Queensland Government

Our ref
Your ref EMO0040
Enquiries Noel Peters

Department of
Transport and Main Roads

26 October 2021

Alisa Toomey
Senior Advisor
Australian Energy Market Commission
GPO Box 2603
SYDNEY NSW 2000

Dear Alisa

RE: Submission to the AEMC Review of the Regulatory Framework for Metering Services – Your Ref: EMO0040

This submission is made on behalf of the Queensland Government's Department of Transport and Main Roads (TMR). The Department plans, manages and delivers Queensland's integrated transport environment for road, rail, air and sea.

In the Department's role as the main road authority for Queensland, it is responsible for a network of more than 34,000 km of National, State Strategic, Regional and District roads (Figure 1). In this role, we have jurisdictional responsibility for both the efficient movement of vehicles and for road safety.

As with all road authorities, street lighting is an important road safety measure for the Department. It is also an area which has recently experienced and is continuing to experience rapid technological change with the emergence of LED street lights, smart street lighting controls (with embedded metering capability) and, most recently, the addition of smart city sensors to lights. It is in this context that we make a submission to the AEMC about its current Review of the Regulatory Framework for Metering Services.

TMR strongly welcomes the AEMC's recognition in Table 2.1 of the Directions Paper that the smart metering capabilities of smart street lighting controls systems offer benefits for road authorities. TMR would welcome reforms that better facilitate the adoption of smart street lighting technologies and enable road authorities like the Department to take advantage of their full functionality in the future.

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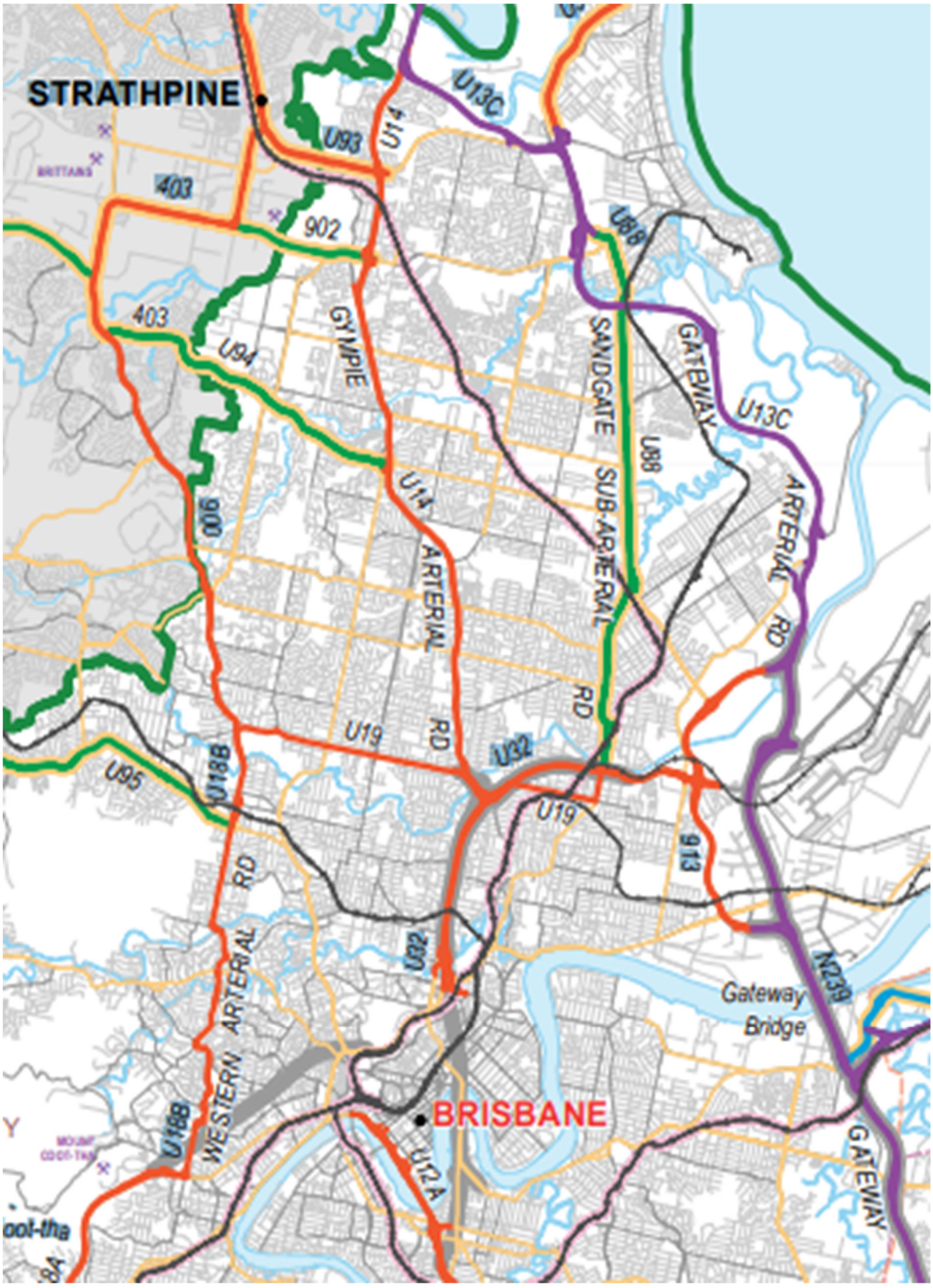


