STATEMENT OF CHRISTOPHER JOHN ARNOLD

I, Christopher John ARNOLD of [redacted] Reddacliff St, Newstead in the State of Queensland, state on oath as follows:

1. I am the Executive General Manager, Network Performance for ENERGEX Limited (**ENERGEX**).

2. In this role I am responsible for the asset management function within ENERGEX. This includes accountability for Network Standards, Network Maintenance Strategies and Plans and Capital Strategies and Plans. The role also includes accountability for Corporate Safety, Environmental Management, Network Property Acquisition, Network Data, Network Demand and Risk Management.

3. From 4 January to 17 January 2011 I was the acting CEO of ENERGEX while the CEO, Mr Terry Effeney was overseas.

4. I have a Bachelor of Engineering (Electrical) from the Darling Downs Institute of Advanced Education and a Post Graduate Diploma in Business Management from Deakin University.

   I am also:

   (a) a Corporate Member of the Institute of Engineers Australia;

   (b) a Chartered Professional Engineer;

   (c) a Registered Professional Engineer, Queensland; and

   (d) a Graduate Member of the Australian Institute of Company Directors.

5. The Commission of Inquiry has requested that I provide a written statement in relation to the Planning Terms of Reference setting out:

   (a) any standards, policies, guidelines or working practices of ENERGEX with respect to the installation of underground electricity in flood prone areas;

   (b) whether and how the potential for inundation of premises at basement level through electrical conduits installed by ENERGEX is considered and addressed by ENERGEX.

A. INSTALLATION OF UNDERGROUND ELECTRICITY IN FLOOD PRONE AREAS

Underground Cables

6. Part of ENERGEX's electrical infrastructure includes underground cables which supply larger buildings such as those located in the CBD. This is part of ENERGEX's Shared Network Infrastructure. These underground cables must follow the roads to supply customers and at times will pass through areas likely to be impacted by flooding.

7. In order to supply commercial and industrial premises ENERGEX runs its electrical cables from the footpath through conduits into the substation enclosure inside the building.

8. The conduits are made available to it by building owners who have an obligation to provide a right of way for ENERGEX cables under Regulation 59 of the *Electricity Regulation 2006* (Qld) (**Electricity Regulation**).

9. Section 59 of the Electricity Regulation requires that a building owner provide space for a substation and right of way for cables to and from the substation. It also requires the owner to:

   (a) maintain the floor or foundation, walls or enclosure, ceiling and access door of the space in sound condition; and

   (b) repair damage to or deterioration of the space, other than damage or deterioration directly attributed to the use of the space by the entity.

10. Space is defined in the Electricity Regulation as necessary or suitable floor or foundation, walls or enclosure, ceiling and access doors in the part of the premises where the substation is to be located and installed (which all must be suitably painted) plus necessary or suitable places for entry and exit of electric lines and cables for the substation and, if required, suitable lighting and general power outlets.

11. ENERGEX does not interpret this definition as authorising it to insist that owners provide space above the the Defined Flood Level (**DFL**). Any insistence upon an owner providing space above the DFL is usually likely to be regarded as involving additional expense for the owner. In this regard, reference is made to paragraph 15 below.

12. When a new building is being constructed, ENERGEX considers that the 'best practice' position is that its assets be located above the flood level (before the 2011 flood event, this was referred to as the Q100 flood level and following the 2011 flood event, it is referred to as the DFL). This 'best practice' requirement is reflected in ENERGEX's Commercial and Industrial Substations Manual.

13. However, although location of a substation above the DFL is ENERGEX's preferred position, there is no specific power in Regulation 59 for it to compel where the substation is located. Likewise, ENERGEX does not have control over the route of the electrical conduits between the building entry and the substation enclosure inside the building.

14. New Development Approvals (**DAs**) or building approvals do not stipulate where substations are to be located. For most new developments, developers will come to ENERGEX **after** they have a DA. In this regard, they will therefore have done much of their design work and costings before ENERGEX has an opportunity to have input into the building and conduit design process.

15. Accordingly, the location of ENERGEX assets is the result of a negotiation between ENERGEX and building owners. The commercial reality is that building space above Q100/DFL is valuable real estate and because of this, it has been common practice in the past that a building owner directed that the ENERGEX substation and associated electrical infrastructure be placed below the Q100/DFL (such as in an underground car park basement).

