

Analysis of Spectrum Licensing for Mobile Service in the Frequency Band of 900 MHz and 1800 MHz in Thailand

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Abstract—In Thailand, the National Broadcasting and Telecommunications Commission (NBTC) granted 900 MHz and 1800 MHz spectrum licenses by way of spectrum auction in the end of the year 2015. The licensing of both spectrum bands can be considered as the first transition of the telecommunications industry from concessions to licensing regime in Thailand. In granting the spectrum licenses for telecommunications service by auctioning, the NBTC strives to achieve the regulatory balance composing of the most efficiency of spectrum assignment, free and fair competition, and state benefits, in order to bring about the greatest benefits to the people and the country. While the technology transition after the auctioning will directly benefit the telecommunication and ICT businesses, it will also provide further positive impact on the economy on top of the spectrum fee revenue from the auctions. The objective of this paper is to analyze and review the results of the spectrum auctions in 900 MHz and 1800 MHz in Thailand. Analysis of post-auction impacts in competition and investment is also discussed in this paper. Spectrum cap rule is explained as a future study.

Index Terms—Analysis, auction, licensing, spectrum, telecommunications, Thailand.

I. INTRODUCTION

In the past, telecommunication services in Thailand were provided exclusively by two state enterprises — Telephone Organization of Thailand (TOT) and Communications Authority of Thailand (CAT). At that time, all private operators could only operate a mobile network business as a concessionaire under TOT or CAT.

Later in 2010, the Act on the Organization to Assign Radio Frequency and to Regulate the Broadcasting and Telecommunications Services, B.E. 2553 (2010) was enacted [1]. The law set the platform for a new independent regulator, called the National Broadcasting and Telecommunications Commission (NBTC). Then NBTC is responsible for managing the spectrum for telecommunications service and regulating the telecommunications business in Thailand. Following this, telecommunication contracts were converted from concessions to licenses.

The Act prescribes that the permission to use radio frequency for telecommunications service must be carried out with due regard to maximum public interests at the national, regional and local levels in education, culture, State security and other public interests, including free and fair competition, and must be carried out in the manner that extensively and

appropriately distributing the utilities as the national communications resource to all segments for public interest.

To achieve the objective of the Act, there must be certain rules with clarity and justification as well as the transparent and fair process. Therefore, the NBTC Master Plan [2] prescribes a strategy regarding spectrum rearming for reassignment or for utilization improvement that “For the government sectors, state-enterprises and other government agencies who allowing other operators to use their spectrum by granting permission, concession or contract which its legality was already examined by the NBTC, after the end of their permission, concession or contract such spectrum shall be returned to the NBTC.”

The end of concession periods of government agencies and the end of permission of the NBTC can be summarized in year-ordering as shown in Table I [3]:

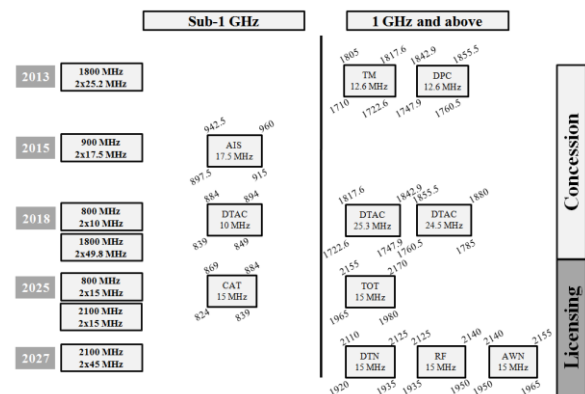


Fig. 1. Spectrum for mobile telecommunications service.

TABLE I: THE END OF CONCESSION PERIODS

No	Licensee	Concessionaire	Frequency (MHz)	Contract End
1	CAT PLC.	True Move Co., Ltd.	1710-1722.6/1805.0-1817.6	15/9/2013
2	CAT PLC.	Digital Phone Co., Ltd.	1747.9-1760.5/1842.9-1855.5	15/9/2013
3	TOT PLC.	Advanced Info Service PLC.	897.5-915.0/942.5-960.0	30/9/2015
4	CAT PLC.	Total Access Communications PLC.	839.0-849.0/884.0-894.0	15/9/2018
5	CAT PLC.	Total Access Communications PLC.	1722.6-1747.9/1817.6-1842.9/1760.5-1785.0/1855.5-1880.0	15/9/2018

