NATIONAL INFORMATION AND COMMUNICATIONS TECHNOLOGY AUTHORITY

DRAFT SERVICE-SPECIFIC PRICING PRINCIPLES FOR: WHOLESALE SERVICE DECLARATION NO. 1 OF 2025, WHOLESALE SERVICE DECLARATION NO. 2 OF 2025, AND WHOLESALE SERVICE DECLARATION NO. 3 OF 2025

Public Consultation into the Service-Specific Pricing Principles for Certain Declared Services – Methodology and Pricing Principles

Public Consultation Paper

23 December 2025

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1. BACKGROUND

1. On 19 November 2025, following a recommendation by the National Information and Communications Technology Authority ("NICTA"), the Minister approved the following three wholesale services declarations encompassing five services:
   (a) Declaration No. 1 of 2025 declared the wholesale international dedicated submarine cable capacity service and the international submarine cable facilities access service;
   (b) Declaration No. 2 of 2025 declared the wholesale long-haul dedicated capacity service and the wholesale local dedicated capacity service; and
   (c) Declaration No. 3 of 2025 declared the wholesale Internet access service.
2. These three declarations (the "Three Declarations") were published in the National Gazette on 15 December 2025.
3. Section 135 of the National Information and Communications Technology Act 2009 (the "Act") empowers NICTA to make a determination on the service-specific pricing principles applicable to declared services. In particular, Section 135(2) empowers NICTA to make service-specific pricing principles that:

   "may contain price related terms and conditions (whether relating to a price or the method of ascertaining a price) and non-price terms and conditions relating to access to the declared service."
4. Pursuant to Section 229 of the Act, NICTA is initiating a public consultation of three service-specific pricing principles and methodology covering the Three Declarations. This Public Consultation Paper includes in Annex A, three draft service-specific pricing principles and methodology covering the five declared services in the Three Declarations (the "Declared Services").
5. The three draft service-specific pricing principles and methodology in Annex A, include NICTA's proposed methodology and principles for setting price related terms and conditions for the supply of the Declared Services.
6. NICTA invites interested parties to provide comments and answers to the set of questions posed in this Public Consultation Paper and the draft service-specific pricing principles and methodology. Written submissions should be sent by email to consultation.submission@nicta.gov.pg and must be received by 5 p.m. on 19th January 2026. For further inquiries contact Mr. Polume Lume, Acting CEO on telephone 3033272 during business hours or by email to plume@nicta.gov.pg

2. OBJECTIVES

7. The purpose of this Public Consultation Paper and the draft service-specific pricing principles in Annex A, is first, to inform interested parties about NICTA's proposed service-specific pricing principles and methdology for the Declared Services.

8. Second, it is to gather the views and comments from interested parties about the proposed service-specific pricing principles and methodology and ensure that they result in well thought out determinations in accordance with Sections 134 and 135 of the Act.

3. LEGAL AND REGULATORY FRAMEWORK

9. Section 10(1) of the Act empowers NICTA to:

> "*do all things necessary or convenient to be done for, or in connection with, or otherwise incidental to, the performance of its functions or to enable it to achieve the objective of this Act*."

10. Section 229 of the Act provides for a procedure that NICTA shall follow when conducting a public consultation for making mandatory instruments.

11. Section 135 of the Act empowers NICTA to make service-specific pricing principles for a declared wholesale service. Section 135 (4) of the Act requires NICTA to undertake a public consultation before making, amending, or revoking service-specific pricing principles for a declared service.

12. Section 134 (3) of the Act requires the service-specific pricing principles to be consistent with the general pricing principles in Section 134 of the Act (the "General Pricing Principles").

13. The General Pricing Principles constrain NICTA on what it can mandate in the service-specific pricing principles with respect to the price of the Declared Services and related terms and conditions, or with respect to the method for ascertaining the prices of the Declared Services.

14. It is important to identify clearly the limits imposed by the General Pricing Principles under Section 134 of the Act:

> *"(1) The "general pricing principles" are that the price of access to a declared service should promote the achievement of the objective of this Part as set out in Section 124 and, in particular, that the price of access to –*
>
> *(a) that declared service should –*
>
> *(i) be set so as to generate expected revenue from that declared service that is sufficient to meet the efficient costs of providing access to that declared service; and*
>
> *(ii) include a reasonable return on investment, over the economic life of the assets employed, commensurate with the regulatory and commercial risks involved, this principle is known as the "cost recovery principle"; and*
>
> *(b) a declared service that is a resale service should be set by –*

(i) RMAC, where this results in pricing that is consistent with the cost recovery principle; or

(ii) cost-based pricing, if RMAC would result in pricing that is insufficient to meet the cost recovery principle; and

(c) a declared service that is not a resale service should be subject to cost- based pricing; and

(d) a declared service, where the access provider is required to extend or enhance to the capability of a facility in order to supply the declared service, should –

(i) be set so as to generate expected revenue in respect of that extension or enhancement that is sufficient to meet the reasonably anticipated costs of that extension or enhancement in the circumstances; and

(ii) include a reasonable return on investment, commensurate with the regulatory and commercial risks involved; and

to avoid doubt, this may require the access seeker to bear up to 100% of the actual cost of any such extension or enhancement.

(2) For the purposes of Subsection (1), the following words have the following meanings –

"cost-based pricing" means pricing based on the cost recovery principle in which NICTA has regard to the following factors –

(a) the application of the cost recovery principle; and

(b) the need for the pricing to make a fair and reasonable contribution to the access provider's common costs; and

(c) the need for the recovery of the reasonable costs, incurred in the provision of access and interconnection by the access provider, that would not have been otherwise incurred but for the requirement to provide such access or interconnection; and

(d) the availability and capacity of the facilities operated by the access provider and the timeframe reasonably required to provide access to additional capacity; and

(e) any other factors that NICTA considers relevant, to the extent that such factors are consistent with the cost-recovery principle and Subsections (a) to (d) of this definition.

"efficient costs" include the direct and indirectly attributable capital, operating and maintenance costs actually incurred by the access provider in providing the declared service to itself and access seekers (including a reasonable contribution to any common costs), unless NICTA determines that such costs are inefficient having regard to the efficiency objective and any evidence before it.

"RMAC" means a "retail minus avoidable cost" pricing methodology in which NICTA has regard to the following factors –

(a) where the access provider offers the benchmark retail service at more than one price point, the starting retail price should be calculated as the weighted average of the retail price points for that benchmark retail service, where the weights are based on the number of units sold by the access provider; and

(b) the avoided costs deducted from that starting retail price should reflect the costs that the access provider would reasonably avoid by not retailing that benchmark retail service; and

(c) any other factors that NICTA considers relevant, to the extent that such factors are consistent with the cost-recovery principle, the efficiency objective, and Subsections (a) and (b) of this definition.

(3) Any provision of the following instruments has no effect to the extent it is inconsistent with the general pricing principles –

(a) any service-specific pricing principles; and

(b) any model terms; and

(c) any access exemption; and

(d) any RIO."

15. Terminology used in the Act may be subject to interpretation; depending on that interpretation, terms may have different meanings. The General Pricing Principles are intended to be applicable to a large array of possible wholesale declared services. However, international best practices often use terminology that is more precise and within the context of regulating a particular service. Therefore, it is important to recognize that the broad language used in the Act may need to be interpreted in more specific terms applicable to the Declared Services.

4. INTRODUCTION

16. Having the Minister declared the five wholesale services listed in paragraph 1, NICTA intends to adopt pricing principles and methodology that are specific to the Declared Services. To that end, NICTA must interpret the terminology in the General Pricing Principles within the context of the Declared Services. The proposed pricing principles must be specific to the Declared Services while at the same time, consistent with the interpretation of the General Pricing Principles.

17. The Act provides limited and general guidance on interpreting the meaning of the General Pricing Principles. Where more specific guidance is required, NICTA will seek such guidance from NICTA's prior regulatory proceedings and from reputable sources that provide guidance on international best practices for the regulation of the Declared Services.

18. The prior paragraph should not be construed as meaning that NICTA would follow its prior regulatory decisions or opinions without critically assessing the appropriateness of applying such decisions or opinions to the current case. New information on specific regulatory matters may cause NICTA to change prior views on the matter.

19. In seeking to develop the service-specific pricing principles for the Declared Services, this Public Consultation Paper focuses on several key issues that in NICTA's view, are fundamental for delineating a methodology and pricing principles applicable to the Declared Services. This methodology and principles need to be specific enough to be used to assess the cost of providing the Declared Services and to set the prices for those services in accordance with Sections 134 and 135 of the Act.

20. This Public Consultation Paper addresses the following issues, which in NICTA's view are fundamental to understand the proposed methodology and principles:

    (a) Appropriate approach to determine cost-based prices: International benchmarking or cost modelling.

    (b) Modelling approach.

    (c) Approach for allocating costs.

    (d) Treatment of capital related costs.

    (e) Network topology for cost model.

    (f) Hypothetical or notional operator's network coverage and demand.

    (g) Modelled services and service increment.

    (h) Method to allocate joint and common costs to services.

    (i) Depreciation.

    (j) Approach to determine a reasonable rate of return.

21. Except for very small differences, the methodology and pricing principles described in Part II. Division 1, of each of the three service-specific pricing principles are similar to each other.

22. NICTA will use the proposed methodology and pricing principles to guide the development of cost models to calculate the efficient costs of supplying the Declared Services in accordance with Section 134 and 135 of the Act.

23. To increase the transparency on the cost models assumption and results, NICTA plans to invite the access provider to a presentation and overview of NICTA's cost model.

5. METHODOLOGY AND PRICING PRINCIPLES TO BE USED FOR CALCULATING COST-BASED PRICES OF THE DECLARED SERVICES

5.1 Introduction

24. Each service-specific pricing principles ("SSPPs") consist of two parts: Part I includes the name of the determination, commencement date, definitions of important terms, and a list of the Declared Services.

25. Part II includes the proposed pricing principles and methodology is divided in three sections, called Divisions. Division 1 presents the proposed methodology to ascertain the efficient costs of the Declared Services. In the next consultation paper, Division 2 will present the results of applying the proposed methodology to determine cost-based prices for the Declared Services and Division 3 will present the method NICTA will follow to assess the access provider's compliance with the maximum allowable prices for the Declared Services.

5.2 Appropriate approach to determine cost-based prices: International benchmarking or cost modelling

26. International best practice on the regulation of wholesale services generally recognizes cost-modelling as the standard best practice approach to set cost-based prices. For example, a study by the Body of European Regulators for Electronic Communications indicated that the majority of regulatory authorities used an approach based on current cost accounting and long-run incremental cost models.1

27. Although cost modelling is regarded as international best practice, the fact that some countries use international benchmarking to set wholesale prices, gave us pause and made us consider it as a possible approach to use.

