

SUBMISSION TO THE HOLMES INQUIRY INTO THE 2010/2011 FLOOD EVENTS

ENERGEX LIMITED

1. The purpose of these submissions is to assist the Inquiry by:
 - (a) providing a general overview of how ENERGEX and its network operated during the 2010/2011 flood events in Queensland (**flood events**);
 - (b) outlining ENERGEX's planning and preparation in the lead up to the flood events; and
 - (c) identifying and addressing those matters which ENERGEX considers should be addressed to plan and prepare for the next wet season.
2. ENERGEX intends to make more detailed submissions relating to the Terms of Reference by 4 April 2011.¹

ABOUT ENERGEX

3. ENERGEX is a Government Owned Corporation (**GOC**) established under the *Government Owned Corporations Act 1993* (Qld). It is an electricity entity as defined in the *Electricity Act 1994* (Qld).²
4. ENERGEX is responsible for the electricity distribution network throughout South East Queensland, including the regions of Brisbane, Ipswich, Gympie and the Lockyer Valley which were affected by the flood events.
5. ENERGEX supplies electricity to a population of more than 2.8 million people. It owns the electrical distribution infrastructure required to supply electricity to these customers. It employs approximately 3,800 employees.
6. A brief explanation of the ENERGEX network is necessary to give context to these submissions, particularly in relation to the challenges ENERGEX faced in relation to:
 - (a) maintaining and restoring power supply in both flood water affected and non-flood water affected areas of South East Queensland; and
 - (b) why ENERGEX took proactive steps to disconnect supply in areas which were at risk of inundation from flood water.
7. This explanation is set out in **Schedule A** to this submission.

IMPACT OF THE FLOOD ON ENERGEX ASSETS

8. The flood events amounted to a natural disaster on a scale which has not been seen in South East Queensland since the 1974 Queensland floods.
9. In South East Queensland the flood events caused three significant consequential effects for the ENERGEX electricity network:
 - (a) devastation of property (including ENERGEX assets in the Lockyer Valley area);

¹ The statistics and other data set out in this submission are based on the records and data available to ENERGEX at the date of this submission. As ENERGEX continues its review, further verification of data is continuing.

² Section 21, *Electricity Act 1994*

- (b) major pre-emptive interruption of supply to approximately 150,000 customers in Ipswich and Brisbane; and
 - (c) the requirement to clean up and restore power to around 60,000 homes affected by flood waters.
10. The flood events seriously affected ENERGEX's electricity assets in South East Queensland. In particular:
- (a) 25 zone substations were interrupted either due to flood inundation of the substation or loss of incoming supply lines due to the flood;
 - (b) four zone substations (Milton, Archerfield, Jindalee and Oxley) were directly affected by flood waters with Archerfield out of service for 10 days until major plant overhauls and testing were completed;
 - (c) 95 poles had to be replaced, most in the western region. A map of ENERGEX's entire area of coverage is set out in **Schedule B**;
 - (d) a total of 101 pad mounted and ground distribution transformers were removed and replaced;
 - (e) 98 kilometres of overhead line was replaced; and
 - (f) 10 major electricity supply points in the CBD were impacted resulting in loss of supply to some 21 CBD buildings, with 4 CBD substations out of service for 7 days.

ENERGEX'S PREPARATION FOR THE FLOOD EVENTS

11. Despite the challenges it faced, ENERGEX was well prepared for the flood events and the emergency that followed as a result of its:
- (a) Summer Preparedness Plan;
 - (b) Flood Risk Management Plan (produced in preparation for the 2010/11 summer); and
 - (c) Business Continuity Plan.
12. The early preparation and initiation of these plans allowed ENERGEX to continue on a 'business as usual basis' throughout the flood events, notwithstanding the devastation caused by the flood.
13. The key aspects of ENERGEX's preparation are outlined below.

ENERGEX's Summer Preparedness Plan

14. As part of its business as usual activities, ENERGEX completes detailed preparation and planning for severe weather events such as storms, heat and high winds. This preparation is set out in the Summer Preparedness Plan which ENERGEX produces every year in accordance with the requirements of the Electricity Industry Code made under the *Electricity Act 1994* (Qld).
15. The Summer Preparedness Plan is developed by ENERGEX as part of its long term continuous improvement approach to improving the resilience of the ENERGEX electricity network and its response to severe weather events. It is updated every year by August to prepare for the next summer season.

