Pricing and Regulatory Working Group

Action Item from 3 March 2021

What is the benefit of a shift to cost reflective network tariffs?

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1. Executive Summary

Prior to the Australian Energy Market Commission (**AEMC**) rule change requiring a move to more cost reflective pricing, considerable research and analysis was undertaken to assess the benefits of such a shift in the way electricity services are priced. Joint research by Energy Networks Australia (**ENA**) and the CSIRO was undertaken, and their *Electricity Network Transformation Roadmap* report ("the roadmap") assessed the benefits of shifting to cost reflective tariffs.

In the roadmap, direct benefits of cost reflective tariffs do not just reduce network expenditure, but also generate economic and customer benefits. For example, investment in improving zone substation capacity across the National Electricity Market (**NEM**) could be reduced from $21 billion to $19 billion[1] and generate an approximate three per cent reduction in required zone substation capacity predominantly through deferring augmentation expenditure (**augex**) and replacing smaller. However, the report roadmap makes clear that these benefits are only realised if there is sufficient uptake of cost reflective tariffs. Further, cost reflectivity is the precursor to efficient and fair pricing for distributed energy resources (**DER**).

Subsequent research by the AEMC has been undertaken to allow for flexible pricing solutions at the network level to enable two-way pricing for export services associated with the growth in DER and the increasing transition to renewable generation. This proposal is to further incentivise customers to better utilise the network and DER technology and enable cost allocation in a more equitable and efficient way. The draft rule change for *Access, pricing and incentive arrangements for distributed energy resources* was published in March 2021[2] ("the draft rule").

The implementation of cost reflective tariffs represents the first wave of tariff reform, and that further reform is necessary to accommodate DER technologies. The benefit of just using cost reflective tariffs as a mechanism to constrain expenditure is likely to be eroded beyond 2026 due to the projected high penetration of distributed battery storage, and the potential for behaviour change among those customers who are able to invest – i.e. customers discharging their batteries to offset their individual peaks and uncontrolled charging of batteries during off-peak.

If there is an accelerated transition of customers to more cost reflective tariffs by 2027 and new technologies are supported by innovative new pricing options, customers – both with or without DER – will experience improved fairness by reducing the gap in project bill outcomes between active and passive customers.

To not transition effectively to cost reflective tariffs and prepare mechanisms for the next wave of technologies, would result in over investment in the network, higher average electricity bills and unfair cross-subsidies paid by some customers. Despite the additional complexity that DER technologies will generate, there remain benefits to pursue the uptake of cost reflective tariffs and further refine these tariffs to offset the initial unintended consequences of battery storage exploitation.

TasNetworks' *emPOWERing You trial* revealed the different behaviours of customers and that there are customers who will respond strongly to cost reflective tariffs compared to those who will not respond at all. In a small sub-group of the trial participants, the magnitude of the response was a reduction in peak consumption was in excess of 30 per cent and peak demand of 15 per cent. Overall, the reduction in the maximum demand recorded during the peak periods for these customers on the system peak days was 27.3 per cent, indicating that there are potential network efficiency benefits to be realised.

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[1] 2026 timeline assumed

[2] https://www.aemc.gov.au/sites/default/files/2021-03/Draft%20Determination%20-%20ERC0311%20and%20RRC0039%20-%20Access%20Pricing%20and%20Incentive%20arrangements%20for%20DER.pdf

2. Findings

Cost reflective pricing is being delivered as the first wave of the tariff reform process. These pricing mechanisms are intended to transition customers towards more equitable network prices and reduce the gap between customers who are able to invest in DER technologies (active customers) and those who are unable to implement DER technologies (passive customers). This equity is achieved through ensuring that network investment is properly targeted and network utilisation is efficient.

A fairer system of prices can be achieved in a reasonable timeframe through changes to the tariff assignment policy which may result in positive economic benefits. However studies have demonstrated that most customers are unlikely to change tariffs even if it is shown that they would be financially better off.

Over $16 billion in network savings (across the NEM) can be achieved by 2050 through improving existing tariffs – including introducing new network tariffs and retail pricing options and establishing frameworks for networks to buy grid services from customers with DER.

