CHAPTER I
INTRODUCTION

1.1. Background

Frequency is one of the natural resources that cannot be renewed by humans. Along with the development of technology, especially in telecommunication, frequency use must be regulated as efficiently as possible. So, that the future technologies such as 5G technology will still receive frequency allocation [1]. Technological developments in telecommunication can be seen in the number of mobile subscribers. Some surveys that were conducted by Ericson found that mobile network users in the world have a high growth rate from 2015 to 2020 up to 311.742%. Data from the number of mobile network users can be seen in Fig. 1.1 [2].

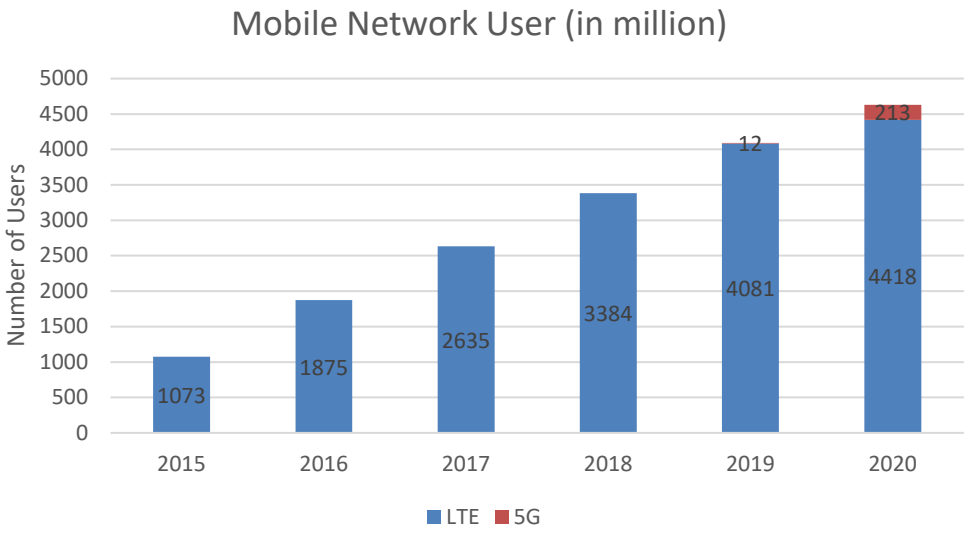

Fig. 1.1 Mobile Network Users Graph 2015 – 2020 [2].

The increasing number of mobile network users provides its own challenges for cellular technology. The large number of devices that are connected to the mobile network requires the backhaul network to accommodate more traffic. Ideally, the first choice for 5G backhaul is Fiber Optic (F.O.). However, the use of F.O. to connect all Base Transceiver Station (BTS) or more specifically small cells in 5G is considerably harder due to obstacles, deployment costs and takes time to deploy [3]. This technological development causes microwave link to be considered

as an alternative for 5G wireless backhaul by using higher frequencies that offer bigger bandwidth, such as the mmWave frequency.

The use of sub-5GHz frequencies for new technologies such as 5G is considered limited because it is already crowded [4]. Many operators are interested in using mmWave due to bandwidth up to 1 GHz. The 5G usage frequency is illustrated in Fig. 1.2 [5].

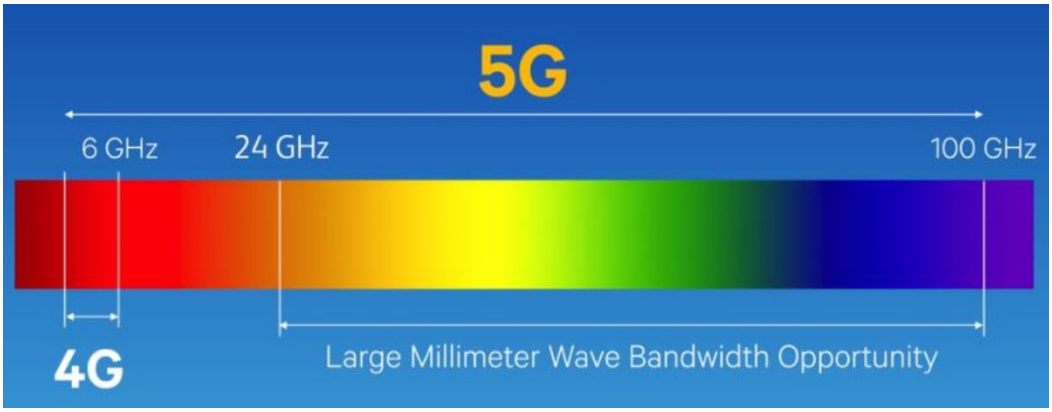

Fig. 1.2 Illustration of 5G Frequency Range.

The rapid development of technology encourages methods to regulate frequency usage. So, the frequency is not used freely. One way to regulate frequency usage is to use a license fee. The application of the license fee has different ways, depending on the regulators in each country. For example, Singapore has a license fee system with parameters such as type of services, frequency band, and bandwidth used. Meanwhile, the license fee applied in Russia has parameters such as the type of technology, the number of radio channels, and the frequency band uses [6][7].