Figure 1: Illustrative Extract of Queensland Arterial Roads Network

Existing TMR Street Lighting

There are approximately 65,000 street lights on the Queensland network of arterial roads. Approximately 30,000 of these street lights are classified by Energy Queensland as 'Rate 1' and ‘Rate 2’ lights where the utility owns the lights and is responsible for their maintenance. A further 35,000 street lights are classified as ‘Rate 3’ where TMR owns the lights and is responsible for their maintenance and replacement. There are some additional smaller categories of lights under other tariff structures.

Energy consumption for all the Rate 1, Rate 2 and Rate 3 street lights is currently billed as deemed loads under the National Electricity Market’s Type 7 metering approach for unmetered loads. Type 7 metering assumes a fixed load as established in the NEM Load Table for Unmetered Connection Points managed by AEMO.

While the Type 7 metering approach may have been appropriate for previous generations of lighting technology, it does not allow for the variable electrical loads that are inherent with modern street lighting technology arising from their ability to remotely dim, brighten, trim excess lighting and implement constant light output controls as well as the emerging array of smart city sensors that may be added to the lights themselves or placed adjacent to the lights on the poles that support them. All of these street lighting and related technology developments entail variable energy consumption.

TMR’s Current Smart Street Lighting Project

TMR has recently awarded contracts for the replacement of 35,000 legacy street lights under a six-year program. These lights are being replaced with LEDs enabled with smart controls.

The smart street lighting controls system for the project is being provided by a consortium of Schréder-Sylvania, CIMCON and Telstra. The smart street lighting controls themselves are manufactured by CIMCON and will operate on Telstra’s NB-IoT and Cat M1 networks (extensions of the 4G network for IoT purposes). Some 4,000 smart controls have been deployed to date. This project will be one of the largest smart street lighting deployments in Australia and the largest on a main road network thus far.

TMR notes that CIMCON’s smart street lighting controls have been approved as a metering system for their deployment on the electricity network of San Diego Gas & Electric in California, USA. In this case the CIMCON system had to demonstrate compliance with the utility’s specification, which was previously approved by the local regulators (Public Utility Commission) and which includes the relevant portions of the US metering standard (ANSI C12.20) while other aspects of the metering standard were set aside as not being relevant to a public lighting installation. Our understanding from both our suppliers and consultants is that this is similar to the approach taken with smart street lighting in other jurisdictions in the USA and that comparable developments that recognise the metering capabilities of smart lighting have occurred in the UK and New Zealand.

Schréder-Sylvania and CIMCON are commencing discussions with the National Measurement Institute with a view to seeking pattern approval for their system in Australia. However, TMR recognises that securing pattern approval is unlikely to be sufficient to have its system readily recognised as a metering installation without reforms of the nature proposed by AEMC.