28. If international benchmarking were to be accepted as an appropriate method to set the price of the Declared Services, it would need to be consistent with the General Pricing Principles.

29. Section 134 (1) (c) states that: "(c) a declared service that is not a resale service should be subject to cost-based pricing". Therefore, NICTA needs to determine

[1] BEREC, "BEREC's answer to the Commission's questionnaire on costing methodologies for key wholesale access prices in electronic communications." 9 December 2011, pp. 4.

whether an international benchmarking approach would result on prices for the Declared Services that are cost-based.

30. NICTA's view is that a cost modelling approach would result in cost-based prices as long as the cost model is consistent with the General Pricing Principles. However, the case for using an international benchmark approach appears less clear. For it to be used, it would need to be consistent with the definition of cost-based pricing in Section 134 (2) of the General Pricing Principles:

> *""cost-based pricing" means pricing based on the cost recovery principle in which NICTA has regard to the following factors –*
>
> a. *the application of the cost recovery principle; and*
>
> b. *the need for the pricing to make a fair and reasonable contribution to the access provider's common costs; and*
>
> c. *the need for the recovery of the reasonable costs, incurred in the provision of access and interconnection by the access provider, that would not have been otherwise incurred but for the requirement to provide such access or interconnection; and*
>
> d. *the availability and capacity of the facilities operated by the access provider and the timeframe reasonably required to provide access to additional capacity; and*
>
> e. *any other factors that NICTA considers relevant, to the extent that such factors are consistent with the cost-recovery principle and Subsections (a) to (d) of this definition."*

31. Jurisdictions that use an international benchmark approach generally claim that their results are consistent with cost-based pricing principles because their benchmarks are from jurisdictions that have developed cost models to set those prices.

32. In this view, if the jurisdictions used cost models that incorporate principles consistent with the General Pricing Principles in the Act, the associated international benchmark results would be acceptable. For this reason, NICTA is not ready to rule out the use of an international benchmark approach to set the price of the Declared Services. However, to account for differences in scale, topography, and technology, to name a few, an international benchmark approach would need to develop appropriate selection criteria to discard jurisdictions that are too different from PNG.

33. At this point, NICTA is of the view that either approach, cost modelling or benchmarking could be regarded as being in accordance with the General Pricing Principles. However, if sufficient data is available, NICTA would favour the use of a cost modelling approach to determine cost-based prices for the Declared Services.

Question 1. Do you agree with NICTA's view that either the cost modelling approach or the benchmarking approach could be consistent with the General Pricing Principles? If so, do you agree with NICTA's preference for using a cost modeling approach? Please explain your answer.

5.3 Modelling approach

34. Top-down cost models use data from an access provider's accounts and allocation rules, to distribute the costs across main categories of services. This approach does not involve detailed network modelling. Top-down models tend to conform with the access provider's accounting costs.[2]

35. Top-down models have often been criticised for incorporating the access provider's inefficiencies. As such, they would not reflect the costs of and efficient operator, as is often mandated in the laws or regulations following international best practices.

36. This criticism prompted National Regulatory Authorities ("NRAs") to introduce changes on how top-down modelling was performed in the past. Some of these changes involved adjusting the top-down models to reflect more closely current (efficient) costs. Attempts to reflect the efficient cost of an operator often require adjustments to the network configuration and costs.

37. Bottom-up cost models use data on demand, network coverage, geographic and technical information to dimension the required network to serve the geographic coverage area with the required capacity and technology. The underlying technical model of a network is used to develop unit costs of various network components. These costs are then allocated to various services based on certain criteria.

38. One advantage of bottom-up models is that they need less information from the operators than the top-down models.

39. Frequently, a hybrid approach is implemented where a bottom-up cost model is used as the primary model to calculate the costs, and then a top-down model3 is used only to fine-tune some of the assumptions and in consequence, the results of the bottom-up model.

40. NICTA considers that either approach could be consistent with the General Pricing Principles, and therefore, depending on the service to be modelled, and the availability of data, we may use any of these approaches.

Question 2. Do you agree with NICTA's view that either approach, top-down, bottom-up, or hybrid for cost modelling may be used? Please explain your answer.

[2] See for example, The World Bank-ITU-InfoDev. "Telecommunications Regulations Handbook". Tenth Anniversary Edition, 2011, pp. 136. ITU, "Guidelines on cost modelling. Economic policies and methods of determining the costs of services related to national telecommunication/ICT networks." ITU, Geneva, Switzerland (2021), pp. 2

[3] It may not be a complete top-down model but the modelling of certain costs using data from an access provider's accounts to fine-tune some of the assumptions in the bottom-up model.

5.4 Approach for allocating costs

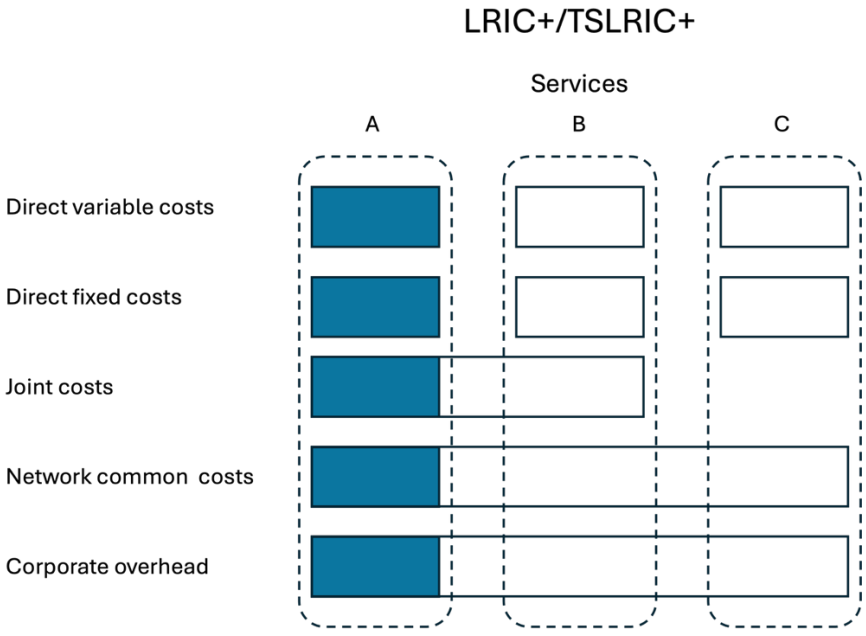
41. Modelling the costs of providing a service requires a method to allocate four different kinds of costs to the services modelled. These costs are often referred as: (a) direct variable costs, (b) direct fixed costs, (c) joint costs, and (d) common costs. [4]

42. Direct variable costs are directly attributable costs for the provision of a service that vary when the output of a service varies.

43. Direct fixed costs are directly attributable costs for the provision of a service that are not sensitive to variations in the volume of the service. These costs include asset related costs and operating costs that do not vary with the volume of service.

44. Joint costs are the costs of an input that is used in the supply of two or more services.

45. Common costs are the costs of certain inputs that are necessary for the supply of two or more services but that cannot be directly assigned to specific services.[5] Common costs can be subdivided, into network common costs and corporate overhead costs. The figure below illustrates the different cost categories for an operator that is assumed to supply three services (services A, B or C).



46. International best practice shows that NRAs generally use two methods for the allocation of the abovementioned costs. The first one is often referred as the fully allocated cost (FAC) approach, also known as fully distributed costs or FDC. The

[4] See for example, ITU, "Regulatory Accounting Guide", Telecommunications Development Bureau, March 2009, pp. 19-20.
[5] *Id.*, pp. 19-20

second approach is often referred as the forward-looking long-run incremental cost (LRIC) approach, also known as long-run average incremental cost (LRAIC).[6]

47. Different jurisdictions use different terminology according to the kinds of costs included or based on convention. For example, the LRIC approach is sometimes subdivided into pure LRIC (without joint and common costs) and LRIC+ which includes joint and common costs.[7] Other terms used are total service long-run incremental cost (TSLRIC) and TSLRIC+.

48. NICTA is of the view that the exclusion of joint and common costs in the pure LRIC approach renders it not consistent with the General Pricing Principles.

49. With regards to the use of the FAC and the LRIC+ approaches, whether they are consistent with the General Pricing Principles would depend on how they are implemented. As discussed in the next section, as long as costs reflect current (efficient) costs, then either approach would be in accordance with the General Pricing Principles and the efficiency objective in Section 124 (1) of the Act.

50. NICTA is of the view that it should strive to implement international best practices as long as they are consistent with the General Pricing Principles. Therefore, NICTA's preliminary view is that either a LRIC+ or a FAC approach that includes fair and reasonable common and joint costs should be used. We seek comments on these views from interested parties.

Question 3. Do you agree with NICTA's view that it should use either a LRIC+ of a FAC approach that includes fair and reasonable common and joint costs in its cost model? Please explain your answer.

5.5 Treatment of capital related costs

51. Cost models need to impute the cost of the assets used in the supply of the services being modelled. Two approaches have been followed by NRAs. The traditional approach was to use information from the access provider's accounting books and impute those values as the costs of assets. This is often referred as historical cost accounting.

52. The second approach is to use the cost of replacing a given asset with a modern equivalent that provides similar level of functionality or use. This is often referred as current cost accounting (CCA) or forward-looking costs.

[6] *Id.*, pp. 20-23, 26. See also BEREC, "BEREC's answer to the Commission's questionnaire on costing methodologies for key wholesale access prices in electronic communications." 9 December 2011, pp.14.

[7] See ITU, "Guidelines on cost modelling. Economic policies and methods of determining the costs of services related to national telecommunication/ICT networks." ITU, Geneva, Switzerland (2021), pp.3.

53. NRAs view historical cost accounting as not reflecting the efficient cost of an operator. Over the past decade or more, NRAs had largely switched from historical cost accounting to using a CCA approach.

54. The General Pricing Principles specify that the prices of the declared services need to be set to generate revenue "sufficient to meet the efficient costs of providing access."[8]

55. This on itself seems to imply that only the use of CCA, as opposed to historical accounting costs, would be appropriate to use for capital related costs. Section 134 (2) provides further clarification on the matter of efficient costs:

> *"include the direct and indirectly attributable capital, operating and maintenance costs actually incurred by the access provider in providing the declared service to itself and access seekers (including a reasonable contribution to any common costs), unless NICTA determines that such costs are inefficient having regard to the efficiency objective and any evidence before it."*

56. Unfortunately, this does not clarify what "*costs actually incurred*" means. One view could be that it means the costs incurred based on historical accounting costs of the access provider. However, a plausible interpretation could be that it means the economic costs actually incurred by the access provider. The later interpretation (i.e., economic costs) seems to be supported by the references to efficient costs and the efficiency objective quoted above. With regards to the efficiency objective in Part VI of the Act, Section 124 (1) (b) states that:

> *"promoting the economically efficient use of, and the economically efficient investment in, the facilities by which ICT services may be supplied, to be known as the "efficiency objective""*

57. It is clear from the quoted paragraph that the "efficiency objective" in the Act is concerned specifically with economic efficiency. Therefore, NICTA is of the view that the references to costs and efficient costs in the General Pricing Principles must represent economic costs or efficient economic costs and not historical accounting costs.

