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Melbourne
Victoria 3000

Australian Energy Market Commission
PO Box A2449
Sydney South
NSW 1235

**For the Attention of Mr Sebastien Henry**
02 8296 7800

8 February 2017

**Commercial in Confidence**

Dear Mr Sebastien Henry,

**RESPONSE TO AEMC**
**Interim report | System security Market Frameworks Review**
**15 December 2016**

Reach Solar energy ('Reach') is very pleased to provide its response to the findings described in the interim report prepared by the Australian Energy Market Commission (AEMC) titled "System security Market Frameworks Review", dated 15 December 2016 and the other rule change requests listed in the document.

By way of background, the intent of Reach is to develop 500MW of large-scale solar photovoltaic (PV) by 2020/21. The driver for this new-build is existing Renewable Energy Act legislation and in particular the large-scale renewable energy target.

Reach management (see Annex C) have a proven track record with operations, development and raising large-scale capital for both energy and infrastructure projects in South Australia, other States in Australia and internationally.

Reach management also understands:

a. the transition that has occurred (and continues to occur), in South Australia and the National Electricity Market (NEM); the NEM rules; changes in system inertia and rate of change of frequency; changes in consumer demand; the demise of coal; gas pricing indexed to oil and LNG, role of the Reliability Panel and interconnection; and

b. the proposed rule changes to the AEMC by the Minister of Mineral Resources and Energy and draft determination by the AEMC dated 22 December 2016 (ERC0212).

It is a complex equation and is not isolated to South Australia and/or the NEM. Ireland, the USA and the UK are all implementing and/or exploring options to integrate an increasing proportion of electricity generation from renewables and distributed generation whilst maintaining system security, and market incentives which promote competition. It is a technical topic which does not lend itself to "sound bite" discussion.

Reach consider system inertia is important and will be provided by synchronous generation in the near-term, but will be increasingly provided by even faster acting asynchronous inverter technologies and/or aggregated consumer generation, controlled load shedding (financial options paid to willing consumers), installation of frequency control on Murraylink, and energy storage/synthetic inertia from wind turbine.

A combination of all of these will ultimately replace and/ or reduce the need for more conventional solutions such as the use of synchronous generation and/ or condensers.

This letter sets the scene about Reach, its objectives, sets down the issues as Reach understands them, and responds to the key questions and issues raised in the AEMC paper.

I hope this is of interest to AEMC and please do not hesitate to contact me if you have any questions on the same (0416 490 393 or tony@reachsolarenergy.com.au).

Yours sincerely,

Tony Concannon
**CEO**

Encs:

Annex A: Reach response to AEMC

Annex B Reach Solar energy view on system inertia and need for improved forecasting

Annex C: Reach Solar energy objectives and management

**ANNEX A**

**Response to AEMC Interim Paper and proposed rulings**

1. Using each of the proposed Rule change requests as a heading:

1.1 Inertia ancillary service market

The AEMC paper articulated what is meant by system inertia and some of the options to respond to it. Reach agrees with a AEMC comment[1] where a focus on system inertia "…may act as a barrier to future innovation in fast frequency response technologies…". Reach agrees with this view.

Reach considers the rate of change of frequency (RoCoF) is being managed as part of the generator performance standard (GPS) modelling (see (2) below), and the requirement for "system inertia" could be reduced by other emerging solutions.

Reach favour long-term contracts with AEMO for the provision of fast-acting frequency service(s) which are expected to reduce the system inertia that would need to be procured and reduce constraining the interconnector (as explained in the AEMC paper Section 5.5.4).

AEMO is also able to constrain certain generation and/ or transmission lines in response to system disturbances i.e. avoiding or reducing the new rules required for what are likely to be infrequent events.

Reach consider system inertia is important and will be provided by synchronous generation in the near-term, but will be increasingly provided by even faster acting asynchronous inverter technologies and/or aggregated consumer generation, controlled load shedding (financial options paid to willing consumers), installation of frequency control on Murraylink, and energy storage/synthetic inertia from wind turbine.

A combination of all of these will ultimately replace and/ or reduce the need for more conventional solutions such as the use of synchronous generation and/ or condensers.

