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**3 June 2020**

Mr. Kami Kaur
General Manager Networks
Australian Energy Regulator
Via email: VIC2021-26@aer.gov.au

Dear Mr. Kaur,

**Re: AER ISSUES PAPER - Victorian electricity determination 2021-2026: electricity tariff structures**

Evie Networks welcomes the opportunity to provide a submission to the Australian Energy Regulator (AER) issues paper- Victorian electricity determination 2021-2026: electricity tariff structures (Issues Paper).

Evie Networks (Evie) is an Australian company privately backed by the St Baker Energy Innovation Fund, and with the support of ARENA, has up to $100M of funding to build a national public fast and ultra-fast electric vehicle (EV) charging network.

We have commissioned an independent analysis (Sapere Report) into the Network Tariff Structure Statements (TSS) proposed by the 5 Victorian Distributors to provide a detailed assessment of:

1. The proposed tariff structures for C&I customers generally against the requirements of the National Electricity Law (NEL) and the National Electricity Rules (the Rules), and
2. More particularly, the impact of these tariffs on the EV fast and ultra-fast charging industry.

Our submission focuses on the findings from the Sapere[1] Report. A copy of the Sapere Report is provided as an attachment to our submission.

It is important to note that Evie takes network security and reliability very seriously and we believe the solution to addressing electricity network risks requires a multi-faceted approach which we have adopted in our network rollout. This includes:

- A tailored cost-reflective network pricing approach for EV public charging which balances the needs of both EV consumers, and provides an equitable return on investment for network providers.

[1] Sapere Research Group is one of the largest expert consulting firms in Australasia, and a leader in the provision of independent economic, forensic accounting and public policy services.

- The deployment of smart chargers with remote control capabilities – our chargers are capable of dynamically adjusting both the total site load and load sharing across multiple chargers through the Open Charge Point Protocol (OCPP) EV industry standard interface. These demand management features, when coupled with tailored cost-reflective network pricing for EV public charging, can help to drive more efficient network asset utilisation.
- Upfront capital expenditure at our sites to augment the network and secure capacity as per DNSP standards – the new or upgraded point of supply is designed by DNSP internal engineers, or by accredited 3rd party designers as per DNSP requirements, and Evie networks typically must outlay several hundred thousand dollars per site to contribute a fair share towards the extra network capacity required for high-power EV charging sites.

**SUMMARY OF KEY FINDINGS FROM THE SAPERE REPORT**

1. **Network Tariffs are not consistent with the NEL:** The current approved tariff structure statements (TSS) do not appear consistent with the NEL requirements that tariffs are based on the long run marginal cost (LRMC). Data from approved network revenue models show very large discrepancies between LRMC, as a proportion of regulated costs, on the one hand, and the LRMC component of expected revenue from tariffs, on the other, for all five networks and across all major tariff classes.

2. **Approved network tariffs not cost-reflective:** Current tariff structures are resulting in excessive prices for customers whose demand is infra-marginal, alongside under-recovery of marginal costs for customers whose demand is marginal. This shifts total network costs between customer segments in ways that produce outcomes (energy prices and customer bills) that are inconsistent with the long-term interests of customers.

3. **C&I customers cross-subsidise residential and small business customers:** A substantial reduction in bills for EV charging sites would not represent a cross-subsidy from other customer classes. Rather, it would represent removal of the very substantial cross subsidy from EV charging sites both under current, and proposed, TSS.

4. **Tariff assignment policies are inconsistent with the NER principles:** There are significant inconsistencies between networks regarding tariff assignment policies for the candidate sites. The sites are assigned to C&I tariffs for four of the five Victorian DNSPs (Powercor, Citipower, Jemena and United Energy), even though the anticipated volumetric consumption of these sites is well below the volumetric threshold for large customer assignment. In assessing tariff assignment policies implemented via network tariff eligibility criteria, the AER must have regard to the tariff assignment principles set out in 6.18.4 of the NER.

These issues require the AER's immediate attention in the current pricing determinations given that electric vehicle motorists are forecast to become a significant electricity consumer demographic within the next five years. Failure to address these now will only result in a substantial, existing inequity growing much larger over time, leading to chronic public fast and ultra-fast charging site underutilization and stranded network assets due to the substantial cross subsidy from EV charging sites back to other customers under the default C&I tariff regimes in Victoria.

## IMPLICATIONS ON THE EV FAST PUBLIC CHARGING INDUSTRY

Assignment of default Commercial and Industrial (C&I) demand tariffs to public EV charging assets by Distribution Network Service Providers (DNSPs) is a significant barrier to the acceleration of EV uptake in Australia and more specifically to the rollout of public charging networks. These sites are characterised as on-demand infrastructure with highly dynamic loadings despite low throughput, yet these load peaks also do not coincide with time of highest utilization of distribution networks. Hence public EV charging site demand is infra-marginal and not a major driver of LRMC. This means that the marginal price tariffs being applied are not cost-reflective and that the tariffs being applied exceed the LRMC.

The existing tariff structures therefore do not create incentives for efficient utilisation of EV charging infrastructure and associated DNSP network assets. These outcomes are contrary to the long-term interests of electricity consumers (the NEO), as well as the Network Pricing Objective (NPO), which is that distribution tariffs should reflect the efficient costs of providing those services to the retail customer. The Sapere Report suggests the methods used by networks to determine the portion of revenue to be recovered from the LRMC component of tariffs is flawed.

The Sapere Report shows that all of Victoria's networks have been substantially over-recovering the forward-looking component of their total regulated costs authorised under clause 6.18.5(f) of the NER, relative to the residual cost component under the following clause. As such, a material reduction in bills for EV charging sites would not represent a cross-subsidy from other customer classes. Rather, it would represent a removal of the very substantial cross subsidy from EV charging sites, under current tariff structures, to other customers.

Public EV charging site demand, at the candidate locations, is infra-marginal in every case. It does not trigger investment in marginal network capacity (excluding network connection upgrades for some sites). In the three locations where capacity augmentation appears to be required (subject to the relevant tests and approvals), Evie Networks is required to pay upfront capital contributions regulated as alternate control services. Accordingly, the bulk of the augmentation cost at these locations should not also be recovered from the application of high LRMC related charges within standard control tariffs.

Drawing on available traffic flow data in NSW, the times of maximum demand by public EV charging sites does not correspond to periods of greatest utilisation of the relevant parts of the electricity network. More particularly, maximum demand for the EV charging sites located at regional petrol stations is likely to correspond to periods of maximum traffic flows, for example during holiday periods. These periods do not coincide with periods of greatest network utilisation. The diversity between EV charging site demand and local maximum demand is not reflected in the present C&I tariff structures because these structures are not cost-reflective:

Similarly, there are significant inconsistencies between networks regarding tariff assignment policies for the selected sites. Those sites are assigned to C&I tariffs for four of the five Victorian DNSPs (Powercor, Citipower, Jemena and United Energy), even though the anticipated volumetric consumption of these sites is well below the volumetric threshold for large customer assignment. This reflects connection capacities that exceed the capacity thresholds set by those DNSPs for default large customer assignment. These connection capacity thresholds are 120kW for Powercor and Citipower, 120kVA for Jemena and 150kVA for United Energy. Ausnet services does not apply a customer capacity threshold, and while our sites do not default to a C&I tariff initially due to lower consumption volumes, default C&I assignment does occur at 160MWh p.a.

Where connection assets are not funded by regulated (standard control) tariffs, but instead by customer contributions regulated separately as alternative control services, there is no clear basis for using 6.18.4(a)(1)(ii) as the sole criterion for tariff assignment. The AER should therefore consider developing guidance to networks requiring them to modify the existing network tariff assignment policies operating under 6.18.4 of the NER, where connection assets are not recovered from standard control tariffs. In this case 6.18.4(a)1(i) would influence tariff assignment, along with other relevant principles (with little or no weight applied to 6.18.4(a)(1)(ii)). This would result in EV fast charging stations being assigned to small business tariffs in place of C&I tariffs, until or unless annual demand volumes exceed the relevant small business volume thresholds for a given site.

In assessing tariff assignment policies implemented via network tariff eligibility criteria, the AER must have regard to the tariff assignment principles set out in 6.18.4 of the NER. At present, for four of the five networks, tariff assignment is determined solely on the basis of the connection criterion (6.18.4(a)(1)(ii)). For those networks, there appears to be no regard to the first criterion (6.18.4(a)(1)(i)) which is the nature and extent of usage by the relevant retail customers.

In the absence of widespread tariff reform, sub-threshold tariffs offer the opportunity to develop cost-reflective tariffs for fast and ultra-fast EV public charging stations, in line with AER guidance. Any such tariffs should be consistent with the network pricing principles and NPO. They should incorporate LRMC at the relevant locations, exclusive of customer capital contributions. An alternative, interim arrangement to address the above-mentioned issues in the short-term would be to relax the Eligibility Criteria in terms of the tariffs assigned to Evie Networks, with sub-threshold tariffs then being used for tariff trial purposes to, as noted immediately above, develop cost-reflective tariffs for fast and ultra-fast EV public charging stations.

## THE ROLE OF TARIFF REFORM

The AER Issues Paper specifically notes that "Tariff reform can support the energy system transition such as enabling more solar PV to be exported in the grid and can facilitate the uptake of electric vehicles while minimising the overall network cost impacts on consumers". [2]

However, there is no reference in the Issues paper to tariff reform in the context of the critical issue of availability of public EV charging sites and the associated energy costs for these charging sites.

Additionally, the AER Issues Paper discussion on tariff structures is limited to residential and small business customers. There is no reference to tariff structures or reform relating to Commercial and Industrial (C&I) tariffs (which are typically the default tariffs applied to public EV fast charging sites). While the AER proposes a move away from demand or capacity tariffs for residential and small business users, toward ToU tariffs, it does not discuss any implications for C&I tariffs. This may suggest there is an assumption held by the network providers, and not challenged by the AER, that existing C&I tariffs are already consistent with the relevant rules and do not require reform to ensure alignment with the relevant National Electricity Rules (NER).

And, as also noted above, the current approved C&I tariff structures do not appear to be cost reflective and, therefore, are not consistent with the NEL.

Based on these considerations, Evie Networks recommends that the AER endorses the need to progress tariff reform and, in particular, supports the use of sub-threshold tariffs to trial alternative tariff structures for publicly available fast, and ultra-fast, EV charging sites in line with the AER's comments in its Issues Paper on the use of sub-optimal tariffs [3]. Sub-threshold tariffs offer the opportunity to develop cost-reflective tariffs for fast, and ultra-fast, EV public charging stations. Evie endorses the requirement for any such tariffs to be consistent with the network pricing principles and network pricing objectives.

[2] Issues Paper, page 17

[3] Issues Paper, page 19, footnote 32

Evie further recommends that the AER should endorse an immediate redefinition of the Victorian DNSPs' eligibility criteria for small business customer tariff assignment. Specifically, the arbitrary capacity thresholds for default large customer assignment should not be applied to customers with low load factors (such as public fast and ultra-fast charging) given the LRMC data reveals this practice to be highly inequitable for such customers and in direct contravention of the National Electricity Objective.

## CALL TO ACTION

There is considerable evidence available to demonstrate that the provision of publicly accessible EV fast and ultra-fast -charging stations remains the greatest hurdle to EV uptake due to consumer concerns about range anxiety and the fear of running out of "fuel". Currently there are less than 110 fast charging stations[4] across Australia and very few investors have proven their willingness to risk capital in developing this essential public infrastructure.

The Federal, Victorian and NSW Governments are now developing EV policies which should lead to an accelerated take up of EVs in Australia, and the success of these forthcoming Government policies will be highly dependent on the AER addressing the critical issue of the current prohibitive and inequitable cost of C&I tariffs as otherwise applied to public fast and ultra- fast charging sites which, as demonstrated by the Sapere report, are clearly not cost reflective and, therefore, inconsistent with the NEL and the Rules. .

