

An Analysis of Telecommunication Spectrum Clearing Prices in Thailand and Abroad

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Abstract—Thailand earned 41.625 Billion Baht (USD 1.39 billion) from assigning 45 MHz of 2.1 GHz spectrum on 16th October, 2012. While there has been much debate on whether the appropriate price has been achieved, it should be emphasized that valuation is subjective. In addressing the point of the value of 2.1 GHz spectrum, this research highlights four typical quantitative factors that are built into valuation models including Direct Cash Flows, Cost Savings, Defensive Value and Option Value, and compares this to Regulatory objectives and valuations. The analysis further takes into consideration benchmark spectrum prices achieved in recent telecom spectrum auctions with added analysis of recent auction failures. In keeping in mind the current supply of spectrum in Thailand and the time period in which the recent 2.1GHz auction took place, the Thai 2.1 GHz 3G auction is shown to have cleared at fair prices enabling licensees to move the industry forward and break free from a deadlock caused by the concessionaire regime. It is argued that if the spectrum was to be cleared at higher prices, it could have resulted in short term revenue maximization however this would hinder the long term growth and development of the telecom sector in Thailand and will potentially lead to higher prices for consumers.

Index Terms—Spectrum valuation, spectrum auction, direct cash flows, cost savings, defensive value, and option value.

I. INTRODUCTION

Thailand earned 41.625 Billion Baht (USD 1.39 billion) in assigning 45MHz of the 2.1GHz spectrum band at auction in October 2012. Licences are technology neutral, allowing for 3G and 4G service deployment, and issued for a period of 15 years [1]. Following the result there has been much conjecture over whether the Kingdom achieved appropriate value for the spectrum or if it was sold to incumbent operators at “too low” a price. The view of the National Broadcasting and Telecommunications Commission (NBTC) and its expert advisors is that the clearing prices achieved in the auction were unequivocally in line with international benchmarks and local market dynamics, and most importantly have enabled the industry to move beyond a high-stakes deadlock caused by the imminent ending of legacy Concessions – which was considered a more important objective than pure short term revenue maximization for the State.

This paper addresses the subject of comparative clearing prices achieved in Thailand and several other markets, on a benchmark basis. Additional commentary and analysis of relevant market dynamics is also presented to support the stated view of the Authors as it is acknowledged that quantitative benchmarking alone cannot fully justify a

comparison of prices paid for spectrum in different markets and/or at different points in time. Finally, examples of recent spectrum auction events is presented to demonstrate selected situations in which the objectives of the State have been misaligned, either positively or negatively, with the market, resulting in aborted auctions, re-auctions or failure to clear offered supply due to auction boycotts or lack of demand at offered reserve prices.

II. PRICE AND VALUE FROM THE PERSPECTIVES OF STAKEHOLDERS

Whilst this paper is not concentrated on methodologies for setting the price of, or conducting a valuation of, spectrum bandwidth, it is necessary to comment on the relative position of stakeholders in setting prices and valuing this intangible asset that is so critical to delivery of modern day telecoms services.

Valuation is a subjective exercise and can be perceived significantly differently between stakeholders. Further, auction clearing prices do not necessarily reveal the value of the spectrum but merely reveal the amount the market is willing to pay at the specific time of allocation given the information at hand and competitive dynamics in play.

The value of spectrum to a commercial telecom operator or investor will be determined considering four largely quantitative factors based on a long range business plan spanning the license period [2]. The typical contributing factors built into an investor’s valuation model include:

- 1) Direct cash flows generated from utilising the spectrum to provide telecom services to customers at specific tariffs together with certain network deployment and operations assumptions [2].
- 2) Cost savings from adding the spectrum to the portfolio and optimising the overall network/technology mix [2].
- 3) Defensive value of keeping the spectrum away from competitors or a new entrant [2].
- 4) Option value of potentially being able to use the spectrum for ‘something else’ not currently certain or allowed under the existing licence terms.

