14 September 2023

ATTN: Lisa Shrimpton – Project Leader
Australian Energy Markets Commission
Level 15 – 60 Castlereagh Street
Sydney NSW 2000

Dear Ms Shrimpton,

RE: Unlocking CER benefits through flexible trading (REF ERC0346) – IPWEA Submission on Minor Energy Flow Metering for Street Lighting & Other Street Furniture

IPWEA is the peak association for infrastructure asset managers and professionals who deliver public works and engineering services. Our members, as the road authorities and as the local government authorities, have primary responsibility for decisions about most Australian public lighting including whether to light, to what level to light to and in what manner to light roads and other public spaces. With our members' interest in mind, IPWEA's Street Lighting & Smart Controls (SLSC) Program was founded in 2016 to accelerate the efficient adoption of modern street lighting and smart controls technologies and best practices throughout Australia and New Zealand.

This submission focuses on the questions in the Directions Paper about Minor Energy Flow Metering (e.g., Questions 10-13) and specifically addresses these questions from the perspective of street lighting as a leading use case. It should be read in conjunction with IPWEA's previous February 2023 submission in response to the AEMC Consultation Paper. The content of this submission has been prepared with input from a range of street lighting customer and supplier organisations.

Summary of Key Points from Previous IPWEA Submission

For background, the following are the key points from IPWEA's February 2023 submission on the AEMC's Consultation Paper:

- IPWEA strongly welcomes the proposal to adopt an opt-in Minor Energy Flow Metering (MEFM) regime in the National Electricity Market (NEM).
- There is a broad and compelling public benefits case to introduce a simple, effective and efficient regime that recognises the metering capabilities of smart street lighting controls and encourages their widespread adoption across some 2.5 million street lights and other similar devices. Reform would greatly improve metering accuracy in this largely unmetered segment of the electricity market but also facilitate energy savings, maintenance savings, road / public safety improvements, a range of environmental gains and other benefits.
- The business case for smart street lighting controls is substantially influenced by the energy savings that they can deliver as these savings account for perhaps 45-60% of the easily realisable

financial benefit. The current absence of a regime in the NEM that recognises the metering data from smart street lighting controls has hampered adoption.

- There is solid precedent internationally for recognising the metering capabilities of smart street lighting controls. Such reforms have been a key enabler of widespread adoption in markets such as the United Kingdom, parts the United States and in New Zealand. We understand that the UK is now on its fourth iteration of such a mechanism with its latest version directly using the data from smart street lighting controls as metering data.
- A key feature of successful regulatory reforms elsewhere is that they have adopted a streamlined version of their metering regime to apply to smart street lighting controls, setting aside or modifying aspects of their regimes that are not relevant to the nature of the small loads being measured.
- IPWEA welcomes AEMO's proposals to set-aside a number of aspects of the current NEM Type 4 metering approach and suggests that further consideration should be given to other aspects that may not be relevant, necessary or could inadvertently impose unreasonable, complex and costly requirements on a MEFM approach that would discourage widespread adoption.
- The average street light now uses less than 100W (with residential roads lighting typically using 13-20W and making up 70% of street lighting while the most common lighting categories on main road lighting 75-150W with a very small percentage using higher Wattages). It is therefore vital that the cost of adopting and complying with the regime is very low on a per lighting point basis if adoption is to be encouraged. If too costly or complex, there will be little take-up and a significant lost opportunity to materially improve metering of these currently unmetered devices and help deliver a wide array of other broader public benefits that smart street lighting controls offer.

QUESTION 10: OPPORTUNITIES AND BENEFITS OF IMPROVING EXISTING ARRANGEMENTS

Do stakeholders consider there are other matters that the Commission should consider in terms of the opportunities, benefits, and costs for improving existing arrangements for the measurement of street lighting and public furniture?

In responding to this question, the structure of the AEMC Directions Paper in Section 5.2 outlining four areas of benefit has been followed to both expand on the benefits identified already and to summarise other important areas of benefit for consideration:

1. **Reducing barriers to enable innovation and competition**

   In addition to the metering benefits identified in the Directions Paper with regards to existing power-consuming infrastructure (e.g., for smart street lighting, telecommunications and bus shelters), a wide range of other emerging infrastructure may also benefit from the new approach being proposed. Indeed, an easy and low-cost approach to smart metering of small energy consuming devices in the public domain may help facilitate the deployment of a growing array of smart city technologies which can currently be expensive and/or complex to meter including:

