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INNOVATIVE PRACTICES IN AIRPORT ELECTRIFICATION GOVERNANCE OF CHINA

(Presented by China)

EXECUTIVE SUMMARY

Airport electrification refers to replacing traditional fuel with electric to achieve clean and low-carbon operation of airport equipment, facilities, and energy systems. China's civil aviation attaches great importance to the green and low-carbon development of airports. Through initiatives such as actively carrying out pilot projects, formulating scientific plans, strengthening organizational implementation, and accelerating technological innovation, China has steadily promoted and improved the electrification of airport operations, achieving remarkable results. By the end of 2024, new energy vehicles accounted for more than 30% of all airport vehicles in China, airports with an annual passenger throughput of over 5 million have achieved full installation and full application of aircraft APU replacement equipment, and the annual power generation of photovoltaic projects at airports across China is close to 60 million kWh. In the future, China's civil aviation will further coordinate safety and environment, enhance the construction of standard systems and policy guidance for new energy vehicle equipment at airports, and strengthen communication and cooperation with global airports and relevant international organizations on the implementation experience of airport electrification.

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| <i>Strategic Goals:</i> | This working paper relates to the Strategic Goal <i>Aviation is Environmentally Sustainable</i> |
| <i>Financial implications:</i> | None |
| <i>References:</i> | |

¹ English and Chinese versions provided by China

1. INTRODUCTION

1.1 Airport electrification refers to replacing traditional fuel with electric to achieve clean and low-carbon operation of airport equipment, facilities, and energy systems. Its application scenarios extend from ground vehicles to energy network and aircraft support. Promoting airport electrification can reduce greenhouse gas and particulate, and pollutant emissions through measures such as "oil-to-electric" vehicle conversion, upgrading and expanding charging piles, and photovoltaic power generation for lighting. While significantly lowering carbon emissions and improving environmental quality, it can further reduce costs and increase efficiency, enhance public health, and boost the green and low-carbon transformation of the civil aviation industry.

1.2 China's civil aviation continues to promote the electrification in airport operations. Under the guidance of the working principle of "pilot first and followed by promotion", China launched the airport "oil-to-power" conversion pilot program in 2015. In 2018, based on the experience gained from early pilot, China's civil aviation formulated work plans to systematically organize and scientifically advance key tasks such as the application of new energy vehicles at airports, installation and use of aircraft APU alternative facilities, and airport photovoltaic project construction. This reveals that China has comprehensively launched the *Blue Sky Program*, and promoted the electrification of airports to achieve remarkable results in energy conservation and emission reduction.

2. DISCUSSION

2.1 By actively promoting the electrification transformation of airport ground equipment and operations, as well as the large-scale application of renewable energy, the effects of pollution reduction and carbon emission reduction through the electrification of operations at China's civil aviation airports have been remarkable.

2.1.1 Accelerating the promotion of electrification replacement for various types of vehicles and equipment in airports. By the end of May 2025, new energy vehicles account for more than 30% of all airport vehicles in China. In several major airports such as Beijing Daxing International Airport, Chengdu Tianfu International Airport, the proportion of new energy vehicles is approaching to 80%.

2.1.2 Innovating aircraft ground power supply technologies and promoting the use of APU replacement equipment. China's civil aviation has vigorously advanced the use of APU replacement equipment. Currently, airports with an annual passenger throughput of over 5 million have achieved full installation and full application of aircraft APU replacement equipment, with both the installation rate and utilization rate exceeding 95%, resulting in an annual reduction of 3.5 million tons of CO₂ emissions.

2.1.3 Airports in China are actively exploring microgrid construction in light of local conditions, and promoting the application of renewable energy and innovative energy storage systems. China's civil aviation is accelerating the large-scale application of renewable energy such as distributed photovoltaic and geothermal energy at airports, and actively exploring new approaches for the construction of low-carbon airports. At present, annual power generation of photovoltaic projects at airports across China is close to 60 million kWh.

2.2 China is continuously strengthening supervision over the safe and efficient operation of airport electric equipment, with making coordinated efforts in optimizing supervision and risk prevention. Therefore, electric vehicles in airports achieve zero reports of unsafe incidents.

2.3 The electrification transformation of airport ground equipment and operation, with the advantages of zero emissions, low energy consumption and high reliability, contribute to the further improvement of airport operation efficiency and significant reduction in operation cost.

2.3.1 Major airports have leveraged new technologies such as vehicle networking, big data, and micro-energy storage to independently develop intelligent monitoring systems for airport energy and equipment, providing critical technical support for enhancing digital and intelligent operations. For example, Hangzhou Xiaoshan International Airport has pioneered a multi-level charging service system for its transportation hub with an innovative concept. Through a three-dimensional layout, it has established an intelligent charging network covering all scenarios. The total power of the charging matrix has increased to over 2 megawatts, with efficiently serving exceeding 350 vehicles daily average. Moreover, the 30-minute fast energy replenishment technology in the fast-charging area has boosted the turnover rate of buses by 40%.

2.3.2 Through the electrification transformation of airport ground equipment and operations, the airport operational costs are reduced. Take the use of baggage tractor (luggage trailer) at Beijing Capital International Airport as an example. The average annual operation cost of an electric baggage tractor is approximately half than a fuel-powered one. Specifically, the maintenance cost of an electric baggage tractor is RMB9,000/year, about two-thirds of a fuel-powered one; its energy consumption cost is RMB130,000 /year, roughly one-third of a fuel-powered one.

2.4 Driven by the market, China promotes equipment manufacturers to pay greater attention to the needs of civil aviation, continuously increase resource input, conduct independent R&D and innovation as well as standardization construction, and enhance product performance.

2.4.1 China's civil aviation has actively advanced the standardization construction process for airport electrification, initially establishing a technical specification system for the electrification of civil aviation airports. It has published the *Design Guide for Airport Electric Vehicle Charging System (MH/T 5081—2024)*, which provides design requirements and specifications for charging systems of airport electric vehicles to ensure their safety and efficiency. China has also formulated the *Communication Protocol and Data Format of Operation Monitoring System for the EV Ground Support Equipment at the Transportation Airports (T/CCAATB 0041-2023)* and the *Communication Protocol between Off-board Charger and Operation Monitoring Platform for Electric Vehicle at the Transportation Airports (T/CCAATB 0042-2023)*. These standards put forward corresponding requirements for the safe operation and intelligent management of electric vehicles at airports, further enhancing the safety management margin for electric vehicle operations in airport.

2.4.2 China has actively carried out independent R&D and innovation, with the localization rate of new energy facilities and equipment at airports exceeding 90%. Meanwhile, China has promoted the application of innovative new energy technologies and developed new types of batteries.

3. CONCLUSION

3.1 The electrification of airports operation involves a wide range of areas. Efforts should be strengthened in aspects such as strengthening technological innovation and industrial collaboration, optimizing policies and market mechanisms, improving infrastructure and energy systems, enhancing social participation and public awareness, and intensifying talent cultivation and scientific research investment. These coordinated efforts will promote the safe and efficient airport electrification and contribute to the green and low-carbon transformation of the civil aviation industry.

3.2 In the future, based on consolidating existing achievements, China is ready to strive to promote in-depth integration of collaborative development between civil aviation and related industries, further coordinate growth, safety sustainability, service and efficiency goals, enhance the construction of standard systems for airports electrification. As well, China is ready to strengthen communication and cooperation with relevant countries and international organizations to share experience of airport electrification.

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