16. ENERGEX developed a Flood Risk Management Plan 2010/2011 (**the Flood Plan**) in 2010 when it became aware of the incoming La Nina weather system. This occurred as part of the Summer Preparedness Program.

Initiation of the ENERGEX Business Continuity Plan

17. ENERGEX's Business Continuity Plan (**BCP**) is drafted in accordance with the guidelines for Business Continuity Management contained in Australian Standard HB292. It is comprised of the following:
- (a) Tier 1 – Initiation of the Corporate Emergency Management Plan (**CEMP**). This is the highest level plan and co-ordinates business continuity for the whole of ENERGEX. It is used for events that affect the entire organisation and drives the activation and control of the Tier 2 plans.
 - (b) Tier 2 – Plans at the Tier 2 level are group or location based and are intended to maintain critical functions during business disruption.
 - (c) Tier 3 – This level of the plan deals with the detail that is needed to maintain and resource ENERGEX's critical functions (as set out in the Tier 2 plans).
18. On 11 January 2011, in accordance with ENERGEX's Tier 1 BCP, a Purple Alert (the highest level of alert under the CEMP) was activated. From this time on management of the flood events occurred through the CEMP led by the Corporate Emergency Response Team.
19. The Corporate Emergency Response team decided on 11 January 2011 that ENERGEX's Newstead office (which houses ENERGEX's Control Centre and Contact Centre) should be evacuated largely due to access concerns as the waters rose at the carpark.
20. In accordance with the Tier 2 and Tier 3 BCPs, the Control Centre was evacuated to Victoria Park and the Contact Centre was evacuated to Warry Street at Fortitude Valley. From this point the emergency response and network operations were directed by the disaster recovery site at Victoria Park.

Operation of the Flood Plan

21. The Flood Plan was part of ENERGEX's strategy to manage its assets and minimise the risks to its asset and customer supply reliability during a major flood event.
22. During the 2011 flood events the Flood Plan assisted ENERGEX to:
- (a) identify which assets were at risk of inundation;
 - (b) develop asset maintenance procedures based on this risk;
 - (c) coordinate its network operations response;
 - (d) liaise effectively with other stakeholders; and
 - (e) determine how and what information needed to be provided to customers related to flood risks and public safety.
23. The Flood Plan also contained a detailed plan for ENERGEX's communication internally, with Emergency Services (including the Police, SES and local disaster coordinators) and with the public during a flood event. When the flood event occurred, ENERGEX followed this communication plan.

24. The Flood Plan was a key preparation tool which worked very effectively to manage ENERGEX's response.

IMPORTANCE OF PRE-EMPTIVE DISCONNECTIONS PRIOR TO A FLOOD EVENT

25. On 11 January 2011 the predicted flood levels for the Brisbane River were revised upwards throughout the day. ENERGEX relied upon the Brisbane City Council (BCC) Local Disaster Centre Situation Reports and maps provided by BCC's Spatial Information Services to assess the areas of the ENERGEX Distribution Network at risk of inundation from the flood waters. These reports were released by the BCC on a regular basis.
26. On the afternoon of Tuesday 11 January 2011 the information ENERGEX received from the BCC was that:
- 'Based on the likely Wivenhoe release strategy (6,400 m³/s this evening 8:00pm), the predicted peak flood height at the Brisbane City Gauge is between 5 m AHD and 5.5 m AHD, (10,500 m³/s). The timing of this predicted peak is 3AM Thursday morning 13/01/11. This flood event will be similar to the 1974 flood.'*
27. On the basis of these predictions, ENERGEX's Corporate Emergency Response team made the decision to pre-emptively interrupt supply to potentially impacted areas. The decision was made in accordance with ENERGEX's right under section 40E of the *Electricity Act 1994 (Qld)* and clause 12.2 of the Standard Connection Contract contained in the Electricity Industry Code made under the *Electricity Act 1994 (Qld)*.
28. ENERGEX had made plans based on technical advice, to start evacuating equipment and isolating supply from the Brisbane CBD and other areas on the evening of 11 January 2011. A media release went to the public at 7.00pm on 11 January 2011 indicating interruptions would start from 7.00am the following morning.
29. In accordance with this decision, ENERGEX prepared plans for the disconnection of supply. The objective was to switch power off **before** the inundation of ENERGEX assets occurred. The decision was also communicated by ENERGEX on 12 January 2011 to the relevant stakeholders at the first meeting of the State Disaster Management Group (SDMG) that ENERGEX was invited to attend.
30. On 12 January 2011 power supply was disconnected to:
- (a) approximately 10 major commercial and industrial substations in the CBD in preparation for the rising water;
 - (b) around 120 feeder systems throughout Brisbane and Ipswich. ENERGEX also removed as much equipment from the substations as possible in order to minimise damage to those substations at risk from the flood water.
31. The decision to pre-emptively disconnect supply was driven by two factors:
- (a) the need to prioritise safety of people; and
 - (b) to reduce the potential for damage to assets (and therefore assist in the timely reconnection of supply).

