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Approaches to Asset Valuation in Regulatory Asset Base Determinations: Lessons for the Review of the Tariff Methodology for Petroleum Storage and Loading Facilities

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Abstract

The purpose of this review is to explore asset valuation methodologies available in regulatory accounting frameworks in the determination of the Regulatory Asset Base (RAB). The Energy Regulator's decision of 25th March 2020 has sanctioned the development of a series of concept papers on elements of the allowable revenue formula. These papers feed into the process of reviewing the tariff methodology to for petroleum storage and loading facilities. The RAB is a key factor in the allowable revenue formula as profits earned by licensees and depreciation (as return of capital) depend on its value as approved by the energy regulator. This in turn has an effect on required revenues of regulated entities in the petroleum sector and the tariffs that the energy regulator may approve for licensees to make profit that is commensurate with risk.

Guidance obtained from the theory of corporate finance suggests that the choice of asset valuation method anchors the capital maintenance motive in place and the desired tariff regime. Rate of return regulation supports asset valuation choices driven by financial capital maintenance, economic capital maintenance or physical capital maintenance. Financial capital maintenance motive leads to the adoption of historical cost-based asset valuation method to estimate the cost that was incurred to acquire the asset with or without inflation indexation minus its cumulative depreciation. The economic capital maintenance motive leads to the adoption of current value-based asset valuation methods, in the form of the economic value or the optimized deprival value approach. The value of an asset is established through the determination of the present value of future net cash flows expected to be generated by the asset.

Keywords: Petroleum; Harmonisation; Methodology; Mitigate regulatory; Dispensatio; Nominal historic values

Introduction

The physical capital maintenance motive promotes the adoption of the replacement cost approach whose variants are the Modern Equivalent Asset Valuation (MEAV) method, the like-for-like method and the Depreciated Optimised Replacement Cost (DORC). The MEAV method guarantees the recovery of cost to replace the asset with another asset capable of producing a regulated service from the licensed activity, adjusting for depreciation to reflect the asset's remaining useful life. The like-for-like method ensures recovery of cost of purchasing the same asset at market prices adjusting for depreciation to reflect the asset's remaining useful life [1]. The DORC method facilitates the recovery cost and replacement of the asset by one that is capable of producing and supplying the regulated service as efficiently as possible. Other asset valuation techniques include the privatisation value and Long-Run Average Incremental Cost (LRAIC). Merits and demerits of any choice are elaborated in section 3. Energy Regulators Regional Association (ERRA) surveys have been considered for benchmarking purposes, including practices of other local regulators to check if the tariff methodology adopted by NERSA is aligned. Jurisdictions considered, as indicated in section 4 include countries in Europe (such as Great Britain, Germany, Bulgaria, Turkey, North Macedonia, Poland, Austria, Hungary and Slovakia), Americas (Peru), Caucasus (Azerbaijan and Georgia), Middle East and North Africa (Oman), Asia (Pakistan and Australia) and Sub-Saharan Africa (Nigeria).

A fundamental aspect in the determination of a Regulatory Asset Base (RAB) is the choice of the asset valuation methodology. In any regulatory dispensation, the asset valuation method adopted has significant consequences on the RAB value, the maximum required revenue allowed by a regulator and, ultimately, on tariffs set or approved by the regulator. The RAB influences two crucial pillars in the regulated firm's required revenue formula, that is the return on capital and depreciation as the return of capital. It is common practice in economic regulation that regulatory authorities endorse particular asset valuation methodology [2].

Methods of valuing assets must be considered with regard to the functional adequacy of regulated assets, overall profitability of the regulated business and sustainable cash flows of the regulated business in tandem with equity considerations. According to the Energy Regulators Regional Association (ERRA)(2009), the RAB is defined as the net value of a company's regulated assets in price regulation. The valuation of the RAB plays a pivotal role in the approval of tariffs for petroleum storage and loading facilities by the Energy Regulator of South Africa (ERSA). Hence, the endorsed asset valuation methodology by the energy regulator ought to be assessed in terms of its potential incentives in fostering efficient and effective regulation, as well as its impact on investment welfare in the petroleum industry of South Africa. This paper is presented before the energy regulator in light of its decision.

