Mechanisms for Promoting Societal Demand Management

Prepared for IPART by
Energy Futures Australia Pty Ltd

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

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FOREWORD

The Premier has asked the Independent Pricing and Regulatory Tribunal to undertake an inquiry into what role Demand Management should play in providing the State's energy services. This paper is an input to the Inquiry and provides some background for considering Societal Demand Management mechanisms that may be appropriate to implement in New South Wales. The Tribunal has employed the services of Dr David Crossley of Energy Futures Australia Pty Ltd to prepare the paper.

The paper brings together information about a number of mechanisms that promote societal demand management, drawing on experiences overseas and across Australia. It includes analysis of the advantages and disadvantages of the various types of mechanisms. It recognises that some programmes have already been implemented in New South Wales and proposes broad recommendations for continued and enhanced use of demand management options. Areas for further investigation are also identified.

The Tribunal regards this paper as a useful contribution to considering the role and implementation of Demand Management in New South Wales.

Thomas G Parry
Chairman
February 2002

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Independent Pricing and Regulatory Tribunal

13 February 2002

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CONTENTS

1 INTRODUCTION 1
1.1 Defining Demand Management 1
1.2 Evaluation of DM Options 2
1.3 Societal Demand Management 2
1.4 Objectives of this Report 3

2 ENERGY EXTERNALITIES 3
2.1 Classification of Energy Externalities 3
2.2 Valuation of Energy Externalities 4

3 BARRIERS TO SOCIETAL DEMAND MANAGEMENT 6

4 MECHANISMS FOR PROMOTING SOCIETAL DEMAND MANAGEMENT 8

4.1 Control Mechanisms 9
4.1.1 Mandatory Planning Processes 9
4.1.2 Mandatory Environmental Targets 11
4.1.3 Mandatory Performance Codes and Standards 14
4.1.4 Advantages and Disadvantages of Control Mechanisms 16

4.2 Funding Mechanisms 17
4.2.1 Direct Allocation of Funds 17
4.2.2 Public Benefits Charge 18
4.2.3 Advantages and Disadvantages of Funding Mechanisms 21

4.3 Support Mechanisms 22
4.3.1 Education, Information and Training 22
4.3.2 Entrepreneurial Greenhouse Organisations 23
4.3.3 Industry Development 25
4.3.4 Voluntary Agreements 26
4.3.5 Cooperative Activities 28
4.3.6 Advantages and Disadvantages of Support Mechanisms 30

4.4 Market Mechanisms 30
4.4.1 Incorporating Externalities into Energy Prices 31
4.4.2 Price Signalling 33
4.4.3 Energy Performance Labelling 34
4.4.4 Green Power 35
4.4.5 Trading Schemes 36
4.4.6 Cooperative Procurement 39
4.4.7 Energy Performance Contracting 40
4.4.8 Competitive Sourcing of Demand-side Resources 41
4.4.9 Demand-side Bidding 43
4.4.10 Advantages and Disadvantages of Market Mechanisms 45

5 APPROPRIATE MECHANISMS FOR APPLICATION IN NSW 46
5.1 Current Application of Mechanisms 46
5.2 Barriers to the Implementation of Demand Management 46
5.3 Increased Application of Mechanisms 48

6 REFERENCES 49

1 INTRODUCTION

1.1 Defining Demand Management

Demand management is one of a number of ways in which suppliers can meet their customers' requirements for energy services (such as operating computers, cooked food or a comfortable working or living space).

This report uses the definition of demand management which was included in the *Issues Paper* for the IPART Demand Management Review[1]. The *Issues Paper* used the term *demand management* to refer collectively to its various forms, including:

- **Energy efficiency**, which comprises activities that reduce the amount of energy consumed in meeting end-users' requirements for energy services. Examples of such activities include: introducing higher efficiency equipment or appliances; improving the management of a process or facility; and reducing waste through installing products such as insulation.
- **Load management**, which involves activities designed to reduce peak load on the electricity system as a whole or in particular parts of the system. The *Issues Paper* distinguished between two types of load management:
  - **Network load management,** comprising activities that reduce the peak demand on the network, thereby deferring or avoiding the need to augment the network;
  - **Generation load management**, comprising activities that reduce the peak demand in the generation market, thereby avoiding the need to call on the most expensive generators and deferring the need to build new power stations.

  Both network and generation load management achieve a benefit by reducing loads on the system directly or by shifting peak loads into off-peak periods.
- **Distributed generation**, which involves electricity generation plant connected within a DNSP's network rather than within the transmission network (also known as embedded generation). Embedded generators are usually located close to electricity loads and may be linked to industrial processes (for example, cogeneration). Distributed generation can also refer to generation that is not permanently synchronised within a DNSP's system, and so can include stand-alone systems that are separate from the network.

In addition, this report contains a discussion of mechanisms which can be applied to increase the implementation of demand management. The discussion includes examples of mechanisms which have been applied to increase the usage of renewable energy. While using renewable energy is not strictly demand management, renewable energy mechanisms operate in similar ways to those which can be applied to achieve increased demand management.

[1] Independent Pricing and Regulatory Tribunal (2001). *Inquiry into the Role of Demand Management and Other Options in the Provision of Energy Services: Issues Paper*. Sydney, IPART.

1.2 Evaluation of DM Options

In the IPART demand management *Issues Paper*, a distinction was drawn between a *financial* and an *economic* evaluation of demand management options[2].

A *financial* evaluation involves comparing the direct costs incurred and benefits received as the result of the implementation of a DM option. This comparison is done from the perspective of a specific stakeholder, such as an energy business or a customer. For example, from the customer's perspective, the net costs of a DM option should be compared with the cost of receiving the same level of energy service through conventional means. Simplistically, the cost to the customer of the conventional option will be expressed as the retail cost of the energy used to produce the energy service. However, this retail cost is made up of a number of components, including the cost of generating the energy, the network costs involved in transporting the energy to the customer, and the retail sales margin.

In contrast, an *economic* evaluation compares costs and benefits from the perspective of society as a whole. In principle, an economic evaluation of a DM option should consider:

- avoided transmission and distribution losses;
- deferred transmission and distribution augmentation investment;
- avoided energy generation costs;
- avoided (and incurred) environmental costs, including greenhouse gas emission reductions (although valuing these costs is often highly contentious).

1.3 Societal Demand Management

Many demand management options may not be financially viable from the perspective of one or more stakeholders, but an economic evaluation will still show an overall benefit to society. A typical example is an energy efficiency program undertaken by, or on behalf of, customers of an energy business. Such a program will result in reduced energy sales. Therefore, usually it will not be financially viable for the energy business to invest in such a program[3]. However, the program may well be financially viable for a customer if the cost of investing in the program is less than the customer's saving in energy costs.

The energy efficiency program will also lead to a reduction in greenhouse gas emissions, which is generally regarded as an overall benefit to society. Indeed, a government may place an implicit or explicit value on greenhouse gas emission abatement. A government may therefore be prepared to provide financial grants and subsidies to customers who undertake energy efficiency programs, where such programs are regarded by customers as non-viable without such financial assistance.

DM options which are not financially viable to one or more stakeholders but which result in an overall benefit to society may be termed *societal demand management*. Typically, societal demand management reduces the adverse impacts associated with energy production, supply and use, either by reducing the quantity of energy required to provide a given level of energy

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[2] Independent Pricing and Regulatory Tribunal (2001), *op cit*.

[3] In a narrow range of specific circumstances an energy efficiency program may be financially viable to an energy business, eg where the reduction in energy use happens to coincide with the system peak in a geographical locality where the network is constrained.

service (ie energy efficiency) or by using energy sources and technologies which have comparatively low levels of adverse impacts (eg renewable energy technologies).

1.4 Objectives of this Report

The objectives of this report are:

- to identify the externalities associated with energy production, supply and use;
- to identify the barriers to increased implementation of societal demand management;
- to identify, describe and evaluate options for encouraging increased implementation of societal demand management.

2 ENERGY EXTERNALITIES

Energy prices paid by customers are generally based on the costs of generating, transporting and retailing the energy purchased by the customer. These are the costs incurred directly by energy businesses. However, there are a range of other costs and benefits incurred by society as a whole which currently are not reflected in energy prices. These additional costs and benefits are generally termed *externalities* because they result as unintended byproducts of an economic activity which accrue to someone other than the parties involved in that activity[4]. As a result, externalities do not enter into the market-pricing calculations of the parties undertaking the activity.

Energy externalities include costs imposed on society and the environment which are not accounted for by the producers and consumers of energy, such as effects of air pollution on health, buildings, crops, forests and global warming; occupational disease and accidents; and reduced amenity from visual intrusion of energy-related infrastructure or emissions of noise. Some analysts would also include as externalities the hidden costs borne by governments, including subsidies for energy production and supply activities and government-funded energy R & D programs.

2.1 Classification of Energy Externalities

Externalities attributable to electricity generation have been classified in the following four general categories[5]:

- **air pollutants** including sulphur dioxide, nitrogen oxides, particulates, and heavy metals with impacts on human health, flora and fauna, building materials, and on other social assets like recreation and visibility;
- **greenhouse gases** including carbon dioxide, methane, and chlorofluorocarbons suspected of contributing to global climate change and thus to potential impacts on agriculture and human health;

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[4] US Energy Information Administration (1995). *Electricity Generation and Environmental Externalities: Case Studies*. Washington DC, EIA.

[5] US Federal Energy Regulatory Commission (1992). *Report on Section 808: Renewable Energy and Energy Conservation Incentives of the Clean Air Act Amendments of 1990*. Washington DC, FERC.

- **water use and water quality** affected by electricity production, principally through thermal pollution or hydroelectric projects that affect aquatic populations;
- **land use values** affected by power plant sitings and by waste disposal including solid, liquid and nuclear wastes.

More extensive and detailed classifications of energy externalities are possible; for example, the National Association of Regulatory Utility Commissioners in the United States has identified 12 categories of externalities associated with the production, supply and use of electricity[6]. These externalities impact on:

- agricultural crops, timber, and livestock;
- catastrophic accidents;
- ecosystems and biodiversity;
- environmental-cultural icons;
- global climate change;
- human morbidity and mortality;
- land use;
- materials;
- recreational opportunities;
- regional economic structure;
- visibility; and
- visual and audio aesthetics.

2.2 Valuation of Energy Externalities

While valuing externalities in financial terms is difficult, studies which have carried out such valuations have shown that the financial impact is significant. Table 1 shows the financial impact of the externalities associated with electricity generation in various European countries in terms of each country's GDP[7].

The value of energy externalities varies according to the technology utilised. Figure 1 shows the financial cost of externalities for the complete fuel cycle of electricity generation, supply and use, according to the generation technology used[8]. The results are aggregated across several European countries. Costs are expressed in European Currency Units (ECU), now equivalent to euros. The units used are milli ECUs (ie 0.001 ECU); one ECU (euro) is currently equivalent to about AUD1.70.

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6 National Association of Regulatory Utility Commissioners (1993). *Environmental Externalities and Electric Utility Regulation*. Washington DC, NARUC.

7 Spanish Research Centre for Energy, Environment and Technology (1998). *ExternE Externalities of Energy - National Implementation.* Seville, Institute for Prospective Technological Studies, Joint Research Centre, European Commission.

8 Spanish Research Centre for Energy, Environment and Technology (1998), *op cit*.

Table 1. Financial Impact of Externalities of Electricity Generation	
Country	**Financial Impact (% of 1994 GDP)**
Belgium	1.2 – 3.1
Germany (Federal Republic)	0.7 – 1.2
Germany (Democratic Republic)	27 – 30
Denmark	2.0 – 2.9
Spain	1.6 – 2.1
Finland	1.3
France	0.5 – 0.6
Greece	3.0 – 5.2
Ireland	1.7 – 3.1
Italy	1.5 – 1.8
Netherlands	0.6 – 1.1
Norway	0.4
Portugal	1.3 – 1.8
Sweden	0.2

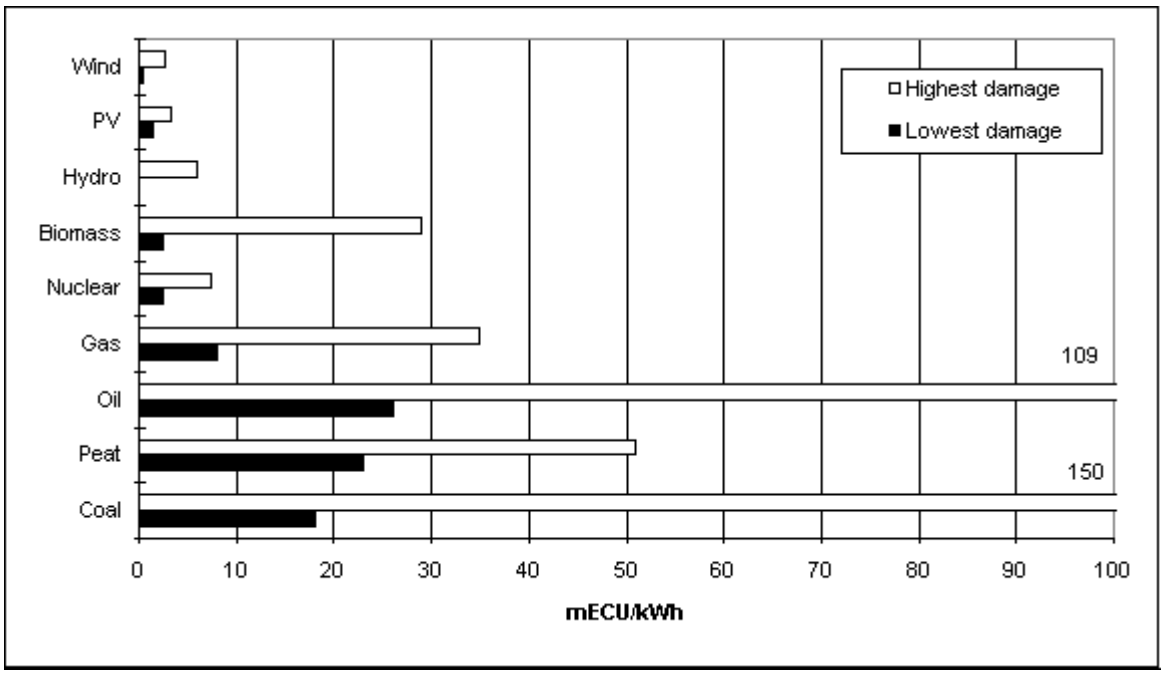

Figure 1. Financial Cost of Externalities for Electricity Generation, Supply and Use in several European Countries According to the Generation Technology Used

Clearly, energy externalities have the potential to impose significant financial impacts on society which are not reflected in the retail prices paid by purchasers of energy. The European study quoted above valued the externalities for electricity generation, supply and use at between 3 and 25 Australian cents per kilowatt-hour, when the electricity is generated from coal. The value of these externalities is likely to be lower in Australia because of the low sulphur content of Australian coal. However, if the European results are used as a guide, including the full costs of externalities in retail prices for electricity generated from fossil fuels in Australia would be likely to increase these prices by between 25% and 100%.

