Subsidies that Encourage Fossil Fuel Use in Australia

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Foreword

This Working Paper is an extended version of a paper presented at the Australia New Zealand Society for Ecological Economics (ANZSEE) 2002 Conference on Ecologically Sustainable Development (Riedy, 2002). It updates and substantially revises an earlier paper on subsidies to fossil fuels in Australia (Riedy and Diesendorf, 2003). The research presented in this paper is part of the author's PhD research.

Note: Dollar values quoted in the text are in Australian 2001-02 dollars unless otherwise stated.

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Abbreviations and Acronyms

4WDs	Four wheel drive vehicles
AAA	Australian Automobile Association
ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACF	Australian Conservation Foundation
ACIS	Automotive Competitiveness & Investment Scheme
AEA	Australian Ecogeneration Association
ATRF	Australian Tax Research Foundation
BTE	Bureau of Transport Economics
BTRE	Bureau of Transport and Regional Economics
CNG	Compressed natural gas
CO_2	Carbon dioxide – the most important greenhouse gas
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFGS	Diesel and Alternative Fuels Grants Scheme
DFRS	Diesel Fuel Rebate Scheme
DISR	Department of Industry, Science and Resources
DITR	Department of Industry, Tourism and Resources
ECITA	Environment, Communications, Information Technology and the Arts
ExternE	Externalities of Energy – a research project of the European Commission
FBT	Fringe benefits tax
FSGS	Fuel Sales Grants Scheme
GDP	Gross Domestic Product – a measure of national economic activity
GGAP	Greenhouse Gas Abatement Program – a federal competitive funding program
GHG	Greenhouse gas – e.g. carbon dioxide, methane, nitrous oxide
GST	Goods and Services Tax
HCFC	Hydrochlorofluorocarbon – a greenhouse gas
IEA	International Energy Agency
IPART	Independent Pricing and Regulatory Tribunal
kWh	Kilowatt hours – a measure of electricity consumption
LCT	Luxury car tax
LCVs	Light commercial vehicles
LNG	Liquefied natural gas
LPG	Liquefied Petroleum Gas
MPF	Major Projects Facilitation
NIEIR	National Institute of Economic and Industry Research
NRTC	National Road Transport Commission
OECD	Organisation for Economic Cooperation and Development
PMVs	Passenger motor vehicles
PRRT	Petroleum Resource Rent Tax
R&D	Research and development
SPP/CPM	Southern Pacific Petroleum / Central Pacific Minerals
TES	Tax Expenditures Statement
UNEP	United Nations Environment Programme
UTS	University of Technology, Sydney
VKT	Vehicle kilometres travelled
WST	Wholesale sales tax

Table of Contents

1 Introduction

1.1 Background

The Australian Government's decision not to ratify the Kyoto Protocol is based at least partially on a concern that domestic action to cut greenhouse gas emissions will harm Australia's economy by exposing Australian businesses to costs not faced by their international competitors (Kemp and Downer, 2002). While certain types of greenhouse abatement action may harm the economy, other actions have the potential to provide substantial gains in economic efficiency in concert with reductions in carbon dioxide emissions – a 'no regrets' outcome for the economy and the environment.

A key action of this type is the removal of perverse subsidies to, and incentives for, production and consumption of fossil fuels. Estimates of global fossil fuel subsidies range from $US151 billion to $US235 billion per year (de Moor, 2001, UNEP and IEA, 2002). Most of the existing subsidies are in the developing world, however OECD countries also provide fossil fuel subsidies (IEA, 1999, UNEP and IEA, 2002).

Modelling of the global economy by (for example) Anderson and McKibbin (1997) has demonstrated that international reform of fossil fuel subsidies can deliver both gains in economic efficiency and greenhouse abatement. An IEA study found that subsidy removal in eight non-OECD countries could increase GDP of those countries by almost 1% and lower CO_2 emissions by 16% (IEA, 1999). If fossil fuel subsidies exist in Australia, it would be reasonable to assume that their removal would have similarly positive impacts.

As well as subsidies to fossil fuel production and consumption, other economic incentives are often built into the structure of the economy, and particularly the taxation system, which encourage greater consumption of fossil fuels. These incentives act as structural barriers to greenhouse gas abatement. Removal of these incentives also has the potential to deliver a double dividend of improved economic performance and greenhouse abatement.

Although public funds are used to provide subsidies, the public is often unaware of the existence and magnitude of the subsidies. One of the aims of this paper is to describe and quantify public subsidies to fossil fuel use and production in Australia to improve the transparency of government funding allocation.

1.2 Previous Work on Subsidies in Australia

The National Institute of Economic and Industry Research (NIEIR) examined subsidies to the use of natural resources in Australia in 1996, but encountered:

> conceptual as well as practical difficulties in getting the data…(which meant that the study)…developed as more of a discussion document and less as a catalogue of hard figures (NIEIR, 1996, p.iii).

Despite these difficulties, NIEIR arrived at an estimate of $1.995 billion (in 1994 dollars) in financial subsidies to the Australian energy sector, and between $4.076 and $5.196 billion in environmental subsidies. However, NIEIR did not completely distinguish between subsidies to fossil fuels and subsidies to other forms of energy.

In November 2000, the Senate Environment, Communications, Information Technology and the Arts References Committee released the final report of its inquiry into Australia's response to global warming (ECITA References Committee, 2000). The report estimated direct fossil fuel subsidies at $2 billion per year, referring to NIEIR's earlier work, but found an additional $4 billion in indirect subsidies such as 'tax incentives, startup grants, preferential purchasing agreements for oil, and biased market structures' (ECITA References Committee, 2000, p.xxxvi).

It is not clear from the report whether the indirect subsidies were only to fossil fuels or to the energy sector as a whole. The $4 billion estimate for indirect subsidies is apparently based on a summation of specific subsidies reported to the inquiry in hearings and submissions. No attempt was made to ensure that all estimates were based on a consistent definition and benchmark, so the accuracy of the overall estimate is questionable.

There have been some studies of specific subsidies in the Australian context, such as subsidies associated with supply of electricity to aluminium smelters at below market prices (Turton, 2002). These studies provide detail

on particular subsidies that was not available to NIEIR when they prepared their report in 1996. However, the subsidy estimates provided in these detailed studies are not always comparable due to differences in methodology and subsidy definition. The widespread confusion about how to define subsidies can lead to inconsistent estimates (UNEP and IEA, 2002).

In the developed world, most energy subsidies are more than offset by special taxes on fossil fuels. A World Bank estimate of the total net fossil fuel subsidies in the OECD found only $US10 billion ($18 billion) in annual subsidies (UNEP and IEA, 2002). It is difficult to reconcile the Senate Inquiry estimate of a $6 billion annual subsidy with this estimate of an $18 billion subsidy to the entire OECD. Again, definitional differences may explain the inconsistency.

From review of these reports, it is evident that the magnitude of subsidies to fossil fuels in Australia is still uncertain and that further work is required to arrive at an accurate estimate of these subsidies, using a consistent definition. The energy sector in Australia has also undergone significant change since NIEIR published its estimate of subsidies in 1996 and it is now appropriate to reassess the magnitude and type of subsidies to fossil fuel production and consumption in Australia using the most recent available data.

This paper builds on and extends the earlier work on subsidies to provide a more complete and up to date description of the subsidies to fossil fuel production and consumption in Australia and a new estimate of their magnitude. Different categories of subsidy are defined as a guide to identifying whether subsidies are appropriate or should be targeted for removal. The paper also considers structural aspects of the economic system that may encourage consumption of fossil fuels.

2 Definition of Subsidies

2.1 Summary of Recent Definitions

There has been extensive debate over how to define a subsidy. De Moor (2001) briefly summarises this debate. Despite this debate, most recent theoretical definitions of subsidies closely agree (see for example De Moor (2001) and UNEP and IEA (2002)). In this paper I have followed the definition provided by De Moor and Calamai (1997) and restated by De Moor (2001, p.168) as:

> Subsidies comprise all measures that keep prices for consumers below market level or keep prices for producers above market level or that reduce costs for consumers and producers by giving direct or indirect support.

This is essentially the same as the definition used by the IEA (UNEP and IEA, 2002). More specifically, energy subsidies are defined by the IEA as:

> any government action that concerns primarily the energy sector that lowers the cost of energy production, raises the price received by energy producers or lowers the price paid by energy consumers (UNEP and IEA, 2002, p.9).

Fossil fuel subsidies can then be defined as *any government action, concerning primarily the energy sector, that lowers the cost of fossil fuel production, raises the price received by fossil fuel producers or lowers the price paid by fossil fuel consumers*.

2.2 Comparison With NIEIR's Definition

The definition used by NIEIR in its 1996 report differs slightly from those listed above. NIEIR states that a subsidy arises:

> …when a government deliberately adds to the revenue or relaxes the financial performance criteria of a productive entity to enable it to sell its outputs at less than the real costs incurred in producing those outputs (NIEIR, 1996, p.14).

While the previous definitions focus on financial benefits for both producers and consumers, NIEIR focuses solely on benefits for producers. This may lead to some discrepancies between subsidy estimates developed here and those developed previously by NIEIR.

2.3 Choice of Benchmark

De Moor notes that choosing a benchmark situation against which to define subsidies is crucial. Theoretically, the benchmark situation is that in which private welfare is maximised. Any deviation of prices from marginal private costs therefore implies a subsidy. In practice, the world market price is commonly used as the benchmark for identifying domestic subsidies for traded goods. Deviation of prices from the world market price indicates the existence of a subsidy. For goods that are not traded, the price charged can be compared with the unit cost of production to identify whether cost recovery is occurring (de Moor, 2001).

Australia trades black coal, oil and natural gas internationally, so any gap between the domestic and world market prices would be indicative of a subsidy for these fuels. Brown coal is not traded internationally, so the price of brown coal would need to be compared to the cost of production to identify subsidies.

While top-down comparison of domestic prices with world prices can indicate the presence of a subsidy, it does not facilitate identification of specific subsidies and the regulatory instruments or policies that support them. I have therefore employed a bottom-up approach, using cost recovery as a benchmark, to identify subsidies. This approach allows for identification of a wide range of specific subsidies that encourage greater use of fossil fuels. Identification of specific subsidies is a prerequisite to subsidy reduction or removal.

3 Subsidy Types

3.1 Financial Subsidies and Externalities

A distinction is often made between financial subsidies and subsidies associated with the failure to incorporate negative environmental and social externalities into existing economic frameworks.

3.1.1 Financial Subsidies

Financial subsidies occur within the existing economic framework. Financial subsidies tend to decrease the cost of production and/or consumption and therefore increase the activity level of entities involved in the activities that are subsidised. When the activity that is subsidised is an environmentally disruptive one, such as fossil fuel production and consumption, financial subsidies will tend to increase the degree of environmental disruption. Specifically, subsidies to fossil fuel production and consumption will increase greenhouse gas emissions, as greater quantities of fossil fuel will be burnt and associated emissions of carbon dioxide will increase.

3.1.2 Subsidies Associated with Externalities

Externalities are costs and benefits that are not explicitly included by markets. Hence, negative externalities are costs that are not fully paid by the entities responsible for incurring the costs, creating an implicit incentive to continue or increase the activity that creates the cost. All future references to externalities in this paper will mean negative externalities.

The main distinction between subsidies associated with environmental and social externalities and financial subsidies is that the former are not the result of a specific policy or action by government. Instead, they arise from the historical evolution of the economic system and the prevailing economic paradigm. Whereas financial subsidies arise from government action, subsidies associated with externalities stem from the absence of government or private action to incorporate the externalities into the economic system.

There is an ongoing debate over the magnitude of the environmental and social externalities associated with fossil fuel combustion and who will bear the brunt of these costs. It is not the purpose of this paper to contribute to that debate. Readers are referred to the European Commission's ExternE study for a comprehensive consideration of energy externalities, including recent estimates of their magnitude in the European Union (see Krewitt (2002) for a recent review of ExternE and European Commission (2001) for comprehensive results).

This paper will concentrate solely on financial subsidies while noting that where financial subsidies are associated with environmental and social externalities, environmental and social disruption will tend to be magnified (NIEIR, 1996).

It is also worth noting that governments around the world have implemented, or are considering, policy instruments that begin to incorporate the environmental and social costs of fossil fuel consumption into prices. These instruments include emissions trading and carbon taxes.

3.2 Different Forms of Implementation

De Moor (2001) provides a practical guide for identifying subsidies that divides subsidies into the following types based on the form of implementation:

- budgetary subsidies, including direct expenditure and tax expenditure;
- public provision of goods and services below cost;
- capital cost subsidies; and
- policies that create transfers through the market mechanism.

Each of these subsidy types is discussed in more detail below.

3.2.1 Direct Expenditure

Budgetary subsidies implemented through direct expenditure include explicit subsidies, rebates, grants or other types of payment to consumers or producers. These types of subsidies are usually the easiest to identify as governments often report the existence and magnitude of these subsidies in annual budget papers. However, subsidies of this type may not be universally disclosed, or may be aggregated with other budget items, which can make identification difficult.

3.2.2 Tax Expenditure

A tax expenditure 'is a tax concession that is designed to provide a benefit to a specified activity or class of taxpayer' (Commonwealth Government, 2003, p.1). Forms of tax expenditure include tax exemptions, tax rebates, tax deductions, reduced tax rates or deferred tax liabilities. Tax expenditures are an alternative to direct expenditure that provides favourable tax treatment for particular entities.

The complexity of the taxation system can make identification of subsidies implemented through tax expenditure difficult. As a requirement of the *Charter of Budget Honesty Act 1998*, the Commonwealth Government publishes an annual *Tax Expenditures Statement* (TES) that estimates the cost of tax expenditures to the Commonwealth budget. This is a key source of information on subsidies implemented through tax expenditure.

To estimate the cost of a tax expenditure to the public, a taxation benchmark needs to be identified against which favourable tax treatment can be assessed (Pender, 2001). Any deviations from the benchmark are then defined as tax expenditures. The *2002 Tax Expenditures Statement* provides a detailed discussion of an appropriate taxation benchmark for Australia, based on a practical interpretation of a Schanz-Haig-Simons definition of income (Commonwealth Government, 2003).