1.2 Managing rate of change of power system frequency

Reach supports in principle the concept of AEMO having powers to procure the necessary services to maintain power system security.

Notwithstanding this however, the GPS approval process modelling now includes an assessment of a new entrant on the grid "system strength" as well as a detailed review of the generator's ability to stay connected (ride through capability for voltage and frequency

[1] Section 5.4.5 AEMC Interim report dated 15 Dec 2016

events), and contribute not only reactive power but also active power (Watts) under extreme rate of change of frequency within National Electricity Rules (NER).

Reach consider the benefits of utility-scale inverter technology are only just being fully understood by AEMO and the transmission network providers e.g. the approved GPS for Bungala One meets the automatic access standard for reactive power and voltage and frequency ride through criteria, not just a "minimum level" as mentioned in the AEMC paper.

Although solar inverters are not magnetically coupled to the grid i.e. asynchronous, and have little to no inertia (see Annex A), they are:

a. able to remain connected at very low short circuit ratio in the order of 1.5 to 2 (typically seen with weaker networks);

b. can provide most ancillary services, especially in fast-acting response to over-frequency events and reactive power; and

c. Fast acting response from the solar inverters is anticipated to dampen the rate of change of frequency under severe network disturbances which is turn may reduce the amount of system inertia required to maintain the frequency.[2]

By way of example, the 110MWac Bungala One solar PV project meets the automatic access standard for both reactive power and ride through conditions (voltage and frequency) and considered a number of disturbance scenarios including three phase and line to ground faults. It also meets the automatic access standard for RoCoF at 4Hz/s for 0.25 seconds as well as a RoCoF of 1Hz/s for 1 second.

The market should provide an incentive to provide such products and services. Be technology neutral and be market and/ or contract-based.

In view of the above, Reach consider the conditions specified in the GPS approval should provide the datum for new inverter-based generation (wind and/or solar generation) on a national basis not on a state-by-state basis.

Licence conditions should not be included on a retrospective basis. This is likely to be considered by investors as increasing sovereign risk and dissuade new investment.

### 1.3 Emergency under frequency control schemes

Reach supports in principle the concept of adapting existing emergency under-frequency control schemes subject to the comments made in items 2 (above), and 4 (below).

[2] As acknowledged in the AEMO commissioned report titled "International Review of Frequency Control Adaptation", dated 14 October 2016.

1.4 Emergency over-frequency control schemes

Reach consider fast-acting solar inverter-based technologies can assist with reducing and/ or dampening RoCoF during over-frequency events. This fast-acting service should be incentivised using a modified FCAS market (faster than 6 seconds, say less than 1 second). This is in line with other energy markets including Ireland and the UK.

1.5 Managing power system fault levels

Reach consider technical solutions are available to manage low current fault conditions.

It is however a technical topic and Reach requested a consultant engineer comment on the same:

"Protection sensitivity to low fault levels has traditionally been a problem on isolated systems and high impedance networks, like rural single wire earth return (SWER) systems, where the fault levels are only marginally above load currents. They are also gaining heightened importance on modern power systems characterised by high levels of renewable generation.

Solar and wind renewables are connected to the grid through inverters, which typically limit the fault current contribution to rated output. Even synchronous machines, typically associated with gas fired renewables, also have very short sub-transient times resulting in fault current contributions decaying quickly before any field forcing takes effect to sustain a higher fault current contribution. Typically, their output will decrease to approximately twice rated current within 300 ms before increasing to approximately three times rating after 1 sec.

The conventional protection paradigm, which uses overcurrent elements set above load, is limited in its ability to deliver secure and reliable clearance of faults on such networks. Current based protection elements are required to be set below load. Residual Overcurrent protection for the detection of earth faults is still effective and negative phase sequence elements that detect the voltage and current unbalances associated with phase – phase and phase - ground faults can be set above the maximum levels of load unbalance expected on the system. Three phase faults present as a balanced condition and therefore voltage sensitive overcurrent elements, which reduce the current threshold as the system voltage decreases are a possible solution.

The effectiveness of the different current based protections discussed above is dependent on the specific application, for example, the performance of voltage controlled overcurrent elements on high impedance rural networks will be limited, as the voltage at the relay point will remain high for remote faults. However, these elements demonstrate that there are available measures that should be considered when protecting low fault level networks seen by renewable based generation system."

