

**ELECTRICAL DEMAND LOAD SHIFTING PROGRAM
ST GEORGE & SUTHERLAND DEMONSTRATION PROJECT**

**LOAD SHIFTING OPPORTUNITIES INVESTIGATION
FINAL REPORT**

FOR

THE DEMAND MANAGEMENT & PLANNING PROJECT

**PREPARED BY
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EXECUTIVE SUMMARY

The Demand Management and Planning Project (DMPP) commissioned Orbis Environmental Pty Ltd (Orbis) to investigate the realistic potential for electrical demand load shifting initiatives that were previously identified through the first round audit for a number of businesses in the St George and Sutherland areas, in south-western Sydney, NSW.

For the purposes of this project, the term 'load shifting' refers to the transfer of electrical demand activities from the peak network period, between 2 - 8pm on weekdays, in summer, to other times during non-peak network use.

To determine the viability of the identified load shifting initiatives, Orbis met with each business to discuss factors such as production issues, staffing and financial and non-financial costs, which may present a barrier to their implementation.

The investigation found that the load shifting opportunities previously identified could not be realistically implemented largely due to barriers and limitations such as staffing and productivity issues. However, further investigations were conducted by Orbis and another engineering consultant in consultation with the businesses. Viable options were identified for two of the 10 businesses, as follows:

- One viable option was identified for a food manufacturing plant in Kingsgrove which included restricting flour deliveries and unloading to outside the peak period where possible. Where this was not possible unloading during the peak period would be restricted to one truck at a time. Implementation of this option is valued at \$272.30/kVA with a peak demand reduction of 150 kVA per interruption.
- One viable option was identified for a moulded plastic producer in Kirrawee, which included the interruption of some production between 12noon and 6 - 8pm. Implementation of this option is valued at \$13.50/kVA and would result in a peak demand reduction of 200 kVA per interruption.

To provide a realistic understanding of the issues facing businesses that would restrict the implementation of electrical load shifting, this report identifies a number of the barriers and limitations raised by the businesses. The most common issues being:

- Staffing and industrial relations issues;
- Increased financial costs;
- Impacts on business relations with clients, suppliers and neighbours;
- Reduced productivity and increased production wastes; and
- Internal communication difficulties.

While some of the limitations and barriers were finance based, in most instances the businesses also identified issues that could not be financially compensated or resolved in a way acceptable to the business.

DMPP has identified that they intend to use this project as a pilot study to assess the feasibility of undertaking load shifting initiatives in other areas of Sydney. It is expected that the results of this report are likely to apply to similar businesses in other areas of Sydney.

1 INTRODUCTION

1.1 Background and Project Objectives

The Demand Management and Planning Project (DMPP) undertook investigations of a number of businesses in the St George and Sutherland areas in south-western Sydney, NSW, between May and September 2004. The audit reports identified the electrical demand management opportunities in each business with respect to:

- Energy efficiency;
- Power factor correction;
- Cogeneration and fuel switching;
- Energy management;
- Standby generation; and
- **Interruptible loads (ie: electrical demand load shifting opportunities).**

The objective of this project is to formulate a more realistic understanding of the potential for implementing demand load shifting opportunities identified through the original site audits for 10 specified businesses, and to gain further understanding of the issues and logistics that may be encountered in applying load shifting measures at a wider scale.

The scope of this report therefore focuses solely on load shifting opportunities. The remaining demand management opportunities listed above have not been addressed.

In order to achieve the above objective, Orbis Environmental (Orbis) was commissioned by DMPP to:

- Confirm whether the load shifting opportunities previously identified are viable;
- Describe the issues, barriers, limitations and logistics that need to be resolved to establish load shifting opportunities;
- Detail the associated costs and savings for each viable option;
- Identify the incentives and commercial requirements of each business for implementation of the load shifting option(s); and
- Identify non-viable load shifting initiatives and discuss the reasons why each was determined to be impractical.

Orbis also facilitated the businesses to come up with alternate scenarios for load shifting in the case that the opportunities previously identified were deemed to be non-viable. These initiatives are also outlined in this report.

The DMPP has selected the St George and Sutherland region to serve as the study area for a variety of energy demand management projects, including this electrical demand load shifting project. This project will therefore function as a pilot project to determine the benefit of pursuing similar options in other areas of Sydney and to identify the likely issues that will arise in similar projects.

