Open Energy Networks Consultation:

Response by **Planet Ark Power** to the joint consultation by AEMO and Energy Networks Australia on how best to transition to a two-way grid that allows better integration of Distributed Energy Resources for the benefit of all customers

Summary

Voltage Management on the LV grid is required as a critical building block for any of the frameworks presented for DER optimisation in the consultation paper. Responses to the consultation questions are provided in the following sections.

Our general contribution and position is:

1. The top priority is to enable DER export into the grid. Voltage Management on the LV grid is required as a critical building block for any of the frameworks presented for DER optimisation in the consultation Planet Ark Power.
2. Trials of voltage management technologies should be implemented immediately which are critical to delivering any of the frameworks presented for DER optimisation in the consultation paper.
3. DER export costs and 'infrastructure' costs should be on a user pays system. Non DER customer connected to the network should not subsidise DER customers.
4. Critical DER infrastructure should be identified and an implementation plan developed. Without a plan to monitor and control DER many of the value propositions will be wasted.
5. DER has substantial direct benefits to DNSPs and these should be identified and used as part of the current regulatory determinations.

1) Path-ways for DER to provide value

Consultation Questions:

1. ***Are these sources of value comprehensive and do they represent a suitable set of key use-cases to test potential value release mechanisms?***

Planet Ark Power believes that there will be a third category of DER customer who will provide 'Commercial Active DER Export' at times when there is an economic benefit to the customer. These customers will most likely have large DER installations and have justified their investment by selling into the market. In time, with Energy Management products and the low cost of DER, this category will most likely predominate. Until the enabling technologies becomes common place cost effective, this market will be restricted the commercial and industrial customers with large DER installations and commensurate financial and commercial resources.

2. ***Are stakeholders willing to share work they have undertaken, and may not yet be in the public domain, which would help to quantify and prioritise these value streams now and into the future?***

Planet Ark Power is willing to share the results of trials but not to share our Intellectual Property or commercial software and products.

Planet Ark Power is currently trailing DER export at a site that was previously deemed to have zero export by the local DNSP due to the DER exceeding the 15% of the minimum feeder load. Planet Ark Power has developed a product using dSTATCOM and control software to manage the connection point voltage within statutory limits while exporting. Once the trial is complete the results will be made available to the public subject to permission from the DNSP.

Another trial will commence in 2019 where a DER installation will perform 'active export' into the market on a commercial basis. The results of this would not be available for public scrutiny.

2) Maximising passive DER potential

Consultation Questions:

1. ***Are there additional key challenges presented by passive DER beyond those identified here?***

This is a reasonable account of the technical challenges from a network and market point of view. What is not apparent is the priority of these challenges: the primacy of voltage in holding back new solar DER, before thermal limits become a problem.

From our point of view, working particularly with commercial customers, the benefit of DER investments is often lost to commercial customers that are often constrained to ***zero export***. This is due to a range of factors including:

- Export capacity is preferentially allocated to residential customers who are usually not refused;
- Inability of the DNSP to have effective control of DER when it needs to for network security;
- Lack of familiarity with, and trust in DER capabilities and the means to access them;
- Insufficient reactive power controls that are cost effective for networks and customers.

We would therefore like to highlight the disincentive to commercial customers to install solar, and the dSTATCOM technology we can offer to change this, and the business models we have developed that allow it to happen.

Problem: Australia is the first jurisdiction in the world where the LV Grid is almost full to rooftop solar because of the high installation of household solar. Hawaii is the second and the rest of the world will follow.

The LV grid has a technical limit due to its one-way design that limits rooftop solar capacity in a suburb at up to 15% of the zone substation rating (not to be confused with the % of homes that have solar). Once this is reached the grid operator imposes ZERO Export, that is, no excess rooftop solar energy can be exported to the grid. Exporting rooftop solar impacts the voltage on the grid and takes the voltage outside the statutory limits which is why the maximum rooftop solar in a suburb can only be up to 15% of the zone substation rating (e.g. the greater suburb) unless detailed studies are done for specific locations (note these detailed studies are expensive and time consuming).

In Hawaii the grid has imposed ZERO Export on all new residential and commercial rooftop solar. In some Australian jurisdictions almost all commercial and industrial (C&I) rooftop solar is imposed with ZERO Export but not households, to date. **ZERO Export significantly reduces the size of a solar system that is economically viable for C&I sites and in many cases destroys the compelling reason for a business to install solar.**

Households have a strong political influence which is generally thought to be why grid operators do not impose ZERO Export on them. This results in residential suburbs with high solar penetration requiring upgrades in grid CAPEX to handle the rooftop solar which then creates rising prices as the grid passes this cost on to consumers. This feeds the grid "Death Spiral" (e.g. higher grid prices encourages more solar and some households going off grid, which then feeds higher prices, etc).

