Vodacom's non-confidential commentary

The Authority's proposed cost modelling approach and underlying methodologies

This submission is structured as follows:

Executive summary

The Authority commenced the second phase of its call termination service review ("**Review**") on 26 May 2023. This followed the completion, on 28 March 2022, of the first phase of the Review. In the first phase, the Authority assessed the appropriate market definitions, considered the effectiveness of competition, identified operators with Significant Market Power ("**SMP**"), listed the relevant market failures and set out pro-competitive conditions. Importantly, the Authority concluded that the market failures were unchanged from its 2010, 2014 and 2018 call termination market reviews, that cost-based pricing be retained as a pro-competitive term and condition and that asymmetric mobile termination rates ("**MTRs**") should be phased out for established operators.[1]

This second phase is concerned with determining appropriate, cost-based rates for fixed and mobile voice call termination services. Given the outcomes of the first phase, Vodacom was reasonably expecting that this phase would (with the exception of those matters determined explicitly within the first phase, such as the move to symmetric rates for existing mobile network operators ("**MNOs**")) apply the same methods as the Authority had applied in 2018 when determining cost-based rates. Indeed, in its 2021 Discussion Document, the Authority stated that, in its view, it was not necessary to make material changes to its existing remedies for call termination services[2].

However, when the second phase commenced, it became evident that this was not the case. This is because it was clear, through the industry and one-to-one workshops, that the Authority was intending to set MTRs through a Pure LRIC approach (with economic depreciation). This contrasted with the LRIC+ approach to setting MTRs previously used by the Authority. These workshops also revealed that stakeholders had a number of other concerns with the Authority's approach to this phase, including with the data requests and shell models it had shared with licensees.

As a result of this and following the licensees submitting extensive lists of concerns, Vodacom notes that the Authority has now appeared to shift its position, publishing a document on 15 June that appears to seek licensees' views on many aspects relevant to determining rates, including both key methodological choices (such as the cost standard which should be used) as well as detailed aspects of the modelling.[3]

Vodacom notes that the Authority's approach to this "consultation" is unusual and does not follow the usual format of such documents. Instead, it simply presents a series of lengthy tables listing the issues / points made by licensees and the Authority's initial response to these, which invariably do not respond to the query but instead invite input. This means that the Authority has first adopted a new cost standard without having in any way consulted on it, presented modelling templates inexorably premised on this standard (Pure LRIC) and sought input on these modelling templates. When queried on the implications and assumptions underlying these templates and how these could or would be adapted were a different cost standard to be employed, it has then failed to provide any clarification, instead saying that all comments are welcome. This is contrary to an open and transparent consultation process and confusing as to what is proposed and why.

What is clear, as set out above, is that all of this comes after the Authority has already undertaken considerable work on its cost models, which are premised on adopting Pure LRIC. The Authority therefore appears to have constructed a process that can yield one outcome only, while pausing midway to allow for comment on what has already been built. This is not a meaningful consultation process designed rationally, fairly and logically to determine the cost standard to be applied, as one would expect from a transparent,

[1] Findings Document on the Review of the 2014 Pro-competitive Remedies imposed on Licensees in terms of the Call Termination Regulations, 2014
[2] "Based on the evidence supplied in response to Phase 1 of this review process, the Authority's preliminary view is that it is not necessary to change materially the pro-competitive terms and conditions imposed on licensees in terms of the Regulation" ICASA Discussion Document on the Review of the 2014 Pro-competitive Remedies imposed on Licensees in terms of the Call Termination Regulations, 2014
[3] "Responses to stakeholder requests for clarification on bottom-up and top-down shell models for the determination of mobile and fixed-line wholesale voice call termination rates." For ease, Vodacom refers to this as the "Clarification Document"

open and receptive consultation process. Further, the consultation on the more detailed modelling to be done (based on the determined cost standards) suffers from similar issues.

Given this, Vodacom remains concerned that the Authority has already, in effect, prejudged the outcome of this exercise and that its pause is intended only to create the impression (and not the reality) of proper consultation with stakeholders on the choice of the cost standard and other key modelling issues. As such, Vodacom continues to reserve its rights to respond as it may at the appropriate point to protect its rights in regard to this Review process.

Nevertheless, and despite its reservations, Vodacom seeks, in this document, to respond constructively where it can. However, in so doing Vodacom notes that many of the issues on which the Authority now appears to be seeking input are, whilst important, secondary to the key question of the cost standard that will be used when setting rates (in the sense that these can only be properly considered once the decision on cost standard is made). Indeed, Vodacom understands that the Authority is only seeking broad comments on its approach at this stage.[4] Therefore, in this submission, Vodacom discusses first the cost standard and then, to the extent possible, provides comments on conceptual and practical matters of model implementation. Vodacom explains why the Authority should continue to use the LRAIC+ (also known as "LRIC+") cost standard. If despite this, the Authority does nonetheless decide to move to Pure LRIC, and as should be clear from the remainder of this submission, then its current proposed approach will need significant changes, as its modelling approach is wholly inadequate.[5]

Furthermore, as part of Phase I of its Review, the Authority has already decided to phase out asymmetric MTRs. Only new entrants will be allowed to charge asymmetric MTRs for a period of 3 years. In practice, it is not clear who such entrants could be. Given this, it may not be proportionate for the Authority to develop a model that can also estimate MTRs for new entrants. However, if the Authority does decide to estimate the MTRs for new entrants, it is important that this is specific to genuine new entrants, rather than other operators who have already been in the market for more than 3 years, such as Telkom and Cell-C. Vodacom notes that the Authority is modelling outcomes incompatible with its symmetry decision only to cater for the possibility that Telkom's challenge to its Phase I decision may be upheld by the courts. Vodacom's responses to the modelling of asymmetric MTRs must accordingly be regarded in the same vein.

Vodacom has structured the remainder of its response as follows[6]:

- Section A sets out, in more detail, Vodacom's concerns regarding the process that the Authority appears to be following.

- Section B describes different cost standards that can be used when estimating "cost based" rates.

- In Section C, Vodacom then reiterates its position that shifting from LRAIC+ (LRIC+) to Pure LRIC is likely to have a number of negative consequences for the market and consumers and that the Authority has not, at any point, demonstrated why its previously held view, namely that a LRAIC+ (LRIC+) approach is the most appropriate basis for setting termination rates, is no longer valid. This is because:[7]

[4] Vodacom understands that it is the 20 June version of the shell models, model guide, and questionnaires that the Authority is seeking only broad comments on. Vodacom understands that, because the BU shell models, model guide and BU information requests may change following this "consultation", , the requested data and additional features fall outside the scope of this "consultation". Vodacom understands and expects that stakeholders will be afforded an opportunity to provide this at a later stage.

[5] At this early stage of Phase II, it is difficult for Vodacom to comment on all of the detailed modelling issues, as the appropriate approach on some matters will depend on which cost standard the Authority ultimately adopts. Therefore, Vodacom reserves the right to further comment on modelling issues as Phase II progresses.

[6] In line with its understanding of the scope of this consultation exercise, Vodacom refrains from commenting on how (assuming the cost modelling exercise demonstrates that the current rates are no longer appropriate) the new termination rates should be implemented. This includes, in particular, the length and shape of any glide path to new rates. For the avoidance of doubt, Vodacom expects the Authority to consult on such matters in due course.

[7] Vodacom notes that it has made a number of these points to the Authority before, both in a submission as part of Phase I and in response to the workshops at the beginning of Phase II. Nevertheless, given that neither the Authority nor its advisors (Acacia) seem to have yet properly engaged with these points, Vodacom repeats and builds on those points here, and again includes a copy of the expert report on this topic prepared previously by Frontier Economics

- The Authority has not identified any changes in the market that would justify a move to Pure LRIC;
- Pure LRIC would not enhance economic efficiency;
- Pure LRIC may harm low-income users who tend to be net receivers of calls;
- Pure LRIC would have minimal to no impact on the overall level of competition between mobile operators; and
- International precedent does not support a move to Pure LRIC in South Africa, especially when taking into account the specific characteristics of South Africa.

- Section D then explains some of the practical challenges with applying Pure LRIC and sets out how the Authority would need to change its approach if it were to ultimately decide to adopt Pure LRIC despite the drawbacks of such an approach, most critically by developing a significantly more granular approach to modelling the hypothetical network;
- Section E discusses modelling methodologies in more detail; and
- Section F comments on specific modelling assumptions the Authority has made in its shell models.

A. Vodacom has significant concerns with the process the Authority appears to be following for this stage of the Review

Robust and transparent consultation, with authorities listening to and considering, in detail, points made to them by other stakeholders, are both critical cornerstones of effective regulation. They are also both fundamental prerequisites for the Authority to act lawfully. Apart from the legal defects inherent in a failure to consult properly, such failures increase significantly the risks of regulation being inappropriately specified and having consequent negative impacts on consumers in South Africa. To this end, and for the reasons set out below, Vodacom has major concerns that, in this inquiry, the Authority is following an insufficiently robust and transparent consultative process. This is particularly acute when it comes to determining the cost standard to use when estimating the costs of termination services. The Authority's decision on which cost standard to use must be aligned with the requirements of the Electronics Communications Act ("**ECA**") and so take into account the previous positions that the Authority has taken on the merits of different cost standards and depreciation methods. In particular, the Authority must justify any unexplained and anomalous departure from a position it has previously held and cogently defended.

In the rest of this section of its response, Vodacom mainly focusses its comments on the cost standard. However, these concerns also affect a number of other topics.

1. The two phases of the Review

The Authority has split its Review into two phases:

- **Phase I** – This Phase assessed the appropriate market definitions, considered the effectiveness of competition, identified operators with SMP, listed the relevant market failures and set out pro-competitive conditions. This Phase concluded with the Authority's 2022 Findings Document. Importantly, the Authority concluded that the market failures were unchanged from its 2010, 2014 and 2018 call termination market reviews. Alongside this, the Authority decided that asymmetric MTRs should be phased out.

- **Phase II** – This Phase will model the efficient costs of providing fixed and mobile call termination services. The Authority has now commenced this Phase, which is the subject of this submission by Vodacom.

In principle, Vodacom supports this two-phase approach. Indeed, this approach has been used in a number of other jurisdictions. However, it is critical that the two phases are aligned.

2. Scope of this (24 July) consultation

In the initial stakeholder workshop for Phase II, followed by Vodacom's one to one meeting with the Authority and its advisors, Acacia, it became clear that the Authority intended, without conducting a consultation, to follow a Pure LRIC approach and the use of economic depreciation. The engagement in these meetings and workshops was premised on this as if it were a given.

Given the numerous concerns raised by stakeholders regarding the lack of consultation on the cost modelling approach, the Authority published a Clarification Document on 15 June.[8] Stakeholders have, therefore, been invited to comment on the issues set out in this document when making submissions on 24 July 2023.[9]

Within the Clarification Document, the Authority confirmed (issue # 9) that it is considering adopting a Pure LRIC approach to modelling the costs of termination services, with this being combined with the application of economic depreciation. It also made it clear that these are departures from the previous methodologies used by the Authority. In addition, the Authority confirmed (issue #17) that it went ahead and implemented this approach (and departures from the 2018 approach) in the BU shell models, model guide and BU information requests.

Many of the issues on which the Authority now appears to be seeking input are, whilst important, secondary to the key question of the cost standard that will be used when setting rates (in the sense that these can only be properly considered once that decision is made). The Clarification Document (issue # 3, 10, 11, 17, 21) confirmed that, should the Authority finally settle on a different cost standard, the modelling guide, model shells and information requests will be re-issued. For this reason, as Vodacom understands it, the Clarification Document seeks (issues # 13 and 15) only broad comments on the models, model guide, and questionnaires.[10] Therefore, Vodacom understands that the scope of this consultation is limited to matters of the cost standard. However, to the extent possible, Vodacom also provides comments on conceptual and practical matters of model implementation.

After stakeholders raised concerns with the Authority's lack of consultation, Acacia produced a guide[11] that attempted to justify the switch to Pure LRIC. Given that the Authority has now accepted that it needs to consult on the appropriate cost standard, it is unclear what status the Acacia guide has. Nonetheless, in this submission, Vodacom provides a more detailed response to Acacia's guide and the points set out in it (Vodacom also commented on Acacia's guide in its 7 June 2023 letter).

Another key issue raised in the Clarification Document relates to the potential differential treatment of different mobile operators. In this regard, Vodacom re-iterates that to the extent that the Authority wants to consult on the modelling approaches for small and large operators, the small operator should only reflect genuine new entrants, in line with the Authority's Phase I findings.

[8] Within the Clarification Document, the Authority explained (issue # 39) that it is presently carrying out a consultation process on all issues, including on methodology, cost standards, modelling assumptions, modelling algorithms and the like, and stakeholders are invited to comment on these issues when making submissions by 24 July 2023.
[9] Vodacom notes this date was originally July 10th and thanks the Authority for the additional time it subsequently granted to respondents.
[10] Vodacom has reflected, in this document, the Authority's request for "broad comments" only. However, this is a term open to interpretation. As such, it is important that the Authority allows for further, more clearly specified consultations, during the remainder of this phase of the call termination review.
[11] Acacia (2 June 2023) – "Guide on bottom-up and top-down shell models for the determination of mobile and fixed-line wholesale voice call termination rates"

3. Vodacom still has concerns with the Authority's process

Vodacom thanks the Authority for affording stakeholders this opportunity to comment on the modelling approach for setting call termination rates ("**CTRs**"). Vodacom strongly agrees that the Authority first needs to consult on the cost standard and emphasises that such a consultation process needs to be robust, with outcomes that cannot be prejudged. However, Vodacom still has concerns in relation to the overall process and approach to stakeholder engagement that the Authority appears to be following. As such, it continues to reserve its rights in all regards.

- **The Authority has not afforded parties sufficient time -** The Authority confirmed that its self-imposed deadline to issue final regulations is March 2024. As a result, the Authority has already put in place stringent timelines for stakeholders to comply with the requests for information (though Vodacom notes that the Authority has also subsequently amended these).

  Given the Authority's clarification that the Bottom-Up ("**BU**") shell models, model guide and BU information requests may change following this "consultation" exercise, Vodacom will provide more detailed comments on timelines once the Authority decides on the cost standard and publishes any updates to the relevant documents. At this stage, Vodacom simply notes the Authority's position in 2017, that collating the required data for regulatory cost models typically takes several months.[12] This will remain the case today. Indeed, even more time will be required if the Authority decides on a Pure LRIC cost standard, given the more complex nature of some elements of this approach (such as the application of economic depreciation and the degree of granularity required in the modelling). It is important, to arrive at reasonable outcomes, that the Authority recognises this and does not attempt to cut corners in order to meet its own internal deadlines.

