first part of the project, the Shaanxi Special Equipment Inspection and Testing Research Institute conducted training for the management and operation personnel of boiler and heat exchanger users, special equipment supervision and management personnel, and other personnel during the project period, effectively improving the technical level and energy-saving awareness of boiler operators and managers, improving equipment management and operation levels, and promoting the green, low-carbon, high-quality development of the high-energy-consuming special equipment industry.

As of December 31, 2023, the Shaanxi Special Equipment Inspection and Testing Research Institute has conducted a total of one training session across the province, with a cumulative total of 85 trainees.



II. Training Plan

2.1 Training Objectives

To promote the implementation of the Global Environment Fund's "Industrial Heating Systems and High Energy-Consuming Equipment Energy Efficiency Promotion" project, effectively improve the technical level and energy-saving awareness of boiler operators and managers in key areas, optimize boiler energy-saving management work, reduce boiler energy consumption and emissions, improve boiler safety and economy, promote the transformation and upgrading of the boiler industry, and achieve green and low-carbon development. The specific objectives are as follows:

1. Carry out publicity on laws, policies, and regulations related to boiler safety, energy saving, and environmental protection for boiler management and operators, and strengthen the legal awareness of boiler operators.
2. Conduct lectures and training on basic knowledge such as the basic structure, working principle, operating parameters, performance indicators of boilers, to improve the business knowledge level of boiler management and operators.
3. In response to common problems in the daily operation of boilers, combined with typical boiler accident cases, conduct lectures and training on daily inspection, maintenance, upkeep, and cleaning of boilers, effectively improve the operation and maintenance level of boiler management and operators, ensure the safe and normal operation of boilers, and reduce the occurrence of accidents.
4. Introduce common boiler energy-saving measures and technologies to boiler management and operators in detail, including improving combustion methods, optimizing control systems, installing energy-saving devices, recovering waste heat, preventing scale and descaling, using new fuels, etc., and analyze the effects of energy-saving renovations in depth with typical energy-saving renovation cases,



strengthen the understanding of energy-saving renovations by boiler-using units, and improve their ability to implement energy-saving renovations.

5. Publicize policy support, technical guidance, and financial subsidies for boiler energy-saving renovations, and improve the enthusiasm and initiative of boiler-using units for energy-saving renovations.

Conduct knowledge dissemination on boiler energy efficiency testing and evaluation methods and standards, including testing instruments, testing procedures, and testing data processing, to enhance the ability to evaluate boiler energy-saving effects.

2.2 Training Targets

The main targets of this training are divided into the following categories:

- 1、 Safety and energy-saving management personnel and operation-related personnel of power station boilers (including Class A boilers with superheaters).
- 2、 Safety and energy-saving management personnel and operation-related personnel of industrial boilers (including Class A boilers without superheaters).

2.3 Training Content

- 1、 The training content for power station boilers is as follows:
 - (1) Power station boiler energy-saving technology and optimized operation;
 - (2) Interpretation of the TSG 91-2021 "Boiler Energy-saving and Environmental Protection Technical Regulations" standard;
 - (3) Clean, low-carbon, safe, and efficient operation of key equipment in thermal power units;
 - (4) Discussion on power station boiler operation and management;



(5) Interpretation of power station boiler inspection standards, analysis of inspection cases;

(6) Discussion on power station boiler operation and management.

2、The training content for industrial boilers is as follows:

(1) Basic knowledge of boiler structure, working principle, operating parameters, performance indicators, etc.;

(2) Laws, policies, and regulations on boiler safety, energy saving, and environmental protection;

(3) Knowledge of daily inspection, maintenance, upkeep, cleaning, etc., of boiler operation and maintenance;

(4) Boiler energy-saving measures and technology, as well as introduction to boiler energy-saving products;

(5) Knowledge of boiler energy efficiency testing and evaluation methods and standards.

2.4 Introduction to the Training Unit

Shaanxi Special Equipment Inspection and Testing Research Institute (hereinafter referred to as "Provincial Special Inspection Institute") is a directly affiliated institution of the Shaanxi Provincial Market Supervision Administration. It is a special equipment inspection and testing research institution merged in September 2017 by the original Shaanxi Provincial Boiler and Pressure Vessel Inspection Institute (hereinafter referred to as "Provincial Boiler Inspection Institute") and Shaanxi Special Equipment Quality and Safety Supervision and Inspection Center (hereinafter referred to as "Provincial Special Inspection Center"). It mainly engages in the safety performance supervision and inspection, periodic inspection, boiler water quality inspection, boiler energy efficiency testing, safety valve calibration, and related special equipment manufacturing, installation, repair, modification, and gas



cylinder inspection agency identification review. It also undertakes commissioned inspection and technical consulting work. It is a comprehensive inspection and testing institution with independent legal personality and impartial third-party status.

