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Diesel Fuel & Back-Up Generation

- Issues for CEOs & Risk Managers -

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Executive Summary

Diesel back-up generators are a common and effective way of protecting organisations against the economic and social consequences of electricity disruptions. However, there are a number of issues that CEOs and risk managers should be aware of to ensure that back-up systems operate effectively when most needed. These issues include the supply and availability of diesel fuel during a significant electricity disruption, and the maintenance and testing of back-up generators and their fuel.

Supply and availability of diesel:

- Demand for diesel would increase during a widespread power disruption, while shortened supply chains have reduced the amount of fuel that is available at short notice.
- The supply of diesel may be slowed during a power disruption due to interdependencies with the electricity and transport sectors.
- Governments may allocate fuel to essential users during a liquid fuels shortage which may coincide with, or be caused by, an electricity disruption.

Generator maintenance and testing

- Where and how does the organisation source spare parts for the generator?
- Is the generator exercised monthly? Is the generator operated under load to adequately test the entire system?
- How many people in the organisation are trained to maintain and operate the generator unit? Are these personnel 'on call'?

Fuel requirements

- How long will the generator operate before requiring refuelling? What are the daily fuel requirements for continuous operation of the generator under load?
- Does the organisation have a fuel testing/fuel management regime?
- How often are stores of diesel fuel replaced (including the generator tank)?
- What is the access for refuelling tanks? Are small refuelling trucks required?
- Does the organisation have a contracted supplier for emergency refuelling?
- Would the organisation receive priority fuel allocation in the event of government intervention?

Introduction

While the Australian energy industry has a very strong track record for reliable electricity supply, the exposure of electricity infrastructure to a range of potential hazards, including deliberate attack, means that uninterrupted supply cannot be guaranteed. Diesel back-up generation is a common and effective way of protecting organisations against the economic and social consequences of electricity disruptions.

This paper has been developed by the Energy Infrastructure Assurance Advisory Group (Energy Group) and the National Oil Supplies Emergency Committee (NOSEC) to assist CEOs and risk managers in assessing and revising contingency plans incorporating diesel back-up generation. Part 1 provides an overview of diesel supply in Australia and outlines issues that are likely to impact on the ability of organisations to source diesel fuel during a significant electricity disruption. Part 2 outlines factors that should be considered by organisations in relation to the effective operation of individual generation systems.

Part 1: Supply and Availability of Diesel

During an extended electricity disruption, organisations relying on diesel back-up generation may need to replenish their fuel supply at short notice. The ability to source this fuel will be dependent on a number of factors external to the organisation, including:

- an increase in the demand for diesel;
- the amount of fuel available in the supply chain to meet short-term demand;
- interdependencies with electricity and transport; and
- regulatory arrangements which may be used to allocate fuel during an emergency or shortage.

While there may often not be a business case for organisations to take steps to address many of these risks, an awareness of these issues will be useful in preparing and revising contingency arrangements.

1.1 Demand for Diesel

During an extended or widespread electricity disruption, demand for diesel fuel could be expected to rise sharply. Many organisations have back-up generation and most generator tanks hold insufficient fuel to allow operation beyond 24 hours, with a limit of several hours being quite common. As such, there would potentially be numerous organisations seeking to refuel their generator tanks at very short notice.

Further, many emergency and essential service vehicles operate on diesel fuel. There is likely to be an increased call on these vehicles to operate in the event of a significant electricity disruption, for example through the need for increased police patrols and SES assistance. Although the aggregate fuel required by these

vehicles is likely to be a small part of available supply, their refuelling may be prioritised over other organisations (section 1.3).

1.2 Diesel Supply

Shortening Supply Chains

As with many sectors, there is a growing trend in the petroleum industry to shorten supply chains and reduce inventory as a means of creating efficiencies and reducing costs. The Australian Institute of Petroleum (AIP) reports the following factors which are contributing to the shortening of the supply chain for liquid fuels:

- There is little or no surplus tankage for crude oil at refineries, and crude tanks operate between full and relatively low inventory on a regular basis, in line with the supply shipping pattern;
- Fuel distributors increasingly supply their customers directly from large terminals or other seaboard facilities, rather than handling product through depots as in the past;
- Tankage at depots has been decommissioned leaving less storage capacity; and
- The downstream petroleum industry is also continuing to look for opportunities to reduce inventory as a cost saving measureⁱ.

This trend has the effect of reducing the level of consumption cover in the supply chain, and consequently less supply is available to be called upon at short notice. The level of consumption cover in the diesel supply chain will vary depending on the time of year; however in 2003-04 it averaged 17 days, down from 22 days in 2000-01ⁱⁱ.