There remains a significant risk of chronic site underutilization and stranded network assets due to the very substantial cross subsidy from EV charging sites back to other customers under the default C&I tariff regime in Victoria.

Consistent with the National Electricity Objective, and to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of electric vehicle motorists (who are forecast to become a significant electricity consumer demographic within the next 5 years), it is important that this issue is addressed by the AER during the current pricing determinations. We propose:

- AER not to approve TSS proposals by all five Victorian networks, on the basis they do not contribute to compliance with the distribution pricing principles and the network pricing objective.
- AER endorse redefinition of the Victorian DNSPs' eligibility criteria for small business customer tariff assignment. Specifically, the arbitrary capacity eligibility could be relaxed on a temporary basis as an interim measure for high-capacity, low load factor customer groups, prior to the development and application of sub-threshold tariffs, noting that this will require DNSPs willingness to participate in this longer process.
- AER endorses the need to progress tariff reform using sub-threshold tariffs to develop and trial alternative tariff structures for fast and ultra-fast public charging network sites in line with the AER's comments in its Issues Paper.

We believe these steps are necessary for the DNSPs and EV Network operators to inform the tariff designs and should be in place by 1 July 2021.

Electricity Networks play a critical role in enabling the deployment of the charging infrastructure network as they are the gatekeeper of the electricity grid.

[4] https://electricvehiclecouncil.com.au/wp-content/uploads/2019/09/State-of-EVs-in-Australia-2019.pdf

Given the importance of fast and ultra-fast charging to EV adoption by passenger and light commercial vehicles and the success of both the Federal and State Government policies underway, we ask the AER to seriously consider our call to action and the barriers raised in our submission, as well as the Sapere analysis highlighting how the C&I tariffs are not cost-reflective and, thus, are inconsistent with the NEL and the Rules, we ask the AER to endorse our call to action and address the barriers raised in our submission.

We are raising substantial matters and would appreciate a meeting to discuss our submission and supporting analysis. Please contact Stephanie Bashir, Head of Policy at [redacted] or mobile [redacted] to organise a meeting or for clarification on any aspects of our submission.

Yours Sincerely,

[redacted]

Chris Mills
CEO Evie Networks

Encl.: Australian Energy Regulator Issues Paper: Victorian electricity determination 2021-2026: Assessment of electricity tariff structures and implications for public electric vehicle charging

# Australian Energy Regulator Issues Paper: Victorian electricity determination 2021-2026: Assessment of electricity tariff structures and implications for public electric vehicle charging

Report for Evie Networks

Simon Orme, Dr James Swansson

May 2020

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# Executive summary

This report was commissioned by Evie Networks (Evie) to assist Evie to respond to the Australian Energy Regulator (AER) *Issues Paper: Victorian electricity distribution determination, 2021 to 2026*, dated April 2020 ('AER Issues Paper').[1] The AER Issues Paper covers the five legal distribution networks in Victoria (with three corporate entities) and all aspects of network pricing proposals.

The focus of this report is the AER Issues Paper consideration of proposed tariff structure statements (TSS). TSS allocate the recovery of the total revenue requirement for standard control services, as eventually approved by the AER, between and within customer classes. Alongside total approved regulated network expenditure, TSS determine the size of individual customer bills.

## Network Tariffs appear inconsistent with NEL

The currently approved TSS, network tariffs and resulting customer bills, do not appear to be consistent with the National Electricity Law (NEL). The relevant sections of the national electricity rules (NER) require tariffs to be based on long run marginal cost (LRMC). There is, however, a very large discrepancy between LRMC, as a proportion of regulated costs, on the one hand, and the LRMC component of expected revenue from tariffs (T-LRMC), on the other, for all five networks and across all major tariff classes.

Data necessary to test whether network tariff proposals are consistent with the NER have so far not been provided by any of the Victorian networks for future proposals, by completing the relevant expected revenue sheets in Post-Tax Revenue Models (PTRM). An assessment of the share of network revenue from the different charging parameters, in particular the LRMC component, is a pre-requisite for such an evaluation.[2] The absence of this information accompanying the current TSS proposals, means that meaningful consultation over tariff proposals is not possible.

There is nothing in proposed TSS or the AER Issues Paper to suggest the new TSS proposals will reduce the present discrepancies between prices and costs (LRMC). This is because there is nothing in the network proposals to suggest the present flawed methods for determining the LRMC portion of tariffs have been reviewed and amended. Similarly, there is also no evidence proposed tariff structures would be adjusted to reflect material changes in LRMC between the current and following price control periods, for at least some networks.

The AER Issues Paper suggests a continued reliance on very broadly defined peak charging windows. Broad charging windows are, however, unlikely to be consistent with the NER since they result in excess charges for infra-marginal demand and insufficient charges for marginal demand.

## Approved network tariffs not cost-reflective

If tariff structures for each customer class ('retail customer') were cost reflective, then the LRMC component of aggregate tariffs would correspond to the LRMC component of total allowed regulated

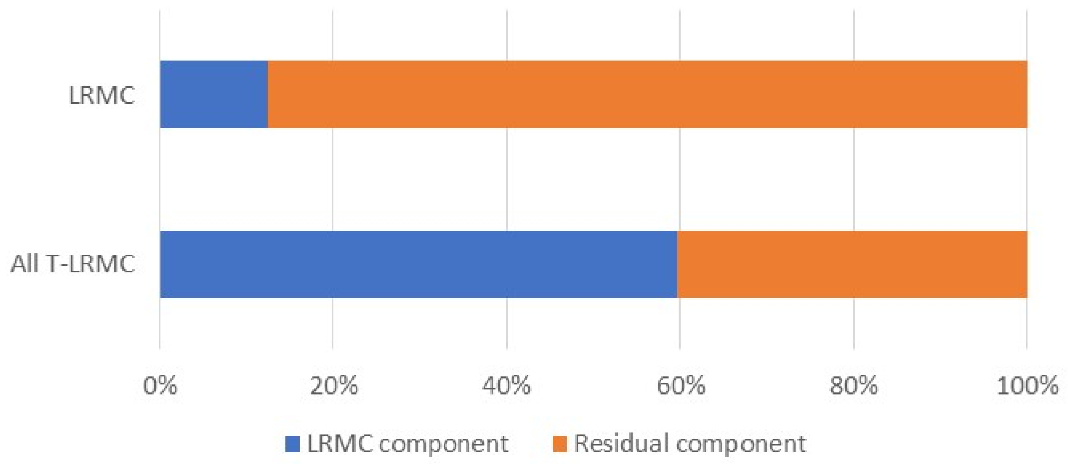
[1] Henceforth 'AER Issues Paper'

[2] See the discussion of the AER's consideration of this matter in Section 2.8 below.

revenues. Our analysis shows that all of Victoria's networks have been substantially over-recovering the LRMC component of their total regulated costs authorised under clause 6.18.5(f) of the NER.

This problem is illustrated in Figure 1 below, which compares LRMC as a proportion of total regulated costs with the LRMC component of current approved network tariffs for a typical approved Victorian network tariff. The tariff structure is clearly not 'based on' LRMC, as required by the NER.

Figure 1 – LRMC as a proportion of total regulated costs vs. LRMC component of current approved network tariffs




Equally, networks have been under recovering revenues under 6.18.5(g) of the NER. This clause relates to the residual ("residual") between the revenue from the LRMC based components of tariffs, and the revenue required to recover the total efficient costs of serving the retail customers that are assigned to the tariff.

Time of Use (ToU) and demand tariffs, without charging windows, or with very broad charging windows, and without reference to location, are not delivering tariffs that reflect the network's efficient costs of providing regulated services. This is inconsistent with the network pricing objective (NPO).[3]

Commercial and Industrial (C&I) tariff structures appear to result in higher prices for customers with low load factors, other things being equal. This is a product of the monthly capacity (demand) charges typically applied under C&I tariffs. However, tariff structures focusing on load factors are not consistent with the requirement for tariffs to reflect LRMC. This is because load factors are unrelated to the additional costs associated with meeting demand at times of greatest utilisation of the relevant part of the network.

Tariffs are less cost reflective for C&I customers than for residential and small business customers. C&I customer segments overall appear to be funding a cross subsidy in favour of residential and small business customer segments.

Overall, current tariff structures are resulting in excessive prices for customers whose demand is infra-marginal, alongside under-recovery of marginal costs for customers whose demand is marginal. This

[3] See 6.18.5(a) of the NER.

has the effect of shifting total network costs between, and within, tariff classes (customer segments) in ways that produce outcomes (energy prices and customer bills) that are inconsistent with the long-term interests of customers.

## Implications for ultra-fast EV charging station tariffs

Similarly, projected network tariff outcomes (bills) for a set of candidate ultra-fast public Electric Vehicle (EV) charging sites across the five Victorian electricity distribution networks do not appear to be consistent with the NER. These sites are assigned to large customer tariffs by four of the five Victorian DNSPs (Powercor, Citipower, Jemena and United Energy). This is because the sites have a connection capacity that exceeds the capacity threshold set by those DNSPs for default large customer assignment. The anticipated volumetric consumption of these sites is otherwise well below the volumetric threshold for large customer assignment.[4]

The relevant C&I tariff structures, and projected network bills for the identified EV charging sites, do not reflect the efficient costs of providing the services at those locations. The difference between costs and prices is substantial.

Public EV charging site demand, at the candidate locations, is infra-marginal in every case. It does not trigger investment in marginal network capacity (excluding network connection upgrades for some sites). In the three locations where capacity augmentation appears to be required (subject to the relevant tests and approvals), Evie Networks is required to pay upfront capital contributions regulated as alternate control services. Accordingly, the bulk of the augmentation cost at these locations should not be recovered from the application of high LRMC related charges within standard control tariffs.[5]

Drawing on available evidence from NSW,[6] the times of maximum demand by public EV charging sites would not correspond to periods of greatest utilisation of the relevant parts of the electricity network. As for regional petrol stations in particular, maximum demand for the identified candidate EV charging sites is likely to correspond to periods of maximum traffic flows, for example during holiday periods. These periods do not coincide with periods of greatest network utilisation. The diversity between EV charging site demand and local maximum demand is not reflected in the present C&I tariff structures because these structures are not cost-reflective.

In the absence of widespread tariff reform, sub-threshold tariffs offer the opportunity to develop cost-reflective tariffs for ultra-fast EV public charging stations, in line with AER guidance. Any such tariffs

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[4] These connection capacity thresholds are 120kW for Powercor and Citipower, 120kVA for Jemena and 150kVA for United Energy. Whereas Ausnet services does not set a customer capacity threshold.

[5] As discussed in section 2.7, while we are satisfied that capital contributions are deducted from the total revenue requirement for standard control services, tariff-LRMC substantially exceeds LRMC. This implies that tariffs may not be cost-reflective, notwithstanding network rebates for capital contributions.

[6] High resolution interval data on highway volumes is not available in Victoria but is available in NSW. This means it is possible to compare electricity demand with traffic volumes at a given location for any time of the year in NSW, but not in Victoria.

should be consistent with the network pricing principles and NPO. They should incorporate LRMC at the relevant locations, exclusive of customer capital contributions.

An alternative arrangement would be for the AER to consider guidance to networks requiring them to modify the existing network tariff assignment policies operating under 6.18.4 of the NER, to reflect the fact the connection assets are not funded from regulated tariffs but instead by capital contributions. In this case 6.18.4(a)1(i) alone would determine tariff assignment. This would result in EV fast charging stations being assigned to small business tariffs in place of C&I tariffs, until or unless annual demand volumes exceed the relevant small business volume thresholds.