Based on the above, a Net Present Value (NPV) of the business opportunity deriving from the spectrum purchase is calculated and represents the maximum price the operator is willing to pay per lot(s) [3].

For a Government or Regulator, the value of the spectrum as a scarce resource to be allocated will typically center on the alternative uses of the spectrum and the socio-economic benefits to be derived from the various uses. Therefore both direct socio-economic benefits and opportunity cost are considered in placing a value on the spectrum lots on offer [4]. Often, however, political motives will also play a role and it

Manuscript received June 10, 2013; revised September 2, 2013.

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is in such situations that revenue maximization (ie. for contribution to State income to be reallocated for other uses) becomes a primary driver.

The challenging task for a Regulator is to understand both sides of the equation and to price spectrum appropriately such that investors are able to make a reasonable return whilst safeguarding consumers from excessive tariffs, piecemeal (cherry-picking) networks or stalled/failed deployments. Evidence suggests that when revenue maximization is pursued singularly as the goal, outcomes of spectrum allocations are often sub-optimal and fall short of expectations, ultimately negatively impacting consumers and in the end failing to bring the anticipated financial windfall to the State anyhow.

In the case of Thailand, the ending of legacy concessions with high revenue sharing burdens and transfer of 2G networks back to the State had skewed the telecom market and stalled technology investment/advancement, leaving the country behind its ASEAN peers in 3G and 4G. By understanding industry needs and carefully balancing the objectives of the 2.1GHz allocation, the NBTC was able to install safeguards via licensing rollout conditions and 15% consumer tariff reductions (relative to 2G) whilst still achieving fair purchase prices in line with benchmarks and efficiently clearing all spectrum supply. In doing so, the regulator has opened a new flood of investment into the telecoms sector which is estimated to be more than 120 billion baht (USD 4 billion) in direct new 3G/4G technology capital investment over the coming 2-3 years (based on operator announcements)

III. 2.1GHZ SPECTRUM PRICE BENCHMARKS

As already stated, evidence clearly supports the view that the NBTC in Thailand achieved fair 2.1GHz auction clearing prices in line with international benchmarks. The accompanying chart shows international benchmarks of recent 2.1GHz spectrum auctions in standard benchmarking format of Price per Unit per Population (USD/MHz/Capita). The blue column for Thailand together with the red line show the finishing price of the Thai 2.1GHz auction compared to other countries.

2100 MHz - Spectrum price benchmarks

2100 MHz spectrum benchmarks, USD/MHz/capita

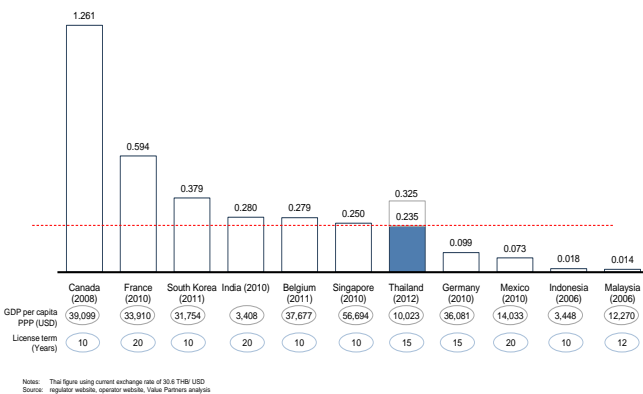


Fig. 1. 2100MHz spectrum clearing price benchmarks [1].

Note that this paper excludes data from 2.1GHz auctions 10 or more years ago since they occurred in a time of

markedly different technical and economic realities, namely a technology investment bubble and a time when 3G was only available on 2.1GHz, whereas today 3G is widely deployed in 850 / 900 MHz and 2.1GHz around the world thereby tempering the perceived value by providing alternative bands.

The Thai 2.1GHz (2012) auction achieved US\$0.235 placing it higher than wealthier countries such as Malaysia and Germany on a non-adjusted basis. On an affordability and license duration adjusted basis, Thailand's clearing price places it much higher than wealthier regional peers Singapore, Malaysia and South Korea, per the second chart. It is already more than 3-times the price of similar developing countries such as Indonesia and Mexico on a non-adjusted basis and remains so when adjusted.

