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Micro Base Station Deployment and Regulation Adjustment in the 5G Era

Taiwan Institute of Economic Research

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Chapter 1 Motivation

With the rapid development of communication technology, 5G base stations will be transformed into a combination of large and micro base stations in the future, in addition to large-scale base stations covering a wide range of signals, in order to achieve the three major aspects of 5G commercial transfer services—high speed and large connection and low latency. However, there are multiple construction methods for micro base station deployment methods or designs. This case aims to study the international micro base station regulatory methods, relevant laws and regulations and deployment methods, and proposes to promote the deployment of micro base stations in my country's existing central and local public facilities or buildings. Recommendations on the adjustment of laws and regulations will serve as a reference for the National Communication Commission and other relevant authorities.

Chapter 2 Methodology

This research mainly adopted Document Analysis and Benchmarking, by collecting the systems and cases of advanced countries, as the background analysis of policies and regulations, and used In-depth Interviews to understand the deployment practices and deployment difficulties of smart pole companies, telecommunications operators, and local governments. The research team used the Focus Group Interview method, and held two meetings, inviting central government and local governments, professionals from the industry, government, academia, and stakeholders to focus on the research and analysis results of this case and discuss issues related to the deployment of micro base stations to gain interest. Finally, the research team comprehensively analyzed Taiwan's current legal system and practices from the technical, operational and cost aspects using Comparative Research method, and offers forward immediate feasible and mid- to long-term recommendations.

Chapter 3 Crucial Discovery

In order to realize the vision of smart cities and rural areas, in addition to large-scale 5G base stations with large-scale signal coverage, using micro base stations to fill gaps is the general trend. Due to the combination of large and micro base stations, 5G commercialization will soon realize, and the whole people can benefit from high speed, large connection and low latency.

As Telecommunications Act, Telecommunications Management Act, Regulations for Administration of Base Stations of Mobile Communications Network Businesses, and Regulations for Administration of Base Stations of Public Telecommunications Network are all abstracted legislation, no deployment details have been formulated, and local governments haven't legislated on deployment of 5G micro base stations, so the research team collected regulatory methods and relevant laws and regulations in the United States, the European Union, Japan, Singapore, Australia, Canada, Hong Kong, South Korea, Germany, and Mainland China. According to the research, in order to lower the deployment threshold, except for legislation, the following measures are mainly adopted:

1. **Establish Streamlines For Deployment Applications:** the US FCC issued "Declaratory Ruling and Third Report and Order" and "Declaratory Ruling and Notice of Proposed Rulemaking" to shorten the local application review process.
2. **The Central Government Sets the Upper Limit of Charges for Deployment:** the US FCC's "Declarative Ruling and Third Report and Order" revealed the upper limit of local government charges.
3. **Adjust the Existing Legal Interpretation to Recognize the Legitimacy of the Deployment Method:** Declaratory Ruling and Notice of Proposed Rulemaking, issued by the US FCC, intending to reinterpret the 2014 Infrastructure Order.
4. **Work with Industry, Government, and Academia to Use Traffic Signs as the Deployment Carrier:** Japan Ministry of Internal Affairs and Communications and related government agencies have promoted the deployment of traffic signs in recent years, and National Police Agency has also conducted related research on deployment matters.
5. **Governments Take the Initiative to Assist in the Release of Public Facilities or Buildings:** Singapore IMDA and telecommunications operators set up a working group to discuss the space and infrastructure needed for 5G deployment. Hong Kong OFCA promises to make use of public facilities, public buildings and coordinate the deployment of

external walls of buildings. Germany Federation of Local Governments negotiated with the telecommunications operators to form a model agreement; South Korea MSIT planned a budget and encouraged the release of public buildings.

6. **Release More Spectrum Resources:** South Korea MSIT gradually expands the release of spectrum resources for 5G use.
7. **Release Deployment Relevant Engineering Drawings:** South Korea releases relevant engineering drawings for the deployment of public buildings and facility base stations.
8. **Promote Experimental Fields:** Mainland China has established experimental fields in many key cities and gradually formed specifications for smart poles.

The US and Mainland China local legislation or policies to promote deployment includes the establishment of expert committees by local governments to review deployment issues, and the application process simplification. Provinces and cities in Mainland China continue to plan 5G deployment issues through policy statements.