II. LICENSING DETAILS

In September 2015, the National Broadcasting and Telecommunications Commission (NBTC) has published the draft version of the 900MHz and 1800MHz Auction Information Memorandum (IM) [3],[4]. A total of four

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spectrum lots were offered for bidding – two each on the 1800MHz and 900MHz bands. The licenses are neutral technology which means that operators can utilize the spectrum with any technology, with durations of 18/15 years for the 1800/900MHz spectrum respectively. Each bidder can only bid for one allocation in the 900MHz auction, and one allocation in the 1800MHz auction, so that the spectrum resources are not monopolized. Details of Important information related to the terms and conditions on the auctions for 900/1800 licenses are described in Table II.

The Licensee must strictly comply with the terms and conditions on “Social and Consumer Protection Measures” as following [3], [4]:

“The Licensee must provide the service in a fair nature, which includes setting of tariff that is clear, reasonable and not taking advantage of consumer, and shall provide service with quality as prescribed by the National Telecommunications Commission (NTC). For this purpose, the Licensee must set forth the tariff for voice and data services which is, on average, lower than the average tariff of mobile phone service using 2.1 GHz spectrum on 25 August 2015. In doing so to promote and increase the opportunity for users in accessing the mobile telecommunications service using the spectrum, the Licensee must provide at least one promotion which has tariff lower than average tariff of mobile phone service using 2.1 GHz spectrum on 25 August 2015, as well as charges based on actual usage and has the quality not lower than the average quality of mobile phone service using 2.1 GHz spectrum. All this will apply until the NTC prescribed criteria relating to the regulation of tariff and quality of service otherwise.”

The spectrum licensing process can be divided into 6 phases as summarised in Table below [3], [4]:

TABLE II: LICENSING PHASES

1) Regulations Preparation	<ul style="list-style-type: none"> Formulation of spectrum licensing criteria Preparation of Information Memorandum (IM) Published the Notification regarding criteria and procedure for spectrum licensing in the Government Gazette
2) Auction Invitation	<ul style="list-style-type: none"> Auction invitation and publication of Information Memorandum
3) Pre-Qualification	<ul style="list-style-type: none"> Consideration of compliance with application method Consideration of Applicant's qualification
4) Auction Training	<ul style="list-style-type: none"> Bidder information session and mock auction
5) Auction Phase	<ul style="list-style-type: none"> Bidding session
6) License Granting Phase	<ul style="list-style-type: none"> Fulfillment of conditions precedent License granting

In the 1800MHz auction, each winner was required to pay half the prices it offered within 90 days and another 25% in the second and third years. However, in the 900MHz auction, the payment terms were eased to 8.04 billion baht or 50% of the reserve price in the first 90 days and another 25% in the second and third years. The remaining amount will be paid in the fourth year [3], [4].

III. ANALYSIS AND DISCUSSION

There are four bidders for both spectrum auctions, JAS Mobile Broadband Co. Ltd., DTAC Trinet, Advance

Wireless Network and TrueMove H Universal Communications.

The 900 MHz auction concluded in December 2015 which raised the price to THB151.952 billion (\$4.2 billion) for the right to use two licenses of 2×10 MHz. This is over 6 times of the reserve price THB12.8 billion per license. The final price per MHz per PoP is estimated to be among the highest in the world for an auction of 900MHz.

The auction of 1800 MHz spectrum concluded in November 2015, raised to total of THB 80.778 billion (\$2.25 billion) for two licenses of 2×15 MHz. That is 2.8 times lower than the 900MHz band on per MHz per PoP basis. The price for a 1800MHz licence is high relative to international standards and the country's population. The results of the auctions are shown in Table III.