3 BARRIERS TO SOCIETAL DEMAND MANAGEMENT

As defined above, societal demand management comprises DM options which are not financially viable to one or more stakeholders but which result in an overall benefit to society.

Even though societal demand management results in an overall benefit to society, the potential benefit may not be fully realised because of various barriers which limit the implementation of DM options[9]. One major barrier which has already been identified is the existence of externalities, ie the non-inclusion in energy prices of the costs of many adverse impacts of energy production, supply and use. However, there are a broad range of other factors which also limit the implementation of DM options which result in an overall benefit to society.

Barriers are defined more broadly for the purposes of this report than they might be defined by economic theory. In economic theory, "market barriers" are factors which are used to explain the non-existence of a perfect market (eg lack of information is a market barrier). More formally, a market barrier is any characteristic of the market for an energy-related product, service or practice that helps to explain the gap between the actual level of investment in, or practice of, demand management by a stakeholder and an increased level that would appear to be cost effective to the stakeholder. However, for the purposes of this report, a barrier is any factor that limits the implementation of DM options.

A study sponsored by the International Energy Agency found that barriers to the implementation of demand management and energy efficiency operate at two levels[10]:

- **the policy level** – barriers operating at the level of government or society as a whole; and
- **the program level** – barriers operating to limit the implementation of particular DM options.

The IEA study found that policy barriers can influence program barriers, but, in contrast, program barriers have relatively little influence on policy barriers. The study developed the classification of barriers summarised in Table 2.

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[9] For a general discussion of barriers to energy efficiency see Crossley, D J (1983). Identifying barriers to the success of consumer energy conservation policies. *Energy* vol 8, pp 533-546.

[10] Crossley, D, Hamrin, J, Vine, E, Eyre, N (1999). *Public Policy Implications of Mechanisms for Promoting Energy Efficiency and Load Management in Changing Electricity Businesses.* IEA DSM Programme, Task VI Research Report No 2. Sydney, Energy Futures Australia Pty Ltd.

Table 2. Barriers to the Implementation of Demand Management and Energy Efficiency (EE)	
Barrier Type	**Barriers**
General Barrier	Lack of government attention to demand management and energy efficiency
Policy Barriers	1. Excess capacity
	2. Short-term perspective
	3. Split (misplaced) incentives to energy providers
	4. Pricing a. Non-transparent pricing b. Non-cost-reflective pricing
	5. Import tariffs and duties
	6. Lack of awareness by policy makers (of EE opportunities)
	7. Imperfect information (restricted access to customer information)
	8. Inadequate competition (market power problems)
	9. Customer instability (problem for energy providers)
	10. Lack of adequate paradigm (for evaluating the value of EE)
	11. Separation of energy policy process (from environment & social policy)
	12. Little market transformation experience (by end-users or others)
	13. Lack of available expertise (in EE during transition periods)
	14. Utility price setting process a. Cost recovery barriers b. Decoupling of profits from sales
Program Barriers	1. Low cost of energy to end users
	2. Lack of information to end users: a. Lack of energy consumption data b. Lack of energy provider information
	3. Information/search costs (to end users & other actors)
	4. End users do not invest in EE because of habits or custom
	5. Lack of end-user and other market actor's experience impacts: a. Lack of experience with proven cost-effective measures b. Performance uncertainties (may perceive EE to be unreliable) c. Reluctance to adopt new technologies d. Fear of disruption in routine

Barrier Type	Barriers
Program Barriers (continued)	6. Financial barriers a. Limited investment capital available for EE b. High initial cost
	7. Product/service unavailability
	8. Inseparability of product features
	9. Organisational (institutional) barriers a. Low priority of energy efficiency b. Views of upper management c. Multiple decision makers
	10. Split (misplaced) incentives

4 MECHANISMS FOR PROMOTING SOCIETAL DEMAND MANAGEMENT

To ensure that the potential benefit to society from societal demand management is realised, it may be necessary to employ mechanisms to encourage or stimulate increased implementation of DM options. The purpose of such mechanisms is to ensure that the level of implementation approaches an economically justified level from the perspective of society as a whole and is not unduly constrained by the more limited financial perspectives of individual stakeholders.

Mechanisms therefore are initiatives that attempt to overcome policy and program barriers that limit or prevent the implementation of cost-effective DM options, where costs are assessed from the perspective of society as a whole and include externalities.

In terms of how they operate, mechanisms can be distinguished from demand management options. *Mechanisms* assist the implementation of DM options but are targeted at organisations that develop and implement these options. In contrast, *DM options* are specific actions taken by energy businesses and others with the aim of directly altering existing patterns of energy production, supply and use.

The IEA study identified four categories of mechanisms for promoting the implementation of demand management and energy efficiency by electricity businesses[11]:

- **Control Mechanisms** – mandate increased implementation of DM options;
- **Funding Mechanisms** – provide funding for increased implementation of DM options;
- **Support Mechanisms** – provide support for increased implementation of DM options;
- **Market Mechanisms** – use market forces to encourage increased implementation of DM options.

[11] Crossley, D, Maloney, M and Watt, G (2000). *Developing Mechanisms for Promoting Demand-side Management and Energy Efficiency in Changing Electricity Businesses*. IEA DSM Programme, Task VI Research Report No 3. Sydney, Energy Futures Australia Pty Ltd.

4.1 Control Mechanisms

Control mechanisms involve governments or regulatory agencies imposing mandatory requirements in relation to DM options. There are three basic types of control mechanisms:

- requiring the use of mandatory planning processes;
- imposing mandatory environmental targets;
- establishing mandatory performance standards.

4.1.1 Mandatory Planning Processes

Under this type of control mechanism, energy businesses are required to carry out a specified planning process in relation to proposals for increased generation capacity or network augmentation. The planning process is designed to first evaluate alternative proposals, taking into account externalities, and then to determine a preferred option, usually on the basis of least cost including externalities. Such a process necessarily involves assigning values to externalities. The required planning process may be specified in great detail or only the required outcomes may be specified, with the methods used to achieve these outcomes to be developed by the energy business.

In relation to demand management, the classic mandatory planning process was the requirement by many public utilities regulators in the United States, in the late 1980s and the early 1990s, that electricity businesses undertake Integrated Resource Planning (IRP). IRP is a planning methodology that seeks the least cost option for meeting customers' energy service needs. In determining the least cost option, IRP evaluates all supply- and demand-side options over a forecast period from a societal perspective, ie it includes explicit values for externalities.

IRP implies significant regulatory oversight which can be applied by a number of means. At one extreme, a regulator may exert significant control over the process. This may involve establishment of an independent energy planning body with responsibilities including[12]:

- development of IRP procedures, including costing of environmental externalities;
- oversight of public consultation and review of plans;
- amendment of plans;
- setting and reviewing utility performance criteria identified in the plans;
- reviewing and approving major capital investment decisions.

At the other extreme, the utility may simply be required by the regulator to periodically publish a report on its strategic planning process, and seek public comments.

United States

The requirement by regulators that electricity utilities implement IRP was the primary reason for the massive growth in DM programs implemented by utilities in the United States in the late 1980s and the early 1990s. Mandating of IRP by regulators in the United States was often fiercely contested by utilities. The resulting legal processes often diverted resources away from achieving the desired outcome of increased implementation of demand

[12] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

management. By about 1995, US regulator interest in IRP had waned in favour of establishing competitive electricity markets. Once IRP was no longer mandated by regulators, electricity utilities quickly and dramatically reduced their level of DM implementation.

Australia

In Australia, the NSW Code of Practice *Demand Management for Electricity Distributors*[13] is an example of a mandatory planning process[14]. The purpose of this *Code* is to prescribe a methodology for the market-based development of options for electricity system support (including demand management, embedded generation and storage options) and their evaluation at the same time and in the same manner as network investments. The market-based procedure in the *Code* is intended to ensure that all supply- and demand-side options identified by customers or third parties and by the distributor itself can be developed and evaluated at the same time and in the same manner as network augmentation. The evaluation is carried out by means of a competitive process.

The planning process specified in the *Code* comprises the following elements[15]:

- a process for informing the market by disclosing appropriate information about the current and future state of the electricity supply system;
- a process for fully and consistently specifying any constraints in the electricity supply system;
- a process for fairly and consistently evaluating proposals to overcome these constraints.

The *Code* contains detailed Protocols specifying how each of these processes should be carried out.

In particular, each distributor is required publish an annual *Electricity System Development Review* and to develop generic support options for the electricity system. The distributor is then required to disclose information relating to specific forecast constraints; and to consult with customers and other interested parties in relation to these constraints. If appropriate (as defined by a "Reasonableness Test") the distributor is required to issue a Request for Proposals (RFP) for system support, including detailed information on the support required. The retailer evaluates proposals identified during the RFP process and then determines a preferred option.

EnergyAustralia has issued one formal RFP under the *Code*, for system support to overcome constraints in the Epping/North Ryde area of Sydney. This RFP was issued after Energy Australia, in association with the NSW Sustainable Energy Development Authority, commissioned an initial detailed scoping study of the area[16]. The RFP process exposed a number of difficulties, including over-optimistic initial assessment of opportunities for

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[13] NSW Ministry of Energy and Utilities (2001). *NSW Code of Practice: Demand Management for Electricity Distributors*. Second Edition. Sydney, MEU.

[14] At present, adherence to the *Code* by NSW distributors is voluntary, so it is not strictly a mandatory planning process.

[15] NSW Ministry of Energy and Utilities (2001), *op cit*.

[16] Energetics (2000). *Epping/North Ryde Demand Side Management Scoping Study*. Report to the Sustainable Energy Development Authority and EnergyAustralia. Sydney, SEDA and EnergyAustralia.

demand management and poor quality submissions in response to the RFP. In addition, a major new load was introduced into the area during the RFP process which could only be supplied by augmenting the distribution network. While Energy Australia is continuing to work towards implementing one of the identified DM options at North Ryde to gain experience, the network augmentation is currently being implemented.

Building on the experience in Epping/North Ryde, EnergyAustralia has modified the process it uses for seeking DM options for system support. Where system constraints are identified, EnergyAustralia now undertakes a preliminary scoping study which incorporates a public consultation process during which EnergyAustralia seeks written submissions to identify the broadest possible range of DM opportunities. Submissions are requested to identify opportunities to reduce peak electrical loads or supply loads from alternative sources in the following broad categories:

- details of specific demand management opportunities that EnergyAustralia can investigate;
- proposals for demand management from parties able to implement demand reduction measures themselves;
- general views and opinions, including probable costs, as to what are the best options for EnergyAustralia to cost effectively meet the future load requirements.

Energy Australia investigates whether any DM options identified through the public consultation process, plus options identified by EnergyAustralia itself, are feasible and cost effective. When such options are identified, EnergyAustralia undertakes a further, more detailed investigation stage to quantify the budget and size assumptions from the scoping study. EnergyAustralia then prepares an optimised combined supply-side and demand-side strategy which is implemented using whatever approach is most likely to be effective. This which may include a formal RFP process.

EnergyAustralia has so far undertaken preliminary scoping studies incorporating public consultation in nine geographical locations in NSW. Generally, there have been few responses to the public consultation process which EnergyAustralia attributes to a low level of awareness and knowledge in the community about demand management. EnergyAustralia has not yet proceeded to issue any formal RFPs in relation to these locations.

4.1.2 Mandatory Environmental Targets

Under this type of control mechanism, governments or regulators establish a mandatory target in relation to an environmental factor, such as a reduction in greenhouse gas emissions, a reduction in the quantity of energy used to achieve a given level of energy service, or an increase in the level of utilisation of renewable energy sources.

Australia

In Australia, the NSW environmental licence conditions for electricity retailers are an example of a mandatory environmental target. These licence conditions were imposed under the *Electricity Supply Act 1995*. Under the terms of their licence conditions, electricity retailers must[17]:

[17] NSW Department of Energy (1997). *Further Environmental Guidelines and Requirements - Retail Suppliers - Greenhouse Gas Reduction Strategies*. Sydney, DOE.

- develop and negotiate with the Minister for Energy strategies to reduce greenhouse gas emissions arising from electricity sales to NSW customers;
- develop one, three and five year plans for energy efficiency and demand management strategies, and strategies for purchasing energy from sustainable sources; and
- prepare and publish annual reports in relation to the implementation of their strategies, and greenhouse gas emissions arising from electricity supplied by them.

In 1997, the NSW Government introduced a benchmark for the overall reduction in greenhouse gas emissions which is to be achieved by the NSW electricity sector. This benchmark is a reduction in the emission of the principal greenhouse gases (carbon dioxide, methane and nitrous oxide) to 5% below the 1989/90 per capita level in NSW by 2000/01. This is equivalent to 7.27 tonnes of CO_2-e per capita[18]. Electricity retailers contribute to the achievement of the Statewide objective by meeting individual "retailer apportioned benchmarks" related to their market share. Individual benchmarks have been developed for the annual reductions in greenhouse gas emissions to be achieved by each electricity retailer and these individual benchmarks are incorporated into each retailer's licence conditions.

Currently, electricity retailers can comply with their benchmark obligations through two approaches:

- **supply-side options,** by obtaining "assigned" energy from low or zero-emissions sources, such as wind-powered generation. The consequent reduction in emissions lowers the greenhouse intensity of the electricity the retailer supplies to end-users;
- **demand-side options**, by reducing electricity consumption through measures which reduce customer demand for grid-supplied electricity, such as improving the energy efficiency of customers through the promotion of more efficient household appliances and solar water heating. Reduced electricity consumption is termed "electricity sales foregone". Successful demand-side measures implemented by a retailer will increase the level of allowable emissions per unit of electricity sold by that retailer, all else being equal.

Each electricity retailer is free to seek out the lowest cost options available which allow it to meet its benchmark obligations.

In early 1999, the NSW Government amended the *Conveyancing Act 1919* to create a carbon sequestration right as a property right attached to land. This conferred on a person the right to the legal, commercial or other benefit of carbon sequestration by any existing or future tree or forest on the land after 1990[19]. In early 2000, the Electricity Supply Act 1995 was amended to change the method of calculating greenhouse gas emissions from electricity supplied to customers in NSW. The amendment now allows retailers to take into account net reductions in greenhouse gases resulting from carbon sequestration by planted forests[20]. The calculation of emission reductions has to be in accordance with a methodology approved by the Minister for Energy; such a methodology is currently under development[21]. Once this methodology is

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[18] NSW Government (2001). *Greenhouse-related Licence Conditions for Electricity Retailers*. NSW Government Position Paper. Sydney, NSW Government.