- **As a result of its failure to consult properly, the Authority has created an additional burden for stakeholders** - From 26 May 2023 (publication of the Notice and relevant materials), all stakeholders were required to invest significant time and money to understand, review, and clarify the approach that the Authority had implemented. Depending on the outcome of this new exercise, stakeholders may be presented with new modelling guides, model shells and information requests, all of which will have to be analysed, reviewed, and clarified again. This additional burden on operators comes at a time when operators are already having to devote significant resources to keeping their networks up and running given the energy crisis in South Africa. In future, Vodacom strongly urges the Authority to avoid imparting additional burden on licensees, by instead following, from the start, a robust, transparent and sequenced process.

- **There is a risk that the Authority has pre-empted the outcome of its consultation, whilst placing undue responsibility on licensees subject to regulation** - Vodacom remains concerned that the Authority (and its advisors) have been pre-empting the outcome of the cost modelling phase. This is because:

  - In relation to the BU shell model, it is not appropriate for the Authority to implement a Pure LRIC approach while claiming to be open to discuss whether a LR(A)IC+ or Pure LRIC approach should be implemented.

  - The race towards a self-imposed deadline generates serious questions about the Authority's willingness and ability, at this point, to alter the cost standard that it implemented, given this would entail a need to redo the modelling work it has done to date. Put simply, the consultation playing field has been laid squarely against any other cost standard. This is a major concern for Vodacom.

[12] The Authority's advisors (Aetha) stated during the initial 2017 workshop that "Collating the required data typically takes several months, so we suggest that parties begin this process as soon as possible" (Slide 52)

- During the meetings with the Authority on 31st May (the stakeholder meeting) and 1st June (the one-on-one meeting), the Authority's advisors mentioned a number of times that the impact of call termination on certain network elements was negligible and hence those network elements could be excluded from the modelling. The Authority's response to the industry clarification questions, and comments made by its advisors during the meetings, further seemed to suggest that unless stakeholders submit corresponding data in relation to any arguments they make, such arguments may be dismissed by the Authority / its advisors. Vodacom finds such statements most irregular given that it is the Authority imposing regulation, and one would expect it to substantiate its proposals, before requiring stakeholders to demonstrate and substantiate alternatives. This is especially important as the time given to stakeholders is limited, the scope of the areas that the Authority seeks responses on is very broad and the existence of additional opportunities for commenting on the Authority's modelling approach uncertain. Vodacom is concerned that the Authority is, in effect, adopting an unsubstantiated default position unless stakeholders are able to build and substantiate an alternative, instead of substantiating its proposals for input.

4. The nature of the Top-Down model

Vodacom is concerned that the Authority's proposals for licensees to complete a new Top-Down ("**TD**") model template will place undue burden on the industry. Given that the Authority intends to use the TD model as a cross-check for the BU modelling, requiring operators to spend significant time and resources to familiarise themselves and complete a new TD model is unjustified. Vodacom would instead propose that the results (e.g., the network dimensions) from the BU model are compared with operators' network dimensions (covered in the data request) and that operators complete the 2018 TD model template, given that this is already familiar to the industry. Furthermore, Vodacom supports the continuation of the 2017 approach towards TD modelling, i.e.:

- Using data for the actual operator (actual footprint, market share, technology mix, network topology, network scope, range of services, and costs).
- Using data for the operator's most recent financial year ended; and
- Using the tilted annuity depreciation method.

B. The choice of cost standard to apply when estimating "cost based" rates

For wholesale access and interconnection markets where competition has been found to be ineffective and where operators are judged to have SMP, regulators may, as a remedy, require those operators to provide interconnection / access on approved, cost-based terms. In such cases, regulators have to decide how they should measure costs, i.e., what cost standard to use. In this section, Vodacom introduces the options available to regulators, before outlining the choices the Authority made and substantiated historically in this regard. From this, it is clear that the Authority has previously stated a preference for setting CTRs using a LRAIC+ cost standard, based on a large increment of traffic. This was partly because such an approach allowed operators to also recover a share of joint and common costs from call termination services, which would help ensure continued investment in electronic communications networks in South Africa. Furthermore, the Authority's own advisors had also recognised the complexity and lack of transparency involved with a Pure LRIC cost standard (see Section D.1 for further details).

It is a requirement of the ECA that the Authority must identify changes in the market since its previous reviews, which would justify a move from LRAIC+ to Pure LRIC. As discussed in Section C.1, the Authority has not identified any such changes.

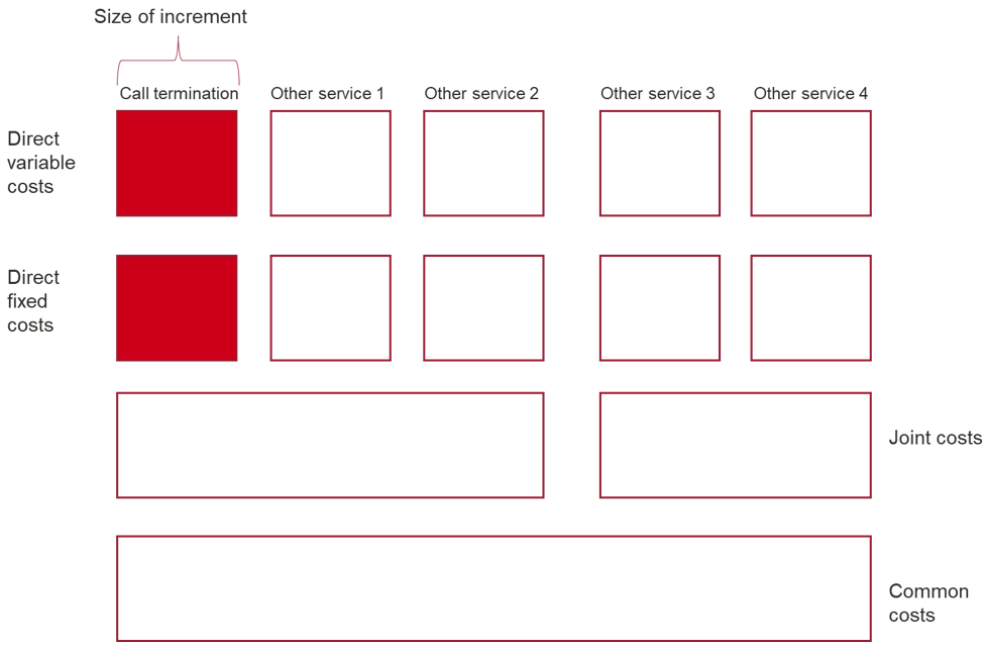
1. Different cost standards

The choice of how to estimate costs (i.e., the "cost standard") is important because telecommunications networks, including mobile networks, typically offer a range of different services, such as voice termination, voice origination, voice transit, messaging and data. Many of the elements (and overheads) of a network are used to deliver several services, rather than being specific to a particular service. This means that telecommunications networks exhibit considerable joint and common costs, whereby common costs are costs which are not directly attributable to specific services and joint costs are costs that can be directly attributed to more than one specific service (but not a single service). When estimating costs for the purposes of setting regulated prices, regulators, therefore, have to decide whether and how to take into account joint and common costs. That is, they need to decide the cost standard to use.

In such circumstances, a regulator will typically choose between four broad ways of estimating costs:[13]

- **Pure Long Run Incremental Cost ("Pure LRIC")** – Pure LRIC measures the incremental cost of a reasonably efficient operator providing a single service over the long-run. Fixed costs that are specific to a particular service (i.e., "direct fixed costs") are also included in an estimate of the Pure LRIC of a service, as such costs are also incremental over the long run. However, the Pure LRIC of a service does not include any contribution towards joint and common costs. Pure LRIC is typically calculated by estimating the costs that could be avoided if a particular service were no longer provided. Therefore, Pure LRIC applies a broad service increment for network dimensioning (e.g., all voice and data traffic), but uses a narrow service increment for unit cost calculations (e.g., call termination services). If an operator priced all its services at Pure LRIC, it would not, therefore, be able to recover efficiently incurred costs. This is because most of the elements of a mobile network are shared between a range of services, especially when it comes to coverage. Put another way, if a regulator sets the price of one service at Pure LRIC, the operator concerned must price its other services in such a way that still allows it to recover all of its joint and common costs.

  Figure 1: Pure LRIC

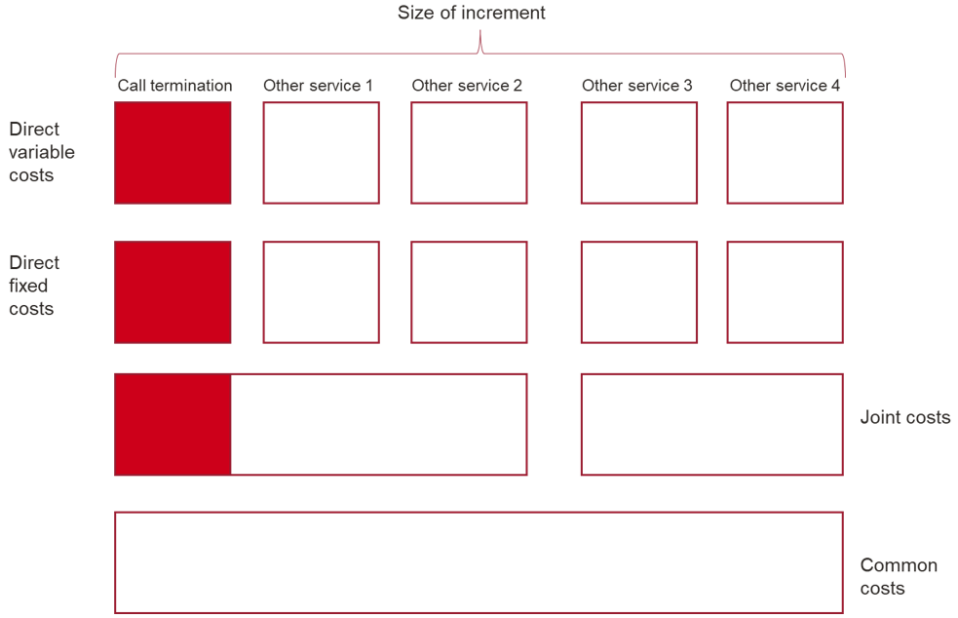


- **Long Run Average Incremental Cost ("LRAIC")** – LRAIC is the average incremental cost of voice termination as part of a larger increment (e.g., all network traffic). Therefore, the key difference

[13] Another cost standard is Stand Alone Costs (SAC), but this is rarely used to set cost-based prices

between Pure LRIC and LRAIC is that a larger services increment is used when estimating incremental unit costs. This means that LRAIC will typically be above Pure LRIC because a greater share of costs is likely to be variable when a larger services increment is used. For example, in the Figure below, the joint costs for services 1, 2 and 3 would be included as part of LRAIC if the increment being removed includes these three services. In addition, LRAIC could also be greater than Pure LRIC if there are economies of scale i.e., marginal costs fall as output increases (not illustrated below).

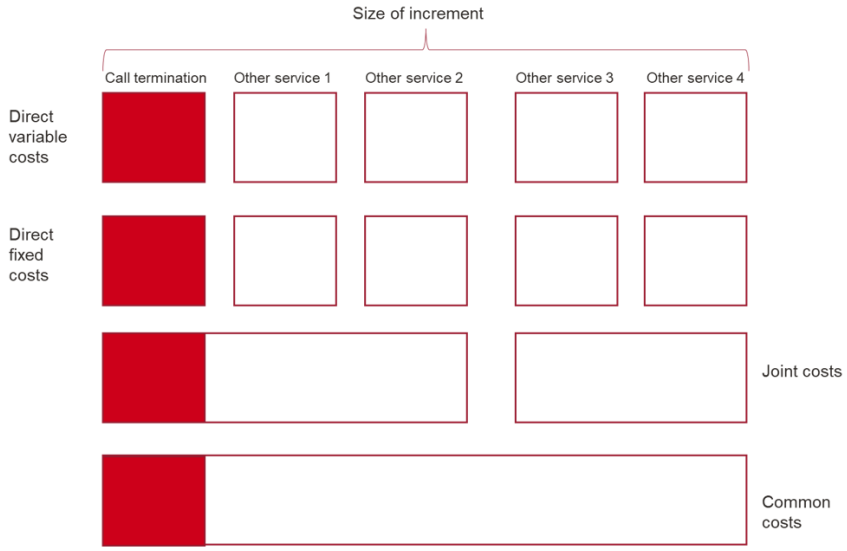
Figure 2: LRAIC



- **Long Run Average Incremental Cost Plus ("LRAIC+")** – LRAIC+ captures the average incremental cost of voice termination as part of a larger increment (i.e., LRAIC) plus a contribution towards joint and common costs. There are a number of different ways to allocate joint and common costs between services e.g., in proportion to traffic volumes or using Equi-Proportional Mark-Ups ("**EPMU**").[14] In principle, however, if an operator priced all of its services at LRAIC+ (using a consistent approach to allocate joint and common costs to services) it would be able to recover its efficiently incurred costs. This measure is often also referred to as "LRIC+". For ease, Vodacom uses interchangeably that nomenclature in the remainder of this submission. For the avoidance of doubt, however, this means LRAIC+.

[14] With EPMU, joint and common costs are allocated between services in proportion costs directly attributable to the different services

Figure 3: LRAIC+



- **Fully Allocated Cost ("FAC")**[15] – With FAC, all costs are taken into account and split between different services. The FAC of a product or service is the total cost of that product or service divided by the total volume, i.e., the average cost of the product or service. The first step in calculating FAC is to identify direct costs (fixed and variable) and then assign these costs to individual services based on the extent to which the different services use various cost elements. FAC also includes a contribution towards joint and common costs. The FAC of a service is typically above or similar to LRAIC+.

