The Pakistan 2026 Multi-Band Spectrum Auction

An insider review of the Pakistan multi-band spectrum auction and the learning for regulators and operators

March 2026

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Insider insights from the Pakistan multi-band spectrum auction

Introduction

Coleago recently supported a successful bidder in Pakistan's 2026 multi-band spectrum auction

Coleago recently supported a successful bidder in Pakistan's 2026 multi-band spectrum auction, assisting them in acquiring their preferred spectrum package at reasonable prices. Coleago provided both spectrum valuation services and auction bidding strategy advice allowing us to develop deep insights into the valuation and auction design issues associated with the Pakistan auction. In this paper we provide a commentary on the auction and the insights for both operators and regulators from the licence conditions, auction design and the bidding strategy of the three incumbents who participated in the auction.

Context and spectrum offered

The Pakistan auction included a significant amount of new spectrum for a country which has been historically spectrum poor

Pakistan has historically suffered from a limited availability of spectrum with the three incumbents, Jazz, Zong and, the recently merged Telenor and Ufone, holding only 274 MHz of spectrum between them. The multi-band spectrum auction offered an additional 597 MHz of spectrum across the 700, 1800, 2100, 2300, 2600 and 3500 MHz bands representing a transformational quantity of spectrum.

The PTA is to be applauded for making a wide range of bands available simultaneously allowing bidders the opportunity to potentially switch their demand across largely substitutional bands. In doing so, the PTA resisted the temptation to drip-feed spectrum into the market to create artificial scarcity designed to drive higher prices. The exhibit below reveals the spectrum available in the auction.

Exhibit 1: Spectrum to be awarded

		700 MHz	1800 MHz	2100 MHz	2300 MHz	2600 MHz	3500 MHz
Auction	MHz	30	7.2	40	50	190	280
Lot size	MHz	2 x 5	2 x 1.2	1 x 10	1 x 10	1 x 10	1 x 10
No. Lots	No.	3	3	4	5	19	28

Source: PTA

A key decision for regulators and their auction designers is the size of the spectrum lots offered. The PTA and their advisers opted for lot sizes of 10 MHz of either paired or unpaired spectrum with the exception of 1800 MHz where limited supply was available.

Larger lot sizes can reduce the 'Exposure Risk' that arises when a bidder is seeking to acquire a profitable minimum viable quantity of spectrum but ends up paying a high price for a low value, small quantity of spectrum. However, a smaller lot size allows the maximum flexibility for bidders to acquire their preferred quantity of spectrum, potentially leading to more efficient allocations. With significant amounts of spectrum available in the 2600 and 3500 MHz bands and with caps in place, it was relatively unlikely that bidders would be stranded with sub-optimal holdings in these bands unless they were caught out by one of the key features of the auction design – the "no excess supply" rule, which we explore below. On balance the choice of lot size was appropriate.

On a slightly less positive note, not all of the 700 MHz band was made available which meant that only one bidder would be likely to secure spectrum in this band or, if the band was contested, one bidder would secure 2 x 10 MHz and another would be stranded with a sub-optimal 2 x 5 MHz which would, most likely, be uneconomic to deploy and could potentially lie idle.

Reduced regulatory uncertainty

Prior to the auction the PTA looked to reduce regulatory uncertainty

The timing of the auction was delayed as a number of major regulatory uncertainties were resolved. All bidders had highlighted that it would be impossible to value the spectrum accurately and hence bid with confidence in an auction until questions over the merger of Telenor and Ufone were resolved. The PTA made the right decision to resolve as many regulatory and competition related uncertainties as possible before proceeding with the auction.

Spectrum caps

Spectrum caps were loose but sufficient to avoid a potential distortion to competition

The PTA imposed relatively loose spectrum caps. There was an overall cap of 348.5 MHz on post auction spectrum holdings. Bidders were also restricted to a maximum of 55 MHz in sub 1 GHz bands after the award. Caps were relatively loose in the 2600 MHz and 3500 MHz bands with caps of 140 and 200 MHz respectively.

The caps were loose enough to allow bidders to acquire a significant amount of spectrum, but not so loose that a single bidder could prevent other bidders from acquiring a competitively viable minimum holding in the key capacity bands of 2300 and 2600 MHz.