The original Provincial Boiler Inspection Institute was established in 1975, and it independently set up and carried out inspection and testing business at the end of 1986. It obtained national qualification certification in 1993, and obtained the measurement certification of the original Shaanxi Provincial Technical Supervision Bureau at the end of 1998, and obtained the "Special Equipment Inspection License" qualification replacement and additional item review of the original State Quality Inspection Administration in 2001; it obtained the measurement certification and review acceptance of the original Shaanxi Provincial Quality and Technical Supervision Bureau in 2001. In 2003, it obtained the qualification for the approval and review of the pressure-bearing special equipment manufacturing installation modification repair license and the gas cylinder inspection agency.

The original Provincial Special Inspection Center was established in 1984 and obtained the Special Equipment Inspection License issued by the former State Quality Inspection Administration in 2001. In the same year, it received metrology certification and review approval from the former Shaanxi Provincial Quality and Technical Supervision Bureau. In 2002, with the approval of the Justice Department, the internal institution "Shaanxi Tiandi Special Equipment Judicial Appraisal Office" was established, which was renamed "Shaanxi Special Inspection Special Equipment Judicial Appraisal Office" in July 2018. In 2003, it obtained the qualification for the review of the installation, modification, and maintenance permit of mechanical and electrical special equipment.

Currently, the institute has 20 departments including the Office (Union), Human Resources Department, Planning and Finance Department, Quality Management Department, Scientific Research and Technology Department, Business Management Department, Pressure Room One, Pressure Room Two, Pressure Room Three,



Pressure Room Four, Mechanical and Electrical Room One, Mechanical and Electrical Room Two, Mechanical and Electrical Room Three, Mechanical and Electrical Room Four, Mechanical and Electrical Room Five, Non-destructive Testing Room, Appraisal Review Center, Party Committee Office, Discipline Inspection and Supervision Room, and Emergency Technical Support Center. The institute has a total of 323 technical and administrative personnel, including 4 senior engineers, 37 engineers, and 144 engineers. Engineers with intermediate or higher titles account for 57% of the total number of employees. A total of 207 inspectors have obtained various types of certificates, including 30 boiler inspectors, 27 pressure vessel inspectors, 13 pressure pipeline inspectors, 53 elevator inspectors, 50 crane inspectors, 13 large amusement facility inspectors, 14 field (factory) special vehicle inspectors, and 7 passenger ropeway inspectors. A total of 397 people have obtained various types of Level II and above non-destructive testing qualification certificates, including 10 Level III non-destructive testing personnel (28 items); 3 API inspection personnel, 2 RBI analysis personnel; 254 employees of the institute hold various types of inspection and testing qualification certificates, accounting for more than 91.0% of the total number of employees. 38 people hold judicial appraisal qualification certificates. All employees have multiple skills and multiple certificates, and the entire team has a reasonable age and cultural structure. The institute currently has an office area of 5278 square meters (including a constant temperature and humidity room of 50 square meters), equipped with offices, equipment and instrument rooms, data rooms, and laboratories. The institute has more than 2200 various testing instruments, with a total value of fixed assets reaching 73 million yuan. The level of inspection and testing equipment is at the forefront of the inspection industry in the province, equipped with instruments and equipment required for the inspection range; the institute has more than 4000 copies of various boilers, pressure vessels, pressure pipelines, elevators, lifting equipment, amusement facilities and other international, national, industry standards and technical materials. Four laboratories for boiler efficiency testing, water quality analysis, material analysis, and non-destructive



testing have been built, greatly improving the technical level of power station boiler, oil and gas pipeline, large storage tank inspection and testing, and boiler efficiency testing. In cooperation with Xi'an Jiaotong University and Northwest University, a graduate training base and undergraduate internship base have been established, and a doctoral workstation has been jointly established with North University. The Shaanxi Provincial Postdoctoral Innovation Base has been approved to provide guarantees for the research of special equipment inspection and testing and energy efficiency testing technology, and promote the integration of industry, education, and research.

Currently, our institute is equipped with a comprehensive range of underground pipeline detection equipment, including American-made underground pipeline detection locators and British-made close-interval pipe-to-soil potential detectors. We also have large-scale storage tank detection equipment such as the British-made automatic ultrasonic C-scan imaging system and the British-made tank bottom corrosion scanning mapping system. Our material analysis equipment includes German-made spectrometers and Japanese-made Olympus metallographic microscopes. For boiler efficiency testing, we have German-made flue gas analyzers and wireless boiler energy efficiency detection systems. Our boiler water quality analysis equipment includes Swiss-made ion chromatographs and American-made Fourier transform infrared spectrometers. We also have non-destructive testing equipment such as Israeli-made portable ultrasonic dual probe phased array imaging detection systems, Belgian digital radiography (DR) imaging detection systems, and TOFD detectors. Additionally, we have portable wire rope load and tension measuring instruments, portable elevator/escalator comprehensive performance measuring instruments, portable elevator acceleration and deceleration testers, elevator door impact force measurement systems, automatic escalator comprehensive testers, braking performance testers, elevator multifunction testers, wire rope flaw detectors, and automobile exhaust gas analyzers. These instruments fully meet the various statutory and commissioned inspection and testing services undertaken by our institute.