58. As NICTA demonstrates in the following paragraphs below, it is our view that the use of historical accounting costs in general, would not reflect costs that are economically efficient and therefore would be inconsistent with the General Pricing Principles and the efficiency objective in Section 124 (1) of Part VI of the Act. There are few reasons for this.

59. First, historical accounting costs, do not reflect the actual economic value of an asset, it only reflects the book value or accounting value. As such, it is heavily influenced by the accounting policies of the access provider. In particular, the corporate accounting policies and practices used for depreciation, or accounting policies or actions to revalue old assets that are still in use. If NICTA were to use those values as the costs of the assets, the resulting costs would most likely not represent the economic costs

[8] Section 134 (1) (a) (i) of the Act.

of those assets.

60. To illustrate the discrepancy between accounting or book value, and economic value, we quote a well-regarded accounting textbook:

> "*depreciation does not measure a decline in the market value of a fixed asset. Instead, depreciation is an allocation of a fixed asset's cost to expense over the asset's useful life. Thus, the book value of a fixed asset (cost less accumulated depreciation) usually does not agree with the asset's market value*."[9]

61. In consequence, the use of historical accounting costs would amount to using costs that are likely to be materially different than economic costs and result in prices that would not be "promoting the economically efficient use of, and the economically efficient investment in, the facilities by which ICT services may be supplied", and therefore, inconsistent with the efficiency objective in Section 124 (1) (b) of the Act.

62. In NICTA's view, to keep consistency with the efficiency objective, one must use the economic value of an asset, which amounts to using the CCA approach and not historic accounting costs.

63. Second, as mentioned earlier, over the past decade, NRAs have shifted from using historic accounting costs into using CCA in their cost models. NRA's do not regard historic accounting costs as representing an efficient operator's actual economic costs. It is clear from the efficiency objective, that Section 124(1)(b) of the Act is concerned with economic efficiency, which implies the use of economic costs and not historical accounting costs. This becomes clear once we recognize that an operator sets its own compensation (i.e., its own price) not based on its historical accounting costs but based on market demand and its own economic costs.

64. It is important to highlight what the EU Independent Regulators Group (IRG) says about this:

> *"In a competitive environment operators may not be able to set the price for every product in order to fully recover its incurred or historic costs, since they have to respond to market prices, which can often lie well below historic costs. They cannot therefore work according to historic costs since reversing investments is, for the main part, either not possible or only possible at a loss. An operator should therefore only be able to recover necessary for maintaining future real-asset values in a competitive market. This implies that the basis for asset valuation is the replacement cost of an asset as derived from the application of current cost accounting (CA) methodologies."*[10]

65. Third, the use of historic cost accounting would not provide operators with appropriate incentives to promote the efficiency objective under Part VI of the Act.

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[9] Carl Warren, James Reeve, and Jonathan Duchac. "Accounting", 27th Edition. Cengage Learning (2018), pp. 492.

[10] Independent Regulators Group. "Principles of implementation and best practices regarding FL-LRIC cost modelling" as decided by the Independent Regulators Group, 24 November 2000, pp: 6

If access providers are compensated for their actual historical costs stemming from investments in legacy technology that has become obsolete due to newer more efficient technology, there would be no incentive to increase efficiency as their inefficiency would be paid by their competitors.

66. For the aforementioned reasons, NICTA's position is that historical accounting costs would not reflect the efficient economic costs of supplying the Declared Services. Moreover, the use of historical accounting costs to value the access provider's assets would not promote the achievement of the efficiency objective under Section 124 (1) (b) of the Act.

67. In consequence, NICTA is of the view that the use of CCA for costing capital related assets would be consistent with the General Pricing Principles and would promote the achievement of the efficiency objectives in Section 124 (1) (b) of the Act.

68. In practice, the implementation of CCA requires NRAs to calculate the economic (i.e., market) value of an equivalent modern asset. That is, to assess the value as if the access provider needed to replace it with a modern equivalent asset. Generally speaking, a modern equivalent asset means the lowest cost asset providing at least equivalent functionality and output as the asset being valued.

69. Specifically, NICTA is of the view that capital related costs should be valued by either (i) using the cost of replacement with the modern equivalent asset, or (ii) use as the cost of replacement, the economic cost of the depreciated assets in use.

Question 4: Are you in agreement with NICTA's view that the use of current cost accounting (CCA) to value the capital assets used for the supply of the Declared Services would reflect the efficient costs of those assets, and that historical accounting costs would not?

Question 5: Do you agree with the proposed approach for valuing assets by either (i) using the cost of replacement with the modern equivalent asset, or (ii) use as the cost of replacement, the economic cost of the depreciated assets in use? Please explain your answer.

5.6 Network topology for cost model

70. The concept of a hypothetical efficient operator is necessary if we are to base the pricing of the Declared Services on the efficient costs of providing those services as required by the General Pricing Principles and the efficiency objective in Section 124(1)(b) of the Act.

71. Usually a bottom-up cost model uses a reference operator's network as guidance to build up the cost model of a hypothetical (or notional) efficient network. To that end, a network topology for the cost model needs to be defined in order to calculate the

cost of the different network components. It is a common practice among NRAs to use any of the following three approaches to build up the cost model: (a) scorched node, (b) scorched earth, or (c) modified scorched node.[11]

72. In the scorched node approach, the existing location of the reference operator's nodes are used to design the hypothetical network. There is room for optimizing the hypothetical network in the cost model, but it is constrained by the predetermined location of the network nodes. The resulting optimized network would have a similar footprint as the reference network. It is important to note that, while this approach permits some network optimization in the cost model, it does to a lesser degree than the other approaches.

73. Using the scorched earth approach allows the hypothetical network to be optimized to the fullest extent by having no constrains on the location of the nodes. With this approach the cost model could place optimally the nodes to serve the required demand with an optimized network.

74. The modified scorched node approach is a combination of the prior two. With this method, the location of the nodes in the model considers the location of the reference operator's nodes but are not strictly fixed at those locations. Locations may be modified or calibrated to optimize the real network.

75. In principle, NICTA could either use a Scorched Node approach, a Scorched Earth approach, or a Modified Scorched Node approach. However, given that the Declared Services are supplied at fixed locations within the access provider's network, NICTA will favour either, a Scorched Node approach or a Modified Scorched Node approach, provided that there is sufficient information about the location of the reference operator's nodes.

> Question 6: Do you agree that NICTA could use either a Scorched Earth, Scorched Node, or a Modified Scorched Node approach? Please explain your answer.
>
> Question 7: Do you agree that NICTA should favor using either a Scorched Node approach or a Modified Scorched Node approach if there is sufficient information about the location of the reference operator's nodes?

5.7 Hypothetical or notional operator's network coverage and demand

76. International best practice on cost modelling of wholesale services has moved away from modelling an actual operator, towards using a hypothetical or notional

[11] ITU, "Guidelines on cost modelling. Economic policies and methods of determining the costs of services related to national telecommunication/ICT networks." ITU, Geneva, Switzerland (2021), pp. 13. See also Independent Regulators Group. "Principles of implementation and best practices regarding FL-LRIC cost modelling" as decided by the Independent Regulators Group, 24 November 2000, pp:3

operator.[12] However, a hypothetical operator's cost model needs to be based on a certain demand and network coverage similar, or equivalent to, that of a reference access provider, which for the Declared Services would be PNG DataCo Limited ("DataCo").

77. In consequence, NICTA is of the view that a cost model for the Declared Services should be based on a notional or hypothetical operator with a market share, network coverage, and facilities, similar or equivalent to that of DataCo, with reasonable adjustments, as needed to reflect efficient costs.

> Question 8: Do you agree with NICTA's view that a cost model for the Declared Services should be based on a notional or hypothetical operator with a market share, network coverage, and facilities, similar or equivalent to that of PNG DataCo Limited, with reasonable adjustments, as needed to reflect efficient costs? Explain your answer.

5.8 Modelled services and service increment

78. A common approach to cost modelling is to group the cost of the services provided into groups of incremental services also known as increments.

79. The incremental service for which the cost model is built shall not be too narrow as to make the cost modelling overly complex and intractable. On the other hand, the relevant incremental service shall not be too aggregated as to preventing the use of the cost model to demonstrate that the resulting price of the declared service is cost-based[13].

80. There are three common ways to define the incremental services: (1) based on technology, (b) based on service type, and (c) based on wholesale/retail distinction[14].

81. NRAs often combine elements of these three approaches to define the groups of incremental services in broad categories, but to define more narrowly the relevant services for which the cost model is being developed.

82. The sections below refer to the services and service increments that NICTA would include in the cost model for the wholesale services in the Three Declarations.

5.8.1 Services declared under Wholesale Service Declaration No. 1 of 2025

[12] See for example, European Commission. "RECOMMENDATIONS. COMMISSION RECOMMENDATION of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013|466|EU)", para. 19. Official Journal of the European Union L 251|13.

[13] Independent Regulators Group. "Principles of implementation and best practices regarding FL-LRIC cost modelling" as decided by the Independent Regulators Group, 24 November 2000, pp. 3-4.

[14] ITU, "Guidelines on cost modelling. Economic policies and methods of determining the costs of services related to national telecommunication/ICT networks." ITU, Geneva, Switzerland (2021), pp. 13.

83. NICTA's view is that the cost model for the wholesale international dedicated submarine cable capacity service should model the following components of the access provider's network:

    (a) Wet plant: Consisting of a submarine cable, in-line repeaters, and branch units.

    (b) Fronthaul: Beach manhole and associated facilities.

    (c) Dry plant: Power feeder equipment, line terminal equipment, and optical add-drop multiplexers, and related facilities.

    (d) Connection gateway.

84. NICTA considers that its cost model should include the demands for all the services specified below.

    (a) Services to be modelled:

        I. Wholesale international dedicated submarine cable capacity service (IPLC)

        II. Wholesale long-haul dedicated capacity service

        III. Wholesale local dedicated capacity service (metro fibre)

        IV. Wholesale Internet access service

    (b) Service increment units:

        I. Capacity services: Bandwidth connection

85. NICTA's cost model for the international submarine cable facilities access service should include the following components of a grid-connected shelter for telecommunications equipment:

    (a) 20-foot telecommunications shelter and associated land and civil works.

