



SMART MONITORING & THE INTELLIGENT GRID

A Technology-Enabled Approach to Unlock Consumer
Behaviour Change for Energy-Efficient Homes



1 Introduction

‘ *It is important to note that technology policy is seeking radical innovation in one of the least innovative sectors in the global economy.*

- **Garnaut Issues Paper 4, *Research and Development: Low Emissions Energy Technologies*, 2008**

A key theme of the retailer’s response was that, if the objective is to change consumer behaviour, then merely rolling out smart meters is unlikely to be sufficient, even if retailers do offer more cost reflective tariffs. They believe there would be a need for a substantial and prolonged customer education program

- **KPMG: *Cost Benefit Analysis of Smart Metering and Direct Load Control to MCE* March ‘08**

Residential and commercial buildings are responsible for a significant proportion of Australia’s emissions, in both construction and use.’

- **Garnaut Issues Paper Forum 5, *Transport, Planning and the Built Environment*, 2008**

Occupant behaviour can also strongly influence a building’s energy efficiency

- **Garnaut Issues Paper 4, 2008 section 4.2**

PROFESSOR Ross Garnaut and other social and economic thinkers have pointed to the significant sustainability benefits - social, environmental and economic - of early action on climate change. In the Garnaut Climate Change Review ETS Discussion Paper (March 2008), it is mentioned briefly at page 23 that significant ‘low hanging fruit’ for emissions reductions may be available in early years through energy efficiency.

Unlocking this early action potential is a major opportunity to achieve emission reductions at low or even negative cost, while also proactively reducing the impact of higher energy costs on Australian households, including low-income households. This submission concentrates on an emerging Australian technology that supports behaviour change leading to reduced domestic energy consumption, with Australia’s 8.5 million households being the key target and prize.

The available reduction through technology-enabled behaviour change in the residential sector is considerable and has so far been largely overlooked. As an ‘energy measure’, the potential contribution to the Kyoto target 2008-2012 is both sizeable and accessible.



Achieving early-term gains in energy conservation and efficiency while low-emission technologies develop is part of the essential path to maximising an Australian long-term emissions reduction goal. This is consistent with the practical implications of 'Figure 3.1: Different cumulative emissions from the same end-year' target at page 22 of the Garnaut ETS Discussion Paper.

Although not explicitly canvassed in the relevant Garnaut Issues Papers (4&5), the case for innovation that empowers consumers is compelling.

There is common purpose in domestic energy reduction: saving carbon (for all of us), saving cost (for consumers, including low-income earners, as energy prices rapidly rise), and reducing peak power demands (for network owners). The consequential benefit of deferred infrastructure capex (the potential saving is equivalent to three to five power stations) is that more capital is available for renewable energy initiatives.

While there are many avenues where innovation is occurring in the electricity industry, including the rise of a new breed of energy service companies or ESCOs, most of it is happening outside of the institutions that make up the market in Australia.

Unfortunately, Australia has a record of driving innovation offshore, with the solar thermal technologies developed by Dr David Mills a recent case in point¹.

We submit that developing 'Smart Monitoring' solutions for energy efficiency – which give consumers real-time capacity to monitor and respond to their electricity use - is an opportunity to reverse this record, and this submission deals with a candidate technology for achieving that.

The **Wattwatcher** is an Australian innovation that puts together expertise in behaviour change and technology. The technology can be framed as an advance on **Smart Metering Systems (SMS)**, which are expected to be rolled out in Australia over the next decade (at a cost of around \$4 billion according to electricity industry estimates). The Wattwatcher technology will underpin a planned home research project to be conducted over the next two years, as part of a **Household Smart Monitoring Initiative (HSMI)**.

¹ *'Coincidentally, Australia's leading solar power innovator leaves the country tomorrow because big American investors want to put his technology to far greater use in California. Professor David Mills, a Canadian expatriate who has made Australia home and carved out a reputation here as a world pioneer in solar research, has developed solar technology that, he believes, could power Australia. The frustrated scientist believes this country can't see past its rich coal and uranium reserves and recognise that the sun is Australia's richest energy resource of all.'* Matt Peacock reports.

- <http://www.abc.net.au/7.30/content/2007/s1837616.htm>



Smart Monitoring is complementary to Smart Metering, but can be rolled out ahead of Smart Meters. While most attention for the development of the so-called 'Intelligent Grid' for the National Electricity Market (NEM) has been focused on utility-led installation of Smart Meters, the march of digital and communications technologies is propelling Smart Monitors into the frame.

The Wattwatcher system is truly 'enabling technology' and addresses the networking requirements of many other innovations in the energy field. While the power industry is focused on the supply and revenue end of the energy business, the Wattwatcher engages demand-side, consumer-led initiatives to save power and carbon.