Our institute has successively undertaken: product supervision and inspection of more than 40 boiler and pressure vessel manufacturers, provincial import boiler and pressure vessel safety performance supervision and inspection, regular inspection of liquefied gas tank trucks in use, installation supervision and inspection, and regular inspection of power station boilers, on-site manufacturing supervision and inspection of large containers, supervision and inspection and regular inspection of ultra-high pressure vessels, medical oxygen cabins, pressure pipelines, elevators, lifting machinery, amusement facilities, and special motor vehicles in the field (factory), etc. We have never had a major accident caused by inspection quality.

In recent years, we have undertaken the safety performance supervision and inspection and regular inspection of three sets of air separation equipment imported from Germany, Japan, and France, the safety performance supervision and inspection and regular inspection of Japanese imported equipment with an annual output of 300,000 tons of synthetic ammonia and 520,000 tons of urea, and the safety performance supervision and inspection and regular inspection of four 10,000 cubic meter natural gas spherical tanks imported from France. We have also undertaken the installation supervision and inspection and regular inspection of more than 100 300MW to 600MW power generation boilers, the installation supervision and inspection of more than 4,000 kilometers of oil and gas pipelines, the regular inspection of inclined elevators, and other major inspection work. We have also been commissioned to undertake comprehensive inspections of high-pressure cast steel vessels, ultra-high pressure vessels for military testing, military tank trucks, tank containers, and safety assessments of old elevators. We have made due contributions to the economic take-off and social development of our province.

Over the past decade, our institute has presided over and participated in the completion of 5 projects of the National Quality Inspection Administration's Science and Technology Plan, 3 projects of the Provincial Quality Supervision Bureau's Science and Technology Plan, and participated in the completion of 2 public welfare projects for quality inspection. We have also participated in 3 sub-projects of the 12th



Five-Year National Science and Technology Support Plan; formulated and revised 4 national standards, 2 industry standards, and 16 local standards in Shaanxi Province; and presided over, participated in, and published 8 technical works. Among them, the research results of "Research on Eddy Current Testing Technology of Crystal Pot" filled a domestic gap, and the research results of "Rapid Detection and Evaluation Method of Boiler Energy Efficiency in Use" won the third prize of the "Science and Technology Prosperity Award" of the Shaanxi Provincial Quality Supervision System during the 12th Five-Year Plan. The revision of GB /T10820-2011 "Thermal Efficiency and Thermal Test Method of Domestic Boilers" was completed as the first drafter.

Our institute has a well-established quality management system and rules and regulations. We adhere to the principle of science and technology as the driving force, management as the foundation, and safety as the core. We strive to satisfy user requirements with accurate and reliable inspection results and excellent and timely service quality as our work purpose. We work together, forge ahead, innovate, and escort the economic take-off of Shaanxi.



III. Training Implementation Overview

3.1 Preliminary Preparation

In order to ensure the smooth implementation of this training project, the training unit carried out a series of preparatory measures in advance before the official launch of the project.

1. Classification training

Categorical Training

2. Training needs analysis

Training needs analysis is the first step in training activities, which determines the direction and goals of training. The main task of this stage is to determine the needs and expectations of the trainees through investigation and analysis, and to find out the deficiencies in their knowledge, skills or attitudes, so as to determine the focus of the training.

Setting Training Objectives

Upon identifying the training needs, it is imperative to establish specific training objectives. These objectives should be explicit, measurable, and reflect the actual needs of the trainees in their work. The goals can be to enhance the skill levels of the trainees, or to improve their attitudes and behaviors.

Planning of Training Content

The content of the training is pivotal to achieving the training objectives. In the planning phase of the training content, it is necessary to determine the themes, knowledge points, and skills to be taught based on the actual needs of the trainees and the training objectives. Simultaneously, the content should possess practicality and specificity, enabling trainees to apply what they have learned in their actual work.

Selection of Training Methods



Training methodologies are diverse, encompassing lectures, seminars, workshops, and online learning, among others. The selection of a particular method should be determined based on the training content and objectives. For instance, for skills training, workshops or practical operations may be more effective; for knowledge-based content, lectures or online learning may be more suitable.

Determination of Training Instructor Resources

The quality of trainers is a crucial element in achieving training objectives. They should possess relevant professional knowledge and pedagogical experience, and be capable of effectively imparting knowledge and skills to trainees. After selecting the trainers, it is essential to collaborate closely with them to ensure the smooth execution of training activities.

Schedule for Training

The scheduling of training sessions should take into account the timetable and workload of the participants to ensure their full engagement in the training. Concurrently, the scheduling should be rational and compact to prevent the squandering of time and resources.