    (b) Standard racks and power distribution units.

    (c) Redundant (N+1) uninterrupted power supply and Diesel back-up generator.

    (d) Redundant (N+1) cooling system.

    (e) Fire protection, monitoring and security systems.

86. NICTA's cost model should include the following facilities access services:

    (a) Space.

    (b) Energy (i.e., electricity).

87. Space is often referred as collocation space or cabinet space, where an access seeker collocates its equipment in the premises or facilities of an access provider.

88. NICTA should model the cabinet space costs based on rack units ("RU"), which is a standard unit of cabinet space for telecommunications and computing equipment. A rack unit is a standard space of 1.75 inches in height and 19 inches wide on a cabinet. A standard 42RU is 73.5 inches high and 19 inches wide. A standard cabinet is considered to have 42 RU.

89. NICTA's cost model should consider the following service increment units:

    (a) Space: Rack units (RU).

    (b) Energy: Kilowatt-hour.

90. To calculate the monthly cost-based price of energy service, NICTA will use the following formula:

$$Energy\ Fee = \frac{E_{ICT}\ x\ Tariff}{12}\ x\ (1 + Mark - up)$$

    Where,

    E_{ICT}: Energy consumption increment due to the access seeker's collocated ICT equipment for one year, measured in Kilowatt-hour,

    Tariff: Is the ongoing electricity tariff charge to the access provider in PGK per Kilowatt-hour,

    Mark-up: Is the mark-up to cover the access provider's corporate overhead common costs (%).

91. To calculate the energy consumption of the access seeker's collocated ICT equipment for one year, NICTA should use the following formula:

$$E_{ICT} = PUE\ x\ ICT_{KW}\ x\ 8{,}760$$

    Where,

    PUE: Is the power use effectiveness factor which generally, is between 1.5 and 1.8,

    ICT_{KW}: Is the average power (KW) of the access seeker's collocated ICT equipment.

Question 9: Considering the cost model for the Wholesale International Dedicated Submarine Cable Capacity Service; do you agree with the proposed network components to be include in the hypothetical access provider's cost model along with the proposed services to be modelled?
Question 10: Considering the cost model for the International Submarine Cable Facilities Access Service; do you agree with the proposed component and services to be modelled? Please explain your answer.

5.8.2 Services declared under Wholesale Service Declaration No. 2 of 2025

92. NICTA's cost model should include the following components of the access provider's network:
    (a) Access nodes points of presence
    (b) Aggregation and repeaters nodes
    (c) Terrestrial and submarine fibre optic cable
    (d) Cable landing stations
    (e) Core network
    (f) Dark fibre
93. NICTA's cost model should include the demands for all the services specified below.
    (a) Services to be modelled:
        I. Wholesale international dedicated submarine cable capacity service (IPLC)
        II. Wholesale long-haul dedicated capacity service
        III. Wholesale local dedicated capacity service (metro fibre)
        IV. Wholesale Internet access service
    (b) Modelled service increment units:
        I. Capacity services: Bandwidth connection

Question 11: Do you agree with the proposed network components to be include in the hypothetical access provider's cost model along with the proposed services to be modelled?

5.8.3 Service declared under Wholesale Service Declaration No. 3 of 2025

94. NICTA's cost model should include the following components of the access provider's network:
    (a) National terrestrial fibre optic backbone
    (b) Kumul submarine cable network

(c) Metropolitan fibre optic networks

(d) International submarine cable network

95. NICTA's cost model should include all the demands for the services specified below:

(a) Wholesale international dedicated submarine cable capacity service (IPLC)

(b) Wholesale long-haul dedicated capacity service

(c) Wholesale local dedicated capacity service (metro fibre)

(d) Wholesale Internet access service

96. NICTA should use the following service increment:

(a) Capacity: Bandwidth connection

Question 12: Do you agree with the proposed network components to be include in the hypothetical access provider's cost model along with the proposed services to be modelled?

5.9 Method to allocate joint and common costs to services

97. NICTA's view is that to be consistent with the General Pricing Principles, the cost model must include joint and common costs. The broad definition of common costs is provided by the European Independent Regulators Group, as:

> *"the costs that are incurred in the supply of all or a group of products or services provided by the company and that are not incremental to any one product or service."*[15]

98. As indicated earlier, the term joint costs is used to differentiate those costs that are common only to a subset of incremental services, while the term common costs is used for costs that cannot be assigned to any incremental services or subset of services.

99. The allocation of joint and common costs to incremental services presents a challenge as they are not a direct cost that can be easily attributed to an incremental service.

100. In theory, these costs are best allocated using Ramsey price rules. The theory is sound, but its implementation is not practical due to the difficulty on estimating the price elasticity of demand for the different incremental services.

101. As we mentioned earlier, the LRIC+ approach adds a proportion of the joint and common costs to each of the services modelled. Regulatory authorities generally recommend the use of the capacity-based allocation rules (technical allocation) or

[15] Independent Regulators Group. "Principles of implementation and best practices regarding FL-LRIC cost modelling" as decided by the Independent Regulators Group, 24 November 2000, pp. 4.

the Shapley-Shubik rule (economic allocation).

102. The capacity-based allocation rule assigns common and joint costs to the services based on the network capacity required by each service at the busiest hour. This rule is used by many NRAs as it follows the cost drivers (networks are dimensioned to support the peak traffic). NICTA's view is that the capacity-based allocation rule should be implemented in the model.

103. The Shapley-Shubik[16] allocation rule consists of setting the cost of a service equal to the average of the incremental costs of the service after reviewing every possible order of arrival of the increment. Such a rule may be worth considering because it gives different insights as compared to the traditional capacity-based allocation rule.

104. A different method is often used by NRAs for the allocation of overhead (common) costs, where overhead costs are allocated in proportion to the cost of each service modelled. This is often referred as the equal proportionate mark-up ("EPMU") rule.

105. Some NRAs combine the use of the capacity-based allocation and the EPMU approaches to allocate network-related and non-network common costs. Non-network related common costs are general and administration costs, often called overhead.

106. While the approaches described above to allocate joint and common costs seem consistent with the General Pricing Principles, the Ramsey Price approach is impractical to implement, so it's discarded. On the other hand, NICTA is of the view that for the allocation of network-related joint and common costs, the capacity-based allocation or the Shapley-Shubik approaches would be appropriate.

107. For the allocation of overhead (non-network related) common costs, NICTA is of the view that the EPMU approach would be appropriate. While for the allocation of network related joint and common costs, NICTA proposes to use the capacity-based allocation approach.

Question 13: Do you agree that for the allocation of network related joint and common costs, NICTA should use the capacity-based allocation? Please explain your reasons for why or why not.

Question 14: Do you agree that for the allocation of overhead common costs, NICTA should use the equal proportionate mark-up (EPMU) approach? Please explain your reasons for why or why not.

5.10 Depreciation

[16] An Introduction to Allocations Rules (2009) Jens Leth Hougaard pp 104.

108. The cost model must include an annualized cost of depreciation of the capital assets used in the Declared Services. In theory, the economic depreciation (i.e., economic cost) should be used. However, while conceptually economic depreciation provides a useful framework, its implementation is difficult.[17] Instead, the following depreciation methods have been commonly used by NRAs: (a) straight-line depreciation, (b) standard annuity, (c) tilted annuity, and (d) adjusted tilted annuity.

109. Straight-line depreciation is the most common method used in financial accounting but unless adjustments are made, it is not suitable for regulatory purposes.18 A common adjustment is to use a straight-line depreciation based on CCA values instead of historical accounting costs.

110. The standard annuity method spreads evenly the annual cost of an asset over its economic life. It also uses CCA values to reflect the efficient or market value of an asset and takes into account the cost of capital.

111. Although the standard annuity approach is an improvement over the prior method, its constant depreciation profile has been criticised for not reflecting the real economic depreciation profile of assets in real life. In a formulaic way, this approach can be represented as:[19]

$$Annual\ Cost = GRC\ x\ \frac{WACC}{1-(1+WACC)^{-UL}}, \quad (1)$$

where,

GRC: Gross replacement cost of an asset,

UL: useful life of an asset, and

WACC: weighted average cost of capital.

112. The tilted annuity method incorporates the notion that the price of the network assets tends to decline over time. This leads to higher depreciation costs in the early years.

113. The tilted annuity formula can be represented by the following:

$$Annual\ Cost_t = GRC\ x\ \frac{(WACC-PT)x\ (1+PT)^t}{1-\left(\frac{1+PT}{1+WACC}\right)^{UL}}, \quad (2)$$

where,

GRC: Gross replacement cost of an asset,

PT: the price trend, or the rate of price change of an asset,

UL: useful life of an asset, and

WACC: weighted average cost of capital.

[17] Independent Regulators Group. "Principles of implementation and best practices regarding FL-LRIC cost modelling" as decided by the Independent Regulators Group, 24 November 2000, pp. 7.
[18] ITU, "Guidelines on cost modelling. Economic policies and methods of determining the costs of services related to national telecommunication/ICT networks." ITU, Geneva, Switzerland (2021), pp. 9.
[19] *Id.*, pp.9.

114. Finally, the adjusted tilted annuity method is a variant of the prior method and is an attempt to mimic more closely what could be the true economic depreciation. This method adjusts the annual cost recovery of the tilted annuity method by forecasting the changes on output produced by the assets and adjusting the annual value of the assets to reflect these changes. A drawback of this method is that it introduces more discretion in the calculation of the annual costs of the assets which can produce annual costs that are significantly different from the other annuity methods.

115. NICTA is of the view that in principle, the use of CCA with any of the annuity approaches could be regarded as international best practices and consistent with the General Pricing Principles and the efficiency objective in Section 124 (1) of the Act. However, this does not mean that NICTA views each of the three annuity approaches as equally appropriate. The tilted annuity approach seems to follow more closely what could be regarded as the economic depreciation profile of assets than the standard annuity approach.

116. On the other hand, NICTA is not convinced that the added discretion with the adjusted tilted annuity approach would represent an improvement over the tilted annuity. On the contrary, the added discretion may result in annual costs significantly different than those calculated with the tilted annuity approach. For these reasons, NICTA is of the view that the tilted annuity approach should be implemented.

Question 15: Do you agree that NICTA should use the tilted annuity approach to calculate the depreciation of assets? Please explain your reasons for why or why not.

5.11 Approach to determine a reasonable rate of return

117. Division 1 in Part II of the SSPPs presents a detailed approach to determine the weighted average cost of capital for the access provider's cost model. NICTA invites interested parties to respond to the question below and provide comments.

Question 16: Do you agree that NICTA should use the approach presented in the SSPPs to calculate the WACC for the access provider's cost model? Please explain your reasons for why or why not.