Potential Water Ingress into Buildings

16. Electrical conduits are among many path-ways which connect essential services to premises. Generally, a number of 'penetrations' will be made through a building wall from outside and conduits or pipes of various types will be placed through the wall of the building to enable service provision into the building. Typically, the following services will be provided from the outside of a building into the area allocated by the building owner for the related assets:

   (a) storm water conduits;

   (b) telecommunications conduits (e.g. Telstra and NBN conduits);

   (c) sewerage conduits; and

(d) electrical conduits.

17. These building penetrations may change over time as new services are provided to a building or there are modifications to an existing service e.g. through a new NBN service provision to the building. Therefore, the building owner must assume the responsibility for ensuring that the building basement is maintained in a flood resistant state, if it intends to rely on its services during flood events.

18. Building owners are responsible for the location, design, installation and maintenance of the electrical conduits in their building. This is reflected in ENERGEX's Commercial and Industrial Substations Manual, section 4.1.6, which states 'Conduits must be securely sealed by the consumer in an approved ENERGEX manner (for example bungs or expanding foam) to prevent ingress of dirt until cable installation by ENERGEX and then resealed by ENERGEX.'

19. Water can enter a building through any of these wall penetrations. For example, during the 2011 flood event it is my understanding that:

(a) the basement of the building located at 150 Charlotte Street, Brisbane was inundated with water. Water entered the basement of this building through backup of the sewerage pipes;

(b) as set out at paragraph 3 of the statement of Lynn de Lange dated 14 September 2011, water entered the basement of Festival Towers located at the corner of Charlotte and Albert Street, Brisbane *'via two waterfalls'*. While one source appeared to be from the electrical conduits, the other source was from the communications conduits;

(c) as set out in paragraph 5 of the statement of Paul Cassels dated 14 September 2011, at the River Park Central building at [redacted] Mary Street, Brisbane water was leaking through a storm water conduit and flowing into the basement of the building.

20. While it may be technically possible to prevent water from inundating a building from electrical conduits, there are many possible sources of water ingress. A building owner is best placed to manage all sources of potential water ingress.

B. ENERGEX DESIGN STANDARDS FOR C & I SUBSTATIONS

21. The technical requirements for the construction of substations in CBD buildings and associated cabling is contained in the Commercial and Industrial Substations Manual. The Commercial and Industrial Substations Manual current at the time of the 2011 flood event stated that ENERGEX assets should be located above the Q100 flood level (post the 2011 flood event, above the DFL).

22. As set out above, the Commercial and Industrial Substations Manual sets out best practice and in the absence of ENERGEX's legislative ability to insist its assets be located above flood levels, best practice cannot be achieved each time. The location of its assets ultimately depends on the space in the premises made available by the building owner.

23. Section 4.1.6 of the Commercial and Industrial Substations Manual also provides that it is the responsibility of the building owner to install the electrical conduits and seal against the ingress of dirt as follows:

Conduits must be 125 mm or 150 mm as specified by ENERGEX and must be supplied and installed by the customer. All joints must be socketed and solvent welded. A 2.5 mm plastic coated steel draw wire or 6 mm black polypropylene rope must be left in each conduit. Conduits must be securely sealed by the consumer in an approved ENERGEX

manner (for example, bungs or expanding foam) to prevent ingress of dirt until cable installation by ENERGEX and then resealed by ENERGEX.

24. Notwithstanding this, ENERGEX generally seals its conduits with an expanding material system. This system is primarily designed to prevent dust and vermin rather than water ingress into the substation enclosure.

C. SPECIFIC ISSUES REGARDING CONDUITS

FESTIVAL TOWERS

25. During the 2011 flood event water entered the basement of Festival Towers located at the corner of Charlotte and Albert Street, Brisbane. There was significant flooding around the building at the time. While it is possible that water entered the basement via electrical conduits, there may well have been other sources of water ingress.