Reservation of Training Venue

Finally, it is imperative to secure an appropriate training venue. The venue should be equipped with the necessary facilities and equipment required for instructional purposes, and should possess optimal ventilation, lighting, and soundproofing conditions to ensure the smooth progression of the training. Moreover, the venue should adhere to safety standards and provide essential protective measures.

3.2 Training Format

This training is primarily conducted through offline methods, supplemented by online methods, with the number of trainees per batch determined by actual



circumstances. Depending on the training format and the region to which the trainees belong, the training locations are arranged differently.

For offline training, we will select venues that are conveniently located and well-equipped, such as conference rooms and training centers. For participants from the local or neighboring areas, we will organize centralized training to facilitate their participation. For participants from distant areas, we will provide accommodation and transportation arrangements to ensure their convenient participation in the training.

For online training, we will utilize sophisticated e-learning platforms or video conferencing software. Trainees merely require a stable internet connection and appropriate devices such as a computer, tablet, or smartphone to participate in the training. Online training is not geographically restricted, facilitating the participation of remote trainees.

In accordance with the actual situation, we will also provide a hybrid training method, combining both online and offline modes. This approach can accommodate trainees from different regions, enhancing the coverage and participation of the training.

In summary, we will select the appropriate training location based on factors such as training needs, objectives, content, and format, to ensure the smooth progress of the training activities and the learning outcomes of the trainees.

3.3 Training Methods

This training adopts a combination of various training methods, the specific methods are as follows:

To ensure the effectiveness of the training and the participation of the trainees, we will adopt a combination of various training methods. The following are the specific methods and implementation strategies:



1. Theoretical Lectures: Traditional teaching methods will be used to systematically introduce knowledge points, theories, and practices. The lecturer should be well-prepared, use clear and concise language to impart knowledge, and ensure that trainees can understand and master it.

2. Case Analysis: By showcasing actual cases, trainees are guided to analyze and solve problems. The cases should be representative, reflecting situations that may be encountered in actual work. During the analysis process, trainees are encouraged to actively participate and propose their own insights and solutions.

3. Group Discussions: Trainees will be divided into groups to discuss a specific topic. Group discussions can enhance the participation of trainees, promote communication and cooperation among them. During the discussion process, open and honest communication is encouraged, and everyone should have the opportunity to express their views.

4. Question and Answer Session: A certain amount of time will be reserved for trainees to ask questions, and the lecturer or trainer will provide answers. This session helps to resolve issues that trainees may encounter during the training process and deepen their understanding of the knowledge points. It also allows the lecturer to understand the trainees' level of comprehension, so as to adjust the subsequent training content.

Through the combination of the above methods, we hope to provide trainees with a fulfilling and interesting training experience, help them better master knowledge and skills, and improve work performance.

3.4 Class Opening Guidelines

This training will be conducted in batches from October to December 2023. The requirement for offline training is that each batch should have no less than 80 and no more than 150 trainees, to ensure the quality and efficiency of the training. This training program requires each boiler operator to participate in all training content,



and absence or early departure is not allowed, to ensure the effectiveness and fairness of the training. Each boiler operator must abide by the training discipline, actively participate in training activities, and complete the training tasks diligently, to ensure the order of the training.

3.5 Course Arrangement

As of December 31, 2023, a total of one training session has been conducted province-wide. The training course arrangement is as shown in the following table:

Session	Class Opening Time	Class Opening Location	Lecturer	Number of Trainees
1	2023.12.21	Xi'an	Chang Yongqiang and others	85
2	Planned for February 2024	Xi'an		415



This training has been conducted in many sessions across the province.

According to the different needs of different training objects, the training unit has made corresponding modifications to the training content. The focus of each training session is different. The following is a summary analysis of some training sessions.

3.2.1 The power station boiler operator training was conducted in Xi'an on December 21, 2023.



From December 21 to 22, 2023, energy-saving training for power station boiler operators was conducted in Xi'an. The main targets of this training session were safety and energy-saving management personnel and related operation and running personnel of power station boilers (including Class A boilers with superheaters). According to the needs of the trainees, this training session focused on explaining the relevant laws and regulations related to boiler safety, energy saving, and environmental protection, mainly including the following six parts:

- (1) Power station boiler energy-saving technology and optimized operation;
- (2) Interpretation of the TSG 91-2021 "Boiler Energy-saving and Environmental Protection Technical Regulations" standard;
- (3) Clean, low-carbon, safe, and efficient operation of key equipment in thermal power units;
- (4) Discussion on power station boiler operation and management;
- (5) Interpretation of power station boiler inspection standards, analysis of inspection cases;
- (6) Discussion on power station boiler operation and management.



