

The South African Spectrum Auction: An Insider View

**A review of ICASA's multi-band spectrum auction
and the learning for other regulators seeking to
award spectrum to support the development of
mobile broadband and 5G**

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Insights from the ICASA South African multi-band spectrum auction: An insider's perspective

Introduction

Coleago has first-hand insight into the ICASA spectrum auction and this paper shares valuable insights for other regulators seeking to assign spectrum in Africa

Coleago Consulting recently supported a successful bidder in the ICASA, South African, multi-band spectrum auction and gained first hand insight into some of the strengths and weaknesses of the ICASA auction process. In this paper we combine our experience of working with mobile operators and regulators across Africa to identify the learning that will benefit other regulators in planning their own spectrum award processes. This paper complements our previous papers on the Tanzanian and Nigerian spectrum auctions as well as our work with BOCRA, the Botswana regulator on spectrum management. These additional papers are available on request.

We begin with a high-level review of the ICASA auction process before summarising the key results. We then review what worked well and where there were opportunities for improvement and identify the key insights for other regulators in Africa.

Overview of the ICASA multi-band spectrum auction

The ICASA process involved a number of stages and commenced with a consultation phase which is to be commended

The process involved a number of stages. There was an initial consultation on the proposed contents of the Information Memorandum (IM). Including a consultation process is a key element of best practice and ICASA is to be commended for doing so. However, a number of critical issues were raised during the consultation which ICASA failed to address in the final IM. For example, the coverage obligations on one particular lot (Lot 9) were very onerous and therefore commercially non-viable. It was highlighted to ICASA that there was a material risk the Lot would not be sold, the spectrum would lie idle and the coverage not achieved – this is indeed, exactly what happened.

The first step of the actual process required bidders to prepare an application based on a pre-defined set of requirements. The task of preparing the application was onerous, complex and time consuming and in some cases, the requirements were not always clear and therefore open to interpretation. Many of the criteria were also subjective which reduced transparency and could have potentially given rise to a legal challenge. We would recommend for future processes that ICASA adopts a simpler pre-qualification process based on a small number of criteria that can be objectively assessed.

The "opt-in" round effectively provided a set-aside of spectrum for smaller players designed to promote post auction competition

Prior to the main auction, ICASA conducted, what they referred to as an "opt-in" round, where only "Tier 2" operators were allowed to participate. This essentially represented a spectrum set-aside for smaller players; MTN and Vodacom were excluded from this phase. In setting aside spectrum for smaller players, ICASA was effectively trading the economically efficient use of the spectrum (which would be realised by assigning the spectrum to the larger operators with the most subscribers) with an attempt to promote increased levels of competition by permitting smaller operators to acquire additional spectrum at relatively low cost. The auction format used was a second price, combinatorial, sealed bid auction which was a reasonable choice as it encouraged sincere bidding (i.e., bidding based on the operator's valuations of the spectrum) and avoided exposure and substitution risk by ensuring that bidders either won their entire preferred package of spectrum, or nothing at all.

The Main Auction followed the “opt-in” round and all bidders were able to participate in this stage. The main auction consisted of a Simultaneous Multi-Round Ascending (SMRA) auction format but unusually, with specific lots but which were actually generic. A specific lot is a well-defined lot related to a specific set of frequencies whereas a generic lot simply confirms a bidder has won spectrum but not which specific frequencies it has won.

The decision to use “specific” lots was one of the flaws in the ICASA design

In the ICASA SMRA, there were a range of uniquely identified “specific lots” in each of the 700, 800, 2600 and 3500 MHz bands numbered from 1 to 33 but whilst a bidder would bid on a specific Lot number, this did not correspond to a specific set of frequencies. Following a bid, the highest bidder (bids were selected from a set of options provided by ICASA) on the lot (or where there were two bidders, the one selected at random) would become the Standing Highest Bidder (SHB) and would be obligated to pay their Standing Highest Bid were the auction to end in that round.

Once designated a SHB, a bidder could not withdraw their bid and would only be able to escape their commitment to purchase the lot if another bidder “overbid” them on that Lot to become the new SHB. This feature of the auction created significant challenges for bidders late in the auction as we will discuss later in this paper. Each round, the price of the lots increased and the rounds continued until there were no more new bids, at which point the auction ended.

The winners were the SHBs and they paid their standing highest bids. Eligibility rules ensured that bidders had to keep bidding. If a bidder reduced its demand, for example if it were bidding for 10 lots and then in the next round, they only bid on 9 lots, then it could never go back to bidding on 10 lots. Eligibility could only ever decline and could never increase. Each lot was assigned a certain level of eligibility points.