The research team recommends that the central competent authority formulate a unified and simplified procedure and charging principles. In addition to gradually releasing more spectrum resources, it is also

necessary to cooperate with the central authority of the legal deployment carrier to promote the experimental field, and to confirm the deployment specifications with the industry, government, and academia, and release deployment relevant engineering drawings to provide reference for equipment manufacturers, power companies, telecommunications operators, and other stakeholders to promote the vigorous development of the 5G micro base station industry.

The current local legislation or policies to promote deployment practices include the United States and mainland China, including the establishment of expert committees by local governments to review deployment issues and simplify the application process. Mainland provinces and cities continue to plan 5G deployment issues through policy statements.

To learn from international regulatory measures, the research team recommends that the central competent authority formulate a unified and simplified procedure and charging principles. In addition to gradually releasing more spectrum resources, it is also necessary to cooperate with the central authority of the legal deployment carrier to promote the experimental field. Confirm the deployment specifications with the industry, government, and academia, and release a schematic diagram of

the deployment project to provide reference for equipment manufacturers, power companies, telecommunications operators, and other stakeholders to promote the vigorous development of the 5G micro base station industry.

In addition to adjusting regulatory methods and laws, legislation or policies on deployment methods are also critical to promoting the widespread deployment of 5G micro base stations. Although Taiwan's telecommunications regulations do not impede the deployment of 5G micro base stations, there is still a lack of specific regulations, which is a legal vacuum. Therefore, in order to put forward forward-looking regulatory amendments and recommendations, the research team focused on extensively collecting and compiling the deployment methods of densely populated areas such as Japan and South Korea, deployment guidelines for Denver, Colorado, USA, and the deployment guidelines of Washington, DC, and Massachusetts, with detailed deployment engineering drawings and related specifications. The relevant measures for the smooth implementation of construction practices are as follows:

1. **Standardization of Deployment Specifications:** includes deployment height, design wind speed, base and connected ducts, hole circle, equipment cabinet (size, maintenance channel and ventilation method), service life, attachment load capacity, installation interface,

etc.

2. **Drafting Construction Drawings:** South Korea released engineering drawings for supporting grounding facilities, power dispatching and pipelines. Mainland China Smart Poles White Paper revealed functional design, pole design, power supply and distribution, integrated cabinets or silo and pipeline configuration specifications.
3. **Propose the Power Meter of Typical Attached Equipment:** Mainland China Smart Poles White Paper revealed the power meter of typical attached equipment.
4. **Governments Provide References for Deployment Methods:** Denver, Colorado, the United States issued Small Cell Infrastructure Design Guidelines to unify the urban road pole 5G small cells deployment matters (regulations and deployment diagrams).
5. **The Establishment of a Third-Party Agency and a Single Window:** Japan plans to set up a single window to integrate traffic signal deployment, adjustment and operation, maintenance, and emergency response, and establish a third-party agency as the coordinator of telecommunications operators and local police.
6. **Participation of the Power Companies in the Deployment:** Every country considers the deployment carrier itself and attached equipment, rewiring, installing independent electric meters, and ensuring

electricity safety.

7. **Various Considerations for Site Selection:** includes traffic safety, the life quality of surrounding residents, pedestrian experience, road tree protection and historical monuments. Some use signal-covered simulation tools to study and analyze the beneficial places for deployment.
8. **Priority is Given to Co-Construction by Multiple Telecommunications Operators:** Mostly, a pole only for one telco deploy in practice. However, in accordance with national laws and policies, considering the landscape, environmental protection and effective use of resources, priority is still given to co-construction by multiple telecommunications operators possibility.
9. **Aesthetic Requirements are Tailored to Local Conditions:** there are Aesthetic requirements in local deployment guidelines, laws and regulations, including visual consistency, concealment, location, design, color, materials, and environmental friendliness.
10. **Diversified Deployment Carriers:** South Korea has released tunnels, roofs, public telephone booths, telephone poles and airports to provide deployment. Japan plans to activate traffic signs as the deployment carriers for femto base stations.

Taiwan's counties and cities are committed to the development of smart cities. The widespread deployment of 5G micro base stations is indispensable. Although 5G micro base station technology continues to evolve, it is recommended that the Bureau of Standards, Metrology, and Inspection of the Ministry of Economic Affairs should cooperate with relevant agencies in order to promote domestic equipment, standardize specifications through empirical fields, and propose engineering drawings based on different deployment carriers to provide local governments and related industry players for consideration. In addition, the public and private sectors work together to solve the obstacles to actual deployment by setting up a dedicated single window, and the establishment of a third-party agency can improve the efficiency of negotiation with local governments and related industries. Besides, the deployment should be negotiated with Taipower company and other power companies to establish a safe power dispatch environment. When it is not easy to pull the power supply due to objective conditions, the legal deployment carrier that is originally power supplied should be activated first to increase added value.

