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What Would an Efficient Regulatory Contract Look Like?

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The intent of economic regulation of monopolies is to best serve the long-term interests of end-consumers (LTIC). For example, the National Electricity Objective is to 'promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity …' (National Electricity (South Australia) Act 1996 (SA), s. 7). The ACCC and AER (2013) state that they aim to 'deliver network regulation to promote competition and meet the long-term interests of end-users'. However, current regulatory practice falls well short of this intent. While some of the shortfall is inevitable, much is not.

As economists agree that competitive markets maximise economic efficiency (which is closely aligned with LTIC – see Kerin 2012), section 1 provides a brief overview of competitive markets. Section 2 asks: if an efficient 'negotiated contract' (ENC) that would best serve the LTIC could be struck with a monopolist, what would it look like? Section 3 compares current regulatory practice with an ENC and considers why they are so different. Section 4 considers possible concerns about potential reforms. Finally, section 5 summarises key regulatory reforms that would help better serve the LTIC. For ease of exposition, an electricity network is used to illustrate. However, the reasoning and conclusions are generally applicable to regulated businesses.

Competitive Markets

As network businesses are, by nature, asset-intensive, consider how competitive asset-intensive markets work.

Overall Efficiency

It is well-known that, in the absence of market imperfections, competitive markets maximise net social benefit (NSB), defined as the present value (PV) of the gross value that consumers derive from products less the PV of all costs incurred in their provision. Efficiency is maximised in all its dimensions: allocative (resources and outputs are allocated to their highest value uses); technical (costs are minimised) and dynamic (productivity growth is maximised).

Specific Market Outcomes

Competitive markets maximise NSB because they facilitate efficient outcomes on multiple dimensions: capacities, prices, quantities and costs. For brevity, other dimensions such as product quality (network reliability) are not considered.

Capacities optimise the trade-off between customer value and cost: suppliers invest in capacity until the expected incremental revenue (which reflects the marginal value to consumers) is equal to the long-run marginal cost (LRMC) of incremental capacity. At any point in time (with given capacities), product prices and quantities are determined where the marginal value to customers of incremental quantity is equal to the short-run marginal cost (SRMC) of providing it. Competition ensures that costs are efficient.

Risk Allocations

These efficient outcomes are facilitated by the ways in which competitive markets, as if by invisible hand, allocate risks to align all parties' interests with the public interest.

Changes in underlying market conditions are reflected in shifts in demand, SRMC and/or LRMC. In general, consumers are exposed to upwards price risks and suppliers to downwards price risks. Suppliers also bear quantity (demand) risks.

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However, in some asset-intensive industries in which suppliers make large customer-specific investments (such as coal-mining), suppliers and customers frequently enter into long-term contracts – often before suppliers make their investments. In part, this is to protect suppliers against customers opportunistically demanding low prices once suppliers' investments are sunk. Customers willingly commit to long-term contracts because suppliers may not invest otherwise.

As well as helping to ensure efficient investment in capacity, well-designed long-term contracts contain mechanisms that help ensure efficient prices. For example, contracts for coal and other commodities have long contained flexible price-adjustment mechanisms (see Joskow 1988), which typically tie prices to observable spot market price benchmarks. If market conditions change – that is, demand, SRMC and/or LRMC shift – prices adjust. Such mechanisms provide both parties with 'enough flexibility to facilitate efficient adjustment to changing market conditions' (Joskow 1988, p. 51). As Goldberg and Erickson (1987, pp. 387-388) explain, a price-adjustment mechanism not only 'gives the parties the proper short-run price signals', but also reduces incentives for post-contracting opportunism (including breach of contract), which is in both parties' interests.

In such industries, customers may voluntarily agree to share quantity risks. Coal contracts often include 'take-or-pay' provisions. This may be efficient if customers can predict their future demands better than suppliers.

All other risks – those that may affect profits but do not shift demand: SRMC or LRMC – are borne by suppliers, unless buyers specifically agree to share them.