2100 MHz - Normalised spectrum price based on Thailand GDP/ capita PPP and license year

2100 MHz spectrum benchmarks, USD/MHz/capita (PPP adjusted and 15 year licence normalized)

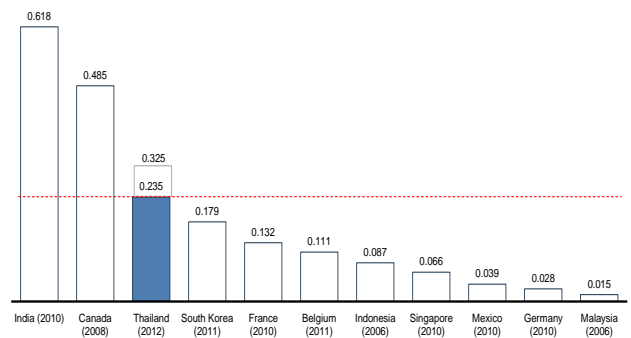


Fig. 2. 2100MHz spectrum clearing price benchmarks (adjusted for PPP and license duration) [1].

Critics of the auction reported that Thailand should have achieved a "correct clearing price" of around 60 Billion Baht (USD 2 billion) for the spectrum, which would have corresponded to US\$0.325 and placed Thailand's spectrum price even higher, exceeding those of all benchmark countries except Canada and France on a non adjusted basis. On an adjusted basis, as shown in the second chart, Thailand would then be the highest of any benchmark country except India (2010) where irrational bidding for 2.1GHz brought high clearing prices. This has negatively impacted profitability of MNOs and the Indian market has seen tariffs on a rising trend - compared with 15% reduction commitment for 3G in Thailand - in an environment where the take up of 3G has been well below analyst projections and industry expectations to date - compared again with Thailand where 3G penetration is estimated to be ~30 % within 2013 alongside customers who still prefer to use 2G services at around 70% regardless of the fact that many if not most hold smart-phones with 3G compatibility. The expected migration of 2G to 3G over the next few years will be 20 to 30% per year with a small number of users remaining on the 2G networks until switch-off.

IV. OTHER RELEVANT SPECTRUM CLEARING PRICE BENCHMARKS

As established above, Thailand's 2.1GHz spectrum clearing prices in 2012 of USD 0.235 per MHz/Pop are well in line with international benchmarks within the same band.

Below a further comparison is presented where complementary and substitution bands for 3G and 4G are compared to the Thai 2.1GHz clearing price. The relevance of this comparison stems from the fact that the stated policy of the NBTC in Thailand is to use preceding spectrum auction clearing prices as a reference price upon which to set starting prices of subsequent spectrum auctions, and that there will be several upcoming spectrum auctions in Thailand for both complementary and substitution bands in the near future.

Therefore it is relevant to assess the benchmark clearing price of 2.1GHz from 2012 in the context of future spectrum auctions of both >1GHz and <1GHz in Thailand, which according to the current NBTC Spectrum Master Plan will start in 2014 with 1800MHz (25MHz) and 900MHz (17.5MHz). Subsequent to this the 2300MHz (64MHz) and 2600MHz (140MHz) will be re-allocated, followed by an additional 1800MHz (50MHz) and 850MHz (10MHz) in 2017-8, then 700MHz in 2022-3 and 850MHz (15MHz) in 2025.

Note: The charts below represent Thai Purchasing Power Parity (PPP) and license period adjusted clearing prices. The reason for utilizing Thai PPP adjusted prices is in recognition of the fact that spectrum cost is a material input to telecom operator expenditure and cost structure within specific markets, and therefore there is a direct linkage to local market tariffs set by the operator for services utilizing the acquired spectrum. Local market affordability, or PPP, is therefore a relevant consideration in pricing spectrum and assessing spectrum clearing prices from the Thai perspective given its lower-income positioning relative to European and other developed Asian markets.