The resulting customer bills would be substantially lower than under the current C&I tariffs reflecting actual costs and excluding cross subsidies. While the LRMC component of efficient EV charging site tariffs would be zero or very low, the dollar value of the reduction in the LRMC component should be partly offset by an increase in the dollar value of the residual component of the tariff.

A substantial reduction in bills for EV charging sites would not represent a cross-subsidy from other customer classes. Rather, it would represent removal of the very substantial cross subsidy from EV charging sites, to other customers, both under current, and proposed, TSS.

## Implications for AER consideration of proposed TSS

Cross subsidies result in dead-weight losses to the economy. Excessive network prices inefficiently suppress demand for infra-marginal capacity, where the marginal cost is close to zero. At the same time, excessive tariffs remove any incentive for EV sites to apply demand tariffs to EVs during periods of greatest network utilisation (i.e. peak demand periods).

Another form of economic cost from inefficient tariffs more generally is lower network asset utilisation and therefore higher network prices than otherwise for other customers. These outcomes are contrary to the long-term interests of electricity consumers (the NEO), as well as the NPO, which is that distribution tariffs should reflect the efficient costs of providing those services to the retail customer.

The analysis suggests the methods used by networks to determine the portion of revenue to be recovered from the LRMC component of tariffs is flawed. This may be related to expectations regarding LRMC that are no longer valid.

A major spur to network tariff reform was in response to growing maximum demand associated with the uptake of air-conditioners. This led to an expectation that LRMC would be a substantial portion of cost-reflective prices. More recently maximum demand from existing connections is now flat or falling, due to the uptake of distributed energy resources, including energy efficiency.

In a 2018 draft decision, the AER suggested that an increase in the LRMC component of residential tariffs for Endeavour, from 15 per cent (2019) to 17 per cent (2024), reflected more cost-reflective pricing.[7] PTRM data for Endeavour indicate that LRMC represents just seven percent of its total

[7] See figure 18.3 and discussion on page 49 of *Australian Energy Regulator: Attachment 18 – Tariff structure statement | Draft decision - Endeavour Energy distribution determination 2019–24*.

regulated costs for the period to 2018. This suggests that increasing the LRMC component of tariffs would decrease rather than increase the extent Endeavour's tariffs are based on LRMC.

It appears that methods used by the AER to assess whether TSS are cost reflective are not cross checked and reconciled with inputs and outputs from the relevant PTRM. There are two main sources of error under current methods.

- The most substantial portion of total network capital expenditure now appears to be in response to growth in customer connections. The bulk of this cost is efficiently funded, under the relevant NER, not from the LRMC component of regulated tariffs, but from customer and developer funded capital contributions.
- Forward-looking costs (LRMC) may not be depreciated over their economic lives, with remaining unrecovered costs being carried forward to the following price control periods applying the Roll Forward Model. They are instead over-recovered within a single price control period.

Accordingly, in the absence of PTRM data, there is nothing to suggest the proposed TSS would move toward cost-reflectivity and away from the current substantial discrepancies between cost and tariff structure. There is also no evidence , in the absence of PTRM data, that cross subsidies resulting in excessive energy prices for C&I customers, would be removed.

It therefore seems unlikely that proposed tariff structures contribute to compliance with the distribution pricing principles and the NPO. Consequently, in the absence of any further information from networks to support their TSS proposals, there appear to be sufficient grounds for the AER not to approve TSS proposals by all five Victorian networks, on the basis they do not contribute to compliance with the distribution pricing principles and the NPO, because they are not based on LRMC, including locational factors. A decision not to approve proposed TSS, with excessive recovery of LRMC, would be consistent with the October 2919 AER Draft Decision to reject parts of Energex and Ergon TSS on the basis the proposals included excessive recovery relative to LRMC.

# 1. Introduction

This report has commissioned by Evie Networks (Evie) to assist Evie to respond to the Australian Energy Regulator (AER) *Issues Paper: Victorian electricity distribution determination, 2021 to 2026*, dated April 2020 ('AER Issues Paper').[8] The AER Issues Paper covers the five legal distribution networks in Victoria (with three corporate entities) and all aspects of network pricing proposals.

The focus of this report is the AER Issues Paper consideration of proposed tariff structure statements (TSS). TSS allocate the recovery of the total revenue requirement for standard control services, as eventually approved by the AER, between and within customer classes. Alongside total approved regulated network expenditure, TSS determine the size of individual customer bills.

The structure of the remainder of this report is as follows.

- Section 2 sets out the regulatory and analytical framework for the analysis in this report. This includes briefly reviewing the AER Issues Paper, the AER's role in approving TSS and a recent draft decision for Queensland.
- Section 3 evaluates proposed and existing TSS, at both network wide and locational perspectives.
- Section 4 sets out our findings and the implications for future AER consideration of TSS proposals.
- Section 5 sets out the detailed methodology and evidence underpinning the analysis in section 3.

[8] Henceforth 'AER Issues Paper'

# 2. Context and framework for analysis

## 2.1 AER Issues Paper

The Issues Paper contains a section entitled *'The role of tariff reform in supporting the [energy] transition'*. including the uptake of solar PV and EVs.[9] It refers to the risk of expensive network upgrades if EV charging times correspond to high demand periods of the day. It notes that tariff reform can lead to smart EV charging to minimise the impact on the grid during peak times.

The focus of discussion of tariff reform in the context of EVs in both the Issues Paper and the DNSP proposals is the impact of low voltage EV charging. We have not identified any discussion of the network capacity and pricing implications of ultra-fast public EV charging facilities.

As discussed in section 2.5 below, publicly available fast charging facilities play a critical role in removing a key barrier to the uptake of EVs by addressing concerns regarding the limited range of current EVs compared with internal combustion engines ('range anxiety'). The Issues Paper currently does not appear to consider the full implications of the further adoption of EVs for network pricing.

The Issues Paper notes that default business tariff structures include a time of use tariff with peak charges applying between 9am and 9pm. This diverges from the residential time of use peak charging window, which is narrower. The AER appears to support Time of Use (ToU) and proposes standardisation of tariff structures with very broad peak charging windows:

- Small business peak tariff between 0900-2100 business days
- Residential peak tariff between 1500-2100 every day.

The AER Issues Paper discussion on tariff structures is limited to residential and small business customers. There is no reference to tariff structures or reform relating to Commercial and Industrial (C&I) tariffs. While the AER proposes a move away from demand or capacity tariffs for residential and small business users, toward ToU tariffs, it does not discuss any implications for C&I tariffs. This may suggest there is an assumption held by networks, and not challenged by the AER, that existing C&I tariffs are already consistent with the relevant rules and do not require reform to ensure alignment with the relevant National Electricity Rules (NER).

The AER refers to the opportunity to use sub-threshold tariffs to trial alternative tariff structures.[10] Sub-threshold tariffs may offer an alternative means for networks to target cases where proposed tariff structures would not be consistent with the Network Pricing Objective (NPO) for a small class of customers (with total demand within the threshold), possibly including ultra-fast EV charging facilities.

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[9] See section 2.5.2, page 17 of the AER Issues Paper

[10] See page 19, footnote 32.

## 2.2 AER role in approving tariff structure statements

Under the relevant electricity rules, networks are required to submit tariff structure statements (TSS) to the AER for approval. The first round of TSS reviews, including for the existing Victorian approved network tariffs, were undertaken after the existing regulatory control period began.

A TSS applies to a distributor's tariffs for the duration of the regulatory control period. It should describe a distributor's tariff classes and structures, the distributor's policies and procedures for assigning customers to tariffs, the charging parameters for each tariff, and a description of the approach the distributor will take to setting tariff levels in annual pricing proposals. It is accompanied by an indicative pricing schedule. A tariff structure statement provides consumers and retailers with certainty and transparency in relation to what network tariff structures will be charged to retailers for different types of customers over the five-year period that it applies.

The AER must determine whether the TSS contributes to compliance with the distribution principles and the network pricing objective.[11] This formulation in the rules recognises and tolerates some discrepancy between proposed TSS and the NER is likely and acceptable, over a staged transition.

In its October 2019 Draft determination for Energex and Ergon, the AER decided not to approve the proposed TSS and required the networks to revise their TSS proposals.[12] Among other factors, the AER determined that Energex and Ergon

> *had not demonstrated that the that the proposed price level of its peak charging parameters for the existing and new cost reflective tariffs comply with the distribution pricing principles in the Rules. Energex has proposed high estimates for Long Run Marginal Cost (LRMC). However, given the level of excess capacity on its network and the prospect of minimal growth in peak demand in the foreseeable future, we consider low LRMC estimates to be more appropriate for its network circumstances…*[13]

The Victorian networks generally have a much lower level of excess capacity than networks in NSW and Queensland. Nevertheless, the AER Draft Decision for Queensland may nevertheless be relevant for its consideration of Victorian TSS, to the extent that the marginal cost component of proposed tariff structures substantially exceeds the LRMC related component of tariff structures.

## 2.3 Regulatory framework

Under the rules governing electricity distribution pricing, subject to transitional and customer impact considerations, network tariffs must be based on the forward looking or long-run marginal cost (LRMC) of providing the service to the retail customers assigned to the tariff.[14] Forward looking costs arise where incremental demand at particular locations during periods of greatest utilisation of the network result in a requirement to augment network capacity at those locations. Such incremental

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[11] See NER, cll. 6.18.5(b) and (d).
[12] See Attachment 18, Tariff structure statement.
[13] Ibid., page 13.
[14] See NER 6.18.5(f) – our emphasis

demand results in incremental future network capital expenditure, associated incremental network capital and operating costs, and therefore a higher regulated revenue requirement.

These incremental costs then need to be recovered from customers. The functional purpose of cost-reflective tariff designs is to increase network revenues from high cost customers while reducing network revenues from low cost customers. Cost-reflective tariffs seek to allocate incremental network costs to customers whose incremental demand causes incremental network cost. Just as importantly, incremental network costs would not be allocated to customers whose demand does not cause incremental network costs.

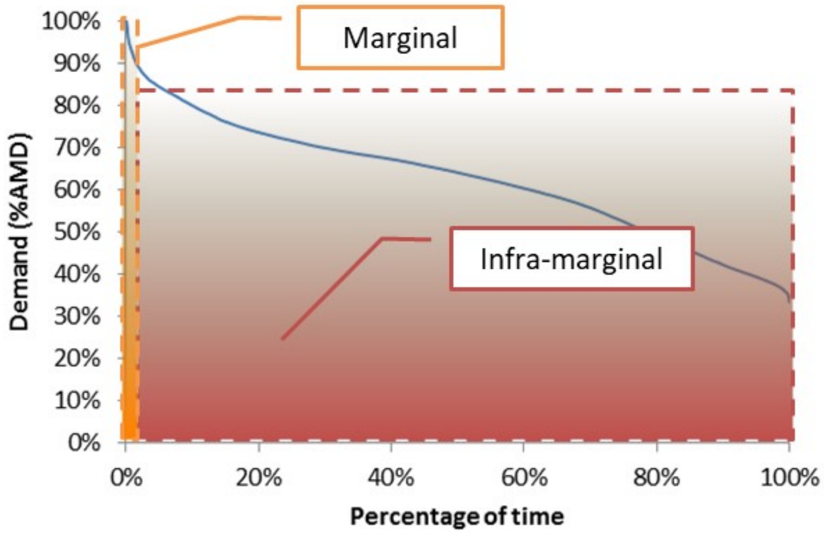
## 2.4 Marginal demand and capacity

Under the economic framework established under the NER, LRMC tariff components should apply only to demand that uses marginal network capacity, triggering a requirement for a future increase in network capacity. As stated by the AER:[15]

> *LRMC could also be described as a distributor's forward looking costs that are responsive to changes in electricity demand. This could include investment in additional network capacity to service growing peak demand.*

It follows that LRMC tariff components should not apply to demand that uses infra-marginal infrastructure capacity – that is demand that does not trigger a requirement for a future increase in network capacity. The distinction between LRMC (marginal) and non-LRMC (infra-marginal) demand is illustrated in Figure 2 for a typical load duration curve for an electricity asset.