When contracts are struck, suppliers expect – but are not guaranteed – that they will earn normal risk-adjusted rates of return. Because suppliers bear many risks (including risks of technological obsolescence and lower-than-expected demand), they carefully consider those risks in their investment decisions. Assets often get stranded by (or suffer substantial value drops from) changes in market conditions. This is an inevitable by-product of Schumpeter's (1942) 'creative destruction', which contributes to our economy's dynamic efficiency.

Contract Nature

Suppliers and customers tend to sign explicit long-term contracts which allow for price (and sometimes quantity) flexibility to reflect market conditions. While these contracts are 'incomplete' (they cannot incorporate unforseeable contingencies), they include rules to deal with key foreseeable contingencies.

Price-relevance of Suppliers' Invested Assets

The greater a supplier's prospective customer-specific investment is, the more likely the supply contract will contain a 'take-or-pay' element.

However, the costs or values of suppliers' invested assets (past investments) bear no relevance to competitive prices. Prices are determined by current and forward-looking market conditions; asset values are simply a by-product – not a driver of market prices. As the share prices of listed asset-intensive companies demonstrate, suppliers' real asset values vary daily in response to new information on market conditions. For example, if demand turns out to be less than expected, product prices usually fall. If a supplier tries to sell at a price reflecting historic investment costs, it will sell nothing. Suppliers do not continue to earn a normal return on historic costs. Instead, asset values fall until the marginal supplier just earns a normal return on its reduced asset value.

As the many billions of dollars of toll-road asset write-downs due to lower-than-expected demand and mining company asset write-downs due to falling ore prices demonstrate, competitive suppliers acknowledge the impact of market conditions on asset values.

A supplier's capex per se does not affect competitive prices. Suppliers that invest based on NPV-positive business cases (for example, replacing existing assets to continue to meet demand, or investing in new assets to meet new demand or reduce opex) do not need price increases to earn normal returns – and couldn't get them in competitive markets anyway. Factors such as new government requirements that require capex (for example, increased safety standards) would raise prices as they shift industry LRMC up, however, these price impacts are automatically and directly picked up through contractual price-adjustment mechanisms.

Therefore, unsurprisingly, the pricing clauses of competitive long-term contracts do not mention suppliers' past, present or future asset investments – other than to confirm their irrelevance.

An Efficient Negotiated Bargain?

Maximising Overall Efficiency

The economics of networks is more complicated than that of coal businesses. First, demand is much higher in peak versus off-peak periods. Second, if networks are 'decreasing cost' businesses (economies of scale are large relative to total market size), it is most efficient to have a single network service provider (NSP). Therefore, end-customers cannot rely on in-market competition to ensure efficiency. So what can they do?

Consider the following thought experiment. Suppose no network exists but that, if a network was built, many end-consumers would (in aggregate) derive more benefits from consuming electricity than the costs of providing it. Parts of the supply chain (generation, retailing) are potentially competitive. However, while there are many potential NSPs, only one can be chosen. Any network investments would become sunk, once made.

It is not feasible for many (often in their millions) end-consumers to co-ordinate amongst themselves and negotiate with potential NSPs. Apart from anything else, the 'transactions costs' of doing so would be enormous. Fortunately, as competition in generation and retailing serves the LTIC, end-consumers can rely on potential network users (for example, generators and retailers) to negotiate with potential NSPs.

Prices and quantities. End-consumers would want network users to maximise NSB by negotiating a contract that produces outcomes as close as possible to the efficient outcomes of competitive markets. The peak-load problem does not change the principles behind efficient capacity and pricing decisions underlying competitive markets. Williamson (1966) derived the efficient solution to the peak-load problem. Capacity decisions should be driven by LRMC. Peak and off-peak prices at any capacity (including the efficient capacity) should be set at SRMC, where SRMC is equal to marginal operating cost (MOC) if demand is less than capacity or opportunity cost (the next-highest value placed on the marginal unit by a customer) if demand exceeds capacity. The SRMC-based peak price will generally exceed LRMC and the SRMC-based off-peak price will generally be lower than LRMC. However, if demands are as expected, the weighted average of peak and off-peak SRMC-based prices equals LRMC at the efficient capacity.

Williamson assumed that peak and off-peak demands were known and that there were constant returns to scale. Meyer (1975) and others have extended Williamson's work to allow for short-term demand uncertainty. Again, the efficient pricing rule remains: peak and off-peak prices should vary in response to demand variations to ensure that they match their respective SRMCs.