The definition of a taxation benchmark requires a degree of judgement as to which aspects of the taxation system are intrinsic features of the system and which are deviations. This means that any proposed taxation benchmark is contestable. For the purposes of this paper, and consistent with the subsidy definitions above, I have assumed that only deviations from the taxation benchmark defined by the Commonwealth Government constitute subsidies.

However, it is possible that features of the taxation system that the Commonwealth Government has included in the taxation benchmark could alternatively be defined as tax expenditures, and would therefore constitute subsidies. Areas of uncertainty in the benchmark definition are discussed in later sections.

It is also possible that the design of the tax system itself can encourage fossil fuel production or consumption. Douglas (2002) identifies design features of the taxation system that discourage expenditure on the environment, and it is reasonable to expect that there are also design features that encourage fossil fuel use. The design of the tax system could therefore be a subsidy by the definition discussed previously. For the purposes of this paper, tax expenditures will be defined as subsidies. Design features of the tax system will also be discussed where they have the potential to act as incentives for fossil fuel production and consumption.

When considering subsidies that are administered through the taxation system, it is important to also consider any special taxes, such as resource rent taxes that are imposed on fossil fuel producers and consumers. These special taxes can offset the impact of subsidies. According to the UNEP and IEA, most OECD countries more than offset any gross energy subsidies with special taxes and duties on fossil fuels (UNEP and IEA, 2002).

3.2.3 Failure to Recover Cost of Public Services

The public provision of goods and services below cost is a form of subsidy. This can include the provision of infrastructure and public agency services, or public contributions to research and development (R&D). A failure to recover costs can include the failure of public agencies and public infrastructure to achieve a normal rate of return on investment.

Infrastructure subsidies are often delivered as part of confidential commercial contracts with governments and can be difficult to identify. Examination of budget papers can reveal that particular public agencies are not recovering the cost of their services, but it can be difficult to determine what proportion of the cost should be paid by particular groups, such as fossil fuel producers. Public contributions to research and development can usually be identified but are often diffuse and difficult to collate.

3.2.4 Capital Cost Subsidies

These subsidies include preferential loans, loan or liability guarantees and debt forgiveness (de Moor, 2001). Complex financial arrangements and commercial protection of details of capital provision can make identification of these subsidies difficult.

Provision of capital at less than market rates can be identified by comparing the actual cost of capital to the subsidised entity to the cost of capital for a comparable unsubsidised entity. Judgement is required to identify an appropriate benchmark.

3.2.5 Market Transfers

Policies that create transfers through the market mechanism include domestic-oriented policies such as price regulation, quantity controls and procurement policies, and trade-oriented policies such as import and export tariffs and non-tariff barriers (de Moor, 2001). In these cases, the benchmark is usually defined as a free trade, free market economy. However, tariffs and other market policies may serve an important public good purpose and are not always suitable for removal, at least in the short-term.

3.3 Scope of Subsidies Considered

The focus of the paper is on domestic financial subsidies to fossil fuel production and consumption and, where appropriate, on economic structural incentives that are not strictly subsidies. Subsidies to consumers and producers are considered separately, as it is rare for a subsidy scheme to benefit both producers and consumers. The list of subsidies discussed in this paper is not intended to be exhaustive as subsidy identification is an ongoing process.

The substantial costs associated with maintaining access to international petroleum fields and protecting shipping routes through military action are excluded. Koplow and Martin (1998) review estimates of the cost to the United States of defending Persian Gulf oil supplies and find a range from $US10.5 to $US23.3 billion. While

the Australian military presence in the Persian Gulf is much smaller, and Australia obtains a large proportion of its oil domestically, it is certain that a portion of Australia's military spending could be justifiably allocated to the protection of oil supplies and shipping routes.

As a result of these exclusions, and the use of conservative assumptions throughout, the subsidy estimates in this paper are considered to be minimum estimates.

As well as subsidies that explicitly support the production and consumption of fossil fuels, subsidies that encourage use of electricity and increased road transportation are considered. In theory, increases in electricity consumption and road transportation do not necessarily lead to increases in fossil fuel consumption, so subsidies to these activities are not necessarily subsidies to fossil fuels. In practice, the high fossil fuel intensity of electricity generation and road transportation in Australia means that many of the subsidies to these activities currently act as proxy subsidies for fossil fuel use. Subsidies to electricity and road transportation that act as fossil fuel subsidies are identified in this paper.

This paper does not attempt to estimate the magnitude of subsidies to renewable energy and end-use efficiency in Australia, other than to note that such subsidies are a small fraction of the subsidies to fossil fuels. NIEIR (1996) estimated that subsidies to renewables and energy efficiency in Australia amounted to $43.1 million, or about 2 per cent of the total energy subsidies of almost $2 billion. Subsidies to nuclear energy and nuclear research are not considered in the paper. Australia operates a single small research nuclear reactor, but has no nuclear power industry.

4 Prioritising Subsidies for Removal

There is a neo-classical economic argument that all subsidies should be removed, as they distort the operation of markets and thereby reduce economic efficiency. However, markets do not always consider environmental and social objectives, and can be subject to market failure. Government intervention in markets in order to meet environmental and social objectives is generally accepted. Subsidisation is one form that this intervention can take.

The UNEP and IEA state that:

> Any subsidy can be justified if the gain in social welfare or environmental improvement that it brings exceeds the net economic cost (UNEP and IEA, 2002, p.19).

This indicates that not all subsidies to fossil fuel producers and consumers should necessarily be removed. Those subsidies that provide gains in social welfare or environmental improvement that are greater than their economic cost can justifiably be retained.

To determine which fossil fuel subsidies are candidates for removal, each identified subsidy has been categorised according to the scheme shown in Figure 1. All fossil fuel subsidies (inside the outer ring in Figure 1) reduce the cost of producing or consuming fossil fuels. Economic theory indicates that a reduction in the price of fossil fuels will encourage greater use of fossil fuels, and therefore greater greenhouse gas emissions. Most fossil fuel subsidies will therefore tend to be environmentally harmful, and a case can be made for their removal. However, in some cases, the negative environmental impact may be offset by other environmental gains.

For example, the provision of government funding to fossil fuel producers for R&D focused on emission reduction constitutes a subsidy. The provision of this subsidy implies that emission reduction is a government objective. The subsidy reduces the cost to the fossil fuel producer of doing the R&D, and reduces the cost of fossil fuel production below what it would be if the producer were asked to meet the emission reduction objective without assistance. However, the net result of the subsidy is likely to be environmentally positive – a reduction in GHG emissions from the production process below what they would otherwise have been.

The complete set of fossil fuel subsidies can therefore be divided into those that are environmentally harmful and those that are not environmentally harmful. In determining whether a subsidy is environmentally harmful, the focus of this research is on GHG emissions alone. Other environmental objectives are not specifically considered, although it is noted that the level of GHG emissions may be indicative of the severity of other negative environmental impacts (e.g. local air pollution). A more useful distinction is therefore between subsidies that are 'greenhouse positive' and subsidies that are 'greenhouse negative' (inside the second ring in

Figure 1). Greenhouse negative subsidies result in a net increase in GHG emissions above the benchmark situation.

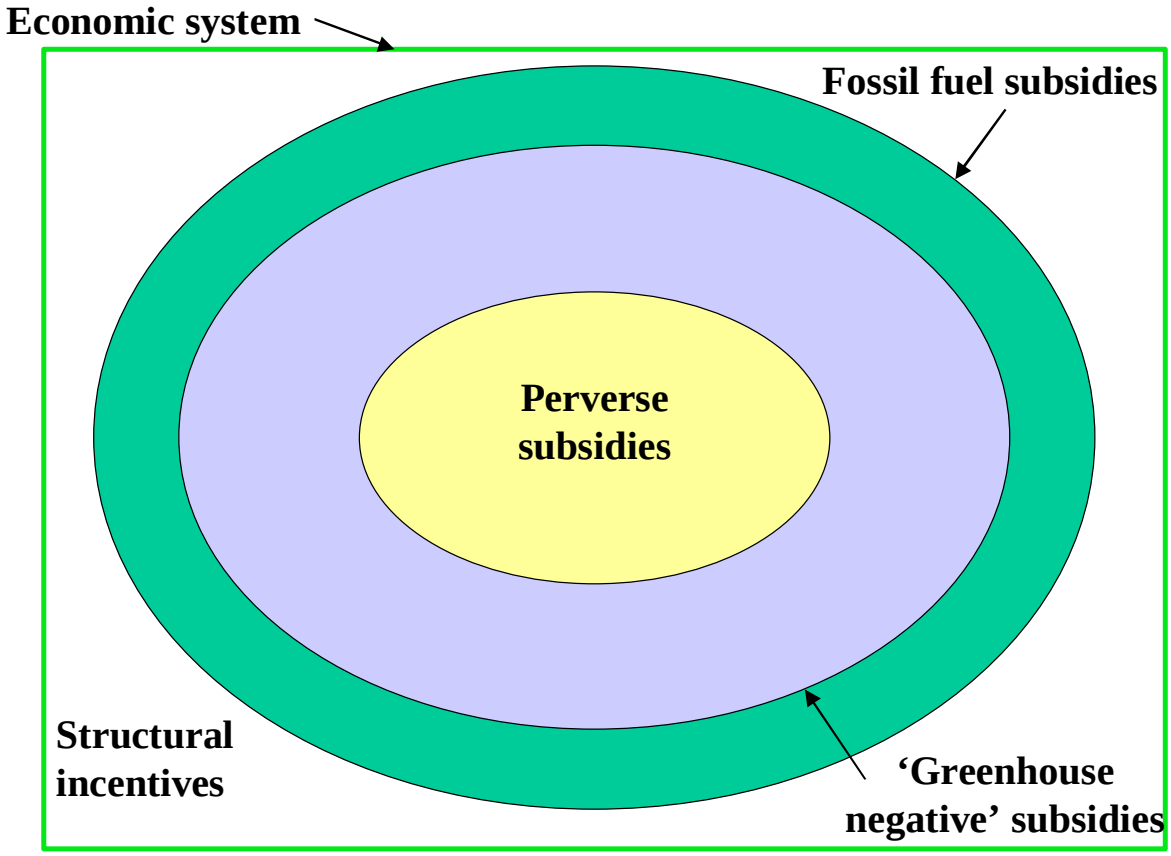
There is a much stronger case for removal of greenhouse negative subsidies than for subsidies in general. However, some greenhouse negative subsidies may meet economic or social goals, such as regional development or employment, so removal of such subsidies needs to be carefully considered against these other objectives. Alternative ways to meet economic and social objectives can often be identified and funds from subsidy removal may be used to reduce the negative social and economic impact of subsidy removal.

There may also be few current alternatives to fossil fuels in some applications, so greenhouse negative subsidies may need to be maintained while alternatives are developed to minimise economic and social disruption.

Within the subset of greenhouse negative subsidies, there is a smaller group of perverse subsidies. Perverse subsidies are those that are detrimental to both the environment and the economy in the long run (Myers and Kent, 1998). Perverse subsidies have few redeeming features and are almost always suitable targets for removal on the grounds of improved economic efficiency and reduced environmental impact. There is still a need to consider the impact on affected parties of removing these subsidies and to reduce disruption where possible.

Figure 1 also notes the possible existence of structural economic incentives for fossil fuel production or consumption that do not strictly meet the definition of a subsidy, usually because they are design features of the taxation system. In these cases, tax reform may be justified where it will improve economic efficiency and reduce GHG emissions.

Figure 1. Categorisation of fossil fuel subsidies and incentives.



Using the categorisation shown in Figure 1, perverse subsidies are a high priority for removal, as long as steps are taken to minimise any social disruption that would result from subsidy removal. Removal of other greenhouse negative subsidies is a lower priority, but may be justified if the environmental gains that result are seen to outweigh the economic and social objectives served by the subsidy. This is a matter for public debate and depends on the weighting given to different objectives. Fossil fuel subsidies that are not greenhouse positive are the lowest priority for removal.

However, there is a separate argument against the use of fossil fuel subsidies to achieve GHG abatement. Although subsidies to fossil fuel producers or consumers to reduce GHG emissions may achieve short-term greenhouse abatement, they provide support to an industry that will need to be phased out if long-term abatement targets are to be achieved. Long-term greenhouse abatement objectives can be better met by allocating funding to renewable energy and energy efficiency, rather than supporting fossil fuel producers.

A decision on whether to remove all fossil fuel subsidies, even those that achieve short-term GHG abatement, depends on the weighting given to long- and short-term environmental objectives. A government that is focused on achieving a short-term GHG reduction target may decide that subsidising fossil fuel producers and consumers to reduce emissions is the most rapid and economical way to achieve GHG abatement. A government that is guided by a long-term objective of achieving deep cuts in GHG emissions may choose to invest available funding in developing alternatives to fossil fuels, rather than in fossil fuel subsidies. In this case, removal of all fossil fuel subsidies will be a higher priority.

5 Fossil Fuel Producer Subsidies

This section discusses subsidies that support entities involved in exploration, mining, processing and distribution of fossil fuels. These subsidies reduce the cost of producing fossil fuels, and therefore allow fossil fuel production companies to either charge less for fossil fuels, or derive increased investment returns from their activities. Fossil fuel producer subsidies are summarised in Table 1, and the category of subsidy is listed. A discussion of each subsidy is provided in the sections below.

Table 1. Summary and categorisation of fossil fuel producer subsidies.