TABLE III: 1800 MHz AND 900 MHz SPECTRUM AUCTION CONDITION AND RESULT

Condition	1800 MHz	900 MHz
Auction Bandwidth (MHz)	2 × 30 MHz	2 × 20 MHz
No. of Licenses	2 Licenses	2 Licenses
Bandwidth per license	2 × 15 MHz	2 × 10 MHz
Lot number	Lot 1: 1710-1725 MHz/1805-1820 MHz Lot 2: 1725-1740 MHz/1820-1835 MHz	Lot 1: 895-905 MHz/940-950 MHz Lot 2: 905-915 MHz/950-960 MHz
License period	18 Years	15 Years
Auction date	11 November 2015	15 December 2015
Number of bidders	4 bidders	4 bidders
Minimum Price	15,912 Million Baht	12,864 Million Baht
First Round Price	16,708 Million Baht	13,508 Million Baht
Term payment	50% within 90 days of auction, 25% in 2 years and another 25% in 3 years	8,040 Million Baht within 90 days of auction, 4,020 Million Baht in 2 years, 4,020 Million Baht in 3 years and remain amount in 4 years
Coverage Obligation	40% within 4 years, 50% within 8 years	50% within 4 years, 80% within 8 years
Winners	Lot 1: TRUE Lot 2: AIS	Lot 1: JAS Lot 2: TRUE
Auction price (each license)	Lot 1: 39,792 Lot 2: 40,986	Lot 1: 75,654 Lot 2: 76,298
Total auction price	80,778 Million Baht	151,952 Million Baht

The results of both 900/1800 auctions were extremely high competition because there were four interested bidders competing for two licenses in each auction. Moreover, nowadays, any operators can roll out 4G services on 900, 1800, and 2100 MHz spectrums when they are granted the licenses. During 2010-2014, data usage by mobile phone subscribers was over 35% every year. Mobile operators therefore need more bandwidth to meet the exponential demand.

A. Analysis of the 900MHz Auction

The 900MHz spectrum can technically serve wide areas on a cost-effective basis when compared with upper bands like 1,800MHz. While the concession of another low-band spectrum, the 850MHz band held by of Total Access Communication (DTAC) under the CAT Telecom concession

contract will end in September 2018. The telecommunications sector has experienced a scarcity of the low-band frequency available for auction. The 900MHz spectrum is the last low-band spectrum that can be put up for auction during this time. Winning the bidding of 900MHz licences is vital for some bidders because it is a matter of win and lose in the mobile market. Though two operators already obtained a 1,800MHz licence from the last auction, they still need a licence for the 900MHz spectrum to reinforce their services. Moreover, one of the bidders is utilizing the 1,800MHz and 850MHz concessions which will expire in 2018; therefore, if the operator loses this auction, it would result in a sharp rise in regulatory fees and depreciation expenses, which could reduce its earnings and result in losses in next coming year.

It was the most surprise in this auction when a newcomer JAS Mobile Broadband Co. Ltd. of Jasmine International emerging as one of the winners of the first licence lot. The company already announced that they want to deploy a wireless broadband service to complement its fixed-line broadband service. The company would seek expertise and a sales channel from partners for quick penetration into the mass market.

B. Analysis of the 1800MHz Auction

The term of 18 years for the expiry date of the 1800MHz spectrum could be a reason why it was very high competition. It will have a long-enough time to provide 4G service and turn a profit. The advent of 4G is set to intensify competition in the mobile market next coming years as operators seek more market share in the lucrative higher-margin mobile data business. More importantly, development of 4G LTE service is compatible with the 1800MHz band [5], which can also support future 5G networks [6]. As four bidders competed for only two licenses, competition was fierce and the bid prices were raised by 154% of the reserve price. As bidders already have a large base of subscribers without having to roll out an entire new mobile network infrastructure, and the country's demand for wireless broadband service is rapidly increasing. That is also a reason why bidders are fighting to get a license. If operators create appropriate strategies on marketing campaigns and investment for the 1800MHz 4G LTE networks, this can significantly raise average revenue per unit (ARPU).

C. Analysis of Post-auction Impacts

Promotional and marketing expenses will remain intense after the issue of new licenses in November and December 2015. Top two operators would be the most aggressive in regaining market share after losing its premium subscribers to the first 4G 2100 MHz operator. On the other hand, the first 4G 2100 MHz operator would also want to protect its market share. Hence, marketing expenses should remain high for all operators. Competitive pressure in the Thai mobile market has increased. Some mobile operators have aggressively used handset subsidies to drive competitive advantages. In 2016, Thai mobile market will see more intense competition, with a new comer as the forth major player with different advantages and disadvantages. The ensuing price war will surely affect the performance of each operator, and those with frequency bands under licensing scheme, which entails lower regulatory

cost, will be in a better position than those under concession schemes.

