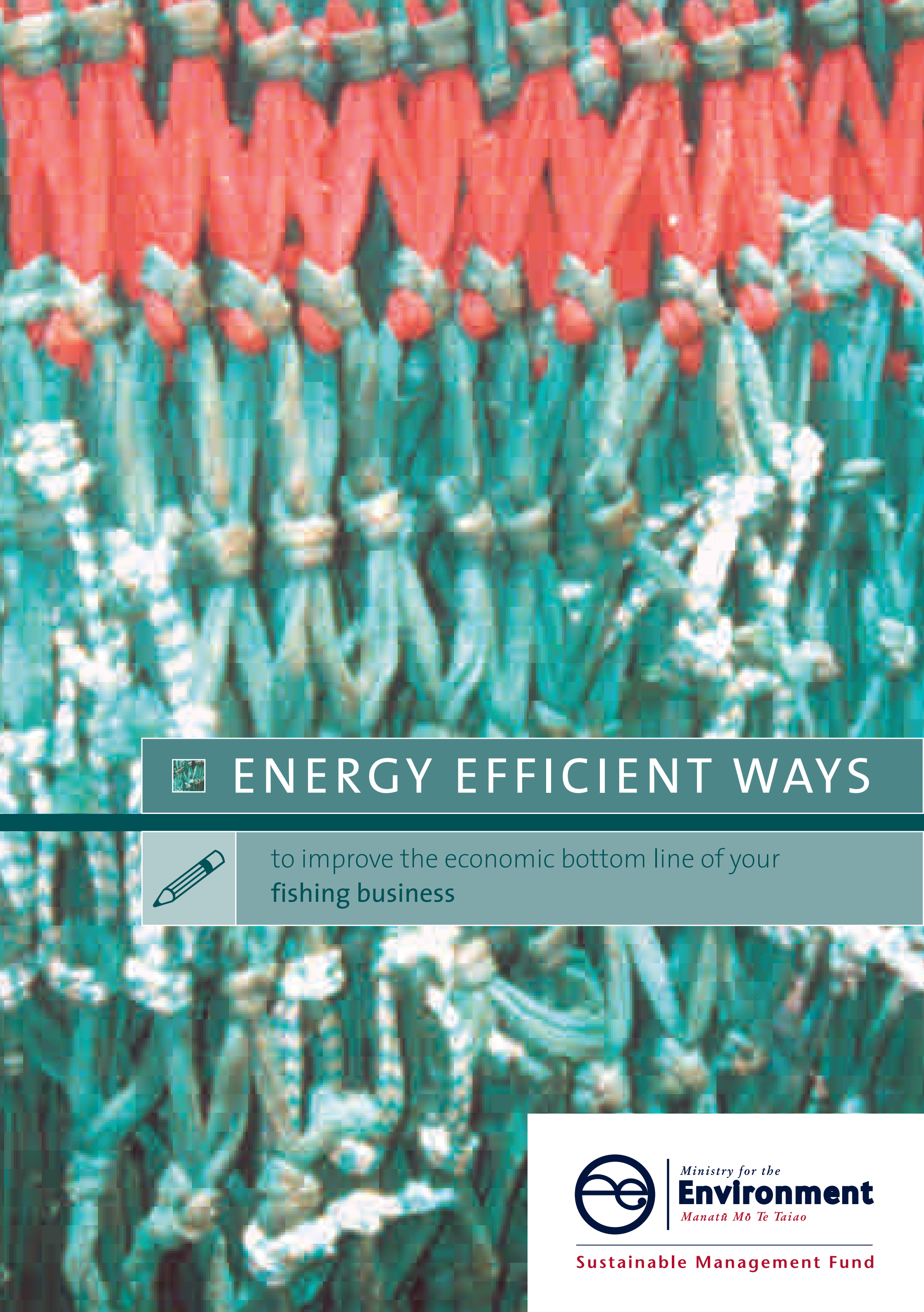


ENERGY EFFICIENT WAYS

to improve the economic bottom line of your **fishing business**

Ministry for the Environment
Manatū Mō Te Taiao

Sustainable Management Fund

Tourism Industry Association New Zealand

Mercury Energy

Coal Association of New Zealand

Westpac

Holcim

ROAD TRANSPORT FORUM NZ

NEW ZEALAND STEEL

Energy Federation of New Zealand

World Energy Council

EBEX21 CarboNZero

CRL Energy Ltd

Westland Milk Products NEW ZEALAND

Vegfed

Manaaki Whenua Landcare Research

Massey University

EECA Energy Efficiency and Conservation Authority Te Tari Tiaki Pūngao

mta ASSURED

New Zealand Business Council for Sustainable Development

Meridian Energy

CONTENTS

Energy Prices and Emission Factors

Use the information in this table to help calculate your potential savings in the case studies.