25th March 2020, that a series of research papers on components of the allowable revenue formula will be written to feed into the ongoing process of the review of the tariff methodology for petroleum storage and loading facilities in South Africa. This will also shed key insights

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during simulations and trials of version 4.1 of the tariff methodology. In this paper, different approaches to asset valuation are discussed and evaluated to display choices available to the energy regulator before recommendations are put forward regarding the optimal asset valuation method of choice [3]. Section 2 of this paper presents the background and legislative framework underpinning the regulation of tariffs for petroleum storage and loading facilities. Section 3 presents the purpose and problem statement before theoretical and conceptual insights on various asset valuation methods, are discussed in section 4. Benchmarking insights are presented in section 5 to reveal the extent to which the energy regulator is aligned to other regulatory contexts in South Africa and in other jurisdictions. Recommendations to the energy regulator are outlined in section 6, with summative and concluding remarks alluded in section 7.

Literature Review

Background and legal basis

NERSA has so far approved and implemented four versions of the tariff methodology for the approval of tariffs for petroleum storage and loading facilities. Versions 1 and 2 of the tariff methodology, approved prior to the revision of the petroleum pipeline regulations, were based on the TOC approach. Following the amendment of the regulations on 28th August 2015, NERSA approved and implemented version 3 of the methodology, which led to the adoption of the Replacement Cost without Depreciation asset valuation technique (RCnD). Version 3 was based on the Indexed Original Cost (IOC) asset valuation method. The decision to change from version 2 to version 3 was driven by two motives. First, the need to harmonise with the practice at the then Department of Energy (DOE). Second, there was a need to address shortcomings of the TOC strategy that was in use in version 2. Shortcomings of the TOC approach in version 2 were that there were no historic records of assets employed in licensed activities by some licensees [4]. It was also the case that project useful lives used to calculate the TOC were shorter than could be ideal and, therefore, unrealistic as assets were getting depreciated at a faster rate than their usage. The shift from the TOC to the IOC approach brought unintended consequences. For instance, tariffs that the energy regulator approves under the IOC/RV tariff methodology, particularly under the standard options, were higher than expected because RAB values were significantly higher. Inflated tariff regimes disadvantaged customers who became more susceptible to high tariff payments, especially Historically Disadvantaged South Africans (HDSAs). On 24th August 2017, the energy regulator decided to revert to the TOC methodology, which is currently in use as version 4, pending completion of simulations and trials on version 4.1 leading to the approval and implementation of version 5 by 1 April 2021. When approving tariffs for petroleum pipelines, storage and loading facilities, NERSA is guided by the prescripts of the Petroleum Pipelines Act, 2003 (Act No. 60 of 2003) and its regulations, especially sections 28; 28 of the Act, read with regulation 4; 4; 4; 4 and 4. Section 28 contemplates that tariffs must be.

- Based on a systematic methodology applicable on a consistent and comparable basis
- Fair
- Non-discriminatory
- Simple and transparent
- Predictable and stable
- Be able to promote access to affordable petroleum products
- Regulation 4 promulgates that tariffs set by the Authority must enable an efficient licensee to
- Recover the reasonable operational and maintenance expenses of the pipeline in the year in which they are incurred
- Recover capital investment and make profit thereon commensurate with the risk and
- Rehabilitate land use in connection with a licensed activity

Regulation 4 stipulates that if the recovery of expenses contemplated in sub-regulation 2 (a) results in an increase of real tariffs by more than 10%, the authority may direct that the recovery of such expenses be effected over a period of more than a year [5]. Regulation 4 provides that the tariffs set by the authority must relate to investment in, operation and maintenance of and profits arising from those parts of a licensed activity for which tariffs are being set. Regulation 4 states that the allowable revenue to be derived from tariffs contemplated in sub-regulation 2 (a) must include:

- Reasonable operating expenses
- Reasonable maintenance expenses
- Depreciation expenses
- Reasonable working capital
- Reasonable real return on the regulatory asset base which should be determined based on the assets' inflation-adjusted historical cost less accumulated depreciation.
- Other applicable obligations

Regulation 4 further prescribes that the RAB contemplated in sub-regulation 4(e) must be calculated as the total investment for assets in operation at the time of promulgation of the regulations and if historical cost records do not exist, an estimated value that the authority accepts as most closely approximating their historical cost. It is also pronounced through sub-regulation 4(6) (e) that the RAB must include only those assets that are prudently acquired. Regulation 5 prescribes that the authority must, when approving tariffs for storage and loading facilities, consider

- Batch size
- The capacity to take petroleum into a storage facility and the capacity to discharge petroleum from that facility
- The throughput capacity of loading facilities and any other relevant matter

Regulation 5 stipulates that the provisions of sub-regulations 4 to 4 and 4 are applicable, subject to the changes required by the context, to the approval of tariffs for loading and storage facilities. The energy regulator is further required to comply with the requirements of section 10 (b) of the National Energy Regulator Act, 2004 (Act No. 40 of 2004), which provides that NERSA must make decisions that seek to priorities public interest [6].