Subsidy	*Annual Value ($m)*	*Greenhouse Negative?*	*Perverse?*
Greenhouse Gas Abatement Program (GGAP)	21	×	×
Geoscience Australia – non-recovery of costs	22	√	√
DITR – non-recovery of costs	36	√	√
State energy departments / agencies – non-recovery of costs	128	√	√
Special company tax deductions for petroleum exploration	214	√	×
Research and development	88	×	×
Stuart Oil Shale excise and royalty exemption	0 - 38	√	√
Timor Sea Treaty projects	8	√	×
CATEGORY TOTALS ($m)	**517 - 555**	**408 - 446**	**186 - 224**

5.1 Greenhouse Gas Abatement Program

The major competitive funding mechanism under Australia's National Greenhouse Strategy is the Greenhouse Gas Abatement Program (GGAP). GGAP provides funding of $400 million for projects that will provide quantifiable additional abatement of greenhouse gas emissions in Australia. The program guidelines state that funds are allocated based on project merit to projects that provide cost-effective, large-scale greenhouse gas abatement. Funds are due to be fully allocated by 2005 and fully paid by 2013.

A total of $93 million was allocated to a range of projects in Round 1 of GGAP funding and another $48 million in Round 2. Table 2 shows how the funding was allocated by industry and project. Some of the funding provides direct expenditure subsidies to fossil fuel producers and some provides subsidies to fossil fuel

consumers. Both types of subsidy are discussed here, however the consumer subsidies are summarised in Section 6.

The coal industry received a total of $70 million. This is a direct expenditure subsidy to coal producers, but does not appear to be an environmentally harmful one, as the money is being used to capture and use methane that would otherwise be emitted to the atmosphere. The net effect of the subsidy is therefore to reduce GHG emissions. The arguments discussed previously about the appropriateness of funding fossil fuel companies to reduce emissions are relevant here.

The aluminium industry received $11 million to assist with energy efficiency improvements and $7 million to replace oil with natural gas at an alumina refinery. The second payment is a fossil fuel consumer subsidy, as it reduces the cost to the alumina refinery of consuming natural gas. Similarly, the cogeneration industry received $26 million for gas-fired cogeneration plants. This funding is a direct expenditure subsidy to natural gas consumers. Both of these subsidies result in a net environmental benefit, as gas is being used to replace more emissions-intensive fossil fuels.

A petroleum company was allocated $8.8 million for assistance with blending of petrol and ethanol. This is a direct expenditure subsidy to a petroleum production company, but again is expected to reduce net greenhouse gas emissions. The remaining funding was for ethanol production at a sugar mill, a training program to assist in HCFC recovery and an efficient freight rail system.

Table 2: Allocation of funding in Rounds 1 and 2 of GGAP showing industry beneficiary.

Industry	***Projects***	***Funding ($ million)***
Coal	Capture and use of waste coalmine gas (methane) to generate electricity	54
	Improve thermal efficiency at a coal-fired power station	5
	Pre-drying of brown coal through Mechanical Thermal Expression	11
	Sub-total	*70*
Aluminium	Increase energy efficiency of an alumina refining plant	11
	Replace oil with natural gas at an alumina refinery	7
	Sub-total	*18*
Cogeneration	Establishment of natural gas fired cogeneration (combined heat and power) plants	26
Ethanol	Production of ethanol from sugar mill byproducts	7.35
	Replacement of petrol with an ethanol/petrol blend	8.8
	Sub-total	*16.2*
Rail freight	Funding for an efficient rail freight system	7
HCFC	Training program for HCFC recovery	3.56
Total		141

In total, $78.8 million of the total $141 million has been allocated to projects that at least partially support fossil fuel producers, and a further $33 million supports fossil fuel consumers. Both payments are direct expenditure subsidies that reduce the cost of doing business for the beneficiaries. However, both also provide greenhouse abatement, so should not necessarily be removed.

While these fossil fuel subsidies should not necessarily be removed, the extent to which the Federal Government's flagship GHG abatement program supports fossil fuel industries, rather than sustainable energy industries, needs to be highlighted. These subsidies are indicative of a strong focus on short-term GHG abatement, rather than deep long-term GHG cuts.

The allocated funding is paid gradually over time, so the annual subsidies are somewhat lower than the figures above. The 2002-03 budget for GGAP is $39 million. Assuming the proportions of the annual budget supporting fossil fuel producers and consumers are the same as the proportion of the total funds allocated, the annual subsidies are about $22 million (for producers) and $9 million (for consumers) in 2002-03 ($21 million and $9 million respectively in 2001-02 dollars).

5.2 Non-Recovery of Public Agency Costs

Public agencies in Australia provide basic geological information, databases and other information and management services to fossil fuel exploration and production companies at nominal costs. The main public agencies involved in the provision of information and support to the fossil fuel industry are:

- Geoscience Australia (formerly the Australian Geological Survey Organisation);
- Department of Industry, Tourism and Resources (DITR); and
- Public energy departments in each Australian state.

NIEIR (1996) concludes that non-recovery of agency costs incurred in supporting the fossil fuel industry is effectively a subsidy to the coal, oil and gas industries in Australia. However, this practice only constitutes a subsidy if the service provided clearly benefits a particular group, and not others. Where this is the case, it may be appropriate to recover the full costs of the service from the beneficiaries. In other cases, support may be more generally available, and will not constitute a subsidy to fossil fuels.

Where subsidies are deemed to exist, they will reduce the costs incurred by fossil fuel production companies and act to increase the activity levels of fossil fuel production companies above what they would otherwise be. This, in turn, allows a lower price to be charged for fossil fuels and is therefore likely to increase GHG emissions above the unsubsidised level. It can therefore be concluded that these subsidies are environmentally harmful. By spreading costs across taxpayers, rather than allocating them to the specific beneficiaries, these subsidies are also likely to reduce economic efficiency and are therefore perverse subsidies.

These subsidies would be an appropriate target for gradual removal, with increased revenue tied to development of alternative fuels.

5.2.1 Geoscience Australia

The total appropriation for Geoscience Australia in the 2002-03 federal budget is $89 million (Commonwealth Government, 2002c). The Geoscience Work Program for 2002-03 lists 54 projects, of which 14 provide direct support for petroleum exploration (Geoscience Australia, 2002). These projects include the provision of technical advice to the petroleum industry, as well as research and mapping aimed at better understanding petroleum resources. Assuming an equal budget allocation for each project, the total budget allocation to projects that support the petroleum industry would be about $23 million. In 2001-02 dollars, this equates to about $22 million.

Some of the other projects may also provide support for fossil fuel exploration, however they equally provide support for other mineral exploration and other purposes. These projects are more appropriately funded out of general revenue, as is the case at present.

5.2.2 DITR

NIEIR (1996) estimated that the Department of Primary Industries and Energy (a predecessor to the DITR) provided advice and administration support worth $30 million to the energy sector in 1994-95. This figure does not include funding for R&D. Budget papers for 2002-03 indicate that DITR has a total appropriation from government of $1.13 billion (Commonwealth Government, 2002c). The budget papers do not provide sufficient information to estimate how much of this budget supports fossil fuel producers and consumers. A number of alternative methods have therefore been used to converge on an estimate of the subsidy associated with DITR administrative support and advice for the fossil fuel industry.

The first approach is to allocate a proportion of NIEIR's original subsidy estimate to fossil fuels and then update this to 2001-02 dollars. As 94% of Australia's primary energy is derived from fossil fuels, it is reasonable to assume that 94% of the DISR support went to fossil fuels. This gives a subsidy of about $28 million per year in 1994-95 dollars, or about $34 million per year in 2001-02 dollars.

Another approach is to look at the organisational structure of DITR and assume that total budget funding is allocated evenly between functional units, then to identify the units that specifically support fossil fuels. DITR is divided into divisions, each of which has a number of subordinate branches or groups.

Based on the organisational chart for DITR as of 1 January 2003, the total funding of $1.13 billion is split between 44 branches or groups. Three branches within the Resources Division and five branches within the Energy and Environment division would routinely provide advice and support to fossil fuel producers and consumers. However, most of these branches provide general support to the energy industry and not just to the fossil fuel industry. Only the Offshore Resources Branch, the Resources Development Branch and the Minerals and Fuels Branch appear likely to provide targeted support to the fossil fuel industry. As these three branches also provide support to mineral industries and other fuels, approximately half of the funding for these branches is assumed to directly support fossil fuels. Assuming equal allocation of funding across the 44 branches or groups, the subsidy to fossil fuel producers is $39 million in 2002-03, or $38 million in 2001-02 dollars.

The subsidy estimates resulting from the two different approaches agree quite closely. In the absence of better data, the average of the two figures ($36 million) will be used as the subsidy estimate.

5.2.3 State Departments

Table 3 summarises the NIEIR (1996) estimates of unrecovered costs from state energy departments. The figures have been updated from 1994 dollars to 2001-02 dollars. NIEIR did not attempt to estimate what proportion of these unrecovered costs were incurred in providing services to fossil fuel producers and consumers. The subsidy to fossil fuels would have been somewhat less than the estimates NIEIR provided.

To provide a better estimate of the portion of unrecovered state department costs that actually constitutes a subsidy to fossil fuel producers and consumers, detailed analysis of energy department annual reports, budget papers and strategic plans was conducted. New subsidy estimates derived from this analysis are provided in Table 3. Where cost recovery was practiced, recovered costs were removed from the estimates.

The subsidy estimates include any direct subsidies to fossil fuel producers or consumers identified from the document review. These types of subsidy were rare at the state level. The estimates also include a portion of department staff and operating expenses equal to the proportion of department programs that were judged to directly support fossil fuels. As it was often difficult to determine funding for specific programs that support fossil fuel production or consumption, it was generally assumed that all major programs within a department were funded equally. As a result, subsidy estimates listed in Table 3 are indicative only. Detailed state-level analysis would be required to improve these estimates. This analysis has not been attempted due to the national focus of the research.

5.3 Petroleum Exploration Tax Concessions

Tax concessions for petroleum exploration subsidise increased levels of exploration and production and keep costs lower than they would otherwise be. This keeps the price of petroleum fuels lower than it would otherwise be, encouraging greater use of fossil fuels, which is environmentally harmful. The following special deductions (from company tax) are available for companies involved in petroleum exploration and development activities (DITR, 2002):

- immediate deduction of petroleum exploration and prospecting expenditures;
- immediate deduction of operating costs;
- immediate deduction of capital and current environment protection expenditures (except for plant subject to depreciation) on pollution control or waste management;
- a deduction for Environment Impact Statement capital costs over ten years or the life of the project, whichever is the lesser;

- immediate deduction of certain mine-site rehabilitation costs including expenditure associated with the removal of offshore platforms; and

- deductions for exploration and allowable capital expenditure are deductible without limit, with any excess to contribute to a tax loss for the year.

Table 3. Estimates of state and territory energy department costs not recovered in 2000-01.

State/Territory	*Agencies*	*NIEIR Estimate[1] ($ million)*	*Current Estimate[2] ($ million)*
New South Wales	Ministry for Energy and Utilities	37	2.5
	Department of Mineral Resources		25.5
Victoria	Department of Natural Resources and Environment	37	10
Queensland	Department of Natural Resources and Mines	92	18.5
	Office of Energy (Treasury)		5.5
Western Australia	Office of Energy	18	2.5
	Department of Mineral and Petroleum Resources		34.5
South Australia	Office of Minerals and Energy Resources	12	15.5
	Energy SA		7
Tasmania	Department of Infrastructure, Energy and Resources	6	2
Northern Territory	Department of Business, Industry and Resource Development	4	4.5
Australian Capital Territory	Urban Services	Not listed	Negligible
TOTAL		206	128

Notes:

1. Total unrecovered costs from NIEIR (1996). The proportion that supports fossil fuel production or consumption would be less than these figures.
2. These estimates include only those costs that were incurred in supporting fossil fuel production or consumption and are based on analysis of budget papers and annual reports.

The tax expenditure associated with the concessions for pollution control, waste management and Environmental Impact Statements is estimated at $13 million for 2001-02 (Commonwealth Government, 2003). The other tax concessions are recognised as tax expenditures in the TES, but estimates of their value are not available.

Earlier TESs give an indication of the possible value of tax expenditures associated with deductibility of mineral and petroleum exploration costs. The 1995-96 TES estimated that the deduction of capital expenditures associated with prospecting or exploration by general and petroleum miners would result in a tax expenditure of $370 million in 2000-01 (Department of the Treasury, 1997). This is the last year in which the value of the tax expenditure is reported. Although there have been some changes in the rules for deductions, this figure should still provide a reasonable estimate of the tax expenditure. DITR staff have provided similar estimates of the tax expenditure (Layer, 2000). In 2001-02 dollars, the tax expenditure equates to $382 million.

In 2001-02, total mineral and petroleum exploration expenditure in Australia was $1.52 billion, comprising $720 million for minerals and $800 million for petroleum (ABS, 2002c). Assuming the impact on company tax is split in the same proportion, and the figure above for the tax expenditure is accurate, additional company tax revenue of $201 million could be earned if petroleum exploration costs were not deductible. This is a rough estimate of the tax expenditure associated with the deductibility of petroleum exploration costs.

Adding the $13 million identified above gives a total tax expenditure associated with tax concessions for the petroleum exploration of $214 million. This is an environmentally harmful subsidy to petroleum production. However, it is not immediately clear whether this subsidy is perverse, as it must be considered in the context of overall petroleum taxation and charging. As well as the normal taxation arrangements applying to all companies, petroleum production projects are subject to a Petroleum Resource Rent Tax (PRRT).

The PRRT is applied at a rate of 40 per cent of a project's net income, as a means of providing the 'Australian community with a fair and reasonable return from the development of non-renewable petroleum resources' (DISR, 2000b, p.23). The PRRT provided $1.306 billion in revenue in 2001-02. The states also impose resource taxes on fossil fuels, so it is clear that petroleum production companies are being taxed by a significantly larger amount than they are subsidised.

If resource taxes are not included in the taxation benchmark, then petroleum exploration and production companies experience a large excess tax burden, or negative subsidy, compared to other companies. The deductibility of petroleum exploration expenses from company tax is then seen as a way of reducing this excessive tax burden.

