International Core Journal of Engineering Volume 7 Issue 2, 2021
ISSN: 2414-1895 DOI: 10.6919/ICJE.202102_7(2).0015

Exploration of 5G+Smart Light Pole

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Abstract

This paper analyzes and discusses the current situation of 5G base station construction. By analyzing the quantity demand of 5G base station and the total investment of the whole country in the next five years, the contradiction between the limited capital investment and the explosive growth demand of 5G base station is obtained. In view of the contradiction, 5G + smart light pole- a new mode of 5G base station, is proposed. From the perspective of promoting 5G business, this paper explores the 5G + smart light pole standard, and proposes that it is imperative to formulate a unified standard according to the principles of openness, compatibility, sharing, extensibility and foresight. Finally, the bottleneck of 5G + smart light pole is discussed.

Keywords

5G; Smart City; NB-IoT; Smart Light Pole; Standard.

1. Introduction

5G is the fifth generation mobile networks, which is the latest generation of cellular mobile communication technology. It is also an extension of 4G (LTE-A, WiMAX) system. With the mature deployment and commercial application of 5G, modern society will enter a new era.The interconnection in 5G era will be not only between people, but also between things. Eric Schmidt, former executive chairman of Google, clearly predicted at a forum held some time ago: "the Internet is about to disappear, and a highly personalized, interactive and interesting world -- the Internet of things is about to be born."

At present, the Internet of things is applied in smart home and smart devices. Soon, smart city, driverless car, smart medical, AR / VR and smart factory will become the reality of our life. The basis of the Internet of things is to establish a vulnerability free 5G network to achieve full coverage.

Due to the improvement of speed and frequency band, the transmission distance of 5G signal is shorter than that of 4G signal under the same configuration and environment. Compared with 4G network, 5G network needs to build more base stations to meet the network requirements of "wide coverage and low delay".

Starting from 2019, operators begin to lay out 5G network in china, and the scale of 5G infrastructure will be unprecedented. According to the Ministry of industry and information technology, by the end of 2019, more than 130000 5G base stations have been built in China; by the end of February 2020, the number of 5G base stations in China has reached 164000. On June 6, 2020, at the "5G licensing anniversary" online summit held by the Ministry of industry and information technology, Lu chuncong, deputy director of the information and communication administration bureau, said that more than 250000 5G base stations have been built by basic telecommunication enterprises; Wu Hequan, academician of the Chinese Academy of engineering, predicted that the number of 5G base stations in China could reach 650000 by the end of 2020. In the next five years, it is still necessary to build large-scale 5G base stations to meet the full coverage of all regions.

ISSN: 2414-1895 DOI: 10.6919/ICJE.202102_7(2).0015

According to the public data, figure 1 shows the number of new 5G base stations planned by provinces and cities in 2020, and Figure 2 shows the number of possible new base stations in China from 2020 to 2025. The two figures clearly show the huge demand for 5G base stations. Figure 3 shows the investment of 5G base stations in China from 2020 to 2025.

