Dear Design Development Team

Submissions by Territory Generation on Issues Paper - Review of Essential System Services in the Northern Territory Regulated Electricity Systems


TGen’s submission is divided into 3 parts being:

1) General comments on the current Essential System Services (ESS) arrangements;
2) General comments on the scope of the Issues Paper; and
3) TGen’s answers to the specific questions of the Issues Paper.

Current Essential System Services (ESS) arrangements

1. The historic cost of provision of these ESS in the Darwin-Katherine power system (DKIS) is not actually a ‘low cost by-product’ from supply by synchronous generators. TGen is of this view because:
   o The historic frequency control services have required older, less efficient, generators to be constrained on as the first units to provide inertia and contingency FCAS. This is not a low-cost solution.
   o Restart services are fully incremental services that require additional assets, ongoing maintenance and regular testing. This is not a by-product.

2. The Issues Paper indicates that provision of ESS is becoming a material portion of the total cost of power supply. TGen is of the view:
   o that the provision of ESS has always been a material portion of the total cost, even prior to the increased uptake of solar. The issue of increasing production of electricity from solar is now increasing the quantity of ESS required and that this has a compounding effect in that TGen’s generating units supplying these ESS are being displaced by solar generation.
   o The provision of the ESS requires an operating mode that increases the costs to provide the services while TGen’s ability to recover these increased costs is spread over a lower energy base due to displacement by solar generation.
3. The paper indicates that there are existing obligations in the *Network Technical Code* (NTC), *System Control Technical Code* (SCTC) and *Secure System Guidelines* (SSG) for provision and procurement of ESS. TGen's experience is that the existing obligations are not implemented, or ineffectual, in compensating for the services provided.

4. The Issues Paper indicates that the magnitude of ESS requirements are specified by the System Controller via a 'spinning reserve' regime. This is true to the extent of the frequency control component of the ESS only. The voltage control and system restart components of the ESS are not currently specified by the System Controller.

5. The existing spinning reserve regime is supplemented by additional requirements placed on generators from time to time by the System Controller to operate specific machines to contribute to the ESS. These requirements often result in generation units being dispatched outside economic order.

**Comments on Scope of the Issues Paper**

1. **Generator of Last Resort**

   TGen is currently required to provide all ESS as outlined in the Issues Paper. It is identified in this review that, for the DKIS, other generators pay TGen for ancillary services TGen supplies the power system on the basis of their sent-out power. The stated intention of this is to recompense TGen a proportion of the total cost for provision of these services based on sent out energy by other generators. This assumes that TGen is being recompensed for provision of these services with its ‘bundled’ rate (energy plus services) for retailers.

   The scope of this review includes reviewing the rate for those services. However, TGen is currently required by System Control to provide other services, outside of the current stated scope, that allows power systems to operate in the current manner.

   In addition to the ESS elements of frequency control, voltage control and restart services already identified in this review, the other services provided by TGen are listed in the document appended as an attachment titled, 'Product Definitions'. TGen is not explicitly compensated for any of these services other than energy, with the three main services that are currently not within scope of this review being capacity, network support and generation Testing Support.

2. **Capacity**

   All generators are currently supplying, and being recompensed by retailers, based on energy only.

   In the Darwin/Katherine Power System, SCTC clause 4.4A requires all generators to have sufficient generating capacity installed or contracted to meet its retail customers’ peak demands. The clause relies on the UC developing and publishing guidelines to assess capacity. Since May 2015, when this clause came into effect, no such guideline has been published. Until such a guideline is published, this clause has no practical effect as there is no measure in place.

   In DKIS TGen is implicitly required to provide sufficient capacity to meet the entire system demand by being required to retain capacity on standby whilst other generators provide energy. In the absence of SCTC 4.4A guidelines there is no enforceable means to require other generators to negotiate outage planning with TGen to ensure sufficient capacity is available let alone standby capacity for forced outages. This results in TGen functioning as the ‘generator of last resort’, with an implied expectation to maintain sufficient installed and available capacity to supply any shortfall in energy as well as ESS.
This expectation has a material impact on the fixed operating cost base of TGen as the implied requirement is that TGen must maintain sufficient installed and available capacity to meet peak power system demand, in an environment where the total energy market share of TGen is diminishing, consequently increasing the cost of energy supply for TGen.

3. Network Support

Network Support services are the additional services provided when the Network Operator is not capable of providing N-1. This can be by design, for example Katherine single 132kV line, or by taking elements of the network out of service (either for planned or unplanned maintenance).