Figure 2 Marginal and infra-marginal demand and pricing




[15] See 18-79 Attachment 18 – Tariff structure statement | Draft decision - Endeavour Energy distribution determination 2019–24

These assets are built with sufficient capacity to deliver forecast maximum demand with spare capacity to ensure firm supply in case of plant failure. The load duration curves of electricity assets are typically 'peaky', that is the top 10-20 per cent of capacity is utilised for less than 2-4 per cent of the time.

Broadly defined peak charging windows (e.g. those proposed in the AER Issues Paper), and even more so, demand and capacity tariffs that do not refer to time of use, may be poorly targeted and inconsistent with the NPO, to the extent they do not distinguish between infra-marginal and marginal demand. This has the effect of over-charging for infra-marginal demand, which inefficiently suppresses such demand and encourages higher uptakes of DER substitutes

Consumers are familiar with marginal pricing of marginal capacity in many markets, for example higher ticket prices for air flights or hotel rooms at peak demand times, peak/off peak public transport pricing, Uber surge pricing, differential car parking charges, and many other examples.

Consumer demand outside peak demand times/places is "infra-marginal", that is there is adequate capacity to meet demand. If the purpose of marginal pricing is to deter consumers from adding to marginal demand when or where capacity costs are higher, then marginal pricing infra-marginal demand will signal to consumers to reduce demand at times or places where supply is plentiful. This is economically inefficient as it provides no benefits in terms of avoided network costs in return for the economic costs of reduced consumer productivity.

## 2.5 Electricity network services and adoption of Electric Vehicles

Large-scale and early adoption of EVs can generate incremental economic benefits. These benefits include reductions in emissions that contribute to climate change and particulate pollution damaging public health. EVs can also improve diversity of fuel choices available for transportation, making Australia less vulnerable to oil price spikes and supply disruptions.

The availability of a network of public EV charging sites, especially those with ultra-fast charging capabilities, is a pre-requisite for mass market uptake of EVs. Range anxiety, including the length of time required for charging *en route*, is a key barrier to mass market uptake of EVs, whether for private or commercial applications.

During the transition, fast public EV charging sites have low load factors – or low average usage relative to peak usage.[16] This reflects the relatively low volume of initial electricity consumption relative to the capacity of site connections. This capacity is sized for a long-term time horizon and will be under-utilised in the short to medium term. Positive returns for EV charging infrastructure are delayed and sensitive to any excessive costs.

During this transitional period, there may also be a mismatch between the name plate or theoretical capacity and actual maximum demand for EV charging sites. This is because individual EV charging

[16] A low load factor does not imply high usage of marginal network capacity and therefore does not in itself justify the application of marginal network prices (as opposed to connection costs).

stations are unlikely to operate at full capacity simultaneously, given downtime between charge cycles for individual charging stations within a charging site. Network pricing structures that do not reflect actual demand and demand profiles will therefore impose significant cost penalties for fast public EV charging sites.

The inefficient network prices identified in Section 3 may render some potential EV charging stations uneconomic and not financially viable. This is because the total cost of electricity supply (including wholesale) to end use customers (EVs) at each site would substantially exceed the economic value of that supply (customer willingness to pay) for a very large proportion of end use demand. It is also possible that non-network alternatives (distributed energy resources) could be lower cost. Public EV charging should be considered by the networks and the AER as a significant component tariff reform in support of the energy transition.

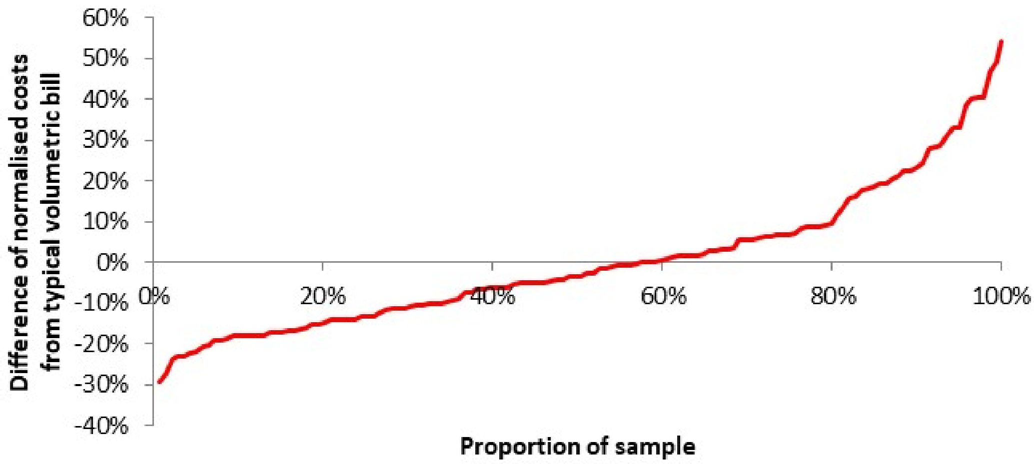
## 2.6 Inefficient tariff structures and consumer cross-subsidies

Cost-reflective tariffs seek to allocate marginal network costs, within a customer class, to customers whose marginal demand causes marginal network cost. Just as importantly, marginal network costs would not be allocated to customers whose demand does not cause marginal network costs, inflating their cost and creating cross-subsidies. Different tariff structures for high and low-cost customers are not required as the tariff structure efficiently distinguishes between customer demand.

Figure 3 illustrates these cost variations and cross-subsidies with the cost curve for a population of consumers. The cost curve shows the ranked costs based on their individual consumption profile normalised for volume, that is total annual volume (kWh) held the same and hence the annual bill with a 'flat' or volumetric tariff is the same.

For about half of these consumers in the middle a simple volumetric tariff (the flat line) approximates the cost of their consumption behaviour (within ±10 percent) – the red curve. However, the segment of consumers on the right of Figure 3 pay far less on a volumetric tariff than the costs of their consumption profile. They are therefore subsidised by the segment of consumers on the left that pay far more than the costs of their consumption profile.

Figure 3 – Customer cross subsidisation within non-cost reflective tariff structures




As with subsidies, cross-subsidies may give rise to deadweight losses. For example, subsidised prices are likely to result in some consumers using more electricity during high cost price/demand spikes. At the same time, consumers contributing to the cross subsidy may use less network supplied electricity than otherwise, or they may increase their investment in or use of substitutes (including distributed energy resources).

## 2.7 Implementing cost-reflective tariffs

Under current regulator approved network tariff structures, LRMC related tariffs components (henceforth T-LRMC), operating under 6.18.5(f) of the National Electricity Rules (NER,) include demand or monthly capacity (demand) charges and peak time of use charges. Non-T-LRMC related components include connection charges and off peak and shoulder time of use charges that accrue the residue of DNSP revenue for existing network assets. T-LRMC tariff components are the mechanisms used to differentiate network charges between customer types so that customers with similar consumption volumes and connection sizes may end up paying higher or lower bills depending on differences in their demand profiles.

Where customers are willing to pay for additional network capacity, through peak time of use or demand tariffs, then network augmentation costs associated with meeting that demand are efficient. By encouraging price sensitive customers to modify their demand during periods of greatest network utilisation, cost reflective tariffs should result in lower total network costs over time.

The method for calculating LRMC, for the purpose of setting network tariffs, must have regard to the additional costs likely to be associated with meeting demand from retail customers assigned to that tariff *at times of greatest utilisation of the relevant part* of the network.[17] It must also take into account the *location* of retail customers and the extent to which *costs vary between different locations*…[18]

[17] See NER 6.18.5(f)(2) – our emphasis
[18] See NER 6.18.5(f)(3)

## 2.8 Capital contributions

A substantial portion of the cost of augmentation for new and enhanced connections is recovered from customer capital contributions. These costs do not form part of the standard control network service, for which costs are recovered under TSS. Their recovery is instead regulated as alternate control services.

In Victoria, where new augmentations are non-contestable, the capital charge contribution is regulated in accordance with the relevant NER and AER connection charging guideline. The capital contribution is payable (and only payable) where the incremental costs of the new connection exceed the incremental revenue from regulated (standard control) tariffs. The incremental cost of new connections is required to be allocated between the dedicated (customer specific) and shared network assets (incremental cost of shared network assets (ICSN).

The networks must set out their augmentation unit rates in their alternate control fee schedules. These rates need to consider diversity factors at the point of connection.

The incremental revenue calculation is the present value of the incremental revenue stream expected to be received from the new or altered connection over a pre-defined period. The incremental operating and maintenance cost for the new connection assets is added to the applicable network tariff. For C&I premises, the maximum period is 15 years.

We understand the application of the relevant guideline results in a reduction in the capital contribution to reflect the incremental forecast network revenue from regulated tariffs. We are confident from the PTRMs that capital contributions from customers are deducted from the total revenue requirement for regulated services – there is no total over-recovery. However, as discussed in the following chapter, there is a large discrepancy between the LRMC portion of cost and the portion of revenues attributed to LRMC (T-LRMC).

We have so far not seen any evidence that the incremental revenue calculation fully incorporates the very high T-LRMC component in actual C&I tariffs. As a result, it is possible the net overall effect of current arrangements does not result in an efficient allocation of total regulated costs between customer segments, depending on their contribution to marginal demand for shared network capacity.

## 2.9 Recent AER views on cost-reflective network pricing

AER views on the design of cost-reflective tariffs are recorded in a recent draft decision for NSW and SA networks. The discussion below refers to the AER's Attachment 18 – Tariff structure statement | Draft decision - Endeavour Energy distribution determination 2019–24. Key points relevant to the present discussion include the following.

The share of network revenue by charging parameter is relevant to its assessment of the cost-reflectivity of network tariff structures.[19] It notes that a reduction in fixed charges as a proportion of total revenue would follow from a move toward cost-reflective pricing.

The AER supports the application of highly cost reflective tariffs for large businesses, that is customers on medium and high voltage tariffs.[20] It notes the pricing principles apply equally to large businesses and encourages distributors to propose more cost reflective tariff designs, including locational based critical peak pricing, on an optional basis for large customers. These customers should be able to understand these tariffs and may find such tariffs beneficial. The AER also supports more transparency in the calculation of individual tariffs as part of the annual pricing proposals, to allow the AER to confirm consistency with TSS.[21]

The AER notes that:

> '*The NER require network tariffs to be based on LRMC.*'[22]

It also states that:[23]

> *LRMC is equivalent to such forward looking costs—more specifically, as measured over a period of time sufficient for all factors of production to be varied. LRMC could also be described as a distributor's forward looking costs that are responsive to changes in electricity demand. This could include investment in additional network capacity to service growing peak demand. As we discuss below, this could also include replacement of fixed assets at the end of their economic life where changes in demand is a consideration.*
>
> *The estimation of LRMC involves three key steps, which are to:*
>
> - *choose the overall approaches or estimation method(s)*
> - *define what costs are considered 'marginal' vs. what costs are considered 'residual'*
> - *define what timeframe is considered the 'long run'.*

[19] Ibid. page 18 and especially figure 18-13
[20] Ibid. page 76.
[21] Ibid. page 78.
[22] Ibid. page 79.
[23] Ibid.