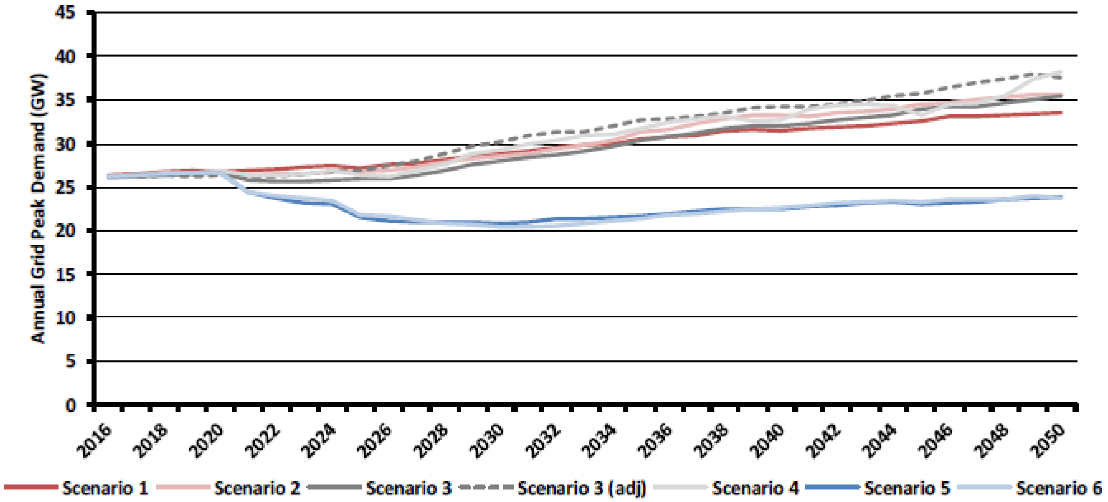
3. Energy Network Australia and CSIRO Analysis

In 2016 Energy Networks Australia (**ENA**) and the CSIRO conducted analysis[3] into determining the benefits to electricity networks of moving to cost reflective pricing. This analysis included a number of scenarios (Appendix 1).

3.1. Network Peak Demand

The drivers or investment are influenced by localised peak demand and that there is often very little relationship between local and system peaks. Figure 1 shows the non-coincident (i.e. the sum of individual peak demand at each zone substation) over the modelling period.

Figure 1 - Non-coincident zone substation peak demand



Source: Network Transformation Roadmap: Work Package 5 – Pricing and Behavioural Enablers - Network Pricing and Incentives Reform – October 2016, Figure 20

In the years between 2021 and 2026 the First Wave scenarios (Scenario 2 to 3 (adj)) – which are underpinned by opt-out tariff assignment mechanisms reduce non-coincident demand compared to the base scenario (Scenario 1). From 2026, the effectiveness of the maximum demand tariffs begins to erode as storage uptake reaches critical mass (Scenario 4). Note the different outcomes in the Second Wave scenarios 5 and 6, where the strategy is to attract customers to allow for any installed battery storage to be accessed periodically to optimise utilisation and to avoid any new peaks in co-ordinated battery charging.

These results indicate the effectiveness of First Wave tariff structures over the period 2016 to 2026 in reducing network peak demand relative to the base case.

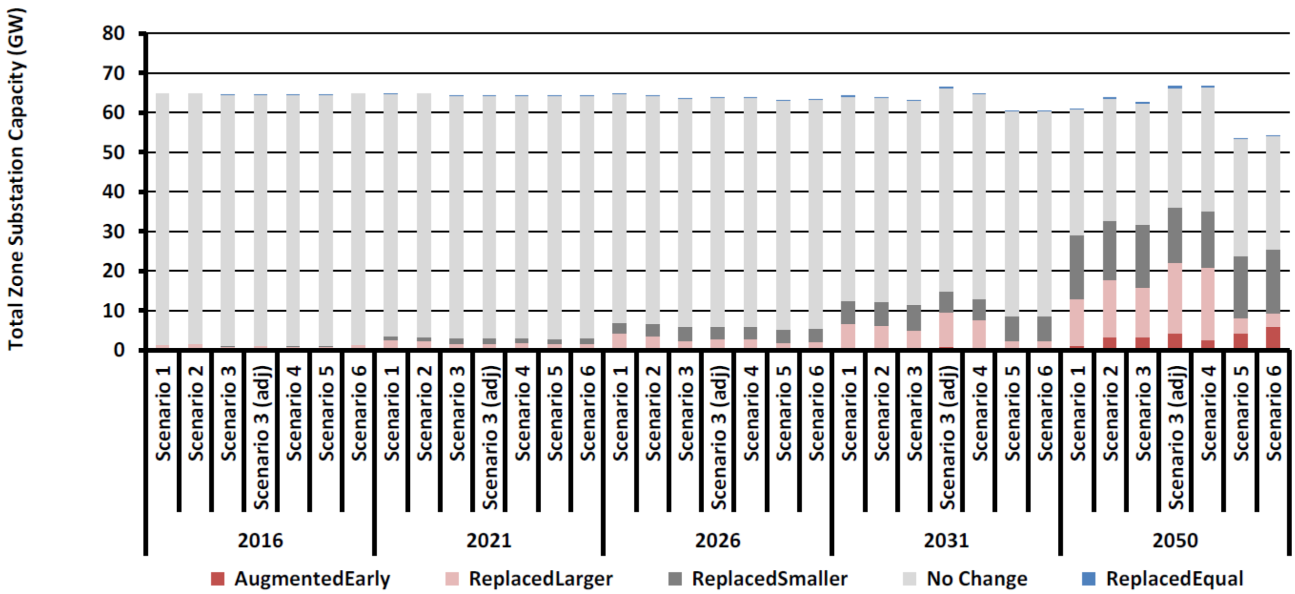
[3] Network Transformation Roadmap: Work Package 5 – Pricing and Behavioural Enablers - Network Pricing and Incentives Reform – October 2016

