SCER request for advice on differences between actual and forecast demand in network regulation – workshop discussion questions

The AEMC is holding a workshop for interested stakeholders in Melbourne on 28 February 2013 on Standing Council on Energy and Resources (SCER) request for advice on how differences in electricity demand should be factored into the economic regulatory framework for network businesses (NSPs).

This review covers both the electricity transmission and distribution networks sectors. Broadly, SCER has asked the AEMC to:

- investigate the implications of differences between actual and forecast demand within the operation of the economic regulatory frameworks applied to electricity NSPs;
- provide advice on the merits of the Australian Energy Regulator (AER) considering differences between actual and forecast demand when undertaking network determinations (in an incentive-based regulatory environment);
- assess how the risks associated with such differences are shared between the NSPs and consumers under the current regulatory frameworks;
- assess how the costs of managing such risks affect consumers and NSPs' incentives; and
- provide advice on whether any changes to the current National Electricity Rules (NER) are needed to ensure consumers receive the benefits of sustained reductions in demand, including but not limited to the AER's ability to consider previously approved capital expenditure (capex) and improvements to NER around annual network tariff setting.

SCER has requested that in considering potential amendments, the AEMC has regard to the need for actions to be proportionate, and not to compromise the ability of the regulatory frameworks to deliver the National Electricity Objective and meet the revenue and pricing principles.

This short paper has been prepared to inform stakeholders of what the AEMC considers to be the key issues for the advice SCER has requested. It also highlights areas that the AEMC would like to explore with stakeholders at the workshop. To that end, a number of questions have been provided for discussion at the workshop. The workshop will not necessarily work through each question sequentially, but it would be helpful if attendees came prepared to discuss the range of issues covered by the questions.

Scope of AEMC's advice

The economic regulatory framework for NSPs under the NER is an incentive-based framework. The AER is required to determine the revenues of distribution businesses (DNSPs) and transmission businesses (TNSPs) through the "building block" approach where allowed revenues are set generally for a five year regulatory control period. These revenues are determined using ex ante forecasts of efficient expenditure over the regulatory control period.

The incentive property of the framework is derived from the fact that once the NSPs' allowable revenues are determined for the regulatory control period, it will keep a share of any cost savings it makes on the ex ante expenditure allowances set by the regulator. In turn, consumers ultimately benefit as the savings are passed on to them in the longer term via efficient investment decisions from the NSP being reflected in lower network prices.

Demand (and in particular peak demand) plays a critical role in driving the investment requirements of the network. Overall system demand also strongly influences the network costs and the revenues to be recovered from consumers through network prices. Network investment decisions largely depend on demand in localised areas than patterns in overall system demand. Likewise, recovery of network revenues will be influenced by changes in demand within particular customer tariff classes. Hence, trends in overall system demand may not give the complete picture with respect to the impact of demand on network costs and prices.

Forecasting demand, whether peak or system demand is inherently a difficult task. It requires a number of assumptions to be made that carry varying degrees of uncertainty such as consumer behaviour, weather patterns and economic activity. It is also becoming increasingly difficult to forecast demand due to the penetration of rooftop solar photovoltaic systems and the impact of energy efficiency and demand management initiatives. While the accuracy of peak and system demand forecasts are important, this issue plus the process the AER employs in making demand forecast for network determinations are out of scope of the AEMC's advice to SCER. However managing the uncertainty associated with demand forecasts is the key focus of the requested advice.

The key focus of this review is how the current regulatory framework manages the risks associated with using demand forecasts to determine the allowed revenues and prices of NSPs over the regulatory control period, which is typically five years.

The risk of outturn demand being materially different from forecast demand creates two types of risks:

1. expenditure risks; and
2. volume risks.

Expenditure risks arise because NSPs' allowed revenues are determined on the basis of a forward-looking assessment by the AER of the efficient level of expenditure over the forthcoming regulatory control period, both capex and opex. The assessment of capex will be heavily dependent on forecast demand, and in particular forecasts of expected peak demand over the period. If NSPs are unable to recover their capex to meet expected demand, then their incentives to undertake efficient expenditure will be impacted. They could face a loss of profit where they undertake additional unforeseen expenditure required to meet their reliability obligations. The impact on the incentives to undertake efficient capex will change during the regulatory control period depending on whether updated forecasts are higher or lower than the demand forecast used to determine the capex allowance at the time of the regulatory determination.

