SDG Solutions
面向SDG的中国行动

COP30 BRASIL AMAZÔNIA BELÉM 2025

2025 Climate Solutions from Chinese Enterprises
应对气候变化的中国企业解决方案（2025）

“Precise Dismantling and Rebirth” of Power Scrap A Digital Solution for Carbon Neutrality in Power Equipment Recycling

电力废旧物资的“精拆重生”：以数智化绿色拆解助力碳中和

国家电网
STATE GRID
国网德州供电公司
STATE GRID DEZHOU POWER SUPPLY COMPANY

"Precise Dismantling and Rebirth" of Power Scrap A Digital Solution for Carbon Neutrality in Power Equipment Recycling

Challenges

Resource recycling is a universal practice and crucial ways for the world to address climate change. With the continuous expansion of the power industry scale and the upgrading of technologies and equipment driven by the energy revolution, the iteration cycle of electrical equipment has been significantly shortened. This has led to large quantities of obsolete power equipment and components. A large-scale decommissioning wave of new energy equipment is on the horizon, presenting a huge potential market. How to achieve standardized, precise, efficient, and eco-friendly dismantling, and promote the transition of green dismantling, is not only an urgent need to improve the economic benefits of enterprises but also a powerful measure to address climate change and achieve the carbon peaking and neutrality goals.

The first green dismantling line for waste transformers independently developed by State Grid Dezhou

Solution

Adhering to the circular economy concept of "Reduce, Reuse, and Recycle", State Grid Dezhou Power Supply Company ("State Grid Dezhou" for short) has built the largest green dismantling and sorting center for power scrap in Shandong Province. The breakthroughs in different dimensions help it successfully create a new model of digital green recycling, including the intelligent and wide-ranging dismantling through breakthrough in key technologies and category limitations, maximized recycling value through breakthrough in value-added potential, and intelligent operation of business platforms through breakthrough in management bottlenecks. Those successes also provide replicable and promotable dismantling experience for the industry.

Technological innovation to enhance recycling value

Targeting the large market of waste transformers, the company independently developed the first green dismantling line for waste transformers, which can integrate separation, crushing, and packaging in a short time. This realizes the professional and standardized dismantling of scrapped transformers, with an annual dismantling capacity of 18,000 units. The production efficiency has increased by 58%, the number of operating personnel has decreased by 42%, the disposal value after dismantling has increased by 56% compared with that before dismantling, and waste discharge has been reduced by 65%. The company independently developed the first set of cable dismantling lines. It innovatively proposed a method combining automatic cable breaking and sorting with auxiliary material crushing and screening, thus building the first "intelligent and automated" cable dismantling line within the State Grid system. It also independently developed an efficient and intelligent cabinet dismantling production line. After being dismantled, sorted, and classified in an orderly manner, various cabinets are transformed into qualified recycled raw materials for downstream manufacturing enterprises, forming a green cycle.

Management innovation to improve efficient operation capabilities

In the process of exploring a one-stop management model covering multiple steps of "collection, transportation, storage, dismantling, sorting, and utilization" of power scrap, State Grid Dezhou focused on optimizing the full-chain resource allocation and collaboration efficiency. It independently developed and designed the operation platform of the Digital Green Recycling Center, connecting professional nodes including material storage and retrieval, on-site personnel safety management, equipment operation task assignment, etc. Therefore, this platform has realized the informatization of the whole process of dismantling business, data visualization, and business traceability. Managers can conduct real-time monitoring of various data in the park through big data, realizing the integrated and efficient management of intelligent dismantling, low-carbon operation, intelligent security, and intelligent fire protection. Currently, the layout of green dismantling is being further expanded. Exclusive automated dismantling production lines are being developed and constructed around auxiliary electrical components such as electricity meters, arresters, and insulation meters. This also provides replicable and scalable dismantling upgrading solutions for the industry.

Multiple Benefits

Through the output of "platform + production line + standards", this model can provide the power industry with the full-chain digital management, intelligent equipment dismantling, and integrated circular economy solutions for its green transition, demonstrating significant potential for widespread industry adoption.

Economic: Since the establishment of the center, the cumulative dismantling benefit has reached more than US$28.08 million, and the disposal value has increased by 56% compared with that before dismantling. In the future, the economic benefits will be significantly improved through the secondary transformation of raw materials.