[19] *Conveyancing Act 1919 No 6 (NSW)*, Sec 87A.

[20] *Electricity Supply Act 1995, No 94 (NSW),* Sch 2, Sec 6A.

[21] NSW Ministry of Energy and Utilities (2001). *Greenhouse Gas Emission form Electricity Supplied in NSW: Framework for the Use of Carbon Sequestration to Offset Emissions*. Sydney, MEU.

approved, retailers will be able to offset greenhouse gas emissions through establishing and managing their own forest plantations to sequester carbon or through purchasing carbon sequestration certificates. If a trading scheme is established, retailers will be able to trade carbon sequestration certificates with other buyers and sellers of certificates.

In 1999/2000, aggregated emissions from electricity sold by retailers in NSW exceeded by 7.7 per cent the progressive overall benchmark to be achieved that year under the environmental licence conditions. Only two out of 18 retailers in NSW achieved emission reductions better than their apportioned benchmarks[22]. In 2000/01, actual emissions were 8.42 tonnes of CO_2-e per capita[23] which is 15.8 per cent above the final overall benchmark of 7.27 tonnes which was to be achieved that year.

Because of the failure to meet both progressive and final benchmarks, the environmental licence conditions for electricity retailers are widely regarded as being ineffective. Following the conclusion of the existing benchmark regime at the end of June 2001 a review of the licence conditions was carried out.

One reason why the overall benchmarks were not achieved is that, at present, no penalties are imposed on retailers who do not achieve their proportional reduction in greenhouse gas emissions. The NSW Government has stated that one of the outcomes of the review will be that electricity retailers will be penalised if they fail to meet their annual benchmarks by being required to pay a dollar amount per excess tonne of CO_2-e emitted[24]. The review proposed that this amount should be at least equal the cost of compliance with the benchmark reductions (estimated by the review as being less than AUD16 per tonne of CO_2-e abated).

Other changes to the licence conditions proposed by the review include:

- extending the deadline by which the benchmark emission reduction has to be achieved from 2000/01 to 2006/07;
- allowing the trading of any assigned energy from low-emission generators, electricity sales foregone, and carbon sequestration credits, whether or not these are "surplus" to a retailer's requirements for achieving its apportioned benchmark. However, it is proposed that any surplus remaining at the end of a year may not be carried forward to subsequent years.

In November 2000, the NSW Government transferred the responsibility for administering electricity licensing from the Ministry of Energy and Utilities to the Independent Pricing and Regulatory Tribunal (IPART). IPART's role is to make recommendations to the Minister with respect to:

- the granting, variation, transfer or cancellation of a licence;
- the imposition, variation or cancellation of conditions in relation to a licence;
- action to be taken in respect of a contravention of the conditions of a licence;

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[22] Independent Pricing and Regulatory Tribunal (2000). *Electricity Distribution and Retail Licences: Compliance Report for 1999/2000*. Sydney, IPART.
[23] NSW Government (2001), *op cit.*
[24] NSW Government (2001), *op cit*.

- any remedial action that may be warranted as a result of the contravention of the conditions of a licence.

IPART monitors and reports annually to the Minister for Energy on the extent to which electricity businesses comply, or fail to comply, with the conditions imposed on their licences. IPART is also responsible for the enforcement of licences. It may impose monetary and non-monetary penalties and take other action against licence holders for contraventions of licence conditions, as it considers appropriate.

4.1.3 Mandatory Performance Codes and Standards

Mandatory performance codes and standards are regulatory tools used to increase the performance level of a particular class of assets, products or services.

The most common performance standards applicable to societal demand management are Minimum Energy Performance Standards (MEPS). MEPS are typically applied to appliances and equipment and specify a minimum level of energy performance for a particular type of appliance or equipment. Any models which do not meet this minimum performance level cannot be sold. MEPS regulations therefore remove from sale the least energy efficient models on the market. This mechanism increases the stock of energy efficient equipment and is generally unseen by the consumer.

Most developed countries have some sort of MEPS program. In the USA, for example, MEPS began in the early 1980s, after the 1970s oil shocks, to try reduce the country's dependence on foreign energy sources. Today, developed nations are turning to MEPS to reduce greenhouse gases.

Building energy efficiency regulations are an example of a mandatory performance code. In many countries, building regulations are being modified and expanded to include provisions which require the implementation of measures in new and refurbished buildings which reduce the quantity of energy used to operate the building.

Australia

MEPS development in Australia started in the early 1990s with various studies on energy usage patterns. The first MEPS were implemented in 1999 for domestic refrigerators, freezers and water heaters[25]. In 2001, MEPS were implemented for certain electric motors and packaged air conditioners. MEPS for fluorescent lamp ballasts and revised MEPS for small electric storage type hot water heaters are in the regulatory impact analysis phase and are expected to come into effect later in 2002. Feasibility studies for the introduction of MEPS for commercial refrigeration, distribution transformers, commercial water heaters, package boilers, air compressors, and commercial evaporative coolers were publicly released for comment in March 2001.

MEPS are developed in consultation with manufacturers and other stakeholders who have an interest in these regulations. Once MEPS levels are determined, Australian Standards are developed to accurately measure the performance of the unit. The proposed standard is then open to public consultation. When the standard is finalised a cost/benefit analysis is conducted to ensure the proposed regulations provide a positive economic benefit to the

[25] National Appliance and Equipment Energy Efficiency Program (2001). *Future Directions 2002-2004: A Discussion Paper*. Canberra, Australian Greenhouse Office.

Australian public. If the cost/benefit analysis is positive, State legislative bodies can enact regulations into law which cite the specific standard.

In 1999, the Australian and New Zealand Minerals and Energy Council agreed that Australia would match the best MEPS level of our trading partners after taking account of test method differences and other differences (eg climate, marketing and consumer preference variations). This new policy represented a radical change of direction from the previous Australian practice of debating the technical possibilities for MEPS levels with all stakeholders. Previously, the absence of an agreed process and the need to determine an appropriate MEPS level for Australia caused lengthy delays while government and stakeholders sought to reach agreement on those issues[26]. In the future, Australia will not need to engage in technical debates to determine MEPS levels in isolation from the major world markets.

In addition to MEPS, certain types of electrical equipment in Australia are covered by a voluntary energy performance standard called Energy Star. Manufacturers sign a voluntary agreement, or memorandum of understanding to undertake several activities under the Energy Star program and are then allowed to use the Energy Star logo on their products. Products that comply with the Energy Star standard use approximately 75 per cent less energy while in 'sleep' (standby) mode than standard products. Because most of these products spend over 60 per cent of their time idle, this is a significant reduction in energy use[27]. The Energy Star standard was created by the US Environment Protection Authority in 1992, and has now been adopted in Japan, Canada, Korea, Taiwan, Brazil and Europe. Energy Star was introduced into Australia in 1996 by the NSW Sustainable Energy Development Authority (SEDA) and was later adopted as a national program. At present, in Australia, the Energy Star standard covers office equipment such as computers, monitors, fax machines, photocopiers and printers. SEDA intends to extend the program to household equipment such as televisions and video recorders.

To facilitate the implementation in Australia of building energy efficiency regulations, the Australian Building Codes Board in association with the Australian Greenhouse Office commenced in 2000 developing mandatory energy efficiency measures for inclusion in the Building Code of Australia (BCA)[28]. At present, the BCA does not contain any energy efficiency measures. However, the ACT, South Australia and Victoria, through their BCA appendices, require ceilings and walls of houses to be insulated, and the ACT and Victoria extend those measures to other residential buildings.

The building industry has expressed its concern at the proliferation of "Energy Codes" at a regional level and is calling for the expedient development of mandatory measures in the BCA. The Australian Building Codes Board will give priority to developing measures for housing. However, wherever possible, measures for public and commercial buildings will be developed in parallel with those for houses. At present, it is intended that a comprehensive package of housing energy provisions will be introduced into the BCA on 1 January 2003.

The range of practical options under consideration for housing include requirements for[29]:

- ceiling, wall and floor insulation of appropriate thermal performance;

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[26] National Appliance and Equipment Energy Efficiency Program (2001), *op cit*.
[27] Sustainable Energy Development Authority (2000). *Corporate Plan 2000–2002*. Sydney, SEDA.
[28] Australian Building Codes Board (2001). *Energy Efficiency in Buildings: Directions Report.* Canberra, ABCB.
[29] Australian Building Codes Board (2001), *op cit*.

- edge insulation for slab floor heating systems;
- windows of appropriate thermal and solar control performance and sealing around sashes;
- appropriate shading from solar radiation;
- sealing of the building envelope, including around windows and door frames, under doors, and within flues and other envelope penetrations (other than those required for health) such as for exhaust fans and recessed light fittings;
- easily accessible controls for built-in energy consuming equipment; and
- limiting the size of resistance electric water heaters, including spa heaters, where gas is available.

In addition to the inclusion of energy efficiency measures in the BCA, House Energy Rating Schemes (HERS) are being introduced throughout Australia. HERS use software tools to rate building envelope thermal performance. The software tools predict demand for heating and cooling energy to maintain conditions of thermal comfort inside the building. HERS results are expressed as a series of 'stars', the more stars, the more energy efficient is the building. In many areas, HERS ratings are a mandatory part of the development approval process undertaken by municipal Councils and buildings are required to achieve minimum levels of thermal performance before the development is approved. The aim is to reduce residential energy consumption and increase thermal comfort by encouraging improved building envelope design.

In NSW, the Sustainable Energy Development Authority has developed an Energy Smart Homes Policy. Launched in September 1997, the Policy assists municipal councils to implement energy efficiency standards including:

- a minimum energy rating of 3.5 stars for the building envelope;
- a minimum 3.5 star greenhouse rating hot water system (eg. solar, heat pump or gas);
- improved solar access for subdivisions;
- guidelines for the installation of energy efficient appliances and water saving devices such as AAA-rated showerheads.

SEDA has made available a model Development Control Plan containing detailed provisions which Councils can use to ensure the energy efficiency of residential development.

By 1 February 2002, 70 NSW Councils covering 80 per cent of the state's residential development had agreed to implement the Energy Smart Homes Policy. Thirty-seven of these Councils have established a full Energy Smart policy, and together save about 57,000 tonnes of greenhouse gas emissions every year.

4.1.4 Advantages and Disadvantages of Control Mechanisms

Control mechanisms are most effective where there is a clearly-defined desired outcome which is practically achievable by the parties to whom the mechanism is applied.

Mandatory planning processes are established on the premise that externalities can be valued and that incorporating these valuations in a planning process based on assessing the cost-effectiveness of alternative processes will result in the desired outcome. However, the

valuation of externalities is difficult and different valuation methods produce widely differing results. Also, because the focus is on the process rather than the outcome, some unexpected outcomes can result.

With mandatory environmental targets and mandatory performance codes and standards, the outcome is specified in quantitative terms and no explicit valuation of externalities is required. If the target is practically achievable, and sufficient incentives or penalties are applied to the parties which are subject to the target, there is a high probability that the target will be achieved. However, these mechanisms rapidly fall into disrepute if the target is not practically achievable and/or insufficient incentives or penalties are applied.

4.2 Funding Mechanisms

Funds for the increased implementation of DM options can be provided in two ways:

- through providing a direct allocation of funds, eg by governments;
- by imposing some form of public benefits charge, such as an environmental levy, eg on energy businesses or end-users.

4.2.1 Direct Allocation of Funds

Government may make direct allocations of funds to implementing DM options where they perceive that there is a societal benefit from DM options which may not be implemented because they are not financially viable to one or more stakeholders.

Australia

In Australia, the Commonwealth Government and most State governments have made direct budgetary allocations towards the cost of implementing measures to reduce greenhouse gas emissions from the energy sector.

For example, the Commonwealth Government has allocated:

- $75 million over four years to the Alternative Fuel Conversion Program to assist in the conversion of buses and other commercial vehicles to CNG and LPG where it meets strict environmental conditions;
- $400 million over three years to the Greenhouse Gas Abatement Program targeting opportunities for large-scale, cost-effective and sustained abatement across the economy, most of which are energy-related projects;
- $31 million over four years to the Photovoltaic Rebate Program which provides cash rebates to householders and community groups who install photovoltaic (PV) systems or extend existing PV systems;
- up to $55.6 million over five years to the Renewable Energy Commercialisation Program to accelerate the commercialisation of innovative, quality, demonstrated renewable energy technologies, and to support projects that have wide industry development benefit, such as industry training and accreditation programs;
- joint Commonwealth/industry funding of around $25 million at a ratio of 2:1 to the Renewable Energy Equity Fund which is designed to provide support to smaller companies undertaking innovative Australian renewable energy technology projects;

- up to $264 million over four years to the Renewable Remote Power Generation Program which provides rebates of up to 50% of the capital cost of a renewable energy installation for renewable remote area power supply systems to reduce reliance on diesel fuel for electricity generation in areas not serviced by the electricity grid.

The NSW Treasury has provided NSW Government agencies with access to a loan facility totalling AUD20 million per annum for guaranteed energy saving projects using energy performance contracting and the Government Energy Efficiency Investment Program. This enables agencies to invest in energy efficiency without affecting their yearly budget.

Energy performance contracting is about guaranteed savings. When equipment or facilities are upgraded to improve energy efficiency under an energy performance contract, the energy savings are guaranteed by the contractor for the term of the contract. If the actual energy savings fall short of an agreed target, the contractor makes up the shortfall in the cost saving.

The Government Energy Efficiency Investment Program (GEEIP) is an innovative funding mechanism which enables the implementation of energy efficiency projects that are not suitable for energy performance contracting. The GEEIP loan facility pays for the capital works for energy efficiency projects and the loans are repaid to the NSW Treasury through the cost savings achieved. Once a loan is repaid, the agency is able to retain 100 per cent of the savings made on its energy bills. Part of the NSW Treasury AUD20 million loan fund has been allocated for GEEIP, and GEEIP funds can be used for energy efficient projects costing between AUD10,000 and AUD500,000.

4.2.2 Public Benefits Charge

A public benefits charge (also often known as a system benefits or 'wires' charge) is a charge, levy or tax imposed on certain parties, such as participants in an energy market. The charge is normally established by government or regulators to generate funding for public purpose programs, such as societal demand management programs.