Coverage and quality of service obligations

Coverage and quality of service obligations were very demanding

A key feature of the Pakistan auction were the demanding coverage and quality of service obligations designed to support Pakistan's digital agenda. The obligations covered four phases which extended to 2035 and, from a coverage perspective, were defined in terms of the number of new sites to be deployed each year, including deployments in areas where no existing sites were present. The four phases were:

- Phase 1 (2026-28);
- Phase 2 (2028-30);
- Phase 3 (2030-32); and
- Phase 4 (2032-35).

The coverage obligations were not particularly impactful on spectrum values but the associated quality of service obligations created a degree of uncertainty due to a lack of clarity over definitions in the original Information Memorandum and then, once clarified, created a significant burden for bidders.

The original Information Memorandum contained increasing QoS obligations associated with each phase, rising to the following for Phases 3 and 4 which were required on a combined basis.

- Minimum downlink speed of 50 Mbps for 4G;
- Minimum downlink speed of 100 Mbps for 5G; and
- Uplink speeds maintained at 25% of downlink speed.

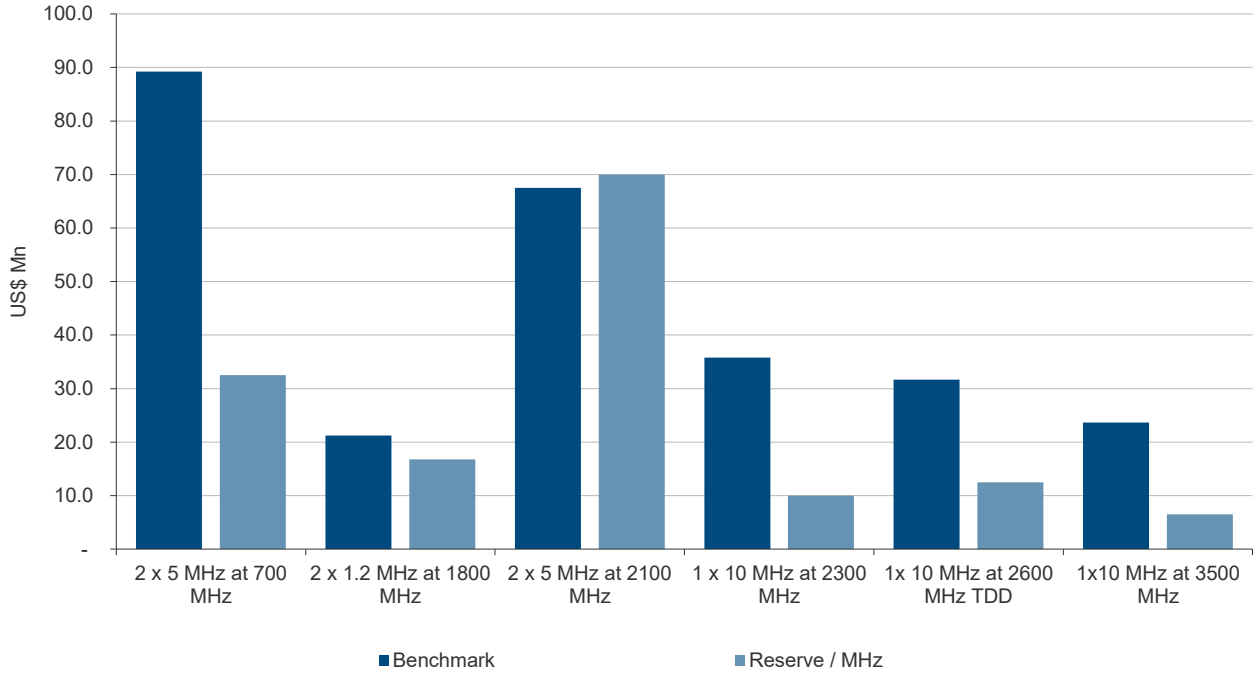
In a subsequent clarification to the IM the QoS obligations were re-defined in terms of the median speed, making for a yet more demanding obligation. The PTA may possibly have mis-judged how onerous the obligations would be but fortunately they had balanced demanding obligations with reserve prices that were set, generally, at sensible levels.