TMR’s current project is entirely focused on the Rate 3 lights that the Department directly owns and manages. The Department is making this submission because it recognises that:

- TMR cannot achieve full value from or use the full capabilities of its current smart street lighting controls deployment on some 35,000 Rate 3 lights without proper recognition of the metering capabilities available in this system which would enable it to implement brightening, dimming, trimming and constant light output as well as deploy emerging smart city sensors on these lights; and
- The lack of a framework in the National Electricity Market that recognises the metering benefits of smart street lighting controls is likely to be a significant impediment for all parties to concluding an agreement with Energy Queensland for the upgrading of the remaining 30,000 Rate 1 and Rate 2 lights that are on the Department's arterial roads network.

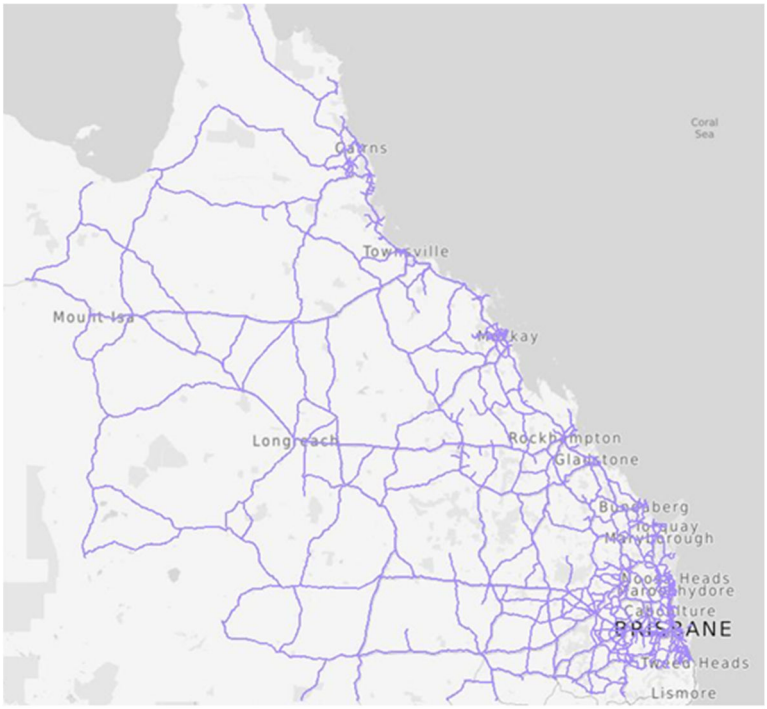
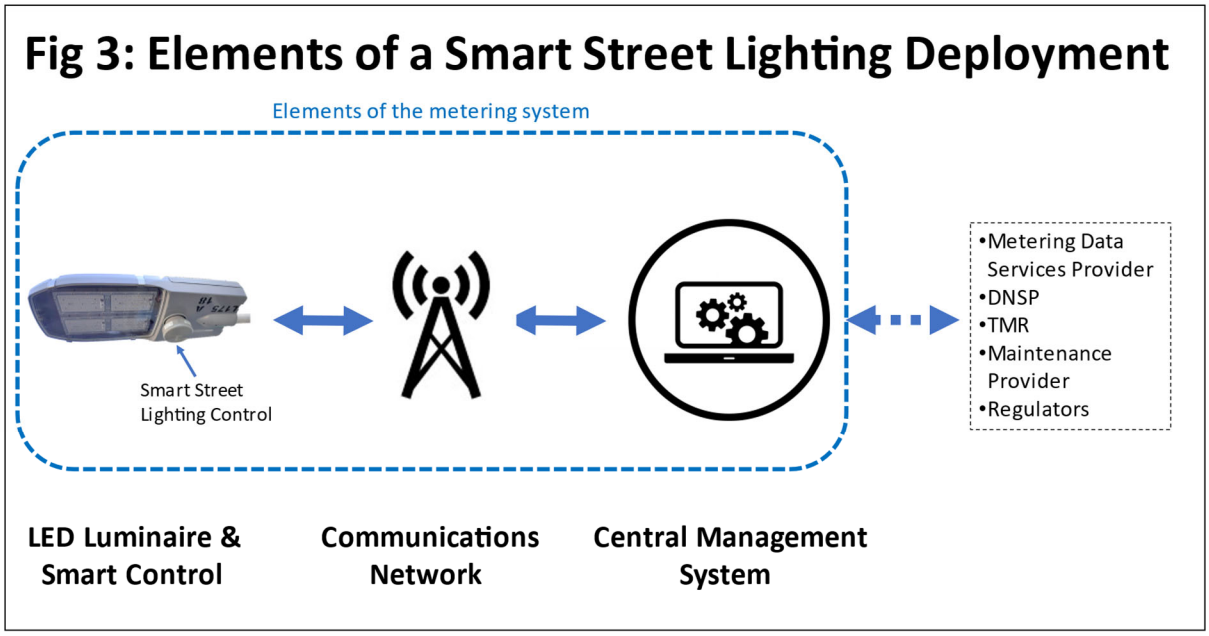