On the other hand, the rationale for the PRRT and other resource taxes is the allocation of a fair share of the profit associated with development of a public non-renewable resource to the public. On this basis, resource taxation is something quite different to company taxation and can justifiably be included in the taxation benchmark, as part of the design of the taxation system. This is the approach taken in the TES (Commonwealth Government, 2003). The deductions available to petroleum exploration companies are then seen as a subsidy to fossil fuel producers. This paper follows the definition in the TES and defines the deductions as a subsidy to fossil fuel producers.

Although this subsidy is likely to harm the environment by keeping oil prices lower than they would otherwise be, it is not necessarily a perverse subsidy. The subsidy acts to encourage oil exploration, which remains vital to Australia's economic performance. Until petroleum alternatives are developed, failure to locate and develop domestic petroleum resources will impact strongly on Australia's balance of payments. On this basis, encouraging petroleum exploration can be justified as a public good. Removal of the subsidy without ensuring that appropriate alternatives exist would likely bring more economic harm than good. Gradual reduction of the subsidy and transfer of the funds to development of oil alternatives may be the best approach.

5.4 Research and development

In 1994, an estimated $180 million was provided for energy R&D, of which only $27 million (15 per cent of the total) was provided to renewable energy and energy efficiency applications (NIEIR, 1996). These figures include not just direct expenditure on energy R&D but also the value of research-related tax deductions in 1994. Expenditure by private companies on R&D can be claimed as a deduction against company tax at a concessional rate of 125% of expenditure.

While the Commonwealth and State Governments have increased funding for sustainable energy R&D in recent years, it appears that fossil fuel R&D continues to receive the major proportion of government funding support. To check whether the situation has changed significantly since NIEIR released its report in 1996, reviews of current funding for the Australian Cooperative Research Centre (CRC) program and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) are provided below.

5.4.1 CRC Funding

CRCs bring together researchers from universities, government and the private sector to research specified topics over a period of years. CRCs involved in R&D that wholly or partially benefits the fossil fuel industry are listed in Table 4, along with the value of their public funding in 2001-02.

As shown in Table 4, four CRCs with government funding of about $8.6 million per year were involved in research and development that supported fossil fuels in 2001-02. About $4 million supported fossil fuel production and $4.6 million supported fossil fuel consumption. In contrast, a single CRC (the Australian CRC for Renewable Energy) with annual government funding of $1.6 million is dedicated to sustainable energy R&D. Sustainable energy R&D funding through CRCs is about 19% of total CRC funding for energy.

In late 2002, the situation worsened, with the announcement that the Australian CRC for Renewable Energy would not be funded after expiration of its existing funding. Sustainable energy R&D funding through CRCs will drop to zero after 30 June 2003.

Table 4: CRCs involved in research and development that wholly or partially benefits the fossil fuel industry in 2001.

CRC	*Government Funding 2001-02 ($m)*	*Proportion Supporting Fossil Fuels*	*Production or Consumption Subsidy*
Coal in Sustainable Development	2.1	100%	Consumption
Mining Technology and Equipment	2.6	50%	Production
Petroleum	2.7	100%	Production
Clean Power from Lignite	2.5	100%	Consumption
WEIGHTED TOTAL		$8.6 million	

5.4.2 CSIRO Funding

Another example of the imbalance in R&D funding is provided by an examination of Commonwealth Government funding allocated to the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia's flagship research organisation, in 2001-02. Approximate funding for energy sector and petroleum sector R&D was $30 million and $20 million respectively. A brief review of CSIRO's energy sector research indicates that five of the nine energy research areas directly support fossil fuel production or consumption. Assuming funding is allocated equally to each research area, total fossil fuel R&D funding is $37 million, including the $20 million petroleum sector funding. Of this, approximately $27 million supports fossil fuel production and $10 million supports fossil fuel consumption.

Funding for sustainable energy was about $13 million, or 26% of the total energy sector funding. Both the CRC and CSIRO estimates are higher than the proportion of sustainable energy funding found by NIEIR for 1994, indicating that funding of these areas may be growing.

5.4.3 Total R&D Subsidy

Total funding for energy resources and energy supply R&D in Australia in 2000-01 was $382.5 million. An additional $123.7 million was spent on transport R&D (ABS, 2002d). Based on ABS figures on the source of research funding, and assuming that the source of funding for the energy sector is similar, government R&D funding for energy resources and energy supply was about $146 million in 2000-01. Government funding for transport R&D was about $40 million.

Additional research funding is provided through the availability of tax concessions for business R&D. In 2000-01, these tax expenditures amounted to $450 million in total. Assuming the tax concessions were taken up by the energy resources and supply sectors in the same proportion as total business sector research funds, the tax expenditure would amount to an additional $21 million in R&D funding for energy.

Assuming about 23% (average of the estimates for CRC and CSIRO funding) of total energy sector R&D funding is allocated to sustainable energy, R&D funding that supports fossil fuel production and consumption is about $129 million. Using the average split between production and consumption from the CRC and CSIRO data gives R&D subsidies to fossil fuel production of $88 million and to fossil fuel consumption of $41 million.

Some proportion of the transport R&D funding may also support fossil fuel consumption, to the extent that it supports forms of transport that rely on fossil fuels. Almost all of Australia's transportation energy requirements are currently supplied by fossil fuels. However, it is reasonable to assume that a much higher proportion of the R&D funding is allocated to low-emission alternatives to current transportation systems. As a conservative estimate, it has been assumed that 50% of transportation R&D funding supports the existing fossil fuel intensive transportation system and the remainder supports low-emission alternatives. This adds $20 million to the estimate of subsidies to fossil fuel consumption, resulting in total subsidies of $61 million.

Although R&D funding that supports fossil fuel production and consumption is clearly a subsidy to fossil fuel producers and consumers, it is not necessarily an environmentally harmful subsidy. Many of the existing R&D programs are aimed directly at reducing the environmental impact of fossil fuel production and consumption,

while others will improve efficiency of fossil fuel use and will indirectly reduce GHG emissions. Some of the R&D funding should certainly be shifted to sustainable energy technologies, however R&D to reduce the greenhouse signature of fossil fuel use is vital in the short- to medium-term.

5.5 Direct Subsidies to Fossil Fuel Development Projects

The Stuart Oil Shale Project in Queensland has received a series of direct subsidies from the Commonwealth and Queensland Governments. The project aims to process a major oil shale deposit located near Gladstone to produce medium shale oil and naptha in approximately equal fractions. The project has been granted a rebate on excise tax for up to 600,000 barrels per year of gasoline produced from oil shale until 2005 (Greenpeace Australia, 2001, SPP/CPM, 2001). At an excise rate of 37.5 cents per litre, this exemption could potentially be worth $35.8 million per year. The 2002 oil production outlook is 400,000 barrels, which would constitute an annual exemption of $24 million. At full capacity and operating continuously, Stage 1 of the project could potentially produce 1.6 million barrels per year.

Shale oil from the project is also exempt from Queensland Government royalties, which normally amount to 10% of the wellhead value. At an average sale price of $52 per barrel in 2002 (SPP/CPM, 2001), and expected sales of 400,000 barrels, this exemption could amount to another $2 million.

Stage 1 of the Stuart Project also received a grant of $7 million from the Commonwealth Government for research and development (SPP/CPM, 2001). It has been reported that the Queensland Government provided $11 million to construct a dedicated bulk liquid tanker berth for the project (Queensland Greens, 2001).

The ready availability of coal from state mines for use in generating electricity may also have contributed to the construction of coal-fired power stations when other options would have been more economic. In Western Australia, the State Government supported the construction of the Collie coal fired power station although the official (Harman) committee recommended that a gas-fired power station would have been cheaper. The total additional discounted (8 per cent discount rate) cost in 1990 dollars is estimated at $170 million and would be even greater if additional costs of greenhouse gas emissions were considered (OECD, 1997).

Australia is giving $8 million a year to East Timor for petroleum-related industry projects under the Timor Sea Agreement, signed in July 2001. It could be argued that this is an environmentally harmful subsidy, as it will assist in the development of fossil fuel resources that may otherwise have gone unused. However, the subsidy is unlikely to be perverse, as government revenue from development of the Timor Sea resources will far exceed the investment.

More than $6 billion in infrastructure is also planned in the form of pipelines and gas processing facilities in the Northern Territory to take advantage of oil and gas resources in the Timor Sea (Dodd, 2001). The public contribution to development of this infrastructure is still uncertain.

These subsidies to the development of a shale oil plant, coal-fired power station and oil and gas field in Australia are an example of the types of subsidies available to new fossil fuel projects.

6 Fossil Fuel Consumer Subsidies

This section discusses subsidies that support consumption of fossil fuel. These subsidies reduce the cost of consuming fossil fuels, and will therefore tend to increase consumption above the unsubsidised level. Most of the subsidies described in Section 5 would likely have flow-on effects that would reduce the price of fossil fuel and encourage increased consumption. The subsidies in this section are even more likely to have such an effect, as they are paid directly to fossil fuel consumers. Fossil fuel consumer subsidies are summarised in Table 5, and the category of subsidy is listed. The table includes a portion of the subsidies associated with GGAP and R&D that are discussed in Section 5. Each subsidy is discussed in more detail in the sections below.

Table 5. Summary and categorisation of fossil fuel consumer subsidies.

Subsidy	*Annual Value ($m)*	*Greenhouse Negative?*	*Perverse?*
Greenhouse Gas Abatement Program (GGAP)	9	×	×
Research and development	61	×	×
Excise exemption for alternative fuels	594	×	×
Concessional rate of excise for fuel oil, heating oil and kerosene	240	√	√
Concessional rate of excise for aviation fuels	770	√	×
Excise exemption for condensate from petroleum industry	Not estimated	√	×
CATEGORY TOTALS ($m)	**1,674**	**1,010**	**240**

6.1 Diesel Fuel Rebate Scheme

It is sometimes claimed that the Commonwealth Government's Diesel Fuel Rebate Scheme (DFRS) is a subsidy for diesel fuel consumption. The DFRS provides a rebate for customs or excise duty paid on diesel or 'like fuels' (e.g. fuel oil) used in specified off-road activities, such as mining, agriculture, rail transport and electricity generation. Excise duty is collected for fuels produced in Australia and customs duty is collected for fuels imported into Australia. As of November 2002, the customs and excise duty rate for diesel is about 38 cents per litre. The Commonwealth Government has budgeted $2.23 billion for the DFRS in 2002-03 (Commonwealth Government, 2002c).

The rationale for the DFRS is that off-road use of diesel fuel should be exempt from duty as the revenue collected through duty is used to fund roads, which are not used by off-road users. In addition, competing end-use energy sources such as natural gas and electricity are not subject to excise duty, so the rebate is a way of avoiding subsidisation of these other sources (NIEIR, 1996). NIEIR concludes that the DFRS should not be seen as a financial subsidy (NIEIR, 1996).

The DFRS is an appropriate way to ensure that a small group of diesel users faces a price that is closer to the world price (Pender, 2001). In recognition of this, the excise on diesel fuel is defined as part of the taxation benchmark in the 2002 TES (Commonwealth Government, 2003). In this paper, the DFRS has not been classified as a financial subsidy or incentive for fossil fuel use and is not listed in Table 5.

This does not mean that the price of diesel adequately reflects environmental and social externalities associated with its use. However, this is a separate matter that is better addressed by other programs. A typical program of this type is the Renewable Remote Power Generation Program, which aims to reduce the use of diesel for remote electricity generation, so that a portion of the DFRS will eventually become obsolete.

6.2 Exemption from Excise for Alternative Fuels

Alternative fuels, including LPG and compressed natural gas, are exempt from excise duty. Ethanol was also exempt from excise duty until 18 September 2002. The 2002 TES (Commonwealth Government, 2003) defines the rate of excise on unleaded petrol (and diesel) as the benchmark rate of excise. As a result, the exemption of these alternative fuels is listed as a tax expenditure, with a value of $660 million in 2001-02.

The tax expenditure is based on estimates and projections of fuel use published by ABARE. It is calculated on an equivalent unit of energy basis, which adjusts for the different energy content of alternative fuels compared to the energy content of unleaded petrol (Commonwealth Government, 2003). As ethanol use in Australia is very low compared to use of LPG and natural gas, most of the tax expenditure in 2001-02 supported fossil fuel consumption. In 2002-03, almost all of the tax expenditure will support fossil fuels, due to the removal of excise exemption for ethanol. A conservative assumption is that 90% of the total tax expenditure in 2001-02, or $594 million, supports fossil fuel consumption.

Although this is a subsidy to fossil fuel use, it is not an environmentally harmful one, as the fuels supported are less emissions-intensive than petrol and diesel. This tax expenditure is a way of supporting low-emission fuels.

The recent Fuel Tax Inquiry reported some reservations about the effectiveness of this subsidy in developing an alternative fuel industry (Commonwealth Government, 2002b), and it is possible that the funds could be better spent on direct industry support.

6.3 Concessional Rate of Excise for Fuel Oil, Heating Oil and Kerosene

Fuel oil, heating oil and kerosene are subject to a lower rate of excise than unleaded petrol and diesel, resulting in a tax expenditure of $240 million in 2001-02 (Commonwealth Government, 2003). This is a subsidy for the use of fossil fuels in heating, lighting and other applications. It encourages greater consumption of these fuels and discourages alternatives such as improving insulation or purchasing a modern efficient heater. This subsidy is therefore environmentally harmful. It is also perverse, as spending these funds on efficiency improvements or fuel switching would likely result in cost savings.

6.4 Concessional Rate of Excise for Aviation Fuel

Aviation gasoline and aviation turbine fuel are also subject to a lower rate of excise than unleaded petrol and diesel. The tax expenditure was $770 million in 2001-02 (Commonwealth Government, 2003). This tax expenditure is another subsidy to fossil fuel use that encourages greater fuel consumption than would otherwise occur, and is therefore environmentally harmful. However, there are few real alternatives to the use of these fuels for aviation at present, so the low rate of excise is a way of keeping costs down for the aviation industry. This is not a perverse subsidy, as it is an efficient way to achieve the objective of supporting the aviation industry. An increase in the excise rate would likely be passed on in ticket prices, as aviation companies have relatively few options for fuel consumption reduction.