1.2 Load Shifting

For the purposes of this project, as per DMPP advice, the term 'load shifting' refers to the transfer of energy use activities from the peak network demand period, between 2 - 8pm on weekdays, to other times during non-peak periods. Summer is the peak season for electrical demand and includes a 13 week period comprising December, January and February. As a result, load shifting options that were discussed with the businesses sought to shift energy use outside the 2 - 8pm period on weekdays, especially in the summer months.

1.3 Scope of Work and Methodology

Out of the businesses that were investigated, the DMPP identified 12 businesses with potential demand reduction opportunities. DMPP contacted each of those businesses to confirm their willingness to participate in the program. Two of the 12 businesses declined at this stage and the remainder agreed to be part of the initial study.

Orbis was engaged to confirm whether the opportunities previously identified for load shifting were viable within the remaining 10 businesses identified by DMPP. A questionnaire was developed based on DMPP's requirements. Orbis contacted each of these businesses by telephone in order to describe the project and its intent and to establish the appropriate contact for each business. The questionnaire was forwarded to the business contacts to assist both parties to prepare for the proposed on-site meetings.

Initial on-site meetings were held in mid-2005 to confirm whether the load shifting opportunities previously identified were viable and to discuss any associated issues. These discussions assisted the business to consider how the issues identified could be overcome to enable the opportunity to be realistically implemented. Discussions also assisted the businesses to consider other possibilities for load shifting available to them.

Variation to the Scope - Alternate Opportunities

During the initial meetings, it was found that most of the options previously identified were not viable and issues associated with each option could not be adequately resolved to the business' satisfaction. In these cases, Orbis facilitated discussion with the business to identify alternate load shifting opportunities, where possible. Discussion of alternate options was outside the original scope of the project and therefore the associated peak electrical demand savings, for these options, were not known.

Another engineering consultant was engaged to identify the peak electrical demand associated with each of the new options. The consultant's review of the new options was combined with the follow-up meeting with the businesses (which was to be undertaken by Orbis under the original scope). This provided an opportunity for the consultant to confirm whether the proposed business cases were viable and to identify all associated costs and savings.

Business cases for each viable load shifting option were then prepared by Orbis based on information both confirmed and provided by the consultant.

1.4 Structure of This Report

This report comprises the following sections:

- **Section 1** provides an introduction to the report including the background to the project, definition of the study area, scope of works and project methodology.
- **Section 2** describes the load shifting options found to be viable, for which business cases have been developed.
- **Section 3** identifies load shifting initiatives that were found to be non-viable and describes the reasons why.
- **Section 4** discusses the common barriers to load shifting and identifies barrier trends across the range of businesses.
- **Section 5** provides recommendations based on the outcomes of the program.
- **Section 6** provides a conclusion to the report.

2 VIABLE LOAD SHIFTING OPTIONS

This section details load shifting options that are viable for the respective businesses. In this section business cases are presented to outline the load shifting opportunities, their associated peak demand savings and implementation costs. A cost benefit analysis is also provided for each opportunity.

Viable opportunities were identified for two of the 10 businesses that participated, as described in the following sections.

2.1 A Food Manufacturing Plant – Business Case

2.1.1 Company Overview and Business Operations

The company produces pre-mix baking products at its Kingsgrove site.

The site operates 5 days per week from Monday to Friday, 24 hours per day. Occasionally production is extended to a Saturday where customer demand requires. The business runs 3 shifts per day, including the morning shift 6:30am - 2:30pm, afternoon shift 2:30 – 10:30pm and night shift 10:30pm – 6:30am.

Production at the company is customer driven.

The unloading of flour deliveries contributes to peak electrical demand and energy consumption on the premises. Approximately 5 truck deliveries of flour are received at the site per day, each taking approximately 2 hours to unload. The site has 2 bays allowing 2 trucks to be unloaded at any given time.

One viable load shifting option was identified for the company, which is described in the following section.

2.1.2 Load Shifting Option

The company discussed with Orbis the possibility of re-scheduling flour unloading activities outside the peak electrical demand period. After further consideration, following the initial on-site meeting, the company identified with the engineering consultant that this scenario would not be feasible for a number of reasons including unacceptable waiting periods for delivery trucks and unacceptable late night deliveries due to noise and traffic impacts on their neighbours.

In a follow up meeting with the consultant, the company identified another option, based on re-scheduling flour deliveries to occur in the morning to avoid deliveries at night and during the peak network period (2 - 8pm).