Energy Source	Unit Energy	Price[+] $	Emission Factor[‡]
Electricity	kWh	$0.072/kWh	0.000625
Natural Gas	MJ	$0.012/MJ	0.0000524
Diesel	litre	$0.56/litre	0.00271
Petrol	litre	$0.82/litre	0.00232
Sub-bituminous Coal	tonne	$100/tonne	2.064

Emission Factor = tonnes of CO_2 emitted per unit of energy.
[+]Ministry of Economic Development 'Energy Data File' July 2004, excluding GST.
[‡]New Zealand Climate Change Office (Projects emission factors), 2004. The electricity emission factor is based on an operating margin electricity factor.

Estimated Potential Savings

Enter the savings you calculate can be made for your operation here.

Initiative	Energy Saved	Unit
Regular hull maintenance		litres per hour
Regular propeller maintenance		litres per hour
Surface roughness of propeller blade		litres per hour
Navigational aids		litres per hour

This information kit is one of six aimed primarily at small to medium sized enterprises (SMEs) in New Zealand's primary production sector, namely:

- Dairying;
- Forestry;
- Mining and Quarrying.
- Protected crops;
- Fishing;

Road transport is an integral part of all of these primary production operations. For this reason, road transport has been included as a separate information kit.

ACKNOWLEDGEMENTS

We wish to acknowledge those who have participated in this project and contributed their time. In particular, our thanks go to the individuals who represented Coal Association of New Zealand, Energy Efficiency and Conservation Authority, Holcim (New Zealand) Ltd, IAG New Zealand Limited, Landcare Research New Zealand Limited, Massey University, Mercury Energy, Meridian Energy Limited, Motor Trade Association, New Zealand Climate Change Office, New Zealand Steel Limited, New Zealand Business Council for Sustainable Development, Road Transport Forum, Tourism Industry Association of New Zealand, The New Zealand Vegetable & Potato Growers Federation's Fresh Tomato Sector & Fresh Vegetable Sector's Covered Crops Group, Westland Milk Products, and Westpac. Thank you also to those companies for their financial support and/or 'in-kind' support towards this study. In addition to making the financial contributions, participants from these organisations participated in the ongoing planning of the research; participated in discussion groups at workshops; provided the information used in the case studies; and provided information about energy use and energy efficiency in each sector. The Minister for the Environment's Sustainable Management Fund, which is administered by the Ministry for the Environment, provided financial support for this study.

There are also a number of other people and organisations that we would like to thank that were not part of this consortium but invested a lot of time into this project. They include Agrilink New Zealand, Carter Holt Harvey, Dairy Farmers of New Zealand (Wairarapa), Fonterra Co-operative Group Limited, Harford Greenhouses, Horokiwi Quarries Ltd, Seafood Industry Council (SeaFIC), Solid Energy New Zealand Ltd, Technolutionz Ltd, Transport Engineering Research New Zealand Ltd (TERNZ) and Winstone Aggregates.

This information kit was developed on behalf of the Energy Federation of New Zealand Inc. (EFNZ) and the above companies by Deborah Maxwell and Julia Rackley of CRL Energy Ltd. Further information and copies of this information kit can be obtained by contacting:

Deborah Maxwell, Carbon Management Climate Change Advisor, CRL Energy Ltd
68 Gracefield Road, P O Box 31 244, Wellington.
Phone: (04) 570 3707 Fax: (04) 570 3701 Email: d.maxwell@crl.co.nz

Julia Rackley, Climate Change and Environmental Advisor, CRL Energy Ltd
77 Clyde Road, P O Box 29 415, Christchurch.
Phone: (03) 364 3177 Fax: (03) 364 2774 Email: j.rackley@crl.co.nz

INTRODUCTION

This information kit can save you money! Energy is a direct cost to your business and one that you can reduce. This information kit will identify and quantify energy efficient ways to:

- Reduce energy consumption;
- Improve energy efficiency; and
- Improve the bottom line of your business.

If all the measures outlined in the case studies throughout this document were implemented, a fishing operator could save over a quarter in fuel consumption per annum.

HOW TO USE THIS INFORMATION KIT

This kit provides information on energy use and energy efficiency in the fish catching sector.

Measures to improve the energy efficiency of your fishing operation are suggested and potential energy savings estimated. You can estimate the potential savings in relation to your own fishing operation by completing the simple calculators throughout this document. To complete these calculators you will need to have with you:

- A calculator;
- Annual energy consumption from your power and fuel bills; and
- The price you pay per unit for your diesel.

WHERE CAN I GET MORE INFORMATION?

While this information kit provides case studies on the effects of various measures on energy consumption and energy related costs, the costs of implementing such measures and the associated payback periods are not included.

Links to sources of information for various technologies, products, contractors and consultants can be found at the back of this kit.

GLOSSARY OF TERMS

Below is a short glossary of terms that are used throughout the document:

MJ megajoule – A joule is the energy required to heat one cubic centimetre of water by approximately a quarter of a degree Celsius, or the energy needed to lift a kilogram approximately 100 millimetres. A megajoule is 1,000,000 joules. In New Zealand it usually refers to gross energy input.

kWh kilowatt hour – Unit of electrical energy. A kWh is 3,600 joules.

tCO_2 tonnes of carbon dioxide.