Reach considers Chapter 5 of the NER is in need of an extensive review (see item 4 below).

2. **Notwithstanding this however regarding the AEMC paper, Reach responds as follows to the options and/ or points made on a section by section basis**:

Section 4.2

AEMO is best placed to determine the categorisation of events.

Reach need to consider more carefully if there is merit in the Reliability Panel imposing additional standards.

Section 5.1

System inertia and fast frequency are "distinct", but related services e.g. fast acting response can reduce the need for system inertia.

Section 5.4

The generator obligation should be prescribed in the generator performance standard for the project.

It is possible that the plant is not capable of accommodating the change either technically and/ or commercially (e.g. long-term contracted offtake).

Differentiation should be made for different levels of market participation e.g non market, semi-scheduled or market participant.

Section 5.4.2

Reach agree any such obligation is likely to be focused on a "old solution", increase costs and not incentivise new solutions (as described in item 1.1 above).

Sections 5.4.5

Reach consider fast-acting solar inverter-based technologies can assist with dampening RoCoF during over-frequency events.

This fast-acting service should be incentivised and valued (not treated as an obligation) using a modified FCAS market (faster than 6 seconds, say less than 1 second). This is in line with other energy markets including Ireland and the UK.

Section 5.4.6

Notwithstanding this however, the GPS approval process modelling now includes an assessment of a new entrant on the grid "system strength" as well as a detailed review of the generator's ability to stay connected (ride through capability for voltage and frequency events), and contribute not only reactive power but also active power (Watts) under extreme rate of change of frequency within National Electricity Rules (NER).

Section 5.5.2

Reach consider the focus should not be on securing system inertia but also services to reduce the need for it e.g. by reducing/ dampening RoCoF using fast-acting response (say less than 1 second in lieu of 6 seconds).

The contract form can be developed with AEMO similar to the Network Support Control Ancillary Sservice contracts.

The interaction between this contract and energy market (and/ or offtake arrangements) would need to be carefully considered). Renewables has the advantage on no fuel linkage.

Sections 5.5.4, 5.5.5 and 5.6.4

Reach agrees with the AEMC statements made in these sections.

Section 5.7.3

Customers are benefitting from least cost renewable energy sources e.g in South Australia renewable developments within the national-market based large-scale renewable energy target scheme which commenced in 2001.

Electricity from these renewable sources is connected to the NEM.

Against this backdrop, Reach does not agree with a proposal that costs being borne on a state-by-state basis for system inertia and/ or payment adjustments based on interconnector flow (which could be due to other factors including ambient conditions and/ or transmission line constraints).

Section 5.7.4

Reach consider fast-acting solar inverter-based technologies can assist with reducing and/or dampening RoCoF.

This fast-acting service should be incentivised and valued (not treated as an obligation) using a modified FCAS market (faster than 6 seconds, say less than 1 second).

Although fast-acting response is a new service it is arguably not in a "fledgling state" as evidenced by developments in other energy markets including Ireland, UK and New Zealand.

## 3. Review of Chapter 5 of the NER

It is suggested Chapter 5 of the National Electricity Rules has not kept pace with technological charges, fuel prices, and/ or consumer behaviour and is in need of a thorough review. Reach would be pleased to participate with this.

The existing Chapter 5 technical rules were largely based on the capability of the coal, gas, hydro-electric and renewable units at the time of market introduction in 1998.

There has however been no material development of a market design which consists of a mix of grid connected, distribution generation, sophisticated aggregation (generation and/ or demand), and more consumer led technology.