The scope of the Issues Paper for ESS does not cover the provision of these services, and currently other generators are not required to provide these services. There are no current arrangements in place for TGen to be specifically compensated for provision of these services, and as such they are spread across TGen energy sales to retailers. This practice has two consequences, the primary being that rational investment in network infrastructure is not necessarily made as the Network Operator currently receives the services for no cost, and the cost of energy supplied by TGen to retailers is not comparable to other generators.

4. Generator Testing Support

When generating units are under test, such as during commissioning, System Control assesses the security requirements under which these tests can proceed. These requirements are advised via a System Risk Notice and typically result in constraints on TGen’s generating units which increases the cost of generation to TGen. These are considered as the Generator testing/commissioning support services.

When these services are required due to testing non-TGen generating units, there is currently no mechanism that allows TGen to be compensated for these services. These constraints are usually ad hoc and are notified by System Control through System Risk Notices, usually with short notice. There is no annual planning in place for TGen to attempt to quantify the services required.

The scope of the Issues Paper for ESS does not currently cover the provision of these services and there are no current arrangements in place for TGen to be compensated for provision of these services and due to their ad-hoc nature the costs of these services are not forecasted and are not budgeted for inclusion in TGen’s bundled retail energy charges. Other generators are not required to provide these services.

TGen’s answers to the specific questions of the Issues Paper

Question 1

(a) Are there other context or developments relevant to the review that the Design Development Team should take into consideration?

The need to ‘unlock’ all elements of the NTEM so that all services can be procured and settled. This might be achieved in part by unlocking or fulfilling existing clauses of regulatory instruments, including but not limited to:

- NTNER 5.20B – relates to Inertia and currently ‘locked’.
- NTNER 5.20C – relates to System Strength and currently ‘locked’.
- NTNER 5.3A.12 – relates to Network Support and currently ‘locked’.
- SCTC 4.4A Guidelines – relates to Capacity and has no effect in the absence of Guidelines.
(b) Is the approach to the review, which ties ESS market design principles back to the National Electricity Objective, appropriate?

Yes, but all elements should be ‘unlocked’ so that all services provided are able to attract compensation, not just for the ESS. The attached “Product Definitions” document describes the services that TGen provides. Many of these services, not considered ESS in the issues paper, are not specifically compensated, for example:

i. Network Support Services are provided at considerable expense to TGen and receive no compensation.

ii. Generator Support Services (testing and commissioning) are provided by TGen and, to date, have not received any compensation for providing.

(c) Are there other relevant matters which should be considered?

TGen currently effectively undertakes a role of ‘Generator of Last Resort’. TGen believes that, during transition to implementation of full market reforms, any expectation of TGen to undertake this role should be formalised.

Question 2

(a) The Design Development Team is seeking initial stakeholder views on appropriate ESS categories and definitions for the Territory’s regulated electricity systems, to inform a draft proposal to be presented in the review draft report.

TGen has developed a description of services that it supplies (see “Product Definitions” attachment). This includes the ESS as defined in this Issues Paper, but also many other services that are not. TGen is not recognised nor specifically compensated for many of these services. TGen believes that all the services should be clarified and determined how they will be compensated.

(b) Is there a need to apply different ESS categories for Alice Springs and Tennant Creek than for the Darwin-Katherine system?

TGen believes that the attached description of services applies to all the regulated power systems with the exception that specific Network Support Services will apply for each power system.

(c) Should the Territory’s ESS framework require and empower the System Controller to develop and publish detailed specification/descriptions for each category of ESS? What, if any, regulatory prescription or oversight should apply?

Given the common ownership of the system controller and network operator, the development of ESS definitions may be better delivered by the Utilities Commission to ensure the perception of independence is maintained for all stakeholders.

(d) Should the ESS framework provide for flexibility for the System Controller to procure other undefined categories of ESS? What, if any, regulatory prescription or oversight should apply?

TGen recognises that the technological changes to electricity supply has undergone rapid evolution in recent years. This has required changes to ESS and it is expected that more changes will be required. TGen supports the provision of a catch-all additional ESS provided it has appropriate checks and balances. This would include:
Appropriate oversight/approval.

Limiting the time frame that such a provision can be relied upon. The limitation of time would be such that this ‘catch-all’ provision could effectively provide the System Controller with a means to rapidly introduce new requirements as they emerge and to bridge the gap until they can go through the regulatory change process to implement long term arrangements for these new requirements.

Procurement of services must come with a framework for compensation, either by the causer of the requirement or the system controller.

(e) What mechanisms are most appropriate for the Territory to preserve inertia and system strength? Should these be defined as ESS? Where would responsibility for their provision more appropriately reside – the Network Operator or the System Controller?