3.6 Existing problems and solutions

During the implementation of the training project, the training unit tried to examine the learning needs of the trainees as much as possible, while also enriching the training forms and optimizing the training methods to improve the training effect. However, there are still some problems and deficiencies in the implementation of the training project:

1、Arrangements for hotel, accommodation, and registration for the conference are not perfect

(1) The selection of training hotels and conference halls mainly considers the hotel environment and the use effect of the conference hall, without considering the hotel accommodation price too much. In response to the feedback that the hotel standard is too high and exceeds the company's reimbursement limit during registration, although the staff actively contacted nearby hotels to meet the accommodation needs of the over-standard trainees, it still caused inconvenience to some trainees who participated in the training, and the related work was not done well.

(2) The hotel location is not very good, the surrounding facilities are far away, it is far from the scenic spots, and the transportation is not very convenient. Considering the hotel accommodation price, the choice of hotel location is not very rich. Relatively speaking, the hotel location and the convenience of transportation are within an acceptable range, but it is still not convenient enough, causing inconvenience to the trainees.

2、The course content is not rich enough

(1) There are not enough real-life case studies

The selection of this training course includes the promotion of boiler energy-saving regulations, power station boiler energy-saving technology, regular inspections, operation and running, and various aspects of use management. The



content is comprehensive and rich. However, due to time constraints, there are not enough real-life case studies. After understanding the theoretical knowledge, the trainees cannot timely connect with real-life cases, which has a certain impact on the learning effect.

(2) Knowledge about medium and low-pressure boilers is not rich enough. Power station boilers (mainly used for power generation) can range from 130t/h to 3000t/h in tonnage. The tonnage and pressure span are large, and the content of this training course cannot design all tonnage furnace types and their operation management characteristics. In response to this problem, power station boilers can be subdivided according to parameters in the future, and relevant training can be held for different parameters.

3、The trainees' participation in interaction is not enthusiastic enough

During the teaching period, the trainees' questions were not collected in advance, summarized, and after the theoretical explanation, the teacher could answer common questions, interact with the trainees, and make full use of the teaching time.

3.7 Summary and suggestions

With the efforts of many parties and the cooperation of many enterprises and trainees, this training project was successfully carried out. Although there were some deficiencies in the process, the training project still achieved some effects:

1、The working principles of power station boilers, laws and regulations on safety, energy saving and environmental protection, and knowledge of operation and maintenance have been effectively conveyed to the users of power station boilers. After this training, the majority of trainees reported that the training content was substantial, and they effectively learned about boiler-related energy-saving and safety knowledge, and understood new technologies for boiler energy-saving and environmental protection.



2、Strengthened communication and exchange between technical experts, testing institutions, associations, and enterprises. This training was both a learning opportunity and an exchange opportunity. Through this training, technical experts, testing institutions, associations, and enterprises all truly understood the needs of the objects, and played a bridging role in solving future enterprise difficulties.

Through this training and exchange, some trainees also put forward their own suggestions for energy-saving training:

During this training period, some participants suggested the establishment of a provincial expert database for energy-saving and safety management of boilers (including professional personnel from power plant users). Some participants suggested creating a checklist of common issues encountered during the operation of boilers, along with their solutions, to facilitate corporate learning and improvement. Some participants suggested visiting exemplary units for observational learning. Such issues are difficult to resolve through a single training session or technical exchange. It is necessary to expand various forms of communication and learning, and establish a mechanism that can effectively integrate enterprises with technical experts. This is the direction that subsequent work should strive towards.



IV. Annex

4.1 Notice of commencement for some training sessions.

1、 Notice of energy-saving training for power plant boiler operators.

陕西省特种设备检验检测研究院

关于举办 2023 年陕西省电站锅炉 操作人员节能培训的通知

各有关单位：

为推进全球环境基金“工业供热系统和高耗能设备能效提升”项目执行，提高我省电站锅炉管理人员、操作人员的安全节能知识，提升高耗能设备管理能力，助力我省电站锅炉行业实现低碳转型，我院将于近期举办 2023 年陕西省电站锅炉操作人员节能培训，请各有关单位安排相关人员参加。现将有关事项通知如下。

一、培训对象

省内电站锅炉、有过热器的 A 级锅炉使用单位的安全节能管理人员和操作运行相关人员。

二、培训内容

- （一）电站锅炉节能技术与优化运行；
- （二）TSG 91-2021《锅炉节能环保技术规程》标准解读；
- （三）火电机组关键设备的清洁低碳与安全高效运行；
- （四）电站锅炉操作运行管理研讨。

三、培训时间及地点

- 1 -



培训时间：2023 年 12 月 21 日——12 月 22 日

报到、培训地点：禹龙国际酒店（西安市未央区二环北路西段 5 号）

四、报名要求

1. 报名截止日期：2023 年 12 月 18 日。

2. 报名方式

（1）请各单位填写会议回执单（见附件）并于 12 月 18 日前发至邮箱 269403618@qq.com；

（2）参加人员请扫描下方二维码完成相关报名工作。



五、其他事项

本次培训不收取培训费。

六、通讯地址及联系方式

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附件: 会议回执单



陕西省特种设备检验检测研究院

2023年12月7日

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4.2 List of training participants (sign-in sheet).