Purpose and problem statement

The purpose of this study is to examine various asset valuation methods from which the energy regulator can choose in the determination of RAB for petroleum storage and loading facilities. It feeds into the discourse within NERSA on why it may be necessary to retain the current status quo as the harmonisation project had previously recommended all regulated industries to adopt the TOC valuation principle. The energy regulator seeks to adopt an asset valuation method that most closely approximates historical cost for effective tariff assessment to ensure that tariffs approved are efficient in the market space. Consequently, the regulatory decision as to how to value the RAB is of particular importance as, in the context of tariff regulation, the RAB will be a key determinant of prices that may be charged for regulated services in the future. Hence, the decision on the RAB will most likely have greatest impact on the balance that the regulator strikes between the interests of the consumers and the interests of the investors as suppliers of the regulated service.

The overall analysis of different options available, which are supported by relevant benchmarks, culminates with recommendations on the asset valuation approach that the energy regulator may adopt in line with the ongoing simulations and trials of version 4.1 of the tariff methodology for petroleum storage and loading facilities in South Africa. A proposal for adoption in version 5 of the tariff methodology will be presented to illustrate what the energy regulator intends to publish for implementation in the regulated petroleum sector with effect from 1st April 2021 [7].

Theoretical and conceptual caveats

In tariff designs driven by the Rate of Return (ROR) methodology, the required revenue for a period in question includes a return (as computed through the methodology) earned on the established RAB. Therefore, it is of paramount importance for the regulation of storage and loading tariffs that both the cost of capital and RAB, are appropriately established through a practical methodology. In doing so, relevant criteria are adopted by regulators in different jurisdictions and industries in setting up an asset valuation system. As noted by the ports regulator of South Africa, some of the identified elements of such suitable criteria that regulators may adopt in setting an asset valuation methodology are that the system must

- Be based on a principled and sound rationale
- Establish a reasonable and plausible value for existing assets
- Yield a stable tariff-path
- Ensure either physical capital maintenance, economic capital maintenance or financial capital maintenance
- Incentivise efficiency and encourage prudent investment
- Mitigate regulatory information asymmetry problems

The notion of capital maintenance is a key principle that provides guidance in the development of an asset valuation system by regulators. Underpinning the choice of asset valuation strategy by regulators of various industries is whether a regulatory dispensation is seeking to promote financial capital maintenance, physical capital maintenance or economic capital maintenance. A regulatory approach that seeks to achieve financial capital maintenance asset valuation system ensures that investors recoup their capital investment with an appropriate return. In this approach, asset value is measured with intention to guarantee recoupment of the financial capital invested in the asset. The asset value can be measured in fixed nominal monetary terms based on nominal historic values, or in fixed real terms so that capital is recouped at constant values. The financial capital maintenance approach enables sufficient recovery of investment into an asset with a reasonable return on capital. The risk of adopting a financial capital maintenance-based asset valuation system is that it may give rise to a tariff path that significantly deviates from the desired tariff path, due to future investment cost influences. It is necessary to curb such influences by introducing a mechanism that will serve to caution against the risk of substantial replacement cost impact on the tariff regime. The ports regulator of South Africa has adopted the Excessive Tariff Increase Margin Credit (ETIMC) to mitigate such potential impacts in its tariff methodology.

A regulatory dispensation that prefers the adoption of physical capital maintenance approach makes investors vulnerable to risks inclined to under-recovery or over-recovery of original capital costs. A physical capital maintenance approach yields a tariff regime that ensures adequate contribution to replacement costs with adjustments from time to time, plus a return on the adjusted value. Under rate of return regulation, an asset valuation method driven by physical capital maintenance can generate revenue streams that are significantly different from asset valuation, based on financial capital maintenance. In all likelihood, replacement costs of any updated or new technology may be lesser than the original costs. The physical capital maintenance approach to asset valuation usually results in a higher tariff regime and it is regarded not suitable in industries where production technologies are fast changing or where assets have very long lifespans.