Reserve prices

Reserve prices were generally reasonable

The PTA accompanied demanding coverage obligations with generally realistic expectations regarding price. The PTA put the needs of customers and its digital agenda ahead of the objective of maximising auction proceeds and for this decision it is to be highly commended. The reserve prices are presented in the exhibit below and are compared with spectrum auction benchmarks.

Exhibit 2: Reserve prices and benchmarks



Source: Coleago and the PTA

As the exhibit reveals, spectrum in the 700, 2300, 2600 and 3500 MHz bands were priced at a discount to auction benchmarks, reflecting the demanding obligations imposed on bidders which would reduce the value of the spectrum. If reserve prices had been set close to the benchmarks then it is very likely that the PTA may have faced a partial or even complete failure of the auction. Interestingly, the decision was made to set the 1800 and 2100 MHz reserves at levels close to benchmarks and it is not surprising that neither band sold in the auction. The failure to sell the spectrum represents a loss of socio-economic welfare, as the spectrum will now lie idle. A consistent approach to reserve prices across all bands could have been a more positive move to ensure a higher level of spectrum sales.

In addition to generally realistic reserve prices, the PTA should also be commended for moving away from the requirement that auction prices were paid in US$ which placed a significant burden on bidders and the industry would have welcomed the move to local currency denominated payments. In addition, the option of paying the final price in instalments would also have been appreciated.

Minimum bid requirements

Bidders were required to make a minimum bid for both the 2300 and 2600 MHz bands to ensure a minimum quantity of spectrum was sold

A relatively unusual feature of the Pakistan auction was a requirement for bidders to make an opening bid in the first round for a minimum quantity of spectrum. This minimum bid, combined with the "no excess supply" rule meant that the auction was designed to ensure a minimum quantity of spectrum was sold. The minimum bid requirement paired a bid for 2600 with 3500 MHz. The minimum bid quantities were:

- 50 MHz (5 lots) in the 2600 MHz band; and
- 50 MHz (5 lots) in the 3500 MHz band.

In the absence of a combined minimum bid it is possible that the 3500 MHz band would have been left completely unsold. The 2300 and 2600 MHz bands are particularly attractive to operators in Pakistan as they can support 4G in the short and medium term and 5G in the longer-term, whereas 3500 MHz only supports 5G. Device

affordability issues mean that many Pakistan customers have devices that support 2300 and 2600 MHz but not 3500 MHz and so the value of 3500 MHz is low and accrues only in the later years of a business plan – a phenomenon common in many developing markets.

Auction design

An Ascending Clock Auction was adopted

The PTA and their advisers adopted an Ascending Clock Auction format for the allocation stage which determined the quantity of generic spectrum each bidder acquired and then a further clock auction during the assignment stage which determined the specific frequencies awarded to each successful bidder.

The traditional Clock Auction is a relatively simple format which involves the auctioneer announcing an increasing clock price for any spectrum band where the demand exceeds supply and bidders indicate how many lots they are prepared to acquire at the current clock price. The clock price(s) continue to rise until demand is equal to or less than supply for all bands at which point the auction ends and bidders acquire their demanded quantity at the final clock prices. Eligibility points and activity rules ensure that bidders cannot conceal their demand and encourages sincere and honest bidding.

The PTA introduced a "no excess supply" rule

The PTA design incorporated a relatively new feature of the Clock Auction which is the "no excess supply" rule[1]. This rule states that if, at any stage in the auction, there is demand for a particular band, then any request to reduce demand in later rounds will only be accepted partially or in full if it does not result in their being an excess supply of spectrum in that band. For example, suppose that there are 5 lots available in a band and opening demand in the first round is 10, then any reduction in demand will only be accepted in full or partially provided that demand never falls below 5 lots.

In this enhanced auction format, bidders are able to make an intra-round bid when reducing demand and their bid is regarded as a "request" that may or may not be accepted partially or in full. The lowest intra-round bid, when multiple bidders seek to reduce demand, is processed first and then the next highest and so on until all requests have been processed to the maximum extent possible based on the relative levels of supply and demand. The intra-round bid prices can be used to establish the "processed" price for a round which may differ from the clock price such that, at least in theory, no bidder should be unhappy with the resulting price and quantity of spectrum it would be potentially awarded.