Social: In terms of low-carbon development, it drives the transformation, upgrading, and green development of the upstream and downstream along the industrial chains and supply chains. Research and calculation show that using 1 ton of scrap steel instead of natural iron ore to produce steel can reduce CO_2 emissions by approximately 1.3-1.6 tons; using 1 ton of scrap aluminum instead of primary natural resources to produce aluminum can reduce CO_2 emissions by approximately 11 tons; compared with using primary natural resources to produce copper, using 1 ton of scrap copper can reduce CO_2 emissions by approximately 2.5 tons; remanufacturing products can save 70%-98% of new materials and reduce carbon emissions by 79%-99%.

In terms of industry improvement, it realizes the connection between finished products and recycled raw materials and reduces the risk of waste equipment re-entering the power grid.

In terms of industrial development, the center proposes a closed-loop path to support power grid upgrading from both technological breakthroughs and talent team building. It has carried out more than 60 training sessions, with over 26,000 participants.

Application Scenarios

Regional dismantling center of provincial power supply companies: It can be built by provincial power companies to centrally handle decommissioned equipment such as transformers, switchgear, and cables, realizing standardized and large-scale dismantling and improving resource recovery benefits.

Urban-level "zero-waste power grid" demonstration area: Supported by local governments, green recycling centers can be established in key cities to promote the compliant disposal and resource utilization of power waste, supporting the building of "zero-waste cities".

Reverse logistics system for power equipment manufacturers: It supports equipment manufacturing enterprises in building a closed loop of "production - use - recycling – regeneration". Through dismantling statistics, it feeds back to the green design of products and fulfills the Extended Producer Responsibility.

Inter-provincial resource recycling collaboration network: Relying on the existing influence, a cross-region power material recycling system can be built to realize resource sharing and joint supervision on environment.

In 2024, a leading digital green recycling center within the State Grid system was established

电力废旧物资的“精拆重生”：以数智化绿色拆解助力碳中和

问题与挑战

资源循环利用是全球应对气候变化的普遍做法和重要手段。随着电力工业规模持续扩张，能源革命带来的技术、设备迭代升级，导致电气设备迭代周期显著缩短，产生大批量退役的电力设备及零部件，新能源设备规模化退役潮已来临，潜在市场规模巨大。如何实现规范、精细、高效、环保的拆解，推动绿色拆解转型升级，既是实现企业经济效益提升的迫切需要，更是应对气候变化和实现“双碳”目标的有力举措。

自主研发首条废旧变压器绿色拆解线

解决方案

国网德州供电公司遵循“减量化、再利用、资源化”的循环经济理念，构建起山东省最大的电力废旧物资绿色拆解分拣中心，通过突破关键技术，实现拆解智能化；突破品类限制，实现拆解广域化；突破增值潜力，实现再生价值最大化；突破管理瓶颈，实现业务平台数智化，成功打造绿色数智循环新模式，为行业提供可复制、可推广的拆解实践经验。

技术创新，提升循环利用价值

针对体量较大的废旧变压器市场，自主研发首条废旧变压器绿色拆解线，可一体化快速分离、破碎、包装，实现报废变压器的专业化、标准化拆解，年拆解能力达1.8万台，生产效率提高58%，作业人次降低42%，拆解后的处置价值较拆解前增加56%，减少垃圾排放65%；自主研发首台套线缆拆解线，创新性提出线缆自动破拆分拣+辅料粉碎筛选的方式，建成国网系统首台套“智能化 自动化”线缆拆解线；自主研发高效智能化箱柜拆解产线，各类箱柜经拆解和有序拣选分类后，为下游制造企业提供合格的再生原料，形成绿色循环。

管理创新，提升高效运营能力

国网德州供电公司在探索构建电力废旧物资“收、运、储、拆、拣、用”多个环节一站式管理模式的过程中，着力优化全链条资源配置与协同效率，自主研发设计绿色数智循环中心运营平台，打通了从物资出入库到现场人员安全管控、设备作业任务分配等专业节点，实现了拆解业务全流程信息化、数据可视化、业务可溯化。管理人员可通过大数据对园区各项数据进行实时监测，实现园区智能拆解、低碳运营、智慧安防、智慧消防一体化高效管理。目前，绿色拆解布局正在进一步拓展，围绕电能表、避雷器、绝缘表等附属电器元件，研发建设专属自动化拆解产线，为行业提供可复制、可推广的拆解升级方案。

