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**Sustainable
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IPART Inquiry into the Role of Demand Management

Submission on the Interim
Report

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Submission on the Interim Report

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ã UTS June 2002

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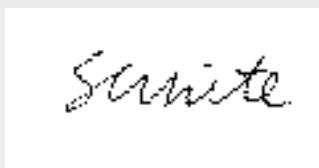
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Where possible, we adopt an approach to our work that is inter-disciplinary and participatory. We aim to engage with our partners, funding agencies and clients in a co-operative process that emphasises strategic decision making. The results are client-driven relevant solutions that work.

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1 INTRODUCTION

The Institute for Sustainable Futures welcomes the opportunity to comment on the Interim Report of IPART's Inquiry into the Role of Demand Management and Other Options in the Provision of Energy Services.

In the Institute's Comments on the Issues Paper in September 2001, we recognised the Inquiry as an important opportunity to achieve greater sustainability in the provision of energy services. The Institute therefore welcomes the thrust of the Interim Report and the specific recommendations in it, as providing an important step towards sustainability, if the recommendations are implemented.

In this submission, the Institute wishes to pursue further the issue of trials and evaluation of demand management options. The Institute originally raised this issue in its Comments on the Issues Paper (p.5 of the Institute's Comments).

The Interim Report stresses in a number of places the need for trials and evaluation:

Developing experience and capability with DM programs and technologies, including rigorous evaluation, is crucial to overcoming real and perceived reliability issues, and to help to reduce the cost of undertaking DM.¹

... [the Tribunal] would like the DNSPs to undertake trials of locational and congestion pricing structures and seeks proposals to do so.²

Establish Demand Management Fund ... [and] support for trials of DM projects across target sectors using fund rather than regulatory guarantees.³

The Institute believes that trials and evaluation are particularly important where the effect of demand management programmes is poorly understood, and more particularly, where different ways of delivering demand-side energy services need to be tested to separate out the better approaches. The Institute has substantial experience both in designing implementation of demand management programmes for water and in evaluating the effects of such programmes on demand.

The Institute believes that the Tribunal could strengthen its recommendations on trials and evaluations by offering to provide institutional support for some well-designed trials and by facilitating such support by other organisations. Some fruitful areas for trials are discussed in the sections below.

2 TRIALS OF SMART METERING AND PRICING

The Interim Report states that the Tribunal proposes to recommend that:

The Government review the policy for rolling-out interval meters to residential customers, to provide better price signals and increase capacity for customers to respond to these signals by modifying consumption.⁴

¹ IPART, *Inquiry into the Role of Demand Management and Other Options in the Provision of Energy Services, Interim Report*, April 2002, p. 10.

² As above, p. 44.

³ As above, p. 65.

⁴ As above, p. 57.

As noted above, the Tribunal also proposes to recommend trials of locational and congestion pricing structures for networks.

The in-principle economic efficiency arguments for both interval metering and locational/congestion network pricing are clear. The most effective ways of using such meters to deliver better usage and pricing information, particularly to small customers, is less well understood in Australia, although there is now some experience overseas.

The Institute is aware of opportunities to conduct trials using interval meters to deliver better usage and pricing information to customers. These opportunities involve buildings where interval meters and/or electronic meter data loggers are being installed, sometimes for other reasons. In response to these opportunities, the Institute has prepared research rationales and objectives for conducting trials and evaluations at some such locations. These research objectives and rationales are attached as an Appendix below. They are in generalised form with identifying features removed. The research rationales and objectives could be adapted for use in similar projects in other locations.

3 TRIALS OF AGGREGATION OF CUSTOMER DEMAND

The Interim Report states that the Tribunal proposes to recommend that:

The Government and retailers/distributors work with the NEM to facilitate the aggregation of customer demand, and development of energy contracts that incorporate real-time energy market signals, to influence forward energy prices and generator bids by significantly lowering demand.⁵

The Report concentrates on one option, an electronic trading platform. Another option for aggregation would be aggregation of energy service purchasing by customers through either:

- a green retailer, with its service extended beyond green power to include energy efficiency services, electronic usage and/or pricing information from interval metering, etc; or
- a pure purchasing organisation, whether set up as a company, co-operative or registered association.