Despite these terms being commonly used and understood in the sector, Acacia has, in its Guide, described only three possible cost standards for setting voice CTRs, namely Pure BU-LRIC, BU-LRIC+ and FAC. Of potentially more concern, Vodacom notes that Acacia described BU-LRIC+ as an approach that "considers the fixed and variable costs avoided without termination (BU-LRIC) and adds an additional margin to cover joint and common costs that are shared between different services"[16]. This is not the same as LRAIC+, as Acacia's description still focuses on a narrow service increment i.e., voice termination services. Acacia also hasn't described LRAIC (or LRAIC+) as a possible cost standard, despite this arguably being the most common standard for estimating termination costs. Given this, Vodacom is concerned that the Authority and Acacia may not understand fully the choices to be made when determining the appropriate cost standard. In Section D of this submission, Vodacom therefore sets out in more detail the implications and importance of how an increment is defined and in particular, what this means for modelling Pure LRIC.[17]

2. Approach taken by the Authority in previous market reviews and the legal framework in South Africa

At no point has the Authority used Pure LRIC as the cost standard in previous market reviews. Therefore, a move to Pure LRIC would represent a new and untested approach towards determining CTRs in South Africa. It follows, therefore, that such an approach should only be applied following a full and transparent consultation and if the Authority is able to identify those changes in the competitive nature of the market that mean a change to the remedies (pro-competitive conditions) is appropriate. Indeed,

[15] At times, FAC is also referred to as Fully Distributed Costs (FDC)
[16] Acacia (2 June 2023) - Guide on bottom-up and top-down shell models for the determination of mobile and fixed-line wholesale voice call termination rates
[17] In addition, Vodacom would highlight that Acacia's statement (in Box 1 of its Guide), that the default demarcation-point between costs which vary with traffic and those which do not is typically at the first point where traffic concentration occurs, should only relate to fixed networks rather than mobile networks.

such a consultation would not only be best practice; it is expressly required under the ECA. This is because, under ECA, when reviewing existing pro-competitive conditions, the Authority has to consider whether it would be proportionate to modify the pro-competitive conditions given changes in competition:

> *"(8c) Where, on the basis of such review, the Authority determines that the licensee to whom pro-competitive conditions apply continues to possess significant market power in that market or market segment, but* ***due to changes in the competitive nature of such market or market segment the pro-competitive conditions are no longer proportional*** *in accordance with subsection (7), the Authority must modify the applicable pro-competitive conditions applied to that licensee to ensure proportionality."*[18] [Emphasis added]

As explained in Section C.1, the Authority has not identified any changes in the competitive nature of the call termination markets that would justify a move to Pure LRIC. For clarity, Vodacom summarises below how the Authority has approached the matter of the cost standard during previous call termination reviews.

- **2010 Regulations** - The Authority's 2010 Final Regulations set MTRs based on FAC. The MTRs introduced in the 2010 Regulations followed a glide path towards these rates, beginning from a higher, unregulated level.

- **2014 Regulations** - The Authority's 2014 Final Regulations explained that MTRs were set on a cost orientated basis. As per the Authority's briefing note[19] issued at the time, these rates were determined based on the LRIC+[20] cost standard. The Authority justified the move to LRIC+ on the basis that:

  - *"LRIC+ would allow operators to recover a portion of joint and common costs incurred in the provision of wholesale voice call termination service through termination rates.*

  - [This would] *ensure continued investment in electronic communications networks in South Africa.*

  - [This would] *correct the imbalances created in 2010 wherein the 2010 Call termination Regulations applied different cost standards to different markets.*[21]

- **2018 Regulations** - The "cost-based" MTRs described in the 2018 Final Regulations continued to follow a LRIC+ approach. In a briefing note (dated 24 November 2017), the Authority clarified that by 'LRIC' it meant LRAIC calculated over a large increment (all the traffic services provided by the operator)[22] and that 'LRAIC+' meant LRAIC plus a mark-up for other common costs including corporate overheads such as accounting and finance, HR, corporate IT, office buildings, office equipment.[23] The Authority's advisors (Aetha, Mazars and Africa Analysis) also made it clear that they were using a large increment in order to estimate CTRs:

  > *"Regarding the technical question of the cost increment, we have adopted a 'large increment' approach.*

[18] Electronics Communications Act (2005), paragraph 8c
[19] The Authority, "Briefing Note on Costing Standards for Call Termination", 19 August 2014
[20] By LRIC+, the Authority meant LRAIC+ i.e., using a large increment of traffic when determining the incremental costs of termination
[21] The Authority, "Briefing Note on Costing Standards for Call Termination", 19 August 2014
[22] "By 'LRAIC' we mean LRIC calculated over a large increment (all the traffic services provided by the operator). The main difference between 'LRIC' and 'LRAIC' is that 'LRAIC' includes the costs of spare capacity arising out of factors such as the need to provide coverage in rural areas." BRIEFING NOTE ON ISSUES RAISED DURING THE 2017 WHOLESALE VOICE CALL TERMINATION COST MODELLING WORKSHOP HELD ON 13 NOVEMBER 2017 AND ONE-ON-ONE MEETING WITH LICENSEES FROM 15-16 NOVEMBER 2017" (Date of issue: 24 November 2017)
[23] "By 'LRAIC+' we mean LRAIC plus a mark-up for other common costs including corporate overheads such as accounting and finance, HR, corporate IT, office buildings, office equipment. By this definition, the 2014 models calculated termination costs using LRAIC+." BRIEFING NOTE ON ISSUES RAISED DURING THE 2017 WHOLESALE VOICE CALL TERMINATION COST MODELLING WORKSHOP HELD ON 13 NOVEMBER 2017 AND ONE-ON-ONE MEETING WITH LICENSEES FROM 15-16 NOVEMBER 2017" (Date of issue: 24 November 2017)

- *'Large increments' were typical in the EU telecoms regulatory cost models produced prior to the European Commission's promulgation of "pure" LRIC*
- *A typical 'large increment' would be: all the traffic from all voice services.*
- *The use of large increments, combined with the universally used 'equi proportionate mark-up' (EPMU) method for distributing common costs, will avoid the need for complex combinatorial LRIC calculations"*[24]

In summary, therefore, the Authority (and its advisors) have previously been clear that they preferred modelling the cost of call termination services using a large services increment, whilst including a contribution towards joint and common costs. This contrasts with the Authority's current proposals where it proposes to model call termination services using Pure LRIC i.e., estimating the avoided cost if termination services were no longer provided. Given this, the Authority would be applying a broad increment for traffic dimensioning (e.g., all voice and data traffic), but using a narrow increment when calculating unit cost calculations (i.e., call termination services). This is an important distinction as a smaller share of costs will be identified as avoidable when using a narrow increment compared to a broader increment. Indeed, modelling the cost of voice termination services using a Pure LRIC approach is a highly theoretical exercise, as operators would not be able to offer a full suite of mobile services if they did not offer voice termination services. Therefore, in practice, operators would never consider just removing voice call termination services from their networks, as this would mean that subscribers would not be able to receive calls. Given this, modelling voice termination services using a Pure LRIC approach is not consistent with operators' business models or how they make investment decisions.

As set out in the following section, moving to Pure LRIC could have significant negative implications for consumers in South Africa. At the very least, these need to be considered properly by the Authority.

C. The case for LRAIC+

In this section, Vodacom sets out the economic case for the Authority continuing to apply the LRAIC+ cost standard. In so doing, Vodacom also responds to specific points raised by Acacia in its guide, concerning what it considers to be the benefits of a move to Pure LRIC.

For the reasons set out in this submission, Vodacom concludes that there is a strong economic case for the Authority to continue setting MTRs based on LRAIC+ i.e., using both a wide increment and including a share of joint and common costs. This is because there is a significant chance that a move to Pure LRIC would make low-income customers, who primarily benefit as mobile subscribers from receiving mobile calls, less attractive to serve, so likely leading to increases in other charges faced by those subscribers. This would, in turn, result in mobile services becoming relatively less affordable for those customers, creating a material risk that a significant number of such subscribers could be deterred from using mobile services, especially given the current cost-of-living crisis.

While there have been some moves in other jurisdictions to setting MTRs based on Pure LRIC, Vodacom notes that it is still the case that the majority of non-EU countries (including virtually all African countries for which information is publicly available) set MTRs using LRAIC+ or a similar methodology, such as FAC. In the EU, the Commission advocated the use of a Pure LRIC approach in 2009,[25] at a much earlier stage of development in mobile markets, and notably when MTR voice revenues still accounted for a much more significant share of total revenues. In 2009, voice services were also the main driver of competition, whereas data services have now become far more important. The situation in South Africa today is, therefore, materially different to the situation in the EU around 2009. Furthermore, in practice,

[24] Development of top down and bottom-up cost models for mobile and fixed line voice termination - Industry workshop Aetha, Mazars and Africa Analysis (13 November 2017), slide 9
[25] The EC advocated the use of Pure LRIC in its 2009 Recommendation for termination services (COMMISSION RECOMMENDATION on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009))

as the EU's 2020 delegated act applies a single MTR in all EU countries, in all countries bar one (France[26]), rates will actually be above Pure LRIC going forward.[27]

In the rest of this part, Vodacom:

- Explains that the Authority has not identified any changes in the market that would justify a move to Pure LRIC, meaning that it has not met the prerequisites set in s67(8)(c) of the ECA; and
- Explains that MTRs have already fallen significantly in South Africa, so reducing any perceived benefits of moving to Pure LRIC;
- Sets out some of the key characteristics of South Africa, which need to be taken into account when deciding on the most appropriate cost standard; and
- Responds to the arguments that Acacia has made in relation to efficiency, distributional effects, competition, and the commercial and regulatory consequences of moving to Pure LRIC.

In considering the points made here, Vodacom also directs the Authority to the expert report by Frontier Economics, which is again provided as part of this submission.

1. The Authority has not identified any changes that would justify a move to Pure LRIC

As set out in Section A, under the ECA, the Authority has to identify changes in competitive conditions in order to modify pro-competitive interventions.

The Authority found in Phase I that the four market failures it identified in 2014, which included above cost pricing,[28] would manifest in the absence of regulation of the relevant markets and, therefore, determined to retain cost-based pricing. During the 2014 and 2018 reviews, the Authority concluded that LRIC+ based pricing removed the market failure associated with above-cost pricing. In its Briefing Note dated 15 August 2014, the Authority illustrated the difference between LRIC and LRIC+ and justified its decision to adopt LR(A)IC+ on the ground that, amongst others, LR(A)IC+ would allow operators to recover, through termination rates, a portion of joint and common costs incurred in the provision of wholesale voice call termination services.

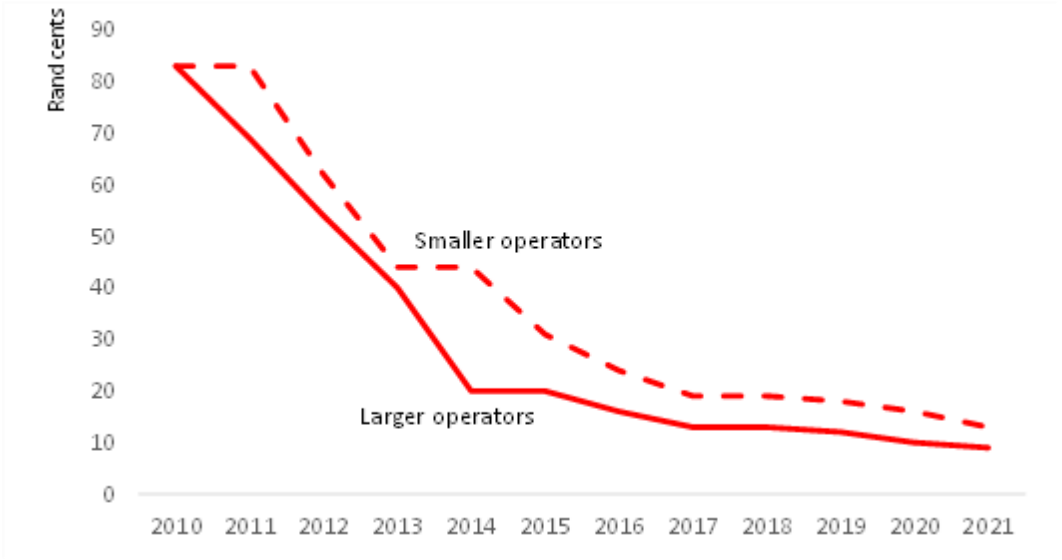
Given the Authority's own finding that there were no changes in the competitive nature of the call termination markets (with all operators continuing to have a 100% market share), Vodacom has seen no evidence of any legal and/or economic basis to justify why cost-based pricing based on LR(A)IC+ is no longer proportional, a jurisdictional pre-requisite of the statute, and why a more extreme Pure LRIC approach (where joint and common costs are ignored and hence not recovered in any form from call termination services, and a smaller services increment is used) is proportional and consistent with an obligation of setting CTRs using cost-based pricing. Critically, neither the Authority, nor its advisor, Acacia, seems to have considered the implications of its proposed Pure LRIC approach and the potential negative consequences of this for South Africa.

2. MTRs have already declined significantly in South Africa

As a result of the transition to a LR(A)IC+ cost standard combined with falls in the unit costs of providing termination services, regulated MTRs have fallen substantially over time in South Africa, as shown in **Figure 4** below. It is important to take this into account when considering the various points raised by Acacia, as this impacts the merits of different cost standards. And, although Vodacom can't prejudge the exact results of the cost modelling exercise, it is clear that even under LR(A)IC+, MTRs would continue to be low in South Africa. Indeed, in this regard Acacia has itself highlighted that MTRs in South Africa are already below the average in Africa (see Section C.7).

[26] And even in France, its Pure LRIC has been rounded up
[27] COMMISSION DELEGATED REGULATION (EU) …/…supplementing Directive (EU) 2018/1972 of the European Parliament and of the Council by setting a single maximum Union-wide mobile voice termination rate and a single maximum Union-wide fixed voice termination rate
[28] The other market failures related to a lack of provision of access, the potential for discrimination between licensees offering similar services and a lack of transparency

Figure 4: Mobile termination rates in South Africa, 2010 – 2021



In general, given that MTRs are already set at a low level in South Africa, termination revenues and payments now only represent a small percentage of overall revenues and costs. [redacted] This lack of materiality helps explain why any move to Pure LRIC is likely to have no or only a minimal impact on the fixed sector or on competition between mobile operators (which is one of the justifications that has previously been used by some regulators to move to Pure LRIC). It also means that the waterbed effect from moving to Pure LRIC would have limited impact on the average mobile subscriber. However, given how price sensitive low-income users are likely to be and given that they tend to be net receivers of calls, it is still likely that a move to Pure LRIC would adversely impact low-income subscribers (see Section C.5, below).

3. The specific characteristics of South Africa

It is important that the Authority takes into account the specific characteristics of South Africa when interpreting international precedent and in turn determining the most appropriate cost standard on which to set MTRs in South Africa. Table 1 provides a comparison between South Africa and the EU for a number of measures – the main jurisdiction where an authority considered Pure LRIC to be an appropriate cost standard. As we return to in subsequent sections, a number of these characteristics may impact the most appropriate cost standard in South Africa and make LRAIC+ more appropriate in South Africa than in the EU:

- South Africa has a low population density, and a considerable share of its population lives in rural areas;

- South Africa has low penetration of fixed services, which means that for many people, mobile services provide the only realistic way of accessing telecommunication services;

- Although there is considerable take-up of mobile services (68% unique penetration), a material share of the South African population still do not use mobile services, meaning there is ample scope for further increasing take-up – especially given these customers are unlikely to have a fixed connection; and

[redacted]

- South Africa's relatively low GDP per capita combined with its high-income inequality will mean that a segment of the population will have very low incomes and therefore are likely to be very price sensitive.

