Comments on: Interim Report, Inquiry into the Role of Demand Management and other Options in the Provision of Energy Services, IPART, April 2002

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General comments

The purpose of the electricity industry is to deliver end-use energy services using electrical energy as an intermediate energy form. The electricity industry is often only one of several possible energy conversion chains by which particular energy services can be delivered. However it has the unique characteristic that electrical energy is transmitted at the speed of light from electrical generators in power stations to end-use equipment in end-users' premises without intermediate energy storage.

There is a particularly strong physical relationship between electrical generators and end-use equipment. Neither generator nor end-use equipment can operate correctly unless they are connected and operating simultaneously (unless the end-use equipment has local energy storage). Moreover, the quality of the electrical energy flow is also important to satisfactory operation of both generator and end-use equipment. Key indicators of AC electrical energy quality are frequency, voltage magnitude, harmonic content and phase balance.

The electricity network to which both generators and end-use equipment are connected provides the necessary paths by which electrical energy can flow between them. Network equipment also plays an important role in maintaining the quality and availability of electrical energy flows (as do generators and, in some cases, end-use equipment). The network tasks of connectivity and contributions to the maintenance of quality and availability of supply can be defined as "network services", which in many cases are delivered as holistic services by the network as a whole.

End-user demands for energy services, generator energy conversion processes and electrical equipment availability are all stochastic processes. The network plays an important role in physically aggregating these stochastic processes. When the stochastic processes are independent, the variances of aggregated demand and generation are reduced, the problem of maintaining supply-demand balance is simplified and the delivery of end-use energy services is made more cost-effective. Also, the deleterious effects of network equipment outages are reduced in those parts of the network that are "meshed". This aggregation function is an important reason why network services often have to be considered in a holistic manner.

However the network's capability to smooth the aggregated stochastic processes is reduced when they are strongly correlated. Thus, the end-use service of indoor temperature conditioning, which is strongly correlated by ambient temperature, is a major contributor to both summer and winter peak demand. Similarly, "multiple contingencies" involving simultaneous failures of network or generator equipment, can lead to "black-outs". Network services become less cost-effective in situations of this kind.

The ability of a network to provide network services is also subject to network losses and constraints. Constraints on network services, due to rating limits, equipment faults or power system security operating requirements, can restrict the electricity industry's ability to deliver end-use energy services. A forecast of future constraints on network services is an important driver for network investment.

Demand-side services can be defined as a set of activities taken on the demand side of the electricity industry that can improve the cost effectiveness of delivering end-use energy services. Demand-side services can range from improving the efficiency of end-use equipment (and thus reducing the amount of electrical energy needed to deliver an end-use energy service) and fuel switching (switching to an alternative energy conversion chain, such as a solar water heater), to embedded generation (generation located close to end-use equipment of equal or greater rating). Demand-side services may be able to substitute for services provided by remote generation and the network. They may also have environmental and/or social benefits.

Traditionally, the electricity industry has relied on supply-side options, and this has served Australian society well for many years. However the importance of demand-side services is now increasing with growing concerns about environmental impacts associated with fossil fuels, and increasing use of air-conditioning and electronic equipment in high-value applications.

All generation, network and demand-side services should be considered on an equal footing when making operating and investment decisions in the electricity industry, according to their cost-effectiveness in delivering valued energy services in competition with other energy conversion chains, and with consideration of externalities. End-users are well placed to make such comparisons, provided they are given the necessary societal support with regard to externalities and demand-side services.

In this Inquiry, the term "demand management" is used in a way that is similar to "demand-side services" as defined above. However, demand management has the additional connotation that the electricity supply industry is responsible for its implementation. This recognises the dysfunctional nature of retail market design in the restructured electricity industry at the present time. Unfortunately restructuring has not provided an alternative mechanism that allows the supply-side of the industry to implement demand management effectively.

It is possible to envisage a future in which that assessment by informed end-users could take place mainly in a market-context. However that would require efficient retail (or more accurately local) energy service markets and adequate support for end-user decision-making – a situation that we are as yet far from achieving.

Instead, the electricity supply industry currently operates under an ill-defined, open-ended "obligation to serve" with uncertain legal accountability for quality and availability of supply, and regulators have been assigned responsibility for achieving economically efficient and environmentally sound industry outcomes. In discharging that role, regulators should facilitate the development of efficient retail electricity markets supported by interval metering that also measures availability and quality of supply, and promote a more active role for end-users, because only then will a "level playing field" be achieved for demand-side services.

