23rd February 2012

John Pierce
Chairman
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Dear Mr Pierce,

Review of Energy Market Arrangements for Electric and Natural Gas Vehicles

SP AusNet welcomes the opportunity to make this submission in response to the AEMC's Issues Paper.

The primary focus of this submission is on electric vehicles, which offer the prospect of an economically efficient and lower emission alternative to the internal combustion engine. SP AusNet has been active in research into electric vehicles through its participation in the Electric Driveway program with CSIRO, Victorian Government's EV trial and the operation of a fleet of Plug-in Hybrid Electric Vehicles.

Economic efficiency

SP AusNet's second submission reiterates that when EVs are connected to the electricity network they are no different in principle to a load or, if Vehicle to Grid (V2G) technology is enabled, an embedded generator. As such, special treatment should be avoided as far as possible.

In line with SP AusNet's earlier submissions to the Power of Choice review and the Approach Paper restates that:

- Price signals will be the most effective facilitator of efficient and orderly uptake of EVs;
- It is imperative that network service providers are not restricted from actively participating in this emerging market as they are well placed to assess, optimise and manage risks and opportunities arising from EV integration; and
- Rules implementing stronger incentive frameworks for demand side participation should be revisited as it is questionable whether current incentives provide sufficient rewards for pursuing, for example, controlled charging or V2G that generates benefits to society as a whole through reduced carbon emissions or lower built capacity.

In this submission SP AusNet emphasises that dynamic tariffs that do not differentiate between an EV and normal load offer the best prospects for an efficient deployment of EV recharging load. While the submission acknowledges the potential for an interim EV specific tariff this clearly a second best option.

Scenario Estimates

SP AusNet concurs with the AEMC that there are inherent uncertainties in forecasting potential EV penetration rates and is encouraged with the prospect of

forming working groups to better forecast EV impacts. SP AusNet considers that this will facilitate the minimisation of risk in the five yearly price setting process.

In addition to estimating EV uptake rates the assessment of the impact of EVs will require an appropriate evaluation of current load trends to enable suitable proportioning of augmentation and maintenance costs between base and EV loads. Also it is likely that specific Australian factors will impact the scenarios which generally appear to follow overseas modelling. While SP AusNet has not yet quantified costs and benefits associated with EVs we are optimistic that benefits can also be obtained through the efficient management of EV loads and targeted V2G options.

The existing regulatory framework could be expected to manage this investment, subject to effective price signals to facilitate efficient consumer decisions. Effective price signals are required to ensure that NSPs have effective processes and delivery capability to respond to consumer demand and maintain satisfactory service and prices to other customers.

EV Service Options

It is essential that EV service providers are charged with the appropriate obligations to ensure safe and reliable network operations and fair treatment of customers. The formation of suitable business models will accrue appropriate benefits and costs to the proper parties. They will be driven by customer preferences with a major requirement likely to be some form of automated charging option. It is also likely that EVs, at least in the interim period, will need to be treated as a separate load given the current established tariffs and negative customer sentiment. While an EV specific tariff is a less palatable option than a flexible tariff treating all loads equivalently, and has a range of other associated issues including load identification, SP AusNet recognises that this option needs to be considered.

A single multi-element meter would provide an appropriate metering solution to allow identification of separate loads with incremental increases in metering costs rather than a multiple meter option. An added advantage is the opportunity to provide a remote load control service for customers. As stated above DNSPs are best placed to manage loads to ensure safe network operation but this would not preclude other management scenarios which do not compromise network integrity.

Attachment 1 outlines SP AusNet's responses to the EV questions contained in the Issues paper.

If you wish to discuss this submission further, please contact Tom Hallam, Manager Economic Regulation on 9695 6617.

Yours sincerely,

Alistair Parker
Director Regulation and Network Strategy

Attachment 1 Response to Issues Paper Questions

Question 1 Assessing the take up of EVs

Is the range of estimates provided by AECOM appropriate for assessing the potential impacts of EVs on the electricity market and developing our advice?

Does the range of scenario estimates provide a credible view on the potential penetration of EVs?

Given the wide range of factors and their variability the range of estimates can be used as an initial guide however localised issues will require individual modeling. The assumptions tend to mirror other global models however the unique nature of the Australian environment and market are likely to impose some deviation from these assumptions in the long term.