With regard to assessing tariff proposals, the AER noted: [24]

> *In the first tariff structure statement round, all distributors in the NEM used the Average Incremental Cost approach to estimate LRMC, which we accepted. We encouraged distributors to continue improving their estimation methods so their tariffs better reflect efficient costs. This may entail modifying the Average Incremental Cost approach, or utilising more sophisticated approaches, such as the Turvey approach if they consider it appropriate. ….*
>
> *A key question in our assessment (and for distributors in making their tariff structure statement) is whether the benefits of more accurate estimates of LRMC outweigh the costs of deriving them. This cost-benefit equation will depend on the circumstance of each business.*

*Relevant factors referred to by the AER include:*

- *The penetration of interval meters*
- *Postage stamp pricing … the marginal costs of distribution vary by location, depending on the rate of change in demand and level of congestion within the substation or feeder zone. Accordingly, basing tariffs on an estimate of average LRMC or a part of the network's LRMC sends inefficient price signals to most, if not all, customers.*
- *Transition to marginal cost pricing* [The levels of cost reflective tariffs may not reflect LRMC estimates but increasing these levels must have regard to customer impacts.]

[24] Ibid page 84.

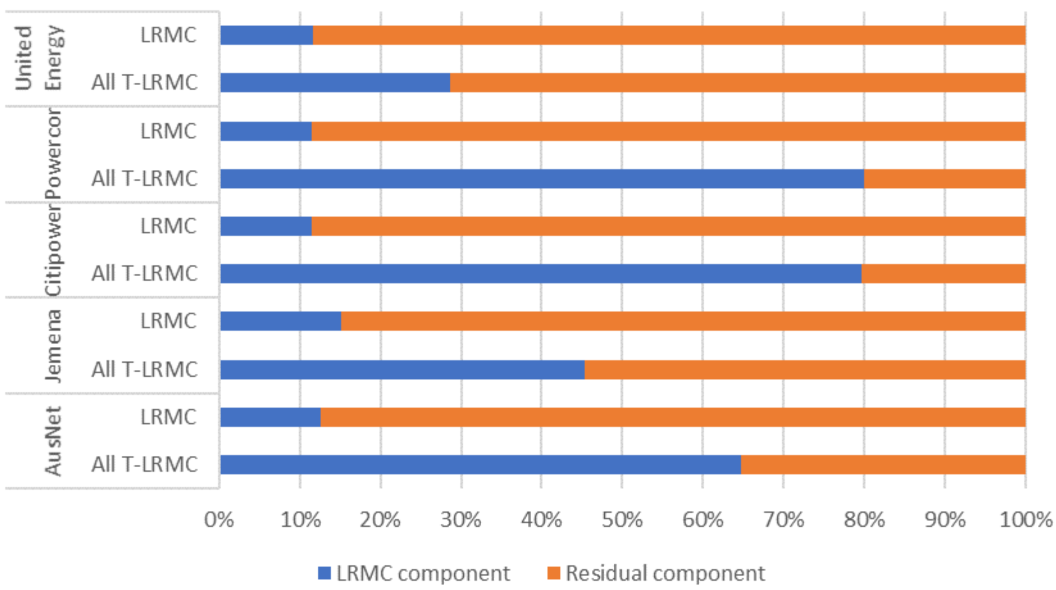
# 3. Evaluation of TSS and TSS proposals

## 3.1 Material discrepancy between costs and tariff structures

Our analysis of existing approved Victorian network tariffs shows they are not cost-reflective. Existing Victorian network tariffs are therefore not consistent with the relevant rules and the National Electricity Objective (NPO). Similarly, Victorian network tariffs do not meet the AER's evaluation criteria.

There is a very large discrepancy between LRMC, as a proportion of total regulated costs, on the one hand, and the aggregate LRMC component of expected tariff revenue (T-LRMC), on the other, across all five networks. This discrepancy is shown in Figure 4 below. If tariff structures for each customer class were cost reflective, then the LRMC component of aggregate tariffs would more or less correspond with the LRMC component of total allowed regulated revenues (T-LRMC).

Figure 4 – LRMC as a proportion of total regulated costs vs. LRMC component of current approved network tariffs




The length of the blue bars for costs and revenues for each network should be broadly similar. In each case, however, the network wide LRMC component of total standard control network costs is less than 15 per cent (average 13 per cent), while all T-LRMC averages 60 per cent.[25] United Energy is the notable outlier, with all T-LRMC of less than 30 per cent.

[25] The method and data sources for the supporting calculations are set out in section 5.1. and 5.2. It includes replacement capital expenditure but excludes customer funded capital contributions.

The analysis shows that all of Victoria's networks have been substantially over-recovering the forward-looking component of their total regulated costs, under 6.18.5(f).[26] Equally, it appears they have not been recovering sufficient revenues under 6.18.5(g), the residual between the revenue from LRMC and the revenue required to reflect the total efficient costs of serving the retail customers that are assigned to the tariff.

This is not to suggest that overall network revenues exceed the overall network costs allowed by the regulator. The overall effect of the current tariffs, however, is to shift total network costs for a given tariff class between customers in ways that produce outcomes (customer bills) that are inconsistent with the long-term interests of customers.

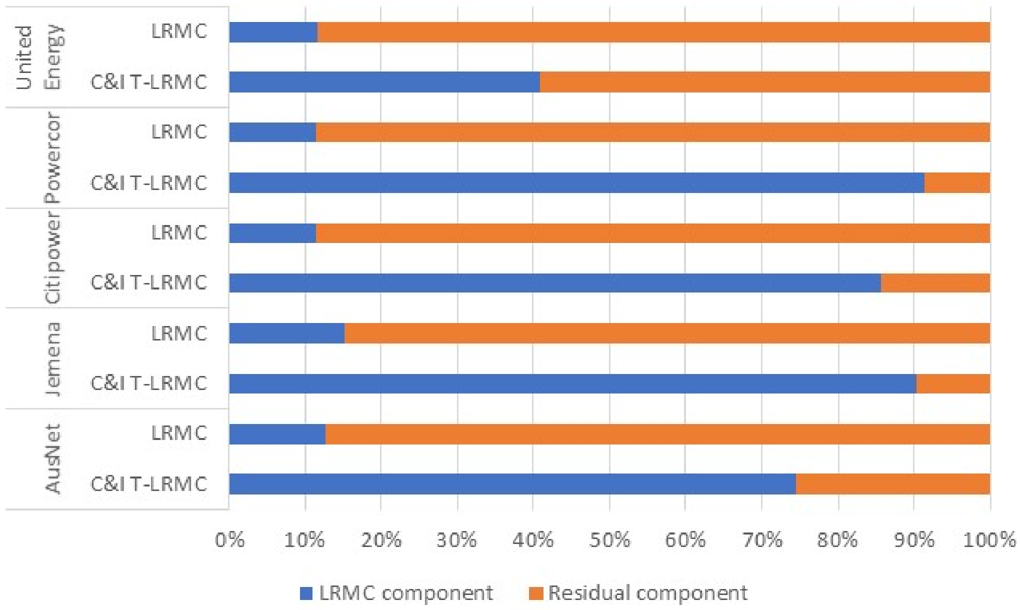
The data sources and methodology for the calculations above are explained in section 5 below. We use data from PTRM for both revenue and costs. The PTRM adjusts all cost building blocks for changes to capital expenditure, including depreciation and operating and maintenance expenditure, as well as the capital charge.

## 3.2 Commercial and Industrial tariffs do not appear cost reflective

Figure 5 compares LRMC as a proportion of total costs, with the aggregate forward-looking proportion tariff LRMC revenues for C&I tariff structures (C&I T-LRMC), for the five Victorian Distribution Network Service Providers.

Figure 5 – LRMC as a proportion of total costs vs. the aggregate LRMC component of approved C&I tariffs

[26] As explained below, this is based on data from each PTRM and we have not sort to compare the CAPEX values used in the PTRM with the actual CAPEX outturns from Regulatory Information Notices, which are in any case incomplete for the relevant period as of the time of writing.




In each case, network wide LRMC component of network revenue is less than 15 per cent (average 13 per cent). With the exception of United Energy (41 per cent), tariff LRMC for the relevant C&I tariff exceeds 75 per cent (average 77 per cent including United Energy).

If C&I tariffs were cost reflective, then the LRMC component of aggregate C&I tariffs would be expected to be lower than total LRMC (as a proportion of total costs). This reflects the fact that average residential and small business demand, not average C&I is more likely to drive total demand during periods of maximum network utilisation. It also reflects the fact that residential and small business customers typically have lower load factors than C&I customers.[27]

High voltage customers are more likely to use dedicated connection assets. Where this occurs, the assets are not standard control service and hence these costs are outside the regulated cost base and hence excluded from the LRMC component of total regulated revenues. Only operating costs are recovered from standard control tariffs.

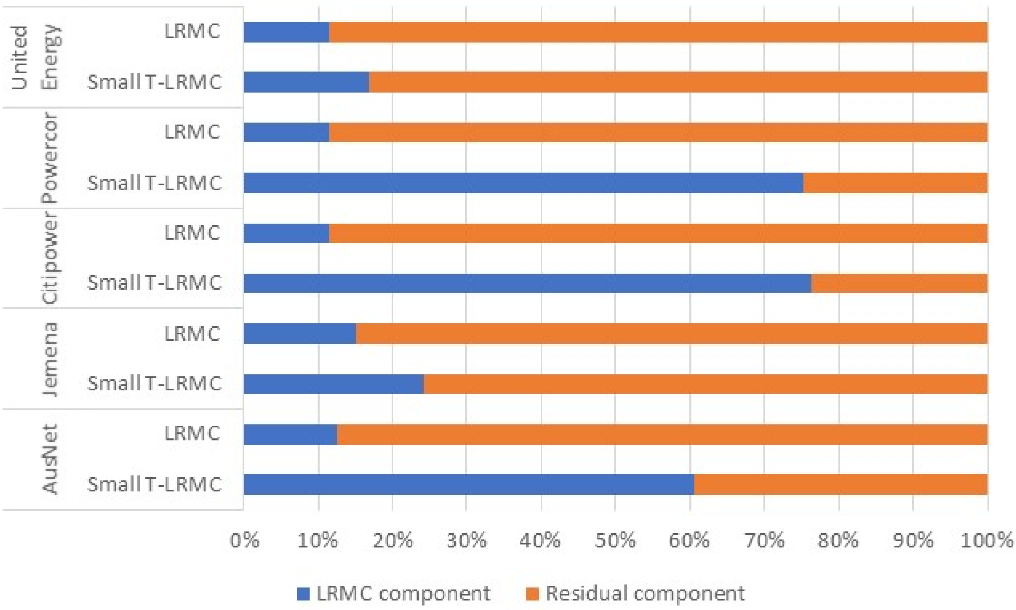
This analysis indicates that, *prima facie*, there is a material cross subsidy from C&I customers in favour of residential and small business customers. This is because the proportion of expected T-LRMC revenue appears higher for C&I customers than small business and residential customers, while LRMC is likely to be lower, taking into account capital contributions for dedicated assets and the fact the aggregate demand profile for C&I segments is “flatter” than small customer segments.

[27] The term ‘load factor’ refers to the ratio of maximum demand over a period relative to total demand over that period. A profile with high maximum demand relative to total demand may be described as having a low load factor.

## 3.3 Victorian residential and small business tariffs do not appear cost reflective

Figure 6 compares LRMC as a proportion of total costs (LRMC), with the aggregate forward-looking proportion of revenues from residential and small business tariffs (ST-LRMC), for the five Victorian Distribution Network Service Providers.

Figure 6 – LRMC as a proportion of total costs vs. the aggregate LRMC component of approved residential and small business tariffs




If individual tariffs were cost reflective, then the LRMC component of aggregate small customer tariffs would correspondent to the LRMC component of total allowed regulated revenues. United and Jemena appear to be two networks where the LRMC component of residential and small business tariffs is closest to corresponding to LRMC.

