



推进煤矿甲烷利用减排最佳实践

Promote Best Practices for CMM Utilization and Emissions Reductions

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2019年3月在中国山西省正式注册设立的非营利组织。

It is a non-profit organization officially registered in Shanxi Province, China in March 2019.

宗旨：致力于提高煤矿安全水平，提高煤矿瓦斯抽采利用水平，减少温室气体排放。

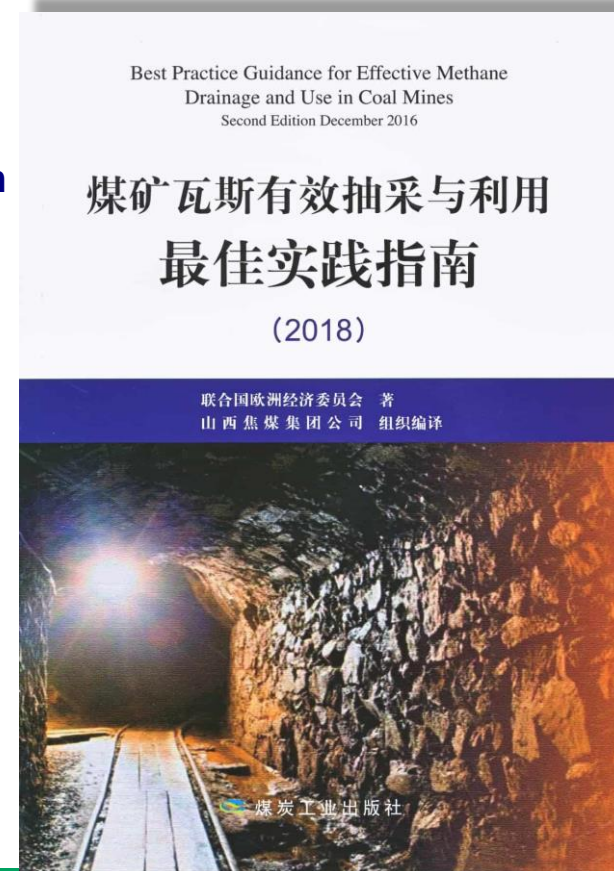
Purpose: Committed to improving the safety level of coal mines, improving the level of CMM control and utilization, and reducing greenhouse gas emissions.

功能：是煤矿甲烷新技术推广平台、国际交流合作平台、项目开发服务平台。

Function: It is a platform for the promotion of new methane technology in coal mines, a platform for international exchanges and cooperation, and a service platform for project development.

任务：推广联合国有效抽采利用煤矿瓦斯最佳实践指南，开展煤矿瓦斯抽采利用减排技术、法律、政策、商业等课题研究，为煤矿、利益相关方、政府、行业协会提供企业、区域、行业低碳发展智力支持。

Mission: Promote BPG for effective CMM control and utilization, and carry out CMM control and utilization emission reduction technologies, laws, Research on policy, business and other topics to provide low-carbon development for coal mines, stakeholders, governments and industry associations Intellectual support.



- 2017年5月与联合国欧洲经济委员会签订合作备忘录Signed MOU with the UNECE in May 2017
- 在专家委员会在指导下积极开展工作Actively carried out work under the guidance of GOE
- 积极传播“煤矿瓦斯最佳实践指南” Actively promote the BPG on CMM and AMM
- 培育瓦斯抽采利用减排示范项目Cultivated gas extraction and utilization emission reduction demonstration projects
- 组织（参与）国际交流合作Organized (participated in) international exchanges and cooperation
- 推广瓦斯抽采利用减排先进技术Promoted advanced technologies for gas extraction and utilization emission reduction
- 服务瓦斯利用项目开发Supply service of development of gas utilization projects
- 参与行业瓦斯标准制定Participated in the formulation of industry gas standards
- 在行业内产生了较大的影响 Has had a great impact in the industry





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第一部分 煤矿甲烷利用减排概况

Part I: Overview of CMM utilization and emission reduction

中国煤层气资源丰富：埋深小于2000米的煤层气地质资源量约为36.81万亿m3，位居世界第三
China is rich in coalbed methane resources: the geological resources of coalbed methane with depth of less than 2,000 meters are about 36.81 trillion cubic meters, ranking third in the world.