   - advanced CCTV with video analytics
   - smart city sensors measuring traffic volumes, monitoring parking spaces, measuring environmental / climatic parameters, monitoring noise levels and many others
   - infrastructure supporting autonomous vehicles and other emerging ITS technologies

- public safety devices (help buttons, intercoms, sirens, PAs, loudspeakers)
- other communications infrastructure such as public WiFi and IoT gateways
- electronic / dynamic signage
- public charging points

2. **Improving cost allocation and energy settlement**

AEMO has identified that there can be improved cost allocation and energy settlement with a new approach to measuring minor electrical loads. With respect to street lighting specifically, there are two main areas of inaccuracy in assumed energy consumption under the current Type 7 unmetered approach that would be addressed with a new approach that recognises smart street lighting controls. To summarise points raised by AEMO and in previous submissions, the two main areas are:

- **Street lighting inventory inaccuracy** can grow over time, particularly as successive generations of lighting technologies are removed and replaced by a wide array of internal crews and external contractors across large and complex electricity networks.
- **Actual luminaire consumption can vary** from that assumed under the current Type 7 unmetered regime due to:
  - supply faults
  - faults in the luminaire or controls causing day-burning
  - photocell switching drift as dirt accumulates on optical windows or as faults develop in photocells that change actual operating hours
  - changing luminaire consumption over its lifetime from that tested when new

3. **Energy efficiency and emissions reduction**

As summarised in the Directions Paper, energy efficiency benefits from facilitating the deployment of smart street lighting controls would have material emissions reductions benefits and direct cost saving benefits for the road authorities (and the ratepayers) paying for street lighting.

Indeed, as energy efficiency and emissions reduction becomes an ever more important societal priority, it is crucial to recognise in this reform process that smart street lighting controls are the ONLY widely proven technology able to further reduce energy consumption from street lighting once LEDs have been installed.

While dimming and trimming are noted in the Directions Paper, one additional energy saving feature of smart street lighting controls should also be considered. This is called Constant Light Output (CLO) control and refers to enabling a setting that holds lighting output constant at compliance levels throughout life of the luminaire by gradually ramping up power to compensate for lumen depreciation of the LEDs over time. Traditional lighting design included a significant component of overdesign to allow for deterioration of lamp output but this is no longer necessary with CLO. Based on discussions with suppliers, this feature offers additional energy savings of 4% over the life for the luminaire (e.g., 8% initially declining to 0% at end of life).

As noted in the IPWEA submission to the Rule Change Consultation Paper, the energy-related components of the business case for smart street lighting controls make up a very significant

fraction of the most easily realisable savings (some 45-60% in the scenario presented by IPWEA). **Without a Minor Energy Flow Metering regime, it would be very challenging for street lighting customers to achieve these energy savings. And, without this crucial element of the business case being readily accessible to customers, widespread deployment of smart street lighting controls is unlikely. This would mean that it is highly unlikely that the broader direct and indirect benefits outlined in Section 5.2 of the Directions Paper and in this submission can be realised.**

4. Improving upkeep of street lighting services

The Directions Paper acknowledges that smart street lighting controls offer a range of maintenance efficiency benefits due to their ability to automatically report faults and performance. In addition to these features, there are three other important asset management features of note:

- **Automatic Asset Data Upload** - Modern luminaire power supplies can be programmed by manufacturers to store asset information about the light including the manufacturer's name, model number, initial lumen output, rated power consumption, colour temperature and other parameters. International standards body, the International Electrotechnical Commission (IEC) has now agreed on a standardised format for this data and Standards Australia is currently formalising the direct adoption of this international standard in Australia (to be designated as AS/NZS IEC 62386.251). Following this international standard means that, when smart controls are plugged into the luminaire they can download the data stored in power supplies and automatically populate street lighting inventories with a very high degree of accuracy. IPWEA's submission on the Consultation Paper included an early example of the dramatic improvements in inventory accuracy achieved by US utility, Georgia Power, by using this feature of smart street lighting controls.
- **GPS Chip** - Many smart controls come with an integral GPS chip offering the ability to locate the street light with high a degree of accuracy and confidence. This leads to much higher inventory and billing accuracy as well as further enhancements to maintenance efficiency by precisely locating assets.
- **Greatly Reduced Call Handling** - Smart street lighting controls can negate most DNSP call handling of faults (and repeat call handling) because of automated detection and the ability to respond quickly and correctly.

5. Other benefits

There are a number of other benefits of facilitating the deployment of smart street lighting controls that may not have been fully acknowledged in the Directions Paper. These include:

- **Safer roads & safer communities**

  Based on a comprehensive review of international studies, AS/NZS 1158 recognises that good street lighting can reduce the risk of accidents on main roads by about 30% and, more broadly, improved street lighting is recognised as having amongst the best benefit cost ratios of all road safety measures (see IPWEA SLSC Roadmap Section 3).