With ZERO Export in place grid connected Microgrids generally become economically unviable. This is a problem as Microgrids are a significant benefit to the grid and general community as they heal and support the grid while reducing the sites energy costs.

Also, ZERO Export destroys any Peer to Peer (P2P) trading possibilities. Overcoming ZERO Export and creating a two-way grid gives the grid operator new two-way pricing options that can overcome the "Death Spiral" and deliver a sustainable clean energy friendly DNSP business model.

Solution: Technology is available today to manage the voltage regulation on LV and MW networks to allow full export of passive DER up to the thermal rating of the network equipment. This technology can be installed by the DNSP or the customer. Today there significant social concern over the subsidiaries given to DER customers over non DER customers. For social fairness reasons, the customer who exports should bear the cost of this technology. If a DNSP implements this technology then a cost recovery mechanism from the export customers' needs to be developed to ensure the user pays principle is adhered to.

Theoretically, the VAR management will allow DER export up to the thermal rating of the network equipment. This technology has not be proven in a series comprehensive network trials. Many DNSP remain sceptical of the technology by virtue of their current DER zero export policies. Extensive trials of VAR management by DNSP is a priority if passive and active DER is to be a mainstream generation source. These trials should test the technology as well as the commercial mechanisms for a user pays principle.

2. Is this an appropriate list of new capabilities and actions required to maximise network hosting potential for passive DER?

This is a strange question because, when the value of active DER becomes apparent and is shared with customers who are investing in it, then the majority of new DER would be active due to its greater ROI – and the problem of hosting passive DER disappears! Put another way, once the level of passive DER is high enough to create concerns about its management, active DER will have high value and will be installed thereafter, until the concerns are alleviated.

But there will remain a level of passive DER for various reasons, and the capabilities and actions listed are sufficient, noting that many relate to introducing active DER which is discussed in the next section.

- The most obvious to us is that here should be a fee for voltage management on the LV grid and supply of data for visibility of voltage and related info beyond the substation.
- These fees are offset by the CAPEX deferral and reduced OPEX they provide to the DNSP and the ability for ENA / AEMO to implement a DER optimisation as outlined in the consultation Planet Ark Power.

Your document has not given enough emphasis on the direct benefits DNSPs and TNSPs. DNSPs in particular will need to develop new methods of planning and maintaining existing networks. DER can have substantial economic benefits to a DNSP. Some benefits are

1. DER, if managed correctly could improve network reliability without expensive capital for ageing equipment and new reliability schemes.
2. New methods of voltage management can extend the LV areas by reducing ADMD and transformer capacity.
3. DER can reduce expensive N-1 and N-2 planning criteria.
4. Judicial use of DERM products can substantially assist network operations during network contingencies.
5. Increased system utilisation by demand reduction.

These are not comprehensive and detailed study should be conducted to assess the direct benefits of DER to DNSPs and TNSPs.

3. What other actions might need to be taken to maximise passive DER potential?

As outlined, voltage management on the LV grid is absolutely critical and along with it visibility of the LV grid beyond the substation. Without these in place and DER optimisation is simply not possible.

3) Maximising active DER potential

Consultation Questions:

1. Are these the key challenges presented by active DER?

It is also a significant challenge to market and sell complex DER propositions including third-party access and control, and to target those sales in geographically specific areas where network-based value streams may be available.

Depending on the achieved penetration of active DER, a combination of network-side and customer-side strategies may need to be used, and this requires an advanced level of integration with network operations – not yet achieved but we are demonstrating this at the Coles Distribution Centre, Edinburgh, in partnership with Schneider Electric and SA Power Networks.

Values and challenges from a retail perspective have also been omitted. Smaller retailers without the physical hedge of a generation portfolio are already attracted to DER propositions, some of them to active DER, as a means of differentiation, customer retention, and hedging against wholesale price peaks. They would have stories to tell about the challenges they are facing.

The other main challenge not covered is the development of government policy to encourage active DER. The market can send various price signal to encourage certain outcomes but without a comprehensive overarching government(s) policy actively supporting active DER the uptake and direction can be inefficient.

2. Would resolution of the key impediments listed be sufficient to release the additional value available from active DER?

- The highest priority is to allow DER to be exported into the grid. Without significant DER export the value of DER is very limited.
- Virtual Power Station (VPS), demand management and Power Factor Correction (PFC) related equipment – have very limited, if any, real impact on the percentage of rooftop solar on the low voltage grid above the 15% limit.
    - Coordinating DER on the LV grid must include real time voltage management to maximise the community benefit and to maximise DER on the LV grid.