Figure 2: Illustrative Map of the extensive Queensland Arterial Roads Network

In terms of context for this submission, TMR notes that smart street lighting controls differ markedly from most other smart metering installations being considered in the Directions Paper as:

- they are multi-faceted systems with their metering capability being just one of many capabilities that they deliver (see response to Question #1a below summarising the range of benefits);
- as per Figure 3 below, the metering system is a multi-part system with the metering chip being embedded in the smart street lighting controls (or potentially the power supply of the street light), a communications network, a central management system and, potentially, other IT systems taking data feeds from the street lighting central management system (such as a metering data services provider, the Distribution Network Service Provider (DNSP) and the maintenance provider).



TMR Responses to Directions Paper Consultation Questions

The AEMC Directions Paper raises a series of thirteen consultation questions. TMR's responses to these questions, as they apply to smart street lighting, are below:

QUESTION 1: BENEFITS WHICH CAN BE ENABLED BY SMART METERS

(a) Are there other benefits which can be enabled by smart meters that are important to include in developing policy under the Review?

As summarised in the table below, smart street lighting controls have a range of road and public safety, asset management, energy reduction, metering, environmental and overall cost benefits. The business case is complex with benefits flowing to different parties. Nonetheless, the business case is strongly positive when the total benefits are considered as demonstrated by the more than 20 million smart controls estimated to be deployed as of 2021[1] and the reported compound annual growth rate of the sector of some 25%.

Importantly, the energy-related benefits are a key aspect of the business case and challenging or impossible to secure without the metering capabilities of the smart controls being recognised. Overall, the additional energy savings delivered by smart street lighting controls can be up to 30% (depending on the degree of dimming) with figures of 10-20% being widely cited as typical in large international deployments[2]. Depending on the Wattage of the lights and the dimming regime, these may contribute 1/3 – 1/2 of the total business case benefits.

Figure 4: Smart Street Lighting Control Device

[1] The Global Smart Street Lighting Market - Research and Markets
[2] IPWEA Street Lighting & Smart Controls Roadmap

Some comparable markets (such as parts of the US, UK, New Zealand and Singapore) where the metering capabilities of smart controls are recognised are reaching very high rates of deployment. In contrast, Australia has deployed few systems to date and most of the larger deployments to date appear to be on lighting controlled by the council or main road authority (eg the ACT, Darwin, Palmerston, VicRoads, Department of Infrastructure and Transport South Australia).

