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19 March 2020

Mr John Pierce AO
Chairperson
Australian Energy Market Commission
PO Box A2449
SYDNEY NSW 1235

Submitted on line: www.aemc.gov.au

Dear Sir,

RE: 2020 Retail Energy Competition Review: Electric Vehicles (Discussion Paper of 20 February 2020)

Magnis Energy Technologies Limited (Magnis) appreciates the opportunity to respond to the Australian Energy Market Commission's (AEMC) "*2020 Retail Energy Competition Review: Electric Vehicles*" issues paper.

Magnis is an ASX listed company that is evolving as a Battery-cell Energy Storage Systems (BESS) provider within the Australian Electricity Market. We are developing our BESS business with a view of providing practical product solutions that deliver to a broad range of consumers the security, reliability and cost savings that they require in regards to electricity generated from renewable energy sources. We do this with the ultimate aim of greatly reducing the environmental footprint by reducing the need for using fossil fuels.

Our submission is in the format of a response to each of AEMC's questions for consultation.

Question 1: Context

Sales of Electric Vehicles (EVs) in the Australian market are forecast to exponentially increase over the coming years at a time when electricity generation is transitioning to a greater proportion of Distributed Energy Resources (DER) on the grid. DER is dominated by intermittent renewables that in isolation create instability on the grid. This instability is increasingly evident as the proportion of DER increases, especially during daylight hours with the "duck curve" now a well-established feature of the National Energy Market (NEM). The arrival of EVs and their increased demand for electricity has the potential to adversely impact on grid stability if the opportunities for EVs to provide auxiliary services to the grid are not captured.

The aim of this submission is to identify the best method EVs can be integrated into the NEM with particular consideration given to the rapid increase of DERs. The key objective is to create a regulatory framework with incentives to promote the convergence of the lowest cost solution for all electricity consumers, including electric vehicle owners. Although not yet adopted in the NEM, vehicle to grid (V2G) and vehicle to

home (V2H) represent an opportunity of shared infrastructure through the car battery that ideally can remain connected to the grid for the majority of time that the vehicle is idle.

The integration of EVs into a grid with high penetration of DER is only seen possible if the Australian Energy Market Operator (AEMO) has a more granular real time view of DER generation and customer demand at all levels including EVs. To realise this, *it is recommended that the NEM combine the wholesale market and the retail market to interact as one which will allow the integration of DERs*. There should not be an independent DER Market as suggested by the Distributed Energy Integration Program (DEIP) as it will be near impossible to achieve efficiency and administer the NEM as a whole. However, the NEM should allow Small Generation Aggregators (SGA) and Renewable Generation Aggregators (RGA) to buy and sell electricity independent for all transactions that are within their Local Distribution Network (LDN) and/or Renewable Energy Zone (REZ) respectively.

The increased proportion of DER and the modular nature of its generation, especially roof top solar, means there are opportunities to realise efficiencies in electricity generation and consumption by avoiding unnecessary transmission. Similarly, if V2G is adopted, any EV owners could be a supplier of auxiliary services in the form of demand response or frequency control.

AEMO should be the operator of the entire electricity market so that deployment can be coordinated between the transmission and distribution networks. AEMO may not be responsible for initiating the deployment of electricity that will remain and be consumed within a LDN or REZ but it needs to know the movement of all electricity loads within and behind the meter in order to coordinate supply with demand for all linked markets to work efficiently as one complete system.

Magnis' view of an appropriate regulatory method will be given with our response to "Question 3" as it involves suggested changes to the electricity market framework, the current metering configuration and the infrastructure in regards to Electric Vehicle (EV) charging stations.

In order to facilitate the implementation of EVs within the NEM, we understand that the AEMC has the crucial role of providing strategic and operational advice to the Council of Australian Governments (COAG) – Energy Council. If Australian Governments are serious about our transition to renewable energies and the use of EVs, then they should be advised to evaluate the effect that taxes are having on the transition and be made aware of how they are hindering the process if they do not act quickly to allow such change.