In each case, network wide LRMC component of total network cost is less than 15 per cent (average 13 per cent). The average ST-LRMC is well above this at 51 per cent.

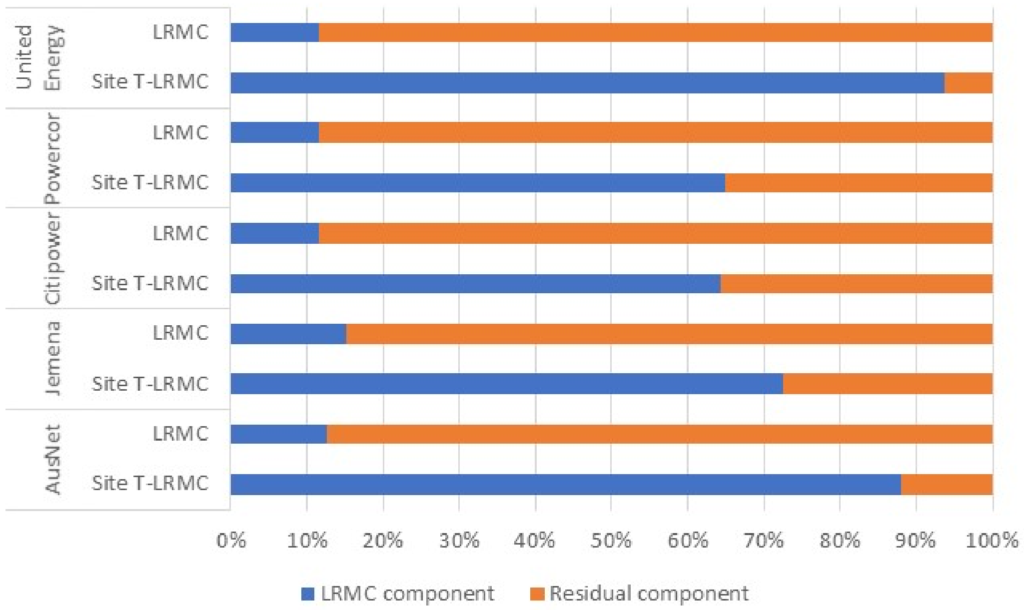
If residential and small business tariffs were cost reflective, then the LRMC component of aggregate residential and small business tariffs would be expected to be higher than total LRMC as a proportion of total costs. This reflects the fact that average residential and small business demand is more likely to drive demand during periods of maximum network utilisation. This result is consistent with the assessment that, prima facie, there is a cross subsidy from C&I customers in favour of residential and small business customers.

## 3.4 Impact of C&I tariffs for public EV charging sites

Figure 6 compares the forward-looking proportion of network costs (LRMC) with the LRMC component of HV network tariffs for EV charging sites (Site T-LRMC), for the five Victorian Distribution

Network Service Providers. The Site T-LRMC refers to a set of nine possible sites for public EV ultra-fast charging stations within Victoria, with most sites being within the AusNet and Powercor networks. This is discussed further below.

Figure 7 – LRMC component of C&I tariffs vs. the LRMC component of Victorian EV public charging sites (Site T-LRMC




The average T-LRMC component of Site T-LRMC (77 per cent) is similar to the average LRMC component of the C&I T-LRMC (77 per cent), discussed in section 3.2. The method for deriving the Site T-LRMC is different from that used to derive C&I T-LRMC, as discussed below. Nevertheless, the result suggests that EV charging stations may not be substantially penalised relative to other C&I customers. However, this analysis demonstrates that, prima facie, C&I tariff structures are not cost-reflective for ultra-fast EV public charging sites

## 3.5 Site-specific network capacity

Figure 7 below compares available firm network capacity ("headroom") relative to a sample of 9 possible public EV charging sites. These sites are assigned to large customer tariffs by four of the five Victorian DNSPs (Powercor, Citipower, Jemena and United Energy). This is because the sites have a connection capacity that exceeds the capacity threshold set by those DNSPs for default large customer assignment. The anticipated volumetric consumption of these sites is otherwise well below the volumetric threshold for large customer assignment.[28]

It focuses on Zone Substations (ZS) as these are usually the major network assets by value for all locations served by a distribution network. Typically, other network elements (e.g. poles and wires)

[28] These connection capacity thresholds are 120kW for Powercor and Citipower, 120kVA for Jemena and 150kVA for United Energy. Whereas Ausnet services does not set a customer capacity threshold.

are sized relative to ZS capacity.  Accordingly, available firm ZS capacity is indicative of available firm capacity for most network elements directly connected to each Zone Substation.[29]

Figure 8 – Forecast network capacity (2024) relative to Evie Network maximum demand for nine possible public ultra-fast EV charging sites

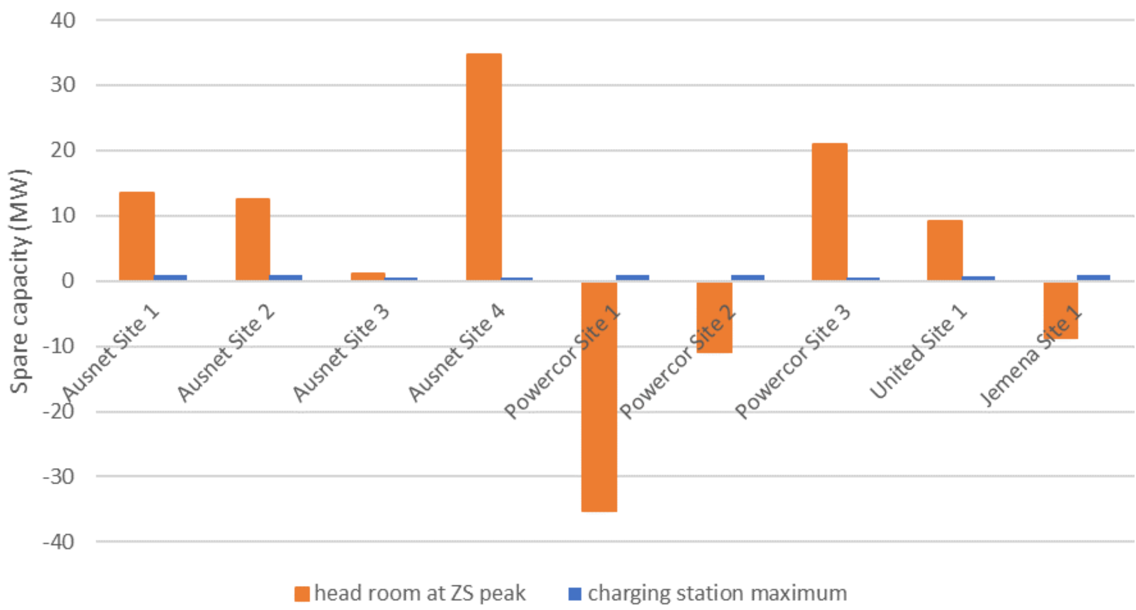



Figure 7 shows there is ample available firm ZS capacity (orange bars) at the periods of greatest utilisation of the relevant parts of the network, relative to the incremental maximum demand of an EV public charging facility (blue bars), for six of the nine sites.  The incremental maximum charging station demand is equal to or less than 1.25MW.

At these six sites, available firm ZS capacity is ample at periods of greatest utilisation of the relevant network assets.  As a result, there is no obvious need for additional forward-looking expenditure that would justify the application of LRMC tariffs for these locations.

The extent of spare capacity clearly demonstrates that public EV charging site demand utilises infra-marginal network capacity even at the expected EV charging peak.  These EV charging sites are unlikely to ever use marginal network capacity.  This suggests these EV charging sites do not have a high-cost demand profile relative to the average network user.

For a third of the sites, however, capacity augmentation to the ZS capacity (e.g. an additional transformer) and associated network elements (e.g. feeders), or non-network alternative, appears to be required, subject to the outcome of a regulatory investment test.  Even in this case, it is uncertain whether a substantial LRMC tariff would be applicable.

This is because any augmentation requirement would be addressed at the point an EV charging site seeks to connect to the network.  The EV site share of the augmentation requirement would be

[29] This depends on local factors, for example differential demand growth rates in different parts of a network served by a ZS – e.g. due to a major industrial or residential development.

substantially funded by one off connection charges (capital contributions) and not ongoing regulated network charges. Accordingly, the cost of such augmentations is not included in LRMC – otherwise the capacity is being double charged. Following any augmentation, there would be no local requirement for a substantial LRMC component in efficient network tariffs.

There may be alternative connection solutions, which could include some form of capacity management control to limit maximum demand from a charging station during periods of maximum demand on the relevant ZS. Again, in this case, there would be an LRMC associated with the new connection.[30]

The analysis suggests that T-LRMC should be a modest proportion of total C&I customer tariffs for these EV charging sites and similar locations. This is consistent with the relevant rules, and in particular the AER's stated support in favour of the early introduction of locational pricing for large customers.

## 3.6 NSW evidence on marginal demand and peak traffic flows

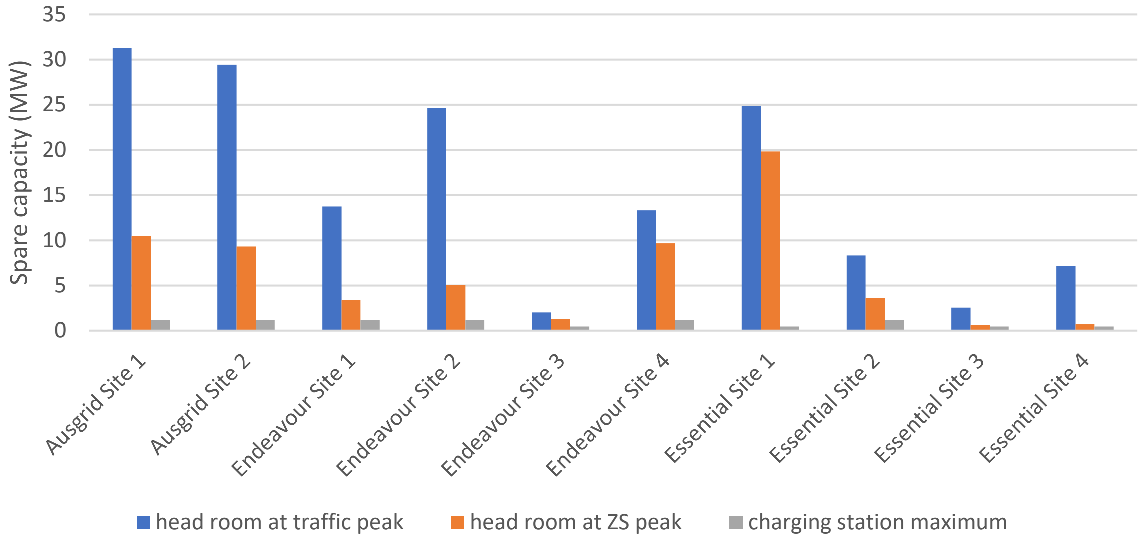
High resolution interval data on highway volumes is not available in Victoria but is available in NSW. This means it is possible to compare electricity demand with traffic volumes at a given location for any time of the year in NSW, but not in Victoria.

Drawing on available evidence from NSW, it seems doubtful that the time of maximum demand by EV charging sites corresponds to periods of greatest utilisation of the relevant parts of the network. As for petrol stations, maximum demand for EV charging sites is likely to correspond to periods of maximum traffic flows.

This can be seen from figure 8 below, which considers a set of 10 possible public EV charging sites in NSW, combining time of use and traffic volume data for each site.

[30] For example, the Californian Pacific Gas and Electric Company requires that EV charging sites that do not pass on peak pricing signals to consumers have load management plans to manage demand during peak events.