WHY REDUCE YOUR ENERGY CONSUMPTION?

ENERGY COSTS ARE GOING UP!

Energy prices have been increasing significantly in the past few years. Rising volatility in oil rich areas of the world has seen the dollar value of a barrel of oil reach record high prices. These prices are being passed on to the consumer who has seen petrol prices reach their highest in 10 years.

Electricity prices have also been rising. Dry years, supply constraints, population increase, economic growth and resource management issues have been attributed to this increase.

Maui gas supplies are running out and the higher costs of exploration for new supplies are forcing the price of natural gas up.

Many renewable energy technologies seem relatively expensive. Work is continuing to develop them into viable energy options and to provide them with a 'level playing field' compared with other energy sources.

Despite price increases, energy demand is continuing to rise in New Zealand and elsewhere. Energy use in the primary production sector has fluctuated in the past seven years but has generally been increasing. Energy may have also been used more efficiently with a greater volume of production per unit of energy in many sectors. In the fishing industry, for example, the rise in energy use coincided with an 11% increase in catch. An improvement in energy efficiency may be attributed to improvements in the way fishing vessels are operated, an increase in fish stocks and technological advancements.

PRICES WILL CONTINUE TO INCREASE!

The increasing demand for electricity and the pressure for ongoing supply will mean that energy prices will continue to increase.

One of the Government's climate change policy initiatives is the emissions charge, which will be introduced on fossil fuels and industrial process emissions from 2007 to create a financial incentive to reduce emissions. The charge will approximate the international emissions price, but will be capped at NZ$25 per tonne of carbon dioxide (CO_2) equivalent.

The emissions charge will be applied at (or close to) the point of production and is expected to be reflected in a higher cost of energy to the consumer. It is uncertain how much of this charge will be passed on but it is inevitable that the fossil fuel end user will bear the brunt of the additional cost.

The emissions charge could result in a significant increase in the costs of running a business. It will impact most significantly on energy intensive sectors such as manufacturing and primary production.

The impact of the emissions charge on businesses has been calculated at three price levels. Table 1 represents the increase in energy bills if the charge were set at $10 per tonne, $15 per tonne or the maximum of $25 per tonne.

The results show that reducing energy consumption will become an increasingly important part of any business strategy.

Table 1. Increase in energy bills for the industrial sector as a result of the proposed emissions charge

	$10/tCO_2$*	$15/tCO_2$	$25/tCO_2$
Electricity	0.63c/kWh	0.94c/kWh	1.56c/kWh
Natural Gas	$0.52/GJ	$0.79/GJ	$1.31/GJ
Diesel	2.7c/litre	4.1c/litre	6.8c/litre
Petrol	2.3c/litre	3.5c/litre	5.8c/litre
Sub-bituminous Coal	$20.64/tonne	$30.96/tonne	$51.60/tonne

Source: New Zealand Climate Change Office for the year to March 2003.
*tCO_2 = tonnes of carbon dioxide. GJ = gigajoule (or 1,000 MJ).
Note: assumes 100% of the price rise is passed through to the consumer and excludes GST for businesses.

IT CAN SAVE YOU MONEY!

Reducing your energy consumption and using the energy you receive more efficiently will save you money!

Lower energy costs associated with reduced consumption will improve the bottom line of your business and help you to run a more efficient operation.

THERE ARE A NUMBER OF OTHER BENEFITS AS WELL

Aside from the benefits of an improved bottom line there are a number of other advantages. Reducing energy consumption and improving energy efficiency may also result in:

- Better risk management planning and strategies;
- Improved record keeping in regard to compliance measures;
- Improved air quality; and
- Helping to reduce New Zealand's greenhouse gas emissions and meet Kyoto Protocol obligations.

Global warming and the resulting changes to the world's climate are a growing problem. If left to run its course, climate change will have significant impacts on our economy, environment and society. By ratifying the Kyoto Protocol New Zealand is taking action to reduce greenhouse gas emissions. Further information about the actions being taken and climate change in general, can be found in the Annex of this document.

NEW ZEALAND'S FISHING SECTOR

New Zealand's economy is largely based on primary production made up of the agriculture, forestry, fishing, mining and quarrying sub-sectors. Products from the primary production sector accounted for over 60% of New Zealand's export income in the year 2003.

In 2003, fishing contributed 3% of GDP, with a total fish catch estimated at 600,000 tonnes earning over $1.5 billion for the New Zealand economy. While New Zealand's exclusive economic zone (EEZ) is the fourth largest in the world (2.2 million square kilometres, covering an area 15 times New Zealand's emergent land mass) New Zealand only contributes approximately 1% of total global fish production. Two-thirds of New Zealand waters are more than 1,000 metres deep and lack nutrient rich currents. As a result, this part of the EEZ tends to be commercially barren. It is in the shallow waters (less than 1,000 metres deep) that most fishing takes place.