  To achieve these safety benefits, the lights must of course be working. As part of its maintenance requirements, AS/NZS 1158 therefore requires a fault detection mechanism on all main roads due to the lack of inherent reporting parties and the higher risk of serious accidents causing injuries and deaths on such roads.

To meet the fault detection requirements in AS/NZS 1158, DNSPs currently undertake night patrols on main roads at a typical frequency of 2-4 times per year (and costing as much as $11 per light per year based on recent DNSP submissions to the AER). Under this approach to fault detection, faults can remain undetected for as much as 6 months including in situations where supply faults on lighting circuits result in multiple outages in a row (a particular safety hazard as the eye cannot adjust quickly enough to the large changes in lighting levels while driving at speed).

In contrast, smart controls allow faults to be detected within minutes and hours rather than weeks and months. Smart controls would therefore be a material improvement in the street lighting fault detection approach allowing prompt detection, prioritisation (e.g., of multiple outages or critical locations such as pedestrian crossings) and more timely repairs. They would also offset the costs of night patrols and reduce the inherent risks of sending staff out to undertake these late-night patrols. In short, facilitating the widespread introduction of smart street lighting via a rule change will make street lighting substantially more reliable and thereby help make roads and communities safer.

- **Reduced environment impact on wildlife**
  In addition to reduced energy consumption and emissions reductions, being able to dim or shut-off lighting in off-peak hours or during particular seasons may have material local environmental benefits for species affected by artificial lighting at night (which is now recognised as a pollutant by many parties). Where public lighting is in close proximity to sensitive eco-systems, smart control systems play a valuable role in mitigating environmental harm. The importance of off-peak dimming and shut-off as a mitigation strategy is now recognised in the National Light Pollution Guidelines for Wildlife.

- **Insights into network performance**
  Smart street lighting controls have been widely cited by overseas DNSPs as providing low-cost insights into electrical performance of the network to the level of about every 5th-10th customer. In addition to power outage detection, the metering chips in the smart controls provide data for multiple power quality parameters that DNSP can use for this purpose (e.g., line voltage, power factor and frequency). Many smart controls devices also have the ability to send last gasp messages about power outages in real time.

- **Non-traditional smart controls usage**
  As recently highlighted by IPWEA in their Spotlight eNews publication, a number of new roles for smart street lighting controls are emerging around the world including their use as a broader public policy tool and for advanced diagnostics. The following examples illustrate that these systems are being put to an ever-expanding range of uses:

  - The extreme energy price rises in Europe over the past year has seen many cities dramatically cut street lighting as a public policy response to severe stress on their budgets (see recent UK examples from Cheshire, Leicestershire and Northern Ireland).
  - Tashkent, Uzbekistan, has been using smart controls to temporarily cut street lighting when experiencing extreme summer temperatures of 44C. This not only reduced load on the electricity network at a critical time but helped prevent lighting from overheating.
  - Pacific Northwest National Laboratory, a highly respected US government research body, has released the first stage of its research on using smart street lighting controls for advanced automated fault detection in situations of network under-voltage.

6. An Alternative to Trials

In response to the AEMC Consultation Paper, one stakeholder suggested that a trial implementation may be useful before any rule change takes effect. We are very hesitant to support a trial as the risk of extensive delay seems significant. Any delay in making a rule change is highly likely to delay smart street lighting controls deployment during a period when the street lighting network is being intensively renewed. A delay in deployment would be a missed opportunity to efficiently co-deploy smart street lighting controls with LEDs as is happening widely overseas.

With 30 million smart street lighting controls deployed around the world and acceptance of the metering capabilities of these systems in a number of comparable countries, it is unclear what would need to be trialled.

As metering data coming from smart street lighting controls systems is highly likely to be a demonstrable improvement over current Type 7 unmetered arrangements, a better approach might be to:

- allow AEMO the flexibility to implement the details of the rule change with bespoke arrangements suitable for the new technology provided that the integrity of metering data is not compromised; and
- to encourage both innovation and adoption, allow:
    - the grandfathering in of existing smart controls deployments (provided that they can demonstrate that they deliver superior metering data than the current Type 7 unmetered arrangements); and
    - a grace period during which existing and new smart street lighting controls deployments can be given additional time to refine initial processes and meet all compliance requirements to the satisfaction of the regulator.