Ensuring contiguous spectrum was assigned is important

Following the Main Auction, an administered assignment stage took place where ICASA attempted to ensure that all operators were awarded contiguous spectrum. The bidder with the highest value set of bids within a band was permitted to have first choice as to their position within the band.

Outcome of the auction process

The auction raised Rand 14.4 billion (USD 974 million) and all the spectrum was awarded with the exception of a “coverage” lot

The auction raised Rand 14.4 billion (USD 974 million) and all the spectrum was awarded with the exception of Lot 9, the onerous coverage lot which received no bids and was left unsold.

The results of the auction are shown in the Exhibit below and the outcome is very interesting. The following points are worthy of note:

- the 2 x 10 MHz coverage lot was not sold;
- Cell C acquired a single Lot in the 3500 MHz band; and
- Vodacom acquired a single Lot in the 3500 MHz band.

The results for Cell C and Vodacom in the 3500 MHz band are worthy of further analysis. Typically, there are economies of scale in acquiring multiple lots of spectra within a band. The very first lot usually attracts a coverage obligation and requires extensive investment in new equipment in order to deploy the band. As a result, the value of a single lot on a stand-alone basis is often very low or frequently negative as the cost of deploying it is high but the limited bandwidth means it offers little capacity. In contrast, the 2nd, 3rd, 4th and 5th lots etc are low cost to deploy and yet significantly enhance capacity. Operators therefore typically prefer to acquire multiple lots within a band (as Vodacom did in 2600 MHz and MTN did in both 2600 and 3500 MHz) and avoid acquiring a single or even just two or three, usually uneconomic lot(s) as Cell C and Vodacom did in the 3500 MHz band.

The result in the 3500 MHz band is not technically or economically efficient

The result in the 3500 MHz band is therefore not spectrally, technically or economically efficient which are counter to the statutory objectives of ICASA. We will discuss later in this paper why ICASA's choice of auction format made it difficult for Cell C and Vodacom to avoid being stranded with orphaned, uneconomic lots of spectra.

Exhibit 1: Auction outcome for main stage

Band	MHz	Winner
700	10	Vodacom
700	10	Vodacom
700	10	Opt In
700	10	Opt In
800	10	MTN
800	10	MTN
800	10	Opt In
800	10	Opt In
800	20	Un Sold
2600	10	MTN
2600	10	MTN
2600	10	MTN
2600	10	MTN
2600	10	Vodacom
2600	10	Vodacom
2600	10	Vodacom
2600	10	Vodacom
2600	10	Vodacom
2600	10	Vodacom
2600	10	Vodacom
2600	10	Rain
2600	10	Opt In
3500	2	Telkom
3500	10	Cell C
3500	10	Telkom
3500	10	Telkom
3500	10	Vodacom
3500	10	MTN
3500	10	MTN
3500	10	MTN
3500	10	MTN
3500	4	Liquid Telecom

Source: ICASA

Simultaneous award of spectrum

ICASA is to be commended for awarding all of the spectrum simultaneously in a single auction process

ICASA is to be commended for awarding all of the spectrum simultaneously in a single auction process rather than a sequential series of auctions. As spectrum in the 700 and 800 MHz bands, for example, are substitutes for each other, a simultaneous award is appropriate as it potentially allows bidders to switch their demand between these two substitutable bands in response to different auction prices across the bands. Similarly, the 2600 and 3500 MHz bands can be seen as (imperfect) capacity substitutes for each other and once again, a simultaneous award process allows bidders to switch demand between the two categories of lots in response to different price levels.

Reasonable reserve prices

ICASA set an appropriate reserve price

Until recently, Africa has had a long history of partial or complete auction failures and when these auctions are examined in detail, the cause of the failure is often the imposition of a high reserve price. It is typical for a regulator to impose a reserve price and regulators are generally encouraged to set a low but material reserve price in order to encourage participation from serious bidders but to discourage frivolous bidders. ICASA is to be commended for setting a relatively low reserve price.

Flawless execution of the live auction

The execution of the auction was flawless

The auction itself was implemented using an electronic auction system which allowed bidders to securely logon to the system and submit their bids remotely. The system was well-designed, simple to use and included checks on the legitimacy of bids. Bidders received adequate training on the system and were able to participate in a mock auction held by ICASA. During the auction itself, the execution of the auction was very smooth and the process worked extremely well providing a high level of confidence for bidders. ICASA is to be commended in hiring a reputable firm to implement the auction format.

