

27 October 2011

Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235



Project Reference Code – EMO0022

Dear Sir/Madam,

ENERGEX welcomes the opportunity to provide comments on the Australian Energy Market Commission's (AEMC) Approach Paper on Energy Market Arrangements for Electric and Natural Gas Vehicles.

As an electricity distribution business operating in the national electricity market, the challenge for ENERGEX is meeting peak demand at a price customers are prepared to pay. Solid economic growth together with increasing population and the adoption of energy intensive appliances have driven significant growth in peak demand over the last decade and with it a requirement for significant investment in distribution network infrastructure.

ENERGEX supports the AEMC's review of the national energy market arrangements to ensure that electric and natural vehicles are introduced to the market in an efficient manner.

Please find attached ENERGEX's response to the questions raised in the Approach Paper. ENERGEX looks forward to providing more detailed input to the AEMC as the consultation develops and the material issues emerge.

Should you have any further questions in relation to this matter, please contact Bevan Kirk, Corporate Analysis Manager on (07) 3664 4092.

Yours sincerely

A handwritten signature in black ink, appearing to read "Kevin Kehl".

Kevin Kehl
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Submission Paper

Energy Market Arrangements for Electric and Natural Gas Vehicles

AEMC Approach Paper

October 2011

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1 Introduction

ENERGEX welcomes the opportunity provided by the Australian Energy Market Commission (AEMC) to submit comments on the Approach Paper *Energy Market Arrangements for Electric and Natural Gas Vehicles*.

ENERGEX supports the need for an assessment of the market and regulatory arrangements that are required to facilitate the efficient uptake of electric and natural gas vehicles.

1.1 Key Points

ENERGEX is committed to delivering safe, reliable and affordable electricity in a commercial environment that recognises the need to balance customer outcomes with effective risk and price management. As an electricity distribution business operating in the national electricity market, the challenge for ENERGEX is meeting peak demand at a price customers are prepared to pay.

Solid economic growth together with increasing population and the adoption of energy intensive air-conditioning and home entertainment appliances have driven significant growth in peak demand over the last decade and with it a requirement for significant investment in distribution network infrastructure.

Key points for ENERGEX are as follows:

- Electric vehicles could be either, the next major driver of peak demand growth or a flexible load that, if managed appropriately, will improve the utilisation of existing electricity supply infrastructure.
- ENERGEX believes that market and regulatory arrangements in both the electricity and gas markets should not create inefficient subsidies that encourage the take up of either electric or natural gas vehicles.
- The relevant market and regulatory arrangements should ensure that appropriate price signals are allocated and presented to customers to ensure that they make rational consumption and investment decisions. This includes situations where electric vehicles may be used to supply electricity to a local premise and/or back into the grid.
- Electric vehicle charging and discharging is expected to have its greatest impact on the most extensive part of ENERGEX's network – the low voltage system.

- ENERGEX considers that without changes to market and regulatory arrangements there is a material risk that significant investment in the low voltage network would be required to overcome capacity and power quality issues. High powered charging equipment that could more than double the peak demand in low voltage networks is of particular concern.
- ENERGEX considers that the AEMC should carefully consider the pricing, connection and metering arrangements as part of this review with particular reference to what arrangements are required to adequately cater for distributed energy resource sited at customer premises.

ENERGEX understands that the AEMC is planning extensive consultation with the industry prior to finalising the 'Directions Paper' that follows this Approach Paper and looks forward to contributing to the AEMC consultation process.

2 Response to Questions

ENERGEX's response to the questions raised in the Issues Paper are provided below.

2.1 Uptake of Electric Vehicles

Question 1

What are the key drivers and likely uptake of EVs in the NEM? Are there any differences in these drivers between NEM and WA?

ENERGEX notes the following key points:

- The uptake of electrical vehicles will be driven by a range of economic, political and social considerations.
- Energy market arrangement should seek to have neutral influence on electric vehicle uptake, neither creating an incentive or disincentive in the electric vehicle purchasing decision.
- Arrangements that do not allocate and present appropriate costs to consumers based on their consumption patterns can create an implicit incentive for customers to purchase electric vehicles and to install high powered charging equipment.