1、Sign-in sheet for energy-saving training for power plant boiler operators.

2023年陕西省电站锅炉操作人员节能培训 合见厅					
序号	单位名称	姓名	联系方式	签字	备注
1	神木市众邦煤化有限公司	戈万元	18099057999	戈万元	
2		白永利	15529990866	白永利	
3		尚军军	15220029039	尚军军	
4	神木市恒晟化工有限公司	郝志明	13720447124	郝志明	2/8
5	陕西省神木市恒晟化工有限公司发电分公司	温永峰	15686763073	温永峰	2/8
6	神木市电石集团能源发展有限责任公司	刘科	18391231855	刘科	2/8
7		王敏于	13429729942	王敏于	2/8
8	陕西乾昇能源科技有限公司 榆能横山煤电有限公司	陈磊	18629225819		
9		朱玉龙	17729120168		
10	陕西美鑫产业投资有限公司锦阳电厂	田邦	18191500705	田邦	2/8
11		屈建利	15353830567	屈建利	
12	神木市久业发电有限公司	高建军	19239128699	高建军	



13	西安热电有限责任公司	王念文	13772164717	王念文	
14	大唐富平热电有限公司	郭明	19991686751		
15	陕西榆林集团杨伙盘煤电有限公司	李小强	17809168260	李小强	2018
16		张小波	18329282514	张小波	2018
17	陕西恒源投资集团发电有限公司	李 涛	13488488955 *	李 涛	2018
18		刘元虎	13098282999 a	刘元虎	2018
19	陕西渭河煤化工集团有限责任公司	李刚	18392821841	李刚	
20		冯治	13892559403	冯治	
21	陕西延长石油榆林煤化有限公司	高旭	18829787827		
22	大唐韩城第二发电有限责任公司	韩海峰	13060338711	韩海峰	
23		石海强	13871518740		
24	陕西未来能源化工有限公司	徐 轩	18292201087	徐 轩	2018
25	陕西未来能源化工有限公司	董 龙	13409198543	董 龙	2018
26	陕西清水川能源股份有限公司	丁傲	13572969733	丁傲	

27	陕煤集团榆林化学有限责任公司	郝二平	18088069621	郝二平	
28		项东李	18686255435	项东李	
29	陕煤电力略阳有限公司	蔡军良	15353371023	蔡军良	
30	神木市站前综合利用发电有限公司	冯建强	13429790055	冯建强	
31		刘小飞	18992264644	刘小飞	
32	大唐瑞昌发电有限公司	马战	15619589596	马战	
33	陕西润中清洁能源有限公司	兰天	18382301990	兰天	2018
34		杨斐	13772316586	杨斐	2018
35	神木市亨泰活性炭有限责任公司	梁伟	13892278653	梁伟	
36		薛秀刚	18098069621	薛秀刚	
37	陕西金鑫凯神木化工有限公司	高耀奇	15529795867	高耀奇	
38	大唐渭河热电厂	王飞	15191059901	王飞	2018 2018
39		刘勇	17762100548	刘勇	2018
40	神木市北海煤电有限公司	马志鹏	15291262129	马志鹏	2018



41	陕西渭河榆林发电有限公司	唐祖期	18220265764		
42	陕西延长石油榆林煤化有限公司	乔成斌	18681917555	乔成斌	1871111111
43		曹星	13772937204	曹星	曹星
44		马东瑞	13408141783	马东瑞	
45	大唐陕西发电有限公司西安热电厂	张波	13991175508	张波	
46	陕西君创智慧能源科技有限公司	杜俊伟	13324636003	杜俊伟	
47	大唐蒲城发电有限责任公司	王德松	17382611082	王德松	
48	国能榆林化工有限公司	王慧	18149136112	王慧	2019
49	陕西北元集团锦源化工有限公司	王峰	13154027000	王峰	2019
50	神华神东电力有限责任公司店塔电厂	折子平	15229829882	折子平	
51	陕西北元化工集团股份有限公司	贺荣	15591230321		
52	陕西渭河彬州化工有限公司	冯新	18702927067		
53		宋宏强	15709220118	宋宏强	2019
54	国能榆林化工有限公司	黄虎旗	18149126061	黄虎旗	2019

55	陕西金泰氯碱神木化工有限公司	段志攀	15909284448	段志攀	2019
56	陕西延长中煤榆林能源化工有限公司	白能东	18809123055	白能东	
57		周国波	13572354840	周国波	
58	大唐富平热电有限公司	滕云贵	17719775323	滕云贵	
59	陕西金泰化学神木氯碱有限公司	史占军	13772922134	史占军	2019
60	国能榆林化工有限公司	王武杰	18149121086		
61	陕西延长石油延安炼油厂	杨西	13571106245	杨西	
62	陕西延长石油延安炼油厂	张皓	13991775737	张皓	
63	陕西延长石油兴化化工有限公司	段博	18740343636	段博	
64	陕西延长石油兴化化工有限公司	曹龙超	15829805324	曹龙超	
65	陕西延长石油(集团)有限责任公司油气田化工科技公司	吕智	13378315877	吕智	
66		刘艺	15929415261	刘艺	
67	大唐秦岭发电有限公司	严新平	13891453699	严新平	
68		黄杜晨	13892584822	黄杜晨	