Public benefits charges around the world share similar features, but can vary widely from scheme to scheme, depending on[30]:

- **the way in which the charge is levied –** how it is calculated. There are several alternatives:
  - ♦ a rate per unit quantity of energy delivered to a customer or passing through a network;
  - ♦ a rate per unit value of energy purchased by a customer or delivered by a network;
  - ♦ a set charge, eg a fixed charge per customer;
  - ♦ cost recovery charges for specific energy efficiency programs;
- **the scope of the charge** – who is charged and how much. Some options include:
  - ♦ a broad based, non-bypassable charge that is collected from key market players (eg network operators) and which is then passed on in regulated prices;
  - ♦ a uniform charge levied on all energy customers;
  - ♦ energy businesses allowed by governments to charge customers for DM programs they choose (or are required by law) to carry out.

[30] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

- **the administration or governance regime for the charge** – who manages the money. Possibilities are: utilities, a government authority (existing or specially created), non-profit corporations or authorities with board of directors;
- **the duration of the charge** – how long it lasts. For example, the charge could be:
  - ♦ set up with an indefinite life time;
  - ♦ established to expire at a specified date;
  - ♦ implemented for a defined time period with provisions to consider in the future whether such a charge is still needed;
- **the point in the energy market at which the charge is collected.** Options include:
  - ♦ retail sales;
  - ♦ distribution network;
  - ♦ transmission network;
  - ♦ wholesale pool.

Typically a public benefits charge would be based on the quantity of energy traded, but may also be derived from (or topped up by) licence fees, participation fees or trading penalties. The charge itself plus any additional fees can be changed over time with little impact on competition, as it is applied across the board.

Australia

In 1990, the Commonwealth Government set up nine Ecologically Sustainable Development (ESD) Working Groups to consider the implementation of ESD principles in the most resource-intensive sectors of the national economy. The Working Groups reported to the Prime Minister in November 1991. One of the Working Groups was concerned with energy use and among its recommendations was:

> *"...that for an initial period of five years, a minimum amount equivalent to one per cent of utility revenue be spent on a range of least-cost demand-side options identified by the integrated least-cost planning process"*[31].

Since the publication of the ESD Working Group reports, various other policy studies have proposed a levy on the revenue of energy businesses as a mechanism for funding energy efficiency and renewable energy programs[32]. Despite these recommendations, an energy-related public benefits charge has not yet been implemented in Australia. However, there are numerous examples in overseas countries.

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[31] Ecologically Sustainable Development Working Groups (1991). *Final Report—Executive Summaries*. Canberra, Australian Government Publishing Service, p 80.

[32] ANZMEC IRP Management Committee (1994). *Least Cost Energy Services for Australia*, Melbourne, the Committee.
Ernst & Young, HRL Morrison and Co, SRC International (1994). *Overcoming Barriers to Electricity Utility Promotion of End-Use Energy Efficiency: A Report to the ESAA Demand Management and Energy Efficiency Committee*. Unpublished.
National Grid Management Council (1994). *Demand Management Opportunities in the Competitive Electricity Market*. (Two volumes.) Melbourne, NGMC.

United Kingdom

In 1994, the then electricity regulator for England and Wales commenced an initiative known as the Energy Efficiency Standards of Performance (SoP)[33]. Under this initiative, the regulator required electricity suppliers to spend GBP1.00 (AUD2.80) per customer on household energy savings measures and set energy savings targets to be achieved by the suppliers. The program was extended to electricity suppliers in Scotland in 1995 and in Northern Ireland in 1997. In 2000, the program was extended by the regulator to all electricity and gas suppliers in the United Kingdom with at least 50,000 customers. The suppliers were required to spend GBP1.20 (AUD3.36) per customer on household energy savings measures. The program is now the dominant vehicle through which energy efficiency measures are delivered to residential customers in the United Kingdom.

Between 1998 and 2000, about four million installations of energy saving measures were carried out under SoP. The total benefit to customers was GBP248 million (AUD694 million), and the total cost of the measures was GBP57 million (AUD160 million), giving a net benefit of GBP191 million (AUD534 million). The average bill savings to customers was GBP4.25 per GBP1.00 invested by the electricity suppliers. The installations resulted in savings of 3,176 gigawatt-hours of energy, and lifetime savings of about 3 million tonnes of CO_2 at a cost of GBP15 per tonne (AUD42 per tonne) spent by the electricity suppliers[34].

Under the *Utilities Act 2000*, a program called the Energy Efficiency Commitment is being established which builds on the success of the Energy Efficiency Standards of Performance. Under this program, the United Kingdom Government will take over the role of the regulator in setting energy savings targets for energy suppliers, commencing in 2002. The savings will be funded on the basis of GBP3.60 (AUD10.08) per customer which suppliers of electricity and gas are required to spend on household energy savings measures. This will result in a forecast expenditure exceeding GBP450 million (AUD1,260 million) over the three years from 2002 to 2005.

Belgium

The electricity retailers in Belgium have made an agreement with the government to raise their electricity prices and to use the additional revenue to fund energy efficiency programs. The Belgian Government allocates some of these funds to social programs to ensure that disadvantaged groups receive some benefit from the increased electricity prices.

Norway

In 1991, following restructuring of the electricity industry, the Norwegian government initiated two related programs funded by a small public benefits charge levied on the distribution network businesses:

- an energy conservation information program;
- the creation and partial funding of independent regional energy conservation centres to provide energy efficiency services.

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[33] Energy Saving Trust (2001). *Energy Efficiency Commitment Report 2000-2001*. London, EST.
[34] Energy Saving Trust (2001), *op cit*.

Portugal

The Portuguese Government has introduced a non-bypassable levy which is a component of the non-bypassable tariff called "global use of the system" (*Uso Global do Sistema*) which applies to all users of the transmission network. The objective of the non-bypassable levy is to cover costs of the implementation of energy, environmental or economic policy measures of public interest. These policy measures could include the implementation of demand management and energy efficiency programs.

4.2.3 Advantages and Disadvantages of Funding Mechanisms

Stability in relation to continuity of funding is the main requirement for a funding mechanism. The majority of demand management programs will have time horizons extending over several years. Continuity of funding over the life of DM programs is essential to achieve confidence on the part of program proponents, end-use customers, and any other investors in joint DM programs.

Direct allocation of funds by governments has the advantage that the amount of funding is known up-front, whereas the exact amount available from a public benefits charge will always be subject to some uncertainty. Direct funding by governments will be subject to policy decisions by the government of the day. However, this could be seen as an advantage since it enables funding decisions to be responsive to changing conditions through government policy and the parliamentary process.

Public benefits charges are administratively simple to establish and collect, and they can raise large amounts of money if they are calculated as a rate per unit of energy. Also, public benefits charges offer significant advantages over other funding mechanisms in the transition period during restructuring of energy industries:

- changes in ownership or number of energy businesses will not affect the amount of money raised, if the charge is calculated as a rate per unit of energy;
- deepening of competition means that regulatory pricing approaches such as passing costs through to customers become inappropriate.

Public benefits charges also attract much criticism – on policy rather than technical grounds. They increase the price of electricity for all customers which may be regarded as counter to the outcomes being promoted by energy industry restructuring and market reform. Some commentators consider that pre-allocation of revenue to specific purposes is not in the best interests of public policy.

Further, if the public benefits charge is imposed on the revenue of energy businesses, the energy supply industries would be likely to exert strong pressures to reduce the amount of the charge and to ensure that the funds are spent on programs directly related to the energy industry providing the funding[35]. Such pressures would threaten the stability of funding continuity and possibly bias the portfolio of funded projects towards particular energy technologies.

[35] Sustainable Energy Fund Working Group (1995). *Final Report*. Sydney, Electricity Reform Taskforce, NSW Treasury.

4.3 Support Mechanisms

Support mechanisms comprise arrangements which provide support for increased implementation of DM options. Examples include:

- implementing general information, education and training programs;
- establishing an entrepreneurial organisation with a mission to reduce greenhouse gas emissions;
- undertaking specific industry development programs with relevant industries and trade allies;
- developing voluntary agreements for greenhouse gas abatement;
- promoting co-operative activities to increase implementation of DM options.

4.3.1 Education, Information and Training

Lack of information and knowledge about energy efficiency measures and use of renewable energy constitute a large barrier to the increased implementation of demand management. Establishing programs to overcome this barrier through providing education, information and training is one of the most frequently employed mechanisms.

The range of possible education, information and training programs is very large, as is the range of possible audiences. Initially, following the first oil price shock in the early 1970s, governments in North America and Europe implemented general information programs on energy efficiency for broad public audiences[36]. Similar programs were implemented in the 1980s and early 1990s as the existence of global warming and its likely effect on climate change became more widely known. Energy advisory centres were also established where members of the public could seek information on implementing energy efficiency measures and utilising renewable energy. Similar advisory centres were also established for commercial and industrial energy customers. More recently, education and information programs have become more narrowly targeted with the content designed to meet the specific needs of more clearly defined audiences.

Australia

In the mid-1980s, the Commonwealth Government twice issued general information booklets on residential energy efficiency to all households throughout Australia. Most State governments also established energy advisory centres which, in some cases, were affiliated with government-owned energy businesses.

As part of its Energy Smart Homes Policy, the NSW Sustainable Energy Development Authority (SEDA) developed targeted training modules for the following groups[37]:

- architects and building designers;
- residential and commercial building companies;
- sales and design teams for land and property developers;

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[36] Crossley, D J (1979). The role of popularization campaigns in energy conservation. *Energy Policy* vol 7, pp 57-68.

[37] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

- suppliers of energy efficient products, such as insulation and skylights.

The demand for this training was high, because it was developed as part of a suite of activities to increase energy efficiency in the building sector. As noted above, municipal councils are the bodies responsible for approving new residential properties in NSW, and they are raising their minimum energy performance requirements through participation in a number of energy programs. Consequently, builders and developers who wish to compete in the more progressive market place are using the training services made available by SEDA.

SEDA has also established the Reach for the Stars, Energy Smart Retailers program which involves partnerships with whitegood manufacturers and retailers to encourage consumers to purchase the highest efficiency appliances available in the marketplace. This is achieved through a variety of marketing and training initiatives. Partnerships have been established with retail heavyweights such as Harvey Norman, Betta Electrical, EnergyAustralia, and Country Energy. Manufacturing partners include Fisher and Paykel, Panasonic, Hoover, Dishlex, Whirlpool and Chef. More than 200 retail staff have undergone training since the commencement of the program and the Energy Smart concept has been promoted through partner catalogues and sales promotions[38].

SEDA is also working with NSW schools through its Solar in Schools program and Energy Smart Zone. A pilot program of Solar in Schools in 2001 provided 18 schools with a solar power system and educational kit. It is planned to extend this pilot to 50 further schools in NSW. The Energy Smart Zone is a web-based interactive resource aimed at teaching school children about energy efficiency and how to apply it both at school and at home. This resource will be available to 2000 schools in 2002.

4.3.2 Entrepreneurial Greenhouse Organisations

Increased awareness of climate change has resulted in the creation by many governments of entrepreneurial organisations with clear responsibilities for achieving reductions in greenhouse gas emissions, often through energy-related measures[39]. Entrepreneurial greenhouse organisations are distinguished from energy advisory centres because their objectives are more commercial than those of energy centres and they aim to eventually become self-funding over time.

A major activity in entrepreneurial greenhouse organisations is to stimulate increasing use of energy efficient and renewable energy technologies and practices, through a wide range of cost-effective, and/or commercially-oriented activities. Such organisations provide a hedge against the risk that the uncertainties created by reforming energy markets and restructuring energy businesses will result in significant reductions in traditional energy efficiency programs carried out by government and energy sector businesses.

Entrepreneurial energy organisations focus on market transformation, ie they are mandated to increase the commercialisation and 'mainstreaming' of energy efficiency technologies and renewable energy across all sectors in the community. The emphasis is on establishing the promotion of energy efficiency and renewable energy as a commercially viable self-funding activity.

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[38] Sustainable Energy Development Authority (2000), *op cit*.
[39] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

Australia

The Sustainable Energy Development Authority (SEDA) is a NSW Government agency created by legislation and funded directly by the government. It commenced operation in 1996 with the objective of reducing the level of greenhouse gas emissions in the State by investing in the commercialisation and use of sustainable energy technologies. SEDA was created as part of the package of legislation which restructured the NSW electricity industry and introduced a competitive electricity market to the State.

SEDA's activities include:

- focusing on energy efficiency, renewable energy and cogeneration technologies;
- identifying funding opportunities that transform the marketplace for sustainable energy technologies;
- supporting commercial or near-commercial enterprises to help increase their market share;
- entering into joint ventures, accepting royalties or other returns on investments, or providing grants.

Following the establishment of SEDA in 1996, most State Governments in Australia have established similar organisations. Also, the Commonwealth Government has established the Australian Greenhouse Office which has a broader mandate which includes both energy-related and non-energy-related greenhouse actions.

United Kingdom

The Energy Saving Trust (EST) was set up after the 1992 Earth Summit in Rio de Janeiro by the UK Government and the gas and electricity industries to help reduce carbon dioxide emissions in the United Kingdom. Today, EST is the UK's leading organisation working with a range of partners to deliver the sustainable and efficient use of energy.

Since 1993, EST has been operational as a non-profit company. Originally it was intended that 75% of funding would come from levies on gas and electricity customers, with the balance being derived from local authorities. Currently, only a small proportion of funding is being provided from customer levies and the EST is mainly funded directly by the UK Government.

Since 1995, the EST has been given the revised role of working with industry to develop schemes and markets for energy efficiency activities and energy services, with the key objectives being:

- to pump-prime markets for energy efficiency products;
- to direct public attitudes towards energy efficiency solutions;
- to promote the development of energy service companies.

The emphasis is on market-based schemes and achieving leveraged funding from a wide range of third party contributors.

4.3.3 Industry Development

This mechanism involves the provision of development assistance to individual firms, and to industries as a whole, which work to implement demand management and sustainable energy solutions. There are a range of industry development assistance activities that can be carried out. Many of these can be initiated and managed by government authorities, often with involvement of industry associations. Examples include:

- business development grants;
- assistance with the development of business plans;
- cooperative marketing and promotional activities;
- provision of business incubator services.

Australia

The NSW Sustainable Energy Development Authority has developed an Energy Smart Allies Program which aims to facilitate the development of the sustainable energy industry as a whole by linking the suppliers of sustainable energy products and services with customers.

Barriers identified by existing Allies as impeding the uptake of their products and services include[40]:

- lack of marketing and sales skills and experience;
- difficulty in selling higher capital cost technology despite lower ongoing costs.

The Energy Smart Allies Program has been designed to help overcome these barriers. Program activities include promoting the Allies in a directory web site, keeping the Allies informed of business and networking opportunities, and providing opportunities for Allies to improve their technical, commercial and marketing skills.

Nearly 400 suppliers have joined the Energy Smart Allies Program, ranging from air conditioning, lighting and renewable energy specialists to engineering consultants and architects.