Shortened supply chains have reduced the amount of fuel that is available at short notice

Risk of Fuel Supply Disruptions

The AIP has reported that supplies of liquid fuels in certain parts of Australia are quite often only 70-80 per cent of normal due to technical difficulties, accidents or scheduled maintenance in refineriesⁱⁱⁱ. The Australian market is also exposed to international disruptions in crude oil, as approximately 95 per cent of the petroleum products consumed in Australia (including diesel) are produced by local refineries which source 60 per cent of their input from imported crude oils^{iv}.

The impact of these factors on supply is rarely felt by consumers as the liquid fuels industry is adept at managing these issues as part of day-to-day operations. However, shortages could occur where a normally manageable disruption in liquid fuel supply coincides with a significant electricity disruption, both due to the rise in demand for fuel and where refinery or distribution operations are affected by the outage.

Managing Disruptions

In the event of a diesel supply disruption or shortage, the major refineries in Australia have a degree of flexibility and are able to alter their product mix to

produce a greater quantity of diesel, although the extent and speed with which this can occur will vary.

Diesel can also be sourced from overseas, including the potential for ships to be redirected to Australia on short notice. Singapore is a useful source of product in the event of a shortage or disruption, as it is relatively close and diesel trades in Singapore are equivalent to nearly half of the diesel market in Australia^v. However, it would still take approximately 15 days for supply from Singapore to reach the Australian market.

It is noted that the Australian Government does not maintain strategic stockpiles of diesel fuel for emergencies.

1.3 Interdependencies

The increase in demand for diesel fuel during an extended blackout is likely to be accompanied with declining or sporadic supplies of diesel fuel due to the interdependencies between liquid fuels and the electricity and transport sectors.

Many elements of the diesel supply chain are dependent upon electricity, with varying levels of back-up capacity installed. For example, the majority of service stations do not have back-up generation facilities and would be unable to supply diesel during an outage. Where refinery terminals are affected by a disruption, production would likely be slowed and if they lost their pumping capacity, trucks would need to be gravity fed which would further slow the rate of supply.

A rise in the demand for diesel to refuel generator tanks would also create an increased demand for trucks and qualified drivers to transport the diesel. This may be potentially difficult to source at short notice. Other transport-related factors, such as congestion and lack of operating traffic lights, may also impede the prompt delivery of fuel to many areas.

1.4 Regulatory Considerations

In the event that an electricity disruption causes, or coincides with, a liquid fuels shortage, governments may intervene to allocate fuel to essential users.

All Governments have emergency response legislation in place to respond to a jurisdictional liquid fuel emergency. At a national level, the *Liquid Fuel Emergency Act 1984* (LFE Act) provides the Minister for Industry, Tourism and Resources with wide-ranging emergency powers to control the allocation of scarce liquid fuels (including diesel). The National Oil Supplies Emergency Committee (NOSEC) has developed a draft National Liquid Fuel Emergency Response Plan which provides the operational guidelines for responding to a national liquid fuel emergency.

Consistent with Australian Government policy, measures developed by NOSEC to manage a fuel supply shortage would attempt to minimise government intervention. Industry capabilities such as sourcing additional stock and allowing the market to reduce fuel demand through the price mechanism would be

encouraged. Failing these measures, the Government would seek voluntary restraint with the support of the oil companies or through public awareness campaigns and, depending on the severity of the shortage, may move to a system of reserving bulk supplies for ‘essential’ users and controlling retail sales. Essential user classification has been defined by NOSEC as ‘those users who have a need for fuel to provide the goods or services that are essential for the health, safety or general welfare of the community’.

Key issues for CEOs and risk managers:

- ❑ Demand for diesel is likely to increase during a large scale electricity disruption.
- ❑ Shortened supply chains have reduced the amount of diesel fuel that is available at short notice.
- ❑ Domestic supplies of fuel are often below full capacity due to international disruptions, accidents and scheduled maintenance at refineries.
- ❑ The supply of diesel may be slowed during a power disruption due to interdependencies with the electricity and transport sectors.
- ❑ Governments may allocate fuel to essential users during a liquid fuels shortage which may coincide with, or be caused by, an electricity disruption.

Part 2: Diesel Back-Up Generators

In addition to the external factors impacting on diesel supply, there are a number of issues that organisations should be aware of in relation to their individual diesel generators, including their maintenance, testing and fuel requirements.

2.1 Generator Maintenance and Testing

Diesel back-up generators are a common and reliable mechanism for protecting organisations against power disruptions. However, for effective operation in the event of an outage, generators must be well-maintained and tested regularly.

The specific testing and maintenance procedures for generator units will vary in accordance with make, size and conditions; however as a guide industry experts suggest that generators should be tested at least once a month, if not more often^{vi}. It is also reported that the rate of discovery of potential problems when systems are tested under load for at least half an hour is almost twice the rate of when a system is tested by manually starting the generating equipment and letting it run unloaded^{vii}.