With all due respect, we would like to make the following suggestions in regards to taxation concerning electric vehicles and electricity as a whole;

- Fringe Benefit Tax (FBT): In our opinion, to encourage the transition, electric vehicles should be exempt from FBT for at least to the period ending 30 June 2030. This is to include Car Parking Fringe Benefits and Property Fringe Benefits such as providing workplace charging facilities and electricity from such charging facilities. Interest free Loan Fringe Benefits should also be exempt from FBT if they are used to facilitate the purchase of an EV or home DER System.

- Goods and Services Tax (GST): Electricity has many facets of use and not just a particular type of use. We require electricity because it is essential or very important to our existence rather than a

desirable possession. The fact that we are a civilised race causes electricity to be a need rather than a want. For this very reason electricity should not be subject to GST. Water as an essential utility is GST exempt and electricity should not be treated any different. Also, as an incentive to consumers to make the transition sooner, GST should be exempt on all EVs, DER installations and equipment purchased up until 30 June 2030.

Services charged for the direct use of an electric vehicle should also be exempt from GST such as taxi, bus courier, and vehicle hire services for at least to the period ending 30 June 2030.

- **Distributed Energy Resource (DER) Offset:** All consumers that contribute to the transition by investing in DER equipment may be rewarded with a refundable tax offset of at least 20%. This offset should run for at least 10 years to 30 June 2030. Due to the fact that there are more Small-Scale Technology Certificates for sale than required to be purchase, the certificate schemes managed by the Clean Energy Council now has the adverse effect of what it is meant to achieve and should be terminated by 2021 as suggested by the ACCC rather than terminated in 2030. In effect, a DER Offset would replace the near redundant Small-Scale Renewable Energy Scheme.

- **Depreciation Write-off:** Commercial investors who install EV Charging facilities in car parking stations, shopping centres, train stations carparks, charging stations and workplaces could be given the incentive to invest by allowing them to depreciate their capital outlay on infrastructure over a 2 year period. This type of infrastructure would not be considered as part of a DER system but more like a specialised extension to a distribution networks. The cap on the depreciable value of an EV (car value limit) should be removed until 30 June 2030.

- **Land Tax:** Land used for carparks that combine the service of charging EVs should be exempt from land tax just as rural land that is used for primary production.

Question 2: Role of Retailer

The role of Retailers within the NEM will obviously change with the introduction of EVs and DER Systems. As a result, the market system where the retailer simply purchases electricity from generators at a wholesale rate and then on-sell it to consumers at a retail rate is becoming redundant.

Retailers will become more like agents for Generator and Storage Providers within the Transmission Network. They will be able to purchase from Generators, Storage Providers and DERs and on-sell to residential consumers, commercial consumers and EV Charge Station Operators.

To encourage competition, the regulation for consumers to contract with the one retailer should be abandoned to a system that allows Multiple Trading Relationships (MTR).

Retailers will still buy electricity from generators within the wholesale market but they will also be buying wholesale electricity from competitors of generators such as Storage Providers, SGAs, RGAs and DERs. Retailers will be competing amongst themselves for the best wholesales price and also against their new competitors, the operators of EV Charging Stations. EV Charging Stations will be purchasing electricity at wholesale rates and on-selling to EV consumers at retail rates.

Finally, the NEM will be a system where the price for electricity is truly determined by the supply to and demand from the consumer.

Question 3(a): Regulatory Environment

It is well-known that our electricity market is currently in transition. It was initially envisaged wind farms, solar farms and hydro-electric power stations would replace coal power plants, especially those at the end of their working life. More recently, it is becoming evident that there will be a need for increased electricity generation capacity in the future to run EVs as they gain market penetration. Against this backdrop, there has been a surge in the last 2 years in the number and average size of rooftop solar PV arrays to currently account for approximately 20% of generation in the NEM during daylight hours. With current incentives for rooftop solar, 50% generation is feasible in a matter of a few years.

In the near future, it is expected that the primary source of electricity for most consumers within their own premises will be renewable energy from rooftop PVs with the Grid serving as a backup. The extent of generation from this primary source will be limited to the capacity that can be installed on any given roof top (if any) and the cost effectiveness of storage. EVs have the potential to reduce the cost effectiveness of storage for owners if excess generation during the day can be transmitted to EVs plugged into the grid. Whilst this scenario for consumers with their own premises is clear, it is less clear how leasehold consumers can benefit unless the regulatory environment is changed to facilitate spill over of excess rooftop capacity to leasehold customers and EV owners.