Volume risks relate to the NSPs' ability to recover its allowed revenues from its customers. The translation of allowed revenues into prices depends on forecast demand, and the form of price control mechanism applying to the NSP. Forecast tariff revenue depends on the volumes expected to be sold in relation to each proposed tariff element. Forecasts of customer numbers, volume of energy and maximum demand (where tariffs include a demand charge) all impact the expected level of revenue associated with proposed tariff structures. The exact nature of this risk is dependent on the choice of the control mechanism and the NSPs' ability to restructure its tariffs as demand forecasts change to continue to recover its revenues.

The focus of our advice to SCER will be on:

- how these two risks are allocated between NSPs and consumers in the current economic regulatory framework; and
- the costs and incentives of managing such risks between NSPs and consumers.

In doing so, we will consider both possibilities regarding demand patterns; that is, actual demand may turn out to be more than or less than forecast demand.

We have identified three main areas of the current network regulatory framework that are impacted by demand forecasts in terms of the risks and incentives for NSPs and consumers. These are:

- risks and incentives for NSPs to undertake efficient investments in their networks given demand forecasts;
- risks and incentives arising from the choice of control mechanism (price cap or revenue cap) used to recover the allowed revenues based on expected demand; and
- risks and incentives on how the NSPs structure their network tariffs as demand forecasts change to continue to recover its revenues while still providing efficient pricing signals to consumers to manage their demand.

The following sections briefly expand on each of the issues noted above with some key questions for discussion for the workshop.

Efficient Investment and Forecast Demand

Forecasts of expected future peak demand are a driver for network investment in addition to replacement cycles. In particular, the expected future level of peak demand across the network is a key factor in determining the need to augment the existing transmission and distribution networks in order to ensure that required network reliability standards continue to be met.[1] The level of capex expected to be required over a regulatory control period is therefore heavily dependent on the expected growth in future peak demand.

Forecasts of peak demand may change over the regulatory control period, compared with that assumed at the time of the NSP's regulatory determination. The efficient level of demand-driven capex required to be undertaken by the NSP may therefore also differ from that which was reflected in the capex forecast at the time of the determination when allowed revenues were determined.

If forecast peak demand is greater than actual peak demand, then if investment decisions remained based on forecasts at the time of the determination, they would likely lead to over-investment creating unused network capacity that consumers would be required to pay for. On the other hand, where forecasts of peak demand are revised upwards following the determination, then investment could either be inefficiently deferred until the next regulatory period or NSPs will be required to spend above their capex allowance, in order to ensure that reliability standards continue to be met, and could be penalised as a result.

The current NER framework includes a number of provisions that are intended to balance these risks and provide NSPs with the incentive to undertake the efficient level of investment based on the latest demand forecasts at the time the investment decision is made, regardless of the capex forecast made at the time of the regulatory determination. Some of these provisions were recently reviewed by the AEMC as part of the *Economic Regulation of Network Service Providers* rule change request and a number of changes were made to improve the NSPs' incentives to invest capital efficiently.[2] The new provisions included:

- improved clarity and removal of ambiguities regarding the powers of the AER to interrogate, review and amend capex and opex proposals submitted by NSPs for a regulatory control period;

[1] The assessment of whether network augmentation is required in order to continue to meet reliability standards is a forward-looking assessment, and is therefore based on forecasts of future peak demand, rather than actual outturn peak demand (although changes in outturn peak demand can be expected to be a key factor underlying changes in forecast peak demand.

[2] See AEMC, *Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services*, Final Rule Determination, 29 November 2012.

- the ability of the AER to determine the extent of actual capex to be rolled into the NSP's Regulatory Asset Base (RAB).The actual capex undertaken by the NSP over the regulatory control period to be rolled into its RAB at the time of the next regulatory determination may be higher or lower than the level of investment underpinning its capex allowance at the time of the earlier regulatory determination; and
- prior to rolling in actual capex into the RAB, the AER has the option of undertaking a review of the efficiency and prudency of the NSP's investment, where the total capex in the regulatory control period exceeds the capex forecast at the time of the determination, and where the AER's *Capital Expenditure Incentive Guidelines* have included the possibility of such an ex post review.

