EXECUTIVE SUMMARY

After a series of four power cable failures, on 20 February 1998 Mercury Energy Limited, the major distributor and retailer of electrical power to the city of Auckland, announced that it could no longer supply power to the central business district. Emergency services were notified and mobilised.

The Cable Failures

From its deliberations the Inquiry concludes that the technical mechanisms of cable failures were as follows:

Failure 1: There is an equal possibility of either thermo-mechanical failure or gas pressure loss;

Failure 2: Thermo-mechanical failure due to lifetime cyclic expansion and contraction;

Failure 3: Thermo-mechanical failure due to lifetime cyclic expansion and contraction; and

Failure 4: Thermal runaway.

The Power Supply Failure

In consideration of why the power supply failed, the Inquiry concludes with respect to the Auckland Electric Power Board:

- AEPB planned the Auckland CBD distribution network in a manner consistent with industry practice at the time;
- Acceptance testing of the gas cables, at the time of installation, was not consistent with industry practice;
- The 1988 and 1989 AEPB Annual Reports indicate a high level of awareness of the unreliability of the gas cables and the potential need to advance consideration of their replacement; and
- Despite awareness of the increased unreliability of the gas cables, the cause of repetitive gas leaks on the 110 kV gas cables was not resolved by systematic investigation.

In further consideration of why the power supply failed, the Inquiry finds with respect to Mercury Energy Ltd:

- The CBD network was planned in a manner consistent with industry practice;
- While Mercury Energy is a competent distribution company, it did not have the required expertise, operations and management procedures for the 110 kV cables;
- The cause of repetitive gas leaks and faults was not resolved by systematic investigation;
- A well-developed asset audit and asset management programme for the 110 kV cables did not exist;
- Maintenance contracts for the 110 kV cables were deficient in terms of their specification, management and monitoring;
- There was inadequate internal expertise on 110 kV cables and inadequate participation in external forums to remain current with cable operating and maintenance practices;
- The specification of the 110 kV cables was never checked nor reassessed against the "as built" conditions;
- Mechanisms for accountability and monitoring of network risk management were not overseen by the Risk Management Committee, but were reportedly handled directly by the Board;
- The 110 kV transmission risk in 1997 was materially underestimated and as a consequence actual security of supply was under-planned;
- The reliance on informal arrangements for the pooling of spares for the 110 kV cables was ineffective as shown by at least one incident prior to 1998; and
- The usual effect of corporate governance on company performance may in the Mercury Energy case have been compromised by the absence of clear Board accountability through effective shareholder and/or market disciplines.

Factors Contributing to the Failure of Power Supply

In considering contributory causes of the power supply failure, the Inquiry finds:

- Mercury Energy placed heavy reliance on the oil cables, which was unaccompanied by any investigation of their actual conditions;
- While network planning was not a contributing cause of the power supply failure, had the actual oil cable conditions and "as built" ratings been known, a different network planning outcome would have been appropriate;

- Joint distribution and transmission planning by Mercury Energy and Transpower (and their predecessors) was not found to be a cause of the power supply failure;

- Mercury Energy's risk management and contingency planning for the 110 kV cables were a contributing factor in the power supply failure;

- AEPB and Mercury Energy's operations and asset management practices for the 110 kV cables were below industry standards and this was a contributing factor in the power supply failure; and

- The corporate governance structure of Mercury Energy did not cause the power supply to fail, but through its effect on governance an opportunity to prevent it was lost.

Future CBD Security of Supply

With the de-rating of the four transmission cables that failed, the supply of power to the CBD is virtually dependent on the temporary 110 kV overhead line. This situation will be little changed even should the oil cables be repaired. The risk associated with this situation derives from the reliance on the Penrose Transpower point of supply and the tunnel through which the temporary overhead line passes. A failure at either point would result in outages in the CBD.

GEC Alsthom and Mercury Energy acknowledged the risk associated with the overhead line at the Public Sittings. This risk was also confirmed by Integral Energy upon a route inspection, in respect of particular elements. The overhead line is generally associated with high reliability, and Mercury Energy have confirmed that additional measures in respect of reliability are being undertaken.

While the temporary overhead line is actually comprised of two separate circuits, a fault on one within the tunnel would almost certainly spread to the other circuit.