The rapid uptake of rooftop solar is now starting to disrupt utility scale wind and solar farms who are experiencing low marginal loss factors (MLFs) and curtailment of power exported to the grid. It is envisaged that the regulatory environment will be modified in the future to facilitate the consumption of this surplus through charging of batteries and electric vehicles.

The dilemma that Magnis has, is that existing BESS products are designed to cater for the current power networks and the inherent characteristics of the Micro-Grid Management Systems (MGMS) used in DERs will become redundant once regulations change in the future. It is thus critical with the exponential growth in energy storage and EVs, that the regulatory environment is updated as soon as possible so that early adopters are not penalised in the future and BESS solution providers such as Magnis are able to serve their customers with clarity.

The main problem within the electricity networks that needs to be addressed in the regulations is the management of inertia. It is a growing problem that needs to be addressed sooner rather than later. The inertia within the networks was easily maintained when the main form of power generation was from coal fired synchronous turbines. The momentum was uninterrupted and therefore continuous throughout the networks. Minimal ancillary services in the form of Frequency Control Ancillary Services (FCAS), Network Support & Control Ancillary Services (NSCAS), and System Restart Ancillary Services (SRAS) were required by the system.

The introduction of renewable energy sources has increased the risk to the security and reliability of the electricity networks. The connection of wind and solar farms does not allow for a direct flow of inertia. This is due to the fact that the inertia is broken at the point of connection by the use of inverters and rectifiers. The system no longer works as one and itis the opinion of Magnis that the only way to solve this problem is

with the mandatory use of fast response battery banks as they are required to act as FCAS at the point of connection of all wind and solar farms forming part of the Transmission Network.

The same should be the case for all DERs forming part of the Distribution Network but obviously at a much smaller scale. The characteristics of these batteries will obviously be different from those of batteries used for energy storage. It is highly recommended that those systems that require storage have the majority of their batteries being of high energy for time shifting and a separate small bank being of high power for fast response FCAS. This will help ensure a stable level of frequency and voltage control.

Once the above problems have been solved, we will then be able to consider regulatory changes to ensure equity and competition such as multiple Financial Responsible Market Participants (FRMP) at a household meter and how this could enable innovative services and products for EV consumers.

The issue that is stalling progress of this transition the most, is the fact there is no definite design for the NEM that will support the transition and the final characteristics of the new market. Waiting until mid-2025 is far too long, especially with mid-2021 being achievable and more acceptable.

This issue has compelled Magnis to briefly outline a system that could work. The suggestion is aimed at encouraging our peers to have more input that will fast track the development of the new NEM to eventually result in moulding a system that will benefit all. We wish to make clear that we are not being critical of the COAG-Energy Council, the AEMC or the ESB but are only trying to point out that the transition and the development of the new NEM cannot move forward without a definite plan. The sooner this is done, the better for the industry and for consumers.

Our suggested changes to the electricity market framework, the current metering configuration and the infrastructure in regards to Electric Vehicle (EV) charging stations are depicted in the response to Question 3(b) below;

Question 3(b): Regulatory Environment

The current wholesale and retail markets work on time pricing which is satisfactory for fossil fuel generators that can operate at any time. But our market is in transition from fossil fuels to renewable energy generation. Therefore electricity is generated whenever the sun is shining and / or the wind is blowing. The only "emission free" way to ensure the constant supply, is with the use of batteries in chemical, hydro kinetic or hydrogen gas form.

If the market continues to operate at the current time pricing basis, there will be an increasing disconnect between when electricity is generated and when it is consumed. This in turn will require more capacity for Battery Energy Storage Systems (BESS) in the system, which will lead to inefficiencies and cost. This will lead to disruption and congestion within the grid system. Massive amounts of generated power will be stored and withheld until it can be released at a maximum "peak" price. This could result in the market being starved of power in order to drive the price of electricity up. Therefore, batteries have the potential to notoriously distort the pricing mechanism of the NEM which will cause the current market framework to become redundant.

It is inevitable that the pricing system within the NEM will be based on *price signalling* of market supply demand fundamentals that when combined with increasing system digitalisation, will enable the required responses in demand and storage to ensure a stable grid. An entire new system needs to be implemented. The introduction of the DER Registry launched at the beginning of this month by AEMO is a good start. All DERs will have their own unique Identification Number (ID) just like all the participants in the wholesale electricity market do.