3.2. Network Capacity

To drive down network costs, the performance of each scenario depends on whether augmentation drivers can be eliminated and/or replacement expenditure (**repex**) is either smaller or equal sized rather than larger.

Figure 2 shows that between 2016 and 2021 there are very few drivers for investment, however from 2021 different investment driver patterns emerge. From 2021, replacement activities are being undertaken across all scenarios. Consistent with network peak analysis, from 2031 more investment in network capacity will be required in scenarios 1 to 4 created by unmitigated off peak charging of battery storage.

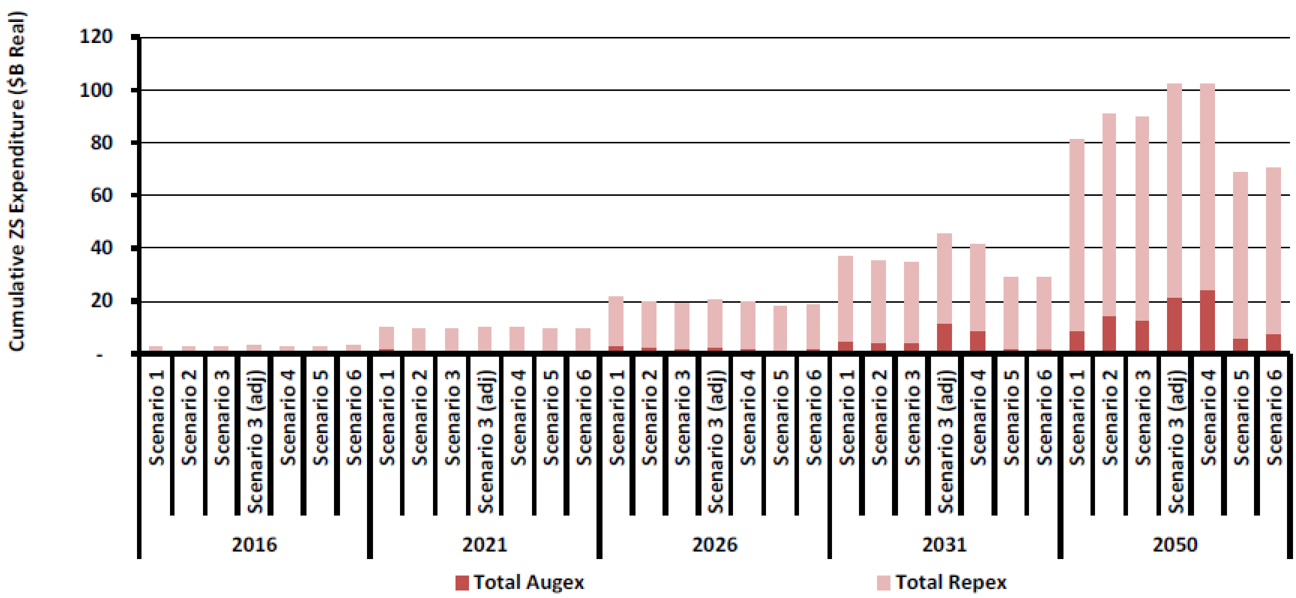
Figure 2 - Total zone substation capacity requirements by investment drivers



Source: [Network Transformation Roadmap: Work Package 5 – Pricing and Behavioural Enablers - Network Pricing and Incentives Reform – October 2016, Figure 22]

This translates into the overall investment expenditure in zone substation capacity to 2026 is $21B, 82% of which is driven by repex. Under an opt-out assignment mechanism – under the first wave – this is able to be reduced to $19B by deferring augmentation expenditure (**augex**) and replacing smaller (Figure 3).

Figure 3 - Expenditure on zone substation capacity requirements



Source: [Network Transformation Roadmap: Work Package 5 – Pricing and Behavioural Enablers - Network Pricing and Incentives Reform – October 2016, Figure 23]

Beyond 2031, the new peaks created by battery storage charging during off peak periods will increase investment in zone substation capacity. New incentives proposed in the Second Wave scenarios will further drive down network costs and offset impacts created by scenarios 1 to 4.