The most significant factor which may not be effectively reflected in the modeling is the future status of growth in peak demands related to existing load requirements which already appear to be in decline. This could lead to EVs representing a greater proportion of the growth in peak loads and subsequently a greater augmentation requirement.

Initial localised up-take scenarios warrant separate consideration as well as the more holistic view at the NEM and SWIS levels. Initially EV take up is likely to be scattered through existing residential properties in more affluent suburbs and concentrated in new housing estates where developers add value by offering EV charging facilities. In the former, evolutionary development of the monitoring, control and network development can occur. In the latter, new design standards can be built in at the time of sub-division development. However, commercial charging in car parks and shopping centres will rapidly develop concentrated loads with charging time options severely limited by hours of business operation. Commercial charging in shopping centres and car parks is a rapidly emerging issue of some significance.

In terms of definitions fast charging should be defined on the level of current rather than the form of the electrical charge ie DC. It may be more appropriate to define fast charging as anything above Australia's current standard supply ie 10Amps standard with 15Amps maximum. Stating that 32Amps is not fast charging may build expectations of customers that this should be the standard installation. Widespread adoption of 32Amp options in residential areas would require significant investment for augmentation by DNSPs.

Question 2 Cost of additional system peak demand

Are these estimates on the cost of additional peak demand provide the correct magnitude of the potential impacts of EVs? Are there any categories of costs not included in this discussion?

SP AusNet has not estimated additional peak demand costs at this stage due to the current uncertainty around uptake rates and geographical distributions of EVs, and the impact of new technologies and government policy on base load demand. As stated above the methodology in the suggested scenarios may underestimate the proportion of augmentation costs attributable to EVs.

Question 3 Costs imposed by EVs on electricity markets

Does this discussion capture all the potential costs impacts that EVs could impose on the electricity market?

The range of costs identified appear to be appropriate and comprehensive.

The assessment utilising the SA load profile as the worst case scenario may not be the most appropriate choice of curve. A flat load profile would be the worst case

scenario for the impact of EVs on a peak as there would be minimal infill opportunities before the peak would be affected.

The assertion by AECOM that the additional peak demand due to EVs will not impact reliability seems somewhat optimistic as any additional peak demand increases the load at risk during a single event leading to a higher reliability impact. The impact of EVs will manifest as either increased costs for augmentation and reliability for additional peak load or increased operational costs for maintenance and potentially shorter asset lives if load falls in off peak periods.

Question 4 Benefits of EVs on the electricity market

Have we correctly identified the range of benefits of EVs on the electricity market? What are stakeholders view on the materially of these benefits and the appropriate arrangements of capturing such benefits?

The range of benefits identified are appropriate however, as stated above, SP AusNet has not estimated these benefits due to the current uncertainty of scenarios.

Question 5 Nature of service provided when an EV is charged

Does the EV charging service need to be prescribed as a sale of electricity?

What are the implications for consumers and EV charging service business models if EV charging was not classified as a sale of electricity?

It is important to ensure that appropriate obligations are in place to protect consumers both as EV and other electricity users. The advantage if the EV charging service is prescribed as a sale of electricity would be to ensure that the parties involved abide by the safety standards already established in the electricity industry and that the appropriate party is responsible. Business models that result in unclear demarcation of responsibilities or endeavour to divorce obligations through redefining services could unfairly place risk upon uniformed consumers.

As an example an EV model which requires a customer to become an embedded network operator with a retailer on-selling power as kilometers through a child meter would obligate the customer to ensure minimum voltage requirements at the child meter to meet regulatory code. The DNSP is required to meet this obligation at the connection to this site hence any line drops from the connection to the child meter would need to be rectified by the customer, which could require costly voltage boosting equipment.

In considering the nature of service an EV charge provider defines, the preferences of the customer will need to be considered. The customer is likely to prefer an automated option which minimises their bills which would imply that either they have a programming option which they can set-and-forget or they nominate a service provider to manage their charging requirements. The first option could become problematic if there is a lack of randomness in the programmed options leading to loads being simultaneously switched on and off the network. The second option may require some form of remote controlled load management service.

Question 6 Should EVs be treated differently as against other loads

Should the treatment of EVs in the electricity market regulatory arrangements be different in respect of any or all of their potential uses?