Key areas for consideration include:

i) The technical specification of the new technology e.g. large-scale solar (PV and thermal), wind, energy storage, high inertia Synch condensers etc) are currently not reflected in the Chapter 5 technical requirements for GPS compliance.

ii) Reserve procurement and management: The current market mechanism has little to no incentive for load participation, use of storage devices to provide voltage regulation and fast reserve as against the conventional (much slower) devices such as conventional thermal units.

iii) Frequency operating standards: The adequacy of current mainland frequency standards needs to be reviewed to assess if they are appropriate for a future energy system which consists of largely renewable and distributed generation.

iv) Some level of relaxation of the frequency tolerance combined with reclassification of events (e.g. generation event, Load event, and/ or network) such that it permits controlled (and perhaps pre-paid) load shedding will materially assist with security and reliability of the power system.

v) System operation procedures: A review of system operation procedures including how reserves are procured and dispatched need to be reviewed. For example, use of storage device to provide fast reserves to manage hourly events will allow slow reserve sources to act as sustained reserves, thus allowing storage devices to recharge and be ready for next event; and

vi) Largest Unit size in each region in light of renewables for a Generator event: the classification of generation size should be reviewed e.g. the size of the individual units is reducing e.g. wind 2 to 3 MW each, and solar inverters are 2.5MVA each.
Which in turn will limit the loss of a large unit or more importantly permit some limited load shedding to occur to restore frequency during a disturbance.

## 4. Other matters

### 4.1 Retrospective conditions

New conditions may not be technically and/or economically viable and effectively "move the goal posts". This introduces increased sovereign risk which will dissuade new investment in state-based generation and may be viewed as a form of indirect expropriation.

Investors and banks ensure the project is designed and built to meet the GPS requirements. If the requirements change then it may not be possible to meet the new requirements or it imposes a commercial and/ or technical burden which reduces the project viability and/ or design life.

### 4.2 Planning

In addition, renewable project sites may not be suitable for such additional developments e.g. there could be objections to noise, vibration and/or aesthetics with schemes such as synchronous condensers and/ or flywheels.

### 4.3 More interconnection

The National Transmission Network Development Plan issued by AEMO in December 2016 suggests the emerging reliance on interconnection is driven by a changing generation mix (particularly in South Australia but the State will not be unique in this regard as more coal-fired power plants adopt a *regime* operation and/ or close).

Analysis suggests that on an individual interconnection basis the RIT-T case is difficult to justify but when assessed on a NEM-wide basis a positive benefit can be derived with the interconnectors proposed.

The dilemma for business (and indeed State Governments) is that greater interconnection could diminish the business case for local generation in each State, which could in turn increase its reliance on more interconnection for supply and stability services.

Reach consider a path can be found which meets the needs of investors (existing and new), and system operation with increased interconnection.

### 4.4 Conventional power plant – reliance on status quo ?

It is clear that the increased use of renewables has uncovered new risks not only in South Australia and other parts of the NEM, but internationally too (eg Ireland and Texas). It is also clear that long-term continued use of the existing conventional power plant is not a viable scenario in Australia. There are three main drivers behind this statement:

**a.** **Plant integrity** is increasingly difficult (and costly) to maintain with coal-fired power plant which has exceeded or approaching its design/ expected life. AEMO have announced a number of conventional power plants are planned to close by 2025 -2030. Forced outage rates are expected to continue to increase and as rehabilitation costs become more tangible this will probably cause an increase in annual financial provisions to be made by power

plants (coal in particular);

**b.** **Gas-fired** power plant is proven technology and emits one third of the greenhouse gas emissions of black coal but gas prices are now linked to LNG/ oil, transport is not straight-forward, and hot gas parts remain expensive, it is therefore not low cost (long-run marginal cost of $100 to $120/ MWh[3]), and there remains a mismatch between gas and electricity market risk allocation; and

**c.** Although the $CO_2$ tax was legislated (2012), and then repealed (2014), business (read equity investors and banks) consider a value will be placed (again) on **greenhouse gas emissions in the future** in Australia (perhaps beyond 2021/22).

Reach consider this rules out energy intensive power generation technologies including ultra-super critical coal technology with reduced greenhouse gas emissions (the emissions are still double gas-fired generation and rehabilitation costs are likely to remain material).

[3] Using $8 to $10/ GJ gas price in SA

**Annex B**

## B1. Reach Solar review of the issues and solutions

### Description

There is a lot of Press reports and misinformation on this topic and the following is description of the issue as understood by Reach management.