New Zealand's fishing fleet is one of the oldest in the world and is made up of mostly smaller vessels. These vessels are principally constructed of wood or steel, with relatively low engine power ratings. In 2001, Statistics New Zealand established that there were 1,700 registered domestic commercial fishing vessels and 36 foreign chartered vessels operating in New Zealand waters.

FISHING ENERGY USE

The primary sector is accountable for 5% of energy consumed in New Zealand. Although this is a fairly small proportion, parts of the sector are highly energy intensive. Since 1998 energy use in the primary production sector has fluctuated but has generally been increasing. This is partly a result of increased product output, increased fishing catch and a greater emphasis on processing (such as cool stores and packing sheds).

In 1998, 33% of the energy used in the primary production sector was for fishing. The major energy inputs are diesel and fuel oil for vessels and land transport and, to a significantly lesser extent, electricity for refrigeration, cool stores and water pumping. Light fuel oil is used primarily by the catching sector to power its fishing fleet whereas most of the electricity is used by the processing sector for running refrigeration equipment.

HOW CAN YOU REDUCE YOUR FUEL CONSUMPTION?

The amount of energy used by a fishing vessel will vary depending on the size (and engineering) of the vessel, time of year, weather, fishing gear, location, skill and knowledge.

On the following page is a calculator which will help you estimate how much fuel you are using to run your vessel. To assist with your calculations, a worked example is provided based on the assumptions below.

WORKED EXAMPLE ASSUMPTIONS

Throughout this information kit case studies are used to provide an indication of the potential savings that can be made through the implementation of particular energy efficient measures.

The worked example in this kit is based on a 25 metre fishing vessel with an engine rating of 700 horsepower. This vessel is out at sea for 300 days per annum. Each trip has the engine operating, on average, 10 hours per day, for 5-7 days with a 1-2 day turnaround at the end. On each trip, between 8 and 15 tonnes of fish are caught. At sea this vessel consumes on average 150 litres of fuel per hour of engine operation.

Although diesel, light fuel oil and heavy fuel oil are all used in the fishing industry as fuel sources, for simplicity, the calculations in this information kit are based on diesel fuel only. These figures will still provide an approximation of savings for other fuels.

The savings calculated in the case studies are based on the figures in Table 2. Energy prices can vary from month to month but the Ministry of Economic Development figures are likely to be typical for some small to medium energy users. The emissions charge has not been included in the prices because it will not be applied until 2007.

Table 2. Energy prices and emission factors

Energy source	Unit Energy	Price $†	Emission Factor‡
Electricity	kWh	$0.072/kWh	0.000625
Natural Gas	MJ	$0.012/MJ	0.0000524
Diesel	litre	$0.56/litre	0.00271
Petrol	litre	$0.82/litre	0.00232
Sub-bituminous Coal	tonne	$100/tonne	2.064

Emission Factor = tonnes of CO_2 emitted per unit of energy.

† Ministry of Economic Development 'Energy Data File' July 2004, excluding GST.

‡ New Zealand Climate Change Office (Projects emission factors), 2004. The electricity emission factor is based on an operating margin electricity factor.

How much energy does your vessel consume?

Fuel Saving Calculation	Worked Example	Your Example	
Hourly diesel consumption =	150		litres per hour
Avgerage operating hours per day =	10		hours per day
Litres per day = hours per day x litres per hour = (150 x 10)	1,500		litres per day
No. of sea days per annum =	300		days per annum
Annual litres = litres per day x no. sea days = (1,500 x 300)	450,000		litres per annum
Tonnes of CO_2 = litres per hour x emission factor = (150 x 0.00271)	0.41		tCO_2 per hour
$ per hour = litres per hour x $/litre = (150 x 0.56)	84.00		$ per hour
Tonnes of CO_2 = litres per annum x emission factor = (450,000 x 0.00271)	1,220		tCO_2 per annum
$ per annum = litres per annum x $/litre = (450,000 x 0.56)	252,000		$ per annum

VESSEL OPERATION

Wave making resistance is the most significant form of resistance. To reduce wave making resistance, and consequently energy consumption, you may consider the following:

- Ensure that the vessel's engine is regularly serviced and maintained;
- Monitor fuel flow and engine performance;
- Ensure that the size and type of engine installed in the vessel are matched to the needs of the operation; and
- At replacement, consider selecting vessels, machines and equipment with fuel efficient technologies .

Speed is the single most important factor to influence wave making resistance and fuel consumption. Reducing speed when steaming can result in significant reductions in fuel demand but may be offset by longer sea days, which increases wages and fatigue and reduces safety. It can also impact on catch rates and delivery times.