1800 MHz - Normalised spectrum price based on Thailand GDP/ capita PPP and license year

1800 MHz spectrum benchmarks, USD/MHz/capita (PPP adjusted and 15 year licence normalized)

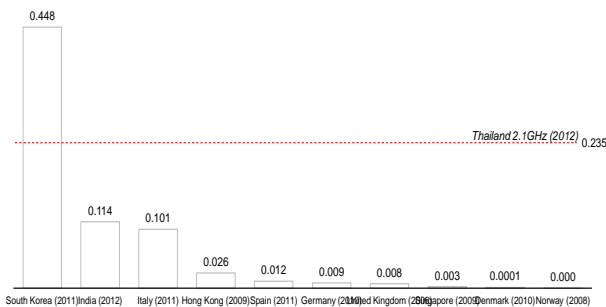


Fig. 3. 1800MHz spectrum clearing price benchmarks (adjusted for PPP and license duration).

It can be drawn out from the above comparisons that the Thai 2.1GHz (2012) clearing price of USD 0.235 per MHz/Pop (adjusted for PPP and license duration), which will be used as a basis for determining future spectrum auction starting prices commencing with 1800MHz and 900MHz in 2014, is:

- 1) Approximately double the recently achieved 1800MHz prices in India and half of South Korea;
- 2) 11% above the average of the recent 900MHz benchmarks shown;
- 3) Higher than the all recent benchmark clearing prices for

2300/2600MHz except for India (2010).[1]

700/900 MHz - Normalised spectrum price based on Thailand GDP/ capita PPP and license year

700 and 900 MHz spectrum benchmarks, USD/MHz/capita (PPP adjusted and 15 year licence normalized)

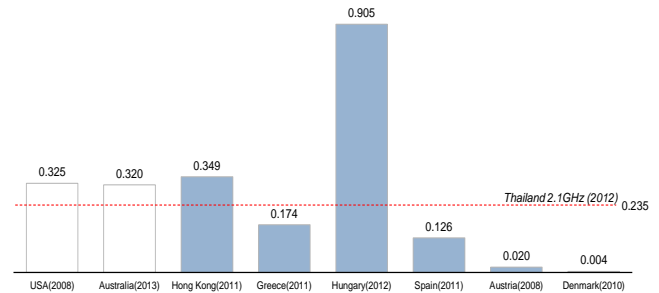


Fig. 4. 700MHz and 900MHz spectrum clearing price benchmarks (adjusted for PPP and license duration).

2300/2500/ 2600 MHz - Normalised spectrum price based on Thailand GDP/ capita PPP and license year

2300, 2500 and 2600MHz spectrum benchmarks, USD/MHz/capita (PPP adjusted and 15 year licence normalized)

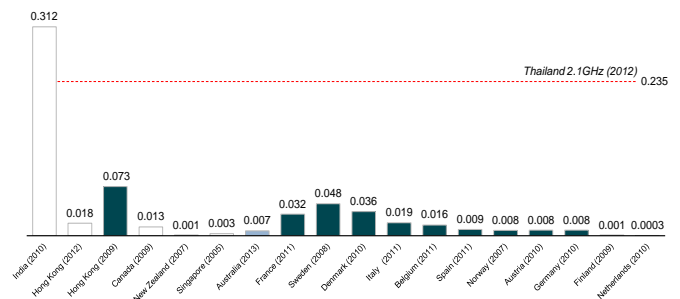


Fig. 5. 2300MHz and 2600MHz spectrum clearing price benchmarks (adjusted for PPP and license duration).

Therefore, considering the specific case and needs of the Thai market in achieving the threefold objectives of i) smoothing the transition to a new licensing regime, ii) efficiently clearing supply of spectrum, and iii) creating a sustainable reference price for upcoming spectrum auctions, evidence supports the conclusion that the NBTC has met its objectives with the clearing prices achieved for the 2012 2.1GHz auction.