Other jurisdictions have sought SEDA's advice on how to establish similar programs in their respective states and territories. As a first step, and in order to avoid duplication of resources and confusion, SEDA is working with other state and Commonwealth greenhouse agencies to produce a national directory of sustainable energy businesses. Many of the Allies and their customers operate across state boundaries and a national directory will ensure that industry resources are used most efficiently.

United Kingdom

In the United Kingdom, the Energy Saving Trust (EST), with funds from the Department of Environment, Transport and the Regions carried out a two year, GBP2 million (AUD 5.6 million) program, commencing in November 1997, to develop the energy service company (ESCO) industry. The purpose of the program was to assist the development of ESCOs, which provide both energy and energy efficiency measures. The program provided examples of pilot projects of energy services packages operating in a number of target market sectors.

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[40] Sustainable Energy Development Authority (2000), *op cit*.

The program operated through a bid process - eg for 1998/99, 19 schemes were selected from 35 bids for funding. Four of these schemes were 'innovative bids' which focus on pilot projects or business start-ups, while 15 were public housing bids which aim to develop business plans.

The EST also investigated the various areas in which involvement by EST could be most beneficial to ESCO development, including gas and electricity suppliers, local authorities, and different financing and delivery models.

United States

In the United States, the Department of Energy's Energy Fitness Program works with ESCOs, public and private ESCO customers and other interested parties to identify and remove barriers to increased delivery of energy efficiency by ESCOs. The program is one of DOE's Energy Star Partnerships and is part of the Rebuild America Program. The Energy Fitness Program aims to help performance-based ESCOs ensure that the installation of energy efficient equipment is maximised by educating customers about how savings can fund the refurbishments.

The Program has four objectives:

- to increase awareness of performance contracting amongst building owners;
- to identify and remove barriers to increased delivery of energy efficiency, new high efficiency technologies and renewable energy by ESCOs;
- to provide accessible information about the energy performance contracting industry; and
- to increase ESCO sales of efficient and renewable energy products.

The Program operates through a partnership approach with organisations such as the National Association of Energy Service Companies, the National Conference of State Legislatures, the National Association of Regulatory Utility Commissioners, the National Association of State Energy Officials and the US Conference of Mayors.

4.3.4 Voluntary Agreements

Voluntary agreements involve a formal agreement between a responsible government body and a business or organisation. The agreement states that the business or organisation will carry out specified actions to achieve a particular target, such as an increased level of energy efficiency or a specified reduction in greenhouse gas emissions[41]. Voluntary agreements are therefore similar to mandatory targets, except that they are entirely voluntary and no penalties are applicable for non-compliance.

The agreement may be 'brokered' by a relevant industry association on behalf of its members, or it may be directly negotiated between a government representative and individual businesses and organisations. The government representative may be a government department, or a government body with the responsibility for promoting energy efficiency. The agreement may or may not be legally binding.

[41] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

A typical agreement sets targets to be met within the business/organisation. The target is usually set by the participating business/organisation, and the government body provides information and limited technical assistance to help achieve the stated goal.

A voluntary agreement program can target companies within specific sectors (eg just industrial) or can be broad ranging, and include all commercial enterprises and organisations which use energy. The program may be part of a broader, government-endorsed energy efficiency or greenhouse gas emissions reduction program.

Australia

Late in 1994, the Commonwealth Government agreed to drop its proposals for a carbon tax in return for voluntary agreements with industry regarding greenhouse gas emission reductions[42]. This led to the development of the Greenhouse Challenge program, which is now established within the Australian Greenhouse Office to assist businesses to develop and implement voluntary agreements. Participating organisations sign agreements with the Commonwealth Government which provide a framework for undertaking and reporting on actions to abate emissions.

An independent evaluation of the program[43] stated that the Greenhouse Challenge has been highly effective in achieving greenhouse gas emissions abatement, and in building the capacity of both government and industry to identify, monitor, manage and report greenhouse gas emissions. Participants are undertaking a wide range of abatement actions including investments in new technology and sinks, process and energy efficiency improvements, fuel switching, and the capture of fugitive emissions. The Greenhouse Challenge has extensive coverage of emissions in some key areas including 100 per cent coverage of aluminium and cement production, 98 per cent of oil and gas and 91 per cent of coal mining. The data available to the evaluation study indicated that the actions undertaken by industrial end-users in 2000 would lead to 23.5 Mt CO_2-e of emissions per annum, or 16 per cent less emissions compared to what would have occurred in the absence of those actions. On the same basis, electricity generators and distributors were expecting a 5 Mt CO_2-e per annum reduction in emissions or 3 per cent less emissions than the status quo.

In NSW, the Sustainable Energy Development Authority (SEDA) launched the Energy Smart Government program in 1996. This program assists NSW Government agencies to reduce their energy use and meet their commitments under the Government Energy Management Policy.

Government agencies who are partners in the Energy Smart Government program sign a Memorandum of Understanding (MOU), thereby agreeing to reduce greenhouse gas emissions by implementing cost-effective energy efficiency upgrades in their buildings over a set period. Typically, agencies agree to upgrade all facilities within their portfolio over the next seven years wherever it is cost effective to do so. The MOU sets out a number of 'milestones', such as undertaking an energy efficiency upgrade of one space within six months of signing the MOU and completing one building space upgrade within two years.

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[42] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

[43] Australian Greenhouse Office (1999). *Greenhouse Challenge Evaluation Report*. Canberra, Commonwealth of Australia.

SEDA provides a range of services to partners in the Energy Smart Government program. The support offered includes:

- technical seminars and resources such as case studies;
- a fortnightly newsletter offering up-to-date news and events relevant to government agencies;
- access to a funding stream through NSW Treasury of AUD20 million per annum for guaranteed energy saving projects using energy performance contracting and the Government Energy Efficiency Investment Program. This enables agencies to invest in energy efficiency without affecting their yearly budget.

In the first three years of the program, government agencies in the Energy Smart Government program have invested over AUD14 million dollars into the sustainable energy industry, and are currently saving more than AUD3.8 million in energy costs and over 37,000 tonnes of greenhouse gas emissions per annum.

4.3.5 Cooperative Activities

This mechanism involves encouraging groups to work together co-operatively to achieve increased implementation of demand management.

For example, an industry association could provide its members with access to energy efficiency services which the individual members themselves may be unable to obtain, including[44]:

- promoting energy efficiency and energy management by targeting and providing information to association members;
- providing a point of contact on energy efficiency for association members;
- advising association members on technical issues, contacts and the market for energy efficiency services;
- offering advice to association members on energy efficiency consultants, contractors and operators;
- constructing and maintaining a detailed database of energy efficiency projects carried out by association members, and the relevant energy efficiency professionals involved;
- promoting and managing national and international information exchange on energy efficiency.

Another example of a co-operative activity comprises individual energy customers aggregating their energy purchases so as to wield significant bargaining power in contestable retail electricity markets. Electricity purchasing aggregation arrangements could take a number of forms including[45]:

- local government voluntarily (in consultation with the community) assuming the responsibility of purchasing electricity bundled with energy efficiency services on behalf of its constituents;

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[44] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.
[45] Crossley, D, Maloney, M and Watt, G (2000), *op cit*..

- individual households forming a 'buyers' club to negotiate and purchase electricity bundled with energy efficiency services;
- private companies operating as aggregators and representing a group of consumers in purchasing electricity bundled with energy efficiency services;
- energy cooperatives purchasing electricity bundled with energy efficiency services. Energy cooperatives can be formed by a variety of 'members', including non-profit environmental organisations, local governments and private aggregators.

Australia

The Partnerships Advancing the Housing Environment (PATHE) initiative is a collaborative environmental program of the Housing Industry Association (HIA) with Environment Australia, Greening Australia and the Australian Greenhouse Office to provide practical and voluntary programs that target energy efficiency, waste reduction, and better environmental management in the building industry.

PATHE develops partnerships between builders, manufacturers, trade contractors and community organisations to develop and demonstrate best practice environmental management in the building industry. The program is a three-year partnership and change initiative, underpinned by the principles of cooperative endeavours, demonstration and self-management.

PATHE aims to:

- improve the environmental performance of Australia's building and land development industry;
- facilitate change in a way that involves the industry, while meeting community expectations on housing types, locations and costs;
- educate consumers that environmentally benign houses are more comfortable as well as being cheaper to run;
- identify market-driven mechanisms to encourage the adoption of environmental innovations in the building industry; and
- facilitate the continuing uptake of leading environmental management principles as they emerge, in order to maintain both the quality and cost effectiveness of Australia's built environment.

A keystone of the PATHE communications strategy is the quarterly PATHE Newsletter, which provides vital information for all PATHE stakeholders. The Newsletter provides an overview of PATHE's progress, GreenSmart building tips, and new environmental products. In addition, PATHE environmental management guides are available on waste management, stormwater management and energy efficiency.

PATHE events are held around Australia. The objective is to equip industry practitioners to use their environmental knowledge as a pro-active marketing tool in attracting and satisfying customers. PATHE networks and forums are being established in State capital cities and regional centres to facilitate the exchange of information and ideas relating to Australia's built environment.

United States

In the United States, one of the first examples of large-scale, automatic small consumer aggregation commenced in Barnstable County, in the State of Massachusetts in 1997.

In September 1997, 14 of the 15 towns within Barnstable County voted in favour of an aggregation strategy whereby residences, small businesses and the few industrial enterprises located in the Cape Cod area would be aggregated unless they specifically opted out. The aggregated electrical loads of 162,000 customers went 'on the market' in 1998. To Commonwealth Electric, the incumbent utility, these customers represented approximately 300 megawatts – half the company's load – and between USD175 million and USD200 million (AUD340 to AUD390 million) in annual revenues.

Barnstable County proposed several terms and conditions for potential retailers. As an example, to secure the cooperation of Commonwealth Electric, one of the terms is that Commonwealth Electric continue to provide metering and billing services during the first phase of the aggregation.

Barnstable County planned to contract with a single power retailer for a five year term and the retailer will provide all the electricity needed by the county's consumers. County planners expect to satisfy growth in electricity demand with a combination of energy efficiency and development of new renewable resources, funded by a surcharge assessed on electricity distribution.

4.3.6 Advantages and Disadvantages of Support Mechanisms

There is a broad range of support mechanisms which vary widely in their attributes. The common characteristic of these mechanisms is that they generally support increased implementation of demand management rather than directly requiring a specific outcome to be achieved. Therefore, to be effective, programs applying support mechanisms must be targeted closely to the situation in which they operate.

The effect of targeting can be seen with education, information and training where initially general information programs on energy efficiency were developed for broad public audiences. Evaluations of these programs showed that they were not particularly effective in achieving long-term behaviour change towards more efficient energy use. Later, more effective, programs were more narrowly targeted with the content designed to meet the specific needs of more clearly defined audiences.

4.4 Market Mechanisms

There are a several different types of mechanisms which use market forces to encourage increased implementation of DM options, including:

- incorporating externalities into energy prices;
- promoting behaviour change through price signalling;
- developing energy performance labelling for appliances and equipment;
- accrediting and promoting Green Power products, ie electricity generated from renewable energy sources;
- developing trading schemes for greenhouse gas emissions and renewable energy;

- enabling cooperative procurement of energy efficient appliances and equipment;
- promoting energy performance contracting;
- enabling competitive sourcing of demand-side resources;
- developing demand-side bidding in competitive electricity markets.

4.4.1 Incorporating Externalities into Energy Prices

The objective of incorporating externalities into energy prices is to use energy markets to encourage more economically rational energy-using behaviour, including achieving increased implementation of DM options where these are economically justified from the perspective of the whole of society. The costing of the externalities and their incorporation into pricing structures leads to a better allocation of economic resources and to an improvement in the overall welfare of society.

Because many externalities are difficult to value in financial terms, attempts to incorporate externalities into energy prices usually use some sort of proxy for the actual value of externalities. Examples of proxies used include[46]:

- **cost of control** – the actual or estimated cost (in monetary terms) of controlling emissions or other pollutants resulting from energy production, supply and use;
- **damage function** – the amount individuals are prepared to pay to avoid a damage that results from a pollutant, or the compensation which individuals are prepared to accept in lieu of the damage;
- **percentage adders** – a predetermined percentage added to energy prices, the percentage being determined by law, judgement or estimates of control or damage costs;
- **energy taxes and emission fees** – a charge imposed on energy purchases calculated in terms of cents per unit of energy or dollars per tonne of emissions.

The most common method used to incorporate externalities into energy prices is a carbon tax, which is a charge imposed on energy purchases calculated either on the carbon content of the fuel used to generate the energy or on the actual greenhouse gas emissions resulting from generating, supplying and using the purchased energy.

Australia

As noted previously, late in 1994, the Commonwealth Government in Australia agreed to drop its proposals for a carbon tax in return for voluntary agreements with industry regarding greenhouse gas emission reductions. Despite several further proposals by various parties since 1994, no carbon tax has yet been imposed in Australia.

Sweden

A carbon tax was enacted in Sweden in 1991. This new tax regime placed a tax of SEK0.25 per kilogram (about AUD47 per tonne) of carbon dioxide emissions on the use of oil, coal, natural gas, LPG, petrol and aviation fuel used in domestic travel. Exempted from these new taxes were ethanol, methane, biofuels, peat and waste. To achieve tax neutrality, the carbon

[46] US Energy Information Administration (1995). *op cit*.

tax was accompanied by reductions in a general energy tax, a tax on sulphur and a value-added tax on energy.

The Swedish carbon tax is not uniformly applied to all sectors. Initially, consumer users were responsible for paying the full tax while, to maintain the international competitiveness of Swedish industries, industrial users were only required to pay 50% of the tax. In 1993, due to protest by many Swedish industries, industrial users were granted further relief; the industry taxation rate was lowered to 25% of the normal rate. In addition, certain energy-intensive industries such as commercial horticulture, mining, manufacturing and the pulp and paper industry were fully exempted from these new taxes. In 1997, the tax code was revised again; the industry rate was returned to 50% and the overall tax was raised to SEK0.365 per kilogram (about AUD69 per tonne) of carbon dioxide emissions. The practice of exempting certain industries from the tax was continued.

Denmark

Denmark has a carbon dioxide and energy tax and the proceeds from the taxation scheme are used to support investment in energy efficiency within the industrial sector. The government has a system where industrial enterprises can obtain a reduction in the carbon tax if the enterprise enters into a voluntary agreement with the government to reduce energy consumption. The voluntary agreement includes a detailed energy audit of the enterprise's facilities and preparation of an energy saving action plan by an authorised energy consultant. The enterprise can then apply for financial support to implement some of the energy saving actions identified in the energy saving action plan.