Table 1: Summary of Business Case Benefits of Smart Street Lighting Controls

Non-Energy-Related Benefits	Energy-Related Benefits
1. Automated fault and performance reporting (with resulting road safety benefits) 2. Negate the need for night patrols to identify faults 3. Reduce call handling from fault reports 4. Maintenance optimisation (by being able to group fault repairs, by correct identification of faulty light, by providing information on the nature of the fault and the type of light that has failed) 5. GIS location 6. Asset management benefits (including the ability to directly download asset management information from the power supply in the luminaire) 7. Inventory accuracy improvements 8. Reduced call handling 9. Longer luminaire life (when dimming regimes are implemented) 10. Ability to support additional smart city sensors on or adjacent to the light	11. **Dimming / Brightening** Dimming is typically off-peak dimming, but systems also employ brightening above baseline at peak times in response to adverse weather, special events or in emergencies 12. **Trimming** Trimming involves both optimising on and off times and permanently reducing excess lighting above compliance requirements 13. **Constant Light Output** Constant light output controls hold lighting output at compliance levels throughout luminaire life by gradually ramping up power to compensate for lumen depreciation 14. **Smart City Device Support** Depending on how luminaires and any smart devices are configures, smart controls may have the ability to properly measure energy consumption by smart city sensors added to street lights 15. **Billing Accuracy Improvements** Compared to current Type 7 deemed approach if metering capabilities are recognised **16. Energy Consumption/Power Quality Reporting** 17. **Reduced Environmental Impact** When dimming, trimming and constant light output controls are implemented, GHG reductions of 10-20% expected 18. **Ability to Claim Environmental Credits** Systems may be able to provide evidence of energy savings where environmental credit schemes recognise smart lighting controls

The Department recognises that the current Type 7 metering approach could accommodate a dimming regime however, this would need to be a fixed regime with unchanging dimming hours and levels. And, each combination of luminaire type and smart controls type would need to be independently tested under each fixed dimming regime. The Department holds concerns about the cost and inflexibility of this regime and notes that it would not facilitate any changing approach to dimming or brightening or most of the other benefits outlined above that entail dynamic energy consumption.

(b) What are stakeholders' views on alternative devices enabling benefits? What are the pros and cons of these alternative devices?

TMR does not see any practical alternatives to smart street lighting controls that deliver the range of benefits outlined above. In summary, lights with traditional photocells are incapable of delivering these benefits and the cost of widely deploying traditional metering arrangements in the public domain would be prohibitively expensive (eg due to the need for extensive rewiring and widespread deployment of new metering cabinets) and this would not, by itself facilitate many of the benefits identified above.

QUESTION 2: PENETRATION OF SMART METERS REQUIRED TO REALISE BENEFITS

(a) Do stakeholders agree that a higher penetration of smart meters is likely required to more fully realise the benefits of smart meters? If so, why? If no, why not (b) Do stakeholders have any feedback on the level of smart meter penetration required for specific benefits? Or to optimise all benefits?

TMR recognises that partial deployments of smart street lighting controls are inefficient and do not allow some of the benefits outline above to be delivered. For example:

- a dimming regime could not be practically or safely implemented unless entire road segments were smart controlled;
- regular night patrols to identify outages would still be required if not all lights are equipped with smart controls that report failures; and
- some of the maintenance optimisation benefits that arise from knowing all of the faults in a given region and being able to address them on one scheduled maintenance run instead of multiple runs would not be delivered if only some lights were monitored by smart controls.

TMR strongly encourage the AEMC to identify reforms that would recognise the metering capabilities of smart street lighting controls and thereby help facilitate widespread deployment of smart controls as part of either planned large-scale LED lighting upgrades or as part of planned maintenance cycles (noting that the marginal cost of installation of smart controls is negligible if a crew is already at the light for another purpose as they are generally easily installed twist-lock devices).

QUESTION 3: TO REACH A CRITICAL MASS IN A TIMELY MANNER, OPTIONS TO ACCELERATE THE ROLL OUT SHOULD BE CONSIDERED

(a) Do you consider that the roll out of smart meters should be accelerated? Please provide details of why or why not
(b) What are the merits, costs and benefits of each option? Is there a particular option which would be most appropriate in providing a timely, cost effective, safe and equitable roll out of smart meters?
(c) How would each of these options for rolling out smart meters impact the cost profiles of smart meters?

(d) Are there other options that you consider would better provide a timely, cost effective, safe and equitable roll out of smart meters?

Smart street lighting controls will not likely be widely deployed on public lighting in the NEM unless customers can easily recognise the benefits of dimming, trimming and constant light output. If these benefits are facilitated by metering reforms adopted in the NEM, the overwhelming evidence internationally (and from customer-owned lighting systems in Australia) is that such systems will be widely deployed at scale.