To achieve efficient pricing, network users must overcome an asymmetrical information problem: they cannot observe SRMC. Coal buyers overcome this asymmetry by using observable spot prices, which reflect SRMC. Network users would therefore ask: are there ways to objectively reveal SRMC?

Fortunately, there are. First, MOC (such as energy cost that varies with network usage) can be reasonably estimated and is small anyway. Second, regulators in Europe, the US and UK have for many years required electricity and gas NSPs to auction off short-term and long-term capacity rights and operate secondary markets in which those rights can be traded. Capacity rights are traded for different network elements (for example, entry points, exit points and common carriage links), time periods (peak and off-peak), and time horizons (from one day to 15 years out).

Capacity auctions and secondary markets remove NSP market power and therefore overcome the 'hold-up' problem; with competitive generation and retail sectors, secondary markets can be competitive. Liquidity of auction and secondary markets can be ensured by allowing any parties (including financial investors) to participate (as in the US). Therefore the sum of MOC-based usage prices and the prices at which short-term capacity rights trade will reflect the true SRMCs of using network elements. MOC-based usage prices, plus the prices at which longer-term capacity rights trade, will reflect the PV of expected SRMCs over the duration of those rights.

As MOC-based usage prices plus capacity rights prices reflect SRMCs, quantities (network utilisation rates) will be efficient. As those who value the rights most will acquire them, network usage will be allocated efficiently between users. As capacity rights will trade at high prices for peak periods and low (even zero) prices for off-peak, quantities will be efficiently allocated by time-of-day.

Initial capacities, costs and user funding. Network users need to overcome asymmetric information regarding NSP capacity costs (LRMC) and the 'hold-up' problem (post-contracting, the NSP will be a monopolist and therefore have incentives to undersupply capacity and set high prices). In addition, if 'decreasing costs' exist, network users will need to provide user funding (in addition to paying efficient prices) to provide an NSP an incentive to invest (an expected normal return on investment). Network users would wish to minimise such user funding.

Fortunately, there is a mechanism(s) to solve these problems: a competitive tender for the right to be the NSP. Subject to meeting certain tender requirements (for example, to auction all capacity rights, operate a secondary market and meet specified network reliability standards), each potential NSP could be asked to bid the minimum user funding it requires to become the NSP.

Tenderers would need to make capacity decisions knowing that efficient prices will exist. They would have strong incentives to work closely with network users to understand their future demands. The tender would largely overcome information asymmetry by giving bidders incentives to truthfully reveal full information; they would know they would lose the bid unless they use their expected efficient costs to calculate their user funding bid. This would enable network users to minimise user funding.

Network users would need to decide how to divide the total user funding between them and how they should pay their user-funding obligations. They might decide to work it out themselves – as they do in Argentina (Littlechild 2012) – or ask an independent party to advise them or decide. It is unlikely that they would ask the NSP to do this.

Ongoing capacities, costs and user funding. As ongoing network capex requirements can be substantial, network users will want to pre-ensure they can overcome information asymmetry and incentive problems on an ongoing basis. Fortunately, they can employ market and other mechanisms to at least partially do so.

One mechanism is to make the initial competitive tender a Build-Own-Operate-Transfer (BOOT) model, with the transfer occurring after, say, ten years. This would enable network users to conduct a competitive tender every ten years.

They can also use other market mechanisms. In particular, they can leverage the hard evidence that capacity-rights auctions and secondary markets generate about the value of capacity expansions. Consistent high prices for existing capacity rights are obvious triggers for considering capacity expansion. Prices by quarter by network element, over 15 years, help decide when and where to invest. Network users could also require the NSP to take bids for incremental capacity rights, and agree triggers for capacity expansions based on those prices. In Europe and the UK, regulatory rules have been developed so that network capacity investments are triggered by transparent, market-based capacity rights prices. For example, Ofgem instituted a rule that if the NPV of bids for incremental capacity over 32 quarters exceeded 50 per cent of the incremental cost, the NSP had to seek approval to expand capacity. Ofgem pre-sets rules to automatically adjust NSP revenue caps in response to demand for incremental capacity backed by a financial user commitment.