SP AusNet's preference is that EV loads should be treated similarly to other loads in the network provided all loads can be subject to cost reflective tariffing. However, given the current constraints on pricing arrangements this may not be possible and EVs may need to be treated differently to better reflect their impact on the network so that other customers do not subsidise a minority of EV users.

Another item for consideration if a separate tariff for EV loads is required will be the propensity of customers to switch non-EV loads onto this tariff if it offers benefits over existing tariffs. A method for ensuring that only EVs access a specialised tariff may be required to support implementation of an EV only tariff including detection and authorised entities to rectify infringements.

As a generation source EVs will need to be considered separately to current local solar generation sources especially when carbon pricing is taken into consideration.

Question 7 EV metering issues

• Should EVs be treated as a standard appliance load or should they be separately metered from other load at the premises?

• Could sub-metering and roaming NMIs be an effective solution to the costs and time issues associated with a separate metering installation?

Are these metering options mutually exclusive or can they coexist thus allowing EV suppliers and customers to choose the solutions that best meet their needs?

• Should metering costs for EVs be recovered any differently than for other existing metering equipment?

• Are the existing metering data confidentiality arrangements appropriate for EVs and, if not, what modifications should be considered?

SP AusNet supports AEMC's approach to provide a range of metering arrangements to allow consumer choice, encourage competition and efficient costing. SP AusNet welcomes the opportunity to participate in the upcoming workshops.

The approach to EV metering will be dependent upon tariffing arrangements. If an appropriate tariff cannot be applied to all loads at a connection then separate identification of EV loads may be required with an appropriate tariff applied specifically for EVs.

As discussed in SP AusNet's prior submission (p9) there are a range of options for a customer to manage their load:

- The simplest charging control would be a timer on the socket in which the EV is plugged.
- A home Energy Management System could control charging times. This could incorporate response options based on tariff messaging through smart metering.
- Enabling an EV as a Demand Response Enabling Device (DRED), with communications through a smart meter (a two-element meter can also provide a separate reading of consumption for the EV and dynamic control), allowing distributors to manage charging as they are best placed to understand the loads on their networks and the best time to enable charging.

The technical outcomes of the separate metering option presented in the Issues paper could be achieved using a meter with multiple elements which could provide a separate meter reading for different loads. Currently a meter is treated as a separate NMI but this could be an area of review on the current rules. A single multi-element meter would provide an opportunity for incremental increases in metering costs rather than a multiple meter option. A single multi-element meter would also enable the retention of separate loads (eg hot water) as required.

SP AusNet supports concerns raised over the use of an embedded network framework as discussed in its prior submission (p13).

An additional issue for inclusion in the *Roaming NMI's* section is that NMIs are traditionally used in the electricity network for a set meter in a set location, associated with specific locational network billing.

One area of consideration, which is not specific to *Roaming NMI's*, will be treatment across state boundaries for roaming vehicles as different states will have different arrangements (eg smart meters) and different tariff structures.

SP AusNet considers the existing meter recovery options should be adequate for metering cost recovery.

Question 8 Options for EV charging

• To what extent are changes required to the regulatory arrangements to allow different battery charge management scenarios to increase efficiency?

• How should the arrangements ensure that the party in control of charging faces the all system costs? Who should be providing the information for decision making for smart meter charging?

An additional consideration under *Un-managed charging* are the default settings chosen by vehicle manufacturers. The Nissan Leaf currently has a default charging time of 11:00pm programmed in its system. This could create charging issues if drivers rely solely on this programming to facilitate an automated off peak charging option. Some form of randomization in programming times would be recommended to randomize start charging times and reduce network stress.

Ripple control (DNSP control option) has been identified as a control option under *Controlled charging* however this may become increasingly problematic as new technologies with harmonic signals interfere with this signaling option.

SP AusNet considers that an appropriate tariff will provide the impetus for the development of different battery charge management scenarios. However, some controls may be required to ensure a random distribution of vehicle charging during off peak periods unless full dynamic pricing with responsive charge management systems are available.

The primary consideration for controlling load on the network is continuing stability for all customers to receive power. The DNSPs have the best opportunity to apply this management due to their understanding of network capabilities and the loads it supports. The optimum management will be achieved if loads are identifiable at an individual household level which includes EV, general, hot water loads, etc. It is recognised that not all states will have this opportunity (in the near future) as this generally will require deployment of smart meters with supporting infrastructure.