The two-tiered market consisting of wholesale and retail trading should become one market that is **segregated** by purchaser type and accessible by all participants via an intranet portal. This portal should be administered by AEMO and could be stored within the mainframe computer of Services Australia located in Canberra. The mainframe database should be accessed by all users via X86 midrange computers with Graphical User Interphase screens with access limited to the user's authority.

Meter Configuration

All importing and exporting movements from-the-meter and those movements occurring behind-the-meter are to be recorded and transmitted to the AEMO database via a secure intranet service. Therefore the metering for all retail and wholesale customers are to be replaced with Smart Meters that will record and transmit the following data in 15 minute intervals to the mainframe:

- Total energy supplied from Grid in kWh
- Total energy feed into Grid in kWh
- Total energy supplied from Grid to FCAS Battery in kWh
- Total energy feed into Grid to FCAS Battery in kWh
- Current self-consumption from PV Array in kW
- Current self-consumption from BESS in kW
- Current charge to BESS in kW
- Current BESS state of charge as %
- Current charge to EV bowser in kW
- Current yield from PV Array in kW
- Total yield from PV Array in kWh
- Total yield from BESS in kWh

Market Framework

The new NEM could be on a portal operated and maintained by AEMO. It would operate similar to a market depth share trading style system showing all bids for purchase and sale. Consumers could have Electricity Management Systems that would manage their DER Systems and have their purchase and sale of electricity automated to their set parameters. The system would operate as follows:

- Residential consumers would be able to select offers from and sell to "peer to peer", SGA, RGA, DER and retailers within their distribution area. They would also be able to sell to EV Charge Station Operators;
- Commercial consumers would be able to purchase from "peer to peer", SGA, RGA, DER and Retailers within their distribution area and pay an additional 30% markup on the sales price. This is due to the fact that electricity is tax deductible for businesses. They would also be able to sell to "peer to peer", SGA, RGA, DER, retailers and EV Charge Station Operators;
- Retailers would be able to select Generator, Storage Providers and DER offers and sell to DER and EV Charge Station Operators;

- Generators and Storage Providers would only be able to sell to retailers and EV Charge Station Operators. Their maximum sales price would be capped and set by the AER every 3 months;
- EV Charge Station Operators would only be able to purchase off DERs, Generators, Storage Providers and retailers;
- The ***segregated market*** above will promote healthy competition which will ensure that the purchaser influences the best possible price. The ACCC will ensure that there are no price fixing syndicates;
- The AEMO System will calculate with each transaction the network costs payable by either the purchaser or seller. The network costs would be set by the AER on a yearly basis and be calculated on distance and network area(s) use basis;
- A yearly registration fee set by the AER would be charged to every participant by AEMO.

Market Billing

Monthly statements in the same format as say a credit card statement could be issued by a financial institution on behalf of AEMO. Multiple meters and EV cars could be linked to appear on the one account. Each EV is to have its own unique ID for billing that links it to a particular account. This will allow an EV to be charged at any given public charge station. The cost of charging EVs at home would be included in the home bill.

This form of billing will also allow for multiple Financial Responsible Market Participants (FRMP). Social Security subsidies will also be processed through this billing process to give assistance to pension recipients and low income earners.

Market Rules

The following rules would apply:

- The meter data is accumulated on a daily basis which starts at 12:01am and sent to the AEMO database in 15 minute intervals;
- For States with daylight savings, an "x" is to be included at the end of the second recorded time (eg 3:15am x) when 2 readings for the same time are transmitted;
- All movements are to have associated IDs recorded in 15-minute intervals for each market place transaction. This will enable the AEMO database system to record and finalise each transaction. The 2 IDs recorded for each transaction will be that of the buyer and seller. This will enable multiple Financial Responsible Market Participants (FRMP) at household meters;
- The kW amount recorded at the receiver's meter will be the amount used to record the transaction. This is to allow for transmission losses which are to be absorbed by the sender;
- Most of this data will be supplied to the Smart Meter from a DER Management System that is certified and designed to the requirements of the AEMO;
- For reasons stated above, "*time of day*" pricing such as "off-peak, shoulder and peak" should not be used as they have become obsolete. The more practical and fair rate of charge should be a "*price signalling*" charge;
- To protect disadvantaged consumers usage, limits should apply whereby pricing is capped below the usage limit allowed to increase above so as to discourage excessive demand in periods of supply scarcity. The scaled usage could be in 3 set increments of 5kWh, increasing in price for each scale as more electricity is used from the grid. For example, the basic-range would be the market rate charged, the mid-range would incur a premium mark-up (penalty rate) of say 50% and the high-range, a premium mark-up of 100%. This would be to discourage excessive use which leads to increase in demand that has the potential to increase the market price;