High level of regulatory uncertainty

The WOAN plans and subsequent abandonment created significant regulatory uncertainty

The Government of South Africa had planned to introduce a Wholesale Open Access Network (WOAN) which they hoped would promote increased competition in South Africa. A significant amount of spectrum had been excluded from the auction which would be assigned to the WOAN. In addition, successful bidders securing spectrum in the auction were compelled to acquire a minimum of 30% of the capacity of the WOAN. Acquiring capacity from the WOAN impacts the value of the spectrum to bidders as if capacity can be served by the WOAN it means bidders require less capacity and hence spectrum for themselves. Unfortunately, there was considerable uncertainty over the WOAN which made valuing spectrum challenging for bidders. Key uncertainties were:

- would the WOAN ever be launched;
- when would the WOAN be launched if it were launched;
- what coverage would the WOAN provide;
- how much capacity on the WOAN would be available; and
- what wholesale price would be charged for that capacity.
- Regulators often have a statutory duty to ensure that spectrum is assigned efficiently. An efficient allocation means assigning the spectrum to those bidders that will create the greatest socio-economic value from the use of the spectrum. This means in practice, assigning the spectrum to those that value it most highly. If regulatory uncertainty makes it difficult for bidders to accurately value spectrum, then this introduces the risk that spectrum is not assigned to those that value it most highly due to valuation errors on the part of bidders.
- Uncertainty was further increased during the auction as the Government announced that it was abandoning the WOAN. This meant that the spectrum set aside for the WOAN would most likely be auctioned in the future to mobile operators. The availability of alternative, substitute spectrum created a Substitution Risk for bidders. Should they bid now in the current auction for spectrum or wait until the future auction where they might be able to acquire similar spectrum more cheaply? The decision was made more complex by uncertainty over when and how the WOAN spectrum would be awarded. Regulatory uncertainty was one of the

major issues during the ICASA award process. ICASA and regulators more generally should seek to reduce regulatory uncertainty in the assignment process.

Uneconomic coverage obligation and unsold spectrum

Regulators should seek alternative solutions for providing deep rural coverage rather than creating risk of failure by imposing uneconomic coverage obligations

Coverage obligations are common in spectrum award processes and can promote wider adoption of mobile broadband but it is important they are set at appropriate levels. If a coverage obligation is set at a level above the level of coverage that operators would choose for themselves on commercial grounds, then they impose a cost on the operator. A coverage obligation effectively requires mobile operators to use the profits from covering profitable areas to subsidise coverage in uneconomic areas (we have developed a paper on coverage which is available on request). However, if the coverage obligation is so demanding that the cost of covering uneconomic areas exceeds the profits from the commercially attractive areas then mobile operators will not be willing to acquire the spectrum as this would generate an overall loss.

The mobile industry in South Africa highlighted to ICASA on a number of occasions that the coverage obligation was not commercially viable. Unfortunately, ICASA did not take heed of the views of the industry and as a result the “coverage lot” received no bids during the auction and was left unsold. The result was that spectrum was unsold which is not economically efficient, the Government failed to raise additional revenues from the sale of this spectrum and the coverage was achieved.

Regulators should be focused on extending coverage into deeply rural areas however they must also recognise the economic realities of doing so. Alternative approaches to achieving these aims include offering subsidies or auction price discounts to those willing to take on the coverage obligation or working collectively with the industry to create a single, shared rural network with roaming obligations. We recommend that regulators work closely with the industry to develop the most economically efficient solutions to meet the challenge of providing deep rural coverage.

Eligibility points and substitution risk

Eligibility points should be set appropriately to ensure that bidders can fully respond to changes in auction prices

A significant flaw in the ICASA auction design was the level of eligibility points attached to different lots. A 2 x 5 MHz lot of 700 MHz or 800 MHz was assigned four eligibility points and so a bidder required eight points in order to bid for 2 x 10 MHz of sub 1 GHz spectrum. The 2 x 10 coverage lot however had an eligibility point assignment of four points. Sub 1 GHz spectrum caps meant that some bidders were unable to bid for more than 2 x 10 MHz of sub 1 GHz spectrum. Whilst in practice the issue never arose due to the unattractive nature of the coverage lot, bidders faced a major substitution risk.