However, implementation of these first wave tariffs can effectively reduce network costs compared to the base case until around 2026. Beyond 2026, careful consideration will be needed to tariff structures to avoid over incentivising battery storage and the mitigation of off-peak charging impacts.

3.3. Residential Bill impacts

Network investment can be reduced by up to $1.4 billion by 2026 through transitioning customers to cost reflective tariffs early, resulting in lower network costs and reducing cross subsidies. By 2050, over $16 billion in network savings can be achieved by also introducing new network tariffs, including establishing frameworks for networks to buy grid services from customers with DER.

There are two key sources of savings in residential electricity bills under the roadmap.

- Reformed prices and incentives for network optimisation of DER, and
- More efficient utilisation of the capacity.

While electricity bills will increase due to higher costs associated with decarbonisation, the average residential electricity bill is lower in the roadmap scenario. Due to fairer tariffs, a mid-size family who were passive consumers of electricity and have not installed DER would be $350 better off in 2027[4].

However, average customer outcomes do not provide all the information on different types of households. Further analysis based on different household profiles to compare the baseline (counterfactual) and the roadmap included both active (i.e. customers who are active in seeking DER to reduce electricity bills) and passive (i.e. customers who do not or are unable to invest in DER) customers. The analysis revealed that there are two clear benefits:

- All customers are better off, whether they are active or passive
- The 'gap' between active and passive customers have narrowed across the households.

Table 1 - Residential bill outcomes for selected Australian household types in 2050 under the Counterfactual and Roadmap scenarios

	Counterfactual				The Roadmap				Change in the Gap
	$ Active	$ Passive	$ Gap		$ Active	$ Passive	$ Gap		
Working Couple	$1,346	$1,811	**$465**	35%	$1,123	$1,422	**$299**	27%	-36%
Medium Family	$1,816	$2,601	**$785**	43%	$1,428	$1,988	**$560**	39%	-29%
Large Family	$2,794	$3,950	**$1,156**	41%	$2,346	$2,734	**$288**	12%	-75%
Single, Retired	$1,058	$1,730	**$672**	64%	$883	$1,355	**$472**	53%	-30%

Source: Economic Benefits of the Electricity Transformation Roadmap, Table 12

4 https://www.energynetworks.com.au/resources/reports/economic-benefits-of-the-electricity-network-transformation-roadmap/

Appendix 1 Scenarios

			First Wave Tariff Type	First Wave Tariff Assignment	SAPS Tariff	Second Wave Incentive Type	Second Wave Assignment Mechanism
First Wave Scenarios	Scenario 1 (Base case)	Current structures, peak and residual charge mechanisms and tariff assignment mechanisms are retained until 2050. For the most part, this implies that customers remain on block/flat rate tariffs unless they opt-in.	Demand based tariff as per Draft TSSs	Opt-in	None	None	NA
	Scenario 2	Base case + more proactive response to existing tariff assignment and uptake policies where customers are assigned to max demand tariffs and advanced metering for all new, altered or additional connections and any customer who adopts DER.	Demand based tariff as per Draft TSSs	Opt-out for new, replacement, and mandatory for new and additional DER from 2021	None	None	NA
	Scenario 3	A further proactive increase in response to tariff assignment and uptake where customers are assigned to max demand tariffs in 2021 and provisioned with advanced metering on an opt out basis.	Demand based tariff as per Draft TSSs	Opt-out from 2021	Opt-in from 2021	None	NA
	Scenario 3 (adjusted)	Has the same proactive increase in network tariff and advanced metering assignment as Scenario 3, but with a restructuring of the residual component of tariffs in 2021 at the same time as the opt-out tariff assignment mechanism is implemented.	Demand based with reduced residual volume component	Opt-out from 2021	Opt-in from 2021	None	NA
Second Wave Scenarios	Scenario 4	Represents a shift to more dynamic tariff – it offers a critical peak price (CPP) from 2021 on an opt-in basis.	Demand based tariff as per Draft TSSs	Opt-out from 2021	Opt-in from 2021	Critical Peak Price (system level)	Opt-in from 2021
	Scenario 5	Represents locational pricing incentives – customers are transitioned to locational, dynamic pricing from 2021, and choose whether they operate their DER themselves or allow the network/3rd party aggregator to manage their technology.	Demand based tariff as per Draft TSSs	Opt-out from 2021	Opt-in from 2021	Incentive in exchange for operational access and periodic use of existing DER	Opt-in from 2021
	Scenario 6	Scenario 5 + an incentive for a firm level of DER to address any shortfalls in scenario 5 – this only operates in zone substations facing imminent investment.	Demand based tariff as per Draft TSSs	Opt-out from 2021	Opt-in from 2021	Incentive in exchange for operational access and periodic use of existing and new DER	Opt-in from 2021