HULL DESIGN AND MAINTENANCE

Frictional resistance is the second most significant form of resistance following wave making resistance and can have a considerable effect on fuel consumption. Frictional resistance is partially controllable by the vessel operator because it depends on the smoothness of the underwater surface of the hull. You can:

- Regularly maintain the vessel's hull by removing marine weed and small molluscs. This maintenance will assist the vessel in moving more smoothly through the water. One month after its last service, a vessel could be using 7% more fuel compared with immediately after the hull service;
- Regularly replace sacrificial anodes and anti-corrosive paint; and
- Consider hull form at vessel replacement or when expanding the fleet:
  - in general a long, thin vessel is more easily driven than a short, fat vessel. While a finely shaped, thin bow with a narrow angle of entry can help to reduce wave resistance, such a design has limited carrying capacity for the length of vessel and may not be economically feasible, in spite of better fuel efficiency; and
  - sharp shoulders should be avoided to minimise flow separation.

Note : A flat transom stern presents higher resistance characteristics than a cruiser or elliptical stern. However, the transom stern creates significantly more deck space as well as internal storage capacity, and it has therefore become a common feature in the design of most small vessels.

Case Study – Regular Hull Maintenance

Regular hull maintenance including removal of marine weed and small molluscs will assist the vessel in moving more smoothly through the water, reducing energy use. Energy use may be further reduced by the use of anti-fouling paints.

It is assumed here that regular hull maintenance improves the vessel's fuel efficiency by 7%.

Fuel Saving Calculation	Worked Example	Your Example	
Hourly diesel consumption =	150		litres per hour
Litres per hour saved = litres per hour x % saved = (150 x 7%)	10.5		litres per hour
Cost reduction = litres per hour x $/litre (10.5 x 0.56)	5.88		$ per hour

PROPELLER

The propeller is the most significant single technical item on a fishing vessel. Its design and specification have a direct influence on fuel efficiency. Poor propeller design is the most frequent single contributor to fuel inefficiency.

Propeller efficiency may be improved and energy consumption reduced if you:

- Increase the diameter of the propeller. The diameter of the propeller should be as large as the hull design and engine installation allow;
- Allow for a large clearance of the propeller between its tip and the hull;
- Remove fouling (weed and mollusc growth) from the propeller. This can result in a fuel saving of as much as 10% if removed annually;
- Ensure that the propeller is suited to the vessel and engine operation;
- Fit a propeller nozzle, which will allow a vessel to tow larger gear or to tow the normal gear at a faster rate and maintain a given tow speed in bad weather conditions; and
- Reduce the surface roughness of the larger propeller blade. Over time a propeller can become damaged and worn, reducing the smoothness of its surface and leading to an increase in fuel consumption by as much as 4%.

Case Study – Regular Propeller Maintenance

Regular propeller maintenance including the removal of fouling (weed and mollusc growth) from the propeller is assumed to improve the vessel's fuel efficiency by 10% after one year.

Fuel Saving Calculation	Worked Example	Your Example	
Hourly diesel consumption =	150		litres per hour
Litres per hour saved = litres per hour x % saved = (150 x 10%)	15		litres per hour
Cost reduction = litres per hour x $/litre = (15 x 0.56)	8.40		$ per hour

Case Study – Surface Roughness of Propeller Blade

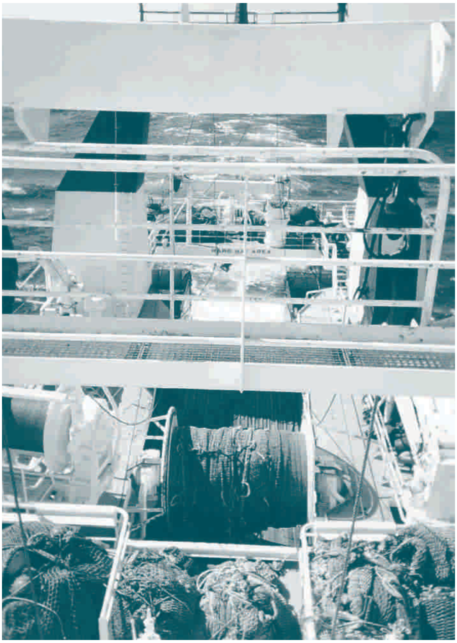
Over time a propeller can become damaged and worn, reducing the smoothness of its surface and leading to an increase in fuel consumption. Reducing the surface roughness of the propeller blade annually can save 4% of fuel consumption.

Fuel Saving Calculation	Worked Example	Your Example	
Hourly diesel consumption =	150		litres per hour
Litres per hour saved = litres per hour x % saved = (150 x 4%)	6		litres per hour
Cost reduction = litres per hour x $/litre = (6 x 0.56)	3.36		$ per hour

EQUIPMENT AND MACHINERY

Careful management of on-board equipment and machinery will help reduce energy. You may achieve improved fuel efficiency by:

- Keeping accurate fuel consumption records in order to monitor performance more accurately;
- Regularly servicing and cleaning machinery and equipment;
- Regularly maintaining on-board equipment, including refrigeration lines and piping;
- Regularly cleaning the air filtration systems of the engine room;
- Using navigational aids such as satellite navigators and echo sounders. The use of navigational aids may reduce fuel consumption by 10%;
- Reducing the resistance of nets (with no loss to fishing ability) by using smaller diameter twines or lighter material in the construction of gear to reduce the towing drag or resistance;
- Increasing operator education and awareness;
- Improving the matching of vessels, machines and equipment to tasks by:
  - ensuring the appropriate machine (engine size for the task) is used; and
  - correctly sizing engines, motors or pumps for the task/operation; and
- Replacing energy inefficient machines, vehicles and equipment with more fuel efficient technologies.