This option removes unacceptable waiting periods by addressing those cases for which unloading in the afternoon could not be avoided by permitting unloading but restricting it to one truck at a time between 2 - 8pm.

This option will lead to an electrical demand saving of 150 kVA, but only during the periods that 2 trucks would otherwise be unloading simultaneously.

The company estimated that this option would incur demurrage¹ charges of about \$80 per hour. However, this would vary depending on the circumstances. In the worst case scenario, if the third delivery of the day commenced at 2pm and was immediately followed by the fourth and fifth deliveries, waiting periods and demurrage costs would be increased. This situation would result in 2 hours demurrage for the fourth truck and 4 hours demurrage for the fifth truck, totalling \$480 per day. Assuming this option is implemented permanently over the 13 week summer period, then a demurrage cost of \$31,200 would be incurred in order to implement this option.

The energy cost savings for this option would be negligible due to the requirement for the same number of trucks to be unloaded regardless of the time period this activity was implemented.

Under this option, network savings based on a low volt Demand Time of Use rate of \$2.75 per kVA per month (Energy Australia, 2005) would be \$412.50 but only in the case that the number of trucks unloading at any one time during the peak network demand period did not exceed one truck at a time in that month.

Limitations and Barriers

The following limitations and barriers were identified by the company:

- Unloading during the night, between 8pm and 6:30am, is not feasible given the likely noise and traffic impacts on nearby residences that could potentially damage the company's relations with their neighbours. The company is therefore not prepared to accept late night deliveries. This further restricts the time available for unloading activities to take place.
- The cost of the demurrage charges, unless reimbursed, would represent a barrier to the implementation of the option by the business.
- The company would require at least two weeks notice. However the energy provider would not be able to forecast that far in advance to notify the company, therefore the company would be required to permanently alter operational practices during the summer period.

Business Requirements

The following business requirements were identified by the company to enable the option to be implemented:

¹ Demurrage relates to a rate or amount payable for the failure to load or unload a vessel within the agreed time.

- The company would require reimbursement of demurrage charges incurred due to the implementation of this load shifting initiative.
- At least 2 weeks notice prior to implementation would be required to enable arrangements with both internal and external suppliers to be made and to organise the on-site operations and staff accordingly.

Cost Benefit Analysis

The following cost benefit analysis is based on the assumption that this load shifting option will be implemented for the entire summer season, as per the recommendations made in **Section 5**. It is also based on a worst case scenario, as precise costs can not be determined at this time given the variables involved in the option.

This option will result in a total cost to the company of \$30,790² for the 13 week summer period, for a reduction of 150kVA per load shifting event, which results in a cost of \$205.30 per kVA reduction. No incentive for the potential inconvenience to the company has been included in the costs.

The total incentive cost will include an incentive for the company (assuming a profit margin of 20% of the total cost) and contract management costs to ensure that the company meets the conditions of the contract (assuming 2 hours per week for 13 weeks at \$150 per hour). The total incentive cost would therefore be \$40,848 which equates to \$272.30 per kVA reduction.

2.2 A Moulded Plastic Producer – Business Case

2.2.1 Company Overview and Business Operations

The company produces moulded plastics at its Kirrawee site. The company operates 5 days per week, Monday to Friday, 24 hours per day. Operations occasionally extend to Saturdays when customer demand requires. The company runs 3 shifts including the morning shift 7am - 3pm, afternoon shift 3 - 11pm and night shift 11pm - 7am. Between 9 - 10 staffs are employed for each shift.

Production generally increases in summer and energy use and demand is highest between 4 - 11pm as this is the period when most of the machines are operating.

2.2.2 Load Shifting Option

The load shifting option identified for the company includes the interruption of up to one-third of their 20 machines for a 6 - 8 hour period from 12noon to 6 or 8pm in the summer period, upon a request from the energy provider.

It is estimated that this option will lead to peak demand reduction of 175 to 200 kVA.

² This figure includes total demurrage charges less the peak demand monetary savings.

The company estimated that this option would incur costs of up to \$2,000 per interruption, although could not be conclusive about the costs at this stage.

Energy cost savings would be negligible as production needs to be increased at other times to regain production lost during the peak period.

This option would not result in any network savings given that these are calculated on a monthly basis and production would be maximised at other peak times in that month to recover production lost.