2.2 Costs and Benefits of Electric Vehicles

Question 2

What are the costs and benefits that EVs may introduce into Australia's electricity markets? Please provide evidence if available.

ENERGEX notes the following key points:

- There is currently considerable uncertainty around the pace and scale of electric vehicle uptake. It is therefore difficult to make accurate assessments of capital requirements and cost implications for electricity networks directly associated with electric vehicle charging.

- There is potential for electrical vehicle charging to improve the load factor on electricity distribution assets especially the low voltage network if managed correctly.
- The cost implications of electric vehicles within the electricity market will depend on the degree of diversity in charging load.
- The least diversified component of the electricity supply chain is the low voltage distribution network. The low voltage network:
 - accounts for approximately 50% of distribution network infrastructure (by length of line);
 - is the most extensive, and therefore expensive, to upgrade; and
 - is typically the area that distribution network owners have the least real time visibility on network performance and condition.
- A significant amount of undiversified charging during the evening peak consumption period is likely to add significantly to peak demand growth and may result in quality of supply issues for customers due to excessive voltage drop. This could result from:
 - large numbers of electric vehicles simultaneously charging at 'low level' charging rates, e.g. 2-3 kW; or
 - where high powered electric vehicle charging equipment, e.g. up to 19.2 kW, has been installed in low voltage networks.

Without appropriate incentives and control mechanisms, networks will need to invest in additional network infrastructure in order to meet capacity and minimum service requirements.

- A further issue is the potential impact of vehicle to house/grid capability on the effective operation of network protection equipment, voltage rise and reverse power flow. These issues are not unique to electric vehicles, they are associated with any distributed energy resource that supplies power directly to a premise and/or feed electricity into the low voltage network. The cost to rectify these issues is expected to be significantly greater the more rapid the adoption of this technology. Regulators and policy makers should bear this in mind when considering the relative costs and benefits of appropriate arrangements to support the introduction of electric vehicles and other distributed energy resources. It should be noted that vehicle to home systems will have nearly all

the benefits and none of the problems that associated vehicle to grid systems present to the distribution network.

- There may also be costs associated with metering and systems required to address mobility of the load. As part of the Smart Grid Smart City project, AusGrid will be trialling and evaluating a roaming NMI concept that would ensure that the cost of charging an electric vehicle would always be billed to a single account irrespective of where the charging occurred, including across jurisdictions.
- Electric vehicle charging could result in quality of supply issues associated with voltage drop and harmonic distortion. The closer to unity that the power factor can be maintained the less investment in voltage support is required. ENERGEX believe these issues are best dealt with through Australian Standards for power quality. Achieving high power factor should be low cost with modern inverter systems.
- The benefits of electric vehicles
 - There is the potential to deliver the electricity required for electric passenger vehicle transportation within the existing capacity of existing electricity supply assets. This would improve both economic and productive efficiency through the increased utilisation of these assets and resulting in a lower cost to serve across the electricity supply chain.
 - Electric vehicles also offer demand management and network support opportunities. Given the separation between grid supply of electricity and the application of that energy to provide motive force to drive the vehicle, in many cases it is possible to manage when charging of the battery occurs and at what rate of charge without having a significant impact on the customer. This means that customers might be willing to reduce or cease charging in response to appropriate price signals.
 - The battery storage in electric vehicles could be discharged to the local premise, or the low voltage distribution network as and when required. There are a number of technical and regulatory issues that would need to be overcome before these benefits could be realised. Any electricity market arrangements that are implemented to support this should only provide financial compensation to consumers consistent with the market value of electricity.
 - Taken together with other distributed energy resources that may also be feeding electricity back into the electricity grid, there comes a point where the current network protection design will be insufficient to

ensure that customers are safely isolated from electrical faults and fire hazards.

2.3 Regulatory Arrangements for Efficient Uptake of Electric Vehicles

Question 3

What are the appropriate electricity market regulatory arrangements necessary to facilitate the efficient uptake of EVs?