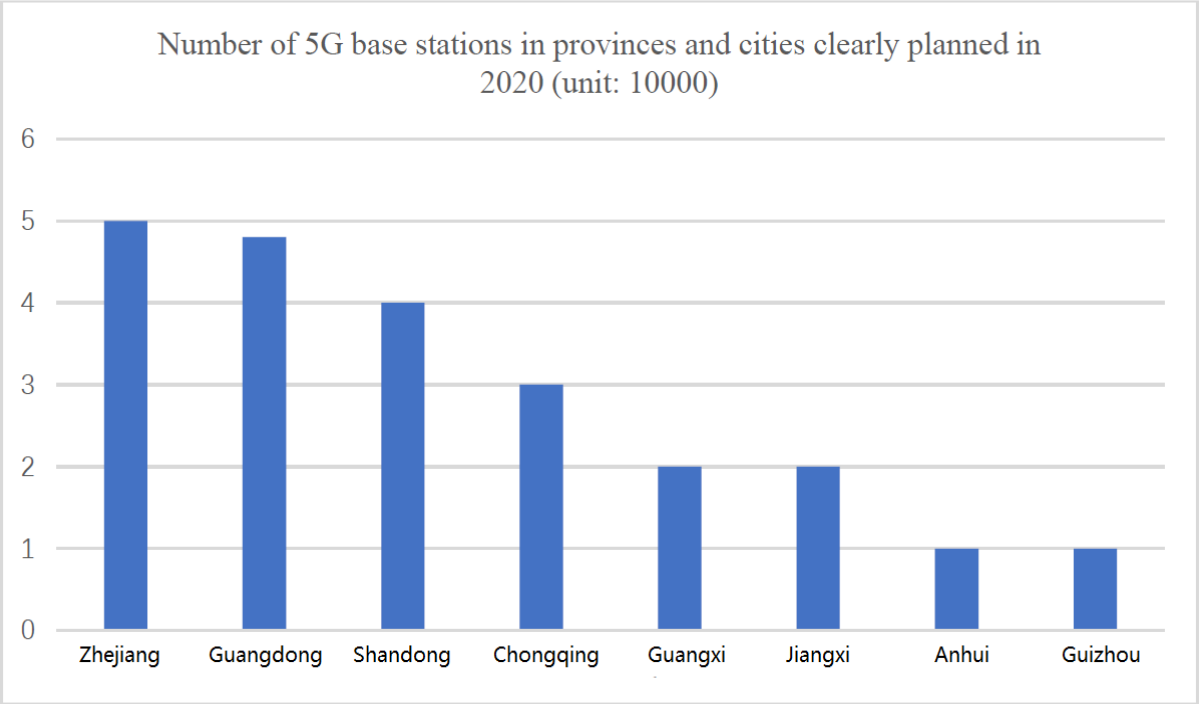

Figure 1 the number of 5G base stations in 2020

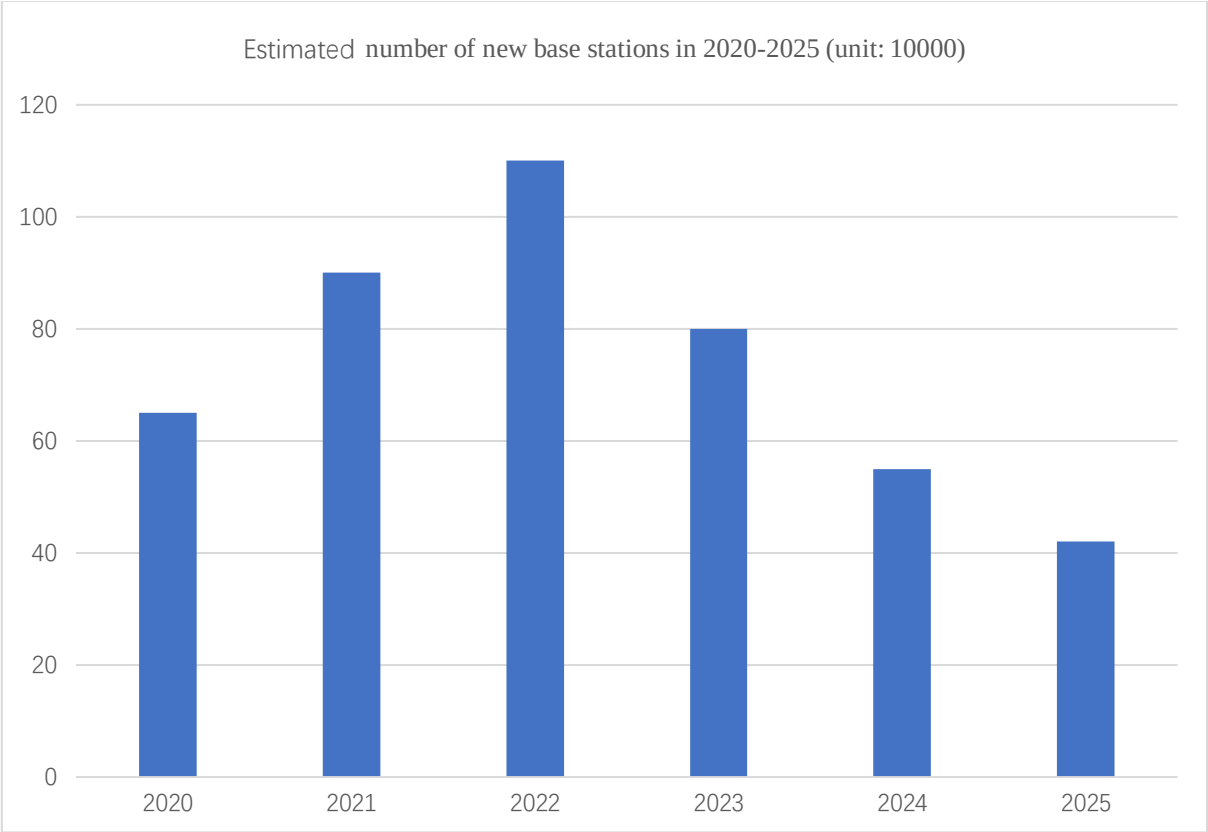

Figure 2 Estimated number of new base stations in China from 2020 to 2025

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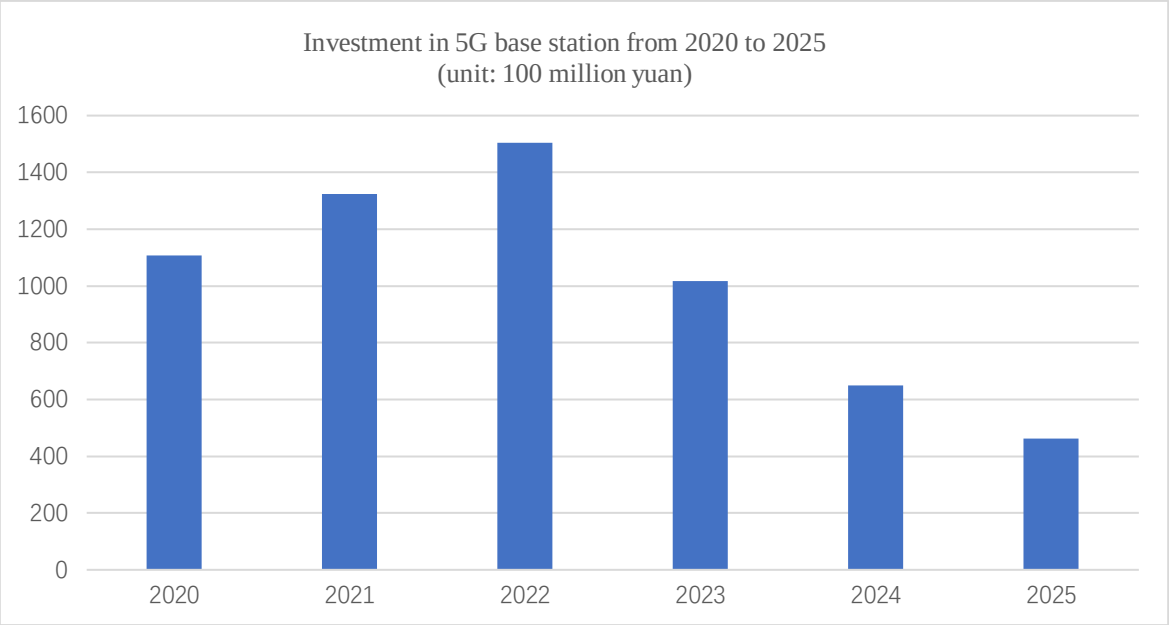

Figure 3 total investment of 5G base stations in China from 2020 to 2025

Such a large number of base station construction and limited investment.If the macro station is still adopted and the micro station is supplemented, the construction cost will far exceed the planned investment. And the rent, electricity charge, the cost of later operation and maintenance will be doubled. [1] In addition, urban planning, urban beautification and environmental protection, as well as restrictions on power consumption by power supply departments, will also restrict the construction of base stations. Therefore, the construction of 5G base station needs a new mode.