The current NER also requires the AER to develop appropriate approaches to provide incentives for efficient investment during the regulatory control period. Specifically, the NER requires the AER to develop a *Capital Expenditure Incentive Guidelines*, which sets out how its approach adopted to various aspects of the treatment of capex meets the *capital expenditure incentive objective* set out under the NER.[3] Such incentive arrangements can incorporate the roll-forward of the RAB on the basis of actual or forecast depreciation (where the former provides a stronger incentive for efficient expenditure) and the introduction of a specific capex incentive scheme (capital expenditure sharing schemes).

Taken together, these provisions are intended to provide incentives for NSPs to only undertaken the efficient level of capex implied by the most recent forecasts of demand, regardless of the capex allowed at the time of the determination.

In addition, the NER also contains provisions relating to:
- requiring the majority of network investment to be subject to an additional regulatory investment test (RIT-T for TNSPs and RIT-D for DNSPs), including investment undertaken in order to ensure network reliability standards continue to be met where peak demand is increasing. As part of these tests, NSPs must consider non-network options, as well as the option value associated with particular investments (where material); and
- ensuring that DNSPs have incentives to undertake demand-management (in particular the Demand Management and Embedded Generator Incentive Scheme.

The NER also includes several mechanisms to address uncertainty – namely, contingent projects framework, capex re-opener mechanism and cost pass-through provisions. Each of these mechanisms may have the potential to address the uncertainty associated with changes in forecast peak demand during the regulatory control period, to a greater or lesser extent.

Another way that NSPs can manage risks associated with changes in demand forecast is though demand management options. However, demand management solutions may only offer a temporary solution to additional network investment. Nonetheless, NSPs are required under the NER to consider non-network solutions in proposing their expenditure proposals to the AER as part of their revenue determination.

The request for advice also asks the AEMC to consider whether the NER should be amended to the AER's ability to consider previously approved capex. This issue has been considered in the *Economic Regulation of Network Service Providers* rule change as well as in the *Optimisation of Regulatory Asset Base and Use of Fully Depreciated Assets* rule change.

[3] In developing these guidelines, the AER is required to have regard to the capital expenditure incentive objective, which ensures that where the value of the RAB is subject to an adjustment, then the only capex that is included in an adjustment that increases the value of that RAB is capex that reasonably reflects the capital expenditure criteria.

In summary, current provisions in the NER attempt to balance the risks to consumers from over-investment and under-investment by incentivising NSPs to make efficient investment decisions as forecast demand conditions change.

Questions for discussion

1. **How do NSPs respond to changes in demand and factor them into their investment planning processes within the current framework?**
    a. **What options do NSPs have to delay or bring forward capex in response to changes in demand during their regulatory control period?**
    b. **Are there any differences between transmission and distribution NSPs?**

2. **How should the regulatory framework recognise the investment risks from changing demand?**
    a. **What are the costs of these risks?**
    b. **Does the current regulatory framework provide appropriate mechanisms to manage the risks and provide the right incentives for efficient investment?**

Revenue Recovery and Forecast Demand

Differences between the forecast volumes at the time of the regulatory determination and actual outturn demand have the potential to affect both the revenues received by the NSP during the regulatory control period and its costs (and hence profits).

The relationship between the volume risk and actual revenue earned by the NSP over the regulatory control period will depend on the form of control mechanism determined by the AER. Under some forms of control mechanism (ie a weighted average price cap (WAPC) or an average revenue cap), the amount of revenue earned will differ from the allowed revenues forecast at the time of the regulatory determination, where actual outturn demand differs from forecast demand.