Table 1: Comparison of country characteristics: S.A. vs EU

	S.A.	EU
Population density (pop/km2)[30]	49	112
Area (km2)[31]	1.2m	4.0m
Rural population %[32]	33%	25%
GDP per capita (US$)[33]	5,091	34,115
GINI index[34]	0.63	0.30
Mobile penetration (unique subscribers)[35]	68%	87%
Mobile penetration (SIM)[36]	177%	130%
Prepaid subscribers %[37]	83%	37%
Mobile broadband penetration (unique subscribers)[38]	54%	79%
Fixed line penetration (households)[39]	10%	107%
Fixed broadband penetration (households)[40]	19%	95%

4. Efficiency

4.1 Allocative efficiency

Acacia has argued that "*Pure LRIC is likely to lead to the efficient allocation of resources in South Africa, since bringing the costs of wholesale termination services close to their marginal cost is likely to lead to the optimal consumption of voice calls.*"[41] Vodacom disagrees with this statement. This is because, given the presence of common and joint costs for telecom services, not all telecoms' services can be priced at marginal (incremental) cost. Pricing MTRs at Pure LRIC may mean higher prices for other mobile services due to the waterbed effect, which could lead to the sub-optimal consumption of such mobile services. Therefore, it is important to consider the full implications of this – something which Acacia does not appear to have done.

Joint and common costs may be more significant in South Africa

[30] World Bank (2020)
[31] Ibid
[32] Ibid
[33] Ibid
[34] World Bank (2014), Eurostat (2019). The Gini index measures income inequality, with a value of 1 representing complete inequality (one household earning all of a country's income) and a value of 0 representing complete equality (all households in a country earning an equal income)
[35] GSMA (November 2021)
[36] Ibid
[37] Ibid
[38] Ibid
[39] Telegeography (2020). Defined as PSTN + VoIP subscribers
[40] Telegeography (September 2021)
[41] Acacia (2 June 2023) – "Guide on bottom-up and top-down shell models for the determination of mobile and fixed-line wholesale voice call termination rates", page 5

Since MTRs based on Pure LRIC do not (among other items) recover the costs associated with providing network coverage, the choice between Pure LRIC and LRIC+ for setting MTRs tends to have a relatively larger impact on MTRs, in proportional terms, in countries that are sparsely populated. This is because a higher proportion of total network costs relates to the provision of population coverage, compared to countries with higher population densities.

As shown in Table 1, South Africa has a much lower population density and a higher share of people living in rural areas than the EU. In particular, South Africa has a population density below half that of the EU. Since a greater proportion of its population is dispersed (i.e., across rural areas), it is consequently relatively more costly to provide population coverage in South Africa relative to countries where the population is more heavily concentrated around urban centres. All else the same, this could mean that the potential impact of moving to Pure LRIC for termination will be greater in South Africa than in the average EU.

Consumers may be more price sensitive in South Africa than in more developed markets

Acacia, in the Guide, appears to assume that it will always be optimal to price termination services at Pure LRIC, with common and joint costs recovered from other services and charges (such as fixed charges). However, this is not always the case. For example, Ofcom's 2015 Mobile Call Termination Statement, which Acacia quotes when considering the link between MTRs and investment, quotes academic research that the optimal termination rate mark-up over Pure LRIC only tends to zero as it becomes more unlikely that low use customers will give up their mobile phones in response to price rises (i.e., the more inelastic is subscription demand). Ofcom then argues that in the UK, the elasticity of subscription is likely to be very low, meaning that in the UK, the optimal mark-up is likely to be low or near zero. Whilst this might be the case in the UK, with almost universal take up of mobile services, Acacia has presented no evidence on why this might be the case in South Africa. Given the very clear differences in income distributions between the UK and South Africa and the fact that, as set out in Table 1, 32% of South Africa's population still do not use mobile services, this seems a very significant omission (especially when combined with the likely proportionately greater amount of common and joint costs in South Africa, compared to the UK and EU). There is a very significant proportion of lower income customers in South Africa who could, therefore, be negatively affected by a policy which requires mobile operators to disproportionately recover common and joint costs from other services, especially given the current cost of living crisis. A failure to take this into account materially affects the rationality and potential lawfulness of any decision to adopt this standard.

4.2 Dynamic efficiency

Acacia states that the transition to Pure LRIC would not adversely impact investment incentives as investments are linked to expansions in data, rather than voice services. However, this is also not correct nor properly substantiated.[42]

[redacted]

[redacted]

[42] "The transition to pure LRIC should not distort investment incentives (dynamic efficiency) as South Africa has a mature mobile market which means investments are linked to the expansion of data services and not traditional voice. In a 2015 MCT Market Review Statement, Ofcom found no evidence of reduced investment when transitioning to Pure LRIC in 2011.7 The industry did experience investment growth in both network and services since 2011." Acacia (2 June 2023) – "Guide on bottom-up and top-down shell models for the determination of mobile and fixed-line wholesale voice call termination rates", page 5

[redacted]

The importance of continued investment in South Africa

Given the continued need for investment in the South African mobile sector, this risk is arguably greater than it might be in other jurisdictions. In particular, given the extremely low levels of fixed voice and broadband penetration in South Africa (see Table 1), it is vital that mobile networks are able to continue to provide near-universal coverage and that mobile operators are incentivised to further expand their networks into the least economically viable areas. Not only is network coverage important for ensuring equality of access to basic communications services, but higher mobile penetration has long been credited with driving significant increases in GDP growth.[43]

5. Distributional effects

The Acacia guide devotes only three sentences to examining the distributional effects of a move to Pure LRIC. It argues that lower termination rates will lead to lower retail prices and so benefit lower income consumers.[44] Acacia's conclusion does not, however, reflect the reality of the South Africa market and is a patently inadequately grounded conclusion.

As set out in the Frontier report, a move to Pure LRIC would result in no share of common or joint costs being recovered in the termination revenues received by mobile operators, compared to a scenario in which the Authority continues to use LR(A)IC+. As a result, mobile operators may seek to recover these common and joint costs from retail services (or through a reduction in handset subsidies, for example). This so called "waterbed effect" could arise for two reasons:

- Setting termination rates below LRIC+ would reduce the net termination revenue that the mobile sector, overall, receives, with this not contributing to common and joint costs; and

- Mobile subscribers who are net receivers of calls will become less profitable with lower MTRs.

Impact on low-income users

These effects would disproportionately impact low-income users. This is because low-income users are likely to be net receivers of calls (and, as shown in the Frontier report, there is also a correlation between low ARPU and low-income consumers). [redacted]

A move to Pure LRIC will make these customers (i.e., where incoming calls exceed outgoing calls) less profitable for all MNOs. Mobile operators would therefore have to raise retail prices to restore profitability, with the likely result that for a number of the individuals with these connections, participation in the mobile market could become unattractive. The Acacia Guide has completely ignored this tranche of customers and the relevant assessment in this regard.

[43] See https://data.gsmaintelligence.com/api-web/v2/research-file-download?id=54165922&file=121120-working-paper.pdf
[44] "Assessing the distributional effects on consumers involves analysing how the switch to pure LRIC would impact different consumer segments in the market. The lowering of termination rates is likely to benefit especially low-income consumers, as lower termination rates are likely to be carried over to lower retail prices.8 This suggests that the distributional effects of pure LRIC will be positive." Acacia (2 June 2023) – "Guide on bottom-up and top-down shell models for the determination of mobile and fixed-line wholesale voice call termination rates", page 5

6. Competition

Acacia argues that moving to Pure LRIC will be pro-competitive, on the basis that it will reduce on-net/off-net price differentiation in the market and hence reduce tariff mediated network effects.[45] Again, however, Acacia has copied the principle of this position from the debate that took place in Europe over the switch to using Pure LRIC (for example, quoting from the Irish communications regulator) and has not considered the application of this principle to the South African market today. It is true that relatively high MTRs can lead to some concerns over the impact of on-net / off-net tariff differentials. However, for two reasons, this is not the case in South Africa today.

- **Firstly**, MTRs in South Africa are already significantly below the average levels in the EU when the European Commission ("**EC**") proposed a switch to Pure LRIC. As set out in Section 3.2.1 of the Frontier report, when the EC produced its 2009 Recommendation, the average MTR within the EU was 8 EUR cents/minute. In comparison, the current MTR for larger operators in South Africa is around 0.5 EUR cents/minute. As such, any supposed competitive benefit in South Africa from moving to Pure LRIC will be much more muted than the benefits expected in the EU, around the time that the Recommendation was published. Indeed, in the EU, some of those benefits were also linked to a concern that the relatively high level of MTRs created a competitive distortion with fixed line telephony (given FTRs were much lower). Again, this is not relevant in South Africa given both the smaller scale of the fixed line sector and, critically, the very small difference between fixed and mobile termination rates today.

- **Secondly**, and unsurprisingly given the relatively low level of MTRs, on-net / off-net pricing differentials are not an important feature of South Africa's mobile market. Indeed, all of Vodacom's contract and prepaid tariff plans include "Any network" voice tariffs, meaning there is no longer a differentiation between on-net and off-net pricing.

Further, Acacia's position on the competitive effects of moving to Pure LRIC in its Guide are not consistent with recent statements made by the Authority and Acacia in other documents. As part of the Authority's Answering Affidavit to Telkom in its review of symmetric MTRs, Acacia made it clear that any externalities under LRIC+ will be limited:

> *"That the fact termination is regulated costs (LRIC+) of a hypothetical efficient operator means that externalities are limited and there will not be under-recovery"*[46]

In its 2022 Findings Document, the Authority also stated that the negative externalities faced by smaller operators have already fallen as a result of setting MTRs based on LRIC+:

> *"Further, since 2014, the Authority has used the LRIC-plus cost standard to calculate the efficient cost of providing fixed and mobile termination services. This has led to a reduction in the negative externalities faced by smaller operators."*[47]

Finally, to the extent that the Authority does have any concerns about on-net/off-net pricing differentials, the move to symmetric MTRs should help to address this. In its Answering Affidavit to Telkom as part of the court review on symmetric MTRs, the Authority stated that:

> *"the move to symmetric mobile termination rates (similar to fixed termination rates) is likely to foster competition due to the expected reductions of off-net retail voice prices, which is expected to improve the welfare of consumers"*[48]

[45] "Switching to pure LRIC would reduce on-net/off-net differentiation among MNOs, and this would reduce the ability for large operators to use low on-net prices relative to high termination rates to generate tariff-mediated network effects. Tariff-mediated network effects increase the barriers to entry and expansion for new entrants and smaller rivals." Acacia (2 June 2023) – "Guide on bottom-up and top-down shell models for the determination of mobile and fixed-line wholesale voice call termination rates", page 5
[46] First Respondent's Answering Affidavit (13 April 2023) - CASE NUMBER: 2022/027509, Paragraph 25.2
[47] ICASA (2022) – Findings Document on call termination services, Paragraph 4.7.10.1
[48] First Respondent's Answering Affidavit (13 April 2023) - CASE NUMBER: 2022/027509, Paragraph 106.4

7. Commercial and regulatory consequences

As its final criterion, Acacia argues that there is limited risk arising from switching to Pure LRIC because of the pattern seen in many countries around the world for MTRs to have declined sharply, with some countries having implemented a bill and keep regime for termination. Whilst recognising that MTRs in South Africa are already below the average for Africa, Acacia states that a switch to Pure LRIC will lead to further significant reductions in MTRs, but that this*, "need not, however, have a substantial impact on the regulator since the Authority already collects detailed bottom-up cost information for setting termination rates".* It is unclear what Acacia means by this or why this is relevant. Acacia then also suggests the commercial impact on any operator will be limited, as the switch to Pure LRIC will affect both interconnection outpayments and receipts.

Indeed, it is not clear really what point Acacia is seeking to make with this criterion. However, with the exception of the EU, its benchmarking does not show that Pure LRIC is a standard approach to setting MTRs.

7.1 International precedent from non-EU countries

As set out in Annex A of the Frontier report, ITU data suggests that a significant majority of African nations do not use Pure LRIC to set MTRs, whilst countries using bill and keep (zero interconnection rates) should clearly not be used in any benchmark of cost-oriented termination rates. Doing so cannot be rational.

Acacia has stated that *"the average termination rate for the 18 African countries in Figure 3 is 0.66 US cents per minute. In South Africa, rates stand at around US 0.52 cents per minute which is below the average."* Moving to Pure LRIC would likely mean that MTRs in South Africa would be even further below the average in Africa.

Finally, Vodacom notes that Acacia quotes termination rates in Tanzania as an example of rates in Africa under a Pure LRIC approach. This is not correct. The determination of Cost-based Interconnection and Retail Service Charges in Tanzania Telecommunications Market dated 2 November 2022, page 16, provides that interconnection rates will be set based on Forward-Looking Long Run Incremental Costs (FL-LRIC) plus a mark-up for common and joint costs.

Kenya is one of the few African countries where termination rates are set using Pure LRIC. Whilst there are clearly a variety of factors that are likely to impact a country's mobile performance, it is notable that the South African mobile market outperforms Kenya's on a number of key measures. In particular, South Africa's mobile market has higher take-up, lower prices, superior network quality and more widespread coverage. Yu also exited the Kenyan mobile market in 2014 and Orange divested its stake in Telkom Kenya in 2016.

Table 2: Comparison of GSMA connectivity index: S.A. vs Kenya

Country	Population coverage				Speed - mobile		Affordability		Mobile ownership
	2G	3G	4G	5G	Down	Up	Entry basket (1GB)	Higher basket (5GB)	
Kenya	97%	99%	97%	2,4	10,6	21,5	65,7	48,1	55,7
S.A.	99,97%	100%	98%	30,3	25,5	33,3	79,4	61,9	73,0

Source: GSMA connectivity index 2022 (the higher the score for a given measure, the better the performance)

7.2 EU approach

The majority of countries that have applied Pure LRIC in the past have been in the EU. The EC's 2009 Recommendation on termination rates required all EU countries to move to Pure LRIC by 2012. The EC largely opted for Pure LRIC due to concerns about cross-subsidies between fixed and mobile markets, and smaller mobile operators facing barriers to expansion. However, the EC's 2009 Recommendation to use Pure LRIC for MTRs is of limited relevance to the current situation in South Africa. This is because:

The context was very different when the EC produced its 2009 Recommendation

When the EC produced its 2009 Recommendation, the average MTR within the EU was 8 EUR cents/min.[49] In contrast, the current MTR for larger operators in South Africa stands at around 0.45 EUR cents/min[50] (i.e., 1/18th of the level observed at the time of EC's 2009 Recommendation). Given the high level of MTRs in Europe at this time, the difference between fixed and mobile termination rates was very significant (approximately 7-8 EUR cents/min[51]). The EC, through its intervention, was, therefore, seeking to reduce this gap in order to limit the risk of competitive distortions between fixed and mobile markets.