69		苏亮	18329250871	苏亮	
70	陕西有色榆林新材料集团有限责任公司发电分公司	呼星光	18329283270	呼星光	
71		魏景伟	18700200994	魏景伟	
72		王萍利			与陈博昇是同一人
73	陕西三江能源燃气发电有限公司	李秋杰	13752284085		
74	黄陵矿业大寨石发电有限公司	高勇	15991546077	高勇	
75	大唐富县热电厂	白明	18409271116		
76	陕西渭北化工集团中水电力发展有限责任公司	齐明	1878017708		
77		王永坤	18766777108		
78	陕西渭北煤化工集团有限责任公司	薛海华	1829118205		
79		曹星明	18700139802		
80	大唐陕西发电有限公司华县热电厂	陈明	17729106822		
81	陕西延长石油延安长源油厂	周倩	13892051752		
82	陕	吴琼	18220128477		

83	康保黄陵矿业煤研石发电公司	叶磊	15991548596		
84		刘科	13468599295		
85	大唐陕西第二发电有限公司	魏正军	13062388711		
86		孙金梁	18571518740		
87	大唐陕西发电有限公司延安热电厂	汪红军	1779596221		
88	陕西华电渭北发电有限公司	邱国光	1822065714		
89	陕西华电渭北发电有限公司	刘强	13892597140		
90		高海峰	15191382319		
91	陕西渭北发电有限公司	刘永强	13892980650		
92	国能古铜木木业有限公司	王武军	18149121026		
93	陕西延长石油榆林炼化有限公司	闫平	1389035023		
94	陕西延长石油榆林炼化有限公司	建强	1511926535		
95	延安石油化工有限公司	徐强	13169110616		
96	延安石油化工有限公司	王芳	1877950229		
97					



4.3 Feedback form from some training participants.

1、Feedback form for energy-saving training for power plant boiler operators.

序号	姓名 (必填)	单位(必填)	您对酒店食宿、报名参会等会议安排满意吗? 请打分。(必填)	您对老师授课内容方面满意吗? 请打分。(必填)	您对酒店食宿、报名参会等会议安排的意见和建议。	您对老师授课内容方面的意见和建议。	您对电站锅炉使用、管理、检验、能效测试等方面的意见和建议。	您对电站锅炉和厂内系统节能等方面的意见和建议。	您对其他方面的意见和建议。
1	郝志明	神木市恒晟化工有限公司	10	10	无	无	无	无	无
2	蔚龙	陕西未来能源化工有限公司	10	10	无	无	无	无	无
3	代文虎	中煤陕西能源化工有限公司	10	9	无	无	无	节能方面的典型案例再多一些	无
4	王峰	陕西北元集团顺源化工有限公司	10	9	很好	建议将培训PPT共享	无	无	非组织类短会议逐步提升各单位管理人员对法律法规的
5	冯李锋	神木市洁能综合利用发电有限公司	10	10					
6	孙相耀	陕西恒河榆林发电有限公司	10	10	无	无	无	无	无
7	薛乔楠	神木市亨泰活性炭有限责任公司	10	10		非常满意	满意	满意	无
8	段志攀	陕西金泰威神木化工有限公司	10	10	安排很好	老师讲的非常好			以后多组织一起学习

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9	王雷	国维榆林化工有限公司	8	8	无	建议建立厂内锅炉节能环保安全管理专家库(包括电厂使用单位的专业人员)	是否按下文明确、检验、试验、能效测试等工作由谁负责完成(或省内其他唯一单位),减少使用单位指标影响中体	无	效果很好,建议一年举办2次类似培训
10	梁伟	神木市亨泰活性炭有限责任公司	10	10					
11	白健东	陕西延长中煤榆林能源化工有限公司	10	10	很好	再多一些现实案例	可以到好的单位进行参观学习	希望可以现场展示新型设备	希望安排到一些做的好单位进行参观学习
12	温永峰	陕西省榆林市神木市恒晟化工有限公司发电分公司	10	10	无意见	无意见	无意见	无意见	无
13	耿军良	陕西电力勘测有限公司	10	10					
14	杜俊伟	陕西君创智慧能源科技有限公司	10	10					