The Netherlands

The Netherlands introduced environmental taxes on energy sources in 1988 to raise revenue to cover the costs of government environmental policy expenditure. The Environment Ministry is required by law to raise a portion of its expenditure on environmental activities from special environmental taxes. In 1990, this tax system was changed to focus on energy use. In 1992, the tax system was revised to reflect carbon dioxide emissions by being based 50% on carbon content and 50% on energy content.

Distribution companies collect the energy tax on behalf of the Government, and can claim exemptions from paying the energy tax for the amount spent by them on renewable energy.

The taxes are primarily aimed at raising revenue, with market signals regarded as an added bonus. A tax based solely on the carbon content of fuel was rejected because this would act counter to the policy of promoting diversity in energy sources.

United Kingdom

The United Kingdom Government introduced a climate change levy in April 2001. The levy is set at GBP0.0043 per kilowatt-hour (AUD0.012 per kilowatt-hour) and it applies to natural gas, LPG, coal and electricity. The levy applies to energy used by business, agriculture and the public sector. It does not apply to energy used by the residential or transport sectors, or to fuels used for electricity generation or non-energy purposes.

Revenues are recycled to levy payers via a 0.3% cut in employers' National Insurance Contributions and GBP120 million of additional support for energy saving measures. There will be no net gain to public finances as the levy package as a whole is expected to be broadly neutral between the manufacturing and service sectors of the economy[47].

An 80% discount on the levy rates is available for those energy intensive sectors of industry that have agreed to meet challenging targets for improving energy efficiency or reducing greenhouse gas emissions within a climate change agreement. Participants in agreements will be able to achieve their targets either by trading emission allowances with other companies in an agreement or by participating in a wider UK emissions trading scheme which is currently being implemented.

Renewable energy (with the exception of large scale hydro of more than 10 megawatts capacity) is exempt from the levy, providing an incentive for business to opt for electricity from this source. Good quality Combined Heat and Power (cogeneration) is also exempt. Exemption gives CHP users levy-free electricity and heat, and the ability to sell levy-free electricity directly to other users.

The UK Government set up the Carbon Trust in April 2001 as a new, independent, non profit-making company that will recycle around GBP100 million of climate change levy receipts over three years to accelerate the take up of cost effective, low carbon technologies and other measures by business and levy payers.

4.4.2 Price Signalling

Price signalling by energy retailers is intended to encourage customers to alter their energy-using behaviour. There are two main elements to this mechanism[48]:

- communication between the energy retailer and its customers;
- the information which is being communicated.

In competitive electricity markets, retailers wish to avoid wholesale purchases of electricity at times of high cost. However, unless they are market participants, most customers are not exposed to wholesale pool prices and therefore do not receive clear pricing signals.

In the past, electricity retailers could exert some influence on customer energy demand through fixed period time-of-use tariffs. However, the prospects for volatility in the wholesale electricity pool price will stimulate interest in more dynamic arrangements. These may involve providing real-time pricing signals to customers with the intention of stimulating demand reduction. The electricity retailer may even bid demand reductions into a wholesale pool and source these demand reductions from its customers on the basis of commercial arrangements. These could include payments to customers for being available to reduce demand, being put on standby or being required to shed load, or lower prices for interruptible electricity. The common feature in all these arrangements is improved communication between the retailer and the customer.

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[47] UK Department for Environment, Food and Rural Affairs (2001). *3NC: The UK's Third National Communication under the United Nation's Framework Convention on Climate Change*. London, DEFRA.

[48] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

Australia

In Western Australia, Western Power provides "SmartPower", an innovative time-of-use pricing system for residential customers. The SmartPower concept is relatively unique with its seasonal pricing structure and four energy prices. It offers off-peak and shoulder prices during low demand periods, and peak prices which match the periods of high demand. Customers are provided with greater choice, being able to control their power bill by changing their household appliance electricity use to take advantage of cheaper off-peak prices. Appliances such as electric storage hot water systems, pool pumps, reticulation pumps, dishwashers and washing machines can be easily set to operate during shoulder and off-peak periods, thus providing significant cost savings of up to 30%.

SmartPower's seasonal pricing structure reflects the change in the peak electricity demands between summer and winter weekdays (midday peak versus morning and evening peaks) and differentiates the lower load periods during weekends and overnight.

Western Power has contributed to the design and the development of the SmartPower meter, manufactured by Email. A special timed circuit for off-peak appliances is incorporated into the meter, with future options to include remote communications and prepayment capability.

SmartPower's cost reflective prices are expected to encourage two demand management impacts. Firstly, customers are expected to shift a proportion of their existing electricity consumption from high to low periods of demand. Customers will also have greater incentive to focus on energy efficiency options which reduce consumption during peak periods. The second anticipated impact is a refocussing of building and appliance design on peak period energy efficiency and storage options together with increased development of smart timer-based appliances.

4.4.3 Energy Performance Labelling

The objective of energy performance labelling is to provide information to customers about the comparative energy efficiency of appliances. Small, easy-to-read information labels are attached to appliances so that consumers can read about their energy performance at the point of sale.

Labelling schemes have existed in a number of countries since the 1970s and 1980s, and an increasing number were implemented during the 1990s.

There are two basic types of energy performance labels[49]:

- **endorsement labels** – these provide an assurance from a reputable body that the product conforms to or exceeds some standard of energy efficiency, which may or may not be stated on the label;
- **comparison labels** – these provide an indication of the level of energy efficiency of the product as compared with similar products. The comparison is usually indicated visually, eg by an increasing number of 'stars' for increasing levels of energy efficiency. An indication of the actual quantity of energy typically used by the product may also be included in the label.

[49] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

Energy performance labelling programs usually aim to reduce the demand for energy in the residential sector and involve several strategies to achieve this goal.

The first strategy is to provide information to consumers about the amount of energy used by products, as well as the associated environmental and financial costs. The intention is to influence consumers' decision making and encourage the purchase and use of energy efficient products. This information can be conveyed by either endorsement or comparison labels.

The second strategy is to use the fact that comparison labels reveal the relative energy performance of competing products to put market pressure on manufacturers to quickly improve the energy efficiency of the products they offer consumers.

A third strategy, which has emerged in a small number of markets in recent years, is the involvement of the retailing sector as potential 'promoters' of energy efficient products, using the energy performance labelling program as a sales and marketing tool.

Australia

The Australian Energy Rating Scheme, the 'Star Rating' program, was launched in 1986 for refrigerators and freezers, and then later extended to include dishwashers, air conditioners, clothes dryers and other appliances. The labels provide comparative information, with an energy efficiency rating from 1 to 6 stars (6 stars being the highest efficiency available).

In 1992, a study was undertaken to assess the costs and benefits of the scheme to date, particularly in Victoria. With respect to refrigerators and freezers, there had been a rapid improvement in energy efficiency during 1986 and 1987 and a more steady improvement from then up to 1992. Significant increases in the average energy efficiency of dishwashers and air conditioners were also noted.

A ten year review of the scheme was conducted during 1997/98, primarily to address the 'bunching at the top' issue. Improvement of product energy efficiency since the program commenced in 1986, had lead to more appliances receiving five and six star ratings (the highest). Consequently, manufacturers had less incentive to improve efficiencies and the labelling information was becoming less useful to consumers. Following this review, a re-rating of the labelling scheme was carried out so that appliances now have to attain higher levels of energy performance to achieve a particular star rating.

Monitoring the impact of the program continued with a report published in 2001 focusing on energy efficiency trends of major household appliances in Australia from 1993 to 1999[50]. The report showed that the sales-weighted energy consumption was decreasing for products subject to the energy rating label.

4.4.4 Green Power

The purpose of a Green Power program is to increase the quantity of electricity generated from renewable energy sources and therefore to drive investment in new renewable energy generators. Under a Green Power program, electricity retailers provide a 'green' tariff option to customers which is at a premium to regular tariffs. The retailer commits to ensuring that an equivalent amount of electricity to the amount of Green Power energy purchased by a

[50] Energy Efficient Strategies (2001). *Greening Whitegoods: A Report into the Energy Efficiency Trends of Major Household Appliances in Australia from 1993 to 1999.* Canberra, National Appliance and Equipment Energy Efficiency Committee.

customer is produced from renewable energy sources by approved electricity generators. The additional cost to the retailer of purchases from these generators is covered by the higher tariff charged to customers who purchase Green Power.

Australia

In Australia, electricity retailers offer Green Power products throughout the country. Depending on the details of the individual retailers' program, customers are offered an opportunity to purchase a proportion or the whole of the electricity they use as Green Power at prices which are usually between 20% and 40% above the normal price. Retailers purchase sufficient electricity to meet their Green Power commitments from approved generators who use renewable energy sources such as wind, photovoltaics or landfill gas. Retailers may also establish their own approved renewable generation facilities.

The retailers' Green Power products are accredited by the NSW Sustainable Energy Development Authority who commenced the accreditation program in 1997. Today, accreditation is offered nationally through joint collaboration by participating state government agencies in NSW, Victoria, Queensland, South Australia and the ACT[51].

Retailers gain accreditation for their Green Power products if they meet a set of stringent environmental and reporting rules. In return, SEDA and other government agencies promote the Green Power concept and help electricity retailers to promote their accredited products. The Green Power accreditation program aims to:

- facilitate the installation of new renewable energy generators across Australia and reduce greenhouse gas emissions;
- encourage consumer demand for electricity with low greenhouse gas emissions;
- increase awareness and confidence in Green Power products.

After four years, around 60,000 customers across Australia have chosen Green Power products, including 2,500 businesses. As a result of the growing demand for Green Power, over 100 new approved renewable energy projects have been installed. Investment in NSW alone has totalled over $140 million.

4.4.5 Trading Schemes

Trading entitlements to greenhouse gas emissions is one of the four cooperative implementation mechanisms authorised by the Kyoto Protocol. Consequently, much work has been done both in Australia and overseas on developing trading schemes.

There are two basic types of trading schemes[52]:

- **credit trading** – certifies emission reductions above and beyond pre-specified legal requirements as emission credits which can be traded. Credit trading schemes tend to focus on specific emission sources or projects;

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[51] National Green Power Accreditation Program (2001). *Accreditation Document*. Sydney, Sustainable Energy Development Authority.

[52] UN Conference on Trade and Development (1998). *Greenhouse Gas Emissions Trading*. Geneva, UNCTAD.

- **allowance trading**– defines an aggregate emissions cap, allocates the emissions authorised by the cap to eligible parties, and enables trading of "surplus" emission reductions achieved by eligible parties below their allocations.

In general, trading schemes that impose emission caps coupled with allowance trading (known as "cap and trade" schemes) have performed well. However, credit trading schemes have proved to be less secure environmentally and to create higher transaction costs and greater uncertainty and risk compared to allowance trading, leading to reduce trading[53].

Under a typical cap and trade scheme, a specified maximum total level of emissions is set and eligible parties (eg energy producers, retailers and end-users) are allocated a proportion of the total which they should not exceed (their "cap" or "entitlement"). Depending on the operational detail of the particular trading scheme, parties may be issued with emission permits or certificates to the value of their emission cap. Parties who reduce their emissions below their cap may trade their "surplus" permits or certificates with parties who exceed their cap.

Recently, cap and trade schemes which include a minimum cap have been developed. For example, a minimum total level of electricity generated from renewable energy sources may be set and eligible parties allocated a proportion of the total which they should achieve (their "cap"). Parties who exceed their cap may trade their "surplus" renewable electricity with parties who do not meet their cap.

Trading schemes facilitate[54]:

- increased use of lower cost methods of greenhouse gas abatement since emission reductions achieved through lower cost methods can be shared between eligible parties;
- the mobilisation of private capital for controlling global warming;
- the development and implementation of novel approaches to climate change control.

Australia

In early 1999, the NSW Government amended the *Conveyancing Act 1919* to create a carbon sequestration right as a property right attached to land[55]. This right was defined in the Act as follows:

> *carbon sequestration right, in relation to land, means a right conferred on a person by agreement or otherwise to the legal, commercial or other benefit (whether present or future) of carbon sequestration by any existing or future tree or forest on the land after 1990*[56].

Once the carbon right was created, it was possible to trade carbon sequestration credits. In 2000, the Sydney Futures Exchange and NSW Forests established a credit trading scheme for trading carbon sequestration credits, principally from tree plantings. However, the volume of trades was low and the scheme was discontinued in 2001.

The Australian Greenhouse Office has established an Emissions Trading Team which has carried out a significant amount of work on developing a cap and trade scheme for greenhouse gas emissions. The Commonwealth Government has yet to make a decision on

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53 UN Conference on Trade and Development (1998), *op cit*.
54 UN Conference on Trade and Development (1998), *op cit*.
55 Similar carbon sequestration rights have also been created through legislation in Victoria, South Australia and Queensland.
56 *Conveyancing Act 1919 No 6 (NSW),* Sec 87A.

implementing a national emissions trading system. However, the Government has announced that such a system will proceed only if the Kyoto Protocol is ratified by Australia and has entered into force (ie Kyoto commitments become legally binding); and there is an established international emissions trading regime in place.

With effect from 1 April 2001, the Commonwealth Government introduced a trading scheme for electricity generated from renewable energy sources. The Mandatory Renewable Energy Target (MRET) is a cap and trade scheme with a minimum cap. MRET places a legal liability on wholesale purchasers of electricity to proportionately contribute towards the generation of an additional 9,500GWh of renewable energy per year by 2010. The target applies nationally, with all electricity retailers and other wholesale electricity purchasers on liable grids in all States and Territories contributing proportionately to the achievement of the target[57].

Wholesale electricity purchasers are proportionately liable for meeting their share of the target. For example, if a liable party purchases 10% of the liable electricity in the country, they will need to meet 10% of the interim target level for that year.

Wholesale electricity purchasers meet their share of the target each year by surrendering renewable energy certificates (RECs). RECs are created by accredited renewable energy generators who deliver renewable electricity to a grid, end-user or directly to a retailer or wholesale buyer. Some installations of solar water heaters are also eligible to create RECs. Following accreditation, renewable generators which commenced commercial operation on or after 1 January 1997 are able to earn RECs for all electricity provided to the appropriate measurement point. Renewable generators in commercial operation prior to 1 January 1997 are only eligible to earn RECs from existing generation assets where they can demonstrate an increase in output from those assets as compared with a 1997 baseline.

Each REC is equal to (or in the case of solar water heaters, equivalent to) one megawatt-hour of renewable generation available at an agreed measurement point. Wholesale electricity purchasers are required to surrender RECs equivalent to their total liability in that year. The actual number of RECs which must be surrendered to discharge a liability is specified in regulations each year. The penalty for non-compliance has been set at AUD40 per megawatt-hour.