- TGen believes that setting levels of inertia may not be preferable in the long term. Inertia is primarily considered to limit the RoCoF for anticipated events in the power system. New technologies are emerging that show potential to be able to provide an equivalence in limiting RoCoF. Specifying required inertia levels may therefore be restricting alternative technologies. TGen believes it may be more appropriate to specify the requirements in terms of RoCoF limiting services that would allow inertia from synchronous machines and alternative technologies to provide these services. This may be akin to the developments happening in the WEM that the Issues Paper refers.

- System Strength impacts should be considered at the time a new generator intends to connect to the network. The connection process is in the domain of the Network Operator. It makes sense that the Network Operator is responsible to ensure adequate system strength is maintained.

- TGen does not have a view on the most appropriate mechanism to ensure inertia (RoCoF limiting service) and system strength are provided and paid for. However, TGen provides the following comments:
  
  i. It may be appropriate to follow the NEM and require System Control to determine required levels and for the Network Operator to provide or procure the capability.
  
  ii. TGen believes that this could be relatively easily implemented by ‘unlocking’ NTNER clauses 5.20B and 5.20C for inertia and system strength respectively.
  
  iii. This will drive future rational investment in assets to minimise the need for these services, through either network design improvements (capital investment in power network) or supply through Operating Expenses (supply by generators).
  
  iv. The emergence of inertia equivalent or RoCoF limiting technologies could be incorporated into the redrafting of the NTNER as part of the ‘unlocking’ process.
  
  v. This would require System Control to clearly define and set inertia levels (or RoCoF limiting requirements) and system strength requirements. Noting that no such definitions nor levels are currently articulated.
  
  vi. An alternative would be to create mechanisms within the technical codes. For instance, clause 5.1 of the SCTC requires this to happen. This clause has been in place since 2012 and requires the System Controller to develop mechanisms but has no date associated with fulfilling this requirement.
  
  vii. The defined levels of services required should be developed and/or reviewed by a party that is independent to the operation of the DKIS to avoid actual or perceived conflicts of interest.
Regarding which licenced participant should be responsible, TGen notes that if the NEM model was to be adopted in the NT, this would require both the System Controller and the Network Operator perform defined parts in the process of both types of service.

Question 3

(a) What issues or concerns do current arrangements for the determination of system service requirements raise? How do these influence investment decisions made by power system participants and is reform warranted?

- Ability of generators to meet peak demand.
- Implied role of TGen as generator of last resort, and the impact this has on the operating cost base of TGen and both operating and capital future investment decisions.
- There is currently a disconnect between the levels of services required, as varied from time to time, and the cost/remuneration for these services. For Network Support Services for instance, the operation of TGen assets occurs on demand and comes at no cost to the System Controller or Network Operator, hence it is not possible for a business case for an alternative arrangement to stack up.

(b) Should the ESS framework incorporate service standards, in addition to system standards? Should ESS standards be applied in a regulatory instrument, or in a System Controller instrument?

- TGen supports incorporating service standards in addition to system standards.
- TGen believes that these standards should be applied in a regulatory instrument that is not a System Controller instrument. System Controller must apply to make changes to the service standards in the same manner that any other system participant is required to do.

(c) Should the System Controller’s determination of service requirements be subject to transparency and oversight mechanisms? If so, what arrangements are appropriate?

- TGen is supportive of the need for transparency and oversight of the decisions made by the System Controller in determining the requirements for supply of ESS.
- These decisions should be made with genuine consultation with system participants.
- A mechanism for recovery of costs by a service provider from the System Controller should be considered where an audit identifies that the System Controller has not genuinely consulted, or is found to have not implemented the lowest cost solution to a ESS requirement.
- Any ESS procured by the System Controller should be conducted with supporting analysis that identifies the requirement in a unit of measure that is transparently shared in full with system participants. At a minimum, those participants that are economically effected by ESS provision as either supplier or customer.

Question 4

(a) What types of ESS are most suitable for market provision and in which systems? Are there certain categories of ESS which would benefit from continued Territory Generation delivery and why?

TGen believes that all services currently provided by TGen are capable of being provided by other providers in all the regulated power systems. The core of this issue is about how to formally recognise suppliers of ESS.
(b) What are the likely costs and benefits of spot market procurement of certain types of ESS in any of the Territory's electricity systems?

TGen considers it unlikely that spot market procurement of some ESS will be at a lower cost and the following consideration should be contemplated:

i. A 24/7 trading desk will need to be implemented.

ii. One service being supplied alone may see all other services (including the one being supplied in isolation) still being supplied from a synchronous generator, resulting in higher total cost of supply.

iii. Determine what happens in the power system if no generator supplies energy or ESS.