Limitations and Barriers

The following limitations and barriers were identified by the company:

- The company could not guarantee a reduction, although indicated that it would be possible to implement this option 90% of the time. Therefore a degree of flexibility would need to be available.
- Interruptions would be limited to 3 - 5 times per year with a minimum of 1 week between interruptions. Interruptions could take place over summer, although other seasons would be preferable to the company.

Business Requirements

The following business requirements were identified by the company to enable the option to be implemented:

- Financial compensation for the costs incurred would be required.
- The company would require 4 - 6 hours notice prior to realistically being able to implement this option.

Cost Benefit Analysis

This option will result in a total cost to the company of \$2,000 per load shifting event, for a reduction of 200kVA, which results in a cost of \$10 per kVA reduction. This costing does not include any incentive for the potential inconvenience to the company.

The total cost will include an incentive for the company (assuming a profit margin of 20% of the total cost to the company) in addition to contract management costs (based on 2 hours per event at \$150 per hour) to ensure the company are meeting the requirements of the contract. Therefore the total cost for implementation of this option would be \$2,700 per load shifting event, equating to \$13.5 per kVA reduction.

3 NON-VIABLE LOAD SHIFTING INITIATIVES

This section identifies electrical demand load shifting scenarios that were found to be non-viable for the respective businesses. In this section the initiatives are listed along with the reasons explaining generally why each business considered the scenarios listed to be non-viable.

3.1 A Food Manufacturing Plant in Kingsgrove

3.1.1 Background

This a food manufacturing plant that produces pre-mix baking products, mixing quantities to specifications (analysed in Section 2 above). Batch processing equipment such as blowers are used to draw raw materials from silos that are housed within a conditioned and dehumidified warehouse. The site is located in Kingsgrove, Sydney.

3.1.2 Scenarios Considered

The following load shifting scenario was previously identified:

Scenario 1. Shift some peak period production to a weekend based on current operations of 5 days per week (Monday – Friday).

The following initiatives were canvassed in on-site discussions between Orbis and the company in June 2005:

Scenario 2. Restricting flour deliveries and unloading times and scheduling them outside the peak electrical demand period.

Scenario 3. Permanent transfer of production to a 14 day roster (4 days on 3 days off then 3 days on 4 days off), 24 hours per day and operating 3 shifts – weekdays.

Scenario 4. Permanent transfer of production to a 14 day roster (4 days on 3 days off then 3 days on 4 days off), 24 hours per day and operating 3 shifts – including one or more weekend days.

Scenario 5. Maintain production 5 days per week (weekdays only), 16 hours a day and 2 shifts per day with the permanent or temporary transfer of the afternoon shift to a night shift.

All of these scenarios were found to be non-viable after further consideration by the business following the initial on-site meeting with Orbis in June 2005. Scenarios 1, 3, 4 and 5 were found to be non-viable due to a change in business operations from 2 to 3 shifts per day, which took place after the initial meeting with Orbis and prior to the meeting with the consultant in November 2005.

Following further consideration of various implementation issues associated with scenario 2, the company modified this scenario with the consultant, and it is now included as part of a viable load shifting option identified in **Section 2.1.2**.

3.1.3 Barriers to Implementation

The company expressed initial interest in these scenarios, however, an increase in customer demand during late 2005 resulted in a production shift from 16 hours per day to 24 hours per day, 5 days per week as reported by the consultant (2006a). The current required levels of production render scenarios 1, 3, 4 and 5 impractical and non-viable.

Other barriers to implementation of these initiatives include the following:

- Shift rosters must be locked in two weeks in advance, and would be inflexible in that time. If a peak day in the network occurred on a day that operations were scheduled, there would be no benefit to the network.
- Production is customer-driven and therefore flexibility is required for load shifting.
- Staff resistance to change and impacts on their after-hours commitments.
- Administration and management issues given those functions are not available during night shifts.
- Communication difficulties between shifts.
- Alternate shift structures are more expensive to operate due to penalty rates for night shift, holiday allowances and higher wages.
- Flexibility of production would be reduced.
- Unloading during the night (between 8pm and 6:30am) is not acceptable to the business given potential impacts of noise and traffic on neighbours.
- Difficulties with arranging deliveries and unloading (especially given tight unloading timeframes) if all unloading is required to take place outside the peak demand period and during daytime hours.

3.2 A Moulded Plastic Producer in Kirrawee

3.2.1 Background

The company produces moulded plastics, specialising in the production of plastic caps and closures for cosmetics, food and beverage packaging. The company site is located in Kirrawee, Sydney.