Safety as a Priority

32. In the 1974 flood event there were a number of electricity related fatalities. ENERGEX's primary and overarching objective during the flood events was to ensure this did not happen again. As explained in ENERGEX's media release on 11 January 2011:

'No-one should underestimate the old adage that power and water don't mix, and as the

water continues to rise ENERGEX will be taking a safety first approach under these extreme weather conditions.'

33. Water provides a path for electricity. As a result, when electrical equipment is submerged short circuits will occur. This has the potential to result in the equipment exploding and potentially fatally injuring people and damaging property or rendering the equipment faulty.

Reconnection Process

34. It is also important from a reconnection perspective that power is disconnected to allow sufficient time for ENERGEX crews to remove critical plant prior to inundation.
35. This allows a quicker re-connection process because critical parts of the assets (for example, relays, batteries and other critical items) do not become damaged by water and can be reinserted once the water subsides.

Outcome

36. ENERGEX's decision to pre-emptively disconnect supply was obviously correct and occurred in circumstances where:
- (a) there were no electricity related injuries or fatalities during the flood event;
 - (b) supply was able to be restored to 90% of the network by the end of 15 January 2011.

The Lockyer Valley

37. The Lockyer Valley flash flooding event was an extreme event which occurred without warning. It should be considered separately.
38. ENERGEX was not able to make pre-emptive disconnection in relation to the Lockyer Valley event. Such course of action was simply not available in the circumstances as they occurred. In the Lockyer Valley, water inundated the area with no warning and great force. As a result, a number of 33 kV and 11 kV feeders in that area tripped their automatic switches.
39. Where automatic switches are tripped (as opposed to being pre-emptively disconnected) the time it takes to repair the equipment and reconnect supply is greater. Importantly, however, the automatic switches worked as they should in an emergency situation. There were no electricity related injuries or deaths in the Lockyer Valley as a result of the devastating flash flooding in that area. This result is attributable to all of the automatic switches operating in accordance with their design.

Central Business District

40. CBD substations and buildings that were required to be shut down were generally located below ground level and were subject to inundation. In addition there were many transformer sites that supply individual buildings or street shops and offices that were also shut down due to the risk of water ingress or inspection after the flooding.

PREPARATION FOR NEXT WET SEASON

41. ENERGEX's planning and preparation for a flood event in South East Queensland has now been tested.
42. Using the experience it has gained, ENERGEX is conducting a full review of the flood events, including its preparation for the next wet season.

43. To the extent that this review identifies matters affecting ENERGEX's preparation for summer 2011/12, these matters will be factored into ENERGEX internal planning processes including the Network Management Plan, the Summer Preparedness Plan and the Flood Risk Management Plan.
44. Overall, the planning and preparation ENERGEX undertook worked effectively. The pre-emptive disconnection achieved ENERGEX's main priorities of ensuring safety and minimising disruption of supply to the extent possible. If a similar catastrophic flood event were to occur, ENERGEX would take this approach again. As a result it is important that, particularly in the CBD area, building owners and operators are prepared for this possibility and have their own Business Continuity Plans in place to allow for this.
45. For this reason ENERGEX proposes to take the following steps prior to the next wet season:
- (a) review the availability of contact data with all CBD and near CBD sites. ENERGEX's database should include both the contact details and substation/switching access point for each CBD site;
 - (b) using this database, make contact with building owners and operators in the CBD and other 'at risk' areas near the CBD to discuss exposure to floods and assist those owners and operators with the development of BCPs in relation to electricity supply;
 - (c) review the flood maps and contingency switching priorities related to various floods levels or dam release volumes to allow ENERGEX to prepare for isolation of unaffected areas in the event of another flood event in the 2011/12 wet season;
 - (d) review the emergency communication and co-ordination processes with building owners and operators for pre-emptive switching and work with the relevant stakeholders (including but not limited to the State Government, local councils, Police and Emergency Services) as broader communication protocols are also required;
 - (e) examine plans for the use of flood warning information to better inform network switching arrangements and flood communications in areas other than the Brisbane CBD; and
 - (f) examine plans to confirm arrangements for co-operation with private electricians to effect repairs to premises as occurred during the flood events.