在过去的20多年间，中国煤矿瓦斯利用快速发展
Over the past 20 years, China's coal mine gas utilization has developed rapidly.

中国煤矿瓦斯抽采利用减排
CMM extraction, utilization and emission reduction in China
单位：亿 Nm3 unit: hundred million Nm3

	2000年	2010年	2018年
瓦斯抽采量 CMM Drainage	18.58	76	128
瓦斯利用量 CMM utilization	5	24	47.1
瓦斯利用率 CMM utilization ratio (%)	26.91	31.58	36.8

截至2022年底，中国煤炭资源储量为2070.12亿吨，其中山西省煤炭储量约为483亿吨。As of the end of 2022, China's coal resource reserves are 207.012 billion tons, of which Shanxi Province has coal reserves of about 48.3 billion tons
2023年山西省原煤总产量137752万吨In 2023, the total raw coal production in Shanxi Province is 137.752 million tons
山西煤层气2000米以浅的资源量约8.31万亿m3，占中国近1/3。The resources of Shanxi coalbed methane shallower than 2,000 meters are about 8.31 trillion m3, accounting for nearly 1/3 of China.
2023年山西煤层气产量112.7亿m3，占中国煤层气产量的90%；In 2023, Shanxi's coalbed methane production was 11.27 billion m3, accounting for 90% of China's coalbed methane production
2024年1-7月山西煤层气产量79.2亿m3，同比增长22.3%，占中国煤层气产量的81.4%，预计全年产量150亿m3。From January to July 2024, Shanxi's coalbed methane production was 7.92 billion m3, a year-on-year increase of 22.3%, accounting for 81.4% of China's coalbed methane production, and the annual production is expected to be 15 billion m3.

2022年山西省煤矿瓦斯抽采量63亿m³，利用量29.2亿m³，抽采瓦斯利用率46.35%

In 2022, the coal mine gas extraction volume in Shanxi Province was 6.3 billion m³, the utilization volume was 2.92 billion m³, rate was 46.35%.

山西煤矿瓦斯利用以浓度为依据，采用梯次利用方式，其技术路线如下：

According to the different concentrations, the gas utilization method of Shanxi coal mine adopts the cascade utilization method

≥30%：城市民用燃气、发电、深冷提浓CNG/LNG
Urban civil gas, power generation, cryogenic concentration CNG/LNG

≥20%：变压吸附提浓CNG/LNG
pressure swing adsorption to concentrate CNG/LNG

≥10%：低浓度瓦斯发电
Low CMM power generation

≤10%：低浓度瓦斯掺混空气蓄热氧化供热
mixed with air and oxidation for heating

≤0.75%：通风瓦斯掺混低浓度抽采瓦斯蓄热氧化热电联产
VAM mixed with low-concentration CMM for RTO and cogeneration

目前，影响抽采瓦斯利用率的主要因素是超低浓度瓦斯即8%以下浓度的瓦斯利用率水平较低，需要新技术的开发和应用。

At present, the main factor affecting the utilization rate is the utilization of below 8% concentration, which requires the development and application of new technologies.



提高通风瓦斯利用水平是主要课题之一

Improving the utilization of VAM is one of major issues

通风瓦斯浓度处于0.2%~0.4%之间，属低阶能源。

The concentration of VAM is between 0.2%~0.4%, which is a low-order energy source.