Substitution and exposure risk

Bidders faced potentially significant substitution and exposure risk in the auction

The "no excess supply" rule has a number of attractive features that counter some forms of strategic bidding that can give rise to inefficient outcomes. For example, it discourages bidders from spiteful bidding; bidding on lots that it knows other bidders want in order to raise the price of those lots to exhaust their competitors' budgets in the hope that this means the perpetrator can acquire their preferred lots more cheaply. Bidders often also "park" their demand on lots they do not want in order to avoid increasing the price of the lots they do want. In the presence of the "no excess supply" rule, these strategies become more risky and therefore bidders are potentially less likely to pursue them.

On the other hand, the "no excess supply" rule also increases Substitution and Exposure Risk. Exposure risk arises when lots exhibit increasing marginal values and such a phenomenon is quite common within a band. The first lot within a band attracts all of the costs of deploying new radio equipment and potentially meeting any obligations associated specifically with the band and hence typically has a very low or often, even a negative valuation. The second lot however doubles the amount of

1 A full exposition of the "no excess supply" rule is beyond the scope of this paper and we focus only on some of the key aspects

available spectrum but the cost of deployment by comparison is considerably lower resulting in the second lot having a much higher valuation. Remaining incremental lots typically exhibit diminishing marginal returns. This pattern means that a bidder will typically require a minimum of between 30 to 50 MHz of a band in order for its acquisition to be economically viable.

Exposure risk is increased with the no excess supply rule as a bidder may want at least 30 MHz within a band but if it cannot acquire at least 30 MHz then it would not want to acquire any spectrum within the band. A bidder might attempt to reduce its demand from 30 MHz to zero MHz in response to an increasing clock price but the no excess supply rule may mean that its request to reduce demand is only partially fulfilled. As a result, the bidder may end up winning only 10 or 20 MHz which has a low or even negative value but the bidder pays a potentially high price for the spectrum.

The no excess supply rule can also raise Substitution Risk – this is the risk of bidders not being able to respond effectively to price and profit differentials between substitute bands. A bidder might be bidding on 2600 MHz but may wish to switch to 2300 MHz as the price of 2600 MHz has increased such that switching to 2300 MHz would result in a higher profit. In a worst case scenario, the bidder's request to reduce demand in 2600 MHz may only be partially accepted and consequently, its request to increase demand in the 2300 MHz band is also only partially accepted as the bidders ability to acquire spectrum is limited by its eligibility. As a result, the bidder may end up acquiring a small quantity of spectrum in both the 2300 and 2600 MHz bands as they were unable to fully substitute one band for the other. As a result, they then also suffer Exposure Risk as they end up paying a high price for both bands but the small amount of spectrum acquired in each band results in low or negative valuations for each band.

Risks increase as the level of excess demand declines

The risks above may be low at the start of the auction if there is a high level of excess demand across all bands, but as the auction progresses and excess demand falls the risk of becoming stranded increases and may deter bidders from switching even if it would be optimal for them to do so.

The "no excess supply" rule effectively transfers the risk of the auction ending with unsold lots from the regulator to the operator but at the expense of potentially uneconomic or inefficient outcomes. In a traditional clock auction, the problem of unsold lots was often resolved by the regulator holding an "unsold lots round" which offered bidders a chance to add to their existing holdings. In the presence of the "no excess supply" rule, the PTA could have offered bidders a "trading window" at the end of the auction where bidders had the opportunity to swap or trade lots between themselves in order to avoid any uneconomic holdings. The risk is also reduced if spectrum trading post auction is permissible as this offers another opportunity for bidders to exit from any stranded or orphaned lots.

These avoidance options were not available in the Pakistan spectrum auction and so bidders would have had to have thought very carefully about their bidding strategies so that they achieved their objectives whilst minimising substitution and exposure risk. As an insider, Coleago can confirm that developing an appropriate bidding strategy was exceptionally challenging.