VENTILATION

Ventilation not only helps to provide clean air but also keeps temperatures in engine rooms lower. You may improve the energy efficiency of ventilation systems by:

- Ensuring cooling fans are clean;
- Regularly cleaning the air filtration systems;
- Installing sensors and timer controls to minimise the operation of secondary fans; and
- Installing and using variable speed drives in applications with varying load requirements.

Case Study – Navigational Aids

Navigational aids such as satellite navigators and echo sounders can reduce steaming distances by more effectively locating fish species, resulting in a saving of up to 10% of total fuel consumption.

Fuel Saving Calculation	Worked Example	Your Example	
Hourly diesel consumption =	150		litres per hour
Litres per hour saved = litres per hour x % saved = (150 x 10%)	15		litres per hour
Cost reduction = litres per hour x $/litre = (15 x 0.56)	8.40		$ per hour

TOTAL SAVINGS

The methodology below provides an indication of the order of savings that can be made by the measures specified. It should be noted that this method over-inflates the potential total savings since each measure has been calculated from the initial energy use.

That is, if the initial energy consumption were 10,000 litres per annum and a measure were implemented that saved 10%, the annual energy consumption would be reduced to 9,000 litres (10,000 litres minus 10%). If a second measure were implemented the savings made would be subtracted from the new energy consumption amount. That is:

First measure (10% saving) = 10,000 litres – 10% = 9,000 litres per annum

Second measure (10% saving) = 9,000 litres – 10% = 8,100 litres per annum

Therefore implementation of two separate measures, each of which produces 10% energy savings, will lead to a 19% energy reduction.

Potential savings for your vessel

	Worked Example	Your Example	
Regular hull maintenance	10.5		litres per hour
Regular propeller maintenance	15		litres per hour
Surface roughness of propeller blade	6		litres per hour
Navigational aids	15		litres per hour
TOTAL saved for this fishing vessel	**46.5**		**litres per hour**
Tonnes of CO_2 = litres per hour x emission factor = (46.5 x 0.00271)	0.13		tCO_2 per hour
$ per hour = litres per hour x $/litre = (46.5 x 0.56)	26.04		$ per hour

Potential savings per annum

	Worked Example	Your Example	
Average number of hours per sea day =	10		sea days per annum
Litres saved per sea day = hours per day x litres per hour = (10 x 46.5)	465		litres per sea day
Average number of sea days per annum	300		litres per sea day
Litres = average no. of sea days x litres per day = (300 x 465)	139,500		litres per annum
Tonnes of CO_2 = litres per annum x emission factor = (139,500 x 0.00271)	378		tCO_2 per annum
$ per annum = litres per annum x $/litre = (139,500 x 0.56)	78,120		$ per annum

Percentage savings of total annual fuel consumption

	Worked Example	Your Example	
Total fuel consumption =	450,000		litres per annum
Litres saved per annum =	139,500		litres per annum
% of total = litres saved ÷ total litres x 100 = (139,000 ÷ 450,000 x 100)	31		%

SIMPLE PAYBACK CALCULATION

It has not been possible to provide examples of payback periods for all the energy efficiency measures in this information kit. However, a calculator has been included on the following page that will help quantify the potential payback for energy efficiency measures in relation to your own business.

The payback period is the most commonly used measure to assess the cost effectiveness of energy efficiency. The payback period is the amount of time it takes for an energy efficiency measure's energy cost savings to cover its purchase, installation and operating costs.

It is calculated by the simple equation:

Payback period =
initial investment net ÷ annual savings

The **initial investment** is the initial cost of purchasing the new energy efficient equipment. It may be the difference between the cost of the energy efficient equipment and the cost of the inefficient equipment that would have otherwise been installed. If existing equipment can be sold, the residual value should be subtracted from the initial cost as well.

Net annual savings is the energy cost savings resulting from the measure (determined either from the calculators in this document or the cost difference between the existing energy consumption and the new energy consumption) minus the annual costs related to the implementation of the measure (for example, operating costs which may include additional maintenance and servicing requirements or periodic replacement of parts such as filters or belts).

If an energy efficiency measure will not result in enough energy cost savings to pay for its purchase, installation and operating cost within the life of the measure, it is unlikely to be installed.

If an emissions charge were applied at the $25 per tonne CO_2 level (to estimate the future cost of energy), this would make energy prices and therefore cost savings higher. Consequently, payback periods would be shorter to some degree.

Simple Payback Calculation

Payback period is a measure of the number of years (or months or days) required for the benefits of a measure to equal the required initial capital investment.

Payback period = initial investment ÷ net annual savings

Net annual savings = annual savings resulting from the measure – annual costs related to the implementation of the measure.