The adoption of the economic capital maintenance approach (alternatively referred to as the economic opportunity cost-based approach) poses risks of under-recovery or over-recovery of investors original capital expenditure. The motive behind adoption of the economic maintenance approach is guaranteed repayment of the economic value or the opportunity cost of the having the physical asset as an investment. The regulatory objective is to ensure that the investor is paid back the economic value of the asset adjusted over time and a return on the adjusted capital value of the asset. It is desired for its ability to yield a tariff regime that closely tracks the economic value of the regulated assets. However, it is not easy to calculate and may introduce uncertainties into the asset valuation system of the regulator due to tariff distortions caused by intangible economic externalities. It is incumbent to note that capital over-recoveries, emanating from excessive returns precipitated by either a physical or an economic maintenance capital approach, are usually of benefit to investors and redistributed through dividends if there are no checks and balances in place, which are supported by effective legal and institutional mechanisms. As a result, such approaches promote profiteering by investors with limited scope to ensure that over-recoveries are ploughed back and invested in the regulated activity. An account of each approach against their respective asset valuation method is discussed below [8].

Financial capital maintenance

The financial capital maintenance approach embraces the Depreciated Original Cost (DOC) or the Historical Cost (HC) asset valuation method and the Trended Original Cost (TOC) method.

The Depreciated Original Cost (DOC)/Historical Cost (HC)

Asserts that the historic cost method of asset valuation entails the accounting approach whereby assets and liabilities are recorded at their true acquisition values. The rationale behind this approach is to monitor and prevent windfall gains and losses by investors and the associated impact on consumers' welfare. Based on the historical cost principle, most assets held on the balance sheet are to be recorded at the historical cost even if they have significantly changed their respective values over time. While the historical cost method is extensively criticised for being inaccurate as the estimated value of the asset often deviates from its true market value, it is widely adopted in most accounting systems. According to Parrish, the historical cost method is based on the actual cost at the time the asset is first employed for production in the regulated activity. It commonly includes financing costs and requires no subjective assessment other than prudency. Opening values are usually added to prudent capital expenditures over the period in question, less asset disposals or retirements, to give an ending asset balance. Regulatory accumulated depreciation is often deducted from the ending asset balance to give a net asset balance. In the interest of fairness, the historical cost approach is deemed fair as it allows licensees an opportunity to earn a reasonable return on prudently acquired assets. The adoption of the historical approach gives assurance that users do not pay for asset utilisation repeatedly. Under International Financial Reporting Standards (IFRS-3), historic costs may also reflect associated cash flows where they are impaired due to market or other factors.

However, some of the identified drawbacks of the historic method are that asset valuations obtained from this approach are often not reproducible or objective since different accountants will not necessarily make the same assumptions about the appropriate amounts of historical depreciation or useful life. Historical cost valuations for fixed assets have proven to be resilient over time, as alternative methods could not be adopted permanently since they were thought to be inaccurate, too non-objective or not reproducible, too expensive or too complex. Potential challenges identified with implementing the historic cost method are that it may be difficult to obtain reliable original cost information for assets that are very old, especially in cases where facilities were constructed decades ago with different technologies and project parameters. It is also challenging to accurately establish the remaining useful lives of assets that are currently in use if they potentially have longer lifespans or in circumstances where their condition cannot be easily evaluated for measurement through visual inspection. ERRA argues that the historic cost method often understate asset prices in times of inflation. Prices of assets employed in dynamic production technologies may be overstated. It has been noted also that it yields unstable tariffs as they are bound to increase when new assets replace existing assets. Information asymmetry problems arise in situations where assets have been acquired long back, and returns may be insufficient to support funding requirements for new investments [9].