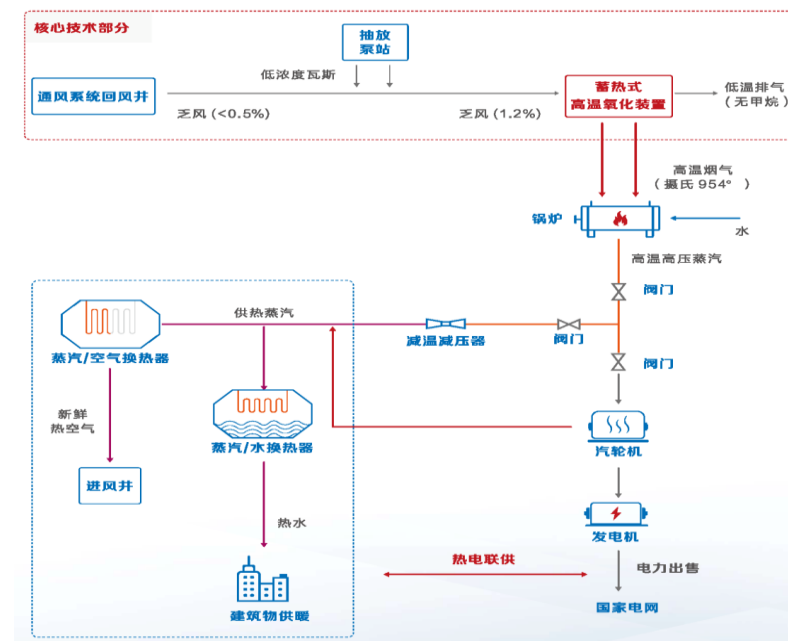
目前的技术路线是：RTO→蒸汽锅炉→汽轮机发电→余热利用。

The current technical route is: RTO → steam boiler → turbine → waste heat utilization.

由于RTO装置对瓦斯浓度的要求是1.2%，故需掺混一定量的低浓度瓦斯
Since the RTO device requires a gas concentration of 1.2%, it is necessary to mix a certain amount of CMM

通风瓦斯利用项目具有投资大、占地面积大、投资回收期长、运营成本高
等特点，需要政府鼓励、约束政策并用，示范项目引领，新技术开发应用
等多重力量的加持。

VAM projects needs large investment, large floor area, long payback period, and high operating costs, which require government encouragement+restraint policies, demonstration project guidance, and new technology development





第二部分 中国煤矿瓦斯利用减排历程

Part II: Progress in CMM utilization and emissions Reduction in China



1、京都议定书和CDM机制，促进了中国浓度30%以上的煤矿瓦斯项目开发

The Kyoto Protocol and CDM mechanism has promoted the rapid development of high-concentration gas in China

2、中国政府建立硬约束机制推动高浓度瓦斯减排快速发展

The Chinese government has established a hard restraint mechanism to promote the rapid development of high-concentration gas emission reduction

2008年7月1日由中华人民共和国环境保护部制定的《煤层气(煤矿瓦斯)排放标准(暂行)》要求:

The "Coal Bed Methane (Coal Mine Gas) Emission Standard (Provisional)" formulated by the Ministry of Environmental Protection of the People's Republic of China on July 1, 2008 requires:

禁止高浓度瓦斯（甲烷体积分数 $\geq 30\%$ ）排放。

Emissions of high-concentration gas ($\geq 30\%$) are prohibited.





3、新技术推动低浓度瓦斯利用快速成长 New technologies are driving the rapid growth of low-concentration gas utilization

2009年12月11日，相关部门连续发布了三项低浓度瓦斯利用减排的国家标准 On December 11, 2009, the relevant departments successively issued three national standards for the use and emission reduction of low-concentration gas

在新技术新标准的加持下，低浓度瓦斯利用的输送系统、发电系统问题得到解决，抽采瓦斯利用率大幅度增长。

With the support of new technologies and new standards, the problems of the transmission system and power generation system of low-concentration gas utilization have been solved, and the utilization rate of extracted gas has increased significantly.

ICS 13.100
D 09
备案号: 27425—2010

AQ

中华人民共和国安全生产行业标准

AQ 1076—2009

煤矿低浓度瓦斯管道输送
安全保障系统设计规范

Code for security system design of low concentration gas
pipeline transportation of coal mine



4、中国以煤炭企业为依托相继成立国家重点实验室（中心）

Relying on coal enterprises, China has successively established State Key Laboratories (Centers)

中国政府为推动煤矿瓦斯抽采利用，相继成立国家级煤矿瓦斯重点实验室，煤与瓦斯共采国家中心，支撑瓦斯利用新技术开发。

In order to promote the extraction and utilization of coal mine gas, the Chinese government established the National Key Laboratory of Coal Mine Gas and the National Center for Coal and Gas Co-mining to support new technology for gas utilization