TMR strongly encourage the AEMC to identify reforms that would recognise the metering capabilities of smart street lighting controls and thereby help facilitate widespread deployment of smart controls as part of either planned large-scale LED lighting upgrades or as part of planned maintenance cycles (noting that the marginal cost of installation of smart controls is negligible if a crew is already at the light for another purpose as they are generally easily installed twist-lock devices).

QUESTION 4: OPTIONS TO ASSIST IN ALIGNING INCENTIVES
(a) What are the costs and benefits of each option? Is there a particular option which would best align incentives for stakeholders?
(b) Are there other options that you consider would better align incentives?

TMR agrees that the benefits of the metering capabilities of smart street lighting are split across a number of parties. In this case, however, the benefits flow primarily to the DNSP (as the owner and maintainer of Rate 1 and Rate 2 lights) and to the customer (of lights of all tariff classes).

In the case of DNSP-owned street lighting, the decision making on the adoption of such systems primarily rests with them. However, the balance of energy-related benefits would flow to the customer and hence the lack of incentive for a DNSP to aggressively pursue the deployment of smart street lighting controls.

As discussed previously, if the energy-related benefits of smart street lighting controls are facilitated for customers by metering reforms adopted in the NEM, the overwhelming evidence internationally (and from customer-owned lighting systems in Australia) is that such systems will be widely deployed at scale.

As acknowledged in the Directions Paper (p14 and elsewhere), the Energy Security Board and AEMC have recognised that the metering and other electrical data (eg relating to power quality) from devices such as smart street lighting controls can provide valuable insights to the DNSPs, retailers and other parties about the state and performance of the electrical distribution network.

TMR agrees that this type of data should be made available to parties such as the DNSPs but also that street lighting customers (who will pay for the full costs of smart street lighting installations under all tariff arrangements) should be appropriately compensated with incentives as suggested by the Energy Security Board. If constructed appropriately, such recognition could provide a modest additional incentive for customer adoption of smart street lighting controls while also providing the DNSPs with rapid and reasonably granular access to power quality data across their network as street lighting is generally at intervals of every 30-80m on all urbanised street and arterial roads.

QUESTION 5: THE CURRENT MINIMUM SERVICE SPECIFICATIONS ENABLE THE REQUIRED SERVICES TO BE PROVIDED

(a) Do you agree with the Commission's preliminary position that the minimum service specification and physical requirements of the meter are sufficient? If not, what are the specific changes required?
(b) Are there changes to the minimum service specifications, or elsewhere in Chapter 7 of the NER, required to enable new services and innovation?
(c) What is the most cost-effective way to support electrical safety outcomes, like neutral integrity? Would enabling data access for DNSPs or requiring smart meters to physically provide the service, such as via an alarm within the meter, achieve this?
(d) Do you agree smart meters provide the most efficient means for DNSPs to improve the visibility of their low voltage networks? Why, or why not? What would alternatives for network monitoring be, and would any of these alternatives be more efficient?
(e) Can smart meters be used to provide an effective solution to emerging system issues?

TMR is not in a position to comment on the detailed metering requirements in the NEM but does note that some aspects of the current requirements may not be applicable to smart street lighting controls. Smart street lighting controls manifestly fit into what the Energy Security Board identified as, "…non-traditional types of metering installations and meter location"[3].

In implementing reform, we would ask that the AEMC (and AEMO) consider whether some accommodations may be needed, recognising the differing nature of smart street lighting controls and that the metering capabilities of smart street lighting controls are a dramatic step forward in terms of metering accuracy compared to the inherent inaccuracies and uncertainties of the unmetered Type 7 approach (eg inventory inaccuracy, the change in energy consumption of luminaires over lifetime, the drift in photocell responsiveness over time, the inability to capture day-burners or outages).