6.5 Excise Free Status for Condensate

Condensate is a product of the petroleum industry that was granted excise free status in 1977. This is identified as a tax expenditure in the 2002 TES but the value of the tax expenditure is not estimated (Commonwealth Government, 2003). This tax expenditure acts as a subsidy for consumption of condensate and is likely to increase GHG emissions above what they would otherwise be. However, as for aviation fuels, it is not necessarily perverse as it is a relatively efficient way of providing support for the petroleum industry.

7 Electricity Subsidies

Subsidies for generation or use of electricity do not necessarily act as subsidies to fossil fuels. However, fossil fuels are used to generate about 91% of Australia's electricity. As a result, a large proportion of any subsidy that supports electricity consumption effectively supports fossil fuel consumption. In this section, electricity subsidies are discussed, with a particular focus on the extent to which the subsidies support emissions-intensive fossil fuel generation. Subsidies are summarised and categorised in Table 6.

Table 6. Summary and categorisation of electricity subsidies and incentives that support fossil fuel use.

Subsidy or Incentive	*Annual Value ($m)*	*Subsidy?*	*Greenhouse negative?*	*Perverse?*	*Incentive?*
Subsidised supply of electricity to aluminium smelters	195-232	√	√	√	×
State electricity supply subsidies for low-income households	224	√	√	×	×
Electricity pricing structures	not estimated	×	√	√	√
Centralised generation advantages	not estimated	√	√	√	×
CATEGORY TOTALS ($m)	**419-456**	**419-456**	**419-456**	**195-232**	**not estimated**

7.1 Subsidised Supply of Electricity to Aluminium Smelters

The aluminium smelting industry is an electricity-intensive industry that consumes almost 15 per cent of all electricity consumed in Australia and accounts for around 5.9 per cent of Australia's total greenhouse gas emissions (Turton, 2002). This proportion is set to increase with the construction of the new Aldoga Aluminium Smelter and Comalco alumina refinery at Gladstone in Queensland. Aluminium production in Australia predominantly uses electricity from coal-fired power stations, whereas aluminium production outside Australia usually uses hydro-electricity, resulting in much lower greenhouse gas emissions.

Turton (2002) provides a detailed analysis of the aluminium smelting industry in Australia, and internationally. There is strong evidence that the aluminium smelting industry receives cheaper electricity than similar large industrial customers, as a result of long-term supply contracts negotiated with State governments attempting to attract industry to their State. This 'represents a subsidy if the prices are below those that would be paid in a freely competitive market, where electricity suppliers charge prices that reflect long-run marginal costs' (Turton, 2002, p.11).

After reviewing the available evidence, Turton concludes that the annual subsidy to existing aluminium smelters is at least $210 million, and is likely over $250 million. The subsidy estimate includes the impact of reduced prices paid for electricity at the six Australian smelters. The estimate also includes the impact of the 1994 sale of the Gladstone Power Station by the Queensland Government (to a consortium headed by Comalco, majority owner of the adjacent Boyne Island smelter) at below market price. It has been estimated that the price was between half and two-thirds of the net value of the power station (Joint Standing Committee on Treaties, 2000). This allows Comalco to either supply electricity to the Boyne Island smelter at below market prices or reap higher earnings on its investment (Turton, 2002).

The proposed $3 billion Aldoga Aluminium Smelter to be built in Gladstone, Queensland, also appears to have been offered substantial subsidies and concessions of about $100 million by the state government, the bulk of which comprised heavily discounted electricity supplies (Sydney Morning Herald, 2001). These subsidies are not included in the previous estimate.

These subsidies reduce the economic incentive for aluminium smelters to invest in energy efficiency, and therefore keep electricity consumption higher than it would be in the absence of subsidies. Electricity for the smelters is supplied by black coal generation (NSW and Queensland), brown coal generation (Victoria) and hydroelectric generation (Tasmania). Around $15 million of the total subsidy is attributed to the Bell Bay smelter in Tasmania (Turton, 2002), so the remainder supports the use of fossil fuels. The estimated subsidy to fossil fuel use is at least $195 million and more likely $232 million (assuming the Bell Bay subsidy rises proportionally to $18 million in the higher estimate).

This subsidy is certainly environmentally harmful, and analysis by Turton indicates that it is also a perverse subsidy. Removal of the subsidies would provide an overall benefit to the Australian economy (Turton, 2002). However, the subsidies are implemented through long-term electricity supply contracts, so options to remove the subsidies in the short-term are limited.

7.2 State Energy Supply Concessions

State subsidies are provided in NSW, Victoria, Queensland and South Australia to assist pensioners, people in country areas and financially disadvantaged groups with electricity payments (see Table 7 for a summary). The subsidies are delivered as a discount on energy bills. By reducing the total cost of electricity to particular groups, they provide an incentive to those groups to use more electricity than they otherwise would. As 91% of Australia's electricity is sourced from fossil fuels, the same proportion of the subsidies listed in Table 7 acts as an environmentally harmful subsidy to fossil fuels. The subsidy to fossil fuels is therefore about $224 million per year (91% of $246.4 million).

These subsidies are not necessarily perverse, as they are a relatively efficient way to deliver the social objective of assisting particular groups with the cost of essential services. However, a better environmental outcome (and possibly a better economic outcome) could be obtained by using the current subsidy funds to improve energy efficiency in the target households. Using the funds for installation of efficient showerheads, shading, blinds and

insulation could potentially reduce GHG emissions while still meeting the social objective of reducing the total cost of electricity bills for the target groups.

Table 7: Estimate of state energy supply subsidies for pensioners, financially disadvantaged users and users in remote areas.

State/Territory	*Subsidy*	*Annual Value ($ million)*	*Source*
New South Wales	Concessions for pensioners and financially disadvantaged in 2001-02	90	NSW Treasury (2001)
Victoria	Energy concessions in 2001-02	85.4	Victorian Treasury (2002)
Queensland	Electricity rebates for pensioners	68	Queensland Treasury (2002)
South Australia	Remote Areas Energy Supplies subsidy scheme	3	SA Auditor General (2000)
TOTAL ($m)		**246.4**	

7.3 Electricity Pricing Structures

7.3.1 Transmission Charging

Existing electricity transmission pricing regimes in Australia are biased against distributed generation (including many renewable energy sources) and cogeneration. Under the current pricing system, the costs of providing the transmission network are paid by customers, rather than the centralised coal-fired power stations that are the main beneficiaries of the network (Australian Cogeneration Association, 2000). Distributed generation sources and demand side management options are not appropriately rewarded for not using the transmission network. A recent Senate Inquiry into global warming found that:

> Current arrangements, which restrict transmission charging to generators to shallow entry costs, while leaving the bulk of costs to be recovered from customers, provide a substantial subsidy to remote, usually coal-fired generation to the competitive disadvantage of more greenhouse friendly natural gas and renewable generation typically located closer to loads. Pursuit of demand management options is also acutely disadvantaged (ECITA References Committee, 2000, p170).

The size of this subsidy has not been estimated but it provides a definite financial incentive to centralised fossil fuel power stations. A report by the Australian Ecogeneration Association (now the Australian Business Council for Sustainable Energy) notes the extensive costs and delays faced by embedded generators and calls for fair network access and cost reflective network pricing, including time and location sensitive signals (AEA, 2001).

7.3.2 End User Pricing

In Australia, electricity usage charges are used to finance fixed costs. This gives electricity authorities an incentive to sell electricity and no incentive to engage in demand-side management. A better system would involve a higher access charge to cover fixed costs, and a lower average charge for usage. However, the usage charge would vary to reflect load, so that charges would be very high at times of peak load. This assumes that the extra cost of smart metering is fairly low (Pender, 2001).

IPART has recommended trials of localised congestion pricing in NSW, as part of its Inquiry into the Role of Demand Management and Other Options in the Provision of Energy Services (IPART, 2002). Real-time pricing and congestion pricing may be difficult to implement due to customer preferences for fixed tariffs, rather than uncertain variable tariffs. If viable, improved end-user pricing could provide better signals for electricity users to reduce their total consumption through energy conservation and energy efficiency. Better pricing structures could also encourage load-shifting behaviour, which can reduce peak demand and the need for network augmentation.

7.3.3 Cross Subsidisation of Electricity

Cross subsidisation of particular electricity consumers by other consumers also occurs in Australia, as reported by Gilchrist (1994). Pears (1998) gives the example of a rural area in NSW where there was an electricity supply cost of up to 21.22 cents per kWh and an average selling price of up to 14.53 cents per kWh. This led to an average annual subsidy of $412 per household on a particular feeder line, presumably paid by electricity consumers in urban areas. In remote communities in Western Australia, the cost of electricity generation can be as much as $1 per kWh, but there is a uniform tariff of 11c per kWh (Ebert, 2002).

The effect of cross subsidisation is to distort the electricity market so that customers do not experience the true cost of generating electricity to meet their needs. Usually, urban customers pay slightly more than the true cost of generation, and rural customers pay less. The likely result is that rural customers will use more electricity than they otherwise would, and urban customers may use less. In terms of total electricity consumption and GHG emissions, the net effect may be minimal. However, if rural customers paid the true cost of electricity generation, renewable forms of electricity generation with higher costs would be better able to compete with fossil fuel generation in those areas. Cross subsidisation would therefore seem to put renewable energy at a disadvantage.

In practice, cross subsidisation is often deemed acceptable on the basis of equity and regional development objectives. No attempt has been made to estimate the size of electricity cross subsidies in Australia, as the focus of the research is on publicly funded subsidies.

7.4 Subsidies for Centralised Generation

As centralised electricity generation projects tend to be large, they have the opportunity to receive certain taxation benefits that are not available to smaller distributed generation projects. For example, projects with a capital cost of more than $50 million that were approved by the Development Allowance Authority (up to 1996) were eligible to claim an immediate deduction of 10 per cent of the value of plant and equipment (Commonwealth Government, 2003). The estimated cost of this tax expenditure in 2001-02 is $200 million.

The existence of tax expenditures of this sort creates a bias towards large-scale fossil fuel generation, and against demand management and renewable energy options that tend to be more diffuse and smaller in scale. The annual value of this subsidy has not been estimated due to the variable nature of investment in power generation and the commercial sensitivity of the information required.

Centralised electricity generation projects are also more likely to gain Major Projects Facilitation (MPF) status from the Federal Government than diffuse sustainable energy projects. This could be a significant subsidy associated with the provision of agency services at below cost, as projects with MPF status receive substantial support from Invest Australia. Estimating the annual size of this subsidy is not possible due to the variable nature of power station investment.

8 Road Transportation Subsidies

Subsidies for road transportation, if such subsidies exist, do not automatically encourage production or consumption of fossil fuels. Rather, a subsidy that reduces the cost to motorists of road transportation will encourage increased use of the road network (in terms of total kilometres travelled). Theoretically, vehicles using the road network could use any one of a variety of fuels, fossil or renewable. If all vehicles used renewable fuel sources, then subsidies for road transportation would not encourage increased use of fossil fuels and would not be a contributor to greenhouse gas emissions.

In practice, Australian road vehicles are almost entirely reliant on fossil fuels. According to Dickson et al. (2001), 99.7% of the fuel used for road transportation in 1998-99 was petroleum products, and the remaining 0.3% was natural gas. Use of renewable fuels was negligible. This does not automatically mean that any road transportation subsidy is also a direct subsidy to fossil fuel use. Some of the road transportation subsidy may improve access to the road transportation system for users that would otherwise be unable to use the system. While this could be expected to increase total fossil fuel consumption, the effects of congestion due to the greater

number of road users could actually keep fossil fuel consumption stable, or even decrease it. The larger number of users would each travel less to avoid congestion.

To estimate subsidies to road transportation, and the proportion of any such subsidies that encourages increased fossil fuel use, a more detailed examination of the structure of the road taxation and charging system is required.

8.1 Subsidy Identification

At present, there is no clear link between government revenue derived from roads and government funding of road maintenance and new road infrastructure. The largest source of road-related revenue is the Federal excise on petroleum products and crude oil, which raised $12.8 billion in 2001-02 (Commonwealth Government, 2002a). Most of this funding is collected through a higher price on the petroleum products consumed by road users. Although many parties believe this revenue should be directly allocated to road funding, the recent Fuel Tax Inquiry concluded that fuel excise is a general revenue-raising measure that should not be linked to the level of road funding (Commonwealth Government, 2002b).

Despite this conclusion, fuel excise is clearly experienced by motorists as one of the costs of road use. Although the intent of the excise may be to raise revenue, in economic terms it acts as a quasi road user charge. For the purposes of subsidy identification, all costs experienced by road users as a consequence of road use need to be considered, including fuel excise.

Pender (1999) surveys the various government taxes on vehicle ownership and use and makes a distinction between revenue from access charges and revenue from usage charges. Access charges in Australia include import tariff revenue on vehicles, GST on purchase of vehicles, state registration fees and stamp duty. Usage charges include federal fuel excise and GST on fuel and other consumables (tyres, oil, parts etc). Fringe benefits tax also influences the usage charges faced by businesses and individuals.

Pender also makes a distinction between economic charges and taxes. Revenue collected by governments that accounts for road network costs and social costs is effectively a charge. Any revenue collected above that amount is a tax. Pender argues that the Federal fuel excise has the economic characteristics of a charge, despite its stated aims.

This distinction has important implications for subsidy identification. A subsidy to road transportation is experienced if total revenue to governments from road users is less than the total public cost of establishing and maintaining the road network. That is, road users experience a subsidy if road charges are not set high enough to cover costs. As total distance travelled on roads is sensitive to user charges (Pender, 1999), any subsidy will increase the total distance travelled, and hence GHG emissions.

If total revenue exceeds the total costs, then there is 'excess' tax on road use. There are economic justifications for an excess tax, as discussed by Pender (1999). However, the absence of an excess tax (or its existence at low levels) does not constitute a subsidy to road transportation. Instead, it is an aspect of the design of the tax system and its level needs to be set as part of the broader tax regime, and to meet public policy goals.