26. On 25 March 2011 the Festival Towers Body Corporate wrote to ENERGEX enclosing an engineer's report prepared by Sheehy & Partners Pty Ltd. The report concluded that:

    (a) the source of the water inundation was believed to be at the incoming electricity mains to the building on the Charlotte Street frontage; and

    (b) the water staining on the vermiculite encasing of the incoming conduits and failed fire proofing of the entry locating boxing soffit confirmed the likelihood of this location being the main source of water entry into the basement.

27. The matter was investigated by ENERGEX and a response was provided to the Body Corporate on 29 August 2011. As a result of the investigations, it was noted that:

    (a) whilst it was possible the flood waters entered sections of the CBD pit and duct system adjacent to the Festival Towers building, it is also possible that water entered through other points including other essential services conduits;

    (b) as required by section 59 of the Electricity Regulation, the building owner has a responsibility to provide ENERGEX with the substation space, which includes providing ENERGEX with the necessary or suitable places for entry and exit of electric lines and cables for the substation;

    (c) the building owner has the responsibility of maintaining and repairing damage to or deterioration of the substation space, including the necessary or suitable places for the entry and exit of electric cables for the substation.

28. Given there is no ability for ENERGEX to compel the positioning of electrical infrastructure in a particular location or to control the design of conduits, decisions about sealing of conduits (whether electrical or otherwise) rest with the building owner. It follows that it is the building owner's responsibility to prevent water ingress.

RIVER PARK CENTRAL

29. In the statement of Mr Cassels dated 14 September 2011 it is alleged that as a result of the flood event, all electronic equipment in the ENERGEX substation at River Park Central at 120 Mary Street, Brisbane was damaged.

30. As a result of the flooding, Mr Cassels makes the following recommendations with respect to all future high rise development in the Brisbane CBD:

    (a) no essential equipment or infrastructure, except for submersible sump pumps with external access to ground level be installed in basements;

(b) no un-encased storm water drains in basements;

(c) all entry points into the building including electrical cables should be sealed to prevent water egress; and

(d) mandatory emergency flood plans for all inner city high rises by created.

31. As reflected in its Commercial and Industrial Substations Manual, ENERGEX has already proposed that all electrical equipment, including HV (high voltage) and LV (low voltage) switchgear, transformers and associated control equipment be located above the DFL however, it does not have the ability to compel this.

32. It is not part of ENERGEX's responsibility to provide water proofing of CBD buildings at the underground cable entry point and the ultimate responsibility for preventing water ingress lies with the building owner.

D. PROACTIVE PROGRAM OF EDUCATION

33. Given ENERGEX does not design or construct essential services conduits in premises, it is not in a position to design out vulnerability to flooding.

34. Notwithstanding this, ENERGEX has embarked on a process of educating building owners about methods to make their buildings more flood resilient (including options in relation to sealing conduits).

35. Following the flood event, ENERGEX reviewed flood mitigation options for substations in the Brisbane CBD. As part of the investigation process, site visits were made to each of the substations affected during the January 2011 flood event.

36. ENERGEX has identified the following potential mitigation options for building owners and managers to consider to increase flood resilience:

(e) **Demountable barriers to doorways** - Demountable flood barriers are barriers installed temporarily immediately before a flood event and removed once the event has passed. To be effective, a reasonable amount of warning time before a flood must be available.

(f) **Conduit sealing** – in addition to installing demountable flood barriers, it is necessary to seal conduits and penetrations to each substation. The sealing of these parts will generally consist of providing a proprietary sealing product around the cables. For more major penetrations (e.g. trenches and large openings), additional works will be required to ensure adequate sealing.

(g) **Ancillary equipment** – the installation of sump pumps and alarm systems are also recommended. However, it should be noted that these will be ineffective if power is disrupted or turned off, where there is no alternative back-up supply.

37. These measures are only likely to be effective in preventing the disruption that resulted from the 2011 flood event if other critical building services can also be protected and building owners recognise that the electrical conduits are only one way that water can enter a building.

38. To increase the flood resistance of buildings affected by the 2011 flood event, building owners must also take steps to address water inundation via telecommunications, sewerage, storm water and other such essential services conduits.

SWORN UNDER OATH by CHRISTOPHER JOHN ARNOLD on 6 OCTOBER 2011

at BRISBANE [redacted] in the presence of: [redacted]

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Deponent [redacted] Solicitor/~~Commissioner for~~ Declarations/Justice of the Peace