Specific comments

Page	Comment
1 & 2	The division of DM options into three categories is attractive for defining the roles of supply-side agents in implementing demand management but is otherwise problematic. For example, installing insulation in a house with an air-conditioner is likely to have benefits in all three categories – environmentally, network and retail market driven. Thus the distinction between network driven and retail market driven DM has more to do with incomplete retail market design than with a difference in kind. At present, the retail market is just as a mechanism to re-package wholesale market risk, rather than a market that internalises network issues. By contrast, an end-user perspective would consider all supply-side issues in a holistic way, providing a more appropriate context in which to consider DM options. From this perspective, the separation of network and retail market driven DM is artificial and deleterious to balanced consideration of DM options. It also risks excessive regulatory intrusion as regulators attempt to use network service providers (NSPs) to deliver balanced outcomes in the presence of the dysfunctional retail market. While it would be premature to subsume all network issues into retail market design, it is important to foreshadow this development, because only then will a "level playing field" have been achieved for DM options, in the form of a set of interconnected "local" markets in which end-users are active participants and in fact the most important decision makers. Thus the need for the regulator to "drive" DM options ultimately derives from the passivity of the end-use sector of the electricity industry. IPART might give more consideration in its final report to ways to overcome end-user passivity.
3	In defining demand management, it would be useful to note that the central purpose of the electricity industry is to deliver end-use energy services, and that electrical energy is merely a transient intermediate energy form. This would help to shift the focus from supply industry "demand management" to active end-user involvement in identifying cost-effective ways to deliver energy services.
4	It is good to note that the term "end-user' is widely used in the report rather than the term "consumer", which implies a focus on electricity rather than on end-use energy services. However "consumer" appears in Section 2.2 on page 4 where end-user would be more appropriate. Also in Section 2.2, the report states that "in practice DM is likely to involve

	complex contractual arrangements", which is stated to be "one of the major challenges facing DM". The root cause of this difficulty is the dysfunctional nature of retail electricity markets as they are presently implemented. DM should not be held accountable for this failure of electricity industry restructuring.
4&5	DM should not be seen as a "contributor to the energy supply system" but rather as a "contributor to delivering cost-effective energy services", as indeed should all supply side options. As previously discussed, this supply-centric perspective reflects the passive nature of the end-use sector of the industry.
9	Box 2.1 Commonwealth Enterprise Energy Audit Program: This illustrates the passivity of the end-use sector by demonstrating how cost-effective government intervention can be. However what is needed is sustained support for end-use decision-making by "end-use facilitators" rather than occasional ad-hoc intervention. The "subsidy" is better described as partial compensation for government failure to implement efficient energy service markets.
9	Section 2.3.4 Reliability: This section is supply-centric, incorrectly defining supply reliability as the key issue rather than cost-effective reliability in delivering energy services. Supply reliability receives excessive attention because end-use equipment that delivers high-value end-uses is often designed in a way that makes it unnecessarily sensitive to imperfect availability or quality of supply. Claims are then made along the lines that electricity systems should now provide "nine nines" reliability, which places inappropriate objectives on network service providers and regulators and exacerbates the bias towards supply-side investment at the expense of DM investment. In most cases of that kind, remediation of availability or quality at the point of end use would be more cost effective than supply-side reinforcement. However retail tariff signals do not provide appropriate price signals nor do end-users receive appropriate advice. Instead, retail tariffs and regulatory paradigms cross-subsidise the electricity prices paid by those end-users who want high availability or quality.
11	Section 2.3.5 Risk management: This should focus on continuity of energy service delivery rather than continuity of supply. A focus on continuity of service allows the value of service continuity to be correctly assessed and the cost-effectiveness of demand-side options to be considered. Of course limitations in retail electricity market design make this more difficult than it should be.
12-13	Section 2.4 & Table 2.2 Barriers to Demand Management: This discussion should include the important barriers of dysfunctional retail market design and end-use equipment that is unnecessarily sensitive to poor availability or quality of supply.
15	Section 2.6: the Tribunal's proposed approach is to be commended, and should place particular attention on improving retail market design, enhancing end-use decision making and improving end-use equipment design.