8.2 Road Network Costs

Costs associated with the establishment and operation of the road network include:

- the capital cost of road network infrastructure improvement;
- road network maintenance costs;
- depreciation of road network infrastructure;
- health and ecological costs of local air pollution associated with vehicles;
- costs of climate change associated with greenhouse gas emissions from the road network;
- loss of aesthetic values;
- disruption of landscape and wildlife;
- the cost of accidents (both direct hospital and medical costs and the cost of lost productivity);
- costs of increased noise; and
- time costs of congestion (NIEIR, 1996, Pender, 1999).

Theoretically, charges for road access and use should cover all of these costs, while also ensuring a normal rate of return on the road network assets (land and infrastructure). In practice, some of these costs are very difficult to estimate in monetary terms, and have traditionally been classed as external costs.

The choice of which costs to include, and the methods used to estimate the value of the different costs, result in widely differing estimates of the subsidy to road users in Australia. There is little dispute that road users should pay the capital cost of road infrastructure expansion and the recurring cost of road maintenance. Further, the road network and the land on which it is sited is a capital asset that should be required to earn a normal rate of return on investment (NIEIR, 1996, Pender, 1999). It is reasonable that road users should be charged at a sufficient rate to provide this return on investment.

It is more difficult to identify which environmental and social costs should be included. Most estimates treat the cost of climate change induced by greenhouse gas emissions from vehicles as an externality. Most estimates also exclude the health costs associated with vehicle emissions. As this paper is focused on financial subsidies, these costs are also excluded from the current analysis.

However, some estimates include the cost of noise pollution, the time costs of traffic congestion and the property damage and medical/hospital costs of two-car accidents. As these costs can be estimated (with difficulty), it may be reasonable to include them in the total cost of the road network. Previous estimated of road user subsidies in Australia are surveyed below with a particular focus on their treatment and inclusion of different costs associated with the road network.

8.3 Previous Estimates of Road User Subsidies

8.3.1 Industry Commission Submissions

A 1994 report by the Industry Commission on urban transport received several submissions on the 'road user deficit' – the difference between the costs imposed by road users and the revenue collected from road users (Industry Commission, 1994). Estimates in submissions ranged from an annual subsidy of $10 billion to an annual excess tax of $800 million. The wide range reflected both the costs and revenue included in the estimate and the methodology used to estimate particular costs, especially congestion costs.

Other submissions did not estimate the size of the subsidy or excess tax, but did note that road users may not be covering all the costs they impose. For example, the NSW Department of Transport noted that road user charges did not cover a return on capital invested or externalities associated with road use. The Commonwealth Department of Human Services and Health considered that the opportunity cost of land provided for transport routes should also be included in the assessment of urban transport costs (Industry Commission, 1994).

The Industry Commission did not reach a conclusion on whether road users are subsidised and the submissions quoted are inconclusive.

8.3.2 NIEIR Estimate

NIEIR (1996) estimates an order of magnitude financial subsidy to road transportation of $1.2 billion for 1994, derived from the figures shown in Table 8. The NIEIR estimate does not make any attempt to include the costs of congestion or noise associated with the road network but does include an estimate of the cost of damage to the road network that requires ongoing maintenance. It is unclear whether this maintenance cost includes an allowance for road network capacity expansion.

Table 8. Summary of cost estimates in NIEIR's estimate of the road transportation subsidy.

Item	*Value ($billion per annum)*	*Comments*
Capital return on road infrastructure (bridges and pavement)	4	8% real rate of return on infrastructure value of $50 billion (at the end of 1994) from ABS national accounts.
Capital return on value of land under the road network	8	8% real rate of return on land value of $100 billion. Land value estimated as 25% of the value of adjacent properties, taken from Commonwealth Grants Commission data (opportunity cost).
Road maintenance costs	2.5	NIEIR estimate
Total Cost	*14.5*	
Total Revenue	*13.3*	*Fuel taxes and other quasi-user charges*
Net Financial Subsidy	***1.2***	

8.3.3 ISF Estimate for Sydney

Banfield et al. (1999) estimated the direct economic costs of cars, buses and trains in Sydney in 1996, taking into account the value of land, infrastructure, rolling stock, and operating costs. Road infrastructure costs were allocated between cars and heavy vehicles according to the paper's 'Flow & Force' scenario, in which heavy vehicles determine the construction and maintenance costs of major roads and cars determine the costs of local roads. Total costs for cars, buses and trains were found to be 60, 28 and 40 cents per passenger-km, respectively, and the corresponding user charges were 5[1], 12 and 9 cents per passenger-km, respectively.

To estimate the subsidies, Riedy and Diesendorf (2003) drew upon the raw data from this research to compare the public components of the total cost of each mode with the user charge. Assuming a 10% real discount rate, the annual public subsidies in Sydney in 1996 were approximately: cars $5.9 billion; buses $0.14 billion; and trains $1.4 billion.

It is likely that the subsidy in Sydney is much higher than the average across Australia, however a subsidy is likely to exist in most Australian cities. Considering that the estimated subsidy is $5.9 billion for Sydney alone, the ISF figures imply that the total Australian subsidy is much higher than the estimates provided above. If the per capita subsidy were the same across Australia, the total subsidy would be in the order of $24 billion.

The ISF estimate is much higher than other estimates because of the inclusion of the value of land under private parking (e.g. garages, driveways, office car parks and shopping centre car parks) and the fleet value of cars as part of the asset value of the road network. This leads to a much higher estimate of the revenue required to achieve an appropriate rate of return. A high discount rate of 10% is also used when a lower rate of return is often acceptable for public investments.

Some attempts have been made to reduce the extent of this subsidy in Sydney by introducing car parking levies of $400 to $800 per space in particular suburbs with good access to public transport (White, et al., 2001).

8.3.4 Pender/ATRF Estimate

Pender (1999) provides a detailed examination of the tax treatment of vehicle ownership and use in Australia. Pender's analysis was conducted using data for 1994-95 and is based on a set of hypothetical road authority accounts that facilitate comparison of actual road user charges with an appropriate taxation benchmark. Pender concludes that actual revenue from road users in 1994-95 was $14.5 billion, and that revenue collection required to cover the costs detailed above would have been $14.4 billion. In other words, Pender finds an excess tax on road users of $100 million per year.

[1] This corrects an error in the original calculation that gave a user charge 10 cents per passenger-km for cars.

Pender provides separate analyses for urban (capital city and urban provincial) roads and rural roads (all other roads), and finds that urban road users pay $2.7 billion excess tax, while rural users pay $2.6 billion less than the cost of the rural road network. This indicates that urban road users subsidise rural users of the road network. This is not necessarily inappropriate, but needs to be recognised.

Pender also notes a problem with the structure of existing taxation for cars, arising from the split between access charges and usage charges. The appropriate level for usage charges on urban roads in 1994-95 was $6 billion, whereas the actual amount of usage charges collected was $5.4 billion. The distance-related charge paid by cars was $600 million too low, and the access-related portion was too high.

The sensitivity of car ownership to access costs is negligible, whereas distance travelled per vehicle is sensitive to usage costs (Pender, 1999). This means that the high access charge is unlikely to reduce the stock of vehicles, while the low usage charge is likely to increase total distance travelled, and hence total fuel consumption. While this is not a subsidy, it is a structural incentive to travel greater distances on urban roads.

The situation is reversed on rural roads, where road users should pay $2 billion in usage charges and actually paid $2.3 billion. This higher usage charge would act to reduce total distance travelled. As the reduced amount paid for urban road use exceeds the increased amount paid for rural road use, and as a greater distance is travelled on urban roads than on rural roads, the net effect of these structural issues is to encourage greater road use and greater fuel consumption than the benchmark tax regime.

Of the different estimates reviewed, Pender's is the most detailed and comprehensive, as it includes road maintenance costs, the cost of capacity expansion and a return on investment for road infrastructure, while also providing estimates of accident, congestion and noise costs. However, there have been significant changes to road taxation since 1994-95, the year on which Pender's analysis was based. Pender's estimates are updated below.

8.4 Road User Revenue

It is a relatively straightforward matter to estimate the revenue from road users, as much of the data is available in budget papers and regular reports. Revenue from road users in 2001-02 was about $16 billion. The different components of this revenue are discussed below and are summarised in Table 9.

Table 9. Sources of revenue from road users in Australia, 2001-02.

Revenue Source	*Value ($m 2001-02)*
Vehicle import tariffs	1,100
Luxury car tax	200
Heavy vehicle registration fees	508
Other vehicle registration fees	2,400
Licence fees	265
Stamp duty	1,400
Federal Interstate Registration Scheme	27
Federal fuel excise	9,780
Toll revenue	450
TOTAL	**16,130**

8.4.1 Tariff Revenue

In 2001-02, the tariff rate for most imported passenger motor vehicles (PMVs) was 15% of the customs value. The tariff rate for imported four-wheel drives (4WDs), light commercial vehicle (LCVs) and most other road vehicles was 5% of the customs value. Pender estimated that tariff revenue amounted to $1 billion in 1994-95 (Pender, 1999). However, tariff rates for PMVs have fallen by 5% since 1994-95, and the customs value of imported vehicles has changed. This means that tariff revenue needs to be recalculated.

The total customs value of vehicles imported into Australia in 1999 was $9.143 billion (ABS, 2002b). Of this, $4.128 billion was attributable to PMVs (excluding 4WDs and LCVs) (DISR, 2000a). The remaining $5.015

billion was attributable to 4WDs, LCVs and other vehicles. Assuming the tariff for all these other vehicles is 5%, the total vehicle import tariff in 1999 was about $870 million.

By 2001-02, the total customs value of vehicles imported into Australia had increased to $11.461 billion. Assuming the same value split between PMVs and other vehicles, the total vehicle import tariff in 2001-02 was about $1.1 billion. Actual tariff revenue may have been slightly lower, due to the relative increase in popularity of 4WDs compared to PMVs over 1999 to 2001-02. However, for the purposes of identifying the road user subsidy, it is conservative to take the higher revenue assumption.

A conservative estimate of tariff revenue from road users is therefore about $1.1 billion. Road users experience the tariff as an increase in the price paid for imported cars above what they would pay if free trade in motor vehicles were permitted.

8.4.2 GST and Luxury Car Tax

In his calculation of total road user charges, Pender included an excess component of the wholesale sales tax (WST), which was abolished when the goods and services tax (GST) was introduced. The excess WST component was calculated relative to a 10% GST, chosen as the benchmark for fair consumption tax treatment. Pender's rationale was that the WST fell relatively heavily on road users compared to other taxpayers and that a broad-based GST would provide fairer tax treatment.

The current 10% GST is a broad-based consumption tax that meets Pender's criteria for a fair consumption tax benchmark. Under the current GST, motorists are taxed at the same rate as other road users. The GST does not, therefore, constitute a road user charge.

Before the GST was introduced, a higher rate of WST applied to luxury cars. To preserve the price difference between luxury cars and other cars, a luxury car tax (LCT) was introduced. In 2001-02, the luxury car tax resulted in revenue of $200 million (Commonwealth Government, 2002a).

8.4.3 Registration Fees, Licence Fees and Stamp Duty

Pender estimated registration fees at $2.2 billion ($1.8 billion for cars and $0.4 billion for trucks). Current figures for registration fees, licence fees and stamp duty on motor vehicle registrations and transfers are available from the Commonwealth Grants Commission (Commonwealth Grants Commission, 2002). For 2000-01, heavy vehicle registration fees were $508 million, other vehicle registration fees were $2.4 billion, licence fees were $265 million and stamp duty was $1.4 billion. Total state revenue from these sources was $4.56 billion. Heavy vehicles can also choose to register under the Federal Interstate Registration Scheme, which collected $26.6 million in registration fees in 2000-01 (BTRE, 2002).

8.4.4 Federal Fuel Excise

Pender estimated that the value of Federal fuel excise was $7.9 billion in 1994-95 and that the state petrol products franchises, which applied in all states except Queensland, brought in additional revenue of $1.4 billion. Since the time of Pender's estimate, the state petrol taxes have been abolished and the Federal Government collects all fuel excise. A portion of the excise is transferred to the states. Total Federal fuel excise collected from petroleum products in 2001-02 was $12.4 billion (Commonwealth Government, 2002a).

However, this figure includes excise collected from off-road users of diesel fuel, which is returned through the Diesel Fuel Rebate Scheme (DFRS). Approximately $2.17 billion of the total excise revenue was returned through the DFRS in 2001-02 (Commonwealth Government, 2002c). As discussed in Section 6.1, the return of these funds is appropriate. However, to calculate the total revenue from road users, the value of the DFRS needs to be subtracted from the total fuel excise collected. About $10.2 billion in fuel excise was collected from road users in 2001-02.

An additional $450 million of Federal fuel excise is returned through the Queensland Fuel Subsidy Scheme, which aims to keep fuel prices in Queensland at the lower levels that existed before the Federal Government

took over all petrol taxes (Queensland Treasury, 2002). When this figure is removed, net fuel excise collected from road users was about $9.8 billion in 2001-02.

8.4.5 Road Tolls

Pender does not include an estimate of toll revenue. Tolls in 1999-2000, the most recent year for which data is available, were estimated at $361 million (BTRE, 2002). In 2001-02 dollars, this is about $394 million. Allowing for the opening of new toll roads, a conservative estimate of toll revenue is about $450 million.

8.5 Determining Appropriate Revenue

As Pender (1999) points out, identifying the existence of a subsidy to road users is not as simple as comparing total revenue from road users to estimates of the total cost of the road network. Instead, it is necessary to compare the treatment of road users against an appropriate benchmark, defined as 'the tax treatment of private activity plus an allowance for the social costs generated by vehicle use' (Pender, 1999, p.31). Pender develops accounts for a hypothetical privatised road authority to facilitate comparison with the benchmark.

The hypothetical road authority is subject to regulation and must abide by the regulator's decisions. On behalf of the regulator, it collects a congestion levy, an accident levy and a noise levy. The regulator sets the levies. The road authority is allowed to retain the funds from these levies, as long as it abides by the regulator's decisions regarding road network improvement and capacity expansion. The road authority also collects a charge for access to the road network and a charge related to the distance travelled on the road network. These charges are set at a level sufficient to cover all expenses incurred by the authority that are not met by the levy revenue.