Signed:



Chief Executive Officer
ENERGEX Limited

Date: 11 March 2011

SCHEDULE A

THE ENERGEX NETWORK

OVERVIEW

1. ENERGEX is responsible for the distribution portion of the network between the power station and the customer.
2. It takes supply of electricity from Powerlink Queensland at various Connection Points to the high voltage transmission network and distributes power via a Sub-Transmission Network and Distribution Network to customers in South East Queensland.
3. Zone Substations and Distribution Substations convert the voltages as necessary to minimise network losses and meet customers' voltage requirements.

KEY FEATURES

4. Explanations of the key features of the ENERGEX electricity network are as follows³:
 - (a) **Transmission Network:** This is the Powerlink Queensland (**Powerlink**) high voltage electricity supply network which transmits power from an electricity generator to Bulk Supply Substations across Queensland. ENERGEX is not responsible for this part of the network.
 - (b) **Connection Point:** This is an agreed point of supply between ENERGEX and Powerlink. A Connection Point is generally located at a Powerlink Transmission Substation and converts the electricity from 275kV to 110kV.
 - (c) **Bulk Supply Substation:** These assets are usually jointly owned by ENERGEX and Powerlink. The equipment provides control and voltage transformation from the Transmission Network to the Sub-Transmission Network. It is also referred to as a Bulk Supply Point.
 - (d) **Sub-Transmission Network:** This is the term used to describe the electricity supply network which operates and supplies Zone Substations or customer connection points at nominal voltage of 110kV and 33kV. There are 110kV Feeders that supply power from a Powerlink Transmission Substation to a Bulk Supply Substation and 33kV Feeders that supply power from a Bulk Supply Substation to a Zone Substation.
 - (e) **Zone Substation:** This is an asset owned by ENERGEX which provides control and voltage transformation from the Sub-Transmission or Transmission Network to the Distribution Network.
 - (f) **Distribution Network:** This is the term used to describe ENERGEX's electricity supply network. It supplies power from the Zone Substations to Transformers or customer connection points via 11kV Feeders (or where so designated, a 33kV Feeder).

The Feeders can be overhead lines, underground cables or a combination of both. There are generally ten 11kV Feeders connected to each Zone Substation which transmit electricity to pole or pad mount Transformers.

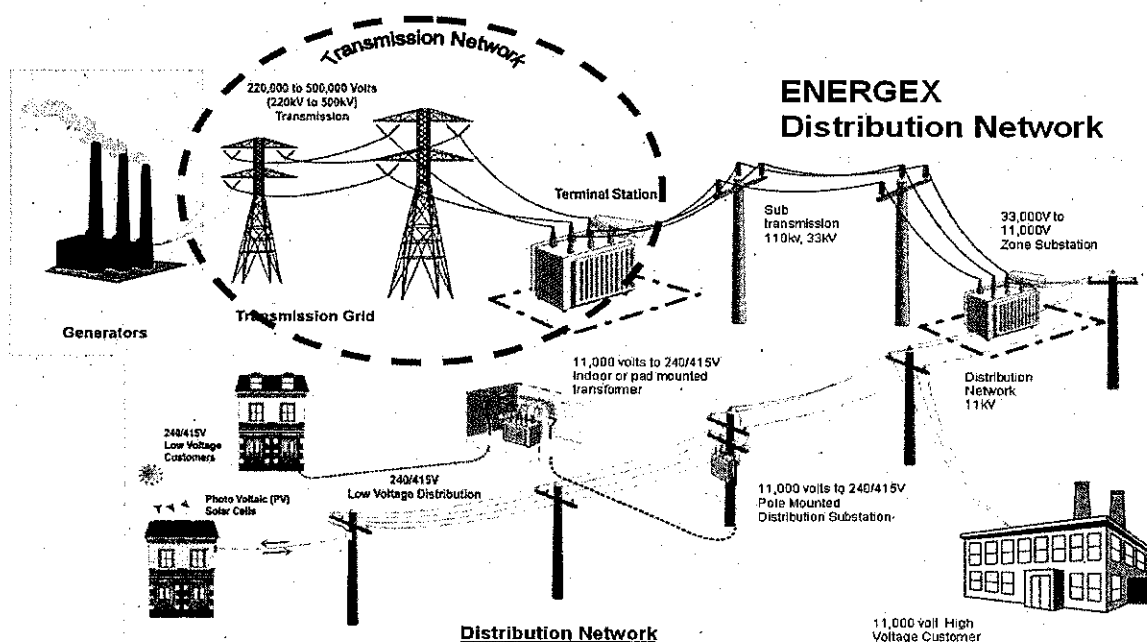
There is also a network of Feeders in each suburb which supply power to Transformers. Each Feeder has a number of Transformers connected to it. One