RECs remain valid until surrendered (ie certificates can be banked for use in future periods, although borrowing certificates is not permitted). Liable parties may either develop their own contracts with renewable energy generators to acquire RECs or trade in RECs at a price negotiated by individual parties.

RECs may be traded in financial markets that are separate from the physical National Electricity Market (NEM), so that there is no interference with the operations of the NEM and non-NEM markets. Owners of renewable energy generation assets hold RECs in the first instance, until traded among liable or third parties.

Trading of RECs is still being developed. The Green Energy Market (GEM) project has been established by 19 electricity businesses and the market development company M-co to establish an electronic trading platform for trading "green electricity rights", including RECs. However, an organised market in RECs has not yet eventuated. Once it is developed, the market is likely to be a two-stage process. First, there is likely to be a contract market

[57] Website of the Office of the Renewable Energy Regulator: http://www.orer.gov.au.

comprising trades between renewable energy generators and wholesale electricity purchasers (eg retailers). Second, there is likely to be a secondary market allowing trade of the renewable energy certificates across locations and time periods. This will involve trades between purchasers of renewable energy, other liable parties and non-liable trading entities[58].

Between 1 April and 31 December 2001, over 120 renewable energy power stations were accredited under MRET and over 600,000 RECs were created, providing more than enough certificates to cover the target of 300,000 RECs to be created during 2001.

4.4.6 Cooperative Procurement

In this mechanism, buyers who purchase large quantities of energy-using appliances and equipment cooperate to define their requirements, invite proposals from manufacturers and suppliers, evaluate the results, and actually buy the products. The buyer's requirements may include energy efficiency specifications which are equal to, or in advance of, world best practice.

A cooperative procurement process for an energy efficient product will involve the following stages[59]:

- establishing the buyer group, including involvement by key end-users of the proposed product;
- defining the particular requirements of the buyer group to produce precise and comprehensive product specifications with the potential for increased energy efficiency highlighted;
- obtaining guaranteed funding of seed money for first series purchases to reduce risks for both the buyers and the manufacturers;
- calling tenders for the first series of the product with guarantees that a specific quantity of the product will be purchased by the buyer group;
- providing indicative commitments by the buyer group members to continue purchasing the product after the first series purchases to provide assurance to potential manufacturers that a long term market exists for the product.

Australia

No cooperative procurement processes for energy efficient appliances or equipment have so far been undertaken in Australia.

Germany

Deutsche Telekom was, by itself, able to demonstrate a large market – several thousand units – for energy efficient ventilation and cooling equipment. Following a cooperative procurement process, the energy usage of such units has been reduced by 60%.

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[58] McLennan Magasanik Associates Pty Ltd (1999). *Projections of Price of Renewable Energy Certificates to Meet the 2% Renewable Energy Target.* Report to the Australian Greenhouse Office. Canberra, AGO.

[59] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

Sweden

The Swedish National Energy Administration, a government body that is responsible for promoting energy efficiency, has carried out a range of technology procurement projects, including refrigerator/freezers, clothes washers and dryers, residential ventilation fans, windows, heat pumps, and high-frequency ballasts for lighting, with achieved energy usage reductions ranging from 20% to 70%.

United States

In the "Golden Carrot" programs, electricity businesses offer financial incentives to manufacturers to make major advances in energy efficiency and product performance. In the Super Efficient Refrigerator Program (SERP), 24 electricity businesses pooled USD30 million (about AUD58 million), and offered the manufacturer who could build the lowest cost, energy efficient, CFC-free refrigerator guaranteed rebates from the pool of funds to offset the incremental product development cost. Parties involved in the promotion, creation and implementation of the program include electricity businesses, the National Resources Defense Council, the Environment Protection Authority and the Council for an Energy Efficient Economy.

4.4.7 Energy Performance Contracting

Energy performance contracting involves a contractor, typically an energy service company (ESCO), guaranteeing energy savings for a site over a specified period; carrying out the appropriate energy efficiency improvements, and receiving payment from the actual cost reductions achieved through the energy savings[60].

An energy performance contract works on the basis that the installation of more efficient equipment results in energy savings and reduced operational costs. The cost savings are then used to fund the capital equipment upgrades. The contract includes a performance guarantee, which means the contractor takes on the project risk.

In energy performance contracting, the project scope is defined by the amount of annual energy savings. Traditionally, energy performance contracts involved primarily the provision of energy efficient products and technologies. Increasingly, they now involve enterprises handing over responsibility for their energy performance and equipment upgrades to an ESCO, which provides a complete service, including ongoing maintenance. Payment for this service depends on the energy savings achieved.

Typical clients for energy performance contracts include: industrial or manufacturing facilities, schools, universities, hospitals and government institutions, and commercial buildings. The benefits for the client are:

- capital savings from not having to pay up front for the investment in energy efficient improvements;
- minimisation of major equipment failure;
- a positive environmental impact.

[60] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

Performance contracts can take many forms, including[61]:

- **first out** – the contractor retains 100 per cent of the energy savings until all project costs, including an agreed profit, are paid out;
- **shared savings** – the contractor and the client each receive a fixed percentage or dollar value of the energy savings over the life of the agreement;
- **contracted energy service or 'chauffage'** – the client pays the contractor a fee equal to its energy bills before the project, less an agreed-upon discount of five to ten percent. The contractor pays the energy user's energy bills over the life of the agreement and receives any cost savings above the discount;
- **supply-side contracts** – these are closely related to chauffage contracts but cover the provision of derivative forms of energy rather than energy services. A typical arrangement would be the sale of steam from a boiler house at a fixed cost per unit;
- **guaranteed savings** – the contractor guarantees a cash flow to the client and retains all savings until the total project costs, including contractor margins, are recovered. The client repays project loan repayments directly to the (usually) third party lender. The contractor and third party financier usually have a working relationship which is recognised in the contract, but have no direct financial relationship.

Australia

In NSW, performance contracting is now routinely used in SEDA's Energy Smart Government program supported by a funding stream through NSW Treasury of AUD20 million per annum for guaranteed energy saving projects using energy performance contracting.

One of the largest hospitals in NSW, the Royal North Shore Hospital, has taken full advantage of the Energy Smart Government Program and energy performance contracting. Their contract with Tarong Energy enabled improvements worth almost AUD1.3 million at the hospital, paid by guaranteed future savings. The energy efficiency improvements will save the hospital AUD266,575 per annum, reducing carbon dioxide emissions by 4147 tonnes. The energy performance contract covered the two main buildings on the hospital site and focused on improvements to lighting, heating controls, ventilation and air conditioning systems, and reductions in water consumption.

4.4.8 Competitive Sourcing of Demand-side Resources

In this mechanism, electricity businesses and/or other parties specify their requirements for demand and energy reductions in a public Request for Proposals (RFP). The responses to the RFP are then evaluated on a competitive basis and commercial arrangements implemented with the selected respondents[62].

Competitive sourcing of demand-side resources involves a proponent (ie the party seeking the resources):

- specifying exactly what resources are required;
- initiating a Request for Proposals (RFP) to those most able to provide the resources; and

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[61] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.
[62] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

- selecting, on a competitive basis, those proposals that best satisfy the requirements.

Essentially competitive sourcing functions like an auction for specified proposals. Proposals offer demand reductions, energy savings or a combination of both, at a particular price for a fixed period of time.

Proponents in a competitive sourcing process are usually electricity businesses. Those responding to RFPs are usually energy service companies or other electricity businesses (eg retailers), but a large end-user or a group of smaller end-users may also be able to respond. The decision to respond is entirely voluntary, and is open to all participants in competition with each other.

Competitive sourcing can be used on a purely commercial basis to select the most cost-effective demand-side option, possibly in direct competition with supply-side options. For example, proposals may be requested from providers of both supply and demand-side resources. These proposals may be:

- competing equally and evaluated using the same criteria; or
- sought at the same time, but evaluated separately using different criteria; or
- sought and evaluated separately.

Alternatively, where price regulation of electricity businesses currently exists (eg for network services in the National Electricity Market), the most simple and efficient approach to funding this mechanism would be for the regulator to allow the business to recover costs associated with competitive sourcing of demand-side resources[63]. The costs involved can be passed through to customers and this process can be designed to provide a ceiling for the amount of energy to be provided by a given competitively sourced option, at an agreed price for that option. The agreed price may be established at a level commensurate with an acceptable impact on prices to retail customers.

Australia

In late 1997, the Victorian Power Exchange (VPX) initiated a Capacity Support Program and tendered for supply of reserve capacity and demand-side options to ensure system reliability over the 1997/98 summer. At the close of tenders in October 1997, approximately 150 megawatts of demand-side resource (of which 58 megawatts was considered firm load, the balance being 'nonfirm') had been contracted for dispatch by VPX[64].

The Capacity Support Program made available three levels of payment:

- **availability payments**, which participants received for nominating a demand-side resource that they could make available;
- **pre-notification payments**, which participants received if the system operator told them to stand by; and

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[63] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

[64] Charles River Associates (Asia Pacific) and Jim Gallaugher & Associates (2001). *Electricity Demand Side Management Study: Review of Issues and Options for Government*. Report to the Victorian Energy Networks Corporation. Melbourne, VENCorp.

- **dispatch payments**, which participants received if they actually shed load in response to a request. Failure to deliver the minimum amounts of load reduction that had been bid resulted in financial penalties.

Two retailers received an availability payment, but were not required to reduce demand because the supply system capacity was sufficient to meet demand over the summer.

Following the closure of the Capacity Support Program, several of the retailers who had participated in the program continued their offerings of demand-side resources. However, participating capacity did not grow (and probably declined) due to the removal of the payment structure.

Competitive sourcing of demand-side resources is also a feature of the NSW Code of Practice *Demand Management for Electricity Distributors*[65]. After publishing an annual *Electricity System Development Review* and disclosing information relating to specific forecast system constraints, the distributor is required, if appropriate, to issue a Request for Proposals for system support. This RFP must include detailed information on the support required and the support can be delivered by means of supply-side or demand-side options. After receiving responses to the RFP, the distributor must evaluate proposals and then determine a preferred option.

4.4.9 Demand-side Bidding

Demand-side bidding occurs when a party bids into a wholesale electricity pool a price level above which the bidder will reduce their demand for electricity. The bidder then receives a financial benefit for actually reducing demand if called to do so[66].

The demand-side bidder could be:

- a large customer purchasing electricity directly from the pool;
- a retailer purchasing from the pool, and sourcing demand reductions from its customers. Various commercial arrangements could be made between the retailer and customers including different payments for being available to reduce demand, being put on standby or being required to shed load, or lower prices could be negotiated for interruptible electricity.

While the demand-side bidder may or may not directly financially benefit from avoiding purchase of electricity at times of high prices, other customers benefit through the pool price not rising as much as it would have done without the demand reduction. This provides a rationale for a payment for the demand-side bid that must be greater than the demand-side bidder's value of their reduced load. If no direct payment is made and the demand-side bidder only benefits from avoided purchase costs, there is little incentive to submit bids – the potential bidder could simply reduce their load.

Payment for demand-side bids could be based on the following[67]:

- the product of pool price and the demand quantity of the bid, similar to generation bids;

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[65] NSW Ministry of Energy and Utilities (2001), *op cit*.
[66] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.
[67] Crossley, D, Maloney, M and Watt, G (2000), *op cit*.

- payments similar to the standby payments that generators receive for availability in some wholesale pools;
- some proportion of the difference between pool price without the bid, and pool price with the bid.

A customer requires significant technical and administrative ability to participate in demand-side bidding. In addition, considerable complexity can be added to the market and trading arrangements, especially in the early stages of competitive market development.

The operator of the competitive electricity market will have to make decisions on:

- the criteria which prospective demand-side bidders will have to meet before they can operate in the market;
- the type of payment for demand-side bids;
- monitoring and verification systems for any demand reduction offered.

Demand-side bidding does not promote energy efficiency. Its outcome is short-term load reduction with negligible or even negative implications for energy efficiency. Such negative outcomes can occur if, for example, generation into the pool by high efficiency gas turbines is replaced by old, inefficient on-site generation at the demand-side bidder's premises. However, the overall economic efficiency for society may be enhanced if demand-side bidding results in reduced investment in supply-side assets.

Australia

In Australia, the National Electricity Code does not prevent demand-side bidding into the National Electricity Market. Indeed, the design of the market assumed demand-side participation[68], and demand-side bidding was seen as a major source of this participation. However, virtually none of the demand response that has been realised has resulted from customers bidding their demand response resources directly into the market. Those loads that are regularly scheduled in some way include the pumped storage facilities associated with hydro-powered generation stations and controlled hot water loads. These are already included in the demand profile and therefore cannot be considered as being engaged in active demand-side bidding.

While the rules in the National Electricity Code allow the demand side to participate in the market on an equal footing with the supply side, they require that demand-side bidders must[69]:

- make offers into the wholesale market in a highly structured and systematic format;
- take full exposure to spot price (if the bidder has no allocation arrangement with a retailer);
- meet prudential requirements and pay market participant fees;
- allow the market operator, NEMMCO, to schedule and dispatch their load.

A recent study[70] concluded that these requirements have made demand-side bidding a non-starter with customers due to the loss of control over their own operations they perceive it involves.

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[68] National Grid Management Council (1992). *National Grid Protocol. First Issue.* Melbourne, NGMC.

[69] Charles River Associates (Asia Pacific) and Jim Gallaugher & Associates (2001), *op cit*.

[70] Charles River Associates (Asia Pacific) and Jim Gallaugher & Associates (2001), *op cit*.

Although the customers can actually maintain total control over their operations by how they construct their demand-side bids, they do not recognise this and would need to learn complex market rules and devote management time to interacting with the electricity market. In addition, in the National Electricity Market demand-side bidding does not generate any cash revenues for the customer. It offers the potential for savings if the customer is willing to face the risk of exposure to pool price, which virtually no customers have been willing to undertake to date.

United Kingdom

In a trial of demand-side bidding into the England and Wales Electricity Pool, bidders offered prices, availability and scheduling each day, similar to generators. They received availability payments (only about 2% of the pool price) if they were not actually required to reduce demand. If they were scheduled to reduce demand they received no direct payments and only benefited from the lower Pool price.

However, in March 2001, the New Electricity Trading Arrangements (NETA) were implemented. NETA is a new wholesale market, comprising trading between generators and suppliers of electricity in England and Wales. NETA replaces the Electricity Pool which was set up after privatisation in 1990. While it was considered that the Pool worked satisfactorily in maintaining quality and security of supply, a review of the arrangements found many shortcomings including the fact that bids into the Pool by generators were not reflective of costs.