- Battery banks used as FCAS should be reimbursed the average market rate used for the same period of time plus a 20% surcharge for power taken by the grid. The 20% surcharge is to compensate the consumer for the power lost in charging and the use of the battery bank. This amount is to be reimbursed from amounts kept for network costs.

EV Market infrastructure

It is envisaged that most charging of EVs will occur in the home garage to take advantage of rooftop PV generation. The problem with this is that night time charging will either be from the home BESS or the grid and not during the day when the EV is more likely to be absent from the home.

The most common places that an EV will be parked during the day is the carpark of either the workplace, train station, shopping centre or parking station. Large-scale Battery Systems will obviously be required with sophisticated charging stations that also act as meters. There is also the en-route fast charge option, similar to our Petrol Stations, to consider which Magnis is still cautious of due to not much being known about the magnified stress and responses on a battery over time.

Question 4(a): Residential Charging

Magnis is of the opinion that electricity flowing through into a household meter should not discriminate if consumed by EV charging. We do not see the fairness in creating a different tariff within the same premise. If the Retailer drops its price to EV users, it will have to recover it in non-EV applications. This is not an ideal way to ensure equity, as disadvantaged consumers are less likely to own EVs.

Question 4(b): Residential Charging

Magnis is currently researching options for residential charging to form part of a DER System that takes the best advantage of sourcing power from a PV array, battery storage and the grid (including "peer to peer" purchasing) given the time of day, the amount of vehicles and the level of charge required. We are also considering V2G and V2H options. The main market barrier in doing so is not knowing the future market framework of the NEM.

Question 5(a): Non-Residential Charging

Magnis is currently researching options for non-residential charging and see that the major focus of establishing "destination charging" such as car parking centres is to develop a very robust large-scale BESS. This requires Magnis to investigate and develop a battery bank that is made up of several different types of batteries which are all controlled by a Battery Management System which coordinates all simultaneous activities related to the import and export of power as it is stored and deployed. Magnis is currently talking to specialised battery module manufacturers.

Question 5(b): Non-Residential Charging

The retail market barriers that prevent the development of non-residential EV charging products and services is the unknown such as how will electricity be supplied and how will consumers be able to charge their EVs with constant pricing within a market with so many variables. We need to know the future market

framework of the NEM and how we may transition to the use of EVs. How can we develop a product for a market that is yet to be developed, especially if we do not know its characteristics?

Question 6(a): EV Value Streams

Magnis is currently trying to develop ways to improve the performance, efficiency, reliability and life of batteries used in EVs. We believe that an EV's battery system may be beneficial as a supplementary back-up system for a home's main BESS. But if you are charging your EV off site and then drive it home to add to your power supply, in effect you are converting your EV into a mobile transmission cable. The idea of a DER is to produce your own power for consumption, not to transport it.

Question 6(b): EV Value Streams

Magnis does not see any true value to the consumer in allowing retailers or new energy service providers to have access to their EV value streams unless the consumer is aware and is compensated in some way. For instance, if a charging station was using the batteries of EVs to bring about stability within the network, then it would need to be with the consent of the EV owner and in all fairness they should be remunerated by some form of a discount.

Magnis understands that there are complexities and that there is a magnitude of work to ensure that the retail energy market transforms along with the transition to renewable energies. We therefore commend the efforts of the AEMC.

Magnis' main hope is that the design and development of the new NEM will be sooner than the anticipated timeline. This discussion paper has given us some "food for thought" within our own organisation and we hope we have been of some benefit to you and our peers as well. If you would like to discuss our submission or would like us to participate further in any way, please do not hesitate to make contact.

Yours faithfully

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