The form of control mechanism determines how the NSP's revenues vary (if at all) due to differences between forecast and actual demand over the regulatory control period and who bears the risk associated with costs changing due to differences between forecast and actual demand. The impact on the magnitude of the risk from the choice of control mechanism does not necessarily exist in isolation, but are related to decisions by the AER in other areas of the regulatory framework. For instance, the choice of a particular control mechanism will impact on the the risk profile of the NSP, which in turn could have implications for its allowed rate of return. In addition, decisions by the AER on how investment uncertainty will be managed during the regulatory control period and how much flexibility NSPs have in restructuring their network tariffs also impact on the ability of NSPs to recover its revenues from the control mechanism it is subject to.

For TNSPs, the AER is required by the NER to apply a revenue cap. For DNSPs, the AER is able to exercise its discretion in selecting what control mechanisms to apply from a range that includes a revenue cap, a WAPC, an average revenue form or any combination of the three.

A brief explanation of various forms of control mechanisms permitted under the NER is provided in Appendix A.

The NER lists the factors that the AER must have regard to in deciding on a control mechanism. These factors include:

- the need for efficient tariff structures;
- the possible effects of the control mechanism on administrative costs of the AER, the DNSP and users or potential users;
- the regulatory arrangements (if any) applicable to the relevant service immediately before the commencement of the distribution determination;
- the desirability of consistency between regulatory arrangements for similar services (both within and beyond the relevant jurisdiction); and
- any other relevant factor.

To date, the control mechanisms determined by the AER have continued to reflect the mechanisms applied by the previous jurisdictional regulators for each DNSP. This has meant that currently, there is a varied approach across jurisdictions. However, in its most recent Framework and Approach Paper for the ACT and NSW DNSPs 2014-2019 determinations, the AER reassessed the appropriateness of the existing control mechanisms and has proposed a change to the control mechanism currently being used for these DNSPs.[4]

In addition to the criteria listed in the NER, the AER also included three additional factors in proposing a preliminary position of a revenue cap control mechanism for the ACT and NSW DNSPs 2014-2019 determinations. These additional relevant factors were:

- volume risk and revenue recovery;
- price flexibility and stability; and
- incentives for demand side management.[5]

The AER concluded that the benefits from a higher likelihood of recovery of efficient costs under a revenue cap outweigh the detriments of within period price instability and weak efficient pricing incentives under the current WAPC control mechanism for NSW DNSPs and the revenue yield control for the ACT DNSP.[6] The AER has noted that that the theoretical incentives for efficient pricing provided by the WAPC have resulted in little practical benefit in DNSPs' pricing.[7]

Questions for discussion

3. **How does each form of control mechanism permitted in the current framework affect an NSP's risk of recovering its allowed revenues?**
    a. **How does revenue cap and price cap approach balance the volume risks from changes in demand?**

4. **Is there appropriate consideration of consumer impacts in the choice of form of control mechanism under the current arrangements?**

5. **Is the current framework adequate to recognise the costs and benefits of volume risks?**
    a. **Are the control mechanism criteria in the NER for DNSPs appropriate?**
    b. **How do other aspects of the regulatory framework manage the revenue recovery risks?**

[4] AER, *Framework and approach paper – Ausgrid, Endeavor Energy and Essential Energy*, June 2012, p. 36. and AER, *Framework and approach paper– ActewAGL*, June 2012, p. 46.
[5] Ibid.
[6] Ibid.
[7] Ibid.

Tariff Pricing and Forecast Demand

In determining the appropriate tariff structures to recover its allowed revenues, the NSP will have regard to the form of control mechanism it is subject to and the risk of it not being able to recover its allowed revenue due to differences between actual and forecast demand.

If tariffs are not cost reflective (ie fixed and variable cost components are not proportionally recovered by fixed and variable charges), then changes in demand may result in over or under recovery of costs, and therefore changes in NSP profitability.

In the case that a portion of fixed costs are being recovered by variable charges, the NSP will under recover its costs when demand falls. Under recovery occurs even when network investment falls concurrently with falling demand, as NSPs must still recover the fixed cost of the existing network.

An ongoing reduction in demand may lead NSPs to seek to modify tariff structures so that fixed costs continue to be recovered. This may be accomplished by rebalancing fixed and variable tariff components so that they accurately reflect the underlying breakdown between fixed and variable costs. An alternative may be the introduction of new fixed tariff components, such as demand charges related to the maximum MW consumed over a period. Increases in the charges associated with initial MWh consumption bands under inclining block tariffs may also have the same impact, by increasing the total amount paid by customers in relation to their base consumption levels.