Under NETA, bulk electricity is traded forward through bilateral contracts and on one or more power exchanges. NETA also includes central mechanisms which do two things. They maintain a balancing mechanism to ensure that demand meets supply, second by second, and they provide a settlement function determining payments between market participants for any surpluses or shortfalls. In the first three months of operation of NETA 97 per cent of electricity was traded in the forward contracts markets, with only three percent traded through the balancing mechanism[71]. Therefore, there are no longer any opportunities for demand-side bidding in the England and Wales wholesale electricity market.

4.4.10 Advantages and Disadvantages of Market Mechanisms

Market mechanisms use one of two basic strategies to achieve increased implementation of societal demand management:

- improving pricing signals to encourage consumers to carry out economically rational behaviour;
- establishing and developing markets for societal demand management.

Both of these strategies achieve outcomes through changing consumers' current behaviour patterns. Therefore, the results of applying market mechanisms are inherently more uncertain than the mandated outcomes of control mechanisms or the usually narrowly-targeted outcomes of support mechanisms. However, the potential changes which can be achieved through market mechanisms are much greater. Because they use market forces which are familiar to consumers, successful market mechanisms can transform a market so that a societal demand management option becomes the preferred choice for the majority of consumers.

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[71] Office of Gas and Electricity Markets (2001). *The New Electricity Trading Arrangements: A Review of the First Three Months*. London, OFGEM.

5 Appropriate Mechanisms for Application in NSW

5.1 Current Application of Mechanisms

Table 3 shows that of the 19 mechanisms identified in this report, six (about a third) are not currently being applied in NSW. The remaining 13 are being applied through at least one demand management program and some mechanisms are being applied through several DM programs.

It is difficult to draw general conclusions about the relative effectiveness of the mechanisms currently being applied in NSW. Detailed evaluations have not yet been carried out for most of the demand management programs. Also the programs are seeking to achieve a wide range of very different outcomes which cannot easily be compared. For example, how does one compare the effectiveness of a training program with that of a MEPs or energy labelling program? However, once detailed evaluations have been completed, it will be possible to make more definitive statements about the relative effectiveness of those programs which are directed at achieving specific outcomes in relation to greenhouse gas abatement and/or reductions in energy use and energy demand.

What can be said is that there is currently a relatively high level of activity in NSW in applying a significant number of mechanisms through a broad range of demand management programs. Determining whether this activity is leading to the implementation of an economically optimal level of societal demand management requires extensive quantitative data and a major study which is beyond the scope of this report. However, given that most DM programs in NSW have been commenced relatively recently, it is highly likely that an economically optimal level of societal demand management has not yet been reached. Therefore, it is legitimate to examine ways in which the current application of mechanisms and consequent implementation of DM programs in NSW can be increased.

5.2 Barriers to the Implementation of Demand Management

A recent top down assessment of opportunities for demand management in NSW has identified seven main barriers to the implementation of demand management[72]:

1. Lack of information about DM techniques and technologies.
2. Lack of information on the costs and benefits of DM.
3. Lack of resources to undertake DM.
4. Low priority given to DM.
5. Perception that DM will result in loss of amenity.
6. Limited funds for capital expenditure.
7. High implied customer discount rates.

Table 3 identifies which mechanisms address each of these barriers.

[72] Charles River Associates (Asia Pacific) (2001). *Assessment of Demand Side Management Opportunities in NSW.* Report to the Sustainable Energy Development Authority. Sydney, SEDA.

Table 3. Current Application of Mechanisms in NSW

Mechanism Type	Mechanism	Barriers Addressed[1]	Applied in NSW	NSW Programs
Control Mechanisms	Mandatory Planning Processes	4	Yes	Demand Management Code of Practice for Electricity Distributors
	Mandatory Environmental Targets	4	Yes	Environmental Licence Conditions for Electricity Retailers
	Mandatory Performance Codes and Standards	4	Yes	Minimum Energy Performance Standards[2]; Energy Smart Homes; Energy Star program
Funding Mechanisms	Direct Allocation of Funds	3, 4, 6, 7	Yes	SEDA budget
	Public Benefits Charge	3, 4, 6, 7	No	
Support Mechanisms	Education, Information and Training	1, 2, 4, 5	Yes	Energy Smart Retailers and other SEDA training and information programs
	Entrepreneurial Greenhouse Organisations	1, 2, 3, 4, 5	Yes	SEDA
	Industry Development	1, 2, 3	Yes	Energy Smart Allies
	Voluntary Agreements	1, 2, 3, 4, 5	Yes	Greenhouse Challenge[2]; Energy Smart Government
	Cooperative Activities	1, 2, 3, 4, 5	Yes	Several industry association programs[2]
Market Mechanisms	Incorporating Externalities into Energy Prices	4	No	
	Price Signalling	4	Yes	Electricity retailer time-of-use tariffs
	Energy Performance Labelling	1, 2, 5	Yes	Energy Rating Scheme[2]
	Green Power	2	Yes	Electricity retailer Green Power programs[2]
	Trading Schemes	6, 7	No	
	Cooperative Procurement	2, 5	No	
	Energy Performance Contracting	2, 3, 4, 6, 7	Yes	Energy Smart Government
	Competitive Sourcing of Demand-side Resources	6, 7	Yes	Demand Management Code of Practice for Electricity Distributors
	Demand-side Bidding	6, 7[3]	No	

[1] See text section 5.2 [2] National programs implemented in NSW [3] If the bidder receives a financial benefit

5.3 Increased Application of Mechanisms

Control Mechanisms

Table 3 shows that control mechanisms address only one barrier: the lack of priority given to demand management. Control mechanisms overcome this low priority by forcing certain parties to increase their implementation of DM options. The outcomes of control mechanisms appear to be more certain than those of the other types of mechanisms because these outcomes are mandated. However, the element of compulsion involved in control mechanisms limits the mandated outcomes to levels which are practically achievable. Otherwise the affected parties will do their best to avoid achieving the outcomes, as was seen with the NSW environmental licence conditions for electricity retailers.

All three types of control mechanisms are currently applied in NSW with somewhat mixed results. The most successful programs appear to be those applying mandatory performance codes and standards, largely because the mandated outcomes have been carefully designed and the operation of codes and standards is well known and understood. Programs applying the other two types of control mechanisms, mandatory planning processes and mandatory environmental targets, have been less successful because there is less experience in designing programs to apply these mechanisms and the mechanisms themselves are less well known.

Recommendation: Existing programs applying mandatory performance codes and standards should be extended and new programs developed. Trial programs to apply mandatory planning processes and environmental targets should be undertaken to improve the design of such programs and to increase understanding about how these programs work.

Funding Mechanisms

Funding mechanisms address four barriers: those concerned with lack of resources, limited capital, low priority and high implied discount rates. Funding mechanisms are potentially very powerful in achieving increased implementation of societal demand management. However, care should be taken to ensure that funding is allocated to economically justifiable demand management programs and this requires careful analysis on a case by case basis.

Only the direct funding mechanism is currently applied in NSW; there is no example of a public benefits charge. The use of a public benefits charge to provide funds to increase the implementation of societal demand management could well be justified on economic grounds. However, a careful analysis of a specific proposal would be required. Care would also have to be taken to ensure the continuity of funding under a public benefits charge and that the portfolio of demand management technologies funded was not unduly biased by the interests of the parties on whom the charge was imposed.

Recommendation: Consideration should be given to increasing funding for societal demand management where this is economically justified. In particular, the establishment of a public benefits charge to provide a proportion of this funding should be investigated.

Support Mechanisms

Support mechanisms address barriers concerned with: lack of information, lack of resources, low priority, and perceived loss of amenity. As noted above, to be effective, programs applying support mechanisms must be targeted closely to the situation in which they operate.

All types of support mechanisms have been applied in NSW. Particularly those programs which have been implemented more recently and which are more closely targeted to specifically defined audiences appear to have been quite successful.

Recommendation: Existing programs applying support mechanisms should be extended and new programs developed. All programs should be carefully targeted to defined audiences.

Market Mechanisms

In terms of the barriers they address, market mechanisms fall into four groups. Incorporating externalities into energy prices and price signalling address the low priority barrier. Trading schemes, competitive sourcing of demand-side resources and demand-side bidding address the limited capital and high discount rate barriers. Energy performance labelling, Green Power and cooperative procurement address the lack of information and perception of loss of amenity barriers. Finally, energy performance contracting addresses barriers concerning lack of information, lack of resources, low priority, limited capital and high discount rate.

As noted above, market mechanisms achieve outcomes by changing consumers' current behaviour patterns. Therefore, the results of applying market mechanisms are inherently more uncertain than the mandated outcomes of control mechanisms or the usually narrowly-targeted outcomes of support mechanisms. However, because they have the potential to transform markets, the potential changes which can be achieved through market mechanisms are much greater.

At present, only five of the nine types of market mechanisms are applied in NSW. The programs applying the mechanisms appear to have been relatively successful, with the exception of competitive sourcing of demand-side resources. Given that most energy markets in Australia cross State boundaries, many of the market mechanisms are applied through national programs. Those that are not currently applied in NSW would have to be applied through national programs.

Recommendation: Most existing programs applying market mechanisms should be extended and new programs developed. The competitive sourcing provisions in the Demand Management Code of Practice for Electricity Distributors should be examined to see whether they can be made more effective. Investigations should be undertaken, in association with other jurisdictions, of the possible introduction at the national level of a carbon tax, a greenhouse gas emissions trading scheme and a cooperative procurement program.

6. REFERENCES

Australian Building Codes Board (2001). *Energy Efficiency in Buildings: Directions Report.* Canberra, ABCB.

Australian Greenhouse Office (1999). *Greenhouse Challenge Evaluation Report*. Canberra, Commonwealth of Australia.

ANZMEC IRP Management Committee (1994). *Least Cost Energy Services for Australia*, Melbourne, the Committee.

Charles River Associates (Asia Pacific) (2001). *Assessment of Demand Side Management Opportunities in NSW*. Report to the Sustainable Energy Development Authority. Sydney, SEDA.

Charles River Associates (Asia Pacific) and Jim Gallaugher & Associates (2001). *Electricity Demand Side Management Study: Review of Issues and Options for Government*. Report to the Victorian Energy Networks Corporation. Melbourne, VENCorp.

Crossley, D J (1979). The role of popularization campaigns in energy conservation. *Energy Policy* vol 7, pp 57-68.

Crossley, D J (1983). Identifying barriers to the success of consumer energy conservation policies. *Energy* vol 8, pp 533-546.

Crossley, D, Hamrin, J, Vine, E, Eyre, N (1999). *Public Policy Implications of Mechanisms for Promoting Energy Efficiency and Load Management in Changing Electricity Businesses.* IEA DSM Programme, Task VI Research Report No 2. Sydney, Energy Futures Australia Pty Ltd.

Crossley, D, Maloney, M and Watt, G (2000). *Developing Mechanisms for Promoting Demand-side Management and Energy Efficiency in Changing Electricity Businesses*. IEA DSM Programme, Task VI Research Report No 3. Sydney, Energy Futures Australia Pty Ltd.

Ecologically Sustainable Development Working Groups (1991). *Final Report—Executive Summaries*. Canberra, Australian Government Publishing Service.

Energetics (2000). *Epping/North Ryde Demand Side Management Scoping Study*. Report to the Sustainable Energy Development Authority and EnergyAustralia. Sydney, SEDA and EnergyAustralia.

Energy Efficient Strategies (2001). *Greening Whitegoods: A Report into the Energy Efficiency Trends of Major Household Appliances in Australia from 1993 to 1999*. Canberra, National Appliance and Equipment Energy Efficiency Committee.

Energy Saving Trust (2001). *Energy Efficiency Commitment Report 2000-2001*. London, EST.

Ernst & Young, HRL Morrison and Co, SRC International (1994). *Overcoming Barriers to Electricity Utility Promotion of End-Use Energy Efficiency: A Report to the ESAA Demand Management and Energy Efficiency Committee*. Unpublished.

Independent Pricing and Regulatory Tribunal (2000). *Electricity Distribution and Retail Licences: Compliance Report for 1999/2000*. Sydney, IPART.

Independent Pricing and Regulatory Tribunal (2001). *Inquiry into the Role of Demand Management and Other Options in the Provision of Energy Services: Issues Paper*. Sydney, IPART.

McLennan Magasanik Associates Pty Ltd (1999). *Projections of Price of Renewable Energy Certificates to Meet the 2% Renewable Energy Target.* Report to the Australian Greenhouse Office. Canberra, AGO.

National Appliance and Equipment Energy Efficiency Program (2001). *Future Directions 2002-2004: A Discussion Paper*. Canberra, Australian Greenhouse Office.

National Association of Regulatory Utility Commissioners (1993). *Environmental Externalities and Electric Utility Regulation*. Washington DC, NARUC.

National Grid Management Council (1992). *National Grid Protocol. First Issue.* Melbourne, NGMC.

National Grid Management Council (1994). *Demand Management Opportunities in the Competitive Electricity Market*. (Two volumes.) Melbourne, NGMC.

NSW Department of Energy (1997). *Further Environmental Guidelines and Requirements - Retail Suppliers - Greenhouse Gas Reduction Strategies*. Sydney, DOE.

NSW Government (2001). *Greenhouse-related Licence Conditions for Electricity Retailers*. NSW Government Position Paper. Sydney, NSW Government.

NSW Ministry of Energy and Utilities (2001). *Greenhouse Gas Emission form Electricity Supplied in NSW: Framework for the Use of Carbon Sequestration to Offset Emissions*. Sydney, MEU.

NSW Ministry of Energy and Utilities (2001). *NSW Code of Practice: Demand Management for Electricity Distributors*. Second Edition. Sydney, MEU.

Office of Gas and Electricity Markets (2001). *The New Electricity Trading Arrangements: A Review of the First Three Months*. London, OFGEM.

Spanish Research Centre for Energy, Environment and Technology (1998). *ExternE Externalities of Energy - National Implementation.* Seville, Institute for Prospective Technological Studies, Joint Research Centre, European Commission.

Sustainable Energy Development Authority (2000). *Corporate Plan 2000–2002*. Sydney, SEDA.

Sustainable Energy Fund Working Group (1995). *Final Report*. Sydney, Electricity Reform Taskforce, NSW Treasury.

UN Conference on Trade and Development (1998). *Greenhouse Gas Emissions Trading*. Geneva, UNCTAD.

US Energy Information Administration (1995). *Electricity Generation and Environmental Externalities: Case Studies*. Washington DC, EIA.

US Federal Energy Regulatory Commission (1992). *Report on Section 808: Renewable Energy and Energy Conservation Incentives of the Clean Air Act Amendments of 1990*. Washington DC, FERC.

UK Department for Environment, Food and Rural Affairs (2001). *3NC: The UK's Third National Communication under the United Nation's Framework Convention on Climate Change*. London, DEFRA.