V. RECENT RELEVANT TELECOM SPECTRUM AUCTION EVENTS

As already addressed, matching objectives of the State to commercial market realities is critical in preventing downstream market failures in spectrum allocations. Regulators need to balance objectives of industry development with value maximization depending on the specific needs of the market at the time of allocation. Pursuing revenue maximization as a singular objective will likely be counterproductive to industry development and ultimately destroy or reduce expected socio-economic benefits to the country from the services to be provided using the spectrum.

Several recent telecom spectrum auctions have highlighted situations where expectations of the State have been misaligned to the realities of commercial marketplace. Below we examine three examples – Czech Republic,

Australia and India – where either a recent auction has been aborted or boycotted by a major incumbent operator, or has failed to clear offered supply of bandwidth due to a misalignment of expectations and/or perceived value between the State and private investors/operators.

Czech Republic – aborted auction due to excessive bidding:

- 1) The Czech Telecommunication Office (CTU) launched its auction of spectrum for 4G in November 2012 with the main objective of the auction to support LTE and the eventual entry of a fourth operator on the market, not purely income to the State budget
- 2) Bands for auction included 800MHz (2x30MHz), 1800MHz (2x24.8MHz), 2600MHz FDD (2x70MHz), 2600 TDD (1x50MHz)
- 3) Total reserve price was set at USD 377 million (USD 0.12 per Pop/MHz)
- 4) In March 2013, CTU suspended the auction because, in their view, the carriers had bid too high a price of ~USD 1.03 billion (USD 0.33 unadjusted or USD 0.12 per Pop/MHz on adjusted basis).
- 5) CTU stated that the current level of bids was not feasible and would lead to an overall price increase for new 4G services and a significant delay in deployment of LTE networks
- 6) In April 2013, CTU revamped the spectrum auction rules, announcing new conditions for a spectrum auction, such as offering 800MHz spectrum exclusively to new operators.
- 7) CTU now expects bids to be below \$505.5 million, or around half of last bidding price in the aborted auction

As a result, compared to Thailand, on an adjusted basis for PPP and Licence Duration, the new auction is expected to clear at USD 0.06 per Pop/MHz, or around one-quarter of the clearing price result for the 2012 Thai 2.1GHz auction.

Australia – failure to clear supply due to major operator boycott of auction citing exorbitant reserve prices:

- 1) The Australian 700MHz and 2.6GHz spectrum auction results were announced on 7 May 2013.
- 2) 2x15MHz of the 700MHz spectrum remained unsold largely due to the third placed incumbent, Vodafone, boycotting the auction citing high reserve prices.
- 3) Number two operator, Optus (Singtel subsidiary), purchased only half the bandwidth of market leader, Telstra, at 2x10MHz. Optus has previously criticised the high reserve prices and it is widely believed their decision to purchase a relatively small bandwidth was influenced by price.
- 4) The reserve price for the 700MHz spectrum was set at USD 1.36 per MHz/pop, which is nearly twice the average price paid in other recent auctions for similar spectrum and compares to USD 0.30 per MHz/pop in UK.
- 5) Communications minister Stephen Conroy has said the government will re-auction the remaining 15MHz of paired 700MHz spectrum in the next two to three years

As a result, compared to Thailand, on an adjusted basis for PPP and Licence Duration, the clearing price of the 700MHz band was USD 0.32; this is the same as the suggested clearing price of critics of the Thai 2012 2.1GHz auction or 36% higher than the actual clearing price.