ENERGEX notes the following key points:

- ENERGEX is of the view that electricity market arrangements should be structured in a manner that enables customers to make appropriate and rational investment and consumption decisions without adversely affecting network performance.
- The efficient uptake of electric vehicles requires the ability to charge customers according to the true cost of supply.
 - Tariff structures can play an important role in influencing electric vehicle charging behaviour. The key underlying objective should be to encourage consumers to make rational and efficient consumption decisions that result in diversity in charging behaviour that matches the underutilised capacity in the network.
 - Appropriate rules governing the connection of electric vehicle charging/discharging equipment are required that facilitate customer choice while ensuring that inefficient cross subsidies are not introduced..
- It is increasingly likely that consumers may engage with multiple parties at a single location for the provision of a range of 'energy' related services, including electric vehicle charging. Depending on the business models pursued by these providers it is possible that there may be a desire to accommodate more than one electricity consumer and/or retailer at a single site. ENERGEX acknowledges that the rules and requirements to accommodate connection and metering vary across jurisdictions and this can be challenging.
 - In Queensland the process to establish a new connection point, inclusive of meter and NMI is relative quick and cost effective. As a new connection point, as opposed to an alteration or addition, the installation is prioritised.

In some situations there may be costs associated with upgrading meter board and panels, however, this is not unique to electric vehicles and applies for any customer installation where the existing infrastructure is non-compliant or where there is insufficient space to accommodate additional meters.

- Parent-child metering arrangements may be easier from an installation perspective but suffer from greater complexity and/or difficulties with respect to ongoing roles and responsibilities under the NER. For example, is the connection arrangement an embedded network under the AEMO Embedded Network Guideline and if so who is the responsible person for the child meter?
- ENERGEX also notes that there are some potential implications of enabling total load at a single premise to be split between multiple customers. In particular, there is the potential for particular price signals, such as time of use and/or capacity based tariff structures, to be dampened because total consumption or demand at the premise is no longer the financial responsibility of a single customer.
- If the installation of electric vehicle charging equipment results in the load exceeding the design capacity of the network then it is fair and equitable that the customer pays a contribution toward the upgrade of the distribution network. Not requiring this would mean that the cost of upgrading the network would be smeared across all customers. This outcome is not efficient, because customers do not face the true cost of their consumption choices.

2.4 Required Changes to Electricity Market Regulatory Arrangements

Question 4

What are the required changes to the current electricity market regulatory arrangements and suggestions for reform to facilitate the efficient uptake of EVs?

- ENERGEX acknowledges that EVs could potentially be used as distributed energy sources and that electricity distribution networks are not designed to manage widespread connection of distributed energy resources (DER). The current regulatory framework, at both a national and jurisdictional level, does not

easily facilitate investment in network infrastructure and technology to efficiently manage technical issues arising from increasing DER.

- Managing the voltage, flow and power issues arising from increased DER, in the current regulatory framework, necessitates distribution network service providers to expend large amounts of capital expenditure to ensure they can still achieve their security, safety and reliability of supply standards. As such any reforms to the regulatory framework need to consider the regulatory and legislative obligations of various market participants and the impact that regulatory change may have on their ability to meet them.
- While ENERGEX supports the principle of providing choice to customers and third party service providers, it is important that the implications of any proposed alternative arrangement be considered carefully so that the costs do not exceed benefits and/or implicit subsidies are created resulting in distributed or smeared costs across all users.
- From a distribution network perspective, ENERGEX considers that the efficient uptake of electric vehicles requires a move away from volumetric (kWh) pricing to include time of use capacity based (kV.A) pricing and a means to allocate costs of upgrading the network to individual customers where their actions result in potential peak loads exceeding the specification for which the low voltage network was designed.
- Clarity is also required on whether the AEMO Embedded Network Guideline is applicable for situations where a charge service provider is the electricity customer for electricity supplied for electric vehicle charging at an existing premise.

2.5 Electricity Market Arrangements for EVs that may affect NGVs

Question 5

Are there any electricity market regulatory arrangements that affect EVs which may also apply to NGVs?

- Arrangements in the NER and NGR should be consistent and ensure that neither framework artificially favours one technology over the other.