For the Worked Example

Using the case study of reducing the surface roughness of the propeller blade annually, a simple payback period can be calculated of 0.19 years or 3 months. This measure can save 4% of fuel consumption which equates to 18,000 litres of diesel or $10,080 (diesel price of $0.56/litre). The initial investment will be the initial audit of the blade and may cost $1,500. If this maintenance is undertaken once a year (when the vessel is already being dry docked for hull maintenance) the other cost to consider will be the cost of the service itself (estimated for the worked example vessel to be $2,000).

The payback period for such a measure would therefore be:

Payback period = initial investment ÷ net annual savings

Initial investment = initial propeller blade investigation = $1,500

Net annual savings = annual savings $10,080 – annual costs above existing costs $2,000 = $8,080

Payback period = $1,500 ÷ $ 8,080 = 0.19 years or 3 months

What does this mean for your vessel?

Initial investments =

Net annual savings =

Payback period = ÷ =

FURTHER INFORMATION

Further information on this sector can be found at:

- Ministry of Fisheries – Ph: (04) 470 2600 (www.fish.govt.nz)
- Seafood Industry Council (SeaFIC) – Ph: (04) 385 4005 (www.seafood.co.nz)

FOR INFORMATION ON:

MANAGING AND REPORTING ON GREENHOUSE GAS EMISSIONS

- Energy/Biodiversity Exchange Project (EBEX21) – Landcare Research New Zealand Limited (www.ebex21.co.nz)
- Emprove (if a company has a large energy bill) – Energy Efficiency and Conservation Authority (EECA) (www.emprove.org.nz)
- Triple Bottom Line Reporting Guide – Sustainable Business Network (www.sustainable.org.nz)
- NZBCSD Emissions Accounting & Reporting Guide – New Zealand Business Council for Sustainable Development (www.nzbcsd.org.nz)

THE BUSINESS OPPORTUNITIES ASSOCIATED WITH CLIMATE CHANGE

- The NZBCSD report on the business opportunities associated with climate change is useful – New Zealand Business Council for Sustainable Development (www.nzbcsd.org.nz)

REDUCING TRANSPORT RELATED GREENHOUSE GAS EMISSIONS

- Econodrive – Energy Efficiency and Conservation Authority (EECA) (www.eeca.org.nz)
- Greenfleet – Sustainable Business Network (www.sustainable.org.nz)

SIMPLE, PRACTICAL TIPS ON HOW TO REDUCE GREENHOUSE GAS EMISSIONS

- ‘Four Million Careful Owners’ – New Zealand Climate Change Office (www.4million.org.nz)
- Climate Friendly Kiwi Guide – BRANZ Limited (www.branz.co.nz)

MEASURING GREENHOUSE GAS EMISSIONS

- E-bench – Energy and Technical Services Ltd (www.energyts.com)
- EnergyPro – (www.energyPro.co.nz)
- NZBCSD Emissions Accounting & Reporting Guide – New Zealand Business Council for Sustainable Development (www.nzbcsd.org.nz)

ENERGY EFFICIENCY TIPS

- NZBCSD guide to energy efficiency – New Zealand Business Council for Sustainable Development – (www.nzbcsd.org.nz)
- Meridian Energy: Energy Efficiency Tips for SMEs – Meridian Energy (www.meridianenergy.co.nz)

CONTRACTORS, PRODUCTS AND SUPPLIERS

- ‘Find An Expert’ – Energy Efficiency and Conservation Authority (www.eeca.govt.nz)

ANNEX – ENERGY AND CLIMATE CHANGE

CLIMATE CHANGE

The global climate changes naturally over time and has undergone significant changes over millions of years. There is a blanket of gases around the Earth, which the sun's warmth can pass through easily. Usually when energy from the sun enters the Earth's atmosphere, about one third of this energy is reflected back into space. Of the rest, the atmosphere absorbs some, but most of it is absorbed by the surface of the Earth.

GLOBAL WARMING

Certain gases in the atmosphere (commonly referred to as greenhouse gases) block the heat being reflected back to space and radiate it back to the Earth's surface, having an insulation effect. Water vapour is the main natural greenhouse gas. Other gases include carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

While water vapour is the most significant natural greenhouse gas it cannot be controlled by humans. Human activity has, however, influenced the atmospheric concentrations of the other greenhouse gases listed above. Since the beginning of the industrial revolution (about 1700 A.D.), the levels of other greenhouse gases in the atmosphere have significantly increased. This increase is largely associated with human activities such as the combustion of fossil fuels and vegetation changes. As a result, more radiation is being trapped in the Earth's atmosphere, causing it to warm (global warming).

Climate change is a global environmental problem, predominantly caused by human activities. The likely effects of climate change include rising average temperatures, rising sea levels, more frequent extreme weather events and a change in rainfall patterns. There is strong scientific consensus that, by the end of this century, these changes will occur on a scale that will cause serious harm to ecosystems, industries, infrastructure, human health, biosecurity and economies world wide.