The Trended Original Cost (TOC)/Indexed Historical Cost (IHC)

The TOC method achieves financial capital maintenance and also a cost-based asset valuation technique. The gross asset value is established through indexation over a period of time to facilitate adjustment of its original value by an appropriate inflation index, which can be the producer price index as a general Purchasing Power Index (PPI), the Consumer Price Index (CPI) or the asset specific index number adjusted historical cost. The gross asset value is then depreciated to establish the net TOC value. There is ongoing debate among academics and regulatory advocates on whether the index chosen should be reflective of price changes in a specific industry under examination or it should reflect price changes in the entire economy. The merits of the TOC method of asset valuation in the class of other alternatives is that it is relatively easy to implement if information leading to accurate determination of original cost is known. It is objective and yields asset values that are aligned with inflation over time. The TOC method does not reflect the impact of changes in technology on asset value, replacement cost and asset utilisation. It achieves financial capital maintenance [10].

Physical capital maintenance

The physical maintenance approach is mainly aligned to the Depreciated Optimised Replacement Cost (DORC), the like-for-like replacement cost and the Modern Equivalent Asset Valuation (MEAV) approach. The replacement cost simply refers to the current price that is payable to replace an asset with another similar asset of equal capabilities. The Like-for-Like replacement cost, the MEAV approach and the depreciated replacement cost method are variants of the replacement cost methodology to asset valuation.

The Like-for-Like replacement cost

The Like-for-Like replacement cost approach entails the payment done by an investor to replace an existing asset with another similar asset not considering potential differences arising from technological advancement or modernisation. It bases the revaluation of assets at current prices, based on current information about what is available in the factor markets. A key feature of this approach is that it assumes that no significant technological changes in the asset in question have taken place since their installation. Regulators ought to consider the allowance for the economies of scale that may arise through vast replacement projects [11].

The Modern Equivalent Asset Valuation (MEAV) approach

In the MEAV approach, the cost of erecting infrastructure to replace the current one is determined considering that the new infrastructure is built with modern materials, construction technology and design. The MEAV therefore reveals the satisfactory replacement cost of a modern substitute of an existing asset in cases where technological advances have resulted in likely replacements having significantly improved quality or quantity of outputs. Technological progress causes the market value of the used asset to decrease, while the replacement value of an identical asset required will be increasing, given that the asset may no longer be available from suppliers. The MEAV method is subjective as it may not be the case that two accountants would arrive to the same valuation result, given the discretionary choices at their disposal and the extent to which assets are aggregated [12].

The Depreciated Optimised Replacement Cost (DORC)

The replacement cost methodology presents the cost of replacing an asset with an equivalent asset capable of providing essentially the same regulated service in the same capacity as the existing asset. The assets are valued based on what they would cost the investor to replace them today. The DORC method is often adopted by economic regulators whose prioritised objective is the achievement of economic efficiency as they mimic a contestable competitive market by setting a tariff that leaves a contestant entrant indifferent between entering the market or not. The current value of an asset is established through reflecting on cost of replacing the asset as efficiently as possible, considering the demand for the regulated service, the asset's service capability and the state of the existing asset. The key principle behind this asset valuation approach is that the economic value of an asset is its net present value in terms of future cash flow generations from the asset in question. There are circularity problems that arise in situations where the future streams of revenue are determined by the regulator, especially in regulated monopolies. Circularity arise with the use of discounted future cash streams as a methodology to value assets presumed to be sunk. Potential can be eliminated through the adoption of the replacement cost method. There are two important interpretations of the depreciated optimised replacement cost. First, the DORC is an asset valuation methodology that can be regarded as consistent with the tariff charged by a new efficient entrant into the market space. Therefore, it is typically consistent with the long run equilibrium and optimal tariff that prevails in the market. The second interpretation is that the DORC method reflects the tariff that is payable in order for the currently existing assets to be replaced by newly acquired assets of similar capabilities.