3.2.2 Scenarios Considered

There was no load shifting opportunity previously identified for the company.

The following initiatives were canvassed between Orbis and the company during initial on-site discussions:

Scenario 1. Permanently transfer production to 7 days per week, with workers working a rotational roster 4 days on 3 days off, reducing the number of shifts from 3 to 2 by removing the afternoon (3 - 11pm) shift.

Scenario 2. Permanently or temporarily transfer high energy use processes to either the morning or night shifts and schedule low energy use activities (such as dye setting) in the afternoon shift.

Scenario 3. Temporarily increase weekly production shifts to 7 days.

Scenario 4. Increase the number of machines on-site to increase production capacity at any one time.

Scenarios 3 and 4 were found to be non-viable options during the on-site meeting with Orbis in June 2005. Scenarios 1 and 2 were found to be non-viable by the company following further consideration after that meeting. The company reported that these scenarios were non-viable to the consultant at their follow up meeting with the business in January 2006. Reasons for these options being non-viable are identified in **Section 3.2.3**.

3.2.3 Barriers to Implementation

The company identified the following barriers which render these scenarios to be non-viable:

- Unreasonable impact on operational needs of the business.
- Specialist staff not available during certain times and can not be called in to rectify problems at other times, creating a production backlog.
- Inability to disturb production as the company works to a tight production schedule.
- Given the machine warm up and cool down times, machine availability is likely to be significantly impacted if dye changing is moved to the afternoon shift. Production capacity would be reduced as a result.
- The resulting disruption to employees would not be acceptable to the company.
- Improvement of processes and operations to reduce electrical demand would require a further capital investment of an anticipated \$20 million. However, despite the availability of such capital, this set up would not work financially for the business.

3.3 A Manufacturing Plant in Kirrawee

3.3.1 Background

The company produces a range of plastic injection moulded products from raw resin materials. The business' injection moulding machines are the major energy users at the site. The site is located in Kirrawee, Sydney.

3.3.2 Scenarios Considered

The following scenario was previously identified:

Scenario 1. Permanently shift use of the site's two larger injection moulding machines to outside the peak electrical demand period.

The following initiatives were canvassed between Orbis and the company during initial on-site discussions:

Scenario 2. Temporarily shift the use of the site's two larger injection moulding machines to outside the peak electrical demand period.

Scenario 3. Run production on a 10 day fortnight (requiring production to occur every second weekend).

Scenarios 2 and 3 were found to be non-viable options at the on-site meeting with Orbis in July 2005. The company agreed to further consider the feasibility of scenario 1 following the on-site meeting however, some difficulty was experienced in gaining further information from the business. The scenario was deemed to be non-viable in a follow up telephone call with Orbis in February 2006.

3.3.3 Barriers to Implementation

The company identified the following barriers which render these scenarios to be non-viable:

- Loss of their largest customer to China along with 20% of their business means they are operating shorter runs with higher turnaround times. Therefore, any form of interruption to production is not feasible.
- Use of the larger machines has recently reduced given the loss of large customers. However, the large machines are generally run full time until the order is completed to meet customer demands and to avoid waste and reject product.
- Interrupting runs results in product loss and waste.
- Shutting down machines incurs downtime costs for the shut down and warm up periods (about 2 hours either side).
- Staffing difficulties for night shifts means skilled workers are not available and all skilled tasks need to be completed before night shift.
- Temporary shifts would be too disturbing to operations and staff.
- Orders are at short notice and are unable to be predicted.

3.4 A Manufacturing Plant in Riverwood

3.4.1 Background

The company manufacture a range of plastic bags including shown bags, boutique bags and food product bags. The company also have design and printing facilities at the site. The site is located in Riverwood, Sydney.

3.4.2 Scenarios Considered

The following scenario was previously identified:

Scenario 1. Shift afternoon production to a weekend day (temporarily or permanently).

The following initiatives were canvassed between Orbis and the company during initial on-site discussions:

Scenario 2. Shift afternoon/evening production outside the peak electrical demand period and create 2 shifts (morning and night).

Scenario 3. Run fewer machines 24 hours per day.

All of these scenarios were deemed to be non-viable options during the on-site meeting with Orbis in June 2005, for reasons identified in **Section 3.4.3**.

