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# Response to the AEMC Approach Paper On Market Arrangements for Electric and Natural Gas Vehicles

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## 1 Introduction

This document is Western Power's formal response to the AEMC request for advice on the Approach paper on Energy Market Arrangements for Electric Vehicles and Natural Gas Vehicles.

As Western Power's responsibility is confined to the transmission and distribution of electricity the questions answered in this response will only deal with electric vehicles and potential market impacts in WA.

## 2 Response

### **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?**

The drivers outlined in the approach paper cover the majority of the variables that will affect the uptake of EVs in WA. However it is likely that each driver will have different significance for WA when compared to the NEM.

WA's Wholesale Electricity Market (WEM) is structurally quite different to the NEM, most notably in that it is based on bilateral contracting for capacity and energy. The bilateral arrangements are augmented by an annual market for capacity and a day ahead market for net energy. The WEM lacks markets for balancing energy and ancillary services at this stage. Currently all balancing and the majority of ancillary service duties are performed by state owned Verve Energy.

IMO's Market Evolution Project (MEP) will introduce a half hour ahead market for balancing energy and a market for load following ancillary service during 2012. It is these last two areas where EVs are likely to have the most impact.

Western Power is the owner and operator of the South West Interconnected System (SWIS). System Management is ring fenced within Western Power and is responsible as a market governance participant for secure and reliable operation of the SWIS and to manage the physical aspects of market dispatch.

Being a storage device the challenge for WA will be to ensure that high volume uptake of EVs aid rather than adversely affecting secure operation of the SWIS. This will require coordination of resource between energy production, energy storage and load energy consumption. The recent introduction of high volumes of windfarms has meant a significant increase in balancing energy and load following ancillary service demand. At this stage of SWIS development this puts downwards pressure on less flexible coal fired generation and upwards pressure on more flexible gas fired generation. High uptake of EVs may provide the opportunity to store surplus energy when load is less than the combined inflexible coal fired generation and windfarm generator energy outputs. Typically this problem is most acute overnight. This opportunity may present itself in both mid term balancing energy needs and short term fluctuations requiring rapid load following changes in load. Whilst the MEP will provide opportunity to broaden the number of providers and the quantity of provided balancing and ancillary services to meet increasing demands, the challenge will be to achieve coordination across a more diverse portfolio of electric energy resources of which EVs may become a significant part.

From a demand perspective the vehicle market in WA is significantly smaller than the one in the NEM and uptake of EV may be constrained by the availability of supply of EVs.

In terms of geography, in WA there are greater distances between population centres and a lower density of population. From this perspective battery range may be a greater driver. However it is also typical of WA homes to have more than one vehicle with one usually dedicated to short distance driving. Without data to answer these questions it is difficult to comment on the variation between WA and the NEM.

Some regulatory structures are currently not in place in WA to promote EV uptake. An agreement of metering framework, domestic time of use energy pricing and an equivalent model for fuel excise for EVs needs to be put into place to promote the uptake of these vehicles.

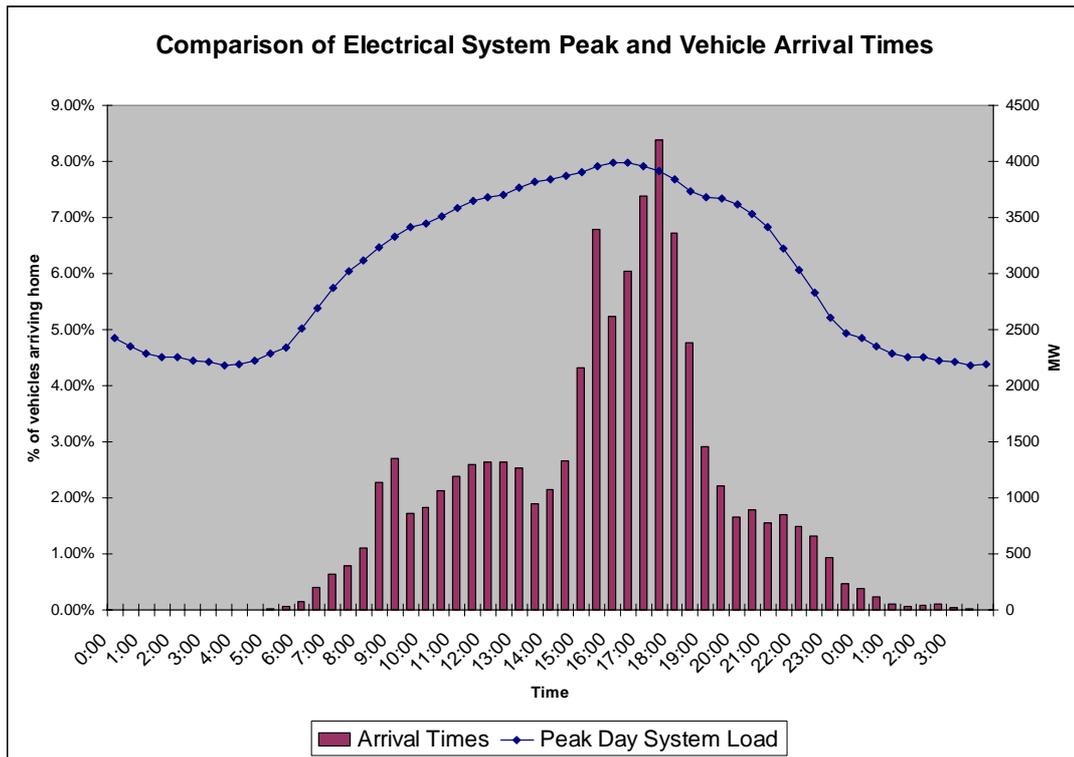
At this stage no known modelling has been performed to show what the uptake of EV in WA might be.