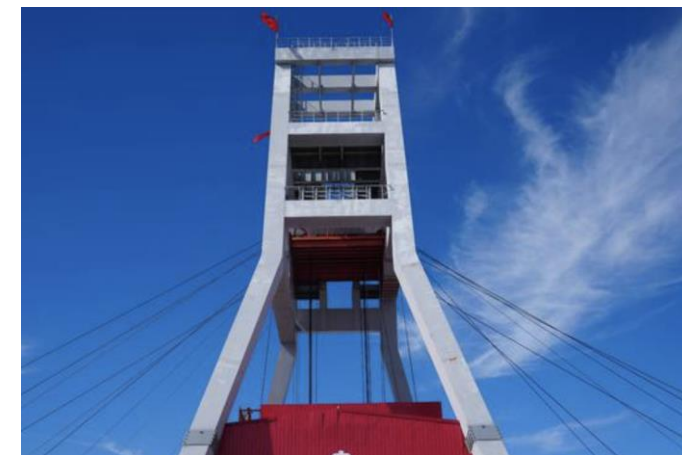
5、示范项目引领实现乏风瓦斯综合利用突破

The demonstration project leads to a breakthrough in the comprehensive utilization of VAM

潞安高河煤矿乏风瓦斯发电、桑掌乏风氧化发电、古城乏风发电、桃园乏风发电，发挥了示范作用，实现乏风利用零的突破。

Lu'an Gaohe ,Sangzhang, Gucheng,and Taiyuan VAM projects have played an exemplary role and achieved a breakthrough in the utilization of exhaustive wind

目前，在煤矿乏风利用方面已有30余个乏风氧化余热利用项目发挥作用。井筒保温、冬季采暖、洗浴热水等。At present, there are more than 30 VAM projects, providing shaft heating, winter heating, bathing hot water, etc.



6、废弃矿井（盘区）瓦斯回收利用进入示范起步阶段

The gas recovery of abandoned mines (panels) has entered the demonstration stage

目前，中国关闭矿井（盘区）瓦斯回收因矿而异，主要采取以下4种方式抽采：There are 4 main ways for AMM and Goaf methane control:

6.1.管道抽采Buried pipe extraction

生产矿井对临近废弃矿井进行管道抽采AMM。如淮河能源控股集团有限公司潘集2矿关闭矿井瓦斯回收利用项目

Production mines perform pipeline pumping AMMs from adjacent abandoned mines. Like Panji 2 Mine in Huainan.

6.2.原预抽井抽采The original pre-drainage surface well for AMM control

利用原有地面预抽钻孔，对煤矿采空区进行抽采。如晋能控股装备制造集团有限公司寺河矿关闭盘区瓦斯回收利用项目。

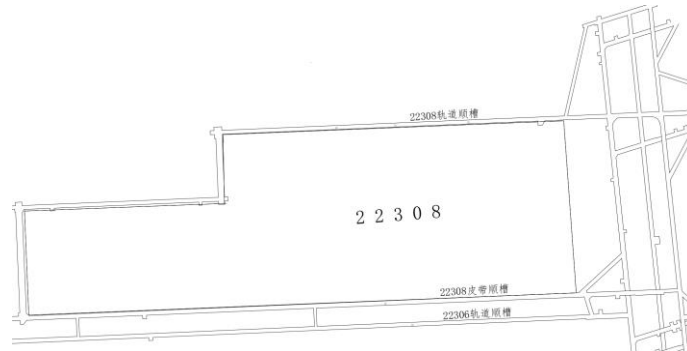
The original ground pre-drainge borehole is used to extract the goaf of the coal mine. like Sihe Mine in Jincheng

6.3.地面钻井抽采Surface drilling and extraction

在地面新设抽采钻井，实现对关闭矿井（盘区）的瓦斯回收利用。

Construct new extraction drilling wells on the surface for Goaf CMM in closed mines (panels).

6.4.井下采空区抽采Underground goaf extraction, like Tunlan in Xishan.