Chapter 4 Main Suggestions

I. Telecommunications Regulations Adjustment

The research team suggests that telecommunications regulations should be revised in the following directions:

i. Add Power Deployment Regulations to Realize the Diversification of Legal Deployment Carriers

According to Article 5-1 of Regulations for Administration of Base Stations of Mobile Communications Network Businesses, and Article 14 of Regulations for Administration of Base Stations of Public Telecommunications Network, there are many legal deployment carriers. However, because micro base stations need power supply all day, not all legal deployment carriers are suitable for deployment of micro base stations. Also, the telecommunications regulations do not regulate the supporting power dispatch requirements for the statutory deployment carrier of full-day power supply, and the obligation to cooperate with relevant administrative agencies and Taipower company or other electric companies is not included, that is, to substantially reduce the option of telecommunications operators to deploy carriers.

In addition, considering that each legal deployment carrier has its own jurisdiction, it is not under the full jurisdiction of the telecommunications authority. Therefore, in order to formulate power dispatch specifications in the telecommunications regulations, in addition to negotiating with telecommunications operators, Taipower company or other power companies, it is better to draft power distribution engineering drawings or

related specifications with the competent authority of the carrier deployment, including explicit procedures, independent meter addition obligations, and charging standards, etc. These can not only provide a reference basis for telecommunications operators to choose deployment carriers, or may be available for relevant administrative agencies to properly plan budgets and activate public facilities and buildings.

ii. Adjust the Aesthetic Requirements and Specifications

According to Article 5-1 of Regulations for Administration of Base Stations of Mobile Communications Network Businesses, where the base station described in the previous paragraph is established on public land, at a public facility or in a public building, the said establishment must be approved by the management authority and the winning bidder or operator shall cooperate therewith to provide necessary aesthetic appeal. Besides, according to Article 16 of Regulations for Administration of Base Stations of Public Telecommunications Network, telecommunications operators are only required to pay attention to beautification facilities such as antenna arrangement or antenna grille and to prevent landscape impact when deploying. Both aesthetic requirements are quite loose, and they are not as detailed as the small cells deployment guidelines issued by cities in the United States. However, the construction regulations including visual consistency, concealment, location, design, color, materials, and environmental friendliness, can improve the city appearance and reduce people's resistance. At the same time, it must also cooperate with the local government's city appearance planning and rectification.

iii. Adjust Multiple Telecommunications Operators Co-Construct Regulations

According to Article 15 of Regulations for Administration of Base Stations of Public Telecommunications Network, telecommunications operators are encouraged to deploy micro base stations in a co-construction or co-site manner, and is obligated to establish construction consultation groups with multiple telecommunications operators.

Even if according to the current 5G micro base station deployment practice, a telecommunications operator's small cells are deployed on one pole, which can meet economic benefits and considerable coverage. There are legislative or policy basis for the co-construction of multiple telecommunications operators in each countries.

Even if the smart light pole operators or local governments take attribution of tort liability, disputes over the location of the construction or overhaul hole, and the necessity of co-construction into account, refuse to co-construction, but legal deployment carriers are quite diversified, and not all of them have the same potential worries, and the demand for filling gaps in the future will increase. Based on the maintenance of the city appearance, there is still the need for co-construction.

However, the research team suggested that field verification should be carried out first to unify the size and weight of the 5G micro base station. By formulating the specification limits for the smart light pole load, antenna external connection, and light pole foundation depth, the threshold for the establishment or co-site deployment can be reduced.

II. Relevant Regulations Adjustment

Though there are local public buildings for base station deployment relevant regulations in some counties or cities in Taiwan, it is lack of public facilities (such as traffic signs and utility poles) for 5G micro base station deployment relevant regulations.

