

## 发明项目展板英文图片内容(一)

CAI No. 03-1

**Invention:** UAV-mounted X-ray Live Working Non-Destructive Testing Technology  
for Transmission Lines      输电线路无人机载 X 光带电探伤技术

**Inventor(s):**

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Grid Liaoning Electric Power Co., Ltd. Anshan Power Supply Company

**Patent No.:** ZL201811483786.1, ZL20212295131.9, ZL20212289521.2,  
ZL202122895022.7, ZL202122884555.5, ZL201921996750.3

**Introduction:**

Addressing the challenges of traditional manual tower climbing tension clamp inspection tasks in the power industry, which involve long power outage durations and high safety risks, this project has pioneered UAV-mounted X-ray Live-Line Non-Destructive Testing technology. It further developed a dedicated drone system for hydraulic tension clamp inspection on transmission lines, establishing an intelligent live-working detection paradigm that prioritizes operational safety and efficiency while ensuring grid reliability.

The overall architecture of the invention includes UAV platform, X-ray flaw detection equipment, ground control system and intelligent analysis system. The UAV platform adopts a heavy-duty design, which can stably carry the X-ray transmitter and mount the imaging board to the wire; The X-ray flaw detection equipment includes an X-ray transmitter and a movable imaging plate, which are used for nondestructive testing of the tension clamp; The ground control system uses Beidou high-precision navigation technology and wireless communication technology to achieve centimeter level precise positioning, hovering control and precise movement control of the imaging board on the wire; The intelligent analysis system is based on big data and artificial intelligence technology to automatically analyze and diagnose the detected images. The invention relies on refined defect management technology to improve the safe operation level of transmission lines.

The invention has been certified by Zhejiang Electric Power Research Institute as safe and reliable, meeting the environmental safety standards for X-ray technology. It is applicable to power grids worldwide across voltage levels from 66kV to 1000kV and holds promising prospects in the field of non-destructive testing for power line hardware. Currently, the invention has been applied in power production across 11 provinces in China, generating an economic benefit of 1.046 million yuan for enterprises. It has filled the gap in the field of unmanned aerial vehicle (UAV)-mounted X-ray non-destructive testing and has won awards including the Gold Award at the 2019 State Grid Youth Innovation Competition and the First Prize at the Liaoning Electric Power Co., Ltd. Employee Innovation Competition. To date, it has been granted 1 Chinese invention patent and 5 utility model patents, with 2 national-level papers published and 1 monograph authored.



Fig 1: Heavy-lift UAV equipped with X-ray transmitter



Fig 2: The movable imaging plate moves to the tension clamp inspection position



Fig 3: The UAV-mounted X-ray transmitter cooperates with the imaging panel to inspect the tension-resistant wire clamp