(c) What service provision framework would deliver the most appropriate balance between costs and benefits for each category of ESS in each regulated electricity system?

Centralised supply, until all services can be supplied independently, or there is a clear displacement of unit level requirements.

Question 5

(a) What changes should be made to the current administered pricing arrangements for the provision of ESS provided by Territory Generation?

(1) What methodology should be used to determine prices for each of the ESS categories?

i. Cost Reflective,

ii. Capacity charge to support installed capacity maintenance, and

iii. ESS dispatched before energy needs as ESS underpin the power system.

(2) What processes should be put in place to ensure the administered prices remain up to date?

i. Auditable by UC, and

ii. Annual review, and amendment, of service cost(s).

(b) What market power mitigation measures would be appropriate for the provision of different ESS by Territory Generation under a market provision framework?

- UC review.
- Quasi Regulated costing.
- Minimisation of additional market compliance costs.
- If TGen is generator of last resort, and provider of ESS, how can an efficient market be established?
- Point of competition occurs with negotiation of Wholesale Energy Supply Agreements between Generators and Retailers.

Question 6

(a) What are the appropriate bases for the allocation of ESS costs?

Fixed capacity and variable charges to ensure the nature of the costs to maintain capacity to supply services are understood. The variable charge is reflective of truly variable cost elements.
(b) Are there alternatives to a causer pays approach for the recovery of the ESS costs?

- Current model of TGen centralised supply, with ESS being more clearly identified and procured to enable improved asset improvement in the future.
- Payment for the provision of the services.
- Payment for some ESS made by Network Operator. This would include services that are provided to support the Network or that the Network Operator is best placed to minimise the cost of services over time.
  i. This may include network support, inertia and system strength services, and
  ii. This would be best to ensure future CAPEX decisions on the network clearly and transparently consider the current, and future ESS, requirements for the configuration of the network.

(c) Are there any technical barriers to the adoption of a causer pays or alternative approaches to ESS cost recovery in the Territory?

- The ability to identify the causer where accumulation meters are still in use.
- The ability to prioritise the service required at any point (which service is most needed, and why).

(d) What issues would the transition to a causer pays or alternative basis of ESS cost allocation present for system participants?

- Capital Investment.
- Settlement – evidence of need and supply.
- Calculation of losses to the meter/generator connection point.
- Ability for centralised supply of ESS to generators under current NTC and SCTC.

(e) What oversight or regulatory arrangements should accompany any causer pays cost allocation or alternative arrangements?

Review and approval by the UC.

Question 7

(a) What are the issues which need to be considered in determining which legislative and regulatory framework would best accommodate changes to the Territory's ESS framework?

- Effect of partially implemented regulatory regime.
- The cost of maintaining capacity, in an environment where start/runtime ratios are increasing in support of running machines only to supply the morning and evening peak loads.
- ESS or energy dispatched first.
- Consideration of generators being able to plan outages and economically manage their fleet safely and reliably. Preferably this would see generators being able to select and dispatch their own fleet into a market in such a way to assure process safety within their operations.
(b) What improvements can be made to the governance of the ESS framework?

- All services recognised, specified and compensated.
- Generator of last resort requirements recognised, established and formalised.
- Legislative framework either fully enabled, or appropriately amended.

TGen hopes the above submission assist the team with its review into the Essential System Services framework.

If you have any questions or require additional information, please do not hesitate to contact Eddie Mallan by email at eddie.mallan@territorygeneration.com.au

Yours sincerely

Gerhard Laubscher
Chief Executive Officer

Date: 20 July 2020

Attachment: Product Definitions
Product Definitions

The nature and scope of the activities to be undertaken by Territory Generation can be categorised into the following three (3) distinct groups of products and services:

1. **Primary Products**
   
   All licenced generators have obligations regarding the provision of these products.
   
   a. **Energy**
      
      The provision of energy in the form of megawatt hours (MWh) ‘sent out’ from power stations required to meet retailers’ customer loads and system losses.
   
   b. **Capacity (to supply peak load)**
      
      Maintaining sufficient generation capacity (MW) so that the peak demand can be supplied when it occurs.
   
   c. **Generator of Last Resort**
      
      A generator that is expected to fulfil ESS or Energy demand on the power system sufficient to meet demand of the whole power system at all times.