Mercury Energy indicated to the Inquiry that it would need to reinforce supply to the CBD by 30 November 1998, in order to achieve an appropriate CBD standard of security during the summer peak load. In the week that this Report was finalised, Mercury Energy announced a decision to improve capacity and security of supply by a new circuit (approximately 100 MVA) from Mt Roskill to Liverpool Street. The Inquiry commends Mercury Energy for this decision and notes the need for the Auckland City Council to continue to work cooperatively with the company to ensure completion prior to the summer peak load.

The security of the Mercury Energy network will need to be closely monitored to ensure that it achieves an appropriate CBD standard of supply. Given the importance of CBD supply and the inherent risks in the current arrangements, the Inquiry recommends that Mercury Energy appoint an independent expert team to review the network capability and future security.

Conclusions

The Inquiry has set out a number of general observations about reasonable and prudent industry practice and has applied these to Mercury Energy. From this the Inquiry has drawn a number of conclusions, which are provided in Chapter 11.

Recommendations

Having considered its findings and conclusions as set out in this Report, the Inquiry is required by its Terms of Reference to:

> "recommend changes to ensure that security risks relating to Mercury Energy's distribution lines are managed efficiently" (Terms of Reference 2)

and to report generally to the Minister of Energy on the issues in Terms of Reference 1.

In preparing and presenting its recommendations, the Inquiry is conscious of the legal structure of energy transmission and distribution in New Zealand, and the role of the Minister under that legislation. As the Terms of Reference require recommendations which would involve change by Mercury Energy in its operations, the following recommendations comprise both matters of report to the Minister under the Terms of Reference, and matters of recommendations to Mercury Energy (and the Auckland Energy Consumer Trust) under Terms of Reference 2.

The Inquiry recommends accordingly that:

In respect of Mercury Energy

Note: *The Inquiry considers that Mercury Energy's response to the power supply failure, both in the immediate emergency response and in the subsequent investigation, has been of a high standard and should be formally acknowledged.*

1. Mercury Energy establish a specific management plan for its 110 kV CBD transmission, recognising that it is different from distribution assets;

2. Mercury Energy periodically have its 110 kV cable management plan peer-reviewed by external experts in 110 kV cables of similar design and age;

3. Mercury Energy review its practices in respect of its use of external contract services to establish clear and definitive specifications for contract services;

4. Mercury Energy review its strategic plan to ensure that the core business of distribution and security of supply is given appropriate priority and allocation of resources;

5. Mercury Energy review its risk management processes so that all risk is managed within one systematic process to a defined standard;

Note: *It is acknowledged that on 22 June 1998 Mercury Energy outlined to the Inquiry measures which, if implemented as proposed, are likely to meet this recommendation.*

6. Mercury Energy obtain, and publish, an independent expert validation of its current and committed plans for restoration of CBD security of supply as it will be by 1 December 1998 and also as it will be upon completion of the tunnel project;

7. Mercury Energy institute periodic technical audits of all major assets associated with the CBD power supply;

8. Mercury Energy review its network services contracts for each class of customer and revise them to:

   - specify defined reliability standards for all outage times; and

   - specify the corresponding liability for each outage period;

   in order that Mercury Energy has incentives to manage security as a commercial risk and enable its customers to see and understand their risk exposure;

   Note: *It is acknowledged that Mercury Energy's customer contracts have taken a step in this direction but the consequence of this approach is that Mercury Energy's liability is capped for events that last longer than three hours. It is also acknowledged that with the split of line and energy services contemplated by the current legislation, the issue of network contracts will require special attention;*

In respect of Mercury Energy & The Auckland Energy Consumer Trust

9. Mercury Energy and the Trust maintain and enhance the cooperation established in May and June 1998 so that effective corporate governance is achieved;

   Note: *The Inquiry acknowledges that this process has commenced and is continuing.*

10. Mercury Energy negotiate a Statement of Corporate Intent with the Trust no later than 1 October 1998;

In respect of the Government

11. The Government consider (and determine) whether the establishment plans of network companies have been completely carried into effect and can be formally accepted as expired. If the Government considers that establishment plans are not expired then the Government should consider, in consultation with Mercury Energy and the Trust, whether, in the public interest, steps are necessary to restore the intended lines of accountability to normal standards in Mercury Energy's corporate structure;

12. The Government consider incorporating, in the electricity power company disclosure regulations, a requirement for every network operator to publish, every three years, its asset management plan together with past and future security standards for each consumer class, and supply area and each distinct voltage level; and

13. The Government encourage and, if necessary, facilitate the electricity distribution industry to develop customer contracts for network service providers that reflect security of supply standards and liability provisions appropriate to each type of consumer and which give network companies incentives to manage security on a commercial basis.