ANNEX A. DRAFT DETERMINATIONS

DRAFT SERVICE-SPECIFIC PRICING PRINCIPLES FOR SERVICES DECLARED UNDER WHOLESALE SERVICE DECLARATION NO. 1 OF 2025

National Information and Communications Technology Act 2009

THE NATIONAL INFORMATION AND COMMUNICATIONS TECHNOLOGY AUTHORITY makes this Determination under section 135 of the *National Information and Communications Technology Act 2009*.

Dated [xxx, 202X]

[Name]

[Signature]

Member

[Name]

[Signature]

Member

National Information and Communications Technology Authority

PART I – PRELIMINARY

1 Name of Determination

This Determination is the *Service-Specific Pricing Principles Determination for Services Declared Under Wholesale Service Declaration No. 1 of 2025*

2 Commencement

(1) This Determination commences on [XX, Month 202X] (***the Commencement Date***).

3 Interpretation

(1) Subject to subsection (2), unless the context otherwise requires, terms used in this Determination have the same meaning as in the Act.

(2) In this Determination, unless the context in Part II – Pricing Principles, otherwise requires:

(a) ***"Act"*** means the *National Information and Communications Technology Act, 2009*.

(b) ***"Bottom-up Cost Models"*** are:

(i) Models that use data on demand, network coverage, geographic and technical information to dimension the required network to serve the geographic coverage area with the required capacity and technology. The underlying technical engineering model of a network is used to develop unit costs

of various network components. These costs are then allocated to the various services supplied by the access provider.

(c) ***"Declared Services"*** are – the wholesale international dedicated submarine cable capacity service and the international submarine cable facilities access service.

(d) ***"Equity Beta"*** is the risk that a company or investment adds to a market portfolio. Intuitively, it measures the sensitivity of a company's rate of return on equity to changes on the market rate of return.

(e) ***"Gearing"*** is – the ratio of the debt to the total capital of a company (debt plus equity).

(f) ***"Hybrid Cost Models"*** are cost models where a Bottom-up Cost Model is used as the primary model to calculate the costs, and then a partial Top-down Cost Model is used only to fine-tune some of the assumptions in the bottom- up model.

(g) ***"International Submarine Cable Facilities Access Service"*** means the wholesale service defined in Part III of the Wholesale Service Declaration No. 1 of 2025.

(h) ***"Modern Equivalent Asset"*** means the lowest cost asset providing at least equivalent functionality and output as the asset being valued.

(i) ***"Modified Scorched Node"*** means an approach to model the network topology where the location of the nodes is based on the location of the reference operator's nodes but are not strictly fixed at the operator's locations. Locations may be modified or calibrated to optimize the real network.

(j) ***"Scorched Earth"*** means an approach to model the network topology that allows the cost model's hypothetical network to be optimized to the fullest extent by having no constrains on the location of the nodes. With this approach the cost model could place optimally the nodes to serve the required demand with an optimized network.

(k) ***"Scorched Node"*** means an approach to model the network topology where the existing location of a reference operator's nodes are used to design the hypothetical or notional network in the cost model. There is room for optimizing the notional network in the model, but it is constrained by the predetermined location of the nodes. The resulting optimized network would have a similar footprint as the reference network

(l) ***"Top-down Cost Models"*** are:

  (i) Cost models that use data from an access provider's accounts and allocation rules, to distribute the costs across the services supplied by the access provider. This approach does not involve detailed network modelling.

  (ii) To avoid incorporating the access provider's inefficiencies, the model would need to adjust the accounting costs to reflect forward-looking (efficient) costs. This may require adjustments to the network configuration and costs in the model.

(m) ***"Wholesale International Dedicated Submarine Cable Capacity Service"*** means the wholesale service defined in Part II of the Wholesale Service Declaration No. 1 of 2025.

4 Determination

The National Information and Communications Technology Authority ("NICTA") determines, pursuant to Section 135 of the Act, that the service-specific pricing principles specified in Part II are to apply to the following services declared by the Minister in the Wholesale Service Declaration No.1 of 2025:

- Wholesale International Dedicated Submarine Cable Capacity Service, and
- International Submarine Cable Facilities Access Service.

PART II – PRICING PRINCIPLES

Division 1 – Methodology to be used for calculating cost-based prices of Wholesale International Dedicated Submarine Cable Capacity Service and International Submarine Cable Facilities Access Service

5 Introduction

(1) NICTA outlines in this Division 1 of the service-specific pricing principles the applicable methodology to be used for calculating cost-based prices for the Declared Services.

(2) Division 2 of this service-specific pricing principles will present the results of applying this methodology to ascertain the price of the Declared Services in the next phase of consultation.

(3) Division 3 will provide the method NICTA would follow to assess the access provider's compliance with the maximum allowable prices set in Division 2 in the next phase of consultation.

6 Appropriate approach to determine cost-based prices: International benchmarking or cost modelling

(1) In principle NICTA accepts that both approaches: cost modelling and benchmarking, could be regarded as being in accordance with the General Pricing Principles ("GPPs"), and therefore, could be used to calculate the costs of supplying the Declared Services.

(2) However, NICTA's view is that the cost modelling approach provides greater accuracy for calculating PNG-specific efficient costs of supplying those services.

(3) Despite its greater data requirements and modelling time, NICTA will use primarily a cost modelling approach to calculate PNG-specific efficient costs of providing the Declared Services. For the avoidance of doubt, when applying the cost modelling approach, NICTA would model the efficient costs of supplying the Declared Services in accordance with the GPPs in Section 124 of the Act.

(4) When using the cost modelling approach, NICTA may also use a benchmarking approach to justify some of the cost assumptions that would be used as inputs in the cost model.

(5) Notwithstanding what is said elsewhere in this Determination, if NICTA considers that the data received for developing a cost model is inadequate, NICTA may decide to use a benchmarking approach instead to calculate the cost-based prices of supplying the Declared Services.

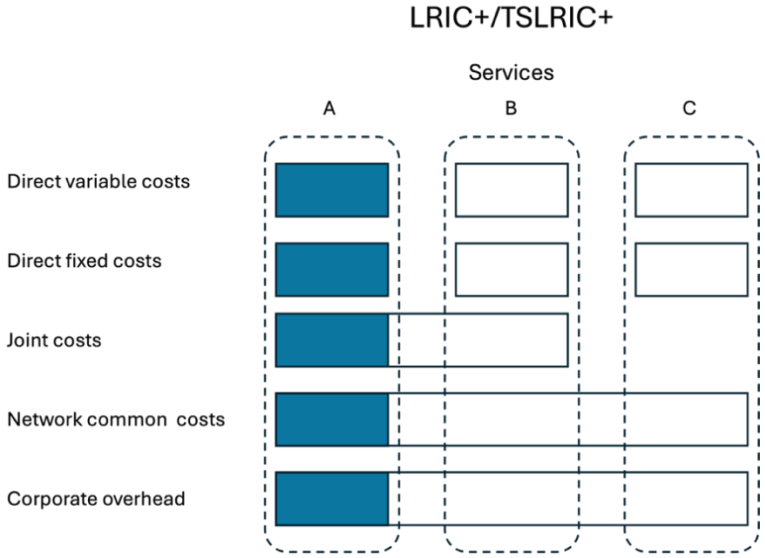
7 Modelling approach: Top-down, bottom-up, or hybrid

(1) In principle, NICTA could either use a Bottom-up, a Top-down, or a Hybrid cost model.

8 Approach for allocating costs

(1) NICTA will either use (i) a long-run incremental cost ("LRIC+") cost allocation approach that includes fair and reasonable common and joint costs (also known as TSLRIC+), or (ii) a fully allocated cost ("FAC") approach, that includes fair and reasonable common and joint costs.

(2) Joint costs are the costs of an input that is used in the supply of two or more services. Common costs are the costs of certain inputs that are necessary for the supply of two or more services but that cannot be directly assigned to specific services. Common costs can be subdivided into network common costs and corporate overhead costs. The figure illustrates the different categories of costs for an operator that is assumed supplies three services.



9 Treatment of capital related costs

(1) NICTA will use current cost accounting ("CCA") also known as forward-looking costs to value the capital assets used for the supply of the Declared Services. Specifically, NICTA will value the capital related costs by either (i) using the cost of replacement with the Modern Equivalent Asset, or (ii) use as the cost of replacement, the economic cost of the depreciated assets in use.

10 Network topology for cost model

(1) In principle, NICTA could either use a Scorched Node approach, a Scorched Earth approach, or a Modified Scorched Node approach. However, given that the Declared Services are supplied at fixed locations within the access provider network, NICTA will favour either, a Scorched Node approach or a Modified Scorched Node approach, provided that there is sufficient information about the location of the reference operator's nodes. PNG DataCo Limited ("DataCo") shall be the reference operator.

11 Hypothetical or notional operator's network coverage and demand

(1) The cost model to calculate cost-based prices for the Wholesale International Dedicated Submarine Cable Capacity Service, will be based on a notional or hypothetical operator with a market share, and network coverage, similar or equivalent to that of DataCo, with reasonable adjustments, as needed, to reflect efficient costs. A similar assumption would be applicable to calculate cost-based prices for the International Submarine Cable Facilities Access Service.

12 Modelled services and service increments

(1) NICTA's cost model for the Wholesale International Dedicated Submarine Cable Capacity Service will include, but not be limited to, the following components of the access provider's network:

(a) Wet plant: Consisting of a submarine cable, in-line repeaters, and branch units.

(b) Fronthaul: Beach manhole and associated facilities.
(c) Dry plant: Power feeder equipment, line terminal equipment, and optical add-drop multiplexers, and related facilities.
(d) Connection gateway.

(2) NICTA's cost model should include all the services' demands specified below.
(a) Services to be modelled:
(i) Wholesale international dedicated submarine cable capacity service
(ii) Wholesale long-haul dedicated capacity service
(iii) Wholesale local dedicated capacity service
(iv) Wholesale Internet access service.
(b) Modelled service increment units:
(i) Capacity services: Bandwidth connection

(3) NICTA's cost model for the International Submarine Cable Facilities Access Service will include but not be limited to the following components of a grid-connected shelter for telecommunications equipment:
(a) 20-foot telecommunications shelter and associated land and civil works.
(b) Standard racks and power distribution units.
(c) Redundant (N+1) uninterrupted power supply and Diesel back-up generator.
(d) Redundant (N+1) cooling system.
(e) Fire protection, monitoring and security systems.

(4) NICTA's cost model should include the following facilities access services:
(a) Space.
(b) Energy (i.e., electricity).