In principle, the gross asset value is obtained as the optimised modern equivalent asset value Optimised Replacement Cost (ORC) and then depreciated to yield the net ORC or the DORC asset value. Thus, the DORC method as a replacement cost-based asset valuation technique, facilitates the realisation of physical capital maintenance by licensees and regulators. The DORC method determines a current asset value that is equal to the cost of replicating the asset in the most efficient manner. The ORC excludes any excess capacity of the assets, redundant assets, overdesigned assets and abandoned assets that are still listed. The DORC method assumes Modern Equivalent Asset Values (MEAV) for all included assets. Hence, the DORC seeks to value assets and equate such value to the cost of providing a modern equivalent that is earmarked to address needs of a particular market. The implementation of the DORC involves the determination of the replacement cost followed by optimisation of the replacement cost before evaluation of depreciation parameters, ultimately leading to a calculated DORC. This technique is extensively adopted by Australian regulators. A distinct advantage of the DORC method is that assets are valued and expressed in terms of their current prices, thus incentivising efficient investment decisions as it gives the regulator a latitude to check for prudency. The regulator is able to determine an RAB that reflects the cost of replacing an asset's service potential. The DORC approximates the asset value, above that, the regulated companies will be subject to bypass risks. Utilisation of the DORC method prevents inefficient duplication of infrastructure in regulated businesses. The revenue trajectory of a regulated business is more stable as a real rate of return is applied under DORC than when other approaches are adopted, such as the historic cost in which a nominal rate of return is applied. Additional advantages of the DORC are that it is based on the current market values as it gives a better reflection of the current cost of production, which discourages wasteful consumption or investment. It matches the economic value of RAB under inflationary conditions. The DORC is capable of providing comparable estimates of the RAB either over time or across regulated entities. The implementation of the DORC method is associated with the following drawbacks. First, all replacement cost-based asset valuation strategies are prone to some degree of estimation and judgement bias. Second, a known weakness of the DORC and its variant approaches is that estimates of replacement costs are open to methodological disputes and are susceptible to manipulation. Third, the replication of assets through establishment of equivalent costs has proven to be a very cumbersome process and often very difficult to accomplish [13].

Economic capital maintenance

The economic capital maintenance is embedded through calculations of asset values on a deprival basis.

Discussion

The Optimal Deprival Value (ODV)

This method seeks to recognise the economic value foregone as a result of facing imminent deprivation of an asset in conducting a regulated activity through selling it or after it is fully depreciated. It is assumed that the economic value foregone may be less than the value based on the depreciated replacement cost. Hence, the deprival value is a measurement of the additional value accruing to the business as a result of owning a facility as an asset. ERRA defines the deprival value of an asset as the replacement cost of the asset if it can be replaceable or if it has a recovery value. The recoverable value can be defined as the excess of what a regulated entity could sell it for in exchange of its value in the market or the opportunity cost of utilising the asset in production activities of the regulated business. Taking into cognisance that infrastructure assets are regulated, the determination of their NPV of their revenues and the disposal value of assets are prone to circularity. The use of the deprival value an Optimised Deprival Value (ODV) depends on two key assessments. The first would be to derive the expected future cash flows as the basis of deriving the asset value. The second would be to consider the maximum DORC value. If the recoverable value is higher than the replacement cost, then the business entity was deprived of the asset it would potentially buy to replace it. The replacement cost therefore defines the maximum loss that the regulated entity suffered due to deprival. If the recoverable value exceeds the replacement cost, no economic deprivation is realisable and replacement of that asset cannot be justified.

A distinct advantage of this approach is that as this method seeks to achieve physical capital maintenance, it discourages inefficient investment because regulators will re-value efficient assets down to their optimised replacement cost. However, a clear disadvantage is that of circularity that arises as the future asset value depends on future cash flows and, at the same time, on the initial cost of the asset. More often, such an asset valuation technique is legally contested. Table 1 below presents a summary of the asset valuation methods in terms of the respective principle that underpins valuation methods, outline and their brief descriptions. Other approaches to asset valuation not aligned to capital maintenance-based strategies, such as the privatisation value and the Long-Run Average Incremental Cost (LRAIC), are included in Table 1 [14].

Table 1: Summary of asset valuation methods, description and supporting principle.

Supporting principle	Valuation method		Description
Financial capital maintenance	Historical cost		The cost of acquiring the asset in the past minus its cumulative depreciation. It is also referred to as depreciated actual cost. It may also be indexed to inflation
Economic capital maintenance	Current (or economic) value	Economic value	The present value of future net cash flows expected to be generated by the asset

		Deprival value	It considers maximum of the DORC, hence a lesser version of economic value and replacement cost
Physical capital maintenance	Replacement cost	Modern equivalent asset	The cost of replacing an asset with another asset capable of providing the same services, adjusting for depreciation to reflect the asset's remaining useful life
		Like-for-Like	The cost of purchasing the same asset, adjusting for depreciation to reflect the asset's remaining useful life
		Optimised	The cost of replacing the asset with another asset that is capable of providing the same services more efficiently, adjusting for depreciation to reflect the asset's remaining useful life
Other	Privatisation value		The value set or implied by the privatisation of the regulated entity
	Long-run incremental cost		The change in the total long-run cost resulting from the additional asset
Source: Author's extension of illustration provided by ECA (2020) and ERRA (2020)			