Figure 9 – NSW local network capacity at maximum annual demand and traffic peak relative to charging station maximum




This analysis suggests that maximum annual electricity demand (i.e. marginal demand)is very unlikely to coincide with maximum charging station demand. Maximum electricity demand is typically temperature related (air-conditioning driven) during extreme heatwaves, whereas maximum charging station demand would coincide with periods of peak traffic flows, which are not temperature related. Put another way, the highest periods of light vehicle use, especially outside cities, whether EV or liquid fuel powered, can be expected to coincide with lower levels of electricity demand, not higher levels.

## 3.7 Tariff assignment policies

There are significant inconsistencies between networks regarding tariff assignment policies for the candidate sites. The sites are assigned to C&I tariffs for four of the five Victorian DNSPs (Powercor, Citipower, Jemena and United Energy), even though the anticipated volumetric consumption of these sites is well below the volumetric threshold for large customer assignment.

This reflects connection capacities that exceed the capacity thresholds set by those DNSPs for default large customer assignment. These connection capacity thresholds are 120kW for Powercor and Citipower, 120kVA for Jemena and 150kVA for United Energy. Ausnet services does not apply a customer capacity threshold and hence there is no default assignment to C&I tariffs, irrespective of consumption volume.

In assessing tariff assignment policies implemented via network tariff eligibility criteria, the AER must have regard to the tariff assignment principles set out in 6.18.4 of the NER. At present, for four of the five networks, tariff assignment is determined solely on the basis of the connection criterion (6.18.4(a)(1)(ii)). For those networks, there appears to be no regard to the first criterion (6.18.4(a)(1)(i)) which is the nature and extent of usage by the relevant retail customers.

Where connection assets are not funded by regulated (standard control) tariffs, but instead by customer contributions regulated separately as alternative control services, there is no clear basis for using 6.18.4(a)(1)(ii) as the sole criterion for tariff assignment. The AER should therefore consider developing guidance to networks requiring them to modify the existing network tariff assignment policies operating under 6.18.4 of the NER, where connection assets are not recovered from standard control tariffs. In this case 6.18.4(a)1(i) would influence tariff assignment, along with other relevant principles (with little or no weight applied to 6.18.4(a)(1)(ii)). This would result in EV fast charging stations being assigned to small business tariffs in place of C&I tariffs, until or unless annual demand volumes exceed the relevant small business volume thresholds for a given site.

## 3.8 Sub-threshold tariffs

There are provisions in the rules for sub-threshold tariffs, where the Distribution Network Service Provider's forecast revenue from the relevant tariff during each regulatory year in which the tariff is to apply is no greater than **0.5 per cent** of the Distribution Network Service Provider's annual revenue requirement for that regulatory year.[31] It appears unlikely that demand by Evie Networks, on its own would exceed this threshold for any of the five Victorian networks.

Sub-threshold tariffs offer the opportunity to develop cost-reflective tariffs for ultra-fast EV public charging stations. Use of sub-threshold tariffs would be consistent with the AER’s view there may be merit in introducing targeted complementary measures to address location specific issues including through the trialing of alternative tariff structures.[32]

Any such tariffs could be consistent with the network pricing principles and network pricing objective. The resulting bills could be expected to be substantially lower than would be the case if the current C&I tariffs were applied. This would not, however, represent a cross-subsidy from other customer classes. Rather, it would represent a removal of the very substantial cross subsidy from Evie Networks, under current tariff structures, to other customers.

[31] See section 6.18.1C(a)(1).
[32] See AER Issues Paper page 19.

# 4. Findings

## 4.1 Network tariffs appear inconsistent with the NEL

The currently approved TSS, network tariffs and resulting customer bills, do not appear to be consistent with the NEL. The relevant sections of the NER require tariffs to be based on LRMC. There is, however, a very large discrepancy between LRMC, as a proportion of regulated costs, on the one hand, and the LRMC component of expected revenue from tariffs (T-LRMC), on the other, for all five networks and across all major tariff classes.

Data necessary to test whether network tariff proposals are consistent with the NER have so far not been provided by any of the Victorian networks for future proposals, by completing the relevant expected revenue sheets in PTRM. An assessment of the share of network revenue from the different charging parameters, in particular the LRMC component, is a pre-requisite for such an evaluation.[33] The absence of this information accompanying the current TSS proposals, means that meaningful consultation over tariff proposals is not possible.

There is nothing in proposed TSS or the AER Issues Paper to suggest the new TSS proposals will reduce the present discrepancies between prices and costs (LRMC). This is because there is nothing in the network proposals to suggest the present flawed methods for determining the LRMC portion of tariffs have been reviewed and amended. Similarly, there is also no evidence proposed tariff structures would be adjusted to reflect material changes in LRMC between the current and following price control periods, for at least some networks.

The AER Issues Paper suggests a continued reliance on very broadly defined peak charging windows. Broad charging windows are, however, unlikely to be consistent with the NER since they result in excess charges for infra-marginal demand and insufficient charges for marginal demand.

## 4.2 Approved network tariffs not cost-reflective

If tariff structures for each customer class ('retail customer') were cost reflective, then the LRMC component of aggregate tariffs would correspond to the LRMC component of total allowed regulated revenues. Our analysis shows that all of Victoria's networks have been substantially over-recovering the LRMC component of their total regulated costs authorised under clause 6.18.5(f) of the NER.

This problem is illustrated in Figure 10 below, which compares LRMC as a proportion of total regulated costs with the LRMC component of current approved network tariffs for a typical approved Victorian network tariff. The tariff structure is clearly not 'based on' LRMC, as required by the NER.

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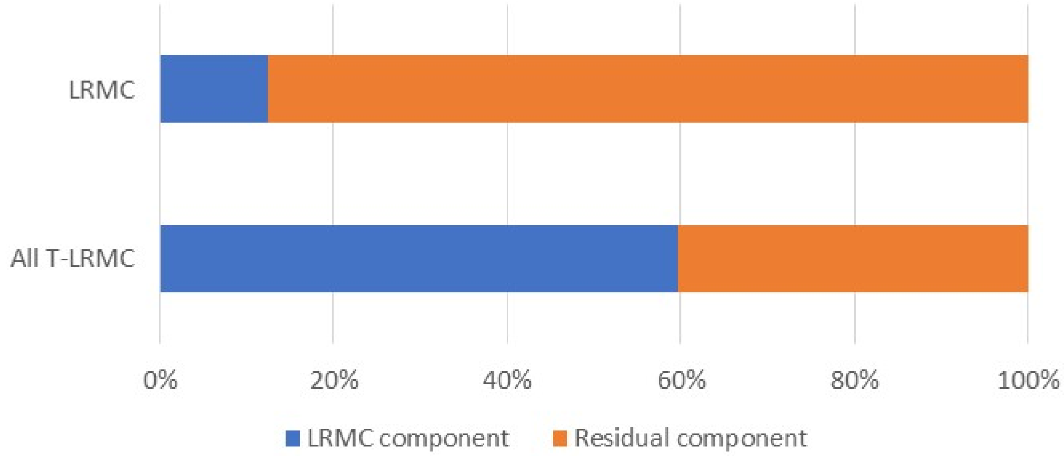
[33] See the discussion of the AER's consideration of this matter in Section 2.8 below.

Figure 10 – LRMC as a proportion of total regulated costs vs. LRMC component of current approved network tariffs




Equally, networks have been under recovering revenues under 6.18.5(g) of the NER. This clause relates to the residual ("residual") between the revenue from the LRMC based components of tariffs, and the revenue required to recover the total efficient costs of serving the retail customers that are assigned to the tariff.

ToU and demand tariffs, without charging windows, or with very broad charging windows, and without reference to location, are not delivering tariffs that reflect the network's efficient costs of providing regulated services. Especially for C&I tariffs, this is inconsistent with the NPO.[34]

C&I tariff structures appear to result in higher prices for customers with low load factors, other things being equal. This is a product of the monthly capacity (demand) charges typically applied under C&I tariffs. However, tariff structures focusing on load factors are not consistent with the requirement for tariffs to reflect LRMC. This is because load factors are unrelated to the additional costs associated with meeting demand at times of greatest utilisation of the relevant part of the network.

Tariffs are less cost reflective for C&I customers. C&I customer segments overall are funding a cross subsidy in favour of residential and small business customer segments.

Overall, current tariff structures are resulting in excessive prices for customers whose demand is infra-marginal, alongside under-recovery of marginal costs for customers whose demand is marginal. This has the effect of shifting total network costs between, and within, tariff classes (customer segments) in ways that produce outcomes (energy prices and customer bills) that are inconsistent with the long-term interests of customers.

[34] See 6.18.5(a) of the NER.

## 4.3 Implications for ultra-fast EV charging station tariffs

Similarly, projected network tariff outcomes (bills) for a set of candidate ultra-fast public EV charging sites across the five Victorian electricity distribution networks do not appear to be consistent with the NER. These sites are assigned to large customer tariffs by four of the five Victorian DNSPs (Powercor, Citipower, Jemena and United Energy). This is because the sites have a connection capacity that exceeds the capacity threshold set by those DNSPs for default large customer assignment. The anticipated volumetric consumption of these sites is otherwise well below the volumetric threshold for large customer assignment.[35]

The relevant C&I tariff structures, and projected network bills for the identified EV charging sites, do not reflect the efficient costs of providing the services at those locations. The difference between costs and prices is substantial.

Public EV charging site demand, at the candidate locations, is infra-marginal in every case. It does not trigger investment in marginal network capacity (excluding network connection upgrades for some sites). In the three locations where capacity augmentation appears to be required (subject to the relevant tests and approvals), Evie Networks is required to pay upfront capital contributions regulated as alternate control services. Accordingly, the bulk of the augmentation cost at these locations should not be recovered from the application of high LRMC related charges within standard control tariffs.[36]

Drawing on available evidence from NSW, the times of maximum demand by public EV charging sites would not correspond to periods of greatest utilisation of the relevant parts of the electricity network. As for regional petrol stations in particular, maximum demand for the identified candidate EV charging sites is likely to correspond to periods of maximum traffic flows, for example during holiday periods. These periods do not coincide with periods of greatest network utilisation. The diversity between EV charging site demand and local maximum demand is not reflected in the present C&I tariff structures because these structures are not cost-reflective:

In the absence of widespread tariff reform, sub-threshold tariffs offer the opportunity to develop cost-reflective tariffs for ultra-fast EV public charging stations, in line with AER guidance. Any such tariffs should be consistent with the network pricing principles and NPO. They should incorporate LRMC at the relevant locations, exclusive of customer capital contributions.

An alternative arrangement would be for the AER to consider guidance to networks requiring them to modify the existing network tariff assignment policies operating under 6.18.4 of the NER, to reflect the fact the connection assets are not funded from regulated tariffs but instead by capital contributions. In this case 6.18.4(a)1(i) alone would determine tariff assignment. This would result in EV fast charging stations being assigned to small business tariffs in place of C&I tariffs, until or unless annual demand volumes exceed the relevant small business volume thresholds.

[35] These connection capacity thresholds are 120kW for Powercor and Citipower, 120kVA for Jemena and 150kVA for United Energy. Whereas Ausnet services does not set a customer capacity threshold.

[36] As discussed in section 2.7, while we are satisfied that capital contributions are deducted from the total revenue requirement for standard control services, tariff-LRMC substantially exceeds LRMC. This implies that tariffs may not be cost-reflective, notwithstanding network rebates for capital contributions.

The resulting customer bills would be substantially lower than under the current C&I tariffs reflecting actual costs and excluding cross subsidies. While the LRMC component of efficient EV charging site tariffs would be zero or very low, the dollar value of the reduction in the LRMC component should be partly offset by an increase in the dollar value of the residual component of the tariff.