This is not a concern in South Africa today. The difference between fixed and mobile termination rates in South Africa is currently only 0.15 EUR cents/min.[52] As a result, there is very limited impact of termination rates on competition between fixed and mobile networks. Furthermore, compared to the situation in Europe 12 years ago, termination revenues now account, overall, for a very small proportion of total mobile operator revenues. Given this, changes in termination rate regimes are very unlikely to have any impact on overall competitive dynamics in South Africa's fixed and mobile markets. As we set out in Section C.5, however, changes in termination rates could still have a significant impact on individual customers, especially those on low incomes.

The EC was keen to ensure that a harmonised approach was adopted across the EU to help promote the internal market

One of the overarching goals of the EC is to create a European single market. For this reason, the EC puts significant emphasis on ensuring that there is a harmonised approach towards regulation within the EU.[53] Linked with this, the EC has stated that:

> *"Consistent low termination rates, in line with the Recommendation, are an important prerequisite for the sustainable implementation of the roam-like-at-home provisions"*[54]

No countries in SADC currently set MTRs based on Pure LRIC. Indeed, continuing to use LRIC+ in South Africa would be more consistent with other SADC countries.

More recently (2020), the EC has set a single MTR for all EU countries, which is in effect above Pure LRIC[55]

The EC now sets a single maximum MTR that applies to all EU countries. Notionally, this has been described as being based on Pure LRIC. However, in practice, the maximum MTR is above Pure LRIC for most EU countries. This is because the EC (and its advisors Axon) estimated the Pure LRIC of mobile

[49] COMMISSION STAFF WORKING DOCUMENT EVALUATION REPORT on the Commission's 2009 Recommendation on Termination Rates (Recommendation 2009/396/EC)
[50] Using an exchange rate of R1 = EUR0.05
[51] See https://ec.europa.eu/commission/presscorner/detail/en/IP_09_710
[52] I.e., an MTR (for larger operators) of 0.45 euro cents and an FTR of 0.3 euro cents
[53] For example, the EC stated that "The lack of harmonisation in the application of cost-accounting principles to termination markets to-date demonstrates a need for common guidelines and a common approach as to the implementation and interpretation of cost orientation obligations in termination markets..." COMMISSION STAFF WORKING DOCUMENT accompanying the COMMISSION RECOMMENDATION on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU EXPLANATORY NOTE (2009)
[54] COMMISSION STAFF WORKING DOCUMENT EVALUATION REPORT on the Commission's 2009 Recommendation on Termination Rates (Recommendation 2009/396/EC)
[55] COMMISSION DELEGATED REGULATION (EU) .../...supplementing Directive (EU) 2018/1972 of the European Parliament and of the Council by setting a single maximum Union-wide mobile voice termination rate and a single maximum Union-wide fixed voice termination rate.

termination services for each EU country, but then took the country with the highest Pure LRIC (France) and applied this rate (rounded up) to set the EU-wide maximum. As a result, in other Member States the maximum MTR will be above the Pure LRIC faced by operators in those states.

More generally, there are also important differences between South Africa and the EU as set out in Section C.3.

7.3 The EC considers that the risks of setting MTRs too low are greater than setting MTRs too high

The EC has explained why the risks associated with setting MTRs too low are greater than the risks associated with setting MTRs too high[56]. In particular, the EC states that its approach, i.e., setting the maximum MTR at the level of Pure LRIC in the EU Member State with the highest Pure LRIC costs of termination, and hence allowing regulators in other Member States to set prices above country specific Pure LRIC, is:

> *"consistent with economic theory as generally, there is an asymmetric risk of setting prices too high or too low with the* ***risks of setting the prices too low being greater than the risk of setting prices too high*** *(i.e. in case of doubt it is preferable to risk setting the prices too high rather than too low). This is because* ***the problem of under- investment*** *(if the MTRs are set too low) is considered to be of greater importance to consumer welfare, including both quality and long-term prices for consumers, than the problems derived from over-investment (if the MTRs are set too high****). This is important when approaching the setting of wholesale caps based on projections*** *of either costs or prices, which will be subject to uncertainties regarding the accuracy of such projections, in particular further into the future."*[57] [Emphasis added]

To paraphrase the EC, cost-based rates are set based on forward-looking modelling exercises which rely to a large extent on forecasts about future costs and prices (and volumes). There is therefore an inevitable (and indeed likely) risk that MTRs set based on such an approach may not truly reflect the actual level of costs faced by operators in a given country. As such, it is prudent to set rates in a way that minimise the consequences of any errors. The consequences of forecasting errors are amplified under Pure LRIC, since any underestimate of the costs (and therefore MTRs) would mean that operators cannot even recover the incremental costs of termination services (let alone recover any joint and common costs). This means the asymmetric risks associated with setting MTRs provide an additional reason for not adopting Pure LRIC as the appropriate cost standard. In this regard it is important that the Authority recognises that it may be especially difficult to accurately estimate the Pure LRIC of call termination in South Africa, due to the practical challenges set out in Section D and in particular the need to develop a much more granular model than it appears to have done so far in the shell model and to trade-off appropriately the granularity that it is possible to model against the time period that should be covered by the model.

[56] A World Bank document also made a similar statement – "The LRIC methodology has been criticized by several authors. Salinger (1998) and Laffont and Tirole (2001) argued that LRIC regulation provides the regulators with a key tool to manage industry entry. It is, therefore, crucial to ensure that, whenever a mistake is made, it is made in favour of overinvestment rather than underinvestment." "World Bank (2003) - A Model for Calculating Interconnection Costs in Telecommunications"

[57] COMMISSION STAFF WORKING DOCUMENT Accompanying the document COMMISSION DELEGATED REGULATION (EU) …/…supplementing Directive (EU) 2018/1972 of the European Parliament and of the Council by setting a single maximum Union-wide mobile voice termination rate and a single maximum Union-wide fixed voice termination rate.

D. Practical challenges with applying Pure LRIC and gaps in the Authority's approach

As Vodacom has set out above, the Authority has not demonstrated why it is now necessary and proportionate to amend, by introducing a new cost standard, the pro-competitive remedies in call termination markets. This is particularly the case because a more detailed analysis of the benefits purported by Acacia to accompany a switch to Pure LRIC shows that, in reality, such a switch would have a number of risks for the South African mobile market and consumers, with any benefits being much more limited than the Authority and Acacia appear to have assumed. There are also practical challenges associated with Pure LRIC. Given this, it is Vodacom's strongly held view that the Authority must maintain a LRAIC+ approach. Indeed, this would also be consistent with the views expressed by the Authority and its advisors on previous call termination rate reviews.

However, in the event that the Authority determines to continue with its Pure LRIC approach, and whilst reserving its rights to take, in such circumstances, whatever measures are necessary to protect its rights, Vodacom sets out, in this section, a set of practical challenges that the Authority will need to overcome. In particular, these cover:

- The need for the model to capture a significantly greater degree of granularity, in how it models the complexity of networks;
- The need for the model to capture how networks evolve over time, with this becoming more important if the network dimensioning in the model is insufficiently granular; and
- The need to model a wider increment, especially if a granular model is not developed.

Indeed, it is clear, for the reasons set out below, that in these areas, the BU shell models prepared by the Authority fall well short of what is required.

1. Degree of complexity and granularity required

In its 7 June submission, Vodacom pointed out that the rollout of an actual network is more nuanced than the current shell model suggests and, therefore, the shell model does not reflect the economic rationale for the actual network. This means the shell model fails to identify costs that are incremental to termination, with this shortcoming affecting the rationality of adopting the model.

Fundamentally, and as discussed in more detail below, implementing a Pure LRIC approach requires the Authority to develop a much more detailed model than its shell model, if it is to accurately capture the impact of removing termination traffic on long run costs. Not doing so risks the Authority making material errors in the determination of Pure LRIC termination costs and rendering any decision based on the absence of such a more detailed model irrational.

In response, the Authority noted at issue # 40 of the Clarification Document that stakeholders are encouraged to submit details of additional features that need to be included in the model, and that the Authority would consider these additional aspects in one of two ways: (i) if operators provide their data on such additional features for dimensioning purposes (i.e. to build the relevant number of units), and on the costs per unit in respect of capital expenditure and operating expenditures, then this can be explicitly modelled, or (ii) if operators do not provide the relevant data, then the comment on the model can be taken into account qualitatively, in order to provide the Authority with a confidence interval for the costs of call termination. That is, the Authority appears to be placing the burden of developing a robust model onto the operators. This is not appropriate. In any regulatory proceeding, it must be for the authority to demonstrate that its analysis is robust and accurate, with stakeholders challenging this if they have evidence to the contrary. By "passing the buck" in this way to the operators, the Authority is not meeting its mandate to ensure its regulatory interventions are proportionate and appropriate.

The approach underscores the apparent resolve on the part of the Authority to adopt a Pure LRIC standard come what may, and to demand that operators make it work for the Authority, instead of considering the deficiencies in the modelling exercise as a serious pointer to fundamental problems with adopting such a cost standard in the first place.

Regardless of the source of information used in the model, the complexity / granularity required in a Pure LRIC model can also lead to unpredictable results which can be hard to review properly, so also increasing the risk of such results not accurately reflecting the true costs of providing call termination services. Indeed, Vodacom notes that as part of the 2018 call termination market review, the Authority's own advisors made this very point:

> *"•The customary approach to estimating the LRIC of voice termination (as the final service increment) is to use a so called 'Pure' LRIC calculation. This usually involves:*
> *– Forecasting coverage, demand and network deployment a long way into the future (typically at least 20 years)*
> *– Using an Excel macro to calculate the total costs of the network with and without voice termination ('Pure' LRIC being calculated from the difference between these two streams of costs)*
> *– Using economic depreciation to distribute the often highly irregular incremental expenditures that come out of this calculation, so as to get a smooth evolution of the price of voice termination over time*
>
> *• The characteristics of the customary 'Pure' LRIC calculation make it extremely difficult to understand and follow, and hence to have confidence in the results*
>
> *• The results can also be sensitive to assumptions about demand, technology and costs a long way into the future"*[58]

Referring to the complexity of a Pure LRIC calculation, the Authority's advisors also explained why estimating LRIC (i.e., cost of termination using a wide, all services, increment, and thus a "LRAIC" approach) rather than Pure LRIC would be preferable:

> *"• We propose to calculate the capacity cost of voice call termination as an estimate of LRIC, rather than calculate 'Pure' LRIC*
>
> *• The capacity cost of a service is calculated as follows:*

$$Capacity\ cost\ per\ unit\ demand_{service} = \sum_{\substack{Service\\ specific\\ elements}} \frac{Total\ cost_{element}}{Total\ demand_{service}} + \sum_{\substack{Shared\\ elements}} \left[\frac{Total\ cost_{element}}{Total\ capacity_{element}} . Routing\ factor_{service,\ element} \right]$$

> *• We believe this produces a result which is at least as good an estimate of the true LRIC of voice call termination as does the considerably more complex calculation of 'Pure' LRIC that is usually used*
>
> *• The advantages of this approach are that:*
> *- The calculation will be far more transparent*
> *- The calculation will be far more stable/consistent over time and forecast scenarios*
> *- The model will not have to look a long way into the future*
> *- It will not be necessary to use the highly complex economic depreciation method"*[59]

[58] Development of top down and bottom-up cost models for mobile and fixed line voice termination - Industry workshop Aetha, Mazars and Africa Analysis (13 November 2017), slide 35
[59] Development of top down and bottom-up cost models for mobile and fixed line voice termination - Industry workshop Aetha, Mazars and Africa Analysis (13 November 2017), slide 36

However, the Authority's current shell model simply washes away all of these very valid concerns. Instead, and as explained further in the remainder of this response, it seeks to overcome the grounds on which pure LRIC was previously rejected by being overly simplistic and incomplete.

The use of economic depreciation in a Pure LRIC model

As part of the 2018 market review on call termination, the Authority's own advisors explained that using Pure LRIC required the use of economic depreciation. They also noted that this introduced a considerable degree of additional complexity into the modelling:

> *"• Economic depreciation spreads the (forecast) whole life costs of a network over the (forecast) whole life demand (use) of that network, so as to achieve full cost recovery whilst ensuring that the resultant service unit costs evolve smoothly over time (consistent with the evolution of underlying network costs)*
>
> *• Calculating economic depreciation therefore requires coverage, demand, network deployment and unit costs to be forecast a long way into the future typically at least 20 years and also for the full history of the business up to the present time to be included in the model*
>
> *• The calculation of economic depreciation is therefore highly complex, difficult to understand and validate, and the results can be sensitive to uncertain forecasts of demand and network deployment a long way into the future*
>
> *• The use of economic depreciation is also only really necessary when calculating 'Pure' LRIC*
> *– Economic depreciation was designed to smooth out the often highly irregular incremental expenditures that arise in a 'Pure' LRIC calculation*
> *– these are less likely to arise in other contexts (e.g., when using capacity cost to estimate LRIC)"*[60]

Indeed, in this regard, Vodacom notes that the shell model also applies an economic depreciation approach, with this potentially being used as an attempt to cover for the simplifying assumptions in the model that generate highly irregular increments of cost.[61]

However, even with such a complex approach to modelling the annual network costs, the extent to which a model can reflect the granularity of network equipment and traffic distribution is limited and the unit costs that would result from an approach that looks at annual costs only (even when calculated using a simpler annuity approach) would result in highly irregular results. Using site traffic as an example, the chart below demonstrates that there is no single traffic profile at any one site. This implies that removing terminating traffic will likely have a different outcome across the network.

[60] Development of top down and bottom-up cost models for mobile and fixed line voice termination - Industry workshop Aetha, Mazars and Africa Analysis (13 November 2017), slide 37

61 Where a model does not capture the complexity of network equipment and demand is attributed to network elements in large homogenous chunks, it can lead to modelling outcomes that predict large incremental costs in some years and no incremental costs in others. Without the 'smoothing' effect of the economic depreciation approach, termination rates would, in this circumstance, be highly irregular, i.e., being significant in some years and negligible or zero in others.