Another interesting aspect of Thai mobile market is that a newcomer won a 900 MHz license among the highest price in the world for an auction of 900MHz. This is a challenging task for NBTC to maintain the competitive advantage for all mobile operators for surviving in the market. A new business model will be challenging which brings into the alternative business models such as start up businesses from a mobile operator itself to pursue given the competitive disadvantage in spectrum holdings and market lifecycle.

The NBTC projects the number of mobile subscribers will exceed 170 million in 2016, up from 100 million this year (2015). Mobile phone penetration in Thailand will grow 3-4 times by 2020, driven by the emerging Internet of Things (IoT) technology that will be deployed in various sectors, especially education, telemedicine, logistics and security [7].

Mobile operators need more bandwidth to serve growing bandwidth-intensive services, fuelled by the proliferation of smartphones and faster speed of wireless broadband networks. Having a variety of mobile spectrum bands (lower and higher 1GHz bands) will enable them to greatly manage frequencies and data traffic flows covering all requirements [6],[8].

Spectrum auctions and technology transitions to 4G will increase industry innovation and competitiveness and will directly and indirectly benefit Thailand's economy in the long term. The improved data rate and enhanced bandwidth on a 4G network are expected to add more subscriber experience and contribute to higher data traffic via rich communication services and more data intensive applications.

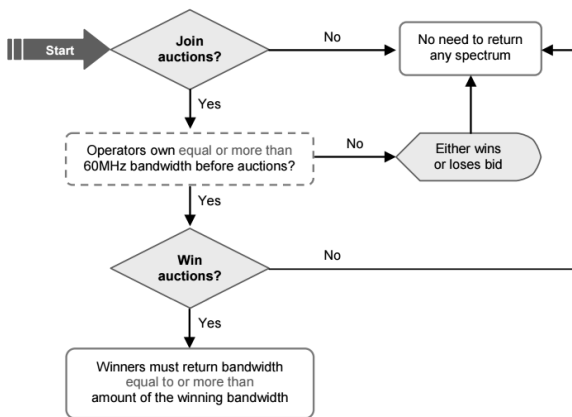
The technology transition from 3G to 4G and technology utilization in other related businesses will require large scale network investment that will benefit installation service providers and suppliers. Very aggressive spending on 4G roll-out networks would boost private investment and support the government's vision for a digital economy. The country's benefits come in the form of revenues from the spectrum auction and business operation taxes, as well as the socio-economic benefits and the development brought about by the spectrum utilization [9]. The supportive policy environment could increase fixed and mobile broadband penetration from 52% in 2013 to 133% in 2020, leading to a cumulative GDP increase of USD23 billion (THB730 billion) [10].

But above all, the high price reflects strong commitment of the bidders' foreign strategic partners to invest heavily in Thailand.

IV. SPECTRUM CAP: FUTURE CONSIDERATION

The NBTC plans to study a spectrum caps rule to prevent an operator from gaining positions through large holdings of a spectrum to protect monopoly or duopoly in the mobile market. Spectrum caps per operator were introduced in the 1990s in the United State to ensure that no single mobile network operator can occupy or hold all or almost all spectrum, which they might cause market failures with reducing competition in mobile market. It will make deleterious effects for customers and overall economic welfare [11].

For an example, operators holding more than or equal to 60 MHz before the auctions can participate in the auction but they have to return excess spectrum as shown the Fig. 2.



Source: RHB

Fig. 2. Spectrum cap rule [12].

However, tight spectrum caps will inhibit mobile broadband development because the ability of innovative operators may be impaired to deploy new valuable services and to exploit the maximum efficiencies of new broadband wireless technologies.

V. CONCLUSION

This paper provides analysis and results of the spectrum licensing by auctions in 900MHz and 1800 MHz in Thailand. The success of spectrum auctions for this time can be considered as a new chapter of Thailand's telecommunications industry with the transformation of next generation mobile services. After licensing by the auction processes, mobile operators with frequency bands under licensing scheme, which entails lower regulatory cost, will be in a better position than those under concession schemes in the past. The required roll-out network investment and the anticipated growth of mobile services and content businesses will foster the growth of the telecommunication and ICT businesses, as well as create new job opportunities and increase competitiveness to the country. The availability of nationwide mobile broadband services is also expected to create an ecosystem conducive to further growth in mobile data services and to support the development of a digitally driven economy

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