3.4.3 Barriers to Implementation

The company identified the following barriers which render these scenarios to be non-viable:

- Staffing issues associated with night shift eg: increased production mistakes, loss of business property and the inappropriate use of machinery by staff. Therefore regardless of any financial compensation, the owners would not be prepared to operate a night shift.
- A security guard would be required for night shift.
- The required warm up periods would result in additional energy being used per output unit where machines were turned off after the morning shift.
- Wastage of materials.
- Income would be reduced for workers where 3 shifts were operated as overtime would be removed as an option.
- The owners and staff would not be willing to work weekends beyond the occasional Saturdays that are presently worked to meet customer demand.

3.5 A Manufacturing Plant in Kurnell

3.5.1 Background

The company is located adjacent to the Caltex oil refinery site in Kurnell. The plant converts off-gases received from Caltex into saleable products such as ethane and hydrogen. Caltex is the sole supplier and customer of the company and therefore the site's production and income is closely linked to the operations of the Caltex refinery.

3.5.2 Scenarios Considered

The following scenarios were previously identified:

Scenario 1. Full shutdown of the plant between the peak period for 1 day (most likely 2 - 8pm).

Scenario 2. Operation without ethane compressor for short periods.

No further scenarios were identified. Both scenarios were identified as non-viable options during the on-site meeting with Orbis in June 2005, for reasons identified in **Section 3.5.3**.

3.5.3 Barriers to Implementation

The company identified the following barriers which render these scenarios to be non-viable:

- The company services the adjacent Caltex refinery through a close working relationship. A shutdown at the company site has significant impacts on the production and operations of the Caltex site. It is considered unlikely that Caltex would allow the company to shut down to avoid a peak electrical demand period.
- Safety would become an issue given that 200 tonnes of LPG are stored on the site. Shut down would result in a pressure build up unless this gas was able to be removed. Therefore a full shut down could not be achieved for safety reasons.
- The wear and tear on the plant would be significant.
- Downtime would be significant given the time required to re-start the plant (at least 1 day) in addition to time off-line as part of the load shifting program.
- Production can not run without the ethane compressor in the short term. Ethane would have to be vented off as part of the shut down and it would take one day to replace the ethane required.

Any load shifting options for the company would depend on the concurrent involvement of the Caltex refinery, which is outside the scope of this project. Orbis understands that Caltex operations are being reviewed under another program, also incorporating options for load shifting. It is recommended that the company and the Caltex refinery be considered simultaneously in any future load shifting investigation.

3.6 Another Manufacturing Plant in Kirrawee

3.6.1 Background

At the time of this investigation, the company is located in Kirrawee, comprised 3 businesses including:

- Civil Products, which fabricated metals;
- EPS – Poles division, which produces support poles for guardrails; and
- A spin plant, which primarily produces nuts and bolts.

3.6.2 Scenarios Considered

The following scenario was previously identified :

Scenario 1. Transfer to weekend production either permanently or temporarily.

The following initiatives were canvassed between Orbis and the company during initial on-site discussions:

Scenario 2. Temporary transfer of afternoon/evening shift workers for galvaniser and press operations to the day shift, during the low demand period (August to October/November) of each year.

Scenario 3. Temporary transfer of afternoon/evening shift workers for galvaniser and press operations to day shift during low demand periods (August to October/November) for 3 - 4 weeks at a time with a total of 2 events per year.

Scenario 4. Permanently or temporarily remove afternoon/evening shift and create a night shift or increase staff on night shifts (depending on business function).

Following further consideration of the options available to the company, the business reported that feasible options would include the following:

Scenario 5. Transfer of press shop operations from three shifts per day to one day and night shift.

Scenario 6. Purchase of replacement equipment for the press shop enabling operation of one shift per day (scheduled outside the peak electrical demand period) rather than three.

The company identified that both these options would be feasible to the business and provided costings to Orbis. However, before the consultant met with the company to calculate the electrical demand for these new options, the company contacted Orbis to indicate that the business was closing down a number of their operations prior to Christmas 2005 and moving their remaining operations to a site in Minto (outside the St George and Sutherland region) soon after. These scenarios are therefore no longer feasible as part of this program.

3.6.3 Barriers to Implementation

The primary reason that these initiatives have been deemed as non-viable load shifting options is due to the company closing down a number of their operations and moving the remainder of the business to Minto within 12 months following.