第三部分 中国碳市场和煤矿甲烷减排政策

Part III: China's ETS and Policies for CMM utilization

1、中国碳交易试点情况China's carbon trading pilot

2011年11月29日国家发展改革委办公厅下发《关于开展碳排放权交易试点工作的通知》，批准北京、天津、上海、重庆、湖北，广东、深圳7个城市开展碳排放权交易试点工作。2013年起，7个试点地区（城市）碳交易市场陆续启动上线交易。

On November 29, 2011, the NDRC approved the establishment of seven cities, Beijing, Tianjin, Shanghai, Chongqing, Hubei, Guangdong and Shenzhen, to carry out carbon emission trading pilots. Since 2013, the carbon trading markets in seven pilot areas (cities) have been launched online trading.

中国先后设立了8个碳排放权交易所。

China has set up eight carbon emission exchanges.

2、建立中国碳排放权交易统一市场Establish a unified market for carbon emissions trading in China

2021年7月16日9时15分，全国碳市场启动仪式在北京、上海、武汉三地同时举行，全国碳市场正式开始上线交易。

At 9:15 a.m. on July 16, 2021, the launching ceremony of the national carbon market was held simultaneously in Beijing, Shanghai and Wuhan, and the national carbon market officially began to be launched for trading.



3、碳排放权交易政策Emissions Trading Policy

2020年12月31日生态环境部公布了《碳排放权交易管理办法（试行）》。

2021年5月14日生态环境部发布了《碳排放权登记管理规则（试行）》、《碳排放权交易管理规则（试行）》和《碳排放权结算管理规则（试行）》。

2024年1月25日国务院总理李强签发《碳排放权交易管理暂行条例》。

On December 31, 2020, the Ministry of Ecology and Environment (MEE) announced the Administrative Measures for Carbon Emission Trading (Trial).

On May 14, 2021, the Ministry of Ecology and Environment (MEE) issued the Administrative Rules for Carbon Emission Allowance Registration (Trial), the Administrative Rules for Carbon Emission Trading (Trial) and the Administrative Rules for Carbon Emission Allowance Settlement (Trial).

On January 25, 2024, Premier Li Qiang of the State Council issued the Interim Regulations on the Administration of Carbon Emission Trading.

4、碳足迹管理制度化Institutionalization of carbon footprint management

2023年11月13日，国家五部委联合发布《关于加快建立产品碳足迹管理体系的意见》

On November 13, 2023, the five national ministries and commissions jointly issued the "Opinions on Accelerating the Establishment of a Product Carbon Footprint Management System"

2024年6月4日，相关部门联合下发《关于建立碳足迹管理体系的实施方案》

On June 4, 2024, relevant departments jointly issued the "Implementation Plan on the Establishment of a Carbon Footprint Management System"



5、甲烷控排行动方案 Methane emission control action plan

2023年11月7日，相关十一部委联合下发“关于印发《甲烷排放控制行动方案》的通知”。《方案》有力推动甲烷类项目纳入CCER市场体系。
On November 7, 2023, the relevant 11 ministries and commissions jointly issued the "Notice on Printing and Distributing the Action Plan for Methane Emission Control". The Plan strongly promotes the inclusion of methane projects in the CCER market system.

6、风排瓦斯利用温室气体自愿减排项目方法学 Voluntary greenhouse gas reduction project methodology for VAM

2024年7月24日，生态环境部发出“关于就《温室气体自愿减排项目方法学 煤矿低浓度瓦斯和风排瓦斯利用》公开征求意见的函”。
On July 24, 2024, the Ministry of Ecology and Environment (MEE) issued a "Letter on Soliciting Public Opinions on the Methodology of Voluntary Greenhouse Gas Emission Reduction Projects - Utilization of Low-Concentration Gas and VAM in Coal Mines".

明确“方法学”适用范围是：甲烷体积浓度不超过8%的煤矿瓦斯和风排瓦斯无焰氧化利用的项目。

It is clarified that the scope of application of the "methodology" is: projects for flameless oxidation and utilization of VAM project and methane volume concentration of no more than 8%.