In this regard, we note a recent example from a NSW DNSP that was faced with the risks of falling demand. Ausgrid, in its 2012-2013 pricing proposal, decided to "transition its transmission tariffs to cost reflective levels," and noted that "the future uncertainty in Ausgrid's volume environment… highlights the need for Ausgrid to continue to improve the cost reflectivity of network tariffs."[8]

Another example of DNSPs responding to volume risk is cited by the AER in regard to the Victorian DNSPs pricing experience over the 2006–10 regulatory control period.[9] The AER notes the potential for substantial over recovery of revenue by DNSPs under the WAPC. In the Victorian DNSPs example, there was over recovery of revenue of $568 million (in real $2010) above the adjusted forecast. According to the AER, this represents an over recovery of revenue of 8.28 per cent annually for each DNSP, leading it to conclude that volume of sales forecasts result in a degree of forecast error that will result in windfall gains and losses to consumers from year to year.[10]

The current NER framework requires the DNSPs to submit an annual pricing proposal to the AER for approval that set out its proposed tariff classes for the upcoming regulatory year and the proposed tariffs and charging parameters that correspond to each of these tariff classes. They also include information, including demand forecasts, which supports the DNSP's proposed tariffs.

The annual pricing proposals must comply with a set of principles set out in the NER. These principles can be summarised as follows:

- The revenue of each price class must be greater than the incremental cost and less than the standalone cost of the service.[11]
- DNSPs must take into account the long run marginal cost (LRMC) for a network service in setting network prices.[12]

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[8] Ausgrid, *Network Pricing Proposal for the financial year ending June 2013, May 2012*, p. 6-7, 9.
[9] AER, *Framework and approach paper – Ausgrid, Endeavor Energy and Essential Energy*, June 2012, p. 36. and AER, *Framework and approach paper– ActewAGL*, June 2012, pp. 55, 126-130.
[10] Ibid.
[11] NER, Clause 6.18.5(a).
[12] NER, Clause 6.18.5(b)(1).

- DNSPs must have regard to (i) transaction costs associated with the tariff, and (ii) whether retail customers of the relevant tariff class are likely to respond to price signals in setting network prices.[13]
- Where the above principles do not result in prices which recover expected revenue, the DNSP must adjust prices in a way that minimises distortion to efficient patterns of consumption.[14]

In addition to the above principles, prices for standard control services must also comply with the ‘side constraints’ outlined in the NER.

Appendix A briefly outlines the risks and incentives NSPs face in how they structure their tariffs to ensure they can recover their allowed revenues within a regulatory control period.

Questions for discussion

6. **What incentives and risks are created for efficient tariff structures from the choice of control mechanism?**
7. **How much discretion should NSPs have in restructuring their network tariffs? Should DNSPs under a price cap be allowed to restructure their tariffs as means of managing volume risks?**

[13] NER, Clause 6.18.5(b)(2).
[14] NER, Clause 6.18.5(c).

APPENDIX A – Form of Control Mechanisms

Revenue Cap

A revenue cap form of control is where there is a direct limit on the maximum allowed revenue (MAR) that a NSP can earn in any year. Revenue caps are normally coupled with a 'truing-up' mechanism that deals with any unforeseen variations in demand that lead to an over-/under-recovery of target maximum revenue.

The MAR for each year of the regulatory period is established at the start of the regulatory period. The MAR is normally established using a CPI-X revenue path, where the X-factor is set to ensure that the present value of the forecast revenue (ie, proposed tariffs multiplied by expected volumes) equals the present value of the building block revenue requirement.

For each year within a regulatory control period, a NSP's proposed prices are approved if:

Forecast revenue from proposed tariffs *(Forecast demand x proposed tariffs)*	≤	*MAR for that year*

The MAR for a particular year is equal to the (smoothed) annual revenue requirement plus any unders/overs adjustment, ie the difference between the MAR for the previous year and the actual revenue earned by the NSP for that year.

