



Gladstone Ports Corporation  
*Growth, Prosperity, Community.*

## PUBLIC REPORT

### INTRODUCTION TO THE ENERGY EFFICIENCY OPPORTUNITIES PROGRAM

The Energy Efficiency Opportunities Program (EEO) is an Australian Government initiative to encourage large energy using businesses to improve their energy efficiency by requiring them to identify, evaluate and report publicly on cost effective energy saving opportunities. Gladstone Ports Corporation Limited (GPC) became a signatory to the EEO program in 2006-7.

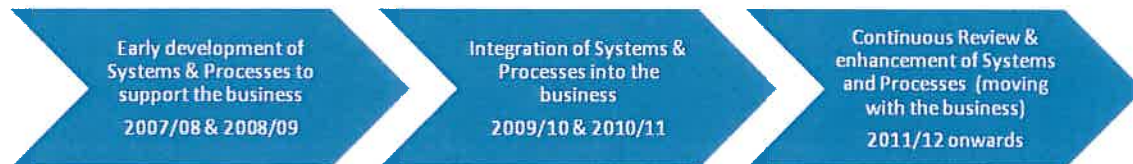
The EEO program is designed to lead to:

- Improved identification and uptake of cost-effective energy efficiency opportunities;
- Improved productivity and reduced greenhouse gas emissions; and
- Greater scrutiny of energy use by large energy consumers.

The Australian Government Department of Resources, Energy and Tourism (RET) is administering the program under the Energy Opportunities Act 2006 and associated Regulations. Please visit [www.energyefficiencyopportunities.gov.au](http://www.energyefficiencyopportunities.gov.au) for further information.

An Assessment and Reporting Schedule (A&RS) has been submitted and accepted by DRET for the first five year improvement cycle.

#### GPC's timeline of key activities:



#### Key business Centre Assessments:

- 2007/08 – GPC Administration Building
- 2007/08 & 2008/09 – GPC Marina
- 2007/08, 2008/09, 2009/10 & 2010/11 – RG Tanna Coal Terminal

**Business Context:**

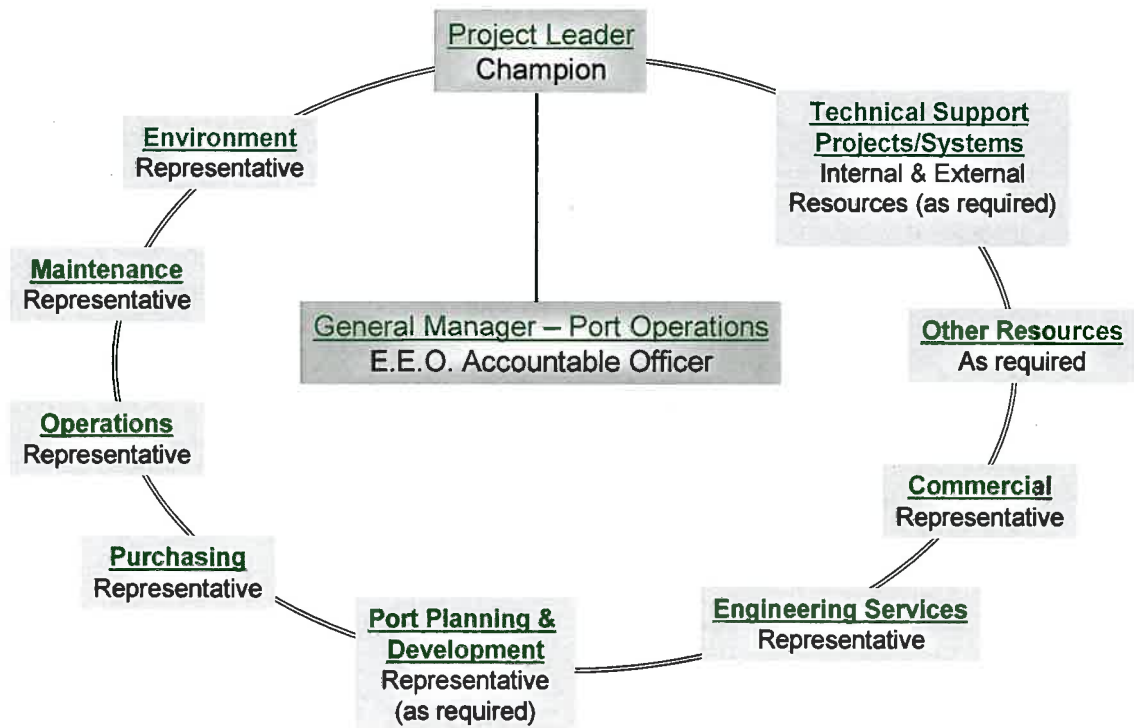
During the financial years 2005 to 2008, GPC has been undergoing a rapid expansion phase at the RG Tanna Coal Terminal to meet the projected growth in coal exports. During this challenging period, the Energy Efficiency Opportunities Legislation, being the Energy Efficiency Opportunities Act 2006 and Energy Efficiency Opportunities Regulations 2006, took effect on 1<sup>st</sup> July 2006 and GPC became one of the 250 plus mandatory participants in the EEO program.