(5) Modelled service increment units:
(a) Space: Rack units ("RU"). Each RU is a standard space of 1.75 inches high and 19 inches wide on a standard cabinet for telecommunications equipment.
(b) Energy: Kilowatt-hour

(6) To calculate the monthly cost-based price of energy service, NICTA will use the following formula:

$$Energy\ Fee = \frac{E_{ICT}\ x\ Tariff}{12}\ x\ (1 + Mark - up)$$

Where,
E_{ICT}: Energy consumption increment due to the access seeker's collocated ICT equipment for one year, measured in Kilowatt-hour,
Tariff: Is the ongoing electricity tariff charge to the access provider in PNG Kina ("PGK") per Kilowatt-hour,
Mark-up: Is the mark-up to cover the access provider's corporate overhead common costs (%).

(7) To calculate the energy consumption of the access seeker's collocated ICT equipment for one year, NICTA should use the following formula:

$$E_{ICT} = PUE\ x\ ICT_{KW}\ x\ 8{,}760$$

Where,
PUE: Is the power use effectiveness factor which generally is between 1.5 and 1.8,
ICT_{KW}: Is the average power (KW) of the access seeker's collocated ICT equipment.

13 Method to allocate joint and common costs to services

(1) For the allocation of network related joint and common costs, NICTA will use the capacity-based allocation approach.

(2) NICTA will implement the equal proportionate mark-up ("EPMU") approach for the allocation of overhead common costs.

14 Depreciation

(1) NICTA will use the tilted annuity approach to calculate the depreciation of assets.

15 Approach to determine a reasonable rate of return

(1) NICTA shall use the pre-tax weighted average cost of capital ("WACC") formula below to calculate the costs of capital.

$$Pre - tax\ WACC = \frac{After-tax\ WACC}{(1-t)},$$

Where the after-tax WACC is:

$$WACC = \left(\frac{E}{E+D}\right)\ x\ r_e + \left(\frac{D}{E+D}\right)\ x\ (1-t)\ x\ r_d\ ,$$

where,

r_e: cost of equity capital or shareholder's expected return on equity,

r_d: cost of debt,

E: Equity of the operator's capital structure,

D: Debt of the operator's capital structure, and

t: corporate tax rate.

(2) For the Gearing ratio, NICTA shall use a value that reflects a reasonably efficient capital structure and not the capital structure of the sole access provider, DataCo. To that end, NICTA shall use a Gearing ratio informed by benchmarking telecom operators from the U.S., Australia, or comparable jurisdictions, that can be regarded as having an efficient capital structure. Alternatively, NICTA could use Gearing ratios from telecom service providers from the U.S., Australia, and comparable jurisdictions, as reported by Professor Damodaran in the extensive database that he regularly updates.[20]

(3) NICTA will use the following formula to calculate the cost of debt of the modelled notional access provider:

$r_d = r_f + CRP + D_p$,

Where,

r_d: Cost of debt,

r_f: Risk-free rate of return

CRP: Country risk premium, and

D_p: Debt-risk premium.

(4) NICTA will use the interest rate on a 10-year U.S. bond or comparable sovereign bond interest rate, as the risk-free rate of return.

(5) NICTA will either use Prof. Damodaran's estimate of the country risk premium ("CRP") for PNG or compute the CRP using the difference (spread) between the interest rate of the PNG government bond and the risk-free interest rate for a bond of comparable maturity.

[20] Prof. Damodaran's database can be found following this link: https://pages.stern.nyu.edu/~adamodar/. Prof. Damodaran is a world-renowned authority on the valuation of financial assets and accompanies. He is a professor of finance at the Stern School of Business at New York University (NYU).

(6) To calculate the debt-risk premium (D_p) in the above formula, NICTA will either use the difference between the cost of debt and the risk-free rate of return from telecom companies in the U.S., Australia, or comparable jurisdictions, as reported by Professor Damodaran, or benchmark debt-risk premiums on a sample of appropriate telecom companies.

(7) NICTA will use the following formula to calculate the cost of equity capital for the modelled notional access provider:

$r_e = r_f + \beta\, x\, (MRP + CRP)$,

Where,

r_e: is the cost of equity capital,

r_f : risk-free rate of return,

β: equity beta,

MRP: Market risk premium, and

CRP: Country risk premium.

(8) NICTA will use the difference between the rate of return on the U.S. Standard & Poor's 500 Index and the risk-free rate of return as the general approach to calculate the market-risk premium ("MRP"). To implement this approach, NICTA could use Prof. Damodaran's calculation of the MRP.

(9) NICTA will benchmark the Equity Betas of publicly traded telecom companies in other jurisdictions as the general approach to calculate the Equity Beta of the modelled notional access provider. To implement this, NICTA could use Prof. Damodaran estimated Equity Betas from publicly traded telecom companies from the U.S., Australia, or comparable countries.

[DIVISION 2 AND DIVISION 3 TO BE INSERTED LATER IN THE NEXT CONSULTATION PAPER]

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DRAFT SERVICE-SPECIFIC PRICING PRINCIPLES FOR SERVICES DECLARED UNDER WHOLESALE SERVICE DECLARATION NO. 2 OF 2025

National Information and Communications Technology Act 2009

THE NATIONAL INFORMATION AND COMMUNICATIONS TECHNOLOGY AUTHORITY makes this Determination under section 135 of the *National Information and Communications Technology Act 2009*.

Dated [xxx, 202X]

[Name]

[Signature]

Member

[Name]

[Signature]

Member

National Information and Communications Technology Authority

PART I – PRELIMINARY

16 Name of Determination

This Determination is the *Service-Specific Pricing Principles Determination for Services Declared Under Wholesale Service Declaration No. 2 of 2025*

17 Commencement

(1) This Determination commences on [XX, Month 202X] (***the Commencement Date***).

18 Interpretation

(1) Subject to subsection (2), unless the context otherwise requires, terms used in this Determination have the same meaning as in the Act.

(2) In this Determination, unless the context in Part II – Pricing Principles, otherwise requires:

(n) ***"Act"*** means the *National Information and Communications Technology Act, 2009*.

(o) ***"Bottom-up Cost Models"*** are:

(i) Models that use data on demand, network coverage, geographic and technical information to dimension the required network to serve the geographic coverage area with the required capacity and technology. The underlying technical engineering model of a network is used to develop unit costs of various network components. These costs are then allocated to the various services supplied by the access provider.

(p) ***"Declared Services"*** are – the wholesale long-haul dedicated capacity service and the wholesale local dedicated capacity service.
(q) ***"Equity Beta"*** is the risk that a company or investment adds to a market portfolio. Intuitively, it measures the sensitivity of a company's rate of return on equity to changes on the market rate of return.
(r) ***"Gearing"*** is – the ratio of the debt to the total capital of a company (debt plus equity).
(s) ***"Hybrid Cost Models"*** are cost models where a Bottom-up Cost Model is used as the primary model to calculate the costs, and then a partial Top-down Cost Model is used only to fine-tune some of the assumptions in the bottom- up model.
(t) ***"Modern Equivalent Asset"*** means the lowest cost asset providing at least equivalent functionality and output as the asset being valued.
(u) ***"Modified Scorched Node"*** means an approach to model the network topology where the location of the nodes is based on the location of the reference operator's nodes but are not strictly fixed at the operator's locations. Locations may be modified or calibrated to optimize the real network.
(v) ***"Scorched Earth"*** means an approach to model the network topology that allows the cost model's hypothetical network to be optimized to the fullest extent by having no constrains on the location of the nodes. With this approach the cost model could place optimally the nodes to serve the required demand with an optimized network.
(w) ***"Scorched Node"*** means an approach to model the network topology where the existing location of a reference operator's nodes are used to design the hypothetical or notional network in the cost model. There is room for optimizing the notional network in the model, but it is constrained by the predetermined location of the network nodes. The resulting optimized network would have a similar footprint as the reference network.
(x) ***"Top-down Cost Models"*** are:
    (i) Cost models that use data from an access provider's accounts and allocation rules, to distribute the costs across the services supplied by the access provider. This approach does not involve detailed network modelling.
    (ii) To avoid incorporating the access provider's inefficiencies, the model would need to adjust the accounting costs to reflect forward-looking (efficient) costs. This may require adjustments to the network configuration and costs in the model.
(y) ***"Wholesale Local Dedicated Capacity Service"*** means the wholesale service defined in Part III of the Wholesale Service Declaration No. 2 of 2025.
(z) ***"Wholesale Long-Haul Dedicated Capacity Service"*** means the wholesale service defined in Part II of the Wholesale Service Declaration No. 2 of 2025.

19 Determination

The National Information and Communications Technology Authority ("NICTA") determines, pursuant to Section 135 of the Act, that the service-specific pricing principles specified in Part II are to apply to the following services declared by the Minister in the Wholesale Service Declaration No.2 of 2025:

- Wholesale Long-Haul Dedicated Capacity Service, and
- Wholesale Local Dedicated Capacity Service.

PART II – PRICING PRINCIPLES

Division 1 – Methodology to be used for calculating cost-based prices of Wholesale Long-Haul Dedicated Capacity Service and Wholesale Local Dedicated Capacity Service

20 Introduction

(1) NICTA outlines in this Division 1 of the service-specific pricing principles the applicable methodology to be used for calculating cost-based prices for the Declared Services.

(2) Division 2 of this service-specific pricing principles will present the results of applying this methodology to ascertain the price of the Declared Services in the next consultation phase.

(3) Division 3 provides the method NICTA would follow to assess the access provider's compliance with the maximum allowable prices that will be set in Division 2 in the next consultation phase.

21 Appropriate approach to determine cost-based prices: International benchmarking or cost modelling

(1) In principle NICTA accepts that both approaches: cost modelling and benchmarking, could be regarded as being in accordance with the General Pricing Principles ("GPPs"), and therefore, could be used to calculate the costs of supplying the Declared Services.

(2) However, NICTA's view is that the cost modelling approach provides greater accuracy for calculating PNG-specific efficient costs of supplying those services.

(3) Despite its greater data requirements and modelling time, NICTA will use primarily a cost modelling approach to calculate PNG-specific efficient costs of providing the Declared Services. For the avoidance of doubt, when applying the cost modelling approach, NICTA would model the efficient costs of supplying the Declared Services in accordance with the GPPs in Section 124 of the Act.

(4) When using the cost modelling approach, NICTA may also use a benchmarking approach to justify some of the cost assumptions that would be used as inputs in the cost model.

(5) Notwithstanding what is said elsewhere in this Determination, if NICTA considers that the data received for developing a cost model is inadequate, NICTA may decide to use a benchmarking approach instead to calculate the cost-based prices of supplying the Declared Services.