Trials of some of these would help to answer the question of whether any can be designed in a way that delivers demand-side energy services profitably within the narrow retail margins available from sales of energy and energy services.

The Institute has considered many of the issues associated with establishing energy purchasing co-operatives.⁶ Some already exist in Victoria and there have also been feasibility studies into establishing energy purchasing co-operatives in NSW.⁷

⁵ IPART, as above, p. 57.

⁶ Sarac, Kaarina (editor), *Proceedings, The New Competitive Energy Market: How Co-operatives and Regional Australia Can Benefit, An Issues and Opportunities Forum*, Institute for Sustainable Futures and Australian Centre for Co-operative Research and Development, 14 December 2000.

⁷ Mark Ellis and Associates, 2000, *Energy Co-operatives Feasibility Study: The Final Report for the Mid-North Coast Co-operatives*, February 2000.

APPENDIX 1: RESEARCH OBJECTIVES AND RATIONALE: PROPOSED TRIAL OF INNOVATIVE USE OF “SMART” METERING INFORMATION TO CUT GREENHOUSE GAS EMISSIONS AND WATER USE

1. Introduction

These research objectives and rationale are for an indicative project to use information from smart meters to test the effect of feedback on energy– and water–usage and energy time-of-use tariffs, on energy and water use by small customers.

The Institute for Sustainable Futures is currently working on the detailed design of a research programme in a specific location where smart meters and data loggers are being installed for other reasons. The Institute is also seeking additional locations for similar trials that would enhance the achievement of the project’s broader objectives.

2. Research objectives

The research objectives being proposed by the Institute will be to provide answers to the following questions:

- a) How much additional water and energy saving potential is achievable for small customers, beyond that achievable through water and energy efficient design and equipment?
 - Specifically, which combination of possible services that can be provided by smart meters yields the greatest savings (and customer acceptance) compared to a control group who do not receive these services? The combinations of services that could be offered include:
 - ✓ feedback only:
 - on energy, water, hot water use combined;
 - on water and hot water use alone;
 - ✓ time-of-use electricity tariffs only; and
 - ✓ both feedback and time-of-use tariffs.
- b) Does the electricity load control potential of smart meters provide any additional benefits to household customers, electricity utilities (particularly network service providers) or demand management service aggregators?

Comment on feedback on water, hot water and energy use

Because hot water is metered separately in many multiple dwelling residential buildings, the feedback has the potential to integrate the energy and water cost of using hot water. This is likely to create a stronger incentive for efficient behaviour with water and energy use than feedback on the cost of water and energy separately. Providing feedback on water and hot water use alone will permit direct focus on the effect of feedback on water use behaviour without a possible dwarfing effect of energy costs.

3. The Evidence on Feedback and Time-of-Use tariffs

3.1 Evidence on Feedback

1. Bath study: The Bath study in the late 1990s compared feedback in various paper and computer based forms:

The only group that performed consistently and significantly better than the others was ... the Computer Group. This group was notable for the percentage of households which reduced their consumption levels – over 80% compared to the average of 55% among the other groups, but also because the households in this particular group tended to have made greater reductions – on average 15% compared to the previous year’s consumption...Reductions in consumption were not related to the socio-economic or demographic criteria typically associated with energy consumption levels nor were they related to this sample’s pre-feedback energy use. However, while such variables did not pre-determine the likelihood of a household changing their behaviour in response to the feedback, the possession of certain attitude variables did.⁸

The project concluded that feedback had to be highly visible, relevant and targeted to the circumstances of the household. A second stage of the project is trialling the delivery of visible, relevant and targeted feedback through the use of smart meters linked to a computer based display.