There are two main technical/ system operation issues emerging:

1. Reducing system inertia which in turn is increasing the risk of a high rate of change of frequency on the system; and
2. Reducing fault current levels

### What is system inertia ?

Conventional grid-connected generation is magnetically coupled to the grid (called synchronous generation). Synchronous generators and loads (those that are spinning synchronised to the power system frequency) contain a spinning mass that holds kinetic (or rotational) energy. This energy is available to be released (or more absorbed) to counteract a sudden imbalance due to a system disturbance. The more of this energy there is available (called "**system inertia**"), the less the change in frequency is for a given imbalance.

This system inertia slows the rate of change of frequency ("**RoCoF**") down following an unexpected loss of generation or load. To date it has essentially been a by-product of converting energy to electricity using conventional synchronous generation.

More details are contained in the AEMO and AEMC papers and these are not repeated here.

### Renewable generation

Wind and solar PV do not have magnetically coupled generation[4] to the grid and therefore provide little to no system inertia.

### What is the system inertia issue ?

As more renewable generation enters the electricity market then there is less system inertia being provided by conventional generation such as gas-fired and/ or coal-fired power plant.

The concern is that this will reduce the system inertia and increase the potential RoCoF. If the RoCoF increases too quickly (up or down) after a disturbance then there is concern on the consequences to the grid system and synchronous generators (e.g. trip and/ or pole slip).

[4] Some wind generation designs are able to draw from blade rotation to provide a form of inertia

**So what is the solution ?**

The impact on the grid system should be included in the review of the generator performance standard ("GPS") by AEMO and the transmission network provider. This includes an assessment of RoCoF.

Wind and/ or utility-scale solar PV inverter technology can provide reactive power and voltage and frequency ride through capability which meets the grid automatic access standard.

**Can utility scale solar PV respond to frequency increasing ?**

Yes.

Although solar inverters are not magnetically coupled to the grid (i.e. asynchronous) and have little to no inertia they can provide most ancillary services (especially a response to over-frequency events) much faster than conventional power plant.

Importantly, this can firstly help to avoid dispatching inertia based generator to increase inertia as the ROCoF will be lower due to solar inverters ability to provide fast responses and solar inverters ability to stay connected at very low SCR 1.5 to 2 thus assisting in AEMO ability to maintain frequency within limits.

**Can solar PV respond to frequency falling ?**

Solar PV has the capability to provide a rapid power injection to respond to frequency changes but it must have its maximum output held-back to do this. There is no incentive to do this in an energy only market.

**Frequency Control Ancillary services (FCAS) market**

The FCAS market for the NEM has traditionally been low cost (A$20 to $30 million per annum) against the NEM settlement of $9 to $12 billion per annum. Reach expects this to increase as more value is ascribed to ancillary services as more conventional plant retire and/ or regime.

As Professor Finkel mentioned in his Preliminary report dated December 2016, the ancillary service market has not kept pace with the transition. Reach supports this finding e.g. FCAS does not currently reward a frequency response which is quicker than 6 seconds from the time of the disturbance.

**Response to reducing system inertia - more system inertia from conventional means, or a different approach ?**

Current technologies exist to provide system inertia including synchronous condensers and flywheels but the cost would need to be factored into the original project scheme and feature as part of the offtake arrangements and then modelled as part of the GPS approval process.

The AEMC paper articulated system inertia and the options to respond to it. Reach agrees with a AEMC comment[5] where a focus on inertia "…may act as a barrier to future innovation in fast frequency response technologies…".

Reach favour long-term contracts with AEMO for the provision of fast-acting frequency service(s) which are expected to reduce the system inertia that would need to be procured and reduce constraining the interconnector (as explained in the AEMC paper Section 5.5.4).

AEMO is also able to constrain certain generation and/ or transmission lines in response to system disturbances i.e. avoiding or reducing the new rules required for what are likely to be infrequent events.

In addition, renewable project sites may not be suitable for such additional developments e.g. there could be objections to noise, vibration and/or aesthetics with schemes such as synchronous condensers and/ or flywheels.

The 110MWac Bungala One project meets the automatic access standard for both reactive power and ride through conditions (voltage and frequency) and considered a number of disturbance scenarios including three phase and line to ground faults. It also meets the automatic access standard for RoCoF at 4Hz/s for 0.25 seconds as well as a RoCoF of 1Hz/s for 1 second.

The market should provide an incentive to provide products and services.