3. What other actions might need to be taken to maximise active DER potential?

Crucial to achieving DER installations and benefits, at this time, is partnership between customers and DNSPs. This is presently elaborated through the connection agreement process that is inhibited by outdated protocols like the "15% rule" for solar penetration with respect to substation transformer capacity. We concede that connection agreements are needed but are too complex at this time. Solving the zero export problem will go some way to simplifying connection agreements. Even though a customer signs a connection agreement, nearly all DNSPs have no way of measuring compliance with the policy. Other counties have developed incentives for customers to go to active DER and provide DNSPs with control and monitoring of the DER installation.

Policy development of DER monitoring and control should be a priority before retro-fitting becomes too expensive. Technology is available to monitor DER inverter voltages and power. DNSPs could mandate data collection from the customer in the connection agreement to ascertain power quality in its network and that customers are adhering to the connection agreement conditions.

4. What are the challenges in managing the new and emerging markets for DER?

To facilitate the various DER market opportunities, the key pieces of market 'infrastructure' have to be identified and a plan put in place to ensure the infrastructure is in place in a timely manner. For instance, knowing the capacity, location and control features in near real time is essential for realising the benefits of DER. Policing and standards development are essential for this planning. What organisation(s) should be responsible for this critical work?

It is already possible for DER to participate in the FCAS markets, and for HV grids to procure voltage services as NSCAS. But DNSPs don't participate in either of these and the services-as-OPEX model, while understood in a theoretical sense, is new as a practical opportunity. Fixing the DER zero export problem is number one priority and if DNSPs do not have the financial or technology resources then it should be outsource to third party organisations at a fee for service. The fee could be justified from saving in capital transformer upgrades, or improved CAPEX efficiency through better network utilisation, or reduced transformer OPEX for tap changes.

5. At what point is coordination of the Wholesale, FCAS and new markets for DER required?

When active DER become critical to the operation and reliability of the network and the point at which DNSPs and TNSPs plan for the DER capacity in their planning processes. The following clarification is provided;

- The critical item is that sometime in the near future DER will make regional hubs almost self sufficient. That is, they will require little if any transfer of energy between regional hubs. So a national coordination of DER is not expected to be a function that is required.
- Step 1 in this process is that we envision each DNSP requiring to install a DERMS (Distributed Energy Resource Management System) layer of control software as part of their overall SCADA systems for demand management and contingency management. This should then allow for regional if not national coordination of DER to commence (but only if voltage management on the LV grid and visibility of the LV grid beyond the substation occurs)
- Step 2 has many potential variations, to many to document at this time.

The important item is that voltage management on the LV grid must occur first to facilitate coordination of DER as part of Stage 1 outlined above. Plus visibility of the LV grid beyond the substation is also critical. Without these in place and DER optimisation is simply not possible.

The other critical items that will facilitate more DER and the cost effective coordination of DER is distance based grid charges to replace the current DUOS and TUOS outdated pricing;

- That is a zone pricing approach where sending DER across the street pays a lower grid transport fee than sending the DER to a neighbouring city or across the city.
- The current one price for all DOUS and TUOS does not suite DER and is simply not fair. For a DER installation in the centre of Sydney to be charged the same DOUS and TUOS to send energy across the street simply does not make sense.
- At the same time the DNSP must earn a fee both ways – for supplying energy to the site and from the site (e.g. clipping the ticket both ways). This is also crucial to helping stop the "Death Spiral" of the DNSP's, that is, provides them with a DER friendly and sustainable business model.

4) Frameworks for DER optimisation within distribution network limits

Consultation Questions:

1. How do aggregators best see themselves interfacing with the market?

We would support any standard interface that would allow different DNSPs to obtain services from different aggregators or individual commercial-scale sites. A multiplicity of standards helps no one and slows the pace of change. Note that a platform like deX could be an intermediary with multiple aggregators and multiple DNSPs, and is thus effectively a tool to support an iDSO.

2. Have the advantages and disadvantages of each model been appropriately described?

The final model will evolve to suite the level and value of DER to the market. In the longer term with a high penetration/capacity of DER the distributed model will more than likely be most apt. In the short term a more liberal centralised model would be most efficient. The open network plan should make an assessment of the time horizons for each model and how to transition between each model.

3. Are there other reasons why any of these (or alternative) models should be preferred?

The broadest optimisation in Open Energy Networks is aggregation and prioritization of distribution level bids and offers; in other global markets also known as "orchestration". We would add that this high-level optimisation should not be confused with feeder-level and substation-level optimisation that can happen during network planning or operation, enabled by effective control of DERs by agreement and in partnership with customers.

