Ms. Jessica Shaw MLA
Chair
Economics and Industry Standing Committee
Western Australia Legislative Assembly
Parliament House
PERTH WA 6000

Dear Ms. Shaw,

Inquiry into Microgrids and Associated Technologies in WA

Tesla Motors Australia Pty Ltd (Tesla) welcomes the opportunity to provide a response to the Parliament of Western Australia on the potential for microgrid solutions across the state of Western Australia.

While best known for its vehicles, Tesla also utilises the battery expertise and production capacity developed for its vehicles to make innovative, cost-effective energy storage systems for use in homes, commercial buildings, and on the bulk electric system. With over 7.5 gigawatt-hours (GWh) of total energy storage produced and deployed in vehicles and over 700 megawatt-hours (MWh) of stationary energy storage systems installed and operating, Tesla has extensive experience in both manufacturing and deploying commercial energy storage systems for both off-grid and grid-tied solutions.

The below submission provides an overview of Tesla's microgrid solution and associated projects as well as the broader benefits of microgrid solutions. Tesla's international experience in delivering microgrid solutions can be replicated in both regional and metropolitan Western Australia. In addition to being an integrated hardware solutions provider, Tesla can also provide a full suite of other services to support a successful microgrid project.

a) Potential for microgrids

Microgrids play a major role in providing affordable energy to rural, regional and remote regions around the globe. Traditionally microgrids can operate both in purely off-grid form, as well as in grid-tied mode in edge of grid locations. They also present unique challenges that require robust solutions to maintain stable and sustainable power supply.

Renewable energy and storage solutions are playing an increasing role in supporting existing diesel generation assets, or offsetting the need for diesel based microgrid solutions. Tesla's microgrid solution leverages existing unit level controllers and a robust, frequency-based load sharing scheme. The solution integrates Tesla Powerpack storage systems with solar photovoltaic (PV) assets and, in some instances the existing, diesel generation assets.

Tesla's Microgrid Controller manages the various Distributed Energy Resources (DERs), such as the Tesla Powerpack system, diesel generators and solar PV to ensure reliable, low cost supply to the system loads. This ensures that the microgrid services can operate in both grid forming mode (where

the communities served are completely off-grid), and grid following mode (where the microgrid is grid-tied). When on grid, Tesla uses bespoke software, Opticaster, which can be used for tariff optimization or providing grid services, such as demand response, frequency response, or non-export.

At a metropolitan level, microgrids can also include virtual power plants, or other aggregated distributed energy resources, or smaller systems used for serving a single customer looking to limit grid connectivity.

In total Tesla has over 20 operational microgrids around the world - from remote communities, commercial and industrial facilities to utility substations, military bases and mining operations. These systems are modular and fully scalable using Powerpack technology – ranging in 210kWh to more than 6MWh in size. An overview of some key Tesla microgrid projects is provided below:

Off-grid examples:

- **Ta'u - American Samoa[1].** The island of Ta'u previously relied on diesel generation to supply all of their electricity at significant cost. This was replaced with a 1.4MW solar PV array and 750kW / 6MWh Powerpack to offer a more reliable source of electricity. The microgrid allows the island to store and use solar energy 24/7, reduces diesel costs, removes the hazards of power intermittency and reduces outages. The microgrid is operated by the American Samoa Power Authority.
- **Vunabaka – Fiji[2].** The Vunabaka resort in Fiji, which consists of two private marinas, 73 private villas and a luxury hotel is completely off-grid. The resort island relies on 1MW of solar PV and 4MWh of storage to provide their energy needs, with diesel generation only providing back-up in the event of a storm.
- **Singita Kruger National Park – South Africa[3].** This project includes an integrated Powerpack system with existing solar photovoltaics (PV) and existing diesel generators to form a hybrid microgrid system, which provides Singita Kruger National Park with a reliable, cost-effective source of energy. The upgraded hybrid microgrid system at Singita Kruger National Park is forecast to provide 1,600 MWh of renewable energy a year to power Singita Lebombo and Sweni Lodges, which is expected to reduce diesel consumption to less than 20% of the total energy supply on site.

Grid-tied examples:

- **Cathedral College – Rockhampton (Australia)[4]**. This project includes a solar and Powerpack system on its campus that will save the college money and reduce carbon emissions. An 85 kW solar system coupled with a 50 kW / 95 kWh Powerpack system is expected to generate enough energy to reduce the college's grid electricity consumption by 50%
- **Kaua'i Island Utility Cooperative (KIUC) – Hawaii[5]**. The project consists of 13 MW of solar and a 13 MW/ 52MWh Powerpack system.