序号	姓名 (必填)	单位(必填)	您对酒店食宿、报名参会等会议安排满意吗? 请打分。(必填)	您对老师授课深内容方面满意吗? 请打分。(必填)	您对酒店食宿、报名参会等会议安排的意见建议。	您对老师授课内容方面的意见和建议。	您对电站锅炉使用、管理、检修、能效测试等方面的意见和建议。	您对电站锅炉和厂内系统节能等方面的意见和建议。	您对其他方面的意见和建议。
15	徐昕	陕西未来能源化工有限公司	9	10	酒店住宿标准太高,超出公团标准上限。	挺好!	严格按照法律法规要求执行。	无	无
16	兰天	陕西汉中清洁能源有限公司	10	10	无	无			
17	吕智	蒲城气化工科技公	8	8	无	无	无	无	无
18	周国斌	陕西延长中煤榆林能源化工有限公司	10	10					
19	唐虎旗	国能榆林化工有限公司	10	10	无	无	无	无	无
20	马东瑞	陕西延长石油榆林炼化有限公司	10	10					
21	苏美	陕西有色榆林新材料集团有限责任公司	10	10	无	无	可以多沟通多交流	无	无
22	李升杰	陕西三江能源发电有限公司	10	10					
23	杨斐	陕西汉中清洁能源有限公司	10	10	无	无	无	无	无
24	侯亮	延安瑞源化工有限公司	10	10					

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25	马志鹏	神东北海煤电有限公司	10	10					
26	段瑞	陕西延长石油兴化化工有限公司	10	10	无	无	无	无	无
27	乔鹏	陕西能源化工集团神木电化发展有限公司	10	10	无	无	无	无	无
28	白曦	大唐宝鸡热电厂	10	10					
29	刘元虎	恒源发电	10	10	满意	满意	满意	满意	满意
30	李楠	陕西渭河煤化工有限公司	10	10	挺好	优秀	无	无	无
31	王鹏宇	神东煤电集团能源发展有限公司	10	10	无	把课件发群里		大面积推广	无
32	刘超	陕西陕化煤化工集团有限公司	10	10					
33	史右军	金泰化学神木化工	9	8					
34	曹龙魁	陕西延长石油兴化化工有限公司	10	10	无	无	延长能效测试年限	无	无



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35	靳子平	神华神东电力有限责任公司岱岳电厂	10	10	满意	满意			
36	刘旭飞	陕西渭河发电有限公司	10	10	满意	老师授课很满意,能沟通交流很好	老设备企业在资料管理方面困难大,丢失频繁	炉墙保温和废水回收利用空间大	下到企业讲课
37	石军华	陕西黄陵煤化工有限责任公司	8	9					
38	丁凯	陕西清水川能源股份有限公司	10	10					
39	惠基明	陕西黄陵煤化工	9	9					
40	惠涛	陕西延长石油榆林煤化工有限公司	8	10	会议室太小,人员密集	无	无	无	无
41	田邦	陕西美鑫产业投资有限公司	10	10	食宿报名参会等会议安排很好	老师经验丰富,无论从理论还是方案讲解很透彻,就是时间短,多少有些意犹未尽。课多时	以成熟管理制度为主,根据各厂存在问题进行针对性管理	无	希望再次组织类似培训,希望老师讲课时间长点,也会有更多学员解疑提问的时间

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42	张鼓	大唐西安热电厂	10	10	无	请老师把课件发群里,回去慢慢领悟	无	无	无
43	王武杰	国能榆林化工有限公司	10	10	酒店位置不是很好,周边配套设施,远离景点	授课期间可征集存在问题,在线答疑,便于课下	可否形成常见问题清单,附处理方法	节能是系统工程,可多讲几个案例分享	建议形成参会人员名单和通讯录,便于日后交流沟通
44	李小鹏	横能集团杨伙盘煤电有限责任公司	10	10	无	无	无	无	无
45	冯利辉,刘小飞	神东市信能综合利用发电有限公司	5	5	无	无	无	无	无
46	冯始	陕西渭河煤化工有限责任公司	10	10					
47	屈满辉	陕西黄陵热电厂	10	10	没住,吃的还不错	现场案例看受益更多一些	没有	没有	没有
48	郝二军	榆林化学	10	10					
49	严磊平	大唐新岭发电有限公司	10	10	满意	老师专业,讲解到位,易懂	无	无	无

序号	姓名 (必填)	单位(必填)	您对酒店食宿、报名参会等会议安排满意吗? 请打分。(必填)	您对老师授课内容方面满意吗? 请打分。(必填)	您对酒店食宿、报名参会等会议安排的意见建议。	您对老师授课内容方面的意见和建议。	您对电站锅炉使用、管理、检验、能效测试等方面的意见和建议。	您对电站锅炉和厂区系统节能等方面的意见和建议。	您对其他方面的意见和建议。
50	高耀奇	陕西金泰复碱滩煤化工有限公司	10	10					
51	闫倩	陕西延长石油延安炼油厂	8	8	满意	满意	无	无	无
52	宋家强	陕西渭河彬州化工有限公司	10	10	无	建议增加中压锅炉方面知识	无	无	无
53	王煜松	大唐蒲城(第二)发电有限责任公司	10	10	无	无	无	无	无

4.4 Some on-site photos.

- 1、 On-site photos from the energy-saving training for power plant boiler operators.