[redacted]

As can be seen, from Figure 5, there is no clustering of any particular amount of traffic per site. This means that the aggregation of site characteristics into just three geotypes in the shell model means it is bound to incorrectly estimate how the network would change in response to a reduction in traffic, regardless of how costs are annualised. Fundamentally, if the network dimensioning in the model fails to associate a cost component with voice traffic it will not be corrected by using economic depreciation, or any other form of cost annualisation.

Given this, the remainder of this section discusses how the shell model needs to be adapted to address Vodacom's concerns and those the Authority has previously raised in relation to development of a pure LRIC model.

2. A Pure LRIC model needs to be more granular

In its current form, the BU shell model relies on a highly aggregated view and incomplete inventory of network equipment. Given this, the model is not able to identify accurately the incremental costs from voice traffic. To illustrate this, the following sections set out how a Pure LRIC model must capture the different parts of the network and contrasts this with the shortfalls in the shell model, drawing also, where appropriate, on Pure LRIC models developed in other jurisdictions. Following this, Vodacom comments on the time period covered by the model. Critically, Vodacom notes that these considerations relate primarily to the development of a model using the Pure LRIC standard. This is because the wider increment definition used within a LRAIC+ (LRIC+) model makes this level of detail less necessary.

2.1 Radio access network

In response to the different demand and characteristics of each site, the shell model needs to develop a more granular approach to modelling network equipment and how this changes with demand. By way of example, the table below shows an extract from Vodacom's sites records. This demonstrates the configuration of different sites.

[redacted]

[redacted] These differences impact on costs. For example, adding the 2600 MHz band to an urban site has implications for the specific cost of the site. By way of further detail, the illustration in Figure 7 shows the modularity of antenna and processing equipment at a site and also the range of factors that can differ from site to site.

[redacted]

Vodacom is cognisant that it is difficult to develop a model reflecting a similar diversity of network equipment. However, it is not impossible. For example, this can be done by applying the distribution of traffic by site using operator-based traffic distributions to hypothetical demand assumptions and a modular approach to site dimensioning on a site-by-site basis, with this being done using an iterative dimensioning with Excel Macros. Vodacom recommends strongly that the Authority should develop such an approach, should the Authority persist with a Pure LRIC model. To not do so would mean that

the Authority risks developing a model that does not capture properly the true incrementality of termination traffic.

2.2 Backhaul links

Vodacom's concerns in relation to the modelling of backhaul links mirror those in relation to RAN equipment. Specifically, Vodacom notes that the shell model considers two types of backhaul links, i.e.,

- Microwave links; and
- Fibre links.

However, neither type is differentiated by capacity, and they are only considered in aggregate. That is, the model considers only the total operating expenditure per link, regardless of the equipment and infrastructure involved in the provisioning of the link.

Vodacom's network inventory, an extract of which is shown below in Table 3, demonstrates also that the reality of its network is much more diverse than that captured by the shell model – a position which is consistent with the diversity of traffic at different sites.

This demonstrates, in a number of ways, that the Authority's current approach to reflecting backhaul links is incomplete and inappropriate for calculating pure LRIC estimates. For example:

- These can include multiple 2Mbps links from one site. A reduction in traffic as a result of removing termination traffic would very likely impact on the number of such links required, especially given that sites connected in such a way are likely to serve mainly voice / SMS traffic.

- , with the majority providing the two lowest capacity ranges. Each represents different amounts of Capex. The shell model does not even consider capacities. Instead, it simply assumes that backhaul links are entirely invariable with traffic, so meaning that it fails to properly capture the incrementality of these links with traffic.

- The same is the case fibre links. In reality, these can be rented or self-built and configured for capacities of 1 and 10Gbps, with corresponding implications for costs and with an operator's dimensioning decision clearly linked to the volume of traffic it expects over that link. However, the shell model simply considers a fibre link without any capacity assumptions, again assuming costs do not vary with traffic. Again, this is not correct and means the model is very likely to understate the incrementality associated with termination traffic.

These examples show clearly that the Authority's assumptions fall short of what would be required in a robust model. Crucially, the shell model must demonstrate that such costs do not vary with traffic (if that is Acacia's supposition, as it appears to be), rather than simply assuming this to be the case. Furthermore, the model uses a hard coded mix of technologies, instead of modelling the backhaul network using the factors (distance, geography, availability and cost) that determine the actual technologies used to build backhaul links. In contrast, Vodacom notes that the EC model, to which Acacia makes multiples references, relies on a 5 step backhaul dimensioning algorithm to calculate the number of links, their capacity and distance between the radio sites and the network controller. It, in particular, uses the traffic per site to optimise the appropriate type and capacity of links. This is shown below.

Backhaul Network Dimensioning steps used in the EC MTR model

- Step 1. Hubs Calculation
- Step 2. Traffic per Site and Hub Calculation
- Step 3. Distance Calculation
- Step 4. Backhaul network calculation (total links and distances) from sites to hubs
- Step 5. Backhaul network calculation (total links and distances) from hubs to controllers

This shows clearly that the simplifying assumptions used currently in the Acacia shell model just ignore the complexities of modelling Pure LRIC, despite such complexity previously being a key reason for the Authority rejecting such an approach. This is clearly irrational.

2.3 Core and transport network

The shell model considers a range of core network equipment in a highly aggregate, monolithic manner. Again, this has had the result of the shell model assuming incorrectly that all of this equipment is invariable with traffic. In reality, actual networks are more complex and a proper Pure LRIC model (if the Authority continues to pursue this approach) must capture this complexity. For example, core network equipment cannot just be characterised as single boxes of equipment. Instead, these consist of chassis, modules, port cards and ports, software and usage licenses, all of which can be adjusted in response to changes in demand.

[redacted]

[redacted]

[redacted]

In relation to the transport network, the Authority yet again predetermines that certain equipment would not vary with traffic, without actually demonstrating this in the model. For instance, the shell model considers a fixed number of core sites (3), a fixed number of links per site (3) and 100 backhaul to core links. Neither the number of backhaul to core links nor the types of links are explicitly modelled. The shell model does also not consider any transport equipment, such as SDH or DWDM. As per its comments during the stakeholder meetings, we understand that the Authority has followed this approach because in its view, such equipment would not vary with traffic. Based on this view, it would seem that the Authority has chosen to exclude this from the model.

Once again, the Authority cannot simply make assumptions about whether network equipment is variable with traffic. Rather, it must substantiate this by properly incorporating the equipment into the shell model. As with core network equipment, transport equipment consists of a number of components (chassis, ports cards, ports) which need to be considered in context of a proper transport network design and the capacity that needs to be carried over the network. This is perfectly feasible within a cost model. For example, such information can be based on the core transport rings of actual operator networks, or can be designed using a typical ring architecture, based on the number of sites that the Authority's shell model dimensions for its hypothetical network.

Finally, even the way in which the shell model considers core network equipment is not reflective of the nature of demand that mobile networks serve in South Africa. For example, a number of core equipment types are considered to be variable with the number of subscribers, but then not reflected in the Pure LRIC of termination. [redacted]

[redacted] As such, equipment that is driven by the number of subscribers is also indirectly driven by the terminating traffic and must be considered as part of the pure LRIC costs.

3. The model needs to reflect how mobile networks evolve over time

A crucial flaw in the shell model is the approach it takes to modelling the network over time. That is, instead of reflecting technology and rollout conditions as they evolved, the shell model assumes that the mobile technology used in the model is entirely static, notionally based on current network technologies. As a result, the model leads to a significantly oversimplified hypothetical network.

For example, to estimate the number of capacity sites needed to satisfy demand, the shell model divides the total capacity needed by the capacity per site. But in doing so, it assumes that the capacity per site is fixed and does not evolve over time.

Table 4: Spectrum capacity

Spectrum capacity - number of TDM slots (2G) or megabits per second per site (3G, LTE)

This is used to establish how much capacity is already available from coverage sites in the network demand tab.

GSM sub-1GHz	Channels	TDM slots per site	25.0
GSM above 1GHz	Channels	TDM slots per site	60.0
UMTS sub-1GHz	Mbps	Downlink mbps per site	2.7
UMTS above-1GHz	Mbps	Downlink mbps per site	8.1
LTE sub-1 GHz	Mbps	Downlink mbps per site	33.6
LTE above-1 GHz	Mbps	Downlink mbps per site	141.6

This is entirely flawed and does not reflect that technologies changed over time. In reality, the model must reflect the actual evolution of technologies over time as not doing so (i.e., assuming current modern networks had existed historically), clearly means it cannot reflect reality, either of actual or hypothetical efficient operators.

In particular, the model must recognise that equipment installed in the network 5, 10 or 15 years ago had less capacity, given the lower demand for (data) traffic at that time. As a result, the sensitivity of that equipment towards changes in voice traffic was greater than is now the case, given that historically, voice represented a greater share of the total traffic. Under an economic depreciation approach, costs that were incremental with terminating traffic from years ago can still be relevant today, especially if incremental costs today are very low compared to incremental costs incurred in previous years.

Linked to this, a similarly stark oversight in the shell model, is its use of 174 MHz of spectrum as a basis for modelling the network over the entire period of the model. This ignores completely the fact that a large amount of spectrum was only auctioned in 2022. As a result, it also means that the model is unable to reflect that networks in their earlier years of operation (an in particular prior to 2022) were frequently capacity constrained, raising the likelihood of operators having to roll out more capacity sites in response to an increase in network traffic. The model also assumes that the mix of technologies used to operate the different spectrum bands does not evolve over time. This ignores the gradual reliance on different technologies as bands get re- farmed, with the corresponding evolution of spectrum efficiency that this has brought.[62]

Spectrum portfolios, busy hour patterns and technologies available will also all evolve to a material extent over the forthcoming years. The model should, in particular, reflect the gradual release of spectrum bands and the expected effects of the phase out of 2G and 3G technologies. For instance, and in contrast to the shell model, the MTR model developed by Ofcom follows such an approach.

[62] This would also be an issue that would need to be resolved in a LRIC+ model.

Vodacom considers that it is critical that effects of time need to be reflected in the model. Since equipment currently rolled out is a result of past market and technological conditions, the model needs to capture past evolutions (which are easy to document and model) The model should also be forward looking and take into account future conditions, whilst also recognising the uncertainty of modelling too far into the future. This is because uncertainty in forecasts of demand, costs or technological evolutions cannot result in robust estimates for mobile termination, especially given the current challenges in South Africa around energy supply / provisioning.

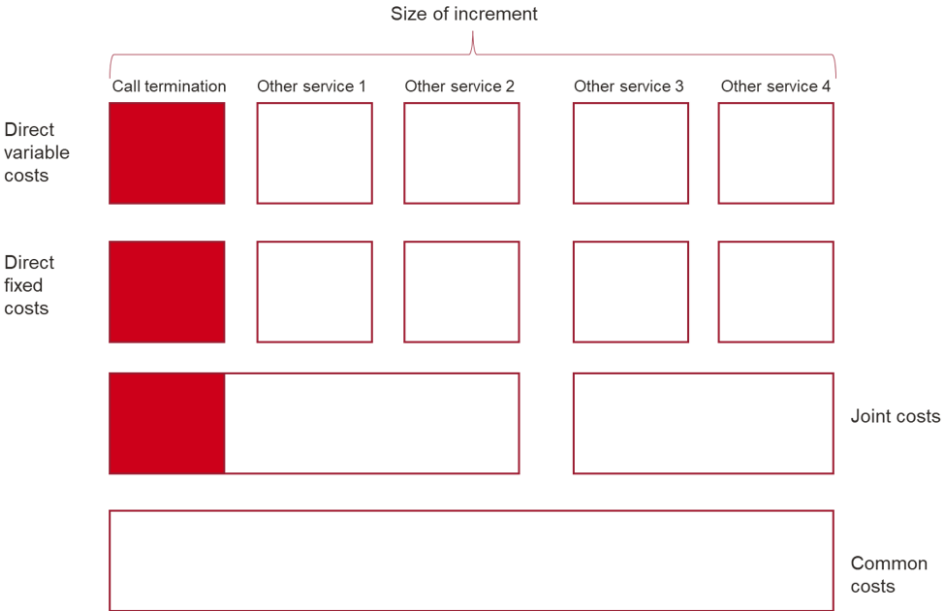
Indeed, Vodacom believes that no operator nor the Authority can reliably forecast as long into the future as the Authority wishes to do for the purpose of implementing a pure LRIC approach. The Authority's reference to operators' business plans submitted in the context of the recent spectrum auction, which covers a similarly long period, is fundamentally flawed in this context. In the context of a spectrum sale, it is for operators to satisfy themselves that they are willing to bid for the spectrum despite the inevitable forecasting risk and to decide how to "shade" their bids as a result. But when setting termination rates, there are no means for operators to mitigate the forecasting risk.

It is, instead, for the Authority to satisfy itself that the model and its approach to setting termination rates mitigates appropriately this forecasting risk. This requires it to properly forecast the evolution of mobile technologies and costs, and how its demand forecasts are driven by that evolution. For example, the Authority should not forecast significant increases of data demand which cannot be satisfied without much denser mobile networks. This is especially critical in light of the lack of granularity in the current shell model (as described above), which results in the model being especially sensitive to assumptions of future demand. That is, the model setup results in a material amount of incremental costs being shifted to the future. This can be seen if the model is curtailed to 2030, whereby neither costs nor demand after 2030 is considered. Under such a scenario, the pure LRIC of mobile termination in 2023 increases by 25%. Vodacom notes that the EU model, which Acacia refers to on a number of occasions relies on a much more granular modelling and approach therefore does not need to rely on such a distant forecast. This limits significantly the uncertainty of forecasts and hence the exposure to forecasting risks. Given this, the Authority and Acacia must trade-off appropriately the modelling time horizon (and the risks of material errors in future forecasts) and the granularity of the model. Vodacom contends that this has not been properly considered in the context of the shell model.

4. A wider increment will be needed, especially if a granular model is not developed

Given the challenges set out above (many of which the Authority has previously acknowledged) and unless it changes its principal position on the costing standard (for the reasons Vodacom has set above) the Authority must now decide if it can develop a robust Pure LRIC model (for example, by developing a much more granular shell model). If it cannot, but it still wishes to move away from a LRIC+ (LRAIC+) approach, it must instead estimate LR(A)IC using a wider increment of all traffic (e.g., effectively estimating LRAIC without an allocation of common costs, as illustrated below).

Figure 9: Estimating termination costs using a wide increment.