As noted in the introduction, CIMCON's smart street lighting controls have been approved as a metering system for their deployment on the electricity network of San Diego Gas & Electric in California, USA. In this case the CIMCON system had to demonstrate compliance with the utility's specification, which was previously approved by the local regulators (Public Utility Commission) and which includes the relevant portions of the US metering standard (ANSI C12.20) while other aspects of the metering standard were set aside as not being relevant to a public lighting installation. Our understanding from both suppliers and consultants is that this is similar to the approach taken with smart street lighting in other jurisdictions in the USA (eg most notably in Georgia).

We also understand that in the UK, under Elexon BSCP520, they effectively recognise the output of the Central Management Systems of smart street lighting installations as a valid proxy for metering data after those CMS are put through an independent testing and approval process.

In June 2021, the New Zealand Electricity Authority recognised street lighting controlled by a central monitoring system as an approved metering profile. TMR understands that this is currently being piloted in Whakatane and is likely to employed shortly in Dunedin.

[3] Energy Security Board Post 2025 Market Design Final Advice to Energy Ministers Part C, p40

We encourage the AEMC and AEMO to consider precedents from the US, UK, NZ and other jurisdictions in formulating an approach that recognises the metering capabilities of smart lighting systems in Australia.

QUESTION 6: ENABLING APPROPRIATE ACCESS TO DATA FROM METERS IS KEY TO UNLOCKING BENEFITS FOR CONSUMERS AND END USERS

(a) Do you agree there is a need to develop a framework for power quality data access and exchange? Why or why not?
(b) Besides DNSPs, which other market participants or third parties may reasonably require access to power quality data under an exchange framework? What are the use cases and benefits that access to this data can offer?
(c) Do you have any views on whether the provision of power quality data should be standardised? If so, what should the Commission take into consideration?
(d)Do you consider the current framework is meeting consumers' demand for energy data (billing and non-billing data), and if not, what changes would be required? Is there data that consumers would benefit from accessing that CDR will not enable?

As acknowledged in the Directions Paper (p14 and elsewhere), the Energy Security Board and AEMC have recognised that the metering and other electrical data (eg relating to power quality) from devices such as smart street lighting controls can provide valuable insights to the DNSPs, retailers and other parties about the state and performance of the electrical distribution network.

TMR agrees that this type of data should be made available to parties such as the DNSPs but also that street lighting customers (who will pay for the full costs of smart street lighting installations under all tariff arrangements) should be appropriately compensated with incentives as suggested by the Energy Security Board.

QUESTION 7: FEEDBACK ON THE INITIAL OPTIONS FOR DATA ACCESS THAT THE COMMISSION HAS PRESENTED

(a) What are the costs and benefits of a centralised organisation providing all metering data? Is there value in exploring this option further? (e.g. high prescription of data management).
(b) What are the costs and benefits of minimum content requirements for contracts and agreements for data access to provide standardisation? Would such an approach address issues of negotiation, consistency, and price of data?
(c) What are the costs and benefits of developing an exchange architecture to minimise one-to-many interfaces and negotiations? Could B2B be utilised to serve this function? Is there value in exploring a new architecture such as an API-based hub and spoke model?
(d) What are the costs and benefits of a negotiate-arbitrate structure to enable data access for metering? Is there value in exploring this option further? (e.g. coverage tests or non-prescriptive pricing principles).
(e) Are there any other specific options or components the Commission should consider?

TMR is not in a position to comment on the details of how the NEM manages metering data but notes that, while the energy savings benefits of smart street lighting controls might be significant in relative terms, they are not significant in absolute terms.

Each individual LED street light might have average consumption of 15 - 40W on a residential road and 100 - 250W on a main road. The additional energy savings facilitated by smart street lighting controls might typically be 10-30% of these loads.

Therefore, any metering market design that is more costly than even a very few dollars per year per light could easily negate the key benefits of deploying smart street lighting controls and severely impede their widespread deployment.

QUESTION 8: A HIGHER PENETRATION OF SMART METERS WILL ENABLE MORE SERVICES TO BE PROVIDED MORE EFFICIENTLY
(a) Are there other potential use cases that third parties can offer at different penetrations of smart meters? What else is required to enable these use cases?
(b) Noting recommendations in incentives and the roll out, are there other considerations for economies of scale in current and emerging service models

In addition to facilitating a range of non-energy related benefits (identified in response to Question 1a, reform measures that enable the widespread deployment of smart street lighting controls are also likely to enable the inter-related deployment of smart city sensors that may be added to the lights themselves or placed adjacent to the lights on the poles that support them.