QUESTION 11: MARKET FUNCTIONS AND OBLIGATIONS - METERING ROLES

• Should there be another level of accreditation for Meter Providers in the NER?

It is reasonable to expect that different requirements, processes and procedures would need to apply to the metering of specialist areas such as street lighting smart controls systems and street furniture. AEMO's proposal that an additional category of Metering Provider accreditation is introduced should therefore be supported to ensure Metering Providers have the capability and competency specific to the installation and maintenance of MEFM installations.

The requirements for installing, commissioning and testing MEFM systems and devices are likely to be substantially different as compared to traditional meters. To summarise, the specific characteristics that make smart street lighting controls different from other metering installations are as follows:

- **LOCATION** - The location of the street light which is typically 5-12m above ground in the public road reserve;
- **COST / DIFFICULTY OF ACCESS** - The high cost of accessing, installing and maintaining the street light and associated smart controls due to both its location (which requires an EWP and potentially, traffic control, to safely access) and the specialist electrical qualifications needed to work on these devices. To minimise these high costs, the installation of smart street lighting controls is usually done either when a new light is being installed or as part of

a regular cleaning and inspection cycle that takes place typically every 5-10 years. Installing smart street lighting control as metering devices separately on existing lights is highly likely to be cost prohibitive in comparison to the small amounts of energy being metered at each light (see next item);

- **SMALL PREDICTABLE MAXIMUM LOADS** - Each street light consumes a minor amount of energy (typically 13-20W for residential roads and 50-140W for the most common lighting types on higher categories of roads). The maximum energy consumption of each light is well understood and the maximum energy use profile of street lights is highly predictable (e.g., established by sunset and sunrise times);
- **A MULTI-PART METERING INSTALLATION** - As per Section 5.3.1 of the Directions Paper, when smart street lighting controls are deployed, the metering installation is best thought of as a system of three geographically dispersed but inter-related components (e.g., the smart controls node, the communications network, the central management system (including the displays used to access it));
- **DATA & CONTROL ACCESSED REMOTELY** - Smart street lighting control nodes sitting on street lights are sealed units that connect wirelessly to an RF communications network. A remote user interface of the central management system becomes the main tool used during commissioning, inspecting, testing and managing these devices during and after the installation process.
- **WIDE RANGE OF ADDITIONAL FUNCTIONS** - As outlined in the Directions Paper and the response to Q10, smart street lighting controls provide a wide variety of functions that go well beyond metering; and
- **LIMTED RANGE OF OWNERSHIP** - The ownership of street lighting assets rests with a small group of parties (eg 12 utilities, 8 State & Territory road authorities and some local councils).

• What are stakeholders' views on distributors performing the functions of the MC, MP and MDP for the street lighting and other street furniture they manage, if MEFM is introduced?

As per the IPWEA submission on the Consultation Paper, for the estimated 2.5 million street lights owned and managed by the DNSPs, it makes intuitive sense for the DNSPs to also play the combined roles of metering coordinator, metering provider and metering data provider.

The DNSPs own the street lights (and already manage the lighting inventory to AEMO accuracy requirements and are already the Metering Coordinators for Type 7 loads), would typically own the smart controls, would either own or have contracted for the communications network and would have a software contract for the central management system overseeing all features of the smart street lighting controls system.

As outlined above in the response to Q10, there are a wide array of features offered by smart street lighting controls beyond their energy and metering-related functions. There would therefore be little benefit in involving more parties and potentially, lots of additional complexity and costs in splitting ownership, contractual and management arrangements surrounding one smart street lighting controls system across a number of different parties.

• For street furniture not managed by distributors, should the existing competitive framework for metering parties apply if MEFM is introduced?

With regards to 'other' types of street furniture (see response to Q10), much of this has similar characteristics to street lighting. Indeed, the natural home for many other types of street furniture

may also be on the poles of the DNSP (e.g., telecommunications devices and many types of smart city devices). It would therefore make good sense for DNSPs to also be able to play the combined roles of Metering Coordinator, Meter Provider and Meter Data Provider for such currently unmetered devices on their network.

Such an approach is potentially a cost-effective solution for the customers of these devices because the DNSP may be able to use the same or similar processes it has developed for its own street lighting assets and hence, offer cost-effective services to customers.

Given the unique characteristics of these installations, the new regime should also allow other parties to act in the combined role of Meter Provider and Meter Data Provider under a new combined accreditation. Allowing parties other than the DNSP to hold such an accreditation is necessary for cases where:

- public lighting is unmetered and not owned by the DNSP (e.g., for the lighting directly owned and managed by main road authorities, by councils such as capital cities and Northern Territory Councils who already own and manage substantial quantities of their own lighting as unmetered loads); and
- where the DNSP does not wish to take on the new metering role, it would still make sense to allow one party to be given appropriate secure access to the metering data coming from MEFM systems and offer the combined metering services across a portfolio of lighting and other street furniture.