22 Modelling approach: Top-down, bottom-up, or hybrid

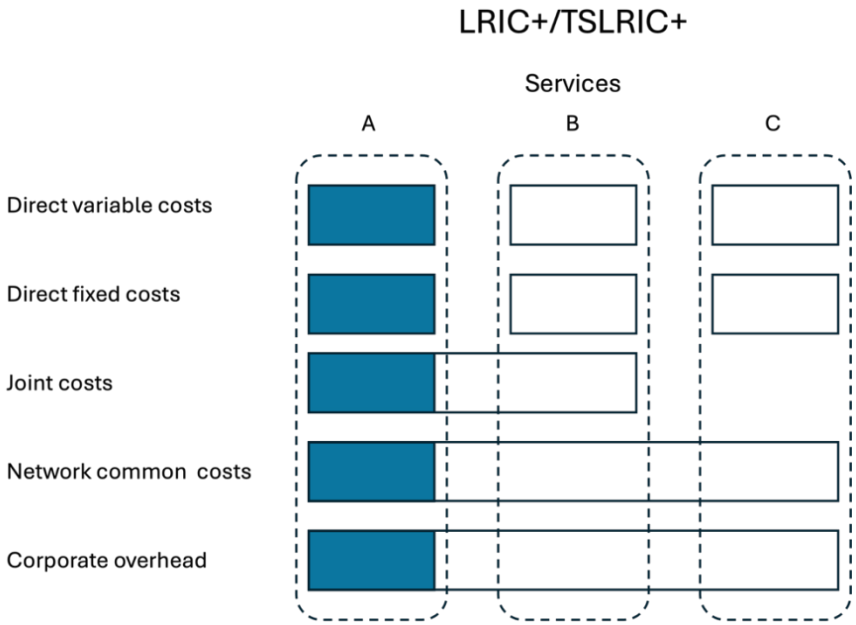
(1) In principle, NICTA could either use a Bottom-up, a Top-down, or a Hybrid Cost Model.

23 Approach for allocating costs

(1) NICTA will either use (i) a long-run incremental cost ("LRIC+") cost allocation approach that includes fair and reasonable common and joint costs (also known as TSLRIC+), or (ii) a fully allocated cost ("FAC") approach, that includes fair and reasonable common and joint costs.

(2) Joint costs are the costs of an input that is used in the supply of two or more services. Common costs are the costs of certain inputs that are necessary for the supply of two or more services but that cannot be directly assigned to specific services. Common costs can be subdivided into network common costs and corporate overhead costs.

The figure illustrates the different categories of costs for an operator that is assumed supplies three services.



24 Treatment of capital related costs

(1) NICTA will use current cost accounting ("CCA") also known as forward-looking costs to value the capital assets used for the supply of the Declared Services. Specifically, NICTA will value the capital related costs by either (i) using the cost of replacement with the Modern Equivalent Asset, or (ii) use as the cost of replacement, the economic cost of the depreciated assets in use.

25 Network topology for cost model

(1) In principle, NICTA could either use a Scorched Node approach, a Scorched Earth approach, or a Modified Scorched Node approach. However, given that the Declared Services are supplied at fixed locations within the access provider's network, NICTA will favour either, a Scorched Node approach or a Modified Scorched Node approach, provided that there is sufficient information about the location of the reference operator's nodes. PNG DataCo Limited ("DataCo") shall be the reference operator.

26 Hypothetical or notional operator's network coverage and demand

(1) The cost model to calculate cost-based prices for the Declared Services, will be based on a notional or hypothetical operator with a market share, and network coverage, similar or equivalent to that of DataCo, with reasonable adjustments, as needed, to reflect efficient costs.

27 Modelled services and service increments

(1) NICTA's cost model will include, but not be limited to, the following components of the access provider's network:

(a) Access nodes (points of presence)
(b) Aggregation and repeaters nodes
(c) Terrestrial and submarine fibre optic cables
(d) Cable landing stations
(e) Core network
(f) Dark fibre

(2) NICTA's cost model should include all the services' demands specified below.

(i) Services to be modelled:

(i) Wholesale international dedicated submarine cable capacity service

(ii) Wholesale long-haul dedicated capacity service

(iii) Wholesale local dedicated capacity service

(iv) Wholesale Internet access service

(b) Modelled service increment units:

(i) Capacity services: Bandwidth connection

28 Method to allocate joint and common costs to services

(1) For the allocation of network related joint and common costs, NICTA will use the capacity-based allocation approach.

(2) NICTA will implement the equal proportionate mark-up ("EPMU") approach for the allocation of overhead common costs.

29 Depreciation

(1) NICTA will use the tilted annuity approach to calculate the depreciation of assets.

30 Approach to determine a reasonable rate of return

(1) NICTA shall use the pre-tax weighted average cost of capital ("WACC") formula below to calculate the costs of capital.

$$Pre - tax\ WACC = \frac{After-tax\ WACC}{(1-t)},$$

Where the after-tax WACC is:

$$WACC = \left(\frac{E}{E+D}\right) x\ r_e + \left(\frac{D}{E+D}\right) x\ (1-t)\ x\ r_d\ ,$$

where,

r_e: cost of equity capital or shareholder's expected return on equity,

r_d: cost of debt,

E: Equity of the operator's capital structure,

D: Debt of the operator's capital structure, and

t: corporate tax rate.

(2) For the Gearing ratio, NICTA shall use a value that reflects a reasonably efficient capital structure and not the capital structure of the sole access provider, DataCo. To that end, NICTA shall use a Gearing ratio informed by benchmarking telecom operators from the U.S., Australia, or comparable jurisdictions, that can be regarded as having an efficient capital structure. Alternatively, NICTA could use Gearing ratios from telecom service providers from the U.S., Australia, and comparable jurisdictions, as reported by Professor Damodaran in the extensive database that he regularly updates.[21]

[21] Prof. Damodaran's database can be found following this link: https://pages.stern.nyu.edu/~adamodar/. Prof. Damodaran is a world-renowned authority on the valuation of financial assets and accompanies. He is a professor of finance at the Stern School of Business at New York University (NYU).

(3) NICTA will use the following formula to calculate the cost of debt of the modelled notional access provider:

$r_d = r_f + CRP + D_p$,
Where,
r_d: Cost of debt,
r_f: Risk-free rate of return
CRP: Country risk premium, and
D_p: Debt-risk premium.

(4) NICTA will use the interest rate on a 10-year U.S. bond or comparable sovereign bond interest rate, as the risk-free rate of return.

(5) NICTA will either use Prof. Damodaran's estimate of the country risk premium ("CRP") for PNG or compute the CRP using the difference (spread) between the interest rate of the PNG government bond and the risk-free interest rate for a bond of comparable maturity.

(6) To calculate the debt-risk premium (D_p) in the above formula, NICTA will either use the difference between the cost of debt and the risk-free rate of return from telecom companies in the U.S., Australia, or comparable jurisdictions, as reported by Professor Damodaran, or benchmark debt-risk premiums on a sample of appropriate telecom companies.

(7) NICTA will use the following formula to calculate the cost of equity capital for the modelled notional access provider:

$r_e = r_f + \beta\ x\ (MRP + CRP)$,
Where,
r_e: is the cost of equity capital,
r_f : risk-free rate of return,
β: equity beta,
MRP: Market risk premium, and
CRP: Country risk premium.

(8) NICTA will use the difference between the rate of return on the U.S. Standard & Poor's 500 Index and the risk-free rate of return as the general approach to calculate the market-risk premium ("MRP"). To implement this approach, NICTA could use Prof. Damodaran's calculation of the MRP.

(9) NICTA will benchmark the Equity Betas of publicly traded telecom companies in other jurisdictions as the general approach to calculate the Equity Beta of the modelled notional access provider. To implement this, NICTA could use Prof. Damodaran estimated Equity Betas from publicly traded telecom companies from the U.S., Australia, or comparable countries.

[DIVISION 2 AND DIVISION 3 TO BE INSERTED LATER IN THE NEXT CONSULTATION PAPER]

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DRAFT SERVICE-SPECIFIC PRICING PRINCIPLES FOR SERVICE DECLARED UNDER WHOLESALE DECLARATION NO. 3 OF 2025

National Information and Communications Technology Act 2009

THE NATIONAL INFORMATION AND COMMUNICATIONS TECHNOLOGY AUTHORITY makes this Determination under section 135 of the *National Information and Communications Technology Act 2009*.

Dated [xxx, 202X]

[Name]

[Signature]

Member

[Name]

[Signature]

Member

National Information and Communications Technology Authority

PART I – PRELIMINARY

31 Name of Determination

This Determination is the *Service-Specific Pricing Principles Determination for Service Declared Under Wholesale Service Declaration No. 3 of 2025*

32 Commencement

(1) This Determination commences on [XX, Month 202X] (***the Commencement Date***).

33 Interpretation

(1) Subject to subsection (2), unless the context otherwise requires, terms used in this Determination have the same meaning as in the Act.

(2) In this Determination, unless the context in Part II – Pricing Principles, otherwise requires:

(aa) ***"Act"*** means the *National Information and Communications Technology Act, 2009*.

(bb) ***"Bottom-up Cost Models"*** are:

(i) Models that use data on demand, network coverage, geographic and technical information to dimension the required network to serve the geographic coverage area with the required capacity and technology. The underlying technical engineering model of a network is used to develop unit costs

of various network components. These costs are then allocated to the various services supplied by the access provider.

(cc) ***"Declared Service"*** is – the wholesale Internet access service.

(dd) ***"Equity Beta"*** is the risk that a company or investment adds to a market portfolio. Intuitively, it measures the sensitivity of a company's rate of return on equity to changes on the market rate of return.

(ee) ***"Gearing"*** is – the ratio of the debt to the total capital of a company (debt plus equity).

(ff) ***"Hybrid Cost Models"*** are cost models where a Bottom-up Cost Model is used as the primary model to calculate the costs, and then a partial Top-down Cost Model is used only to fine-tune some of the assumptions in the bottom- up model.

(gg) ***"Modern Equivalent Asset"*** means the lowest cost asset providing at least equivalent functionality and output as the asset being valued.

(hh) ***"Modified Scorched Node"*** means an approach to model the network topology where the location of the nodes is based on the location of the reference operator's nodes but are not strictly fixed at the operator's locations. Locations may be modified or calibrated to optimize the real network.

(ii) ***"Scorched Earth"*** means an approach to model the network topology that allows the cost model's hypothetical network to be optimized to the fullest extent by having no constrains on the location of the nodes. With this approach the cost model could place optimally the nodes to serve the required demand with an optimized network.

(jj) ***"Scorched Node"*** means an approach to model the network topology where the existing location of a reference operator's nodes are used to design the hypothetical or notional network in the cost model. There is room for optimizing the notional network in the model, but it is constrained by the predetermined location of the network nodes. The resulting optimized network would have a similar footprint as the reference network.