QUESTION 9: IMPROVING CUSTOMERS' EXPERIENCE
(a) Do you have any feedback on the proposal to require retailers to provide information to their customers when a smart meter is being installed? Is the proposed information adequate, or should any changes be made?
(b) Should an independent party provide information on smart meters for customers? If so, how should this be implemented?
(c) Should retailers be required to install a smart meter when requested by a customer, for any reason? Are there any unintended consequences which may arise from such an approach?

These questions do not apply to the deployment of smart street lighting controls as, under all practical scenarios, the deployment decision would lie with the DNSP or road authority. International evidence seems to strongly indicate that, when the metering regime properly recognises the metering capabilities of smart street lighting controls, customers are strongly motivated to progress large scale deployments.

QUESTION 10: REDUCING DELAYS IN METER REPLACEMENT
(a) Do you have any feedback on the proposed changes to the meter malfunction process?
(b) Are there any practicable mechanisms to address remediation issues that can prevent a smart meter from being installed?

These questions do not apply to street lighting as:

- Existing street lighting installations are largely unmetered and managed as deemed loads under the Type 7 metering approach for unmetered loads, so no metering replacements are required; and
- If smart street lighting controls were installed, under all practical scenarios, the deployment, maintenance and replacement responsibility for them would need to lie with the DNSP (or customer) as an integral part of managing their lighting installation. In the absence of current valid metering data on any given day, defaulting back to the maximum consumption of the connected load would seem to be a reasonable incentive for the manager of or customer of the street lighting installation to rectify any faults or failures. TMR has been advised that this is the approach taken under the UK's Elexon regime for smart street lighting controlled by CMS systems.

QUESTION 11: MEASURES THAT COULD SUPPORT MORE EFFICIENT DEPLOYMENT OF SMART METERS

(a) Do you have any feedback on the proposal to reduce the number of notices for retailer-led roll outs to one?

(b) What are your views on the opt-out provision for retailer-led roll outs? Should the opt-out provision be removed or retained, and why?

(c) Are there solutions which you consider will help to simplify and improve meter replacement in multi-occupancy premises? Should a one-in-all-in approach be considered further?

These questions do not apply to the deployment of smart street lighting controls as, under all practical scenarios, the deployment, maintenance and replacement responsibility for smart street lighting controls would need to lie with the DNSP or road authority as an integral part of managing their lighting installation.

QUESTION 12: FEEDBACK ON OTHER INSTALLATION ISSUES

(a) Do you have feedback on any of the other installation issues raised by stakeholders? Are there any other installation issues the Commission should also consider?

No additional comments.

QUESTION 13: IMPROVEMENTS TO ROLES AND RESPONSIBILITIES

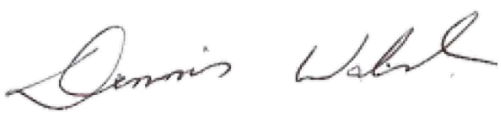
(a) Are there any changes to roles and responsibilities that the Commission should consider under this review? If so, what are those changes, and what would be the benefit of those changes?

As noted above, under all practical scenarios, the deployment, maintenance and replacement responsibility for smart street lighting controls would need to lie with the DNSP or road authority as an integral part of managing their lighting installation. Furthermore, the communications arrangements and Central Management System used to both operate the lights but also the recipient of metering data would reasonably need to remain under the control of the DNSP or road authority.

TMR recognises that, with the metering capability of smart controls embedded in the devices and the arrangements described above, there may need to be changes in the roles and responsibilities of parties in the NEM responsible for delivering and administering metering data from smart lighting installations.

TMR would welcome any further discussion with the AEMC (and AEMO) about its smart street lighting controls deployment and the comments made in this submission. Questions in the first instance should be directed to Noel Peters, Director (ITS Technologies), noel.c.peters@tmr.qld.gov.au .

Yours sincerely



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