Benefits of microgrid solutions

[1] https://www.sciencealert.com/this-island-in-american-samoa-is-almost-100-powered-by-tesla-solar-panels
[2] https://electrek.co/2016/12/23/tesla-powerpack-microgrid-fiji-island/
[3] https://singita.com/press-release/singita-partners-tesla-use-powerpacks-sustainable-energy/
4 https://www.gemenergy.com.au/case-studies/rockhampton-cathedral-college/
[5] https://www.utilitydive.com/news/teslas-dispatchable-solarstorage-project-in-hawaii-brought-online/437858/

There are significant benefits to be gained from microgrid solutions for communities, network providers and the Western Australian Government more broadly.

Solar PV and energy storage based microgrids reduce reliance on the full cost of diesel. The projects undertaken to date have shown that solar PV and storage solutions represent a lower cost solution than diesel on a levelised cost of energy (LCOE) basis. In addition, the stand-alone nature of these microgrid projects means that there's no ongoing costs associated with the transport and storage costs of fuel.

Storage provides intelligent grid control with low maintenance costs and reduced downtime, to ensure reliability with low ongoing operational spend. Remote communities served by long single wire earth return (SWER) lines are more susceptible to energy reliability issues and microgrids can be used to reduce these risks.

For networks, microgrids provide an opportunity to minimise ongoing costs of infrastructure augmentation, and reduce the costs associated with serving customers in remote areas. As Western Power noted in their rule change request to the Australian Energy Market Commission (AEMC) in respect of "Removing barriers to efficient network investment"[6] in the longer term this results in more efficient infrastructure investments and lower costs to consumers.

For consumers across Western Australia – efficient use of microgrids and the resulting reduction in network infrastructure spend can also work to reduce the tariff equalization contribution (TEC) paid by all Western Australian energy consumers, by reducing the network costs that are passed through.

b) Key enablers - Regulatory barriers

There are several key regulatory considerations that will be vital in ensuring that microgrids can operate effectively in Western Australia. These include the following:

- Ensuring that networks are able to replace existing network infrastructure with non-network solutions such as solar PV and storage based microgrids. Providing that the appropriate consumer protections are met, where microgrid investments represent more efficient network spending, they should be encouraged. Note as well that this is the topic of an ongoing AEMC review based on the Western Power proposed rule change on "Removing barriers to efficient network investment".
- Ensuring that new microgrid technologies (such as solar PV and storage) are provided. Solar and storage providing microgrid solutions in Australia is still a relatively emerging sector. Tesla would be happy to work with the Western Australian parliament and other interested stakeholders to provide any relevant information on the technical capability of these solutions, specific to the Western Australian environment.

In respect of active participation of an aggregated distributed energy resource base in providing microgrid solutions the points above are equally applicable. As some of the grid-connected virtual power plant projects on the east coast start to create data, this will provide valuable information for Western Australia opportunities.

[6] https://www.aemc.gov.au/sites/default/files/content/b379bfe2-5ee0-43e5-a36c-6eef9068b05c/Rule-change-request-Western-Power.pdf

c) Initiatives in other jurisdictions

In addition to the focus on the regulatory considerations outlined above, the Western Australian Parliament should also consider lessons from the following jurisdictions that have introduced policies or incentives for grid-tied microgrids:

- **Victoria**[7] announced $10 million in funding to develop and implement state wide microgrid demonstration projects using a range of different models including virtual power plants and smart embedded networks, in addition to off-grid microgrids.
- **Vermont (USA)[8].** Green Mountain Power announced a grid-tied microgrid network solution to link up to 2,000 Tesla Powerwalls to homeowners within the utility's service territory, to enable more renewable energy and increase grid efficiency.
- **Massachusetts (US)[9]** announced over $1 million in funding for feasibility studies for a number of small community microgrids to lower consumer costs and increase energy resilience.

These projects provide a small subset of jurisdictions supporting microgrid solutions, and may provide a basis for some of the ongoing considerations from the Western Australian Parliament.

Tesla looks forward to continuing to work with the Western Australian Parliament on opportunities for microgrid projects across the state. We are happy to provide any more information on any of the projects and broad benefits discussed in the submission above.

If you have any further questions please contact Emma Fagan on efagan@tesla.com.

Kind Regards

Mark Twidell

APAC Director – Energy Products

[7] https://www.energy.vic.gov.au/microgrids
[8] https://greenmountainpower.com/press/gmp-launches-new-comprehensive-energy-home-solution-tesla-lower-costs-customers/
[9] http://www.masscec.com/community-microgrids-program