India - limited demand for spectrum at high prices causes cancelled auctions and failure to clear supply

- 1) In November 2012, the Department of Telecommunications (DoT) in India auctioned 271.5MHz of 2G technology specific spectrum in both GSM (1800MHz) and CDMA (800MHz) bands. Three blocks of 1.25MHz in the 800MHz band were available for auction, but all bidders withdrew their applications and the auction for 800MHz was subsequently cancelled. Eleven blocks of 1.25MHz each in the 1800MHz frequency band were auctioned, except in Mumbai and Delhi where only eight blocks were available.
- 2) The Government received bids worth a total of USD 1.775 billion, far lower than its target of USD 5.283 billion from the sale of 2G spectrum in the 1800MHz band.
- 3) No bidders bid for a pan-India spectrum and out of the 140 blocks of spectrum on offer, only 102 slots were bid.
- 4) Delhi and Mumbai circles which are considered as the most lucrative circles in India did not receive any bids; the case was similar for Karnataka and Rajasthan circles.
- 5) The winning price was equal to reserve price in all but 1 circle, Bihar, where the winning price was just 9% higher. Some operators did not even re-purchase licenses in circles where they already had spectrum, preferring to cease operations in those circles due to lack of a viable business case.
- 6) An unsuccessful 2012 1800MHz auction in India's case showed that there was limited demand for spectrum at high prices. In addition, similarly to Thailand, since the winning price of this auction will be linked to future renewal spectrum prices, the incumbents did not bid aggressively.

As a result, compared to Thailand, on an adjusted basis for PPP and Licence Duration, the clearing price of the 1800MHz band was USD 0.114 or approximately half the equivalent clearing price of the Thai 2.1GHz auction[1].

In 2013, the DoT re-auctioned unsold 1800MHz spectrum in Delhi, Mumbai, Karnataka and Rajasthan, and again offered pan India for the 800MHz band [5]:

- 1) The Government reduced the reserve price for 1800MHz by 30% and by 50% for 800MHz compared to the 2012 spectrum auction.
- 2) The Government had also planned to auction 900MHz spectrum in Delhi, Mumbai and Kolkata for simultaneously, with the reserve price for 900MHz being set at two times the reserve price of 1800MHz spectrum. However, it was not able to finalize the auction for the 900MHz band as incumbent operators had moved the Delhi High Court, seeking its intervention to stop the auction of the 900MHz band on the grounds of pricing and uncertain upcoming licensing renewal issues.
- 3) Despite reducing the reserve price of 1800MHz by 30%, the response to the 2013 spectrum auction was poor and there were no bidders for spectrum in 1800MHz band.
- 4) There was only one bidder for the 800MHz band, at reserve price. [5]

As a result, it can be concluded that unsuccessful 2013 1800MHz/800MHz re-auction in India's case showed that

there was limited demand for spectrum at high prices, especially in an environment where prices are used as a benchmark for subsequent license renewal fees.

VI. CONCLUSION

As has been addressed in this paper, evidence shows that the clearing prices achieved in the Thai 2012 2.1GHz spectrum auction were unequivocally in line with international benchmarks and the needs of the local market at the precise point in time at which the auction was conducted.

Importantly, the supply of spectrum was efficiently cleared at fair prices, and the award of licenses has enabled the industry to move beyond a high-stakes deadlock caused by the imminent ending of legacy Concessions. Together this unlocked a flood of new investment into the sector which will flow into greater socio-economic benefits to Thailand through the enablement of affordable nationwide broadband. In the absence of high quality fixed line and wireless broadband outside of the economic center of Bangkok, the digital divide is now being narrowed and Thailand has even seen the launch of 4G wireless broadband services on the new spectrum by one commercial telecom operator, leapfrogging 3G altogether.

Arguing for higher prices above evidential benchmarks in a short term revenue maximization quest would have likely hindered the growth and development of the telecom sector in Thailand, and led to potentially higher prices for consumers in contrast to the reality today where 15% 3G tariff reductions have been committed by the license winners together with rapid network rollouts to achieve 50% nationwide coverage well ahead of license stipulations.

Furthermore, in the context of upcoming spectrum auctions the fair clearing prices for all stakeholders have ensured a reasonable and balanced reference basis for proceeding with a smooth transition from legacy concessions to an industry standard licensing regime, and will assure the continued investment in and prosperity of the telecom sector and its contribution to the development of the overall Thai economy.

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