Further reasons given by the company for load shifting scenarios 1-4 being non-viable included:

- Shifting production would be overly disruptive (in terms of rosters and staff).
- Skilled staff are not available during night shift. If skilled staff are required, a call out fee would be incurred for a contractor and downtime would also be significant.
- Current working arrangements have been in place for a long time and staff would be disrupted by the introduction of weekend and night shifts.
- Safety incidents increase during both night and weekend shifts.

3.7 A Manufacturing Plant in Arncliffe

The company manufactures aluminium cans at a site in Arncliffe, Sydney. The plant serves small customers and therefore batch sizes are also small with frequent production line changeovers.

The original recommendation was that shifting production to the weekend would be a feasible option for this business. The questionnaire was completed by the company and returned to Orbis in June 2005. The completed questionnaire identified that the business would be unable to run at any other times than currently operating given customer demand and short turnaround times. The business identified that they would be unable to participate further in the program due to resourcing issues.

3.8 A Manufacturing Plant in Turrella

The company is a producer of moulded plastics, specialising in casings for lighting and other electronic applications. The business is located in Turrella, Sydney.

The company was recommended that shifting production temporarily to the weekend would be a feasible option for this business. The company identified that they were unable to participate in the project further than completing a questionnaire given current resources and pending structural changes. However, difficulty was experienced in contacting the appropriate staff in order to obtain a completed questionnaire and following a number of attempts, it was agreed with DMPP that no further attempts would be made. Therefore the option previously identified has not been confirmed as an option and is assumed to be non-viable at this stage.

3.9 A Manufacturing Plant in Peakhurst

3.9.1 Background

The company produces a range of plastic injection moulded products from raw resin materials. The site is located in Peakhurst, Sydney.

3.9.2 Scenarios Considered

The following scenario was previously identified:

Scenario 1. Permanent move of one or more afternoon/evening shift(s) (3 - 11pm) to the weekend.

The following initiatives were canvassed between Orbis and the company during initial on-site discussions:

Scenario 2. Short term transfer of the afternoon/evening shift (3 - 11pm) to one weekend day shift.

Scenario 3. Permanent transfer of the afternoon/evening shift (3 - 11pm) to night shift.

Scenario 4. Short term transfer of the afternoon/evening shift (3 - 11pm) to night shift.

Scenarios 1, 3 and 4 were found to be non-viable options at the on-site meeting with Orbis in June 2005. The company agreed to consider scenario 2 further through

discussions with staff. However, Orbis confirmed with the company in July 2005, following their staff meeting, that this scenario was not viable for the business.

3.9.3 Barriers to Implementation

Following closer consideration, the company identified the following barriers which render these scenarios to be non-viable:

- Night shifts previously operated at the premises however the business experienced difficulty finding and maintaining suitable and capable staff.
- Previous night shifts proved to be inefficient, producing 50% reject product.
- Night shift requires the owners to be on call, for shifts outside daytime hours and indicated a preference for call out during the afternoon/evening as opposed to the night shift hours.
- Set up of the machines would occur prior to the start of night shift and would require a night shift worker to be trained for set up.
- Staff have family and other commitments and are therefore not prepared to work nights.
- Shutting down machines for the afternoon would be energy and time inefficient.
- Staff currently work occasional Saturdays to meet customer demand.

3.10 A Utility Station in Hurstville

3.10.1 Background

The utility station uses pumps to distribute water potable water to storage reservoirs in the Penshurst area and also to the Sutherland water network system. The utility station is located in Hurstville, Sydney.

3.10.2 Scenarios Considered

The following scenarios were previously identified as feasible initiatives. These options were not confirmed as viable options for reasons identified in **Section 3.10.3**, however, neither have they been identified as non-viable for a future project:

Scenario 1. Full load shifting of pumps 3 and 4.

Scenario 2. Load shifting of pump 3 or 4 to low speed operation.

3.10.3 Barriers to Implementation

The station identified upfront that disclosure of the financial incentives per kilowatt saving would be required from the network provider in addition to any other reimbursements available for capital outlay requirements, additional staffing and training costs etc, before they can decide whether further participation in the load shifting program is worthwhile.

The station identified that the scenarios previously identified (June 2004) are likely to be feasible but would need to be confirmed with operational staff at a later date. The station would be prepared to discuss these (and any other) scenarios further, in the case that there is adequate financial incentive for their participation in the program.