Such an approach would remove the need for the Authority to define precisely all network elements. This is because all elements of the traffic network are driven by all the services provided over the network. This would then mean that costs can be allocated to individual services using a routing matrix consisting of causality driven network usage factors, rather than estimating directly the incrementality of individual services.

E. General modelling methodologies

In this section, Vodacom provides its views in relation to three other aspects of the approach that the Authority has so far reflected in its shell model. This covers the size of the network operator that is modelled as well as the scale of the corresponding network that is assumed to be deployed. Finally, Vodacom raises a number of concerns in relation to how the shell model dimensions the radio access network, before also considering briefly how spectrum costs are treated. In so doing, Vodacom notes that certain modelling decisions will also depend on the cost standard that is eventually implemented. As such, Vodacom reserves its rights and expects to have the ability to comment on these matters further, as the Authority develops its shell model(s).

1. Modelling small and large operators

Vodacom supports the Authority's position, as set out at Issue #44 of the Clarification Document, that given the Phase I determination that MTRs for all operators bar new entrants should move to symmetry within a transitional period of twelve months, the BULRIC model should cover only a single operator scenario for mobile and fixed networks respectively. Vodacom is therefore surprised by the Authority's proposal to continue to develop a large and small network operator model for the purpose of estimating asymmetric termination rates, whilst putting on stakeholders the onus for suggesting the appropriate approach to reflect this in the model. Vodacom notes that the Authority is doing so only in case Telkom's review challenge is successfully upheld. However, this places an unnecessary burden on other operators. Instead, the Authority should proceed as it considered appropriate prior to the legal challenge or postpone the process until such a time when the legal uncertainty has passed.

2. The scale and scope of the hypothetical operator

The Authority has also requested stakeholders to set out their views on the appropriate assumptions for the scope and scale of the modelled hypothetical operator (separate to the discussion above regarding the definition of large and small operators).

In this regard, Vodacom considers that an appropriate assumption, given the size of the market, is a market share of 25%. This would be consistent with the number of mobile network operators in the market. Furthermore, the vast majority of African countries have 3 or 4 operators, similar to markets in Europe and Asia.

Vodacom is also aware of the Authority's efforts to establish a 5th operator, most recently reflected in the rules applied in the spectrum auction. It is also aware that RAIN has recently started offering voice service[63]. This could be considered as indication that a five-operator market would be consistent with the Authority's aims and recent market developments. This would be equivalent to assuming a market share of 20%. However, Vodacom is not aware of mobile markets where five operators have been operating on a sustainable basis with a national footprint. As such, it does not consider that this is a likely scenario on which the hypothetical operator should be modelled. Indeed, if anything and as the Authority will be aware, the trend globally is towards market consolidation, with some indications of potential future consolidation in South Africa.

More important, in Vodacom's view, than the question of what market share should be assumed in the model, is the characteristics of a network operator with a certain market share. Most notably, Vodacom considers it unrealistic to assume a hypothetical operator with a market share of 25% (or 20%) would have the same scale and scope of network as any of the actual network operators. It is therefore key that the Authority defines a level of network coverage for a hypothetical operator that is viable given the market share considered. That is:

- A network scale similar to the networks of Vodacom and MTN would not be sustainable with a 25% or 20% market share;

- A market share of 20 or 25% may not be achievable with the scale of Cell C's or Telkom's networks without national roaming. However, in the hypothetical scenario, all operators would have a market share of 20 or 25%, such that the opportunity to roam could be significantly limited.

Therefore, instead of using existing operators as a basis for its calculations, the Authority needs to consider the network deployment equilibrium that would exist in the case of four or five MNOs with equal market shares. That equilibrium would likely consist of network overlap in urban locations, with each MNO covering different rural areas (i.e., where the deployment of multiple networks isn't viable). This would imply that a realistic network coverage level would be somewhere between those of the existing operators and that each hypothetical operator would require access to national roaming from other operators. 99% population coverage, as currently assumed in the draft shell model would be entirely unrealistic for a hypothetical operator with 25% or 20% market share. Instead, this must be adjusted in such a way that the total costs estimated by the model (and calibrated by reference to actual network operators) does not exceed the revenues that operators can realistically generate in the South African market.

3. Dimensioning the radio access network sites

The Authority's advisors seem to suggest that the shell model follows a modified scorched node approach when modelling the radio access network. A modified scorched node approach means that current locations of existing nodes are taken as given, but with some of the nodes eliminated to account for inefficiencies.

[63] Although Rain should not be considered as a new licensee (in the context of the Phase 1 findings) as it has already been offering data services for many years.

Consequently, the shell model uses, as a starting point, information on the average cell radii in three different geo-types, with those cell radii being based on the current cell radii of existing mobile operators. This is problematic for a number of reasons:

- The cell radii metric is based on current mobile networks and applied to both coverage and traffic networks. Acacia describes this as two steps in the modelling of radio access network equipment. However, the concept of a coverage network is the network that is required for making one call from any location to any other location. In contrast, the cell radii information requested from mobile operators is that of a traffic and coverage network (i.e., already reflective of the traffic that operators need to carry on their networks, which leads to a significant densification of a mobile network). What the Authority should instead consider is cell radii that are reflective of the physical characteristics of the spectrum deployed, e.g., low-band spectrum, for which much higher cell radii can be used. The network size required to meet current levels of demand should then be calibrated against the actual number of sites that are deployed. This should be implicit when using average cell radii based on operator information, but Acacia's reference to the modified scorched node approach suggests that it considers that certain adjustments to operator's cell site information must be made. This is not appropriate because any efficiency improvements that the modelled network might suggest when compared to existing networks is likely to be a reflection of the model not being able to capture accurately all drivers of network deployment. There is no practical reason for operators to be inefficient given the competitive nature of the mobile market in South Africa.

- The current dimensions of the radio access network should not, however, be considered in all years covered in the model, especially years in the past. Instead, the model should consider network dimensions as they evolved over time and calibrate the estimated dimensions against actual reported volumes of equipment. This is because that development is a true reflection of the relationship between the evolution of demand, technology and network dimensions. Using, in earlier years, the current network structure, which is based on the technology currently available, and the demand currently faced, is likely to underestimate the impact of terminating traffic. This is because the same network structure as has been deployed today would likely be underutilised in earlier years when overall demand was lower.

- The current network dimensions should also not be considered when dimensioning the network required for delivering service demand excluding terminating traffic. This is because the network without that traffic may no longer be able to justify sites that are primarily delivering voice and mostly terminating traffic. [redacted] This means sites where such users are very prevalent (e.g., in very rural areas) may no longer be viable without revenues from terminating traffic. The shell model should therefore also consider the mix of traffic at different sites.

4. Spectrum costs

Vodacom considers that the shell model underestimates the spectrum cost of the modelled operator and that it fails to reflect the incremental nature of spectrum costs. The shell model estimates spectrum costs by multiplying the quantity of spectrum of the modelled operator by the Price per MHz paid by MTN for sub 1Ghz and above 1Ghz LTE spectrum in the 2022 auction. This fails to take into account the spectrum issued prior to the auction and that such spectrum holds considerable value which the Authority had taken into account in the 2018 model.

The shell model also assumes that spectrum costs would be identical in the scenarios with and without terminating traffic. However, this fails to reflect the fact that if termination volumes were zero, operators would have had a lower valuation of the spectrum they acquired and hence reflected this in the amounts they were willing to bid in the auction.

F. Model assumptions

In this final section, Vodacom comments on a number of the more detailed assumptions included in the draft shell model. Vodacom starts by discussing the specific matter of voice and data conversion rates, where the Authority's approach seems to ignore a number of technical specificities of mobile network technologies. Vodacom then comments on a number of other concerns it has identified in the shell model. Again, Vodacom reserves its rights to comment further on these matters, and on any other matters that may arise in due course, as the Authority updates is shell models.

1. Conversion rates: the impact of voice and data on radio access network dimensioning in the BU shell models and cost allocations in the TD model template

In commenting on the approach that the shell model takes, Vodacom sets out firstly a number of technical principles in respect of how the radio access network operates. It then explains how the approach followed by the shell model fails to recognise this and also fails to reflect the approach taken in other models – with the result that the shell model understates the costs associated with mobile termination.

2G radio

With 2G technology, the available spectrum is divided up into 0.2 MHz channels (or more accurately, pairs of 0.2 MHz channels, with one used for transmission from the base station to the handset and the other for transmission from the handset to the base station). This means, for example, that if an operator had access to 5 MHz of spectrum, it would be able to make use of 25 distinct channels, each one operating around a different, distinct central frequency.

Whenever a handset is in use it will be allowed to use one (and only one) of the available channels in the downlink spectrum and one in the uplink spectrum. Each 0.2 MHz channel is used to transmit data digitally using a sequential stream of data "frames", each of which has a duration of around 4.6 ms. There are, therefore, around 216 frames transmitted one after another per second.

Each frame is sub-divided into 8 time slots, with each timeslot capable of carrying one voice call (at full rate encoding) or two voice calls (with half rate encoding). In practice, at least one of the 8 time slots will tend to be reserved for signalling purposes, and for carrying SMS messages, thus leaving less than the total 8 for carrying voice calls and for data use.

The gross transmission rate of each timeslot is 22.8 kbps. Where the timeslot is used for voice, the net data rate is 13 kbps with full rate encoding and 6.5 kbps with half rate. When a voice call is made, the channel will be in use for the entire duration of the call.

Originally, data was sent in a similar way to that of a traditional data modem – thus a "voice call" was set up, and then the data was then transmitted as a set of tones instead of speech. With GPRS this was changed so as to allow a persistent data "connection" to be established between the handset and the base station, with the connection only used as and when necessary. Thus, data was sent as a set of individual data packets and the channel was only required when a packet was ready to be sent. The GPRS specification allowed data to be sent at a maximum data rate of 21.4 kbps (including overheads, around 20 kbps excluding overheads) using a single timeslot.[64] However, it also enabled up to eight timeslots to be combined – thus providing a maximum user throughput of 160 kbps.

EDGE increased the gross data rate of each timeslot up to a maximum of 68.4 kbps. By utilising all eight timeslots, an aggregated maximum gross data rate of just over 500 kbps was possible over each 0.2

[64] GPRS utilises 4 coding schemes, with the choice made by the base station in real time depending on its assessment of the signal strength / quality of communication with the particular handset. These provide usable data rates of 8, 12, 14.4 and 20 kbps per allocated timeslot. Clearly, the weighted average usable data rate will in practice lie somewhere between the two extremes.

MHz channel. This improvement was obtained by utilising different modulation/coding schemes. Nine schemes are available, ranging from a usable data rate per slot of 8 kbps up to a maximum of 58.4 kbps.

To summarise, each timeslot can be used for either a voice call or for the transmission of data. However, for non-voice calls, the amount of data that can be sent within each timeslot will depend on the quality of the connection and will change in real time during the use of the handset to, for example, send or receive an email or download a website page. The maximum throughput of each cell for voice calls is fixed, in that, for example, it does not vary with how close the handset is to the base station. The maximum throughput of each cell for data (GPRS, Edge) is not fixed, but depends on the quality of the connection between the handset and the base station. But in general, the amount of data relative to voice expressed in data traffic that can be carried on one time slot is higher, e.g., a maximum of 20kbps (GPRS) and 58.4 kbps (EDGE). This means that the dimensioning and cost allocation in any model of a 2G network needs to take into account that a voice call, if expressed in data traffic, consumes a relatively higher amount of the network resource (1 slot / 13 kbps) than data (e.g., 1 slot / up to 58.4 kbps).

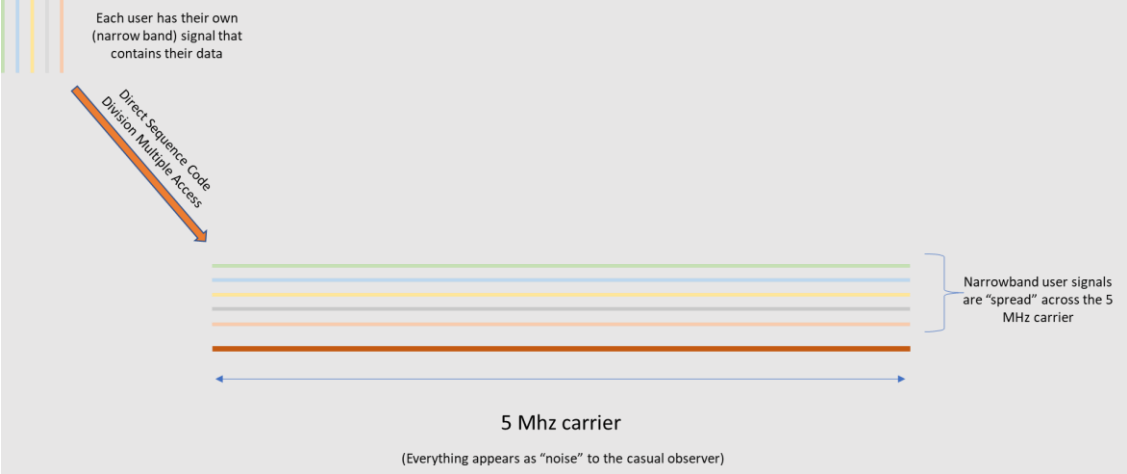
However, the BU shell model uses a constant bitrate of 28.6kbps of data traffic per channel timeslot, which it uses to convert data traffic to minute equivalents. As a result of using a constant bitrate across the entire network, the model fails to appreciate that the impact of data traffic is different across the network, especially between rural and urban sites but also sites throughout each geotype. This implies that the relative weight of data is also kept constant despite the fact that, especially in urban sites, the relative cost attributable to voice is likely to be higher than in rural sites given the prevalence of higher data modulation schemes in urban areas. This means, once again, that the model fails to appreciate the variability of traffic and costs across a mobile network, to the detriment of accurately reflecting the costs that are incremental to terminating traffic. Vodacom will provide corresponding data to demonstrate the variability of data throughput as part of its response to the model data request.

3G radio

Under 3G, individual radio channels are not allocated to specific customers. Instead, all the customers who are connected to a base station cell share the same 5 MHz wide band carrier, utilising Wideband Code Division Multiple Access ("**WCDMA**"). With this scheme, each customer is assigned a different code that allows that customer to insert/extract the data relevant to them.

The specification provides 512 individual codes that can be used. In practice, these tend not to be used individually but are grouped together depending on the purpose they are used for. When used for voice, a spreading factor of 128 is used, meaning that each voice session (essentially each voice call) uses 4 of the 512 individual codes. When used for HSDPA data sessions, the spreading factor is generally 16, with each HSDPA session using 32 of the 512 individual codes.