Strategic demand reduction

The low reserve prices created incentives for bidders to adopt strategic demand reduction strategies

We have previously congratulated the PTA on the adoption of realistic reserve prices that reflected the demanding coverage obligations. However, the presence of lower reserve prices can give rise to another form of strategic bidding, strategic demand reduction (SDR). When there is the potential to acquire valuable spectrum at lower prices, bidders have an incentive to reduce their demand for potentially valuable spectrum in order to end the auction early, with less spectrum, but at prices below those levels that would have been incurred if they had competed aggressively, resulting in a potentially higher profit. This strategy may be more profitable than simply bidding for all valuable lots until the prices rise to meet their valuations, at which point they begin to reduce demand.

The risk of SDR would have been known to the PTA and their advisers and this is evidenced in the very limited information that was made available at the end of each round of bidding. By reducing available information, certain strategic bidding strategies can become more challenging to implement. However, the PTA will have accepted the possibility that the spectrum would be sold at or close to the reserve.

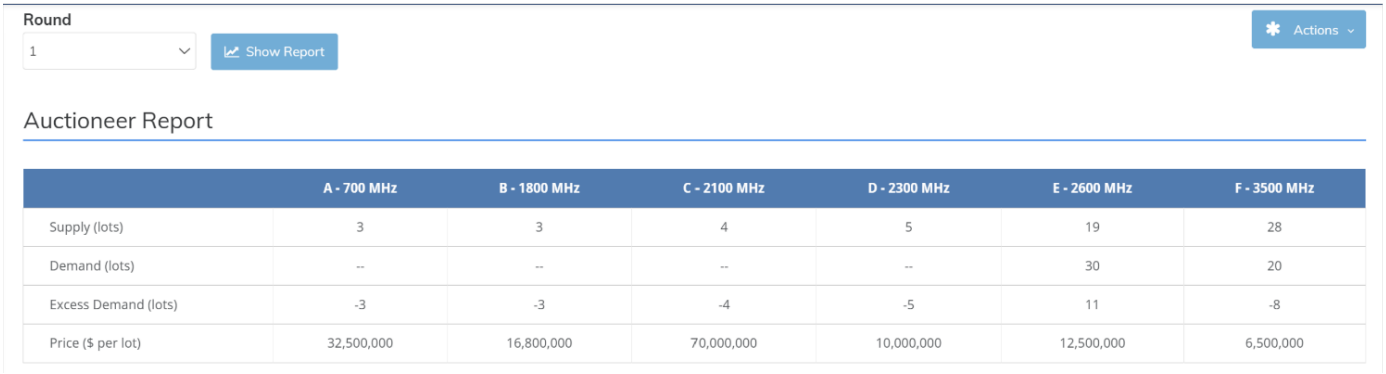
Bidding in the Pakistan spectrum auction

The PTA provided a high level of transparency during the auction

The PTA provided a high level of transparency during the auction and the results of each round were published live on a dedicated auction website. Due to the high levels of transparency, the small number of rounds, the fact that 1800 and 2100 received no bids and the clarity in the final results as to which bidder secured which quantities of spectrum, it is possible to infer the logic and choices of some bidding decisions.

Auctions can be thought of as a process through which bidders, observing the results of each round, can learn about and eventually arrive at a mutually acceptable allocation of the spectrum between the different bidders. Bidders have an incentive to learn quickly as the longer the process continues, the higher the prices they pay and the less profit they make. In the case of the Pakistan auction, the auction ended after just three rounds.

Exhibit 3: Round 1



	A - 700 MHz	B - 1800 MHz	C - 2100 MHz	D - 2300 MHz	E - 2600 MHz	F - 3500 MHz
Supply (lots)	3	3	4	5	19	28
Demand (lots)	--	--	--	--	30	20
Excess Demand (lots)	-3	-3	-4	-5	11	-8
Price ($ per lot)	32,500,000	16,800,000	70,000,000	10,000,000	12,500,000	6,500,000

Source: PTA

The results from the first round are shown above. There were no opening bids for 700, 1800, 2100 or 2300. However, there were 30 bids for the 19 available lots in 2600 resulting in excess demand of 11 lots. In 3500 MHz, there were bids for 20 lots and as each bidder was required to make a minimum bid of 50 MHz it meant that one or more bidders had bid more than the minimum requirement. The limited information rules meant that bidders did not know who had bid what, only the levels of excess demand.