Householders don't currently participate in the Electricity market, so efficiencies and realised market values available through collective action are immense and the energy savings available are such that large-scale adoption is self funding.



2 A New Path for the Grid

Wattwatcher enables the growth of a consumer led movement to manage the use and cost of energy and to deploy new forms of sustainable energy: the Household Smart Monitoring Initiative (HSMI).

This submission contrasts the HSMI with Smart Metering Systems (SMS) as currently promoted by the electricity industry for the development of an 'Intelligent Grid' through 'advanced metering infrastructure'.

The argument HSMI makes is essentially that:

- (1) SMS is a concept rooted in past practice and promoted by the industry to further supply side interests. The kind of 'market' enabled by this technology does not include consumers buying energy from the most appropriate supplier.
- (2) The HSMI is about consumer choice, behaviour change and the demand side: the intelligent application of technology to achieve a wider set of goals.

The HSMI is part of the Intelligent Grid, an idea that is a 'catch all' for the new functionality required in managing a modern energy grid. It covers the use of Information and Communications Technology (ICT) to:

- Handle existing problems more gracefully (avoid total blackouts);
- Integrate domestic scale generating technology without resulting in grid instability;
- Enable cooperative demand side management;
- Enable equitable billing;
- Adapt easily to new situations, *and*
- Other features that will bring electricity distribution and management into the 21st Century.

Promoting all the applications that fall within the scope of the Intelligent Grid is not the purpose of this document, just the aspects which go to reducing carbon emissions.

The most immediate of these is promotion of behaviour change that can unlock the estimated 20 percent of wasted domestic energy; this can play a large part in achieving emission reduction targets as well as deferring capex for new power stations, reducing peak power, providing physical hedging to offset the financial hedging, and most importantly enrolling the community in the spirit of sustainability.

Although not pursued in this document, it is worth pointing out that HSMI supports renewable utility-scale generators as well as domestic energy efficiency.



The so-called 'failing' of wind and solar furnace generators is supposedly the intermittent form of the energy. One method of managing this is matching intermittent generators to managed loads that use energy 'as is available' and not otherwise. Integrating this kind of demand side management with generating capacity is simply not envisioned in SMS, yet is a natural part of the HSMI. SMS takes a 'monolithic' approach to peak: it should be possible to buy power from a renewable generator at peak time at a different rate than traditional generators.

HSMI is adaptable: it can incorporate requirements that emerge at any time, rather than spend years in the definition phase like SMS.

3 Contrast: SMS, IHD, HSMI.

The HSMI is about the intelligent deployment of technology and behaviour change expertise to provide both what the utilities really need on the supply side, as well as what the consumers and the planet really needs on the demand side of the electricity business.

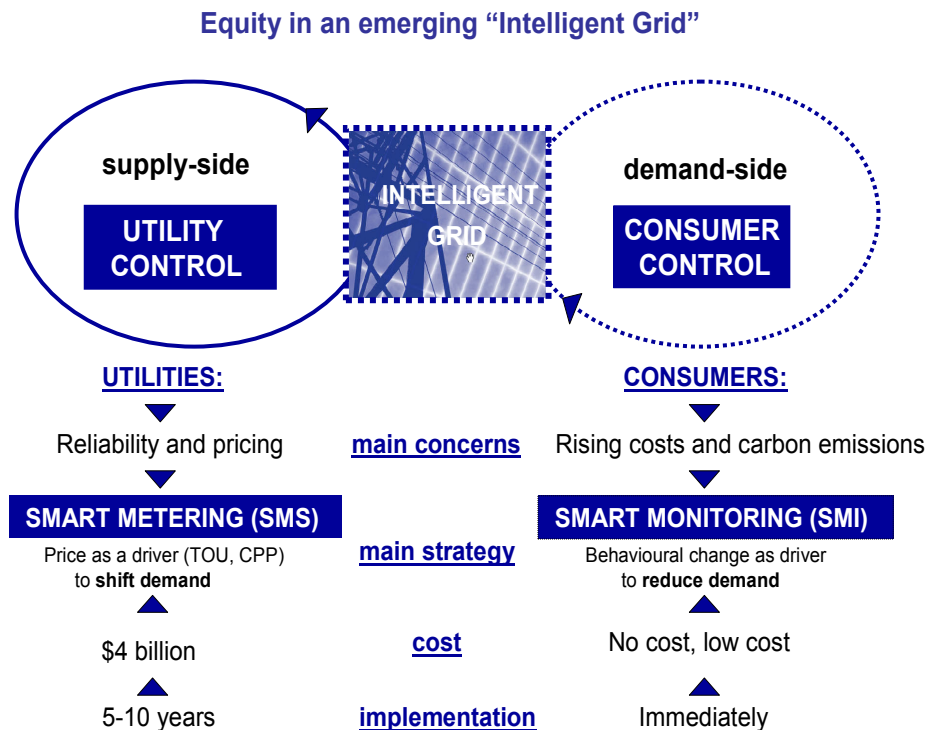


Fig. 1 Equity in an emerging Intelligent Grid ©Wattwatchers Pty Ltd, 2008.