多重价值

该模式通过“平台+产线+标准”输出，能够为电力行业绿色转型提供全链路数字化管理、智能拆解装备与循环经济一体化解决方案，具备广泛的行业推广价值。

经济效益。

自该中心建成以来，累计拆解效益达2亿元，处置价值较拆解前提升56%，未来还将通过原材料二次转化大幅提升经济效益。

社会效益。

在助力绿色低碳方面：驱动上下游产业链供应链转型升级和绿色低碳发展。经研究测算，每吨废钢代替天然铁矿石生产钢可减少二氧化碳排放约1.3-1.6吨；采用废铝代替原生资源生产铝每吨可减少二氧化碳排放约11吨；与利用原生资源生产铜相比，每利用1吨废铜可减少二氧化碳排放约2.5吨；对产品进行再制造可节省70%-98%的新材料使用，可减少碳排放79%-99%。

在促进行业提升方面：实现了工业成品和再生原材料的链接，并减少了废旧设备回流电网的风险。

在带动产业发展方面：绿色数智循环中心从技术突破和人才队伍建设两方面提出保障电网升级的闭环路径，累计开展培训60余期，培训人数超2.6万人。

应用场景

省级供电公司区域拆解中心：可在各省电力公司布局建设，集中处理退役变压器、开关柜、电缆等设备，实现标准化、规模化拆解，提升资源回收效益。

城市级“无废电网”示范区：与地方政府合作，在重点城市设立绿色循环中心，推动电力废弃物合规处置与资源化利用，助力“无废城市”建设。

电力设备制造商逆向物流体系：支持设备制造企业构建“生产—使用—回收—再生”闭环，通过拆解数据反馈产品绿色设计，履行生产者责任延伸制度。

多省市资源循环协同网络：依托现有辐射能力，构建跨区域电力物资循环利用体系，实现资源共享与环保监管联动。

2024年建成国网系统内领先的绿色数智循环中心

About “GoldenKey – SDG Solutions”

To implement the assertion that sustainable development is the “golden key” to solving current global problems proposed by Chinese President Xi Jinping and to respond to the Decade of Action, “GoldenKey – SDG Solutions” (GoldenKey) was launched by China Sustainability Tribune in October 2020. The initiative aims to identify, shape, and promote outstanding corporate SDG solutions in China, tackle humanity's greatest challenges and drive sustainable development in China and beyond. In 2021, the GoldenKey was selected as the UN Good Practices (#33560).

As one of China’s most influential platforms for sustainable development, GoldenKey has been held for six consecutive sessions. A total of 2,365 corporate SDG solutions have been collected, with 1,054 selected as outstanding SDG solutions. These solutions span areas such as climate action, well-being for all, rural vitalization, tech4SDG, quality education, action4nature, and zero waste. They stand out for their clear problem definition, outstanding innovation, strong replicability, and significant integrated value, demonstrating the capability and innovation of Chinese enterprises in advancing the SDGs.

With the growing emphasis on green and low-carbon transformation, the number of climate-related corporate solutions featured on the GoldenKey platform has increased each year. Participating enterprises range from central state-owned enterprises and foreign-invested companies to private enterprises of all sizes and sectors, contributing to China’s carbon neutrality goal through efforts in energy transition, low-carbon production and operations, digital empowerment, financial support, as well as low-carbon consumption and living. GoldenKey has become one of China’s most influential and internationally recognized platforms for corporate sustainability exchange and evaluation.

From 2022 to 2025, GoldenKey and State Grid Corporation of China (SGCC or State Grid) co-hosted the “GoldenKey · SGCC Special” for four consecutive years. The event collects innovative solutions on topics such as low-carbon transformation and green grids, and has identified and promoted numerous exemplary practices within the power sector. In 2025, GoldenKey launched the “GoldenKey · Power Sector Special” in partnership with the China Electricity Council (CEC) to further collect and showcase breakthroughs by power enterprises in climate change, China’s 30·60 Decarbonization Goal, and low-carbon transition of clean energy.