2. Puget Sound Energy, Washington State, USA (2001, continuing):

Customer usage data is gathered by using newly developed metering technology that gathers and stores this information in as small as 15-minute increments...At Puget Sound Energy (PSE) we began providing usage information to 410,000 of our residential, commercial and industrial customers last December. In addition to monthly information in our billing statements, our customers can also gain access to their usage data over the most recent 24-hour period on our web site. They also see the time blocks their usage occurred in...The survey also showed that 79% of residential customers and 70% of business customers had taken actions to alter their energy use...and finally that as a result of the information they received about their usage 43% of residential customers shifted when they used electricity, and 41% reduced their usage.⁹

3.2 Evidence on Time-of-use tariffs

One recent overseas study showed a 26 per cent reduction in average load and a 50 per cent reduction in critical-period peak load, in response to a three-part time-of-use tariff, with a higher critical period rate.¹⁰

The recent summer incentive scheme in California showed a strong relationship between peak demand reductions and total energy consumption. That is, consumers don’t just cut extreme

⁸ Brandon, Gwendolyn and Alan Day, 2000, “Making Domestic Energy Use Visible”, in Warhurst, Alyson (ed), 2000, *Towards a Collaborative Environment Research Agenda: Challenges for Business and Society*, Macmillan Press, Basingstoke.

⁹ Mr. Gary Swofford, Vice President and Chief Operating Officer—Delivery, Puget Sound Energy, prepared witness testimony to the inquiry into [National Energy Policy: Conservation and Energy Efficiency](#) by the Subcommittee on Energy and Air Quality of the The Committee on Energy and Commerce, House of Representatives, at <http://energycommerce.house.gov/107/hearings/06222001Hearing265/Swofford437.htm>

¹⁰ Steven Braithwait and Sung Chung, “Not Your Father’s TOU Rate: Price Response in the Presence of Interactive Communications Equipment,” in *Proceedings from the EPRI Conference on Pricing Energy in a Competitive Market*, June 17–19, 1998. Published by the Electric Power Research Institute; quoted in Putnam, Hayes and Bartlett – Asia Pacific and Lacuna Consulting, *op cit*, p.6-13.

peak demand when wholesale market prices are high (and supply might be constrained), they cut energy consumption across the board and in doing so reduce extreme peak demand. This suggests that consumer response to price signalling and load management offers will result in both market-effective demand management (i.e. an economic response that should reduce price and demand volatility in the wholesale market) and greenhouse gas-effective reduction in consumption.

Note, however, that the Californian scheme did not require any changes from existing 19th century metering technology - meaning there is an open question about the equity of the incentives (consumers who didn't cut their electricity consumption still benefited because those who did prevented blackouts across California).

4. Need for the Project

4.1 Sustainability perspective: Greenhouse abatement and water efficiency

Water efficiency and greenhouse abatement actions tend to focus on installation of hardware to improve the efficiency of end-use of water and energy, and, in the case of energy, on supply of energy with low, zero or negative greenhouse gas emissions. There has been much less focus on the behavioural aspects of energy and water use, apart from generic advertising campaigns (eg It's a Living Thing in NSW).

Although significant energy [and water] savings can be achieved by upgrading the physical fabric of buildings, there are alternative ways to promote conservation. People's behaviour also has a significant impact and can completely undermine the physical improvements if it is inappropriate.¹¹

The evidence from overseas, quoted in Section 3 above, shows that more targeted approaches to influencing energy and water use behaviour – including electronic feedback and financial incentives such as time-of-use tariffs – can have a significant impact on energy and water use. Yet there have been few trials in Australia of these more targeted approaches and little research into their effectiveness.

It must be stressed that influencing water and energy use behaviour must be seen as a complement to, not a substitute for, the construction of efficient buildings and the installation of energy- and water-efficient appliances.

Smart meters provide the potential to influence water and energy use behaviour through two main services:

- electronic feedback on water and energy use; and
- time-of-use tariffs (mainly for energy; potentially for water where water infrastructure is constrained by seasonal peak demand).

4.2 Customer perspective

Household and small commercial customers face many barriers and challenges to reducing their water use and greenhouse gas emissions from energy use. Some of the barriers relevant to these research objectives include:¹²

¹¹ Brandon and Day, as above, pp. 72-3.

¹² This is not a comprehensive list, such as that in the IPART Interim Report on the Role of Demand Management, pp. 13 and 73-4. Some barriers would not be addressed by provision of usage and pricing information, such as the split incentives between landlords/developers and tenants/occupants, and the competition for capital to pay the up-front costs of efficiency improvements.