Local and international practices of asset valuation methods in RAB determination strategies

In this section, insights on experience of regulatory regimes are presented based on regulatory precedencies in other local regulators and beyond. This is meant to explore and learn best practice in terms of RAB determination methodologies adopted by other regulators in South Africa, as well as in other parts of the world, mainly focusing on energy markets. In South Africa, the ports regulator has been identified as one of the local benchmarks. Three European countries, namely Great Britain, Australia and Germany have been identified from a survey conducted by ERRA, in 2009, to obtain information on what approaches are adopted by their regulators.

In Great Britain, Ofgem as the responsible regulator of gas and electricity markets, reported to ERRA in 2009 that it was using rolling forward approach to RAB determination. In this approach, a privatisation value-based asset valuation approach was in use, where the value of an asset was set as implied in the privatisation process of the regulated entity. The RAB value is then indexed to the Retail Price Index (RPI) as a relevant inflation indicator over time to allow for the licensee's capital allowances. The Federal Network Agency (Bundesnetzagentur or the BNetzA) of Germany is empowered through the amended Energy Act of 2005 to regulate the energy sector as a Federal Regulator. It has implemented an RAB definition, summing all capital and operating expenditure (to give total operating expenditure) of any licensed and regulated activity in the energy sector, in what is known as the German TOTEX regime. A dual asset valuation methodology, as indicated through the 2009 ERRA survey, is a methodology in which assets are valued observing both notions of financial and physical capital maintenance. Assets in the class deserving valuation through the notion of financial maintenance as per their date of acquisition, are valued following the depreciated historical cost approach. Assets in the other class deserving valuation through the notion of physical capital maintenance, are valued on the basis of a depreciated replacement cost.

The Australian Energy Regulator (AER) declared in the ERRA survey of 2009 that it had adopted a rolling forward approach to RAB valuation with the Victorian Tariff Order (VTO) setting out RAB values for assets in each regulatory period for inflation adjustment over time. The rolling over strategy considers historical capital expenditure, hence linked more to the desire to ensure financial capital maintenance. Twenty countries that are members of ERRA from Europe, Americas, Caucasus, Middle East and North Africa (MENA), South Asia and Sub-Saharan Africa (SSA) have been examined in a recently concluded study by ERRA in a report published in April 2020. ERRA is an inter-institutional non-profit organisation covering countries and regulators from the five regional blocks. These regulators are responsible for regulating oil, liquid fuels, Liquefied Petroleum Gas (LPG), natural gas and electricity markets, including other public utilities in their respective countries [15].

Table 2: Regions and countries surveyed by ERRA (2020) for insights on asset value determination strategy.

Region	Countries	ISO codes
Americas	Peru	PE
Caucasus	Azerbaijan, Georgia	AZ, GE
Europe	Albania, Austria, Bulgaria, Czechia, Estonia, Hungary, Latvia, Lithuania, Moldova, North Macedonia, Poland, Slovakia, Turkey, Kosovo	AL, AT, BG, CZ, EE, HU, LV, LT, MD, MK, PL, SK, TR, XK
Middle East and North Africa (MENA)	Oman	OM
South Asia	Pakistan	PK
Sub-Saharan Africa (SSA)	Nigeria	NG
Source: ERRA (2020)		

Findings from the study confirm that there are three main asset valuation strategies appreciated by ERRA countries that participated in the survey. These are based on historical cost, current value and replacement cost, with regulator choices driven by financial capital, economic capital or physical capital maintenance motives. Outside capital maintenance-driven asset valuation methods are the privatisation valuation strategy, as well as valuation based on Long-Run Average Incremental Cost (LRAIC). In the ERRA sample, 14 countries out of 20 have revealed preference for the historical cost-based asset valuation method. Hence, 65% of these countries have adopted an asset valuation supported by the financial capital maintenance motive. Twenty-five per cent 25% have adopted the replacement cost-based strategy in favour of a regime supported by physical capital maintenance. The Austrian regulator is using an asset valuation methodology, blending the historic cost and the replacement cost. Of the 14 jurisdictions using the historic cost method, 14% have opted for the historic cost indexed to inflation. Slovakia and Peru have adopted the modern equivalent assets approach, although Slovakia indicated, in 2009, that asset revaluation was based on the observed asset conditions and asset replacement cost by reference to market evidence of transactions for similar properties during the period in question. In broader terms, findings from the survey reflect that 15 jurisdictions use historical cost with or without inflation indexation. No jurisdiction has shown preference over the current value approach.