7、碳排放统计核算体系工作方案 Work plan of the Carbon Emission Accounting System

2024年10月8日，八部委联合下发“关于印发《完善碳排放统计核算体系工作方案》的通知”

On October 8, 2024, eight ministries and commissions jointly issued the "Notice on Printing and Distributing the Work Plan for Improving the Carbon Emission Statistical Accounting System"



关于就《温室气体自愿减排项目方法学 煤矿低浓度瓦斯和风排瓦斯利用》《温室气体自愿减排项目方法学 公路隧道照明系统节能》公开征求意见的函



第四部分 工作回顾及未来工作重点

Part IV: Review of work and future key work

1、 2024年的主要工作情况The main work situation in 2024

1.1 2024年4月16日，参加由生态环境部和欧盟举办的“中欧能源与农业领域甲烷排放政策对话及挑战与最佳实践专家对话会”

On April 16, 2024, participate the "EU-China Expert Dialogue on Methane Emissions in Energy and Agriculture" organized by the Ministry of Ecology and Environment and the European Union



1.2 2024年4月25日-28日参加“第二届甲烷观测与量化国际合作研讨会”

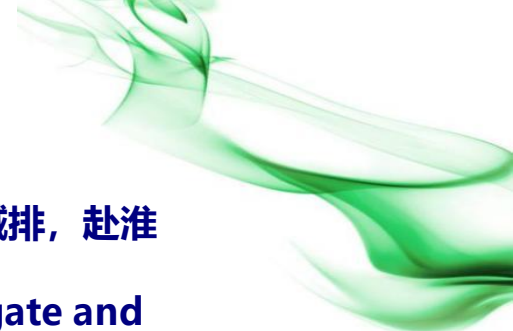
April 25~28, 2024 Participated in the "2nd International Cooperation Symposium on Methane Observation and Quantification"



1.3 2024年6月29日，中心参加“2024甲烷论坛”。在论坛发言中，昽越中心专家分享了国际合作经验，探讨了煤炭领域甲烷减排技术创新研发重点。

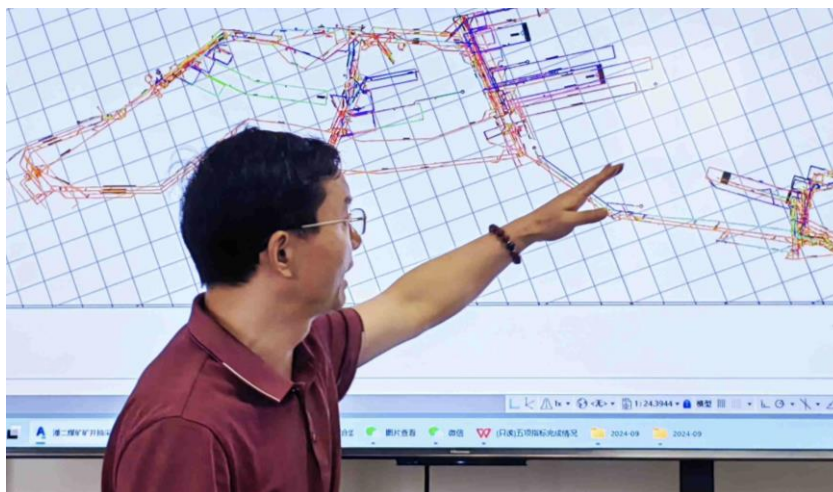
On June 29, 2024, the Center participated in the "2024 Methane Forum".





1.4 2024年9月11日至9月14日，就废弃矿井（关闭盘区）瓦斯回收利用减排项目开发、技术应用、温室气体减排，赴淮河能源控股集团有限公司、晋能控股装备制造集团有限公司调研考察。
From September 11 to September 14, 2024, took group visit yo Huainan and Jincheng to investigate and examine on the development, technology application, and greenhouse gas emission reduction of gas recovery and emission reduction projects in abandoned mines (closed panels).

1.5 2024年9月，与“国家能源煤与煤层气共采技术重点实验室”、“煤矿瓦斯治理国家工程研究中心”建立了业务交流合作关系
In September 2024, it established a business exchange and cooperation relationship with the "National Energy Key Laboratory of Coal and Coalbed Methane Co-production Technology" and the "National Engineering Research Center for Coal Mine Gas Control".



2、未来工作重点Future key work

2.1.开展“低碳进校园 关注你我他”

Carry out "low-carbon into University,low-carbo be focused by all".