GoldenKey continues to optimize and upgrade China’s corporate SDG solutions. Through a series of initiatives, including publications, academic forums, field research, international launches, and demonstration projects, GoldenKey showcases and promotes these solutions on domestic and global platforms such as the China International Import Expo, China International Consumer Products Expo, UN Climate Change Conferences, and IUCN World Conservation Congress. This provides replicable models for more regions worldwide and supports the implementation of the SDGs.

Additionally, GoldenKey and the International School of Low-carbon Studies of Shandong University of Finance and Economics jointly established the GoldenKey Low-Carbon Action Center. Focusing on empowering enterprises in their green and low-carbon transformation, the center provides comprehensive knowledge empowerment and capacity building, covering low-carbon strategy development, carbon management capacity building, green project implementation, application of green financial instruments and climate risk control.

SDG Solutions
面向SDG的中国行动

GoldenKey Annual Event

关于“金钥匙——面向SDG 的中国行动”

为落实中国国家主席习近平关于 “可持续发展是破解当前全球性问题的‘金钥匙’”论断，响应联合国可持续发展目标“行动十年”计划，《可持续发展经济导刊》于2020 年发起“金钥匙——面向SDG 的中国行动”（简称“金钥匙”）。“金钥匙”旨在寻找、塑造、推广来自中国企业贡献SDG 的优秀解决方案，应对人类所面临的重大挑战，为推动中国和全球可持续发展贡献力量。2021 年，“金钥匙”获评联合国SDG 优秀实践（编号：SDG Action#33560）。

“金钥匙”是中国可持续发展领域具有重要影响力的平台型活动，目前已成功举办六届，共征集了2365项行动，其中1054项行动脱颖而出，在气候行动、人人惠享、乡村振兴、科技赋能、优质教育、礼遇自然、无废世界等领域涌现出一批问题定义精准、创新性突出、可复制性强、综合价值显著的 SDG 解决方案，展现出中国企业贡献SDG 的行动力和破解难题的创新力。

随着企业对绿色低碳转型重视程度的增加，金钥匙平台上关注气候议题的企业行动数量逐年增加，涉及企业包括不同规模、不同行业的央企、在华外企以及民营企业等，这些行动分别从能源转型、低碳生产与运营、数字化赋能、金融支持、低碳消费与生活等方面积极参与全球气候治理，贡献中国碳中和目标。“金钥匙”成为中国最具影响力和国际化的企业可持续发展交流与展示活动。

2022-2025年，金钥匙与国家电网连续四年合作举办“金钥匙·国家电网主题赛”，围绕低碳转型、绿色电网等议题征集创新方案，发掘推广了一批行业示范实践；2025 年，金钥匙与中国电力企业联合会启动“金钥匙·电力行业主题赛”，旨在更广泛征集推广电力行业在应对气候变化、服务“双碳”目标、促进能源清洁低碳转型等方面的突破性行动。

“金钥匙”持续对中国企业 SDG 解决方案进行优化升级，举办成果出版、学术研讨、走访调研、国际发布、推广示范等一系列活动，在中国国际进口博览会、中国国际消费品博览会、联合国气候变化缔约方大会、世界自然保护大会等国内外平台上展现和推广中国企业 SDG 解决方案，为全球更多地区提供可复制的经验，助力联合国 2030 可持续发展目标落实。

此外，“金钥匙”还联合山东财经大学中国国际低碳学院成立“金钥匙低碳行动中心”，以推动企业绿色低碳转型为核心，提供涵盖低碳战略制定、碳管理能力提升、绿色项目实践、绿色金融工具应用及气候风险管控等全方位的知识赋能和能力建设。

SDG Solutions
面向SDG的中国行动

金钥匙年度盛典

Read the full version of 2025 Climate Solutions from Chinese Enterprises
获取《中国企业应对气候变化解决方案》完整案例集

Learn more about GoldenKey SDG Solutions
了解更多关于
“金钥匙——面向SDG的中国行动”

Follow China Sustainability Tribune's WeChat account
关注可持续发展经济导刊微信公众号

Follow sdg-china.net
关注可持续发展网

Authors: State Grid Dezhou Power Supply Company
Editor: Du Juan
Designer: Guo Zhiyu
Translator: Yang Mingming

作者：国网山东省电力公司德州供电公司
编辑：杜　娟
设计：郭志宇
翻译：杨明明