The research team then provides many advices on deployment cooperation and possible additions and amendments to related laws and regulations, including deployment specification, public sector cooperation mechanism, power dispatch, site selection, aesthetic requirements, and deployment fees, deployment carriers, etc.

i. Deployment Specification

Even if it is clear that the unified specification may be inappropriate due to the rapid evolution of network and micro base station technology, the formulation of a unified deployment specification is conducive to city appearance maintenance, subsequent maintenance and cost reduction, local governments agree that the central government should formulate specifications and verify them to provide reference for public works departments. J.Y. Interpretation No. 764 stated that the telecommunications industry is a public utility, and in accordance with Article 108 of the Constitution of the Republic of China, micro base station deployment is closely related to the telecommunications industry, and it should be enacted and implemented by the central government or be implemented by local governments. Taking a step back, even though the deployment of micro base stations is not a public utility, but in accordance with Article 111 of the Constitution of the Republic of China, the affairs of a nationally consistent nature should be handed over to the central government. For this,

the research team recommends that the Bureau of Standards, Metrology, and Inspection of the Ministry of Economic Affairs and other relevant agencies (including NCC and information security maintenance agencies) should carry out the trials of various types of 5G micro base station pole deployment, inspect the practice of local government smart street lights, consider the solution suggestions put forward by the industry after the actual deployment, and establish the abstract standard.

5G micro base station deployment relevant specifications should be formulated in terms of pole height, wind speed, base and connected ducts, hole circle, equipment cabinets (dimensions, maintenance channels and ventilation methods), service life, attachments, carrying capacity, installation interface and component materials. In addition, technological evolution and local needs must be considered. It is recommended to formulate common specifications based on basic requirements such as telecommunications safety, electromagnetic compatibility, and structural safety. The construction method must consider the load, appearance, size, power direction design, transmission line settings, power demand, construction methods, ancillary equipment, transmission equipment and uninterruptible power systems, etc. Patent and landscape impacts are also big issues. In practice, it is advisable to broadly integrate multiple opinions to build consensus.

ii. Public Sector Cooperation Mechanism

The deployment of 5G is mostly led by the government in the world, but in Germany, there is also a model agreement between the telecommunications operators and the federation of local governments. According to Article 18 to Article 20 of the Local Government Act,

organization and management of the special municipality/counties/cities townships is self-government matters, and so does management and disposition of properties in the municipality/counties/cities/townships. Therefore, by considering above regulations, the implementation of smart street lights in Taiwan, and the consensus reached by the industry, government and academia through two focus group meetings, it is recommended that a compromise approach can be adopted, establishing a third party, which acts as the coordinator of all stakeholders, and in terms of local governments, setting up a single window is also conducive to policy implementation and communication and coordination.

iii. Power Dispatch

According to Article 109 and Article 110 of the Constitution of the Republic of China, Taipower company is a public utility, so the power dispatch related matters are enacted and implemented by the local government. For this, the local governments should review the application requirements, the current power pipeline deployment status. The local high-ranking officials or single window will integrate the opinions of the various bureaus, negotiate with the telecommunications operators, Taipower company or other power companies, and then draw up the power distribution engineering drawings or related specifications, including the specified procedures, independent meters addition obligations, and charging standards, etc. These can not only provide a reference basis for telecommunications operators to choose deployment carriers, or may be available for relevant administrative agencies to properly plan budgets and activate public facilities and buildings.

iv. Site Selection

Since the micro base station is mainly used to fill the coverage gap after the construction of the large base station, road safety, surrounding residents' life quality, pedestrian experience, road trees and the historical monuments protection should be taken into consideration. In addition, the signal coverage simulation tool may be used to analyze the beneficial places of the deployment, and the smart city application planning may be considered before the site selection and deployment.

J.Y. Interpretation No. 764 stated that the telecommunications industry is a public utility, and in accordance with Article 108 of the Constitution of the Republic of China, micro base station deployment is closely related to the telecommunications industry, and it should be enacted and implemented by the central government or be implemented by local governments. Taking a step back, even though the deployment of micro base stations is not a public utility, but in accordance with Article 111 of the Constitution of the Republic of China, the affairs of a nationally consistent nature should be handed over to the central government. For this, the research team suggested that although each county and city has different locations for deployment, because the network is deployed in a cellular manner, if the central competent authority wants to establish relevant regulations for site selection, it should require local governments not to boycott the deployment with urban plans. In addition, the central government agency should assist local governments in planning to deploy more telecommunications lines in the future, to make use of sidewalks and divisional islands, and increase the choice of locations for telecommunications operators.

v. Aesthetic Requirements

In accordance with Article 109 and Article 110 of the Constitution of the Republic of China, management and disposal of provincial or hsien property shall be enacted and implemented by the local government, and in accordance with Articles 18 to 20 of the Local Government Act, management and disposition of properties in the municipality/counties/cities/townships are self-government, and it is not difficult to beautify the appearance of the micro base station. In practice, it depends on the government bidding requirements, which also consider local characteristics such as city appearance, plants, animals, history and culture. In addition, both article 5-1 of Regulations for Administration of Base Stations of Mobile Communications Network Businesses and article 16 of Regulations for Administration of Base Stations of Public Telecommunications Network do not restrict localized aesthetic. Therefore, aesthetic requirements and other considerations can be placed in government open bids.