In this scenario during a network constraint event DNSP control would take priority over other programmed/load control operations to ensure all customers remain on supply which may require large loads (such as EVs) being turned off or cycled to maintain minimum power supplies to essential loads (eg food refrigerators). Ensuring an equitable distribution of load between customers and hence an equal sharing of costs reflected in network charging assuming all loads are treated equitably.

Other charge management regimes may operate unimpeded when network constraints, including mass switching events, do not threaten supply to some or all customers, or increase the probability of asset failure. The most appropriate method of ensuring a user-pays scenario is to ensure appropriate tariffing arrangements.

Question 9 Retail pricing and EVs

In an area where the sale of electricity is subject to retail price regulation and given the appropriate metering capability, should the sale of electricity for recharging be treated any differently to other loads? If so, why?

SP AusNet believes that an appropriate flexible tariff arrangement should provide the appropriate signals for both general and EV loads (see Question 11).

Question 10 Structure of retail pricing for EVs

How are rules regarding the availability of TOU pricing likely to affect efficient uptake of EVs? Should there be a requirement to offer TOU tariffs for EVs? Should other forms of pricing apply to EVs to discourage charging at peak times, such as critical peak tariffs or other dynamic tariff structures? Should EVs be treated any differently from any other load in this regard?

SP AusNet believes that an appropriate flexible tariff arrangement should provide the appropriate signals for both general and EV loads (see Question 11).

Question 11 Network pricing and EVs

Are new or bespoke network tariffs warranted for EV charging? If so, what form should these network tariffs take? How can these network tariffs be better integrated with overall retail tariffs?

If there are to be separate tariffs for EV tariffs, should there be regulations for identifying the EV household and for monitoring consumption? If so, how?

SP AusNet believes that an appropriate flexible tariff arrangement should provide the appropriate signals for both general and EV loads and deliver the most cost efficient and simple solution. However, in lieu of being able to apply a flexible tariff to all loads then an interim tariff may be required to manage EV loads prior to wide scale adoption of flexible tariffs. In general EV charging could be managed to an appropriate time period to minimise peak demand impacts. Some issues regarding appropriate proportioning of augmentation costs between all customers are likely to arise, in particular where EV adoption is concentrated.

Tariffs already exist to encourage hot water systems to be operated during off-peak periods with a booster option for limited operation during peak periods with a commensurate tariff. It is envisaged that an interim EV tariff would be structured in a similar manner. The tariff will need to be dynamic with sufficient peak, off-peak price differentials to ensure an on-going response over time, across seasons and across different network segments.

If an individual tariff is required for EVs then this load will need to be identified separately for billing issues. At a minimum this will require a two element meter which can separately report non-EV and EV loads.

If the tariff is constructed to be a network controlled load, similar to hot water loads, then this will require a dedicated circuit for control. SP AusNet recognises that there may be conflicting requirements for charging times which do not align with a network controlled charging option including:

- Customer driving requirements,
- Generation costs,
- Location and timing of charging,
- Retail tariff structure, and
- Default charge time settings (eg Nissan Leaf default start charging at 11pm).

These requirements would need to be considered in the development of a controlled charging option.

An appropriately structured EV tariff could be used to provide clear messaging to customers of appropriate charging times. This could facilitate education and the movement of other loads to more cost reflective tariffs to better manage loads in the future.

Regulations may be required to ensure that all EVs are subject to the appropriate tariff and are not added to an existing load with a general consumption tariff which does not appropriately reflect the impact of the EV load. The best method of ensuring

that all EVs are appropriately charged may be to utilise the existing car registration information for vehicle types and registered addresses. As mentioned before perverse outcomes may also eventuate if an EV tariff provides a benefit for other load types on alternative tariffs hence measures will need to be developed to mitigate this risk.

An additional consideration for the use of EVs in a V2G situation would be to consider the value of this type of connection based on the surrounding network at the point of connection. The greatest value would be if this type of asset is available at the required times during network constraint events. At other times this connection may not add much value and may increase costs. A V2G solution is likely to be of most value for short duration events as persistent network constraint issues are more likely to be resolved through a non-network service engaged by the DNSP or network augmentation.