The authority incurs expenses associated with road maintenance and capacity expansion, in line with regulatory requirements. As a private entity, it must also pay state land tax on the 'single dwelling residential use' value of land under roads in urban areas. Finally, the road authority must pay the state a normal rate of return on the value of the land under roads and the written down value of road materials.

By setting the access and distance charges at a level sufficient to ensure total road authority income equals total expenditure, it is possible to determine the total income that would be appropriate for the hypothetical road authority. This can be compared to actual income from road users (estimated in Section 8.4) to estimate the magnitude of the road user subsidy or excess tax.

A modified version of Pender's accounts is presented in Table 10, based on updated figures for 2001-02. The derivation of each of the line items in the accounts is discussed in more detail below.

Table 10. Hypothetical road authority counts for Australia in 2001-02. Based on Pender (1999) with updated figures.

Income	***Value ($m 2001-02)***
Congestion levy	3,860
Accident levy	3,320
Noise levy	210
Access and distance charges	13,230
Total Income	**20,620**
Expenditure	***Value ($m 2001-02)***
Road maintenance and capacity expansion	9,560
Land tax	2,000
Total Expenditure	**11,560**
Return on investment	**9,060**

8.5.1 Congestion Costs

As noted above, a proportion of the total road authority income is in the form of a congestion levy. This is not an attempt to internalise the full costs of congestion. Rather, the charge 'should reflect the balance between the social benefits which result from lower congestion and land resumption costs' (Pender, 1999, p.39). Ideally, the congestion levy would be location sensitive and would be collected from road users that are most responsible for increasing the marginal congestion of the road network, such as urban users.

Pender estimates optimal congestion levies of 2.9 c/km for cars in urban areas, 7.3 c/km for trucks in urban areas and zero for all travel in rural areas, and notes that these estimates are very conservative (Pender, 1999). He then uses estimates of vehicle kilometres travelled (VKT) to determine the total value of the congestion levy.

Total VKT in 2000 (the most recent year for which data are available) were 180.8 billion, of which approximately 56.4 billion was in rural areas. About 6.3 billion of the rural travel was by trucks and the remaining 50.1 billion was by cars. About 118.7 billion of the urban VKT was by cars and the remaining 5.7 billion was by trucks (ABS, 2001b). Applying these updated figures gives an estimate for the total congestion levy of $3.86 billion.

It should be noted, however, that the true costs of congestion are significantly higher than this partial congestion levy. The Bureau of Transport Economics estimated a congestion cost in Australia's major urban areas of $12.8 billion dollars per year (BTE, 2000b). The estimate was based on the value of excess travel time and other resource costs, such as fuel use, incurred by the actual traffic in comparison to free-flow conditions. These costs are not captured by the congestion levy.

8.5.2 Accident Costs

A similar approach is used to calculate an accident levy. Pender's estimates of the optimal accident levy for 2 car accidents are 1.8 c/km for cars in urban areas, 1.6 c/km for cars in rural areas, 3.8 c/km for trucks in urban areas and 2.6 c/km for trucks in rural areas (Pender, 1999). Using updated estimates for VKT, this gives an estimated accident levy of $3.32 billion.

However, another report by the BTE conservatively estimates the cost of road crashes in Australia at $15 billion per year (BTE, 2000a). This estimate is much more comprehensive than the estimates surveyed by Pender and is likely to be more accurate. Again, Pender's accident levy is only recovering a small portion of the total cost of motor vehicle accidents.

8.5.3 Noise Costs

A similar approach is used to calculate a noise levy. Pender estimates the cost of motor vehicle noise at 3.7 c/km for trucks in urban areas and assumes that noise costs from cars, and from trucks in rural areas, are negligible (Pender, 1999). Using updated estimates for VKT, an appropriate noise levy in 2001-02 would be $210 million.

8.5.4 Road Maintenance and Capacity Expansion Costs

The National Road Transport Commission (NRTC) provides up to date information on total government expenditure on road maintenance and road network expansion, based on reports from state and local governments. The NRTC's most recent estimate was $9.268 billion in 2000-01 (NRTC, 2002) or $9.56 billion in 2001-02 dollars.

8.5.5 Land Tax

Pender's hypothetical road authority must pay state land tax at 1.5% on the 'single dwelling residential use' value of land covered in tarmac in urban areas (Pender, 1999). The current rate of land tax in NSW is 1.7%, and

after a review of land tax rates in other states, this is a reasonable rate to apply in 2001-02. The lengths of urban arterial roads and urban local roads in 1999 were 12,200 km and 75,300 km respectively (AAA, 2000). Assuming, after Pender, that arterial roads have four lanes and local roads two lanes, and that average lane width is 3 metres, the total lane length is 199,400 km and the total urban road area is about 0.6 billion square metres.

The median single dwelling residential value of land in the capital cities is $194,400 (ABS, 2002a). Assuming, after Pender, that the average urban lot size is 1,000 square metres, the total land tax payable by the hypothetical road authority is about $2 billion.

8.5.6 Return on Investment

By valuing land allocated to the urban road network at its alternate use of single dwelling residential, Pender estimated the value of the urban road network at $88 billion and the rural road network at $63 billion. These figures include the written down value of the tarmac and other materials in the road network. The road authority is required to pay the state a 5 per cent real pre-tax return on the value of the road network. Using the figures above, Pender's estimate of the size of this payment in 1994-95 was $7.6 billion (Pender, 1999).

While it is possible to update Pender's estimate of the value of land under the urban road network, as discussed above, there is little new data on the value of land under the rural road network and the value of road infrastructure (tarmac, gravel etc). The data used by Pender appears to be the best available, so his estimate has been converted to 2001-02 dollars. The normal rate of return required for 2001-02 is therefore $9.06 billion.

8.5.7 Access and Distance Charges

The road authority sets charges for access to the road network and travel on the road network at a sufficient level to cover expenditure on road maintenance, capacity expansion, land tax and the payment of a normal rate of return to the state. The magnitude of these charges is determined last by summing the total expenditure, and subtracting the congestion, accident and noise levies. The result is $13.2 billion in combined access and distance charges.

8.5.8 Discussion

When the access and distance charges are included, the total appropriate revenue for the hypothetical road authority is $20.6 billion. Actual income from road users in 2001-02 was $16.1 billion (see Section 8.4) so there is an apparent subsidy of $4.5 billion to road users. It is important to note that this method does not attempt to recover the full costs of congestion, accidents and noise from road users. It merely attempts to structure charges so that road users are more aware of the marginal impact of their road use on congestion, accidents and noise.

It is interesting to note that Pender found an excess tax of $100 million on motorists in 1994-95, while a similar method finds a substantial subsidy of $4.5 billion to road users in 2001-02. This partially reflects changes in taxation arrangements since 1994-95, including abolition of the WST, reductions in fuel excise and suspension of fuel excise indexation. Taxation of motorists has failed to keep pace with increases in the value of land under the road network (reflected in the land tax and rate of return on assets) and increases in expenditure on the road network.

The subsidy to road users reduces the cost of using the road network below what it would be in the unsubsidised case. Pender notes that the stock of vehicles does not appear to be sensitive to the cost of accessing or using the road network, so a subsidy to road users is unlikely to have much impact on the number of vehicles in Australia. However, the distance travelled is sensitive to distance-related costs (such as fuel price). This means that a subsidy to road users will tend to increase the distance travelled by road users and hence the GHG emissions (as 99.7% of road transport uses fossil fuels). It is reasonable to conclude that the road user subsidy is environmentally harmful, as long as fossil fuels remain the main energy source for road transportation.

Subsidisation of road users is also economically inefficient, as it prevents optimal use of the road network and will tend to increase congestion, accidents and noise, all of which have substantial economic costs. Additional revenue from road users could be used to fund the development of sustainable fuels and transport alternatives.

8.6 Additional Road Transportation Subsidies

There are additional subsidies to road transportation not considered in the above analysis. These subsidies are listed in Table 11 and discussed in more detail below.

Table 11. Summary and categorisation of road transportation subsidies that support fossil fuel use.

Subsidy	*Annual Value ($m)*	*Greenhouse Negative?*	*Perverse?*
Road user subsidy	4,490	√	√
Diesel and Alternative Fuels Grants Scheme	660	√	×
Fuel Sales Grants Scheme	210	√	×
Availability of statutory formula method for FBT on employer-provided cars	910	√	√
CATEGORY TOTALS ($m)	**6,270**	**6,270**	**5,400**

8.6.1 Diesel and Alternative Fuels Grants Scheme

The Diesel and Alternative Fuels Grants Scheme (DAFGS) provides grants for use of diesel, compressed natural gas, liquefied petroleum gas, recycled waste oil, ethanol, canola oil and other fuels for long-distance road freight. The scheme provides particular support for use of these fuels by primary producers. The cost of the DAFGS was $735 million in 2001-02 (Commonwealth Government, 2002c). This is a direct financial subsidy to the use of diesel and alternative fuels for road transport in Australia.

The proportion of this subsidy that supports fossil fuels is uncertain. Some proportion of the subsidy supports renewable fuels such as ethanol, however the volume of diesel, LNG and CNG consumed in Australia is much higher than the renewable fuels. In 1997-98, consumption of diesel was roughly three times the consumption of LNG/CNG, with other alternative fuels having much smaller consumption rates (ABS, 2001a). A conservative assumption is that 90% of the DAFGS funding is taken up by fossil fuel users. This amounts to a fossil fuel subsidy of about $660 million.

It is likely that this subsidy is environmentally harmful. While combustion of diesel, LNG and CNG generates lower emissions than combustion of an equivalent amount (based on energy content) of petrol, it is unlikely that the DAFGS is stimulating fuel switching from petrol. It is more likely that existing users of diesel and alternative fuels will instead be encouraged to drive more by the lower net prices for the fuels. This will result in GHG emissions above what they would have been in the unsubsidised case.

The intent of the DAFGS is to reduce the cost of fuel to businesses, particularly in rural and regional areas. This is linked to objectives of regional development and economic growth. These objectives could equally be met through funding that is not tied to fuel consumption. However, this does not mean that the DAFGS is a perverse subsidy. As fuel is a significant input to businesses that can receive the DAFGs, the subsidy is likely to be an efficient way to stimulate greater economic activity by those businesses.

8.6.2 Fuel Sales Grants Scheme

The Fuel Sales Grants Scheme (FSGS) pays grants to fuel retailers and distributors of petrol and diesel in regional and remote areas of Australia in order to prevent rises in fuel prices as a result of the implementation of GST in Australia. The cost of the FSGS was $210 million in 2001-02 (Commonwealth Government, 2002c). This is a direct subsidy to retailers of fossil fuels, which must be passed on to consumers as a condition of the grant.

As the FSGS reduces the price of fuel in regional and rural areas, it encourages greater consumption of fuel in these areas, and hence greater GHG emissions. It is reasonable to conclude that the subsidy is environmentally harmful. However, the subsidy is not necessarily perverse, as it is a relatively efficient way to achieve the

government's stated objective of preventing fuel price rises in the targeted regions. As for the DAFGS, the driving objective of the FSGS is regional and rural economic development. This objective could be equally met without tying the funding to fuel consumption.

8.6.3 Tax Benefits for Cars Provided by Employers

Employers that provide vehicles or other benefits for use by employees in Australia are liable for fringe benefits tax (FBT). Two methods may be used to calculate liability for FBT: the operating cost method and the statutory formula method. The operating cost method accounted for only 7% of total motor vehicle FBT in 1998/99 (Australian Taxation Office, 2001). It requires a logbook to be kept to determine actual operating costs and the actual proportion of the time that the car is in private use. The benefit to which FBT applies (the taxable value) is then equal to the private fraction of the actual vehicle operating costs as determined from the logbook.

The statutory formula method determines the taxable value to which FBT applies by multiplying the purchase value of the vehicle by a statutory percentage that varies with total distance travelled by the car during the year. The greater the distance travelled, the lower is the taxable value. This method accounted for 93% of total FBT paid on motor vehicles in 1998/99 (Australian Taxation Office, 2001). The method assumes that the greater the distance travelled by the vehicle, the lower the proportion of private use and hence the lower the fringe benefit to the employee. This acts as a clear incentive to drive further and hence to consume more fuel and generate more GHG emissions.

The Commonwealth Government recognises that the use of the statutory formula provides a concession to taxpayers and therefore includes an estimate of the financial impact of this arrangement in its Tax Expenditures Statement (Commonwealth Government, 2003). The tax expenditure associated with the application of the statutory formula to value car benefits was estimated at $910 million for 2001-02. As this tax expenditure encourages employees to drive further, it is an environmentally harmful subsidy. The subsidy does not appear to be tied to any specific government objective, other than to simplify record keeping for employees with company cars. This objective could be met without encouraging greater driving. As the subsidy distorts the true cost of driving, and its objectives can be met in other ways, it can be categorised as a perverse subsidy.

8.6.4 Automotive Industry Support

The Commonwealth Government provides direct support to the automotive industry in Australia through the Automotive Competitiveness & Investment Scheme (ACIS). This scheme is budgeted to provide $400 million per year over the five years from 2001 to 2005 to encourage investment and innovation in the Australian automotive industry.

This direct support for the Australian automotive industry could theoretically allow the industry to sell motor vehicles at lower prices, which could increase the number of vehicles on the road. However, in practice, the automotive industry may choose to take increased profits, rather than lower vehicle prices. In addition, the low sensitivity of vehicle stock to vehicle price (Pender, 1999) means that lower vehicle prices are unlikely to lead to a significant increase in stock. It is therefore not possible to unequivocally link this subsidy to greater consumption of fossil fuels. The subsidy is not listed in Table 11.