Frequency spectrum license fee that applied in Indonesia is regulated in the Ministry of Communication and Informatics (MoCI) regulation number 17 of 2005, regarding "Tata Cara Perizinan dan Ketentuan Operasional Penggunaan Spektrum Frekuensi Radio". The regulation discusses the use of radio frequency spectrum, licensing procedures, license fee of Biaya Hak Pengguna (BHP) or Usage Right fee, operational provisions, supervision and control, and transitional provisions [8].

Izin Stasiun Radio (ISR) spectrum license fee that must be paid by telecommunication operators that using frequency spectrum is stipulated in MoCI regulation number 19 of 2005 regarding "Petunjuk Pelaksanaan Tarif Atas

Penerimaan Negara bukan Pajak dari Biaya Hak Pakai penggunaan Spektrum Frekuensi Radio" which received a revision in 2010 in MoCI regulation number 24 of 2010. ISR spectrum license fee consists of several components, namely Indeks Biaya Pendudukan Lebar Pita or bandwidth index (Ib), Indeks Biaya Daya Pemancaran Frekuensi or power index (Ip), Power transmits (p), bandwidth (b), Harga Dasar Daya Pancar (HDDP) or Power transmit base price, Harga Dasar Lebar Pita (HDLP) or bandwidth base price, dan zonation [9][10].

Frequency segmentation that applies in Indonesia according to Government Regulation number 28 of 2005, still focuses on low frequencies, namely 9 kHz to 3000 MHz. However, Indonesia has begun to allocate the use of the 3 GHz – 86 GHz frequency and its bandwidth allocation in MoCI regulation number 2 of 2019. Meanwhile, the allocation of frequency and bandwidth only allocates its use and there is no change in HDDP and HDLP. The determination of HDDP and HDLP is reviewed based on the type of frequency band and the location of the transmitter area [11].

Compared to peer country, Indonesia's license fee is far below the average price [12], [13]. It is feared that license fees that are too low can make the usage of frequency become less efficient. The ISR license fee which was released in 2005 hasn't been reviewed since it was released. From 2005 till now, technology development has made several breakthroughs such as 4G deployment, and currently in process to deploy the 5G technology. Denny Setiawan which is currently the General Director of Postal Informatics Resources and Equipment of MoCI has a view that the component of ISR license fee is needed to be reviewed every five years.

The research method that will be used in this research is the techno-economic method using the Operating Expenses Ratio (OER) as an economic approach. So, the result of this research is expected to be a recommendation for regulators in reviewing license fee for 5G backhaul.

1.2. Problem Identification

Problem identification from this research is as follows:

1. Knowing 5G technology requirements and its network plan.

2. Review of license fee regulations that apply to 5G Wireless Backhaul.
3. Stability of the industry after the recommendation is used.

1.3. Objective

The objective of this research is as follows:

1. Literature review of 5G technology and calculate the network planning.
2. Recommending a new license fee pricing for 5G wireless backhaul.
3. Review the effect of changing the license fee after the implementation of the new license fee according to the recommendations.

1.4. Scope of Work

The scope of work from this research is as follows:

1. Calculate the license fee for microwave link technology for 5G deployment in Indonesia.
2. The license fee calculation reviewed does not include administrative cost in obtaining permits.
3. The economic aspect that is reviewed in the industry is the Operating Expenses Ratio (OER) of the cellular operators.
4. Every microwave radio station is assumed to have one link.

1.5. Research Methodology

Research methodology used in this study are:

1. Literature Study

   Literature studies are carried out by studying references on related topics from trusted sources such as research papers, journals, academic reports, government or company reports, and several other references that can support this research.

2. Data Collection

   Data is collected from telecommunication companies, government divisions, and other trusted supporting sources and modeling for data that cannot be displayed to the public.

3. Technical Studies

The technical studies carried out are in the form of technology trends, technological developments in Microwave Link services, capacity and coverage planning to simulate the new license fee based on needs.

4. Economic Calculation

   Economic calculations will be carried out using the Operating Expenses Ratio (OER) to find out the initial conditions of the industry based on the annual reports and financial statements of the cellular operators and the impact resulting from the incorporation of a new license fee.

5. Conclusion

   It is expected to produce a conclusion and recommendation for the formulation of a microwave link technology license fee to telecommunications regulators in Indonesia that is more effective, efficient, and economical.

1.6. Hypothesis

Frequency is a limited resource that has a different characteristic on each band thus resulting in uneven usage and need to be made more efficient so new technology such as 5G network still has frequency allocation. License Fee on spectrum frequency appear to regulate and oversee the spectrum usage to make it more efficient. The pricing of license fee can't be too expensive or too cheap, a license fee that's too cheap can make the spectrum usage is more careless and less efficient. On the other hand, if the pricing is too expensive, it can make the operators go bankrupt and held the technology deployment and development. Therefore, by reviewing the frequency spectrum license that applied in Indonesia, in this case is for the 5G wireless backhaul hopefully can push more efficient spectrum usage in Indonesia while keeping the state income stable.