17	Section 3 Encouraging environmentally driven DM: The proposed approach is to be commended, assuming that the flaws are corrected in the existing retail licence condition and the proposed changes to it. In particular, a much simpler retailer licence condition should be adopted that is fully consistent with other regulatory instruments (such as the MRET scheme) and avoids inefficient windfalls and moral hazards. The demand management fund is an important innovation that partly compensates for poor retail market design. It should be given a broad brief to facilitate informed end-user decision-making and undertake end-use advocacy. The work of this fund should be supported by improved retail market design and by the installation at all network-user points of connection of interval metering that can also record key indicators of supply availability and quality.
35-36	Section 3.3.6 'Green' Retailers: The wording in this section incorrectly suggests that 'green' retailers can deliver 'green' energy to particular end-users who subscribe to 'green' tariffs. This is physically impossible using a shared electricity network. It would be more correct to say that retailers pass on the premium paid by purchasers of "green" energy through contractual arrangements to eligible generators who inject "green" energy into the electricity network. Retailers in accredited green power schemes agree to "purchase" as least as much "green" energy as their "green" energy customers pay for in any given year. There are similarities between the MRET scheme and "green" tariffs. In both cases, eligible generators receive an additional source of income apart from their electricity sales, which is proportional to the amount of electricity that they produce. The differences between the MRET scheme and "green" tariffs are as follows: In the case of MRET, the federal government determines generator eligibility and the retailer determines how the required cash flow is recovered from end-users. In the case of "green" tariffs, end-users volunteer to pay a premium and, particularly if they are contestable, have some influence over which generators receive it by their choice of green tariff scheme. Green tariffs have played an important cultural change role in the early stages of adoption of renewable energy. The take-up of green tariffs demonstrated willingness to pay by at least some end-users and thus legitimised renewable energy within government and the electricity supply industry. However the role of green tariffs is likely to contract to the "premium green" category now that the MRET scheme has been introduced, and it is not really appropriate for government to pursue this. It would now be better to expand the MRET scheme, which has a more equitable basis, and complement this by supporting innovation and maturation of the renewable energy industry through industry development policies. End-users should also be allowed to purchase and extinguish RECs, because this

	would overcome a fundamental weakness of green tariffs – they require end-users to purchase electricity to indicate their support for renewable energy and thus improperly deter end-users from improving their efficiency of energy use.
37-47	Section 4 Encouraging network-driven DM: This section is unfortunately supply-centric. This is probably inevitable given the regulatory framework for network service providers (NSPs), in which NSPs are permitted to recover "sunk" investment costs if they can demonstrate that a particular investment decision was justified in some sense. Unfortunately it is very difficult to determine if a particular investment was justified because each decision is taken at a particular point in time, usually in the face of considerable future uncertainty. Unless more emphasis is placed on techniques to reduce uncertainty and to manage the residual uncertainly more wisely, the end result will continue to be one in which "justice has not been seen to be done" with respect to DM options. The underlying problem can be summarised as follows: Subject to network losses and constraints on energy flows, the network: • Allows the spatial pattern of generation to differ from that of demand • Combines and smooths the individual stochastic processes of generator injection into the network and end-use off-take from the network in a way that physically resolves the imbalance between aggregate supply and aggregate demand (distribution planners recognise this process in the concept of After Diversity Maximum Demand). • Contributes to maintaining availability and quality of supply DM options can substitute for network services to the extent that they can provide these functions, particularly those that the network is poorly placed to provide. These include: • Catering for highly correlated end-use demand that contributes to local demand peak (eg summer air-conditioning demand), particularly in summer when network thermal ratings may also be reduced, or when generation contingencies also occur • Catering for situations when energy flow constraints become binding due to network contingencies Technologies such as stand-by generators and uninterruptible power supplies are well placed to provide such services, however traditionally they are only triggered when the supply at their point of connection is interrupted and are not synchronised to the supply system. To improve this situation, more information should be placed in the public domain that characterises the nature of the services that a network has difficulty in providing and that identifies appropriate locations for DM options. The revised NSW DM Code of Practice is an important step forward in this