In such situations, leaving the Metering Coordinator role with the DNSP may make sense as DNSPs currently have this role for all Type 7 unmetered loads. As such, DNSPs already have the required asset information in their street lighting inventories to a level of accuracy mandated by AEMO.

QUESTION 12: TECHNICAL REQUIREMENTS

• Do stakeholders have views on the removal or amendment of minimum service specifications for minor energy flow meters?

AEMO submitted that it considers that minor energy flow metering installations should not be required to comply with the minimum services specification. This position should be supported in the AEMC's determination.

In IPWEA's submission on the Consultation Paper, support was noted for AEMO's proposal to not require remote disconnection, reconnection, on-demand meter reading, scheduled meter reading and meter installation inquiry services from Minor Energy Flow Meters. It is a given that metering data accuracy and integrity needs to be maintained in a Minor Energy Flow Metering regime but this necessarily needs to happen through other means and mechanisms appropriate to the technology and its location.

As per the IPWEA submission on the Consultation Paper, it is vital that the cost of adopting and complying with a new MEFM regime is very low on a per lighting point basis if adoption is to be encouraged. If it costs even a few dollars a year to meter a street light using $15-$150 of electricity a year, there will be little take-up and a significant lost opportunity to materially improve metering of these currently unmetered devices and help deliver a wide array of other broader public benefits that smart street lighting controls offer.

• Do stakeholders have views on inspection and testing requirements for minor energy flow meters?

In its Rule Change Proposal, AEMO suggested that Metering Coordinators should be able, "…to propose bespoke arrangements for the testing and inspection of existing, new, and emerging metering devices, technologies, and systems, and for these to be assessed for approval to ensure that the integrity of metering data is not compromised." This suggested approach should be supported.

With regards to physical inspections of devices on street lights (or other similar loads on poles), IPWEA remains unclear how current requirements to physically test or inspect meters would apply to these devices *in situ* but noted in its earlier submissions that any such requirements should be carefully considered and likely rejected. With a high cost to access smart street lighting controls nodes and no display or secondary access ports, the purpose of such inspections is entirely unclear. Inspection of performance should more appropriately take place via the central management system.

As per the response to the previous question, given the small quantities of energy being measured at each light, it is vital that the cost of adopting and complying with a new MEFM regime (including its inspection and testing requirements) is very low on a per light basis if adoption is to be encouraged.

QUESTION 13: IMPLEMENTATION AND TRANSITION

• Are there any other implementation or transitional issues we should consider for this aspect of the rule change?

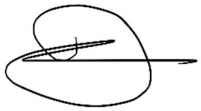
1. One approach to substantially mitigating the risks of inaccuracy of a new Minor Energy Flow Metering regime, particularly in its early implementation phase, would be to enact rules that default back to the rated maximum load of any device (e.g., the load stated in the current Type 7 Unmetered Load Table) if the metering data from a smart controls system is missing, corrupt, defective or unsuitable for some other reason. It is understood that the UK Elexon system uses this approach. Using such an approach in the NEM:
    - would address any concerns that energy could be consumed and yet unaccounted and unpaid for; and
    - create a clear commercial incentive for technology suppliers, operators and customers to ensure that systems are performing as required.

2. United Kingdom metering data aggregator, Power Data Associates (PDA), plays a pivotal role in administering smart street lighting accounts and has expressed a willingness to provide briefings and respond to questions from both the AEMC and AEMO about the UK approach including recent revisions to Elexon. Introductions can be facilitated as required). PDA may, for example, be able to provide:
    - A briefing on recent changes to the approach to street lighting metering data which we understand has moved the method from a deemed method (where power consumption was calculated based on fixed time ON/OFF/DIM events logged by a CMS in combination with a lighting load table) to a method where actual metered energy consumption data from each street light is now used for billing purposes.

- Insights into the process and framework about how metered and logged energy consumption data from connected street lights is shared between a vendor's central management system, Exelon and ultimately, an energy retailer's billing system.

Should you have any questions about this submission, please feel free to contact me or the IPWEA Emerging Technology Adviser, Graham Mawer (graham.mawer@ipwea.org T 0412 229 544).

Yours sincerely,



David Jenkins GAICD EMBA

Chief Executive Officer at IPWEA Australasia