As part of the annual price setting process, NSPs propose new tariffs for the forthcoming year on the basis of its latest demand forecasts. Therefore, under a situation where kWh demand is falling relative to forecasts at the time of the regulatory determination, prices per kWh will increase (all else equal) in order to recover the MAR (which remains unchanged). Conversely, per kWh prices would decrease (all else equal), under a situation where kWh demand is rising relative to expectations at the time of the regulatory determination. An example of a change in demand relative to initial expectations is outlined in Box A.1 below.

Under a revenue cap, customers therefore bear the risk that a decrease in demand over the regulatory period will increase prices over the period.

If outturn demand falls below that forecast for a particular year, the NSP will earn less than the MAR for that year. However, to make up for this, the 'true-up' mechanism allows the NSP to receive the shortfall revenue (multiplied by the WACC, to account for the time value of money) as part of their MAR in the following year.

Overall, a revenue cap provides the NSP with a guaranteed amount of revenue (in NPV terms) over the regulatory control period, independent of actual demand. Put another way, allowed revenue received by the NSP under a revenue cap is always exactly equal to the expected revenue at the time the building block is determined.

Where demand falls relative to what was forecast for a particular year, the NSP will recover the same amount of revenue. However, the NSP's costs may also decrease with lower demand. While the majority of NSP costs are fixed, some of its costs are variable and would decrease with a fall in demand. In addition, the NSP may be able to defer or even avoid investment, where demand is lower. In this situation, the NSP's profits would increase for that particular year.

Conversely, under circumstances where demand increases relative to what was forecast for a particular year, the NSP will recover the same amount of revenue, even where it's underlying costs increase. In this situation, the NSP's profits will fall for that particular year.

Box A.1 - Impact of changing demand under a revenue cap

Suppose an NSP has an annual fixed cost of $100/customer, a variable cost of $1/kWh and currently serves 1,000 customers. Suppose also that the NSP has a MAR for the upcoming year of $120,000 and it expects annual demand to be 20MWh.

If the NSP sets a fixed tariff of $70/customer and a variable tariff of $2.50/kWh the NSP would earn the following revenue and profit:

- Revenue: $120,000, ie, (1,000 customers x $70/customer) + (20,000kWh x $2.50/kWh); and
- Profit: $0, ie, $120,000 – [(1,000 customers x $100/customer) + (20,000kWh x $1.00/kWh)]

These tariffs would be approved, since the expected revenue is equal to the MAR.

If demand for the year turns out to be lower than the initial 20MWh expected, the NSP will collect less revenue in that particular year. For example, suppose that outturn demand is only 15MWh, the NSP would earn the following revenue and profit:

- Revenue: $107,500, ie, (1,000 customers x $70/customer) + (15,000kWh x $2.50/kWh); and
- Profit: -$7,500, ie, $107,500 – [(1,000 customers x $100/customer) + (15,000kWh x $1.00/kWh)]

However, under a revenue cap there would be a 'truing-up' of revenue in the subsequent period. Specifically, $12,500[15] (ie, $120,000 - $107,500) would be added to the following year's MAR, bringing it to $132,500 (for simplicity we have assumed the un-adjusted MAR for the subsequent year is again $120,000).

As part of the annual price reset process, the NSP would again have an incentive to structure its tariffs so that it expects to earn its MAR for the year, ie, $132,500. In addition, the NSP would take account of the latest (lower) demand forecast when structuring tariffs for this subsequent period, ie, 15MWh.[16]

Incentives and risks under a revenue cap

Under a revenue cap, NSPs do not have an incentive to set prices in order to reflect the underlying costs of supply, given that they receive the same, fixed amount of revenue over the regulatory control period irrespective of the prices they set.

Under a revenue cap, the NSP has an incentive to minimise the cost of providing its services, since revenue received will remain unaffected, resulting in improved profitability.
A revenue cap may provide incentives for inefficient pricing in some cases. Because revenue is fixed, there is an incentive for an NSP to increase prices above costs on price sensitive services. By doing so, demand for such services will fall, reducing the overall associated costs while maintaining a high rate of return.

An NSPs' incentive to provide demand management solutions are not undermined under a revenue cap, given that revenue received remains unaffected by reductions in demand. Because revenue is fixed, DNSPs can benefit (at least in the short term) by implementing demand side management projects which reduce demand and therefore costs.