GPC and its Board have embraced the intent of this legislation. This includes providing funding as items in the annual operating and capital budgets, and forming an EEO project team to provide guidance and support in meeting the requirements of the legislation.

**EEO Team:**

The EEO team has been formed with senior representatives from each of the main areas of operation (see diagram below). It is important to have a team that has a balanced view of the business, and involves key personnel to help overcome the obstacles that may impede GPC from meeting the intent of the EEO program.

**GPC REPRESENTATIVE TEAM**



## **Systematic Approach:**

The first critical step for a successful outcome was introducing the EEO program to all of our employees. To ensure that a consistent message was given to all employees, the EEO team produced a video presentation which covered the following basic areas:

- An introduction to the EEO program and its objectives;
- The energy used by GPC in the financial year 2006/7;
- The EEO team structure and its members;
- The basic steps in performing an assessment and evaluating improvement ideas; and
- A central point for collecting ideas.

This video has been presented to the majority of our employees. It is presented by at least one member of the EEO team, which enables additional context and more up to date information to be presented, and to answer any queries regarding either the legislative requirements or GPC's intent.

Key systems that will be required for the EEO program to become sustainable are currently under development by the EEO team. These systems include:

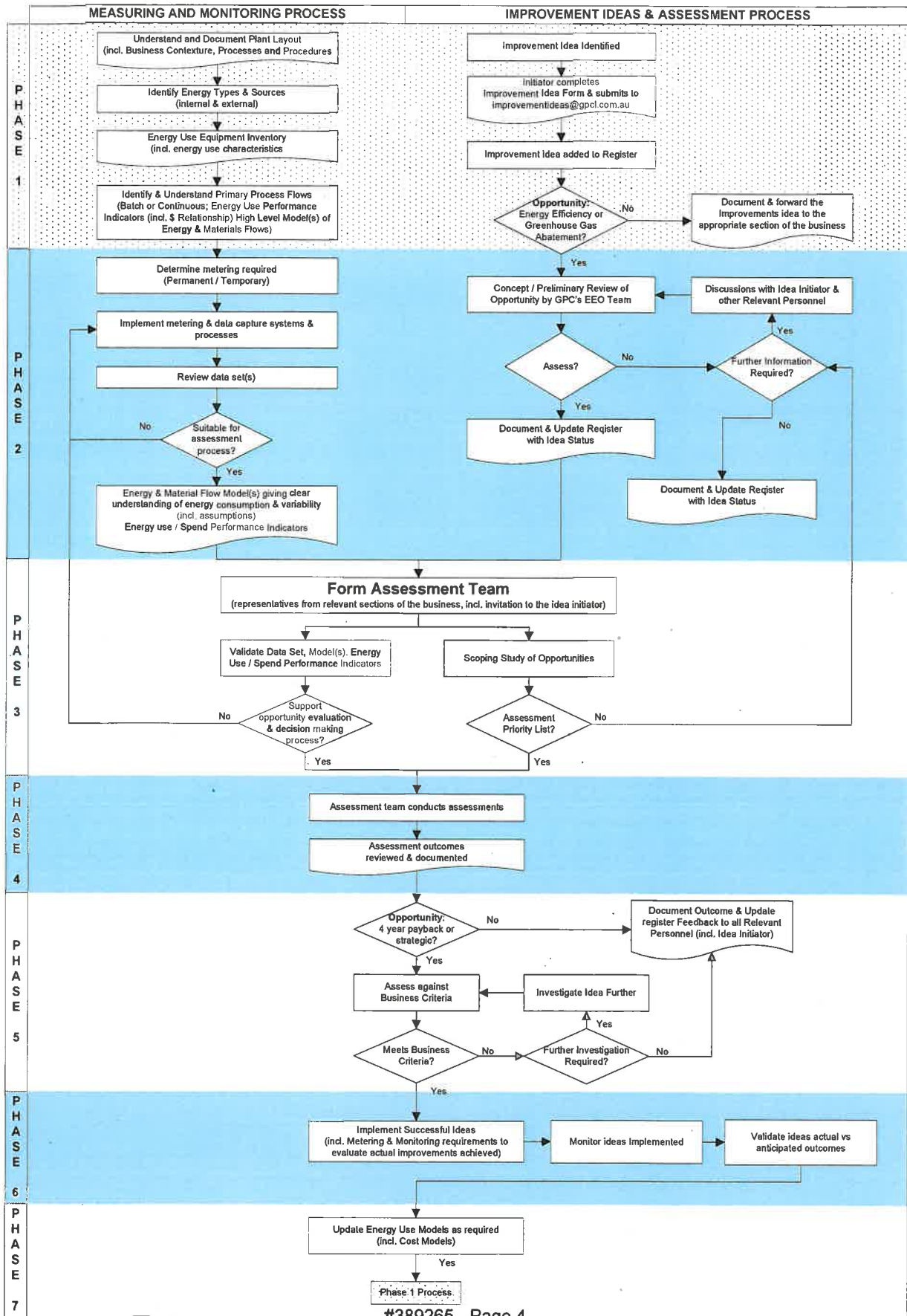
- A common data repository that will collate the base data from the various systems within GPC. This will allow the reporting requirements for various legislative programs (eg National Greenhouse and Energy Reporting System, and National Pollution Inventory) to be met with consistent data.
- A system to enable all employees to register improvement ideas, including those related to energy efficiency opportunities, and to track each idea's progress.
- A system for analysing energy usage and assessing improvement ideas (see flow chart below). This system also defines documentation that is required for auditing and the monitoring of implemented ideas to validate the achieved energy efficiency / cost savings.