Other markets are introducing new services e.g. UK recently tendered for 200MW of fast acting services (zero to full active load in less than 1 second). The winning participants were virtually all battery-based/ inverter technologies because conventional plant cannot respond this fast.

Investors and banks ensure the project is designed and built to meet the GPS requirements. If the requirements change then it may not be possible to meet the new requirements or it imposes a commercial and/ or technical burden which reduces the project viability and/ or design life.

Imposing regulation and/ or compliance would introduce increased sovereign risk which will dissuade new investment in state-based generation and may be viewed as a form of indirect expropriation.

[5] Section 5.4.5 AEMC Interim report dated 15 Dec 2016

## B2. Blackout Incident on 28 September 2016 and ElectraNet RIT-T local to Davenport

Reach is cognisant that the final report has not been issued by AEMO, but the preliminary reports by AEMO suggest the blackout was caused by a combination of a 1:50 year storm in the North, planned upgrade work to the Heywood interconnector and protection settings for a number of windfarms being set "too light".

Reach wrote to the Minister for Mineral Resources and Energy in mid October 2016 in response to some Press articles and set down its thoughts on the September 2016 incident.

It is understood these protection settings have now been corrected, that interim arrangements are in place using the upgraded Heywood interconnector from Victoria (650MW) is not fully loaded (providing an additional buffer as well as increased access to NEM system inertia), and constraints on the use of two SA-based synchronous generators.

It is also worth noting that in late 2016 ElectraNet issued a RIT-T paper which outlined options to improve system support issues close to Davenport. Reach submitted a response to this RIT-T and considered the Bungala solar PV project could assist the grid. ElectraNet confirmed in January 2017 that as a result of its investigations the RIT-T process has been stopped i.e. the perceived issue is now resolved.

## B3. Potential improvements – better wind and solar forecasting

Reach consider renewable forecasting can be improved. Reach advocates for each project to be able to manage its own forecast and to feed this into the AEMO SCADA system. This would also assist with mitigating causer pays liability (if any).

Numerous studies[6] have concluded that integrating renewables into grids requires improved forecasting.

Reach consider forecasts can be improved from the current AEMO produced forecast for semi-scheduled power plants (wind and solar).

Figure 1 below illustrates actual performance versus forecast. The yellow line denotes the AEMO generated forecast for the semi-scheduled 56MW Moree solar PV plant in NSW. The purple line is the actual solar PV plant output. The performance of the solar PV is monitored every second by the solar PV plant and the AEMO SCADA system measures performance every 4 seconds.

Reach consider the solar PV project can produce a forecast which is better than the current forecast from AEMO (automated for semi-scheduled power plant).