It should be noted, however, that support for the automotive industry helps to lock in the existing dominance of motor vehicle transport over alternative forms of transport, and maintains a situation where fossil fuels are the main source of transport energy. Although the ACIS is not strictly a subsidy to fossil fuels, it does act to support the dominance of fossil fuels. Removal of this subsidy, and transfer of the funds to development of alternative transport, could help to significantly reduce transport emissions in the long-term.

9 Possible Subsidies Not Estimated

The 2002 TES lists a number of tax expenditures that could potentially act as fossil fuel subsidies, depending on the details of their implementation. These include:

- the availability of alternatives to the actual expenses method of substantiating employment-related car expenses;
- FBT exemption for employee taxi travel arriving at or leaving from place of work;
- reimbursement of car expenses incurred with occupational health and counselling services and some training courses;
- FBT concession for car parking on small business premises;
- FBT exemption for certain car parking fringe benefits, including benefits provided by employers who are non-profit scientific organisations, charitable institutions, religious institutions or public education institutions;
- FBT undervaluation of benefits resulting from valuation arrangements for car parking;
- FBT exemption for private use of a taxi, panel van, utility or other vehicle where the use is minor and infrequent, including use for home-to-work travel;
- FBT exemption for fuel for live-in employees caring for the elderly or disadvantaged;
- FBT reduction of the taxable value for residential fuel for remote area housing provided by employers;
- discounted valuation of employee stand-by travel for airline employees and travel agents;
- FBT exemption for up to $500 per employee of the taxable value of airline transport fringe benefits;
- FBT reduction in the taxable value of holiday travel for employees posted overseas;
- capital expenditure incurred on connecting or upgrading mains electricity to a property on which a business is conducted can be depreciated on a ten-year prime cost basis;
- accelerated depreciation for mining buildings; and
- excise exemption for condensate produced by the petroleum industry (see Section 6.5 for a very brief discussion).

These potential subsidies have not been investigated in detail due to constraints on the time available for the research, their small size in relation to the other subsidies considered, the lack of estimates in the TES, or difficulty in separating them from other tax expenditures. They would be suitable for further research in the future.

Other subsidies that were identified and discussed in previous sections, but for which a value could not be readily estimated include:

- subsidies arising from electricity pricing structures that encourage greater fossil fuel consumption; and
- subsidies arising from the greater scale and degree of centralisation of fossil fuel power stations.

Further research on these subsidies would also be useful, however it may not be possible to estimate the magnitude of these subsidies.

One possibility for identifying and investigating additional subsidies is to hold a parliamentary inquiry into subsidies to fossil fuels in Australia. This would allow access to a much greater range of information than was available for the current research and a clearer link to a process for subsidy removal.

10 Summary of Subsidies

The subsidies described in the previous sections are summarised in Table 12. Only those subsidies for which a value has been estimated are listed. For each identified subsidy, the following information is provided:

- the estimated magnitude of the subsidy in 2001-02 in A$ million;
- the section of the paper in which the subsidy is discussed in detail;
- identification of which fossil fuels (coal, oil, natural gas) are supported by the subsidy;
- an indication of whether the subsidy supports fossil fuel production or fossil fuel consumption;
- identification of subsidies that act to increase GHG emissions ('greenhouse negative' subsidies); and
- identification of perverse subsidies that are 'greenhouse negative' and economically inefficient.

Where more than one fossil fuel is supported, the proportion of the subsidy that supports each type of fossil fuel has been estimated. These estimates should be treated with caution, as they are generally even less certain than the magnitude of the total subsidy.

Where the subsidy supports both production and consumption of fossil fuels, an estimate of the proportion that supports production and the proportion that supports consumption is provided. Confidence in these estimates is similar to the confidence in the total subsidy estimate, as production and consumption subsidies have been estimated separately.

As shown in Table 12, the total magnitude of identified subsidies is about $8.9 billion. Figure 2 shows the proportion of the identified subsidies that support each fossil fuel. By far the majority of the identified subsidies (93%) support production or consumption of oil or petroleum products. Support for coal is only 4% of the total and support for natural gas is 3% of the total. Figure 3 shows that there is a similar dominance of fossil fuel consumption subsidies over fossil fuel production subsidies. Consumption subsidies make up 94% of the total. It is clear from these figures that subsidies for consumption of petroleum products, mainly for road transport, are dominant in Australia. As with most developed countries, direct subsidies to coal have largely been removed. Subsidies to natural gas are relatively small, but may grow as the share of natural gas in the fuel mix continues to grow.

The proportion of the total fossil fuel subsidies in each of the categories defined in Section 4 is shown in Figure 4. Of the total identified fossil fuel subsidies, just under 9% are 'greenhouse friendly' as they actually reduce net GHG emissions from production and consumption of fossil fuel. The remaining 91% are 'greenhouse negative'. About 34% of the total subsidies are greenhouse negative, but not perverse. About 58% of the total subsidies are perverse – both greenhouse negative and economically inefficient.

Table 12. Summary and categorisation of subsidies identified in this research for which values have been estimated.

Subsidy	*Magnitude ($m 2001-02)*	*Section of Paper*	*Fossil Fuel Supported*			*Supply Chain Location*		*Categorisation*	
			Coal	*Oil*	*Natural Gas*	*Production*	*Consumption*	*Greenhouse Negative*	*Perverse*
Greenhouse Gas Abatement Program (GGAP)	30	5.1	63%	8%	29%	70%	30%		
Geoscience Australia – non-recovery of costs	22	5.2							
DITR – non-recovery of costs	36	5.2	20%	50%	30%				
State agencies – non-recovery of costs	128	5.2	27%	35%	38%				
Special company tax deductions for petroleum exploration	214	5.3							
Research and development	149	5.4	40%	30%	30%	59%	41%		
Stuart Oil Shale excise and royalty exemption	0 to 38	5.5							
Timor Sea Treaty projects	8	5.5							
Excise exemption for alternative fuels	594	6.2							
Concessional rate of excise for fuel oil, heating oil and kerosene	240	6.3							
Concessional rate of excise for aviation fuel	770	6.4							
Subsidised supply of electricity to aluminium smelters	195 to 232	7.1							
State electricity supply subsidies for low-income households	224	7.2	87%	1%	12%				
Subsidy to motorists	4,490	8.1 to 8.5							
Diesel and Alternative Fuels Grants Scheme	660	8.6		75%	25%				
Fuel Sales Grants Scheme	210	8.6							
Availability of statutory formula method for FBT on employer-provided cars	910	8.6							
TOTALS ($m 2001-02)	**8,880 to 8,955**		**315**	**8,260 to 8,355**	**305**	**517 to 555**	**8,363 to 8,400**	**8,107 to 8,182**	**5,111 to 5,186**

Figure 2. Proportion of identified subsidies that supports each fossil fuel.

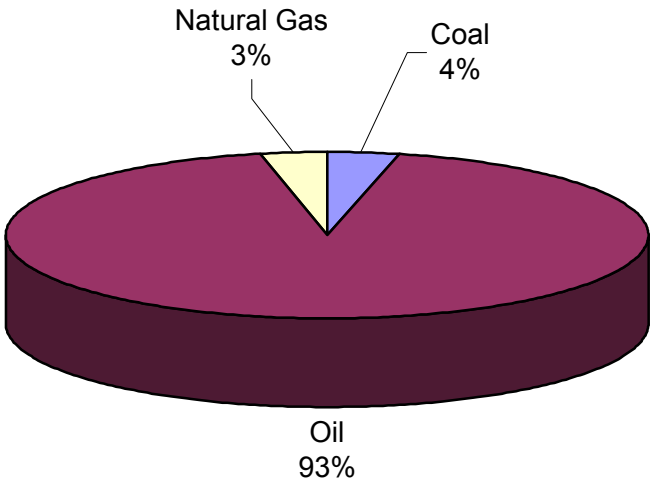


Figure 3. Proportion of identified subsidies that support producers and consumers.

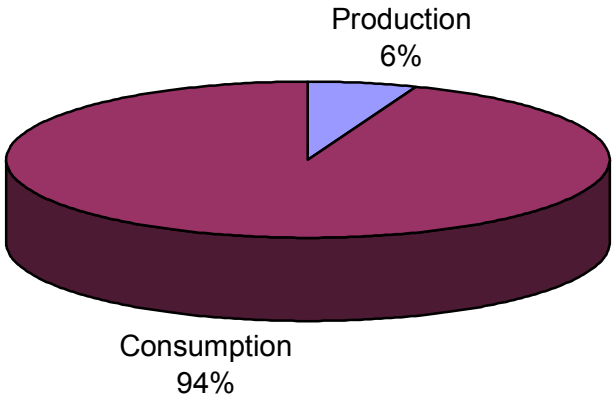
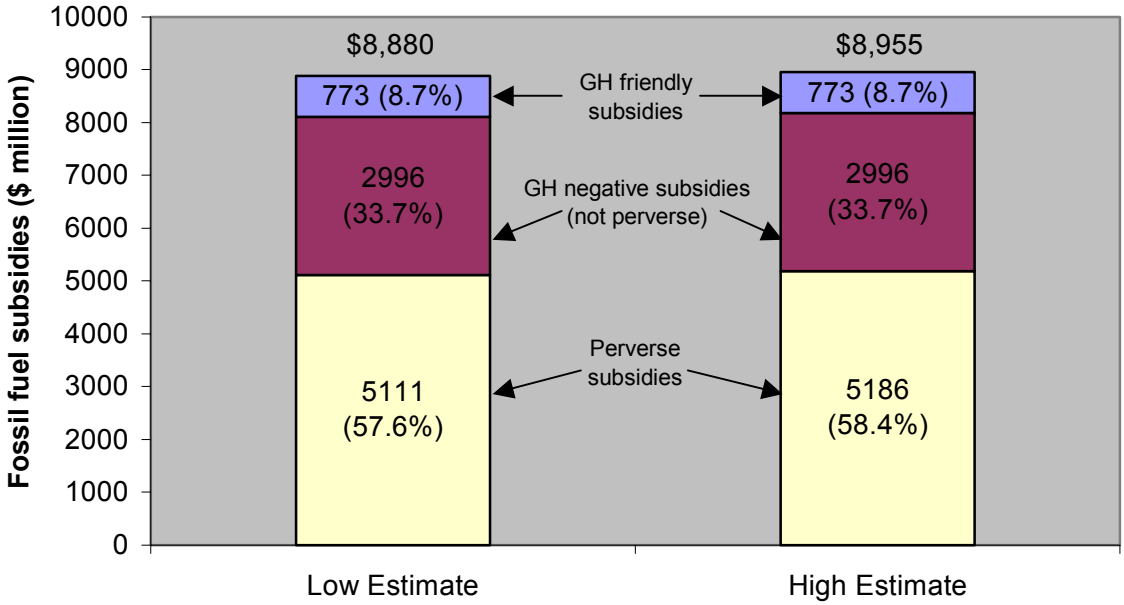


Figure 4. Total fossil fuel subsidies showing the proportion in each category.



11 Conclusion

Total fossil fuel subsidies worth almost $9 billion were identified in this research. Some economists argue that all subsidies should be removed to allow markets to operate efficiently, however most governments continue to use subsidies to achieve environmental and social goals. This is justifiable where the cost of the subsidy is less than the value of the environmental and social gain that results from the subsidy. As such, removal of all fossil fuel subsidies may not be appropriate.

Of the total fossil fuel subsidies identified, about 91% ($8.1 billion) are likely to increase GHG emissions above the unsubsidised level. There is a much stronger argument for removal of these subsidies than for fossil fuel subsidies in general. However, many of these subsidies are used to achieve other economic or social objectives, and the benefits of subsidy removal need to be balanced against the negative impacts of their removal. In many cases, the subsidy can be restructured to achieve the desired economic or social objectives without encouraging increased GHG emissions.

About 58% of the total fossil fuel subsidies identified are perverse subsidies. These subsidies increase GHG emissions while at the same time reducing economic efficiency. Removal of these perverse subsidies can provide a 'double dividend' of greenhouse abatement and improved economic performance. However, this 'double dividend' will only be delivered if careful planning is conducted to ensure that the disruption caused by subsidy removal is minimised and steps are taken to ensure equitable treatment of all parties. Gradual removal of subsidies is more likely to provide an economic benefit than sudden removal.

It should also be noted that it is not possible to remove all perverse subsidies in the short-term due to the persistence of the arrangements that create the subsidies (e.g. contractual arrangements).

The subsidy estimates in this paper are approximate and incomplete. Some possible subsidies have been identified but not investigated in detail, and there may be additional subsidies that have not been identified. Further research could uncover additional subsidies and improve the estimates of identified subsidies. However, a clearer understanding of fossil fuel subsidies is of little use if not linked to a clear process for subsidy removal or reform.

The Australian Conservation Foundation (ACF) has proposed a national inquiry into environmentally damaging government programs and subsidies and environmental tax reform. ACF estimates that a broad-reaching inquiry

would cost about $10 million over a year to 18 months. Fossil fuel subsidies would only be one of the areas examined (Krockenberger, et al., 2000). Government commitment to such an inquiry would be essential if its recommendations were to be successfully implemented.

An inquiry of this sort could access information that was not readily available for this research and would have access to far greater resources to improve subsidy estimates. It would no doubt greatly improve current understanding and public awareness of fossil fuel subsidies.

For any government contemplating subsidy removal or reform, the question of what to do with the newly available funds arises. Rather than returning the funds to general revenue, an opportunity exists to shift existing subsidies from fossil fuels to sustainable energy systems, incorporating energy efficiency and renewable energy. Such subsidisation can be justified to offset the unpaid social and environmental costs of competing fossil fuel technologies.

There is also an argument for providing temporary subsidies to emerging industries of strategic importance until such industries can compete with more established industries. The public funds currently used to subsidise fossil fuel production and consumption could justifiably be used to subsidise the emerging sustainable energy industry, as establishment of this industry would constitute a public good.

If Australia is serious about greenhouse abatement, then removal of fossil fuel subsidies offers an attractive 'no regrets' abatement option. It also provides a possible source of funding for more costly greenhouse abatement options, which may be required if deep cuts in GHG emissions are contemplated in the future.

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