2. 5G + smart light pole helps 5G network construction

Smart lamp pole is a kind of equipment which can add reasonable function modules according to different requirements on the basis of lighting.

It is an infrastructure integrating intelligent lighting, video monitoring, traffic management, environmental monitoring, wireless communication, information interaction, emergency help and other functions. It is an important carrier for building a new type of smart city comprehensive perception network, and it is the basic guarantee for the realization of intelligent lighting, green energy, intelligent security, wireless city, intelligent perception, intelligent transportation and intelligent municipal administration. [2] Using smart light pole as an effective carrier of 5G base station will help the construction of 5G network and accelerate the scale of 5G industry, and minimize the costs of 5G network.

According to public data, as of 2017, there were more than 70 million poles of various types in China, including smart light poles, video monitoring poles, communication tower poles and other poles. The large scale, different property rights and heavy maintenance workload of poles bring difficulties to urban management; there are lack of unified overall planning in the construction of some poles, and the site selection of poles is relatively random, resulting in repeated excavation for wiring of pavement and the waste of resources. [2]

Therefore, it is necessary to investigate and forecast the demand, reasonably layout the base station location, make overall planning, and strive to maximize the comprehensive benefits. The first is to make rational use of existing resources. After the reconstruction of 5G macro station, the various poles resources should be integrated and transformed to save the cost. For the members that cannot be transformed to meet the requirements, new intelligent poles are built to replace them. Secondly, for the new development area, it is necessary to make a unified long-term planning and use of smart light poles, to avoid or reduce waste.

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3. Research on the standardization of 5G +smart light pole

There is no doubt that the peak deployment of 5G +smart light pole will come soon. It is imperative to establish a unified standard for smart light pole to better promote 5G business, interconnecting business components and sharing date. Standards should be established in accordance with the principles of openness, compatibility, sharing, extensibility and foresight.

(1) Considering the city beautification, the height of pole should be unified. Two height standards can be formulated according to the applicable road and community places.

(2) Standardization of the structure of the pole. The base station and wireless return communication equipment are placed at the top. The camera, display screen, sensor and other intelligent unit equipment are mounted in the middle of the pole. The transmission equipment, power supply equipment, edge computing and other equipment are built in the bottom of the pole. As shown in Figure 4. [3]