Exhibit 4: Round 2

	A - 700 MHz	B - 1800 MHz	C - 2100 MHz	D - 2300 MHz	E - 2600 MHz	F - 3500 MHz
Supply (lots)	3	3	4	5	19	28
Demand (lots)	2	--	--	--	26	20
Excess Demand (lots)	-1	-3	-4	-5	7	-8
Price ($ per lot)	32,500,000	16,800,000	70,000,000	10,000,000	13,125,000	6,500,000

Source: PTA

The results of round 2 are shown above. In the second round we can observe that one operator switched 2 lots of demand from 2600 to 700 MHz. Post final auction results being published by PTA, we know it was Jazz that made this move as the results revealed that Jazz was the winner of 2 lots of 700 MHz. However, as demand for 2600 MHz reduced by 4 lots in total and there was no corresponding increase in demand in other bands, it suggests that one or more bidders recalibrated their demand in 2600 MHz in line with their individual bidding strategies and assessment of likely outcomes under the auction framework.

The auction ended in round 3 and the final results are shown below.

Exhibit 5: Final auction results

	A - 700 MHz	B - 1800 MHz	C - 2100 MHz	D - 2300 MHz	E - 2600 MHz	F - 3500 MHz
Supply (lots)	3	3	4	5	19	28
Demand (lots)	2	--	--	5	19	22
Excess Demand (lots)	-1	-3	-4	--	--	-6
Price ($ per lot)	32,500,000	16,800,000	70,000,000	10,000,000	13,125,000	6,500,000

Source: PTA

As the exhibit above reveals, demand in 2600 MHz fell to 19 lots, a reduction of 7 lots; this resulted in demand aligning with the available supply; with no excess demand observed in other bands, the auction concluded in accordance with the auction rules.

Based on an analysis of the final results presented below, we can determine which moves were made in this final round.

Exhibit 6: Final auction results

	700 MHz	1800 MHz	2.1 GHz	2.3 GHz	2.6 GHz	3.5 GHz	Total
Jazz	2 x 10	–	–	50	70	50	190
Ufone	–	–	–	–	60	120	180
Zong	–	–	–	–	60	50	110

Source: PTA

It can be inferred that Jazz switched 50 MHz of demand from 2600 to 2300 MHz, reducing demand in 2600 MHz by 5 lots. In addition, Ufone switched two lots of demand from 2600 to 3500 MHz. As with any demand switch of this nature, the outcome was dependent on the behaviour of other bidders - had competing demand in 2600 MHz shifted by more than 2 lots in total, the switches may only have been partially accepted, resulting in a smaller than intended holding in 2300 MHz and 3500 MHz and a larger residual position in 2600 MHz.

Summary and conclusions

The Pakistan multi-band auction should be seen as a significant success

Overall, the Pakistan multi-band auction should be seen as a significant success for the PTA, the Government of Pakistan and the people and businesses of the country. A significant proportion of the available spectrum was sold and in doing so, the PTA secured a commitment to a significant increase in coverage and quality of service for the country. All three operators acquired valuable spectrum assets at reasonable prices which will support future investment, avoid potentially increasing consumer prices and will have gone some way to improving the financial health of the industry. The process was generally well managed although the original timetable was challenging and the delay in the start date for the final auction was welcomed. The auction design presented bidders with some significant risks and challenges which could have been mitigated through further process enhancements but fortunately the potential risks did not materialise. Overall, the process and outcome must be viewed very positively.

How Coleago can help

Coleago has over 25 years' experience in auction design for regulators and supporting operators in developing and executing their auction bidding strategies

Coleago has over 25 years of experience in advising both operators and regulators on issues related to spectrum management including designing auctions for regulators and developing and implementing auction bidding strategies for operators as well as spectrum valuation. Coleago played a key role in ensuring that our client secured its preferred package of spectrum in the Pakistan auction at low prices.

About Coleago Consulting Ltd and the author

Graham Friend, M.A., M.Phil., (Cantab), ACA, is an economist, an award-winning author and the Managing Director and Co-Founder of Coleago Consulting. Coleago is a specialist telecoms strategy consulting firm and advises regulators and operators on issues relating to spectrum, regulation and network strategy. If you would like to discuss any of the issues raised in this paper, then please contact Graham.

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