2. **Ancillary Services**

   These are the services that are essential to enable the secure operation of a power system.

   a. **Frequency Control Ancillary Services (FCAS)**
      
      Power system frequency standards require that the frequency is maintained around the nominal frequency (50 Hz) within normal and abnormal operating bands. The services that TGen provide to support this are:
      
      i. **Regulating FCAS (R-FCAS)**
         
         Regulation of frequency is to maintain the frequency of the power system within the normal operating band. Effectively this is achieved by having one or more generators varying the output as the load on the power system varies. These services are being utilised continuously.
      
      ii. **Contingency FCAS (C-FCAS)**
          
          The power system frequency may move outside the normal operating band into the abnormal operating band after there is an unexpected disconnection of generating units, items of transmission equipment or sudden loss of load. These services are the ability to rapidly increase or decrease the supply of electrical power (MW) into the power system to return the frequency to a stable level. These services are always available and utilised rarely.
      
      iii. **Inertia FCAS (I-FCAS)**
           
           The amount of Inertia online determines the rate at which frequency changes immediately following a sudden imbalance between the supply and demand, such as outlined in C-FCAS. Inertia is an inherent property of synchronous machines and varies across machine types. High inertia machines are sometimes constrained on for dispatch by System Control.
      
      iv. **System Frequency Control / Backup System Frequency Control**
          
          As part of maintaining power system security, the Power System Controller is required to maintain the system frequency (SCTC 3.3.2a). In real time the frequency is maintained with a frequency controller. PWC System Control utilise a system frequency controller in Darwin/Katherine and Alice Springs but require generators to provide system frequency control in Tennant Creek and backup system frequency controller capability in Darwin/Katherine and Alice Springs.
Note that Regulating and Contingency FCAS are often combined together and called ‘Spinning Reserve’.

b. Voltage Control Services

As part of the connection obligations, the Generator Performance Standards (GPS) require all generators to provide specified controllable reactive power capability when they are generating energy. The variable reactive power is used to control voltage at the generator terminals and are central in the overall management of voltages across the power system. Some generators are capable of providing more reactive power capability than required by the GPS. This additional capability is a saleable ancillary service (in the NEM and WEM).

c. Black Start services

In the event all generation is lost (System Black), TGen maintains black start capability to ensure that the stations and network can be re-energised and power systems restored after a ‘system black’ event. This capability is maintained continuously and tested periodically to ensure high availability.

3. Other System Services

All of these ‘other’ services are not essential to the operation to a power system, but generally provide additional security to the power system.

a. Capacity security services

TGen maintains dual fuel capability in Darwin, Katherine, Tennant Creek and Alice Springs. This involves maintaining diesel storage and the associated infrastructure ensuring generation security during a gas interruption (primary fuel).

b. Generator support (testing/commissioning)

When generators are under test, such as during commissioning, System Control assess the security requirements under which these tests can proceed. These requirements are advised via a System Risk Notice and usually result in constraints on other generating units. When these constraints are imposed on TGen generating units that typically increases the cost of generation to TGen. These are considered as the Generator testing/commissioning support services. These constraints are ad-hoc and are notified by System Control through Risk Notices.

c. System Strength

This term part of the considerations of renewable integration within the NEM. The term is associated with the capability of generation to supply reactive power for network faults in a manner that does not result in a voltage collapse of the power system. An early measure of a generators contribution to ‘system strength’ was the short circuit ration (SCR) of the unit.

d. Network Support services

Network Support services are the additional services provided when the Network is not capable of providing N-1. This can be by design, eg Katherine single 132kV line, or by taking elements of the Network out of service (either for maintenance or unplanned). Examples

i. Ad-hoc outage support - planned and unplanned outages of network elements sometimes result in constraints being applied to the dispatch of generation. These constraints are notified by System Control through Risk Notices.

ii. Katherine Power Station N-1 – due to the single 132 kV line from Channel Island to Katherine, the loss of a single network element can cause total loss of supply to Manton, Batchelor, Pine Creek and Katherine region. The existence of Katherine provides these regions with a level of redundancy afforded to other parts of the power system.

iii. Katherine Power Station Voltage Support – at times of low load on the 132kV line, the voltage at Katherine rises due to the capacitance of the 132kV line. At such times,
Katherine power station generating units are dispatched to provide voltage control services.

iv. Katherine Power Station Storm Mitigation – when lightning is detected in the vicinity of the single 132 kV line between Channel Island and Katherine, System Control require a start of Katherine generation in the case that the 132 kV line is taken out of service due to the storm. The intent is to ensure there is not a total loss of supply to the loads electrically south of Channel Island.

v. Weddell Power Station minimum output - due to the nature of the network connecting Weddell Power Station to the Network, there are periods of medium to high loads that System Control require a minimum output from Weddell to prevent overloading of some elements of the network in the case that another network element trips.

The potential development of the Northern Territory Electricity Market (NTEM) arrangements may impact on the categorisation and pricing for these services going forward.