vi. Deployment Fees

J.Y. Interpretation No. 764 stated that the telecommunications industry is a public utility, and in accordance with Article 108 of the Constitution of the Republic of China, micro base station deployment is closely related to the telecommunications industry, and it should be enacted and implemented by the central government or be implemented by local governments. Taking a step back, even though the deployment of micro base stations is not a public utility, but in accordance with Article 111 of the Constitution of the Republic of China, the affairs of a nationally consistent nature should be handed over to the central government. In this

regard, the research team suggested that in order to eliminate the worries of telecommunications operators about the local charging, the central government should uniformly formulate various legal deployment carriers charging principles and specific regulations to promote the deployment of 5G micro base stations.

vii. Deployment Carriers

According to the current central or local public facilities or building management regulations, there are few norms for the deployment of micro base stations, that is, local governments can choose appropriate public property to deploy micro base stations in accordance with Articles 18 to 20 of the Local Government Act. After comparing the advantages and disadvantages of the street lights or traffic signs for deployment, the research team found that two deployment carriers have their own advantages. However, in the short term, based on power dispatch difficulties and cost-benefit considerations, it is recommended to choose traffic signs as the main deployment carrier.

III. Feasible Suggestions

According to the current central or local public facilities or building management regulations, there are few norms for the deployment of micro base stations, that is, local governments can choose appropriate public property to deploy micro base stations in accordance with Articles 18 to 20 of the Local Institutional Law. International practice mostly chooses street lights or traffic signs for deployment. After comparing the advantages and disadvantages of the research team, they found that the two deployment carriers have their own advantages. However, in the short term, based on power dispatch difficulties and cost-benefit considerations, it is

recommended to choose traffic signs as the main deployment carrier.

i. Immediately Feasible Suggestions

A. Formulate Specifications As Soon As Possible:

It is recommended that the Bureau of Standards, Metrology, and Inspection and in conjunction with relevant competent authorities (including National Communication Committee and information security maintenance agencies), carry out the specification testing and field verification of 5G micro base station deployment by legal deployment carriers, and inspect local deployment performance of the government, taking into account the solution suggestions put forward by the industry after the actual deployment, and formulating detailed specifications for power supply, centralized control, 5G equipment physical requirements and deployment carriers.

B. Grasp the Local Deployment Obstacles and Deployment Requirements:

Even if the deployment of 5G micro base stations urgently needs to be coordinated by the central inter-ministerial meeting and local inter-bureaus, the city planning, application requirements, and deployment obstacles of each county and city should be initially counted, deployment carriers and deployment site selection restrictions, etc.

C. Invite Power Companies to Negotiate Power Layout:

Micro base stations are closely related to power sources. Therefore, the power companies should be negotiated to form a balanced public and private benefit power charging and project implementation solutions.

D. Establish the Principle of Deployment Fees As Soon As Possible:

Telecommunications operators should first consider economic benefits in deployment. In order to promote the deployment of micro base stations, the central government should regulate local government fees and charges, and authorize local governments to adjust the discretionary power of fees according to local conditions. Besides, launching experimentation for 5G equipment setup related cost sharing, and gradually form a reasonable cost sharing principle.

ii. Medium and Long-Term Recommendations

A. Utilize More Legal Deployment Carriers:

As legal deployment carriers are quite diverse, it is recommended that the deployment possibilities of other carriers should be reviewed at any time.

B. Planning Extensive Local Telecom Deployment and Adjusting

Right of Ways Acquisition Regulations:

In order to make more use of more deployment vehicles, it is recommended to plan a budget for extensive local telecom deployment, and increase Right of Ways acquisition regulations.

C. Establish A Third-Party Agency to Coordinate Deployment Matters:

For telecommunications operators, central or local related agencies, equipment vendors, power companies, or residents near the deployment site, the establishment of a third-party agency helps to exchange opinions and adjust deployment requirements. Besides, the legal system and the objective environment may be improved, and what is more, be responsible for handling residents' petitions and protests. In this way, the establishment of third-party agencies to eliminate disputes and the reduction of the negotiation costs of all stakeholders will help form a multi-win and mutually beneficial situation.