[15] For simplicity, we have assumed dollars are in constant, real terms between periods and so a net present value calculation is not necessary.
[16] For simplicity, we have assumed the reduction in demand is perceived by the NSP to be permanent in nature, rather than being perceived as being 'one-off'.

Weighted Average Price Cap (WAPC)

A WAPC form of price control is where the limit on price increases during a regulatory period is set in terms of a weighted average of the prices charged by the NSP, with this changing over time based on a “CPI-X” formula.

The “X factors” are calculated at the time of the determination by setting the NPV of the allowed tariff revenue over the regulatory period equal to the NPV of the forecast revenue requirement (calculated using the building block approach). In estimating future tariff revenue at the time of the determination, forecast quantities for each year are coupled with assumed prices for each tariff component.

The NSP is able to rebalance tariffs (eg, increasing/decreasing some tariffs more than others) under the control, provided that the cap on the overall weighted average price is not breached, and subject to a separate rebalancing constraint set out in the NER.

Unlike a revenue cap, under a WAPC, changes in actual demand compared to that forecast at the time of the determination directly affect the revenue received by an NSP over a regulatory control period. The revenue earned by the NSP depends upon its approved tariffs and the actual quantities sold at those tariffs, in each year. If demand falls below that forecast for a particular year, the NSP will earn less than their expected revenue for that year at the time of the regulatory determination. Conversely, if electricity demand is greater than forecast for a particular year, the NSP will earn more revenue than expected.

An example of a change in demand relative to initial expectations is set out in Box A.2 below.

Where DNSPs are under a WAPC price control mechanism, the WAPC places volume risk during the regulatory control period on DNSPs. While the volume risk rests with the DNSP under a WAPC, the link between volumes sold and allowed revenue may act as a disincentive on DNSPs to undertake demand management initiatives. Reductions in volumes reduce the revenues earned by the DNSP. Where the reduction in revenue does not also represent a reduction in the costs faced by the DNSP, it would also reduce their profitability. The DMEGIS is intended to counter this disincentive, by allowing prices to be adjusted to reflect foregone revenue as a result of having undertaken (approved) demand management initiatives.

Box A.2 - Example of changing demand under a WAPC

Consistent with Box A.1 above, suppose a NSP has an annual fixed cost of $100/customer, a variable cost of $1/kWh and currently serves 1,000 customers with the expectation that annual demand will be 20MWh.

Suppose that the NSP chooses to set a tariff structure that is not aligned with its underlying cost structure. Specifically, assume the NSP chooses to do this by charging a fixed tariff of $70/customer and a variable tariff of $2.50/kWh. The NSP would expect to earn the following revenue and profit:

- Revenue: $120,000, ie, (1,000 customers x $70/customer) + (20,000kWh x $2.50/kWh); and
- Profit: $0, ie, $120,000 – [(1,000 customers x $100/customer) + (20,000kWh x $1.00/kWh)]

This tariff strategy exposes the NSP to profit risk if demand turns out to be lower than expected. For example, suppose that outturn demand is only 15MWh, the NSP would earn the following revenue and profit:

- Revenue: $107,500, ie, (1,000 customers x $70/customer) + (15,000kWh x $2.50/kWh); and
- Profit: -$7,500, ie, $107,500 – [(1,000 customers x $100/customer) + (15,000kWh x $1.00/kWh)]

Under a WAPC the shortfall in revenue is not made-up in later years by an adjustment to the price cap (in contrast to a revenue cap). As a consequence, the NSP would make a loss in this case.