A substantial reduction in bills for EV charging sites would not represent a cross-subsidy from other customer classes. Rather, it would represent removal of the very substantial cross subsidy from EV charging sites, to other customers, both under current, and proposed, TSS.

## 4.4 Implications for AER consideration of proposed TSS

Cross subsidies result in dead-weight losses to the economy. Excessive network prices inefficiently suppress demand for infra-marginal capacity, where the marginal cost is close to zero. At the same time, excessive tariffs remove any incentive for EV sites to apply demand tariffs to EVs during periods of greatest network utilisation (i.e. peak demand periods).

Another form of economic cost from inefficient tariffs more generally is lower network asset utilisation and therefore higher network prices than otherwise for other customers. These outcomes are contrary to the long-term interests of electricity consumers (the NEO), as well as the NPO, which is that distribution tariffs should reflect the efficient costs of providing those services to the retail customer.

The analysis suggests the methods used by networks to determine the portion of revenue to be recovered from the LRMC component of tariffs is flawed. This may be related to expectations regarding LRMC that are no longer valid.

A major spur to network tariff reform was in response to growing maximum demand associated with the uptake of air-conditioners. This led to an expectation that LRMC would be a substantial portion of cost-reflective prices. More recently maximum demand from existing connections is now flat or falling, due to the uptake of distributed energy resources (DER), including energy efficiency.

In a 2018 draft decision, the AER suggested that an increase in the LRMC component of residential tariffs for Endeavour, from 15 per cent (2019) to 17 per cent (2024), reflected more cost-reflective pricing. [37] PTRM data for Endeavour indicate that LRMC represents just seven percent of its total regulated costs for the period to 2018. This suggests that increasing the LRMC component of tariffs would decrease rather than increase the extent Endeavour's tariffs are based on LRMC.

It appears that methods used by the AER to assess whether TSS are cost reflective are not cross checked and reconciled with inputs and outputs from the relevant PTRM. There are two main sources of error under current methods.

- The most substantial portion of total network capital expenditure now appears to be in response to growth in customer connections. The bulk of this cost is efficiently funded, under the relevant NER, not from the LRMC component of regulated tariffs, but from customer and developer funded capital contributions.

[37] See figure 18.3 and discussion on page 49 of *Australian Energy Regulator: Attachment 18 – Tariff structure statement | Draft decision - Endeavour Energy distribution determination 2019–24*.

- Forward-looking costs (LRMC) may not be depreciated over their economic lives, with remaining unrecovered costs being carried forward to the following price control periods applying the Roll Forward Model. They are instead over-recovered within a single price control period.

Accordingly, in the absence of PTRM data, there is nothing to suggest the proposed TSS would move toward cost-reflectivity and away from the current substantial discrepancies between cost and tariff structure. There is also no evidence , in the absence of PTRM data, that cross subsidies resulting in excessive energy prices for C&I customers, would be removed.

It therefore seems unlikely that proposed tariff structures contribute to compliance with the distribution pricing principles and the NPO. Consequently, in the absence of any further information from networks to support their TSS proposals, there appear to be sufficient grounds for the AER not to approve TSS proposals by all five Victorian networks, on the basis they do not contribute to compliance with the distribution pricing principles and the NPO, because they are not based on LRMC, including locational factors. A decision not to approve proposed TSS, with excessive recovery of LRMC, would be consistent with the October 2919 AER Draft Decision to reject parts of Energex and Ergon TSS on the basis the proposals included excessive recovery relative to LRMC.

# 5. Methodology and evidence

## 5.1 Data sources

| | Data | Comment | Source |
|---|---|---|---|
| 1 | Zone substation load profile and Zone substation capacity data | DNSP zone substation load data and (firm) capacity data is compared and used as the general network asset where significant augmentation costs may be triggered by significant additional future load. By comparison, for example, an additional feeder between a zone substation and public EV charging site is a relatively low-cost augmentation of the network that may be funded by connection fees. | Distribution annual planning reports. Australian Renewable Energy Mapping Infrastructure https://nationalmap.gov.au/renewables/ |
| 2 | DNSP Post Tax Revenue Models | Post Tax Revenue Models (PTRM) for Victorian networks are used to identify the LRMC component within overall regulated network costs, compared with the LRMC component of revenue forecasts also contained within PTRMs. | From AER website |
| 3 | Energetics Network Tariff model | A model previously developed for Evie to estimate annual bills of charging stations for representative sites across Australia, including Victoria. | Received from Evie |
| 4 | Site information | The location of potential sites | Received from Evie |

## 5.2 Calculation methodology

Our estimates of LRMC uses data from the (sometimes updated) approved version of the PTRM for each DNSP's standard control service for the current regulatory period (2016-2020). Using data in the PTRM input sheet, we measured the contribution to the annual and total revenue requirement from forward looking capital expenditure on the total revenue requirement for the five-year forecast period. With the exception of capital contributions, we included all capital expenditure, including replacement expenditure (Repex), in line with AER guidance.

We removed all capital expenditure from the cost base, ran the model and recorded the total revenue requirement. The PTRM automatically excludes data for capital expenditure recovered from customer capital contributions, as this capital expenditure is not recovered from regulated network tariffs.

The PTRM automatically adjusts all cost building blocks, including the capital charge, depreciation and operating and maintenance expenditure. We cross checked the differences to ensure impacts on other building blocks were included in the results.[38]

[38] There were some discrepancies but these are ignored for present purposes.

By comparing the revenue requirement with and without the forward-looking cost, we derived the effect of the forward-looking cost on the revenue requirement. This produced the top bars in figure 1 showing LRMC as a proportion of the total revenue requirement.

Together with the RFM, the PTRM also allocates LRMC over time. Some asset types may be fully depreciated over the duration of a single PTRM. Many other asset types may be fully depreciated over 50 years.

The T-LRMC values are derived from data provided in the forecast revenues tab. For each customer tariff class, this data provides expected revenue forecast for each tariff component for each year. This reconciles with the aggregate revenue requirement for each year. The tariff components are divided into either forward looking (e.g. peak time of use or capacity) or "residual" (e.g. standing charge or off-peak). The total revenues for each component are then added together for all tariffs. The bars in Figure 1 record the contribution to total forecast revenue from the forward-looking revenue component (T-LRMC) compared with the residual component.

Our estimate of the Site T-LRMC component for each site is based on the following.

1. A Network Tariff model previously developed by Energetics for Evie. The Energetics Network Tariff model estimates the network bills for a range of EV charging station configurations and the corresponding network tariff for a range of DNSPs.
2. Depending on the charging station/DNSP configuration, the estimated network bill is composed a combination of five types of charges: Supply charge, Usage charges (in Peak, Shoulder and Off-peak periods) and Demand charge. The total bill is derived by summing up applicable charges.
3. The T-LRMC component is the total value of resulting payments required under the Demand Charge and the Peak Usage charge. 7

## 5.3 Legal requirements for network tariff design

Electricity networks are statutory monopolies and subject to economic regulation. The regulations governing electricity network pricing were updated in 2014 under a determination made by the Australian Energy Market Commission.

Under the electricity distribution pricing rules, network tariffs *must be based on the LRMC of providing the service* to the retail customers assigned to the tariff.[39] There are a variety of LRMC related components in network tariffs, including demand or capacity charges and peak time of use charges.

The method for calculating LRMC, for the purpose of setting network tariffs, must have regard to the additional costs likely to be associated with meeting demand from retail customers assigned to that tariff *at times of greatest utilisation of the relevant part* of the network.[40] It must also take into account the *location* of retail customers and the extent to which *costs vary between different locations*...[41]

[39] See NER 6.18.5(f) – our emphasis
[40] See NER 6.18.5(f)(2) – our emphasis
[41] See NER 6.18.5(f)(3)

Under 6.18.5 (f) Each tariff must be based on the *long run marginal cost* of providing the service to which it relates to the *retail customers* assigned to that tariff with the method of calculating such cost and the manner in which that method is applied to be determined having regard to:

(1) the costs and benefits associated with calculating, implementing and applying that method as proposed;

(2) the additional costs likely to be associated with meeting demand from retail customers that are assigned to that tariff at times of greatest utilisation of the relevant part of the distribution network; and

(3) the location of retail customers that are assigned to that tariff and the extent to which costs vary between different locations in the distribution network.

Under 6.18.5(g) The revenue expected to be recovered from each tariff must:

(1) reflect the Distribution Network Service Provider's total efficient costs of serving the retail customers that are assigned to that tariff;

(2) when summed with the revenue expected to be received from all other tariffs, permit the Distribution Network Service Provider to recover the expected revenue for the relevant services in accordance with the applicable distribution determination for the Distribution Network Service Provider; and

(3) comply with sub-paragraphs (1) and (2) in a way that minimises distortions to the price signals for efficient usage that would result from tariffs that comply with the pricing principle set out in paragraph (f).

# References

Australian Energy Regulator Issues Paper: Victorian electricity distribution determination, 2021 to 2026, dated April 2020

Australian Energy Regulator: Attachment 18 – Tariff structure statement | Draft decision - Endeavour Energy distribution determination 2019–24

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Regional Queensland distribution and retail price determinations - Ergon Energy revised proposal 2020-2025 and QCA issues paper 2020-21 , Sapere report for CANEGROWERS, January 2020

# Glossary

| Abbreviation | Stands for |
|---|---|
| AER | Australian Energy Regulator |
| All T-LRMC | The proportion of total revenue recovered under 6.18.5(f). |
| C&I T-LRMC | The proportion of total revenue from Commercial and Industrial customer segment tariffs recovered under 6.18.5(f). |
| EV | Electric vehicle (battery powered). |
| Infra-marginal demand | Demand that does not result in augmentation expenditure requiring recovery under 6.18.5(f)and instead recovered under 6.18.5(g) |
| Marginal demand | Demand at times of greatest utilisation of the relevant part of the network that results in augmentation expenditure requiring cost recovery under 6.18.5(f). |
| NEL | National Electricity Law. |
| NER | National Electricity Rules. |
| NPO | Network pricing objective. |
| LRMC | Long run marginal cost – also used to refer to the portion of total cost that is forward looking (capital expenditure) related. |
| PTRM | Post-tax revenue model. |
| Residual | The proportion of total or segment revenue recovered under 6.18.5(g), excluding T-LRMC (6.18(f)). |
| RFM | Roll-forward model. |
| S T-LRMC | The proportion of total revenue from residential and small business segment tariffs recovered under 6.18.5(f). |
| Sub-threshold tariff | A trial tariff operating under 6.18.1C(a)(1). |
| TSS | Tariff Structure Statement. |

## About Us

Sapere Research Group is one of the largest expert consulting firms in Australasia, and a leader in the provision of independent economic, forensic accounting and public policy services. We provide independent expert testimony, strategic advisory services, data analytics and other advice to Australasia's private sector corporate clients, major law firms, government agencies, and regulatory bodies.

The authors have extensive credentials in the economic regulation of electricity networks, including the design of tariffs. They have completed numerous consulting assignments for the COAG Energy Council on aspects of network tariff reform. They have prepared numerous analyses comparing costs and prices, and cross subsidies between and within customer classes. They have consulted to the Australian Energy Regulator including by undertaking a review of a major aspect of economic benchmarking of operating expenditure for electricity distribution networks.

Simon Orme has been a member of the Western Australian Expert Panel for the Energy Review Board, the WA equivalent to the Australian Competition Authority, with respect to Energy, for more than a decade. He has appeared in regulatory hearings before the ACCC, the New Zealand Electricity Authority, the Philippines Electricity Regulatory Commission, and was retained by USAID to provide training on economic regulation for the National Electricity and Pricing Regulatory Authority of Pakistan.

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