Figure 11: Illustration of 3G user data and network carrier



To preserve the quality of a voice call, the actual data rate used is fixed at around 12.2 kbps. However, with HSDPA data, different coding/modulation schemes are used depending on the overall quality (essentially the signal to noise ratio) of the transmission channel. Where the quality is high (for example, the handset is close to the base station with no obstructions in the way), then higher rate modulation schemes are used, increasing the available data throughput. With standard HSDPA, the highest modulation scheme used is 64 QAM, which provides for a maximum cell data throughput of around 21.1 Mbps (if 15 of the possible 16 HSDPA sessions (512/32) are utilised, so leaving the final one effectively to allow for some voice calls to be made if needed). More recent enhancements to the specification (HSDPA+) do provide for even higher throughputs per cell, but again will only be practical if/when the signal quality is sufficient.

The base station and handset will do what they can to even out the signal levels for handsets closer to and farther from the base station, but even so, handsets further away (or otherwise obstructed from the base station antenna) will tend to be forced to utilise less efficient modulation schemes in order to provide at least some level of data throughput.

Other factors also come into play which lower the effective utilisation of the total theoretical base station capacity include:

- The need to ensure that a certain distance is maintained between different cells utilising the same orthogonal code for different users (as all cells are using the same 5 MHz carrier).

- The use of "soft handover" as a means of enabling moving handsets (such as in cars). This allows the two relevant cells to both send a signal to the handset, with the relative received signal levels used to determine when the handset "officially" switches from using cell A to cell B.

To summarise, each code can be used for either voice calls or for the transmission of data. However, for non-voice calls, the amount of data that can be sent will depend on the quality of the connection and will change in real time during the use of the handset to, for example, send or receive an email or download a website page. As with 2G, the maximum throughput of each cell for voice calls is fixed, in that it does not vary with, for example, how close the handset is to the base station. The maximum throughput of each cell for data (HSDPA) is not fixed but depends on the quality of the connection between the handset and the base station.

However, the conversion assumptions applied in the shell model are disconnected from the network dimensioning. Here, the model assumes a simple average spectral efficiency per carrier, measured in bits per hertz. The data rates applied to this are the plain unadjusted data and voice rates (i.e. the

nominal rate of data traffic and voice at a rate of 12.2kbps). This approach fails to appreciate that the varying impact of voice and data traffic already needs to be applied at the network dimensioning stage, not just the cost allocation stage. This is because the impact of voice traffic on network dimensioning is relatively larger than the impact of data traffic, meaning the shell model's current approach will underestimate the impact that voice terminating traffic will have on the modelled network equipment and hence the incremental network equipment required to serve voice traffic. To correct for this, an uplift factor, similar to the effective downlift factor applied in the conversion from data traffic to minutes used in the cost allocation stage, at least needs to be applied to the data rate of voice traffic prior to the network dimensioning stage.

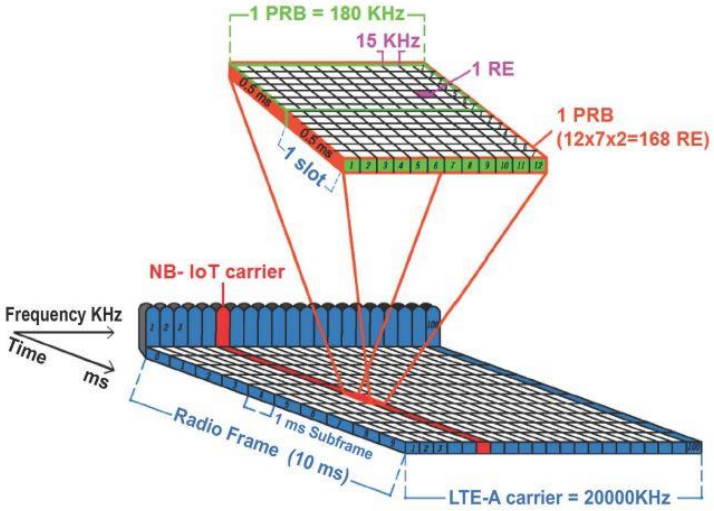
4G radio

4G technology introduces the concept of a Physical Resource Block ("**PRB**"). In some ways this could be considered the 4G equivalent/replacement for the 3G spreading code as it is the basis behind which the available radio resources are allocated to different handsets/devices connected to the 4G base station (eNodeB). The PRB is the basic unit of frequency/time resources, and in effect the smallest unit of resources that can be allocated to an individual user. Each PRB has a bandwidth of 180 kHz and a duration of 1 millisecond.

The number of PRBs allocated to a user at any given time will depend on the data rate required/requested by that user along with the available network resources at that time, and the quality of the user's signal. The actual amount of data that can be carried by a single PRB will depend on the modulation scheme used (e.g., 64-QAM), which in turn will depend on the quality of the signal path between the base station and the handset/device.

4G technology is thus a blend of both OFDM (Orthogonal Frequency Division Multiplexing - dividing the available spectrum into 180 kHz chunks) and ACM (the modulation scheme used within each PRB so as to transmit the highest practical number of bytes of data).

Figure 12: Illustration of 4G resource



Source: CTMC modelling for M2M/H2H coexistence in a NB-IoT Adaptive eNodeB

In contrast to both 2G and 3G, with 4G there is no real distinction made between voice traffic and data traffic, as it is all carried as IP packets. However, voice packets can be carried "over the top" as a generic VoIP connection (that has nothing to do with the operations of mobile operators) or can utilise an LTE-specific connection between the handset/device and the Integrated Multimedia Subsystem ("IMS") within the LTE core network. Where voice traffic is handled by the IMS (Voice over LTE, or VoLTE), it can be "looked after" in the sense of Quality of Service and traffic prioritisation (and indeed the actual bit rate used to encode the voice conversation). This means that, given the dedicated quality of service of

a voice call over the best effort nature of data traffic, more network resources should be attributed to voice than would be suggested based on plain data and voice data rates alone. The 4G focus on data traffic also implies that a PRB is better suited towards the carrying of data, however, when used for voice one PRB can only carry a fixed data rate at 13kbps compared the same PRB used for data can provide a much larger amount of data throughput. This relationship between network resource and service demand is not reflected in the shell model. Vodacom is in the process of collecting adequate data to demonstrate these relationships and will provide these in response to ICASA's data request.

However, the model again fails to take into account that such a conversion also needs to be applied at the network dimensioning stage. Instead, the model uses generic spectral efficiency assumptions to dimension the network based on unadjusted data and voice data rates. As described for 3G, this results in the model under-dimensioning the impact of removing terminating / voice traffic and so must be corrected.

The BU shell model versus technical principles and other model implementations

Below Vodacom summaries whether the assumptions made in the shell model regarding the technical principles of carrying voice and data traffic in the radio access network are consistent with those principles and assumptions made in other models. As this shows, the shell model is not in line with the technical principles or how other models capture the impact of different types of services on radio access network equipment. While some conversion is applied at the cost allocation stage by converting data traffic to minutes, there seems to be no reflection of underlying technical principles or the fundamental difference between voice and data traffic at the network dimensioning stage. The model further fails to appreciate that the impact of voice and data traffic differs across the network based on the site characteristics that impact on the maximum data throughput achievable at any given site. Given this, Vodacom urges the Authority to better reflect the technical principles of radio access networks at all stages of the modelling. Without this, its shell model will not accurately estimate network equipment requirements and not appropriately allocate service costs to termination.

2. Other observations on network dimensioning in the shell model

In this section, Vodacom comments on a number of other observations it has made with respect to the network dimensioning part of the Authority's BU shell model.

Additional resource requirements for voice calls

The shell model suggests that the number of minutes provided to customers, i.e., the billed minutes, drives the dimensioning of the network and allocation of service costs. However, network resources are not only used whilst a voice call is in progress. They are also in use whilst a call is being set up and closed down. They are even used whilst an unsuccessful call is being attempted. Thus, when dimensioning the network for the number of voice minutes occurring in the busy hour, it is also necessary to consider:

- The additional timeslot "holding time" necessary to set up and close down each call.
- The percentage of call attempts that are unsuccessful.
- The holding time associated with unsuccessful call attempts.

None of these factors are currently reflected in the shell model. This is likely to result in under dimensioning the network and underestimating the total costs and costs attributable to voice. Such factors can easily be accounted for in the model by calculating an idle-traffic factor such as the one used by Axon in its MTR model for the European Commission[65].

Busy hour traffic assumptions

[65] Assessment of the cost of providing mobile telecom services in the EU/EEA countries – SMART 2017/0091, descriptive manual, 2.2

The shell model assumes a busy hour ratio per technology which is applied to the total annual traffic. This is different from other models (e.g. EC and Ofcom and others) where the busy hour traffic is first based on estimating the proportion of traffic on busy days, as there are busy and non-busy days in a year, and then the proportion of traffic in the busy hours on busy days. Instead of using this approach, ICASA's shell model assumes a single ratio where it is unclear whether the ratios applied are implicitly implementing the two step approach (e.g. by applying a higher busy hour ratio than the ratio that other models would assume and operators measure for busy days). Vodacom will, in its response to ICASA's data request, measure the busy hour traffic and submit a suitable conversion to ICASA's approach or propose an alternative approach to measure busy hour traffic.

Further, the busy hour ratios are applied to the whole of the network. This assumes that the share of traffic in the busy hour is precisely the same for every cell in the network. However, every cell will not necessarily have the same busy hour. For some cells, the busy hour might occur at 07:30 in the morning (perhaps as people are driving to work). For others it might be during the lunch break. Suburban cells covering residential areas may experience their peak during the evening hours. There are also likely to be seasonality effects, with some cells very quiet during certain months, but very busy during other months (such as common holiday periods).
The above means that dimensioning the network for the overall "network" busy hour is insufficient, and a more granular approach (applying busy hours specific to each geography / geo-type) needs to be taken if sufficient capacity is to be available in the modelled network. Such dimensioning rules are not reflected in the current shell model and should be considered in the modelling. This is because, the averaging of the busy hour across the whole of the network reduces the extent to which the removal of termination traffic impacts on the required network equipment and thus on the costs which are identified as being incremental with terminating traffic.

Erlang calculations and channel dimensioning

The number of channels required to be able to cater for a given average number of concurrent voice calls depends on the level of "blocking" that is deemed to be acceptable. Within the radio access network, the blocking probability (likelihood of a channel / timeslot / code / PRB not being available when required) is generally set at 2% when dimensioning the access network and at a lower rate when dimensioning the core network (e.g. 0.5%). The impact of this is that at low levels of channels, the number of channels that must be provisioned is higher than the Erlangs of traffic / concurrent voice calls that can be carried.

The application of this dimensioning step in the shell model leads to absurd results. This is because the calculation of the number of channels for a given number of Erlangs is applied at the level of total network demand. The consequence of this is that the model estimates fewer channels than the number of concurrent calls that the network is dimensioned for. This is physically impossible and leads to the model underestimating the amount of radio access network equipment required. This is the result of the shell model using the Erlang B table for large numbers, i.e., total network demand. However, doing so is akin to assuming that a call that is blocked at a cell in Johannesburg can be served by an underutilised cell in Cape Town, which is clearly not possible in practice.

Instead, the model must reflect the principle that the provisioning of sufficient channels must be applied at the level of each sector. This is because no other sector can provide the resource required for a call that is made within the area covered by that sector.

Vodacom further notes that the Erlang calculation is only applied to 2G and not 3G and 4G. It is also only applied in the access network, not the core network. This must be corrected as the resources available at different technologies and in other parts of the network clearly need to take into account the probability at which concurrent calls can vary over the course of the busy hour. This is equally the case on 3G and 4G where user sessions reserve dedicated network resources (e.g. codes and PRBs) in the same way as timeslots / channels are dimensioned on 2G.

3. The determination of the appropriate WACC

The BU shell model uses a pre-tax nominal WACC of 18.25% (from 2018). This is applied in the economic depreciation formulae by adjusting the 2018 value using inflation forecasts. In the model description, Acacia notes that the value of 18.25% is based on the Authority's previous decisions. Vodacom is not aware of such a decision but only the rate of 17% applied in the 2018 model.

The process through which the 18.25% is derived is thus unclear. However, the comment made by Acacia that an update may not be required is concerning. Indeed, the reference made to WACC determinations in Europe from around 15 years ago *("11.64% in Spain to 12.4% in Italy in 2008")* seems highly irrelevant. Regardless of the elapsed time since those determinations, it is unclear why Acacia has referred to European precedent, since mobile operators in Europe have very different risk profiles to those in South Africa. In fact, the document says it is unclear whether these WACC rates are pre-tax or post-tax, which makes their inclusion in the document even more puzzling.

In their document, Acacia also referred to a difference in risk premia and WACC in Estonia and Czechia, which differ between copper and fibre fixed line networks. The purpose of this comparison is once again unclear. Acacia suggests *"that the Authority is developing cost models that do not concern risky investments in new technologies but rather rates applying to 2G, 3G and 4G services, which have long-established business models and do not involve substantial risks."* This comment is again quite puzzling given than any investment, other than in notionally risk-free government bonds of top-rating countries, carries risks.

This is evident from the rate itself that Acacia proposes to use. 18.25% is significantly higher than WACC estimates in Europe. This suggests, correctly, that the risk that investors seek to compensate from an investment in a South African telecommunication company is significantly higher than that associated with a European telecommunication company. For example, in 2020, Ofcom estimated a mobile WACC (nominal pre-tax) of around 8% for mobile operators, approximately 10% lower than the rate Acacia currently proposes to use.

Yet, it is concerning that Acacia seems to consider it appropriate to continue to use a rate from a number of years ago, despite the significant challenges facing the South African economy. Over the intervening period, parameters determining the WACC have experienced significant shocks. For example, the risk-free rate, measured using US government bond yields has gone up from 1.83% in 2017 to 3.8% in 2023. The country risk premium for South Africa is likely to have also gone up significantly as a result of South Africa being downgraded in credit risk ranking from Baa3 in 2017 to Ba2 in 2023 (moving from investment to speculative grade).

There are also other operational challenges facing South African telcos that may not be reflected in country wide WACC parameters. Investors may see a specific risk in the fact that operators are subject to increased investment needs to tackle power shortages and risks to revenue generation in light of challenges facing the wider economy. Some of these risks may not be directly reflected in a country risk premium given its specific to the industry and could rather impact beta estimates.

Therefore, whilst Vodacom supports the estimating of WACC through the use of the CAPM, it is critical that this reflects fully the market and investor environment in South Africa today. To this end, Vodacom reserves the right to comment further on the individual parameter values that should be used to derive the appropriate WACC.