- lack of information: with only a quarterly total of water and energy use to work with, customers receive no feedback on the effects of new or replaced appliances or of changed behaviour or usage patterns.
- historically, households have had a fairly passive relationship to water utilities and energy distributors and retailers, with no choice of supplier and little control over their water and energy bills or the source of their water and energy.
- without competition, retailers and distributors have had little reason to provide information or water and energy efficiency services to add value to their basic utility service.
- without tariffs that provide clearer time-of-use signals, customers have had little incentive to monitor their patterns of energy use (or water use where relevant).
- energy demand management service companies face difficulties entering the household market because of:
 - the lack of time-of-use metering, which makes proof of demand reductions difficult to establish; and
 - the transaction costs of recruiting and aggregating many small customers to achieve the critical mass needed to provide services on a commercially sustainable basis.
- energy and water efficiency service companies face similar transaction costs of recruiting and aggregating many small customers.
- the wiring in customers' premises has been installed without the capability for automatic or external control of load—except for off-peak water or space heating.

Smart meters help remove some of the barriers to cutting water use and greenhouse gas emissions by providing the basic infrastructure needed to make it possible for retailers or others to offer a variety of services including:

- real-time (or near real-time) customer feedback;
- time-of-use tariffs; and
- load and energy management.

From January 2002, small electricity and gas customers in NSW, Victoria and the ACT will be able to choose their energy retail supplier. Customers without smart meters will still be billed on the basis of their existing accumulation meter and tariffs that are averaged over time, based on a net system load profile.

This approach will prolong most of the barriers to reducing greenhouse gas emissions that existed up to now.

For example, if an assigned load profile rather than an interval meter is used to calculate a customer's electricity bill based on half-hourly prices, the bill won't change even if a customer responds to the price signal by shifting demand to lower cost periods. However, with

metering that measures usage each half hour, if a customer reduces demand during peak periods, his or her bill will fall.¹³

Comment on Electricity Load Management for Residential Customers

Smart meters also provide the potential for load control. This may be less relevant for direct greenhouse gas emission reduction, but the potential to achieve network and wholesale -price related cost savings may improve the overall viability of the smart metering package.

While load management in its traditional form of peak lopping or peak shifting has objectives other than greenhouse gas emission reduction, there are powerful synergies between the load- and energy-management. Both require similar technologies and institutional arrangements. Customers and energy service companies/retailers will need the benefits of both load management and energy efficiency to make the overall “smart metering” package financially attractive.

Comment on Time-of-use Tariffs for Residential Customers

Having time-of-use tariffs:

of course, does not mean that individual consumers should or would be fully exposed to wholesale market price volatility. The degree to which customers are impacted by wholesale market prices depends on the service offering agreed with their retailer - and, ultimately, the customers’ energy consumption choices ... Retailers [would] also bill their customers using information from interval meters; and the same information can be used by the customer and competing retailers to develop alternative service offerings. This allows customers to gain real benefit from competition in the supply of electricity, to exert real and effective economic power and, if they so choose, to benefit through targeted load management.¹⁴

Similarly, the NSW Independent Pricing and Regulatory Tribunal states that: “While the Tribunal is supportive of better pricing, such averaging [in pricing for small users] is inevitable and residential customers are highly unlikely to be directly exposed to the volatility of wholesale market prices (nor should they be).”¹⁵

4.3 Market development and regulatory perspectives

One of the main reasons to introduce competitive markets to any sector is to improve productive, allocative and dynamic efficiencies. In any market, a key to achieving efficiency gains is the capacity for both a supply and demand response to prices and market conditions. However, use of net system load profiling for small retail electricity customers fails to provide either an incentive or a mechanism for demand response. To use a topical example, customers who install air-conditioners and use them at times of peak demand force up the total cost of supplying electricity and hence increase the average cost for all customers. However, customers who use air-conditioners at peak times see no difference in price to customers who do not use air-conditioners at peak times. Hence, customers have no incentive to manage or avoid their use at these times.

¹³ Putnam, Hayes and Bartlett – Asia Pacific Pty Ltd and Lacuna Consulting Limited, 1998. *Development of a Conceptual Metering and Settlement Design for Full Retail Competition in the National Electricity Market – Final Report*, prepared for the National Electricity Market Management Company Metering and Settlement Steering Committee, 11 December, p.6-11.