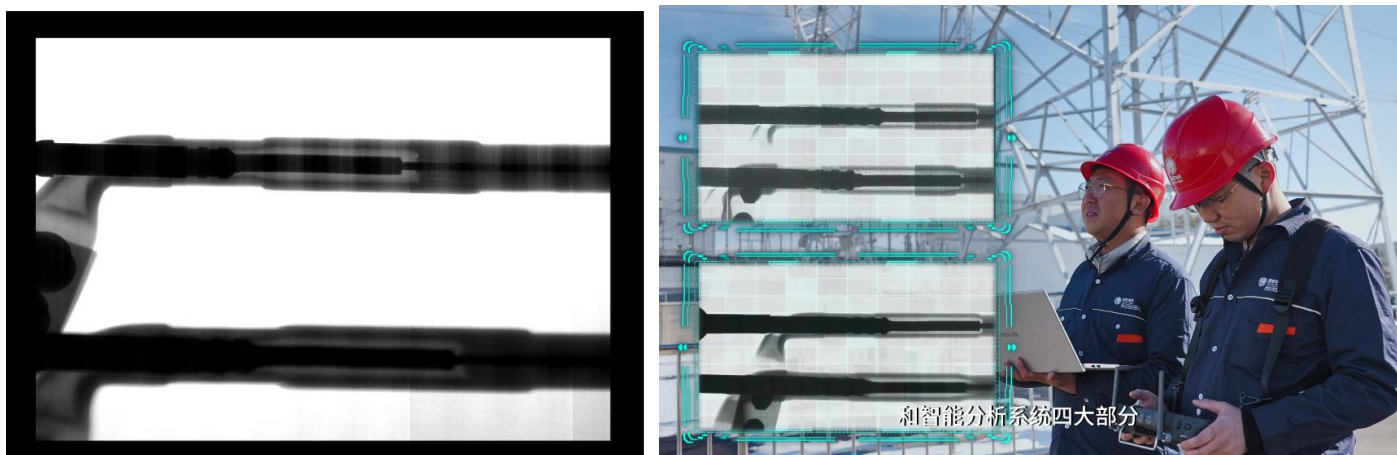


Fig 4: Intelligent Analysis Detection Results



Fig 5: Awards and Honors



Fig. 6. X-ray Detector Devices

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## 附件 2-2 E-NNOVATE 2025 波兰国际创新展览会线上展

### 单位/公司介绍展板英文、图片内容（二）

CAI No. 3-2

**State Grid Liaoning Electric Power Co., Ltd.**

**Anshan Power Supply Company**

#### **Introduction:**

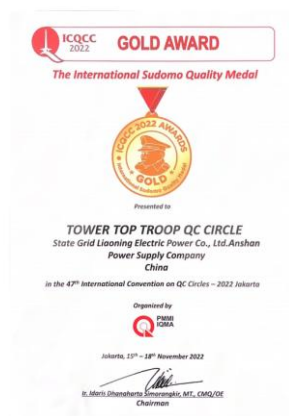
State Grid Liaoning Electric Power Co., Ltd. Anshan Power Supply Company located in Anshan City, Liaoning Province, China, is responsible for the power supply of "three counties (cities) and four districts" (Haicheng City, Tai'an County, Xiuyan County, Tiedong, Tiexi, Lishan, and high tech Zone) and Angang group. Anshan Electric Power started in 1917, and the company was founded in 1948. It is known as "the birthplace of live line work in China" because it took the lead in studying live line work nationwide and made a major breakthrough. After years of development, the company's comprehensive strength has been continuously improved. It has successively won many collective and innovation honors, such as China's May Day Labor award, outstanding enterprises in China's power industry, advanced collective of State Grid Corporation of China, Gold Award of the International Convention on Quality Control Circles (ICQCC) from 2021 to 2023, etc.



Fig1: Company panorama



(a) Gold award of the 46th International Convention on Quality Control Circles (ICQCC) in 2021



(b) Gold award of the 47th International Convention on Quality Control Circles (ICQCC) in 2022



(c) Gold award of the 48th International Convention on Quality Control Circles (ICQCC) in 2023

Fig 2:

From 2021 to 2023, the company's innovation achievements won the gold award of the International Convention on Quality Control Circles (ICQCC) for three consecutive years.

### Operational Highlights (as of 2024):

Service Coverage: 9,251.9 km<sup>2</sup>

Customer Base: 2,090,500 accounts

Grid Infrastructure: 500 kV: 4 substations (9,000 MVA capacity), 17 transmission lines (620.57 km)  
 220 kV: 23 public substations (10,440 MVA), 81 lines (1,182.536 km)  
 66kV: 148 public substations (8,650.6 MVA), 251 lines (2,778.811 km)  
 Annual Performance: Electricity Sales: 26.009 billion kWh  
 Comprehensive Line Loss Rate: 2.61%  
 Fixed Asset Investment: CNY 1.115 billion (+3.05% YoY)



Fig3: Power dispatching command center of the company



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Guided by our core philosophy of "Excellence in Conduct, Elevated Standards, Tangible Results, and Industry Leadership," we are committed to building "Exceptional Anshan Power" – an enterprise distinguished by first-class awareness, corporate image, management practices, and operational performance. Our continuous innovations drive the high-quality development of both the company and the regional power grid.

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