**Question 2 What are the costs and benefits that EVs may introduce into Australia's electricity markets? Please provide evidence if available.**

The uptake of electric vehicles has a strong potential to increase peak load demand and ancillary service demands if charging is unmanaged. Peak load demand impact is shown by the following graph illustrating the last trip home with a peak in the afternoon. Coupled with the above is the assumption that people will plug in their vehicle when they arrive home. This coincides with the system peak load period and continues into the residential peak load period. The overall effect of this increased peak load will be the need to bring forward transmission and distribution asset augmentation plans in high uptake areas and result in an increase in network tariff costs to the consumer. Also the MEP mechanisms would be expected to bring higher costs of balancing energy and ancillary services associated with uncoordinated changes in energy storage load demand. At the supply side the increased demand associated with uncoordinated EV charging demand would increase the rate of generator capacity augmentation and could easily affect the shape of the load duration curve resulting in less efficiency in generator capacity procurement.

However, if vehicle charging is managed through coordination of technical, regulatory and financial incentive mechanisms, to encourage off-peak charging, there is potential for significant benefits to consumers (cheaper vehicle charging costs), the network costs (increased utilisation of assets), and costs of SWIS system operation (balancing energy and ancillary service costs). Proper coordination of increased night loads resulting from EV charging has the potential to increase the uptake of renewable generation on the isolated WA SWIS.

Longer term Vehicle to Grid energy exporting may provide consumer and market benefits such as balancing short term energy deficits if load energy requirements exceed the combined energy production from conventional and renewable sources.



### Question 3 What are the appropriate electricity market regulatory arrangements necessary to facilitate the efficient uptake of EVs?

The electricity market arrangements should allow freedom for conventional and renewable generators and energy storage resources to participate in the energy balancing and load following.

The current day ahead energy market with its dispatch merit order tranches does not provide the flexibility necessary for broader participation in energy balancing and load following. Verve is the sole provider. With higher penetrations of intermittent generation increasing difficulties are being experienced by System Management Verve in making commitment and dispatch decisions to maintain SWIS system security.

The MEP is expected to provide more flexibility for participation by IPPs but it is not certain that the IPPs will be interested in providing balancing and ancillary service. Better cost reflectivity associated with the MEP would be expected to drive the desired levels of participation. The current MEP rule amendments do not allow participation of loads in balancing or ancillary service. Similarly energy storage as a source of balancing and ancillary service is not anticipated in the MEP rule amendments.

Another area which would need attention in the regulatory frameworks is the impact of connection of more electronically interfaced energy resources in SWIS on stability of the power system. This trend is already well established in many modern load devices and renewable energy sources but would increase rapidly with high levels of uptake of EVs. Reduced or zero inertia, voltage and frequency sensitivity and lack of fault ride through are all issues affecting the security and reliability of supply. Risk based mechanisms should be built into the regulatory instruments of the Electrical Network Access Code (ENAC) and Technical Rules (TR). These would require regular testing and review of the change to SWIS stability margins and be

strengthened where necessary to avoid a gradual deterioration of the system stability margins in SWIS. Strengthening of monitoring and enforcement regimes would also be required. The WEM market rules do not address these issues properly and should as a minimum be better aligned with the

Interfaces that allow central coordinated control of charging would be needed to overcome the issues noted in answer to question 2. These interfaces could also be configured to accept coordinated controls to allow participation in balancing and load following on SWIS. Smart grid technology would seem to have a broadly based capability in the control interfaces needed.

**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?**

As per question 3:

- Market Rules that provide flexibility for EV participation in balancing and ancillary services.
- Improvements to regulatory instruments such as the ENAC, TR and better alignment of the WEM rules, to prevent gradual deterioration of stability margins in SWIS.
- Interfaces to allow coordinated control of charging to overcome unchecked system load increases and to allow participation in balancing and load following.

**Question 5 Are there any electricity market regulatory arrangements that affect EVs which may also apply to NGVs?**

None are known to Western Power.