The Competition Authority (CA) of Estonia, as the responsible regulator, has consistently adopted the historic cost method in asset valuations, although evidence from both the 2009 and the 2020 surveys is not clear enough to demonstrate whether it is indexed with inflation. In Georgia, the regulator revalues the RAB at the beginning of each regulatory period, and the methodology has changed from a replacement cost-based approach before 2009 to a historical cost-based system before 2020. Findings from the 2009 and 2020 surveys reveal that the Hungary Energy Office (HEO) computes asset value for RAB determination using the depreciated replacement value. The State Energy and Water Regulatory Commission (SEWRC) in Bulgaria is using the historical cost to value assets for RAB calculation purposes. African countries that are members of ERRA include Egypt, Ghana, Cameron and Nigeria. Only Nigeria participated in the 2020 ERRA survey, with an indication that physical maintenance capital underpins its asset valuation methodology choices and that it is using the replacement cost approach. Peru, as the only representative of the Americas in the ERRA 2020 survey, is currently using a historical cost-based approach to asset valuation. The Middle East and North African block, represented by the Republic of Oman, is also using the historical cost method.

Conclusion

It is incumbent to maintain the status quo and retain the TOC method of asset valuation for RAB determination in the tariff methodology for petroleum storage and loading facilities mainly for the following reasons: First, the TOC method is based on historical costs with potential to yield a lower tariff regime in the market space as efficiency gains are accumulated by licensees. Second, its implementation guarantees compliance with statutory provisions of the Act and its regulations, as financial capital maintenance is the supported motive in the Act and its regulations. Third, it has been recommended by the majority of stakeholders in the petroleum industry of South Africa. Fourth, it is adopted by regulators in the South African context and beyond for its merits that are universally recognised by regulators and investors. Fifth, it is in line with the recommendations of the harmonisation project that the TOC method be adopted for all the industries regulated by NERSA. While the historical cost approach without inflation indexation yields a declining tariff regime over time, it is based on actual costs of the licensee and it leads to a clearly defined, quantified and transparent return on capital. The indexed historical cost, alternatively referred to as the TOC method, yields tariffs that are constant as the actual cost is adjusted with inflation over time.The replacement cost does not allow for depreciation as return on capital and leads to a higher tariff regime in real terms. Use of this asset valuation strategy contravenes sub-regulation 4 (e) of the petroleum pipeline regulations, which categorically states that the allowed revenue to be derived from tariffs contemplated in sub-regulation 4 must include reasonable real return on the regulated asset base which should be determined based on the assets' inflation-adjusted historical cost less accumulated depreciation. Hence, it is not supported in the Petroleum Pipelines Act and sub-regulation 4 (e) of the regulations. Under the replacement cost approach, the return of capital is not clearly quantified or determined in a transparent manner. Estimations of asset value, based on replacement value principles, are often prone to manipulation and methodological disputes. The replacement cost method leads to a tariff regime that promotes inefficient investment decisions. In the same vain, a depreciated replacement cost that is not adjusted is not compliant with the Act as it not inflation adjusted.

The TOC approach remains the most appropriate asset valuation method in RAB determinations for petroleum storage and loading facilities as it achieves financial capital maintenance for existing and new assets, thereby minimising the risk and costs of financing new investments. During the consultation phase with stakeholders in 2019, it was discovered that the TOC approach was the preferable asset valuation method, and it was also supported by the harmonisation project previously concluded for all the three industries regulated by NERSA. The TOC method ensures that customers of a regulated service do not pay twice for the regulated assets used to produce the service for their consumption. The TOC approach yields a more stable price path compared to other asset valuation techniques in RAB determinations. This has an effect of making it easier to support future investments, compared to the alternative whose implementation triggers huge tariff increases when new investment decisions are required. The TOC method reduces discretion and uncertainty through basing RAB values on the recorded historic cost asset values and future inflation rates. The TOC method is extensively applied by regulators in other jurisdictions, as evidenced by findings from the 2009 and 2020 ERRA surveys.

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