The EEO team has also been working to ensure that:

- Energy efficiency clauses are being added into all future equipment tender specifications.
- Energy efficiency considerations have been included in the new Capital Investment System.

The EEO team has also been working with the Wiggins Island Coal Terminal (WICT) development team regarding the EEO program requirements. The WICT team have now set up an internal team to consider energy efficiency opportunities during the design phase.

A comprehensive company policy has been drafted which covers both the Energy Efficiency Opportunities program as well as the National Greenhouse and Energy Reporting System.

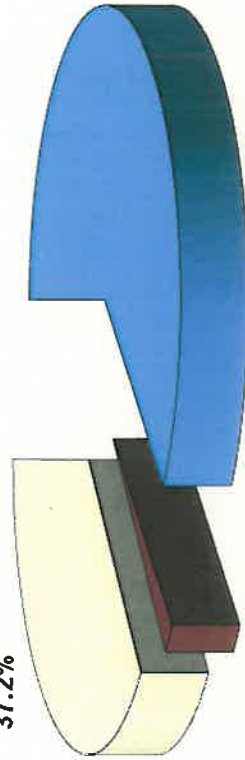


# ENERGY USE SINCE GPC'S TRIGGER YEAR 2005 – 2006

2006 – 2007

## Energy Types & Sources

Electricity,  
37.2%



Unleaded  
Petrol, LPG  
& Acetylene  
Gas, 2.0%

Automotive  
diesel oil  
(diesel),  
60.8%

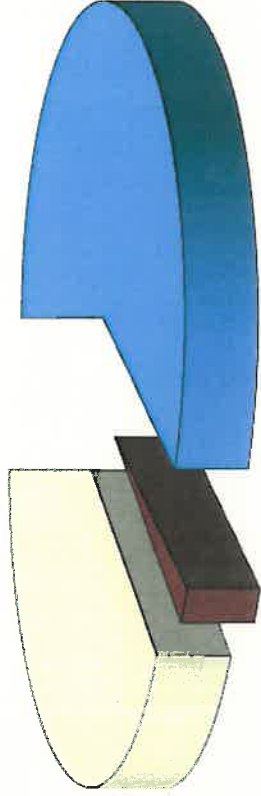
2006 – 2007

640,848,093	MJ pa of Energy	Coal Throughput: 51,500,00 Tonnes pa Other Product Throughput: 22,700,000 Tonnes pa
12,817	Households' energy use	
88,160	Tonnes CO <sub>2-e</sub> pa	

2007 - 2008

## Energy Types & Sources

Electricity,  
40.1%



Unleaded  
Petrol, LPG  
& Acetylene  
Gas, 2.0%

Automotive  
diesel oil  
(diesel),  
57.9%

2007 - 2008

682,173,250	MJ pa of Energy	Coal Throughput: 54,100,00 Tonnes pa Other Product Throughput: 22,570,000 Tonnes pa
13,642	Households' energy use	
97,427	Tonnes CO <sub>2-e</sub> pa	

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## SUMMARY OF ASSESSMENTS CONDUCTED 1 JULY 2005 TO 31 AUGUST 2008

### Assessment process:

During the first half of calendar year 2008, the main administration building had an initial assessment performed while the sustainable systems were being developed.