Furthermore, since the mid-1990s, Argentina has followed what Littlechild (2012) calls a 'remarkably successful' user-funded competitive process for network capacity expansions. Expansions are put out to competitive tender. This approach has reduced costs of capacity expansions substantially. Beneficiaries pay in proportion to their benefits (estimated by an independent party) and payments may be spread over time up to 15 years.

As capacity rights prices help allocate demand between peak and off-peak periods efficiently, this alone can help save substantial ongoing capex by containing peak demand and avoiding unnecessary capacity expansions.

An ENC would allow competition for network investments, where feasible. However, I believe that NSPs should make the final decisions. Like any business, NSPs should make use of the best evidence and customers' views, but make the final decisions and bear the risks of those decisions. Network users/regulators should employ user-funding offers (competitively sourced, where possible) to promote their favoured options; they can employ economists' innovations, such as Laffont and Tirole's 'menu' approach to partially overcome information asymmetry and incentive issues in doing so.

An ENC would completely separate efficient prices for network capacity/usage and user funding, for several reasons. First, it would expose the NSP to all the risks that competitive suppliers face; and NSP profitability would vary with market conditions. Second, it would enable network users (or their representative) to decide the user funding they are willing to offer to support expenditures. Third, it would enable users (or their representative) to decide how user funding is paid.

The ENC would require an independent party to perform various roles, such as: running competitive tenders; vetting expenditures that cannot be competitively tendered (and help minimise user-funding requirements for those expenditures); and estimating the distribution of capex benefits between users to help allocate total user-funding between users.

Specific Outcomes

An ENC would come close to emulating the outcomes of competitive markets, but employ different mechanisms to achieve them. MOC-based usage prices plus short-term capacity rights prices would be near-efficient, as they would approximate SRMCs and be transparent and evidence-based. Therefore, network usage would be near-efficient. Network capacities and costs would be near-efficient initially and workably efficient on an ongoing basis. Total user funding would be workably efficient, explicit and transparent, reflecting the minimum amounts required to encourage NSB-maximising investment. User funding charges would be decided upon by network users (or their representative), who know their preferences best and how those charges would affect their choices.

Risk Allocations

An ENC would achieve near-efficient risk allocations by emulating those of capital-intensive competitive markets, although using different mechanisms to do so. Network users' and end-consumers' risks of monopoly hold-up would be largely eliminated, as prices would be determined by markets (not the NSP). The NSP's risk of assets being 'stranded' by opportunistic behaviour would be largely eliminated, as capacity/usage prices would be largely determined by markets, and legally enforceable user funding obligations would be explicitly agreed upfront.

An ENC would also cover major foreseeable potential contingencies. For example, if an ENC were written today, it would specifically rule out compensation for assets that may become stranded in future by competition from distributed generation and battery storage.

Contract Nature

An ENC contract would be explicit, binding and long-term. It would legally protect network users from 'hold-up' risk and the NSP from post-investment opportunism risk. An ENC would specify market-based mechanisms and rules to ensure that near-efficient outcomes are achieved. It would also specify how key foreseeable contingencies would be dealt with. Finally, it would not refer to price-irrelevant factors (such as the NSP's invested assets), other than to explicitly exclude them.

Price-relevance of NSP's Invested Assets

Under an ENC, users (or their representative) would agree in advance the extent to which user funding (over and above efficient prices for services) for certain NSP expenditures is necessary. Some expenditures would not receive user funding; others would receive partial user funding due to 'decreasing costs'. However, once expenditures were made, they would become irrelevant to prices. As in competitive markets, the costs or values of suppliers' invested assets (past investments) are not price-relevant. Therefore, the pricing clauses of an ENC would not mention the NSP's invested assets, other than to confirm their irrelevance.

Current Regulatory Practice Versus an ENC

The rationale for economic regulation rests on the assumption that an ENC cannot be struck. While that assumption is debateable, despite its stated intent, current regulatory practice bears little resemblance to an ENC. That is not surprising, given that Australia inherited a regulatory system that was established well before many important developments in our knowledge and markets were made, including advances in the economics of auctions, corporate finance, incentives, incomplete contracts, information and uncertainty, as well as the development of capacity and futures markets.