(kk) ***"Top-down Cost Models"*** are:

(i) Cost models that use data from an access provider's accounts and allocation rules, to distribute the costs across the services supplied by the access provider. This approach does not involve detailed network modelling.

(ii) To avoid incorporating the access provider's inefficiencies, the model would need to adjust the accounting costs to reflect forward-looking (efficient) costs. This may require adjustments to the network configuration and costs in the model.

(ll) ***"Wholesale Internet Access Service"*** means the wholesale service defined in Part II of the Wholesale Service Declaration No. 3 of 2025.

34 Determination

The National Information and Communications Technology Authority ("NICTA") determines, pursuant to Section 135 of the Act, that the service-specific pricing principles specified in Part II are to apply to the following service declared by the Minister in the Wholesale Service Declaration No. 3 of 2025:

- Wholesale Internet Access Service.

PART II – PRICING PRINCIPLES

Division 1 – Methodology to be used for calculating cost-based prices of Wholesale Internet Access Service

35 Introduction

(1) NICTA outlines in this Division 1 of the service-specific pricing principles the applicable methodology to be used for calculating cost-based prices for the Declared Service.

(2) Division 2 of this service-specific pricing principles will present the results of applying this methodology to ascertain the price of the Declared Service in the next consultation phase.

(3) Division 3 will provide the method NICTA would follow to assess the access provider's compliance with the maximum allowable prices to be set in Division 2 in the next consultation phase.

36 Appropriate approach to determine cost-based prices: International benchmarking or cost modelling

(1) In principle NICTA accepts that both approaches: cost modelling and benchmarking, could be regarded as being in accordance with the General Pricing Principles ("GPPs"), and therefore, could be used to calculate the costs of supplying the Declared Service.

(2) However, NICTA's view is that the cost modelling approach provides greater accuracy for calculating PNG-specific efficient costs of supplying that service.

(3) Despite its greater data requirements and modelling time, NICTA will use primarily a cost modelling approach to calculate PNG-specific efficient costs of providing the Declared Service. For the avoidance of doubt, when applying the cost modelling approach, NICTA would model an efficient notional or reference access provider to calculate the efficient costs of supplying the Declared Service in accordance with the GPPs in Section 124 of the Act.

(4) When using the cost modelling approach, NICTA may also use a benchmarking approach to justify some of the cost assumptions that would be used as inputs in the cost model.

(5) Notwithstanding what is said elsewhere in this Determination, if NICTA considers that the data received for developing a cost model is inadequate, NICTA may decide to use a benchmarking approach instead to calculate the cost-based prices of supplying the Declared Service.

37 Modelling approach: Top-down, bottom-up, or hybrid

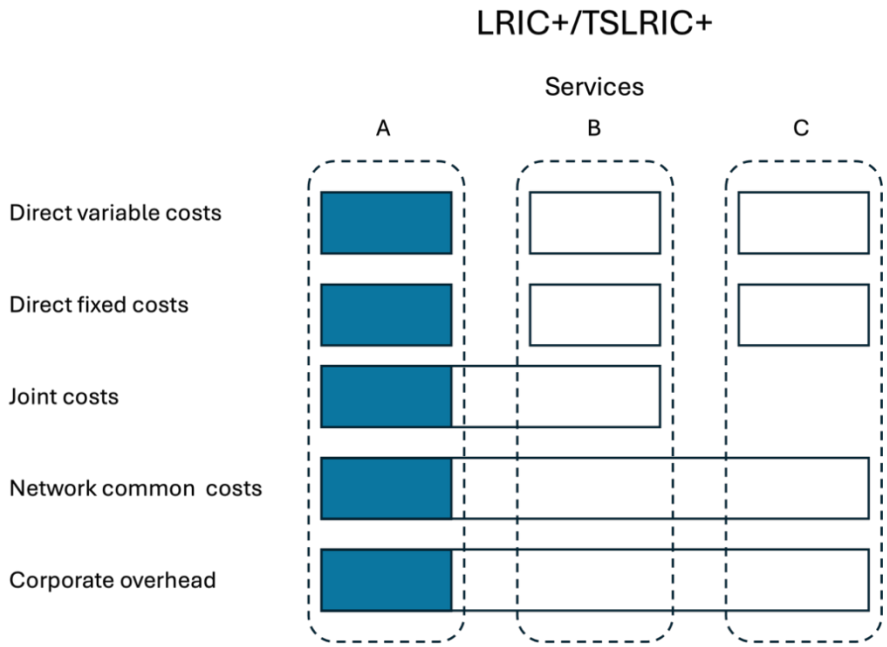
(1) In principle, NICTA could either use a Bottom-up, a Top-down, or a Hybrid Cost Model.

38 Approach for allocating costs

(1) NICTA will either use (i) a long-run incremental cost ("LRIC+") cost allocation approach that includes fair and reasonable common and joint costs (also known as TSLRIC+), or (ii) a fully allocated cost ("FAC") approach, that includes fair and reasonable common and joint costs.

(2) Joint costs are the costs of an input that is used in the supply of two or more services. Common costs are the costs of certain inputs that are necessary for the supply of two or more services but that cannot be directly assigned to specific services. Common costs can be subdivided into network common costs and corporate overhead costs.

The figure illustrates the different categories of costs for an operator that is assumed supplies three services.



39 Treatment of capital related costs

(1) NICTA will use current cost accounting ("CCA") also known as forward-looking costs to value the capital assets used for the supply of the Declared Service. Specifically, NICTA will value the capital related costs by either (i) using the cost of replacement with the Modern Equivalent Asset, or (ii) use as the cost of replacement, the economic cost of the depreciated assets in use.

40 Network topology for cost model

(1) In principle, NICTA could either use a Scorched Node approach, a Scorched Earth approach, or a Modified Scorched Node approach. However, given that the Declared Service is supplied at fixed locations within the access provider's network, NICTA will favour either a Scorched Node approach or a Modified Scorched Node approach, provided that there is sufficient information about the location of the reference operator's nodes. PNG DataCo Limited ("DataCo") shall be the reference operator.

41 Hypothetical or notional operator's network coverage and demand

(1) The cost model to calculate cost-based prices for the Wholesale Internet Access Service, will be based on a notional or hypothetical operator with a market share, and network coverage, similar or equivalent to that of DataCo, with reasonable adjustments, as needed, to reflect efficient costs.

42 Modelled services and service increment

(1) NICTA's cost model for Wholesale Internet Access Service will include, but not be limited to, the following components of the access provider's network:
   (a) National terrestrial fibre optic backbone
   (b) Kumul submarine cable network
   (c) Metropolitan fibre optic networks
   (d) International submarine cable network

(2) NICTA's cost model should include all the services demands specified below.

(a) Services to be modelled:
    (i) Wholesale international dedicated submarine cable capacity service
    (ii) Wholesale long-haul dedicated capacity service
    (iii) Wholesale local dedicated capacity service
    (iv) Wholesale Internet access service
(b) Modelled service increment units:
    (i) Capacity: Bandwidth connection

43 Method to allocate joint and common costs to services

(1) For the allocation of network related joint and common costs, NICTA will use the capacity-based allocation approach.

(2) NICTA will implement the equal proportionate mark-up ("EPMU") approach for the allocation of overhead common costs.

44 Depreciation

(1) NICTA will use the tilted annuity approach to calculate the depreciation of assets.

45 Approach to determine a reasonable rate of return

(1) NICTA shall use the pre-tax weighted average cost of capital ("WACC") formula below to calculate the costs of capital.

$$Pre - tax\ WACC = \frac{After\text{-}tax\ WACC}{(1-t)},$$

Where the after-tax WACC is:

$$WACC = \left(\frac{E}{E+D}\right) x\ r_e + \left(\frac{D}{E+D}\right) x\ (1-t)\ x\ r_d\ ,$$

where,

r_e: cost of equity capital or shareholder's expected return on equity,

r_d: cost of debt,

E: Equity of the operator's capital structure,

D: Debt of the operator's capital structure, and

t: corporate tax rate.

(2) For the Gearing ratio, NICTA shall use a value that reflects a reasonably efficient capital structure and not the capital structure of the sole access provider, DataCo. To that end, NICTA shall use a Gearing ratio informed by benchmarking telecom operators from the U.S., Australia, or comparable jurisdictions, that can be regarded as having an efficient capital structure. Alternatively, NICTA could use Gearing ratios from telecom service providers from the U.S., Australia, and comparable jurisdictions, as reported by Professor Damodaran in the extensive database that he regularly updates.[22]

[22] Prof. Damodaran's database can be found following this link: https://pages.stern.nyu.edu/~adamodar/. Prof. Damodaran is a world-renowned authority on the valuation of financial assets and accompanies. He is a professor of finance at the Stern School of Business at New York University (NYU).

(3) NICTA will use the following formula to calculate the cost of debt of the modelled notional access provider:

$r_d = r_f + CRP + D_p$,

Where,

r_d: Cost of debt,

r_f: Risk-free rate of return

CRP: Country risk premium, and

D_p: Debt-risk premium.

(4) NICTA will use the interest rate on a 10-year U.S. bond or comparable sovereign bond interest rate, as the risk-free rate of return.

(5) NICTA will either use Prof. Damodaran's estimate of the country risk premium ("CRP") for PNG, or compute the CRP using the difference (spread) between the interest rate of the PNG government bond and the risk-free interest rate for a bond of comparable maturity.

(6) To calculate the debt-risk premium (D_p) in the above formula, NICTA will either use the difference between the cost of debt and the risk-free rate of return from telecom companies in the U.S., Australia, or comparable jurisdictions, as reported by Professor Damodaran, or benchmark debt-risk premiums on a sample of appropriate telecom companies.

(7) NICTA will use the following formula to calculate the cost of equity capital for the modelled notional access provider:

$$r_e = r_f + \beta\, x\, (MRP + CRP)$$

Where,

r_e: is the cost of equity capital,

r_f : risk-free rate of return,

β: equity beta,

MRP: Market risk premium, and

CRP: Country risk premium.

(8) NICTA will use the difference between the rate of return on the U.S. Standard & Poor's 500 Index and the risk-free rate of return as the general approach to calculate the market-risk premium ("MRP"). To implement this approach, NICTA could use Prof. Damodaran's calculation of the MRP.

(9) NICTA will benchmark the Equity Betas of publicly traded telecom companies in other jurisdictions as the general approach to calculate the Equity Beta of the modelled notional access provider. To implement this, NICTA could use Prof. Damodaran estimated Equity Betas from publicly traded telecom companies from the U.S., Australia, or comparable countries.

[DIVISION 2 AND DIVISION 3 TO BE INSERTED LATER IN THE NEXT CONSULTATION PAPER]

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