This initial assessment was conducted using the following basic steps:

- Engaging a data service to collect the ½ hour metering energy use data from the energy retailer's meter;
- Installing temporary metering on the various sub boards to monitor the ½ hour energy used for the building A/C system, office equipment by floor, and lighting equipment by floor;
- Collating a list of office equipment and lighting equipment used in the building;
- Analysing the energy consumption patterns; and
- Forming a representative group from the building for a brainstorming session. This produced both behavioural and equipment related ideas.

As a result of this work, behavioural changes have been noticed which include;

- Employees and contractors are turning off lights when they leave; and
- Cleaners have changed how they utilise the lighting on multiple floors after hours.



## OUTCOMES OF AND BUSINESS RESPONSE TO OPPORTUNITIES THAT HAVE BEEN IDENTIFIED

Table 1.2 – Gladstone Ports Corporation

Status of Opportunities		Number of Opportunities	Estimated energy savings per annum by payback period (GJ)			Total estimated energy savings per annum (GJ)	*Accuracy range (%)
			0 – < 2 years	2 – ≤ 4 years	> 4 years		
Outcomes of assessment	Identified (accuracy ≤ ±30%)	6	8.70		5,630.00	5,638.70	≤ ±30%
	Identified (accuracy > ±30%)	1		27,600.00		27,600.00	> ±30%
	<b>Total Identified</b>	<b>7</b>	<b>8.70</b>	<b>27,600.00</b>	<b>5,630.00</b>	<b>33,238.70</b>	<b>&gt; ±30%</b>
Business Response	Awaiting Investigation	1		27,600.00		27,600.00	
	Under Investigation						
	To be Implemented	3	8.70		1,930.00	1,938.70	≤ ±30%
	Implementation Commenced	1	70.40			70.40	≤ ±30%
	Implemented	2			3,700.00	3,700.00	≤ ±30%
	Not to be Implemented						

During the first six months after submitting the Assessment and Reporting schedule to the Department of Resources, Energy and Tourism (DRET), most of the work conducted by GPC has been about introducing the program to our employees, introducing changes to enhance energy efficiency in future works, and creating a sustainable process for addressing energy efficiency. Once implemented, this sustainable process will be used to conduct our ongoing energy audits and assessments, and to monitor the success of implemented projects.

## SUMMARY OF SOME ENERGY EFFICIENCY OPPORTUNITIES IDENTIFIED

### Opportunity 1 – Equipment Choice

GPC required a new coal loader in 2006. The business decision making process included a technical evaluation of mechanical vs diesel electric drive systems and the decision making criteria included a high % weighting factor on fuel/lubricants and energy efficiency performance for the life of the machine.

The evaluation team identified the diesel electric loader would use approximately 15 to 20 litres per hour **less** diesel when compared to a similar size mechanical drive loader with the same loading capabilities. The Diesel Electric 783 kW Wheel Loader was recommended and purchased.

This Diesel Electric Loader has been in operation for over 2 years. The average hours of operation have been 2,700 per annum. The estimated savings resulting from the purchase decision are:

- An energy saving of 1,600,000 to 2,100,000 MJ per annum; and
- Reduction in greenhouse gas emissions of approximately 109,000 to 145,000 kg CO<sub>2-e</sub> per annum.

Main contributing factors identified for fuel/lubricant savings when operating at an average 50 metre carry loading cycle (eg stockpile to bin) are as follows:

- Unique power regeneration using capacitors to store energy from the 4 x 300 kW Switched Reluctant (SR) motors when in the retard braking mode, 30% of overall cycle time. The capacitors stored energy reduces the demand on the engine when the traction system calls for peak power.
- Constant RPM engine speed driving an AC regulated electric alternator.
- Engineered efficient drive systems, no torque converter, transmission, drop box differentials for improved cycle times and no wet brake systems.
- Reduced quantities of on-board lubricants/fluids thus reduced wastage and leaks.