Question 12 Forecasting the take up of EVs for the network operator and NSP

Are measures required to facilitate more effective forecasting of EV take up for network operator and NSPs?

SP AusNet would welcome the opportunity to participate in workgroups which improve the forecasting of EVs as DNSPs will be at the forefront of dealing with the impact of EV loads.

Question 13 Network Issues: Connection services

What issues arise in regard to connection services for EVs? Are there further connection issues if additional capabilities such as Vehicle to Grid arise? How should these issues be addressed?

SP AusNet agrees that more clarity is required around the connection issues identified in the Issues paper. These issues need to be discussed to determine the most appropriate arrangements.

Question 14 Network Issues: Network reinforcement and augmentation

What new issues arise regarding requirements for network reinforcement and augmentation to support EV charging and recovery of the costs incurred, and how should they be addressed?

How should the connection services for EV households be classified? It is necessary to differentiate between EV and non-EV households?

Does the take up of EVs require a departure from the current method of recovering the costs of grid augmentation from small customers, with the costs spread across all customers, towards a “causer pays” approach?

SP AusNet believes that an appropriate flexible tariff arrangement should provide the appropriate signals for both general and EV loads (see Question 11). Additional augmentation costs should be levied against the highest users which should not only consider total load (kWh) but peak load (kVA) in the system. Fast charging EV users are likely to require higher peak load supplies but a house with a standard charging supply for an EV may not require a higher load than a house with a large air conditioners.

V2G arrangements may require higher investments to facilitate two-way flow of power including increased monitoring and control facilities. This type of augmentation may provide benefits to surrounding customers in lowering overall network investment in the surrounding network such as primary equipment (transformers and conductors) augmentation. This would require flexible tariffing arrangements to localise this type of investment. It would also need to be determined if and by how

much the community benefit would offset the augmentation cost which would be attributable to the V2G installation.

Consideration needs to be given as to whether EV connections are incorporated into house values and whether if specific network connection/augmentation costs are levied on a property that they continue regardless of change of ownership, incorporated into the house value. In the long term this may negate the need for these issues to be treated as exceptions however an interim solution may be required when EV penetration is limited.

Question 15 Retail issues: Retailer and NSP exemptions and embedded networks

Should the provision of commercial charging (both in public spaces and in dedicated charging stations) be classified as on-selling? Do retailer and NSP exemptions and embedded networks provide an appropriate framework to apply to EV charging? What would be the preferable arrangements?

As discussed in SP AusNet's prior submission (p13) there are existing issues regarding embedded networks which require attention if this option is selected. Currently the system for SP AusNet is manual due to its complexity and limited scale. This would incur additional costs for large scale deployment. There are also obligation requirements which need to be appropriately assigned.

Question 16 Retail issues: Settlement

What new issues for wholesale settlement arise with EVs, and to what extent do they depend on the metrology arrangements in place? How can these issues be addressed?

See Question 15 response.

Question 17 Retail issues: Licensing arrangements

What licensing issues arise with EVs, if licences are required? Do new issues arise because of the nature of EV loads or from new business models for EV charging? Are the existing licensing arrangements still appropriate?

As discussed in our prior submission (p12) SP AusNet's considers that aggregators will play a role in the future market to enable participation of EV loads in the market. The Issues paper has acknowledged the importance of ensuring appropriate obligations/arrangements are in place to ensure safe network operation and protection of consumers.

Question 18 Vehicle to Grid/Home issues

What additional issues arise from EV discharging and to what extent are those issues different from those that arise from any other on-site small scale generation? Are there any unique issues or requirements if the electricity is only provided to the home and not exported to the grid? Who should control discharging schedules? How can the right incentives be provided to facilitate the use of EV discharging to support DSP?

The primary function of an EV is for transport as opposed to on-site small generation which has a dedicated function is to supply energy. This compounds availability issues and the firmness of network support. This and associated carbon issues should be incorporated into the business model for dispatch which could be expected to be handled under current regulatory rules.

Control of discharging schedules will depend upon the function that the EV supply is being used for such as VAR support, network load support or minimising generation costs. It is likely that contracts between parties will determine the responsible controller eg a DNSP would contract for network load support in constrained areas

and would call upon the supplier when required as the current regulatory regime supports.