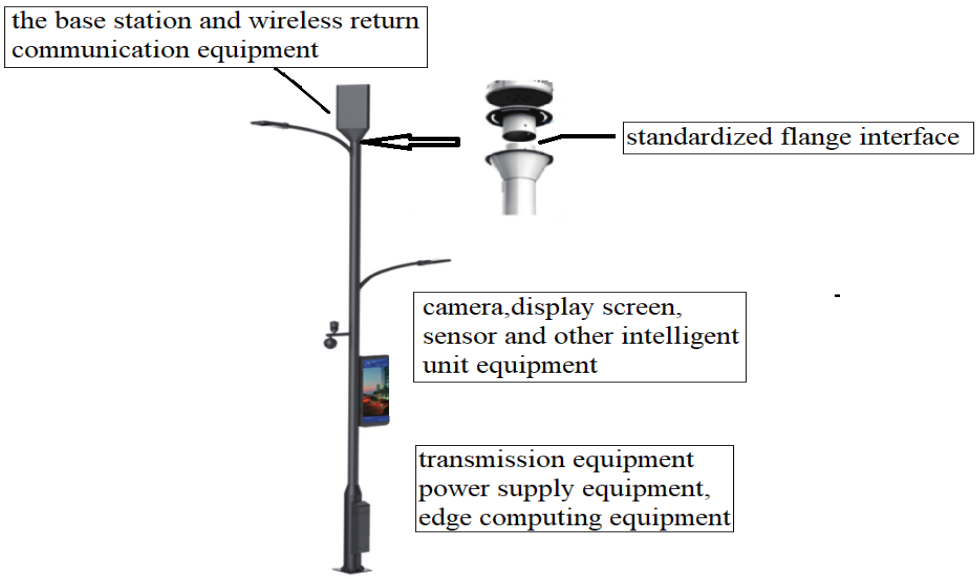

Figure 4. 5G + smart light pole architecture

(3) The smart light pole reserves interface for equipment, defines key interface standards, which guides industrial partners, and reduces customized design. For example, at the top of the pole , standardized flange interface is uniformly set for 5G micro base station. When the operator needs to add stations, the equipment can directly loaded on the standardized flange. This will make it more convenient to add stations in the future and minimize the cost, which highlights the great practical significance of 5G pole standardization.

(4) The technical parameters such as the size, height, weight, distribution position, direction angle, power load, backup mode, lightning protection performance and other technical parameters of the equipment are formulated. The manufacturers of the equipment should implement production in strict accordance with the technical standards and implement the market access system.

(5) For the selection of 5G equipment, it is required to guarantee the power of tens of watts to increase the coverage. [3]

(6) 5G + intelligent lamp pole management system. Smart light pole has many services due to the mounting equipment. In order to facilitate the management, a number of business carried by the lamp pole should be through a unified management system platform. This platform is the key content of standardization construction.

(7) In the process of standard formulation, it is necessary to comprehensively consider the requirements of urban informatization and 5G and its extended services for station, power and transmission. In accordance with the principles of compatibility, openness, sharing, extensibility and

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foresight, we will gradually establish industry standards and technical specifications, so that they can adapt to the development in the next 5-10 years.

4. The development bottleneck of 5G + smart light pole

4.1 No industrial power has been formed, which restricts the rapid development of the industry

With the further deployment of 5g network, the demand for 5g micro base station will increase. The 5G micro base station based on smart light pole is constructed in accordance with the principle of multi-purpose. It includes Internet of things, 5G micro base station, sensor, camera, lighting, display screen, charging pile, etc., involving many industrial fields However, there is no industrial power among various industrial fields, which will restrict its rapid development.

4.2 The immature business model restricts the rapid development of the industry

At present, EPC, BOT and Boo are mainly adopted in the world. EPC is invested and operated by the government, BOT is operated by social capital entrusted by the government and Boo is invested and operated by enterprises. Due to the regional differences in economic development and industrial policy, business model can not be simply applied. Therefore, it is necessary to practice and summarize constantly at present.As soon as possible, a business model of sustainable development of 5G smart poles will be formed.

4.3 5G + smart light pole standard has not been established, which restricts the rapid development of the industry

It is necessary to formulate relevant standards for 5G + smart light poles as soon as possible.It wil guide industrial partners and accelerate industrial development. The formulation of standards should be based on the principles of compatibility, openness, sharing, extensibility and foresight.

4.4 Hidden danger and high maintenance cost restrict the development of industry.

In order to achieve good signal coverage, the height of most light pole base stations is reduced, which will inevitably lead to cable theft or damage, and even lead to the loss of Engineering assets.

Most of the light poles adopts the way of regional construction and unified information source. The power supply distance is too long.The loss of power supply route is increased.The maintenance cost is increased. These are all problems that need to be solved urgently.

5. Conclusion

Although there are bottlenecks in the construction of 5G + smart light .It will soon usher in a period of high-speed development in the long run. And smart light pole will be an important carrier of 5G micro base station. With the construction of 5G network entering the later stage, the construction of smart lamppost will become the focus in a certain period of in the future. With the gradual breakthrough of the bottleneck, it will be promoted in China to improve the quality of life of urban residents.

Acknowledgments

General project of Wenzhou Polytechnic (WZY2014036).

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