	regard. However it was developed within a "technical regulation" framework that was still too isolated from the commercial and economic aspects of regulation. Thus distributor planning remains based on demand forecasts rather than forward contracts, so that risks of interruption to end-use services remain socialised. As a result, there are still legal and regulatory asymmetries in accountability that maintain the bias towards network options. IPART should investigate ways in which these might be addressed. Section 4.2 Potential to enhance network reliability: Consistent with the previous comment, "network reliability" is a supply-centric concept that biases the context in which DM options are assessed. A more balanced context would be to consider the value that end-users derive from reliability in delivery of end-use services. Clearly, this would vary from one end-use to another and from one time period to another for any particular end-use service. Moreover, for many end-uses, reliability in end-use service delivery can be decoupled from electricity supply reliability by appropriate choice of end-use technology. Off-peak water heating and combined UPS and surge protection for electronic devices are well-known examples. Thus investment in network options should be assessed against DM options in terms of their cost-effectiveness in improving end-use service reliability, rather than considering DM options as a way of improving "network reliability" – an ambiguous term that derives its value from meeting regulator-specified targets against uncertain demand forecasts or avoiding litigation over poorly specified legal accountabilities arising from incidents involving poor availability or quality of supply.
39	(see above: Section 4.2 begins at this item)
40	Section 4.3 Barriers to network driven DM: The fact that this section could also be labelled "Barriers to regulator driven DM" illustrates the problem with using regulatory mechanisms to offset retail market inefficiencies. Network service providers (NSPs) respond to regulatory and legal accountability drivers rather than market drivers, both of which inappropriately emphasise electricity supply at the expense of end-use service delivery. These problems will remain until the contractual relationships between NSPs and network users are modified to include clear mutual obligations regarding present and future availability and quality of supply. In parallel, end-users should be assisted to understand the difference between end-use service availability and electricity supply availability and to make appropriate choices between demand side and supply side solutions to their end-use service reliability needs. The manufacturers of end-use equipment should also be engaged in this process.
42	Section 4.4 Options for encouraging network driven DM: Again, this section could be titled "4 Options for encouraging regulator driven DM". This is an inefficient way for the regulator to act as a surrogate for efficient end-user decision-making, and risks excessive intrusion by the regulator into industry decision-making process.

	The most important recommendation is discussed in Section 4.4.2 – to encourage trials of congestion pricing, which implies trials of improved retail electricity market designs. However, such trials require careful design rather than being "non-prescriptive" and should form part of a general shift of regulatory focus towards end-use energy services, with an appropriate allocation of resources to improve end-use decision-making, including interval metering with measurement of availability and quality of supply and innovation in end-use equipment and control techniques.
47	Box 4.4 Standard offers: A 40% increase in load factor implies improved utilisation of the network but not necessarily "much greater energy efficiency". In fact the reverse may be the case if the load factor improvements have been the result of greater use of end-use storage with significant losses.
51	Section 5 Encouraging retail market driven DM: Without incorporating flow constraints and network losses, retail markets largely replicate "wholesale" markets and don't internalise additional network issues. This approach inappropriately leads to separate consideration of network effects as so-called "network-driven DM". By contrast, an end-user perspective would consider all supply-side issues in a holistic way, providing a more appropriate context in which to consider DM options. As indicated in Section 5.2, it "is not necessary for end-users to be exposed to the volatility of wholesale market [spot] prices". However end-users should not be prevented from accepting exposure to spot price volatility on a voluntary and informed basis. Nor should end-users be subjected to the cross-subsidy that arises without interval metering that can also record key indicators of supply availability and quality. Crude and inefficient mechanisms such as the Electricity Tariff Equalisation Fund should also be removed. Instead, resources should be allocated to develop financial and physical mechanisms that allow end-users, with support from appropriate advisers, to efficiently manage volatility in electricity spot prices, and in availability and quality of supply. The intent should be to assist end-users to make informed decisions about supply and demand side options in the context of cost-effective delivery of end-use energy services. Thus the objective of Section 5 should not be to encourage "retail market driven DM". Rather, it should be to facilitate efficient decision-making about end-use energy services through, amongst other things, improvements to the design and operation of retail electricity markets with location-specific pricing signals.
6	Section 6 Overview of conclusions and recommendations: This section lacks focus because of the lack of an over-arching conceptual model for the electricity industry in which a discussion of demand management can be placed. This problem could be overcome by adopting a focus on end-use energy services, in

	which the electricity industry provides only one of several possible energy conversion chains by which energy services can be delivered. In that context, all supply and demand side options in the electricity industry should be subjected to a cost-benefit assessment in terms of their effectiveness in delivering valued energy services. It is possible to envisage a future in which that assessment can take place mainly in a market-context, however for the time being it must occur within a hybrid market-regulated model.