Experts estimate that, during the North American blackout which affected more than 50 million people in 2003, **more than 20%** of back-up generation systems either did not start, or ran for only a few minutes before sputtering out

source: NFPA (endnote vi)



Key issues for CEOs and risk managers:

- Is the generation capacity sufficient to maintain necessary operations for an extended outage?
- Is the generating plant itself robust enough to withstand continuous operation in hot weather?
- Is there sufficient airflow around the generator to prevent overheating?
- Has the wiring on the premises been adequately structured to support back-up generation?
- In the event of load rotations or 'rolling blackouts', is the electrical installation on the premises adequate to maintain essential operations while diverting the non-essential operations to the external (grid) supply?
- Where and how does the organisation source spare parts for the generator?
- Does the organisation have a maintenance contract for the generator?
- Does the organisation maintain the recommended maintenance procedures?
- Is the generator exercised monthly? Is the generator operated under load to adequately test the entire system?
- How many people in the organisation are trained to maintain and operate the generator unit? Are these personnel 'on call'?

2.2 Fuel Requirements

The potential difficulties in sourcing diesel fuel outlined in Section 1 of this paper also highlight the importance of taking prompt action to secure fuel supply in the event of a significant power outage. Organisations (and the relevant personnel within organisations) must know and understand their fuel requirements, including how long their generator will operate before requiring refuelling; the availability of additional on-site storage; and the quantity of fuel required to support continuous operation (on a daily basis).

Organisations should also be aware that diesel fuel has a useful life of between 12 and 18 months and stores must be replaced within this timeframe.

The Queensland Government has identified that there are approximately 40 mini-tankers in the SE Qld region which could be used to refill emergency generator tanks due to the narrow access for most tanks. These are mostly owned and operated by private contractors.

Key issues for CEOs and risk managers:

- What is the capacity of the generator fuel tank?
- How long will the generator operate before requiring refuelling? What are the daily fuel requirements for continuous operation of the generator under load?
- Is on-site fuel storage available? What is this storage capacity?
- Does the organisation have a fuel testing/fuel management regime?
- How often are stores of diesel fuel replaced (including the generator tank)?
- What is the access for refuelling tanks? Are small refuelling trucks required?
- Does the organisation have a contracted supplier for emergency refuelling?
- Would the organisation be considered an 'essential user' under state/territory or LFE arrangements?

Conclusion

There are a number of issues which will impact on the effectiveness of organisational risk management strategies incorporating diesel back-up generation. From an external perspective, the ability of an organisation to source diesel to support ongoing generation may be affected by increased demand, reduced consumption cover in the supply chain, regulatory arrangements and interdependencies with transport and electricity. From an internal perspective, organisations should understand and manage their fuel requirements and ensure their generator is well-maintained and tested regularly.

It is acknowledged that there may not always be a business case to address many of the issues outlined in this paper; however an awareness of them will assist CEOs and risk managers in preparing and evaluating effective contingency arrangements. Where appropriate, organisations are encouraged to reduce exposure to these risks, for example through contracting emergency fuel supply, replacing their diesel stores regularly and understanding how external factors such as regulatory arrangements will impact on their ability to source diesel during a significant electricity disruption.

Contact Details

Energy Infrastructure Assurance Advisory Group (Energy Group)

The Energy Group is part of the Australian Government's Trusted Information Sharing Network (TISN) and facilitates the sharing of information between the owners and operators of energy infrastructure on threats, vulnerabilities and appropriate measures and strategies to mitigate risk. The Energy Group is comprised of representatives of the Australian Government, all State and Territory Governments, industry associations and the owners and operators of energy infrastructure.

Further information on the Energy Group and the TISN can be found at www.tisn.gov.au or email eiaag.secretariat@industry.gov.au.

National Oil Supplies Emergency Committee (NOSEC)

NOSEC is the main executive channel through which Governments, in cooperation with industry, formulate the overall response to a widespread fuel shortage. NOSEC reports to the Ministerial Council on Energy (MCE) and comprises officials from the Australian Government, State and Territory Governments and the oil industry.

Further information on NOSEC is available at <http://www.industry.gov.au>

The NOSEC Secretariat can be contacted at NOSEC@industry.gov.au

Endnotes

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- ⁱ Australian Institute of Petroleum, *Supply Security*, 2001, <http://www.aip.com.au/pdf/supply.pdf>
- ⁱⁱ National Oil Supplies Emergency Committee, *Australian Petroleum Statistics*, July 2003, March 2005
- ⁱⁱⁱ Australian Institute of Petroleum, op cit i
- ^{iv} Ibid
- ^v Ibid
- ^{vi} National Fire Protection Association (US), *Ensuring Reliable Emergency Power*, <http://www.nfpa.org>
- ^{vii} Electrical Generating Systems Association, *Diesel Fuel Basics*, <http://www.egsa.org/powerline/plarticle.cfm?article=44>