### Additional benefits

- Annual maintenance cost reduction and extended 'working' life of the engine by up to about 20% compared to a mechanical loader due to the lower total duty cycle.
- Lower noise levels – The diesel electric loader's environmental noise level test results at high engine idle were 10% less than a mechanical loader as measured at the level of a person standing 15 metres away from the loader.

The performance of the diesel electric loader has matched expectations and a second diesel electric 783 kW wheel loader was purchased and commissioned September 2008.

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## Opportunity 2 – Equipment Replacement

Two (2) existing Caterpillar D11N bull dozers with Cat 3508B engines are being replaced with Caterpillar D11T bull dozers with Cat C32 ACERT engines, one in November 2008 and the other in September 2009. Both types of bull dozers have the same work capabilities.

The business decision criteria did give due consideration to the amount of energy to be consumed to do the work specified in the performance evaluation base scenario and demonstrated performance of the measuring and monitoring system(s) to facilitate the effective and efficient operation of the equipment.

Caterpillar's tests show their D11T bull dozer uses at least 4.7% less diesel than their D11N under the same conditions of operation. On average a bull dozer works 5,000 hour per annum. The estimated savings resulting from the replacement of the 2 bull dozers are:

- An energy saving of 965,000 MJ per annum per dozer; and
- Reduction in greenhouse gas emissions of approximately 67,000 kg CO<sub>2-e</sub> per annum per dozer.

### Additional benefits

- Less air pollution – The ACERT™ technology manages combustion using a combination of air management, multiple fuel injections and careful timing to lower Nitrous Oxides (NO<sub>x</sub>) formation.
- Lower maintenance costs – The oil change over time is every 500 hours of service for the D11T bull dozer compared to the D11R which is every 250 hours of service.
- Measuring and Monitoring system - The D11T comes with an 'advisory monitoring system' providing data which is beneficial to both the operators and the service technicians.

## Opportunity 3 – Simple Control System Modification

GPC's Administration building was opened in 1974. There have been many changes within the building since then including the upgrade of the centralised air-conditioning system in 2005.

The building consumed 501,774 kWh per annum in 2007-2008.

To assist understand the building's electricity requirements and usage patterns the primary metering system was modified to provide metering data recorded in half hour intervals on a monthly basis. The centralised air-conditioning system has its own distribution board. Temporary metering was installed and the electricity requirements of the centralised air-conditioning system and computer server room dedicated air-conditioning units were measured and monitored in half hour intervals.

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The centralised air-conditioning system and computer server room dedicated air-conditioning units consume about 56% of the building's total electricity usage.

Whilst reviewing the metering data it was noted that on public holiday's the building was consuming around half the normal business day's peak electrical demand (kW). Discussions with refrigeration personnel and review of the temporary metering data of the air-conditioning systems identified the centralised air-conditioning system was operating in normal mode on public holidays. The control system is being modified with an after hours operational mode being scheduled for public holidays.

The electricity saving is estimated at 2,430 kWh per annum. This is a reduction in greenhouse gas emissions of 2,205 kg CO<sub>2-e</sub> per annum.

#### **Opportunity 4 – Education and Awareness**

Awareness is an important part of GPC's systematic approach to identify energy efficiency opportunities from both a procedural and technical aspect. After the presentation of the introductory video to the personnel in GPC's administration building informing them of the Energy Efficiency Opportunities Program, GPC's energy usage portfolio, the responsibilities of all personnel with respects the program and how they can contribute, some simple, but effective changes in general practices have occurred.

GPC's administration building was part of the assessments done thus far. The building consumed 501,774 kWh per annum in 2007-2008.

The electricity usage has been measured and monitored over the past 5 months and will continue to do so into the future. Whilst reviewing electricity usages patterns, a significant change in electricity usage was noticed at the end of the business day. This has been a result primarily of initiatives taken by cleaning personnel to modify office cleaning practices and initiatives by personnel to turn office equipment and lights off when leaving the office.

The electricity saving is estimated at 19,554 kWh per annum. This is a reduction in greenhouse gas emissions of 17,739 kg CO<sub>2-e</sub> per annum.

The electricity cost benefit is approximately 2% per annum for the administration building.

#### **DECLARATION**

The information included in this report has been reviewed and noted by the Board of Directors and is to the best of my knowledge, correct and in accordance with the Energy Efficiency Opportunities Act 2006 and Energy Efficiency Opportunities Regulations 2006.



**LEO M ZUSSINO**  
**CHIEF EXECUTIVE OFFICER**