This profit risk can managed if the NSP instead sets a tariff structure in-line its underlying cost structure, ie, a fixed tariff of $100/customer and a variable tariff of $1.00/kWh. When tariffs are in-line with costs, the NSP would expect to recover its costs under any demand volumes, ie:

If demand is 20MWh as expected, the NSP would earn the following revenue and profit:

- Revenue: $120,000, ie, (1,000 customers x $100/customer) + (20,000kWh x $1.00/kWh); and
- Profit: $0, ie, $120,000 – [(1,000 customers x $100/customer) + (20,000kWh x $1.00/kWh)]

If demand is lower than expected (ie, 15MWh), the NSP would earn the following revenue and profit:

- Revenue: $115,000, ie, (1,000 customers x $100/customer) + (15,000kWh x $1.00/kWh); and
- Profit: $0, ie, $115,000 – [(1,000 customers x $100/customer) + (15,000kWh x $1.00/kWh)]

The NSP therefore has an incentive to set their tariff structures to reflect their underlying cost structure under a WAPC as it minimises their profit risk.

Incentives and risks under a WAPC

The greatest risk to revenue recovery results from a WAPC form of control mechanism.

Under a WAPC, NSPs have an incentive to set their tariff structures to reflect their underlying cost structure, as this will minimise their profit risk.

Where the weights applied in the WAPC constraint are based on actual quantities sold previously, NSPs also face an incentive to set prices with regard to how fast or slow demand for each of the different price components is growing. NSPs can increase their overall revenue by increasing prices the most for those price components for which demand is growing at the fastest rate, given the weights in the WAPC formula are based past demand data. If a NSP knows demand for a particular service is growing, it has an incentive to increase the price charged for this service in the current year as it can increase its revenue received given that its actual revenue will reflect the actual quantity sold at the higher tariff.

NSPs also have an incentive to keep prices constant (or to raise them more slowly) on those components where demand is falling, in order to limit the decline in expected overall revenue as a result of reducing demand for some services.

Average Revenue Cap

Another price control mechanism available to the AER under the NER for DNSPs is a the "average revenue cap". Under this form of control (also known as a 'revenue yield' control), a cap is placed on the average revenue per kWh the DNSP is allowed to earn per year. Average revenue is calculated as total revenue divided by total output, and so requires a homogenous unit of output in order for a 'total output' measure to be established, ie, kWh.

The average revenue per unit is typically calculated by dividing the MAR calculated at the time of the determination by the forecast kWh of output. It is then allowed to vary throughout the regulatory period on the basis of a 'CPI-X' formula. The DNSP must ensure that the average revenue per unit in a given year (calculated using proposed prices and forecast quantities for that year) is less than or equal to the maximum allowed average revenue per unit. This is represented by the following formula:

$$\sum \frac{p_t q_t}{q_t} \leq \mathrm{Re}\,vYield_{t-1}(CPI - X)$$

Importantly, the amount of revenue earned on each *individual* unit (as opposed to the *average* revenue per unit) is not regulated. Therefore, the NSP has a degree of flexibility in setting individual tariffs within this price control.

Changes in demand directly affect the revenue received by a DNSP each year under a revenue yield form of price control. The revenue earned in a particular year by an NSP depends upon the actual prices applying and the actual quantities sold of each of the charging parameters. If demand falls below that forecast for a particular year, the DNSP will earn less than its expected revenue for that year. Conversely, if demand is greater than forecast for a particular year, the NSP will earn more revenue than expected.

Overall, under a revenue yield, NSPs bear the volume risk given the revenue received for a particular year depends on the quantities sold.

Incentives and risks under revenue yield

Under the revenue yield form of price control, NSPs cannot manage profit risk through changes in their tariff structures. This is because the amount of revenue earned on each *individual* unit (as opposed to the *average* revenue per unit) is not regulated, creating a mismatch between marginal revenues and marginal costs. Instead, NSPs are provided with incentives to design tariff structures which do not necessarily reflect cost structures, but promote distribution of additional output as this will increase their revenues.

Specifically, the revenue yield cap implies that each additional unit attracts the per kWh allowance, regardless of the actual tariff applied to that unit. As a result, NSPs face incentives to increase the units of energy distributed by the lowest cost method (ie so long as the marginal cost of the incremental unit does not exceed the revenue allowance). Further, in those segments of the market where total demand can be increased at relatively low marginal cost, NSPs have an incentive to lower prices below economically efficient levels, in order to increase their overall profitability.

The link between volumes sold and allowed revenue may also act as a disincentive on NSPs to undertake demand management initiatives (as it reduces the revenue they are allowed to earn), and may encourage NSPs to expand volumes by non-price means.