³ Appendix 1, ENERGEX Network Management Plan 2010/11 – 2014/15.

11kV Feeder generally supplies power to approximately 4000 customers but can be significantly less in rural areas.

- (g) **Distribution Substation/Transformer:** This is an ENERGEX asset that provides control and voltage transformation from the Distribution Network to the Low Voltage (415/240 V) Network. Generally, a Transformer will supply 100 to 200 customers with electricity.
- (h) **Low Voltage Network:** This is the part of the Distribution Network that carries power from Distribution Transformers to the Primary Fuses, a protection device on the supply to individual customers. In overhead areas, the Primary Fuse is generally mounted on an ENERGEX pole in the street whereas, in underground areas, it is within a service pillar at the front property boundary.
- (i) **LV Service:** In overhead areas, the LV Service runs from the power pole in the street to the house or property pole within a customer's property. LV services are not required in underground areas where supply is made available via a service pillar at the front property boundary.

5. The diagram below demonstrates how the elements of the ENERGEX electricity network deliver supply to the customer.



SPECIFIC ISSUES REGARDING THE OPERATION OF THE NETWORK IN THE FLOOD EVENT

Feeders

- 6. The Feeders in the ENERGEX network can be overhead lines, underground cables or a combination of both. Generally supplying between 200 and 1000 homes in urban areas, or two or three CBD buildings, these Feeders form the backbone of the ENERGEX supply network, and include automatic switches that detect a fault on the line. When a Feeder has a fault, it is designed to automatically disconnect the line from the power.
- 7. In a flood event, for example, if ENERGEX has not already pre-emptively disconnected a Feeder, disconnection should occur automatically when the flood waters touch energised equipment. However, it is preferable to disconnect supply before flood waters reach live assets to prevent extensive damage to the assets. This is not only safer but also

improves the ability to remove the equipment before inundation and subsequently replace after flood waters recede, thus enabling faster restoration of supply.

8. Once a Feeder is disconnected from the network, there will be customers who are remote from the flood waters but still lose power. This occurs because those customers receive power from a Transformer connected to the Feeder which has been affected by water. For example, in the CBD a number of Transformers that were isolated from the network were not directly affected by flood water, and the interruption resulted from the fact that the components of the network supplying to this point were affected by water.
9. ENERGEX will inspect the relevant Feeder and open a switch(es) along the line disconnecting the affected section. The healthy part of the feeder is then re-energised, restoring power to homes in unaffected areas.
10. Due to isolation points being at discrete locations, supply will be interrupted to some homes that are clear of floodwaters.

Transformers

11. During a flood event, ENERGEX will disconnect power to the Transformer if houses connected to the Transformer are likely to be inundated with water. Initially, all customers connected to that Transformer will lose power even though only a small number of customers may be directly affected by flood waters.
12. Once the flood waters subside, ENERGEX will inspect the damage and remove the primary fuse for each flood affected premises, isolating it from the network. The Transformer can then be re-energised to restore power to the houses which were not affected by flood waters.
13. ENERGEX will advise customers still without power of the need to get their premises inspected by a qualified electrician. Once the electrician advises ENERGEX that the premises is safe for reconnection, the primary fuse will be replaced to restore power.

SCHEDULE B AREA OF COVERAGE