This global warming has begun to affect the world's climate. The effects on weather patterns and larger scale climatic trends are expected to become steadily more pronounced over time.

There will be both positive and negative consequences of climate change. But globally, more people are likely to be harmed by the effects of climate change than will benefit. If greenhouse gas emissions are not reduced significantly over the coming decades, the impacts of climate change will more than likely get steadily worse and the costs could be severe.

KYOTO PROTOCOL

In response to this risk, the Kyoto Protocol was initiated to try to reduce global greenhouse gas emissions, with each member country being set reduction targets. Under the Kyoto Protocol, New Zealand will have to limit net average greenhouse gas emissions to 1990 levels during the period 2008 to 2012 (the first commitment period). Almost 62 million tonnes of CO_2 equivalent were emitted in 1990, meaning that New Zealand must take responsibility for any emissions in excess of its 307 million tonnes allocation over the first commitment period.

New Zealand is steadily increasing its greenhouse gas emissions. Current estimates suggest total emissions for 2002 were 22% higher than in 1990 (excluding net removals from forest sinks).

CLIMATE CHANGE POLICY

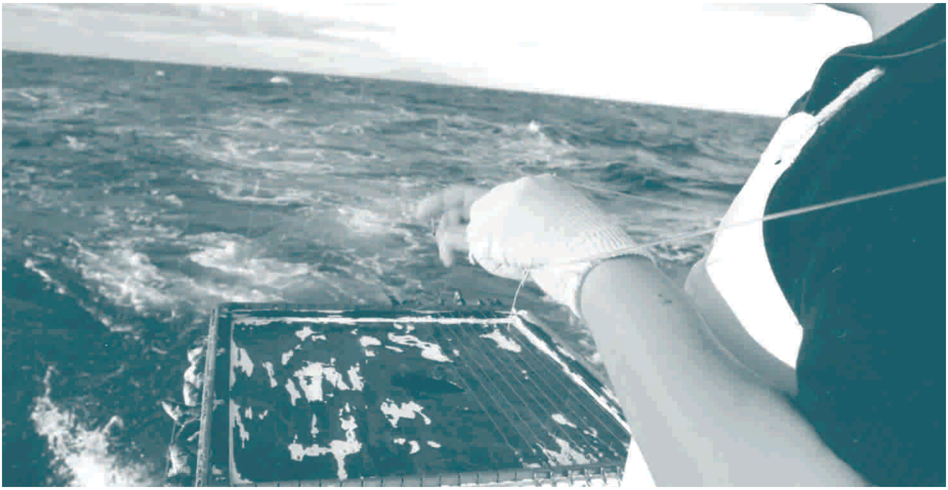
In order for New Zealand to meet its Kyoto Protocol target the Government has introduced a climate change policy. This policy includes the use of an emissions charge, incentives for greenhouse gas emission reduction projects, agriculture sector funded research, negotiated greenhouse agreements (NGAs) with mainly larger industries, the encouragement of forest sinks and the possible use of emissions trading. For this policy to be a success the Government requires the assistance and cooperation of a wide variety of sectors of the economy.

Further information in relation to this policy can be found at the New Zealand Climate Change Office website – www.climatechange.govt.nz

ENERGY AND CLIMATE CHANGE

Agriculture and energy are two of the largest emitting sectors in New Zealand. Since 1990 emissions from the energy sector have increased by 35%, largely due to increased CO_2 from road transport and thermal electricity generation using natural gas and coal.

Therefore, a good way to reduce greenhouse gas emissions is through reducing the demand for energy and improving energy efficiency.



ENERGY FEDERATION OF NEW ZEALAND INCORPORATED (EFNZ)

This information kit was produced on behalf of the Energy Federation of New Zealand Incorporated (EFNZ) with support from the Sustainable Management Fund and a consortium of companies. The EFNZ is a non-profit, membership based professional and independent energy industry assosciation, which promotes the sustainable development and use of energy resources in New Zealand and globally. It was established in 1997 by the merger of the Energy Foundation of New Zealand and the New Zealand branch of the World Energy Council. The EFNZ runs an active programme of seminars, conferences, submissions and research projects, both independently and in collaboration with other energy sector organisations.

As a member of the World Energy Council, the EFNZ:

- Liaises with similar international organisations;
- Participates in international research projects on energy issues;
- Promotes New Zealand representation at World Energy Council meetings;
- Supplies information on the activities of the World Energy Council; and
- Participates in World Energy Council study committees.

A range of services is provided to members of the EFNZ including:

- Newsletters;
- Faxed or emailed circulation of new items;
- Seminars, conferences and workshops;
- Energy studies;
- Distribution of World Energy Council and other energy related international material;
- Collective research commissions;
- Participation in international studies and working groups;
- Representation of energy industry views; and
- Member access to the global energy information system at www.worldenergy.org.

For further information in relation to the EFNZ contact:

Mr Cito Gazo
EFNZ Executive Officer
Phone: (04) 570 3712
Fax: (04) 570 3701
Email: energy.fed@crl.co.nz

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