与中国煤炭学会、太原理工大学、中国矿业大学、山东科技大学合作，开展“低碳进校园关注你我他”活动；聘请联合国瓦斯专家委员会专家、国际国内减排专家举办低碳系列讲座；培育低碳发展理念，适时选派学生志愿者赴联合国、国际低碳公益组织提供志愿服务。

Cooperate with China Coal Society, Taiyuan University of Technology, China University of Mining and Technology, and Shandong University of Science and Technology to carry out the activity of "low-carbon into University,low-carbo be focused by all"; Invite experts from UNECE GOE and international and domestic emission reduction experts to hold a series of low-carbon lectures; Cultivate the concept of low-carbon development, and send student volunteers to the UN and international low-carbon organizations to provide volunteer services.

2.2.与主管部门合作，编写“关闭煤矿验收及督查技术指南”，为政府提供关闭矿井验收及督查标准服务Cooperate with the competent authorities to compile the "Technical Guidelines for Acceptance and Supervision of Coal Mine Closures", Provide the government with the standard service of mine closure acceptance and supervision

2.3.为煤矿编制低碳发展规划 Prepare a low-carbon development plan for coal mines





2.4.编制煤矿低碳发展手册Compile a manual on low-carbon development of coal mines

2.5.培育无焰氧化减排碳交易示范项目Cultivate flameless oxidation and emission reduction carbon trading demonstration projects

2.6.加强与科研机构的合作Strengthen cooperation with scientific research institutions

**加强与两个国家重点实验室合作，开展煤矿瓦斯科研项目合作、项目开发合作、技术培训合作。
Strengthen cooperation with the two national key laboratories to carry out cooperation in coal mine gas scientific research projects, project development, and technical training.**





第五部分 结论

Part V: Conclusion

纵观煤矿甲烷减排发展历史，卓越瓦斯中心对未来的路径设计是“减、治、用”。

Review the history of coal mine methane emission reduction, the path design of the our Center for the future is "Reduction, Control, and Utilization".

减： 就是要大量发展可再生能源，尽可能地减少煤炭在国民经济中一次能源的占比，如在现有技术条件下，以燃煤发电的超超临界机组升级换代带动电力产业的技术迭代，以新能源电力产业发展为抓手，以虚拟电网为引导，建设以燃煤发电为基础消纳新能源电力的网智能电网，从而大幅度减少电力产业对煤炭的依赖度。

Reduction: it is necessary to develop a large amount of renewable energy and reduce the proportion of coal in the primary energy of the national economy as much as possible. For example, under the existing technical conditions, the upgrading of ultra-supercritical units of coal-fired power generation will drive the technological iteration of the power industry, and the development of new energy power industry will be taken as the starting point, and the virtual power grid will be used as the guide to build a smart grid based on coal-fired power generation to absorb new energy power, thereby greatly reducing the dependence of the power industry on coal.



治： 就是以新技术开发应用为抓手，以法规政策为约束，提高瓦斯抽采水平，有效控制煤矿瓦斯排放、逃逸，同时提高瓦斯浓度，生产高阶清洁能源，为下游瓦斯利用创造条件。

Control: it is to take the development and application of new technologies as the starting point, and the laws and regulations as the constraints to improve the level of gas extraction, effectively control the emission and escape of coal mine gas, and at the same time increase the gas concentration, produce high-level clean energy, and create conditions for downstream gas utilization.

用： 就是以鼓励政策为引导，照顾利益相关方的关切，积极开发煤矿瓦斯利用减排项目，当前要特别鼓励通风瓦斯利用项目的开发建设，逐步实现煤矿瓦斯近零排放，打造“零碳矿山”。

Utilization: it is to be guided by encouraging policies, take into account the concerns of stakeholders, and actively develop coal mine gas utilization and emission reduction projects. At present, it is necessary to especially encourage the development and construction of VAM projects, gradually achieve near-zero emissions of coal mine gas, and achieve "zero emission coal mines" .





谢谢！ THANKS

THE VIEWS EXPRESSED ARE THOSE OF [Mr. Sheng Jinming and Research Centre of Excellence on Coal Mine Methane in ShanXi] AND DO NOT NECESSARILY REFLECT THE VIEWS OF THE UNITED NATIONS