5) Immediate actions to improve DER coordination

Consultation Questions:

1. Are these the right actions for the AEMO and Energy Networks Australia to consider to improve the coordination of DER?

The proposed actions seem right if it includes voltage management and visibility of the LV grid beyond the substation. The following functions identified to enable distribution level optimisation are especially relevant to our customers and technology:

2. Are there other immediate actions that could be undertaken to aid the coordination of DER?

As outlined, voltage management on the LV grid is absolutely critical and along with it visibility of the LV grid beyond the substation. Without these in place and DER optimisation is simply not possible.

Appendix A: ZERO Export drastically reduces C&I rooftop solar!

- We expect all of Australia to impose ZERO Expert on most commercial solar;
  - ZERO Export significantly reduces the size of a solar system that is economically viable for C&I sites and in many cases negates the compelling reason for a business to install solar.
  - With ZERO Export in place grid connected Microgrids generally become economically unviable. This is a problem as Microgrids are a significant benefit to the grid and general community as they heal and support the grid while reducing the sites energy costs.
  - Also, ZERO Export destroys any Peer to Peer (P2P) trading possibilities.

The Opportunity – every roof with solar

Game Changing Impact on ROI if you can overcome ZERO Export

	560 KW rooftop solar Simple payback (Sydney)	850 KW rooftop solar Simple payback (Melbourne)
With Zero Export	23.6 years	8.8 years
With Export Allowed (with dSTATCOM)	6.8 years	5.8 years

ZERO Export destroys the Microgrid business case

- In the early 20th century, the centralization of electricity production made huge progress, enabling significant economies of scale and improved power plant efficiency.
- Today, decentralization could help tackle the energy challenges of the 21st century by creating an optimized way to access reliable, green, and resilient energy.
- Microgrids are the emerging energy eco-system that provides practical answers through a local, interconnected energy system within clearly defined electrical boundaries, which incorporate loads, de- centralized energy resources, battery storage, and control capabilities.
- Microgrids contribute to the energy transition by providing practical and accessible answers to improve energy reliability, resiliency, energy accessibility, energy independence, green energy, safety, energy cost optimization, energy flexibility, and the ability to participate in demand response or grid-balancing programs.
- It is possible to use microgrids as a flexible, distributed energy asset. For example, the microgrid can participate in demand response or grid balancing by optimizing the local generation, energy storage, and load management schedules to comply with a curtailment or ancillary services request-while taking customer constraints and utility tariff rates into consideration.
  - ZERO Export, imposed by the grid operator due to voltage problems, generally destroys the business case for microgrids as the excess rooftop solar and battery cannot be sent to the grid.

Appendix B: About Planet Ark Power

BRINGING CLEAN ENERGY TO AUSTRALIAN INDUSTRY

Planet Ark Power is a leading Australian renewable energy company focused on providing comprehensive clean energy solutions that help businesses and organisations slash electricity costs and build a sustainable energy future. Our expertly engineered systems reduce businesses' grid-supplied energy and demand charges, replacing them with clean solar power, battery storage, microgrid technology and improved efficiency. Our micro-grid systems enable businesses to access the benefits of exporting energy to the grid, revenue streams from demand response and allow network operators to smooth specific sections of the grid.

At our heart, we're an innovative engineering company with a remarkable depth of knowledge and experience in energy and solar power. Our team of engineers has decades of experience in the energy industry. We take a holistic approach to energy management, focusing on the commercial and industrial sectors, educational and health organisations and government facilities.

Founded as GoZERO Energy in 2014, we partnered with Planet Ark in 2017, one of the most trusted environmental brands in Australia. Today, as Planet Ark Power, we are among the fastest growing clean energy providers in the country.

Established in 1992, Planet Ark is one of Australia's leading environmental behaviour change organisations with a focus on working collaboratively and positively. The Planet Ark brand has 86% national brand recognition in Australia and is listed in the top five most "ethical and sustainable brands".

Positive environmental actions, for everyone.

Planet Ark Power is an important initiative of Planet Ark encouraging a Low Carbon ecosystem by significantly growing commercial rooftop solar installations in Australia. Planet Ark has licensed GoZERO Energy Pty Ltd to trade as Planet Ark Power.

Planet Ark Power was founded to deliver large scale commercial rooftop solar installations to create a cleaner, greener distributed energy future.

We do this by transforming the economics of commercial rooftop with our solutions that overcome industry voltage regulation and overcome the restrictions regulating ZERO EXPORT of excess power.

The inability to export clean energy drastically reduces the ROI of rooftop solar and therefore the size of rooftop solar that is installed, that is – only a small portion of the roof is used.

With offices in Brisbane, Sydney, Melbourne and Adelaide, we have the capability to install systems almost anywhere in Australia.