Orbis was advised that DMPP will be reviewing station in a later program and while the scenarios identified in **Section 3.10.1** have not been confirmed as either viable or non-viable options as part of this program, it is recommended that the process be undertaken at a broader scale to incorporate more of the station's functions.

4 DISCUSSION OF COMMON BARRIERS

As identified in **Section 3**, most of the barriers to the implementation of load shifting options are common across the range of businesses. It can therefore be expected that these issues would also apply to similar business in other areas of Sydney. The following common barriers were encountered through this project:

Reduced Productivity and Damaged Customer Relations

The most common barrier was that of reduced productivity, and the potential for the business to be unable to meet customer demand within required turnaround times. This barrier is particularly relevant for businesses in the plastics industry for whom overseas competition is currently a real and significant threat. Most of the businesses raised concern over the impact that lost productivity would have on their customer relations.

Staff Productivity and Safety

Staff productivity and safety were identified as significant barriers with respect to both night and weekend shifts. Businesses identified that productivity is reduced during these shifts and safety incidents generally increase.

Staffing and Industrial Relations Issues

Staffing and industrial relations issues were also common barriers to load shifting across the range of businesses. Businesses identified that staff are either unwilling to work night and weekend shifts due to family and other commitments, and/or the business cannot find and maintain suitable staff for these shifts. Many of the businesses also have established employment agreements that do not permit a change in their staff's working hours and conditions without entering into the renegotiation process.

Unacceptable Downtime

Many of the businesses identified that the downtime associated with load shifting would not be limited to the 2 - 8pm period given that machines often need to be warmed up and test runs are required prior to production. Overall this equates to significantly more down time than only the intended load shifting period.

Wastes and Wear and Tear on Plant

All of the plastics companies involved identified increased waste as a likely scenario for those cases where production runs were to be interrupted. Increased wear and tear on machinery associated with the increased shut down and start up of plant was also identified. Both these issues were considered as barriers to the implementation of load shifting initiatives.

Impacts on Neighbours

Many of the businesses for which shifting production to a night shift or weekend was raised, expressed concerns over the impacts such a shift in production would have on their neighbours. Most of the businesses were located in light industrial zones with residential areas located nearby.

Communication Barriers

Across the range of businesses it was identified that changing shifts would create internal communication issues, which would be unacceptably damaging to the business.

Financial Costs

All of the businesses that participated in initial site meetings identified that the financial costs incurred by implementing a load shifting opportunity would represent a key barrier to their business' decision to consider load shifting as a possibility. In most cases the businesses agreed that this issue would be annulled if financial compensation were provided to the business to cover all costs directly associated with implementation of the load shifting opportunity.

5 RECOMMENDATIONS

This section provides recommendations with respect to each of the main outcomes of the project (*details have been deleted due to confidential information*).

6 CONCLUSION

Orbis was engaged by DMPP to confirm whether the opportunities identified through the first round investigations in 2004 for load shifting were viable within 10 businesses located in the St George and Sutherland areas in south-western Sydney, NSW. Consultation by Orbis with each business comprised an initial project briefing via telephone, a questionnaire and an initial on-site meeting. Follow-up meetings were conducted by the engineering consultant for this project.

The objective of this project was to develop a more realistic understanding of the potential for implementing demand load shifting opportunities previously identified for 10 specified businesses, and to gain further understanding of the issues and logistics that may be encountered in applying load shifting measures at a wider scale.

This report describes viable load shifting options for two businesses. The following alternate options are considered as viable and suitable demonstration projects:

- A food manufacturing plant – Restrict flour unloading to outside the peak network period where possible. Where this is unavoidable restrict unloading to one truck at a time.
- A moulded plastic producer – Interrupt one-third of the machines during the peak electrical demand period, upon request from the network provider.

Costs associated with each of the viable options have been estimated for both businesses. The costs would need to be recovered in order for the load shifting to be feasible.

The full range of load shifting opportunities for the remaining businesses that participated in this project, which have been identified as non-viable, are also provided in this report. Opportunities previously identified through their investigations were found largely to be non-viable, with the exception of the utility station in Hurstville, whose options were not confirmed as either viable or non-viable under this project, and a manufacturing plant in Kurnell, who identified that one of the options may be possible in the case that the main customer and supplier agreed to its implementation.

This report has identified a number of limitations and barriers to the implementation of load shifting opportunities in each of the businesses. Most of the issues identified were common across a number of the businesses and it is therefore expected that these issues can be applied at a wider scale for similar businesses in other areas of Sydney.