If a bidder was seeking to acquire 2 x 10 MHz of sub 1 GHz spectrum and the price of unencumbered lots was increasing then it may have wanted to switch its demand to the coverage lot. Bidding on 2 lots of unencumbered spectrum requires eight eligibility points, however, switching to the coverage lot would reduce the eligibility of the bidder to four points. The rules of the auction meant that once a bidder moved its demand to the coverage lot, it could never return to bid on the unencumbered lots because it would no longer have sufficient eligibility. This meant that bidders would only ever switch to the coverage lot as a “last resort” and probably further contributed to the failure of ICASA to sell this lot. The issue was highlighted to ICASA during the consultation process but unfortunately the concerns of bidders were not addressed. Regulators should take great care when assigning eligibility to lots to ensure that it does not create auction bidding risks for bidders.

Specific and generic lots and the use of an SMRA

An ascending clock auction with truly generic lots would have been a better choice of auction design

The biggest overall flaw in the ICASA award process was the initial choice of auction format. In the ICASA auction design, as the auction approached its close, there were only a small number of new bids in each round. A bidder, such as Cell C or Vodacom in the 3500 MHz band, would probably not want to be left stranded with a single or even a small number of uneconomic lots in the band. They would either want four or five lots or more or no lots at all, but certainly not a single lot. As the auction approached its end, they would have wanted to either exit the auction completely or switch their demand into their preferred band. Cell C may well have wanted to exit completely with no lots and Vodacom would have preferred to move demand from 3500 MHz to 2600 MHz. However, once a bidder has become SHB on a particular lot, they can only exit or switch demand once another bidder bids on their lot. In the final stages of the auction, there may only be one new bid and if that new bid is not on “their” lot, then they are stranded and cannot move. If, as a result of another bidder reducing its demand, the auction then ends, this means the bidder is stranded with a lot they do not want.

It is reasonably likely that neither Cell C nor Vodacom was targeting a single lot in the 3500 MHz band. The outcome is likely not be economically efficient and it may well be that Cell C and Vodacom do not invest in the lot and potentially may return it to ICASA to avoid the annual spectrum usage fees. This uneconomic result arose due to the decision to adopt an SMRA with specific lots (which were in fact, generic).

An alternative auction format would have been to adopt some form of ascending clock auction with truly generic lots. In this format, the auctioneer would announce an auction price for each category of lot and bidders would indicate how many generic lots they would be willing to buy at that price. The auctioneer would continue to raise the price until the demand for lots was equal to or less than supply (an unsold lots round could have addressed the risk of there being unsold lots at the end of the clock phase). This approach would have made it easier for bidders to switch between bands and would have reduced the risk of bidders being awarded stranded lots which they did not want. Regulators should ensure that the appropriate auction format is selected.

It is also worth noting that if ICASA had implemented spectrum trading, then any “mis-allocations” that arose during the auction could be addressed in a series of post-auction trades.

Summary of key insights

ICASA is to be commended for a largely successful award process

ICASA is to be commended for a largely successful auction. The factors contributing to success were:

- conducting a consultation process;
- the simultaneous award of available spectrum;
- setting a low but material reserve price; and
- selecting a reputable adviser to ensure the effective implementation of the auction.

There are a range of insights which are valuable for other bidders in Africa

The areas for improvement and the main insights for other regulators are:

- if a consultation process is to be held, then act upon the legitimate responses to that consultation;
- adopt a simple, transparent and objective pre-qualification process;
- reduce regulatory uncertainty to ensure bidders can value spectrum with confidence;

- ensure that coverage obligations are commercially viable and partner with the industry to resolve the challenges of providing deep rural coverage;
- ensure that eligibility points are set at levels for different lots which do not create bidding risks for bidders;
- select the appropriate auction format to ensure that spectrum is assigned efficiently and bidders are not stranded with lots they are unlikely to invest in; and
- introduce spectrum trading to ensure that a mechanism exists for spectrum to move to its most economically efficient use.

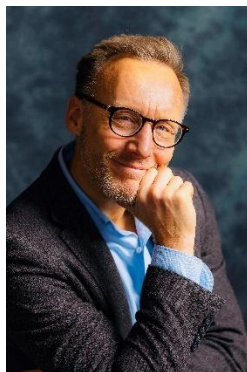
How Coleago can help

An understanding of spectrum from an operator's perspective is key to developing appropriate spectrum management and assignment strategies

Coleago has over 20 years of experience in advising both operators and regulators on issues related to spectrum including spectrum management strategies, roadmaps, pricing and award process design and implementation, including auctions. We are able to provide regulators with the “operators’ perspective” to ensure that our recommendations take account of the practical real-world realities faced by mobile operators to ensure that our regulatory advice will achieve the regulator’s objectives. Coleago has a long history in Africa and has advised both governments and operators in most countries within the region.

About Coleago Consulting Ltd

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