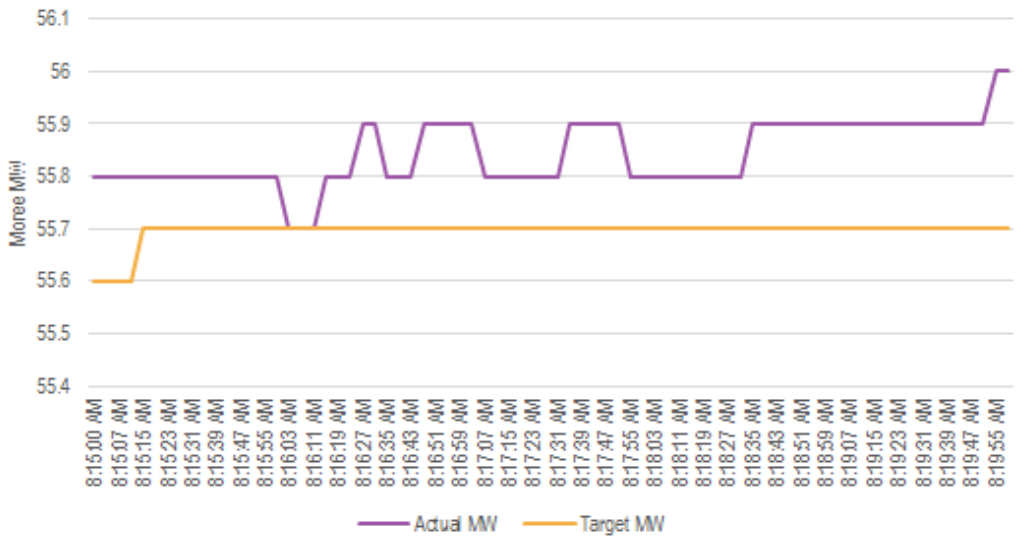


**Figure 1 - Moree Solar PV, NSW (56MW) - Actual Output v AEMO Forecast**

Source: AEMO 8.15am to 8.20am on 2 November 2016

[6] NREL and IEC reports

**ANNEX C**

Reach Objectives for large-scale solar PV

1. Structure and negotiate contracts such that large-scale solar PV is competitive with wind generation;

2. Generate an electricity tariff for customers which is relatively predictable and not linked to LNG and/or oil price and assists them to meet legislated renewable energy obligations;

3. No reliance on capital from either Government and/or ARENA to be economically viable;

4. Develop sites near to relatively strong grid connection points and design the solar PV project to meet grid automatic access standards whenever it can;

5. Fulfil all requirements of relevant legislation and position to be able to participate in providing ancillary services both in the existing market(s) and expected new services e.g. fast-acting frequency response; and

6. Design for future fitment of energy storage, when it becomes economically viable to do so, as well as regulations/market incentivise the same.

300MWac solar PV local to Port Augusta

The flagship solar project for Reach is the Bungala Solar Project located approximately 10km from Port Augusta. The project received "Crown sponsorship" from the SA Government in June 2016 and its development application was approved at the end of November 2016 for 300MWac of large-scale solar PV.

Reach has successfully negotiated a long-term offtake for 2 x 110MWac with a tier 1 retailer and financial close, including the raising of circa $** million, is targeted by March 2017. Material investment and in the North of the State which is welcomed by the local community.

The two solar PV projects will produce circa 570,000 MWh per annum (P50 basis) of renewable energy certificates.

The offtaker will firm-up the intermittent generation from the project using its conventional generation portfolio i.e. gas and coal-fired, based in SA and other parts of the NEM.

The first 110MWac (called Bungala One) had its generator performance standard (GPS) approved by AEMO and ElectraNet on 10 January 2017. The connection process has commenced for the second 110MWac phase namely Bungala Two. The above Reach objectives will apply for this phase as well.

# Reach Management Team

***Tony Concannon** – Chief Executive Officer*

- Tony was the former CEO (Asia Pacific) of GDF SUEZ Energy and a former executive director of International Power plc. Tony has gained extensive experience as a chartered power engineer over his 30 year career, including skills in governance, interface with government/ regulators, trading and use of project finance.
- Tony has extensive knowledge of the Australian renewable energy industry and the electricity and renewable markets.

***David Webster** – Director Business Development*

- David led the development of several renewable energy projects across Australia including the Ord River Hydroelectric power station. His renewable energy expertise stems from his instrumental role in the successful development of a large-scale PV solar project 'behind the meter' to supply up to 50% of the energy requirements for the Karratha Airport in Western Australia.
- David contributes expertise in project management and development to the Bungala Project having previously worked in project and business development for Lendlease and Transurban.

***Julian Dichiera** – Technical and EPC manager*

- Julian has 18 years of power industry experience with International Power plc, GDF SUEZ Energy and Sumitomo Corporation. Previously based in the Middle East (11 years), Julian was responsible for all technical matters relating to the development, implementation, contract negotiation and asset management of new power and desalination projects.
- Julian's expertise in technical matters in relation to renewable energy projects has been leveraged to negotiate competitive EPC and O&M terms.

***Andrew Biffen** – Director Construction & Operations*

- Andrew has over 30 years of power sector experience (fossil fuels and renewable energy) in numerous overseas locations and is currently CEO of the first privately owned power and water facility (Shamal Azzour) in Kuwait.

***Chris Kendall** –Director Project Finance*

- Chris has over 30 years of Australian and international experience in structuring and raising project and corporate finance for infrastructure developments across a range of sectors. Chris was previously the Australian Head of Corporate Finance for International Power plc and Director, Acquisitions Investments and Financial Advisory, for GDF SUEZ Energy in Asia. He has undertaken projects in Australia, Asia and USA.