These developments, our own experiences, and those of innovative regulators overseas can be leveraged (as section 2 attempted to do) to improve regulatory practice. First, let's review the efficiency of outcomes under current regulatory practice.

Overall Efficiency

Overall efficiency falls well short because regulatory practice does not adopt many of the efficient rules or mechanisms of an ENC; therefore, outcomes on most dimensions are less efficient than they could be.

Specific Outcomes

Prices and quantities: Prices are very inefficient, because short-run capacity prices bear no relationship to SRMC, long-run capacity prices bear no relationship to the expected PV of SRMCs and prices are inflexible to market conditions. Prices are inefficient for at least seven reasons.

The first and single biggest reason is that revenue allowances (and therefore prices) are set largely on the basis of an irrelevant factor – the regulated asset base (RAB). Depreciation and cost of capital allowances based on RAB values typically account for around 70 per cent of total revenue allowances. Yet, as shown above, historic costs of past investments have no bearing on efficient prices.

Second, casting RAB values in stone (other than indexing with inflation and deducting pre-set depreciation rates) ensures that price flexibility in response to market conditions is minimal. Indeed, it can be perverse. Supposed demand turns out to be permanently lower than expected. In competitive markets, prices would generally fall (at least in the short-run), although revenues per unit may rise under take-or-pay contracts; as a by-product of the price drops, asset values would fall. Under an ENC, prices of both short-term and long-term capacity rights would fall. Asset values would fall, reflecting lower than expected future revenues. However, the values of pre-agreed user funding obligations would not change. In contrast, under RAB-based regulation, NSP revenues per unit would rise too much, because there is no explicit separation of efficient prices and user funding payments. When demand falls, efficient prices should fall, but this means that (given the fixed RAB), user funding obligations rise by default. That is, the implicit non-transparent user funding obligations vary with market conditions. As shown in section 2, it is more efficient to fix user funding obligations explicitly in advance. Carving RAB values in stone and not explicitly identifying user funding obligations generate perverse outcomes.

Third, assets cannot become stranded due to changes in market conditions. This encourages overinvestment. For example, under the ENC, if network users expected that compact, low-cost in-home solar and battery storage systems could become pervasive within the next five-to-ten years, capacity rights prices ten-to-fifteen years out would be low, and this would send a powerful signal to think very carefully before investing in assets that typically have lives for 40+ years. In contrast, our RAB-based system gives NSPs no incentive to consider those risks. Insulating NSPs from many risks that competitive suppliers bear, distorts investment decisions and promotes overinvestment.

Fourth, revenues and prices are inefficient because capex per se raises revenue allowances. While some capex may warrant partial user funding, not all capex should flow through to revenue allowances.

Fifth, efficient pricing rules are not used.

Sixth, revenues and prices are also inefficient because they are set by regulators and NSPs, respectively, rather than markets, without the benefit of the information that markets can provide.

Seventh, as shown below, we do not explicitly separate out efficient prices from user funding obligations and do not efficiently deal with user funding obligations. As regulated prices are inefficient and, in particular, do not generate price signals that reflect the SRMCs of usage of network elements by time period and location, network usage quantities are also highly inefficient.

Capacities, costs and user funding. Regulated capacities are likely to be inefficient, for several reasons. First, regulators do not employ various mechanisms (as an ENC would) to overcome asymmetric information and incentive problems; they therefore operate without the benefit of hard evidence on the value of capacity expansion that capacity rights markets produce. Second, the use of cast-in-stone RAB values to set revenues/prices gives NSPs strong incentives to overinvestment. This has probably been the single biggest driver of overinvestment in regulated industries in recent decades – yet it has received little or no attention.

Costs are also highly inefficient. The RAB-based system promotes overinvestment. Market-based mechanisms are not used to reveal efficient costs. Furthermore, cost-plus pricing (albeit with some incentives) does not provide the strong efficiency incentives that exposing NSPs to normal business risks would.

User funding obligations are inefficiently high because costs are inefficiently high. The quantum of user funding obligations is: not explicit; not disentangled from efficient prices; and not fixed in advance. It implicitly varies with market conditions, which inefficiently offloads risks that NSPs should bear, on to network users.