¹⁴ Pareto Associates Pty Ltd, 2001. *Smart Meters For Smart Competition: Handing Back Power To Consumers. Comment On Current Policy Affecting Interval Metering And Load Profiling For Full Retail Competition In Electricity*, Report For The Customer Energy Coalition, May, p.69.

¹⁵ IPART, as above, p. 61.

Interval metering offers a number of market benefits not captured by load profiling.

- it provides the opportunity for retailers and other energy service companies to compete on more than just an averaged price, by offering a range of services including tailored prices, energy and load management, and feedback to customers on their usage patterns.
- smart metering provides the potential for system cost savings by reducing the requirements for peak capacity in generation, transmission and distribution, because of the ability to more closely link individual usage patterns to wholesale market prices.
- interval metering also provides the potential for environmental benefits: “If such services were on offer, they could be tailored to reduce bills by reducing energy consumption – and thus have a greater impact on greenhouse gas emissions.”¹⁶

While retail competition is being introduced in 2002 with load profiling, the decision does not preclude the use of interval meters. The challenge is to trial the use of smart meters in ways that clearly demonstrate (in Australia) the feasibility and the benefits of their widespread installation and use.

Widespread installation of smart meters is beginning overseas.

[Pareto Associates] identified three cases where low-cost interval meters have been rolled-out, or where roll-out will commence within the next twelve months. **Each of these roll-outs includes low-cost, remote reading and feedback/control to the meters.**¹⁷ (emphasis in original)

The cost of installed smart meters is also falling rapidly as overseas utilities achieve economies of scale through mass installation.

The unit costs of the Wisconsin roll-out and cost for the Italian roll-out are about the same or lower than the costs suggested in the IES [Intelligent Energy Systems] report to the DBs [Victorian Distribution Businesses] **for manually read interval meters**. The initial investment cost for the Italian roll-out is just A\$110/metering point for interval meters with a flexible two-way communications technology that will allow automatic load management and a range of other services to be offered to Italian consumers by competing retailers. ENEL expects to recover the investment cost of this roll-out in just four years through improvements in its business and from new services that can be provided to customers in a competitive market.¹⁸ (emphasis in original)

4.4 Utility perspectives

Electricity retailers

This project offers electricity retailers the opportunity to test the potential use of data from smart metering technology to:

- trial the effectiveness of combinations of feedback and/or time-of-use tariffs, in reducing the magnitude of peak wholesale prices as a whole (ie contribute to a demand response in the national energy market) and/or reduce their risk

¹⁶ Pareto Associates, *op cit*, p.(v). Later material from Pareto Associates also provides information on other examples of remotely read, smart meter rollouts.

¹⁷ *Ibid*, p.59.

¹⁸ *Ibid*, p.60.

exposure to peak wholesale prices (depending on whether smart meters will eventually be used for reconciliation of domestic energy use or not);

- make claimable greenhouse gas emission reductions towards the NSW greenhouse benchmark, under the Electricity Sales Foregone methodology;
- investigate the benefits of sharing meter data logging and collation platforms with other utility service providers; and
- trial remote reading of meters.

Electricity distributors

This project offers electricity distributors the opportunity to test the potential use of data from smart metering technology to:

- trial the effectiveness of combinations of feedback and/or time-of-use tariffs, in reducing the magnitude of peak loads on the network;
- investigate the potential of the capability of smart meters for load control, for reducing peak loads of residential customers; and
- investigate the benefits of sharing meter data logging and collation platforms with other utility service providers.

Water utilities

This project offers water utilities the opportunity to test the potential use of data from smart metering technology to:

- trial the effect of customer feedback on the integrated cost of water and energy in hot and cold water use, on total water end-use demand, as part of meeting Sydney Water Corporation's statutory targets for reduced water use per household;
- for possible subsequent stages of project in dwellings with outdoor water use and in areas where peak water demand is an issue, trial the effect of time-of-use tariffs on peak water demand;
- investigate the benefits of sharing meter data logging and collation platforms with other utility service providers; and
- trial remote reading of meters.

Gas distributors/ retailers

This project offers gas distributors/retailers the opportunity to test the potential use of data from smart metering technology to:

- offer innovative value-added services to customers, which can be used by customers to manage their use and cost of all utility services;
- investigate the benefits of sharing meter data logging and collation platforms with other utility service providers; and
- trial remote reading of meters.