Decision rights on how universal funding obligations are paid are inefficiently allocated to NSPs. The National Electricity Rules require that, if prices based on its Pricing Principles do not recover expected revenue, NSPs must adjust those prices 'so as to ensure recovery of expected revenue with minimum distortion to efficient patterns of consumption' (6.18.5(c)). However, it is not appropriate to give NSPs powers to levy 'taxes' like these. Such taxes are policy decisions and should be made explicitly and transparently by an independent party in consultation with network users, who best know their own preferences and how alternative payment arrangements will affect their choices.

Risk Allocations

Network users bear far more risk than they would under an ENC. In particular, regulators' use of RAB values to set (and rigidly fix) revenues/prices, transfers substantial risks that suppliers would normally bear from NSPs to network users, end-consumers and, possibly, taxpayers.

Regulatory leaders and courts overseas have long-recognised that regulated businesses should not be insulated from market conditions. The US Supreme Court set the precedent 70 years ago in the Market Street Railway case[1]:

> The use of, or failure to obtain, patronage, due to competition, does not justify the imposition of charges that are exorbitant and unjust to the public.

As legendary regulator Alfred Kahn (1977, p. 33) stated: 'The historical commitment of regulators to permit the recovery of prudently incurred costs was never absolute' and specifically referred to 'changing technology or other exogenous market developments'.

[1] Market Street Railway Co. v. Railroad Commission of California, 324 U.S. 548, 567 (1945).

An ENC would not leave network users, consumers or taxpayers at risk of having to compensate NSPs for past investments if, for example, compact low-cost in-home battery storage and solar systems, became pervasive in future. But would the implicit and incomplete nature of Australia's RAB-based regulatory 'contract' do so?

In theory, no. As Boyd (1998, p. 75) explained:

> When confronted with an incomplete contract, courts determine liability by asking how the parties would have designed the contract had they accounted for the contingency ex ante. The terms are derived by assuming that the parties would have agreed to *the contract that maximised their expected joint surplus at the time the contract was signed* (emphasis added).

That is, courts would ask: what would the ENC have been? As shown above, asset values would be irrelevant to an ENC and therefore NSPs would receive no compensation for stranded assets. However, network users (but not end-customers) would be liable for outstanding user funding obligations.

Boyd (1998, p. 75) noted, however, that suppliers' compensation cases may be stronger if regulators compelled them to make investments that they otherwise would not have, but added that 'many, and perhaps most, utility investments do not fall in this category'.

Nevertheless, in the wake of electricity deregulation in the US and Europe, industry players argued successfully that as regulators 'approved' their capex plans, they should be fully compensated for stranded assets. Consumers ended up paying many billions of dollars in bill surcharges; and in some cases, taxpayers footed the compensation bill.

Fortunately, under an ENC, NSPs would not be compelled to engage in capex and therefore there would be no case for compensation. Regulators would not decide prices (markets would), nor would they 'approve' capex or opex – they (or network users) would only offer network funding where warranted, while NSPs would make expenditure decisions. In contrast, regulators' use of RABs and 'allowing' capex may well be setting network users, end-consumers and taxpayers up for a repeat of the US/Europe experience. Why take the risk when we don't need to?

Protecting suppliers from risks does not eliminate those risks – it just transfers them to others. Because regulatory-risk allocations depart substantially from the efficient risk allocations of competitive markets, major inefficiencies are generated.

Contract Nature

Unlike competitive contracts and an ENC, the current regulatory 'contract' is, at best, implicit, very incomplete and does not explicitly deal with key contingencies.

Price Relevance of NSP's Invested Assets

Unlike competitive markets or in an ENC, the cost of NSP past investments greatly influences – and, indeed, largely determines – regulated prices, while current and planned future capex influences regulated prices more than it should.

Possible Concerns About Reform

Reform proposals should always address potential counter-arguments. Consider the following six potential counter-arguments.

Must avoid stranded assets: As acknowledged above, it is appropriate to prevent assets being stranded by opportunistic behaviour by regulators or governments. However, this can be done without giving up the benefits of cost-reflective prices and price flexibility.

ENCs would protect NSPs from opportunism, as explicit legally enforceable user funding obligations would exist and only the market would set capacity/usage prices. However, NSPs should not be protected against stranded assets for any other reason. Casting RAB values in stone does that, even though (as shown in section 2) it is not necessary to ensure efficient investment – and it promotes inefficient over-investment.

Relatedly, some regulators may wish to avoid stranded assets on the basis that, if an investment appeared prudent, based on the information available at the time it was made, it is not the NSP's fault. However, that's not what happens in competitive markets: many investments that seemed good at the time go pear-shaped and investors bear the costs. Kahn (1977 p. 33) was clear that regulators' commitment to prudent cost recovery was always subject to disallowances if assets were not 'used and useful'. He added that:

> prudence of costs incurred can logically be judged only at the time when they were incurred, whereas disallowances under the used and useful doctrine are necessarily on the basis of how the expenditures turned out.

No objective way to revalue RAB: Some regulators agree in principle that NSPs should be exposed to market conditions, but argue that there is no objective way to revalue RAB values for changes in market conditions without creating perceptions of opportunism. That is correct. It is even difficult to pre-specify rules (to avoid those perceptions) that would adjust RAB values based on future observable data. However, this is further reason why the RAB-based system should be abandoned altogether and replaced by market-based mechanisms that directly expose NSPs to market conditions, as an ENC does.

Unobservability and/or revenue-inadequacy of SRMC: Some regulators and regulatory rules support using LRMC for pricing rather than SRMC. For example, the Pricing Principles of the National Electricity Rules state that network tariff-setting must take account of the LRMC of a service. However, economic theory clearly demonstrates that efficient prices are based on SRMC, not LRMC – including decreasing-cost industries (Hotelling 1938). Regulators' historical reliance on LRMC was a reasonable practical choice, given the past unobservability of SRMC. However, as shown above, overseas regulators have for many years relied on market mechanisms to reveal SRMC.

Another concern may be whether SRMC-based prices would generate less revenue than LRMC-based prices. However, economic theory shows that, on average, SRMC equals LRMC, including in decreasing cost industries (Andersson and Bohman 1985). In practice, capacity-rights auctions do raise substantial revenues.

Price variability: While some end-consumers might want stable prices, competitive retailers will provide that if end-consumers value them enough, and network users can hedge if they wish to. However, just as generators and retailers face variable wholesale electricity prices, network users should face prices that vary with market conditions – NSB cannot be maximised otherwise.

Welfare losses are low: It could be argued that efficiency losses generated by inefficient regulated prices are low because end-consumer demand elasticities are low. Yet both the AEMC (2012 p. 155) and the Productivity Commission (2013 p. 356) have presented evidence of significantly greater demand responsiveness (including demand-shifting from peak to off-peak) to time-based or capacity pricing, and hence the potential to considerably reduce peak demand save substantial capital costs

Capacity rights auctions/trading generate efficient prices, which help manage peak demand and save substantial unnecessary capacity expansion costs. Not varying prices according to demand-driven variations in SRMC – both between peak and off-peak periods and as total demand changes – can generate significant welfare losses.

Increased NSP risk: An ECN would increase NSP risk. However, that is because it would move risk allocations towards the efficient risk allocations of competitive markets. NSP risk is currently far too low. That is the problem.

Towards an Efficient Regulatory Contract

The biggest problem of current regulatory practice is that it focuses on by-products of competitive markets – asset values and normal rates of return – rather than on how to deliver efficient outcomes on the key dimensions that drive NSB. Four reforms would help achieve more efficient outcomes:

1. Introduce market mechanisms (capacity auctions and secondary markets) to set network capacity/usage prices.

2. Improve network capex decisions by:

   a. leveraging hard evidence produced by market mechanisms and network users to understand the values of capacity expansions;

   b. offering menus of explicit user funding obligations (only where necessary) to NSPs and, where possible, competitive providers;

   c. reallocating investment risks to NSPs.

3. Eliminate RAB values and replace with explicit user funding obligations.

4. Transfer decisions on how user funding obligations are paid from NSPs to regulators, in consultation with network users.

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