SMS in the Australian sense is a utility-inspired Victorian Government (Essential Services Commission 2004) demand for communicating interval meters. This is the latest in a long series of attempts over the last decade to have variable pricing to deal with the problem of peak. It is remarkable in that it ignored the fact of the internet as a communications platform.

The core objection is that SMS is a supply side, utilities-led, expensive, and slow initiative that goes nowhere near creating a true market for energy that would: serve utilities and consumers alike; serve the demand side of the market; *and provide early and useful outcomes for carbon*. SMS is essentially a traditional response to a modern problem in a social and technological setting that has moved on. It is fair to say that the carbon problem is now better accepted in 2008 than it was in 2004 but that the proposals by the industry over that period have not changed. Rather, forms of consumer displays (IHD's), are considered 'possible' add-ons, and not included in the Victorian mandated rollout of SMS, nor being considered in the MCE mandatory national roll-out of SMS

The HSMI has functional similarities and differences to SMS. The two systems deal with the same supply side issues (power, peak, time of day, energy, cost) but HSMI goes on to address the demand side issues (consumer behaviour, real time information, carbon reduction, automated response to tariff, implementing and delivering the benefits of market derived value of aggregated demand side response).

The HSMI and SMS both record energy; SMS records only 'meter quality' data and provides an expensive, dedicated utility-controlled network to collect the data and update tariff details in the meter. The HSMI doesn't need 'meter quality' data to address the carbon issue; and therefore doesn't have to wait for SMS.

The HSMI and SMS both deploy networks. SMS relies on dedicated networks that carry nothing but electricity utility data (not even water or gas data); HSMI makes use of the internet and methods of managing data that obviate the requirement for a dedicated network. The home network is open and connects to the many devices already on the market.

Internet based HSMI can achieve far higher penetration than SMS in the 2008-2012 Kyoto reporting period. The SMS rollout will take at least five years in Victoria, currently the only jurisdiction committed to a roll-out schedule. HSMI will track the internet roll-out, which is already well advanced and has an Australian Government commitment to reach 98 percent of homes.



Studies clearly indicate that even basic In-Home Displays (IHDs) result in consumers reducing use (IHDs provide consumers a one-way feed of electricity use data into the home in real time, but lack two-way communications capacity and are not Smart Monitors). The HSMI uses displays that are a ‘step on’ from the SMS concept of an IHD. They use meaningful displays and don’t rely on numbers which many people don’t relate to. They execute a wide range of applications designed to engage all members of the household in the common goal of carbon reduction.

	Smart Metering (SMS)	In-home Displays (IHD)	Smart Monitoring (SMI)
	Utility Control.....		Consumer Control
Main Strategy	Pricing TOU/ CPP	View consumption	Change behaviour
System design	supply-side network	meter data display	consumer information network
Load control capability	Yes	No	Yes
Cost*	\$4-5 billion	\$200	\$200
Savings* (Energy and CO2)	0.04%	4.0%	20.0%

Fig. 2 HSMI Is A Step On From IHD. ©Wattwatchers Pty Ltd, 2008.

**As described in Phase 2 submissions to MCE: Cost Benefits and Analysis of Smart Metering: Work Stream 4: NERA Consumer Impacts, and Work Stream 3: KPMG Retailer Impacts, both March 2008*
**NERA (above report) for Smart Metering and In-home display savings in Australia. Note: international studies for IHDs suggest av. 9% savings.*
Smart Monitoring savings are non-validated estimates, based on higher quartile International IHD results and Smart Monitoring engagement effect.



4 HSMI: the technology

Smart Monitoring is delivered to consumers and stakeholders as a mix of open networks, devices and web delivered services.

The most significant early offering is from the Australian company Wattwatcher, which is adopting a Linux-like 'open development' strategy to engage large numbers of 'device developers', like the Linux development community.

4.1 Wattwatcher Architecture

The components making up the Wattwatcher Smart Monitor environment include

- (1) Secure network providing 'open' services i.e. public access
- (2) Displays. Attractive, meaningful, attention grabbing
- (3) Low cost energy monitoring devices
- (4) Low cost standby control switches
- (5) PC and Web delivered product information, advice and support services.
- (6) Various forms of Media content and public campaigns
- (7) Applications to reduce total energy and peak (expensive) power
- (8) Applications to review energy use and reward reductions
- (9) Secure reprogramming.
- (10) Updateable functions support evolution and growth.

The primary function of the advanced Wattwatcher environment is to support consumers in reducing energy and cost without inconvenience or inadequate technology.

4.2 Wattwatcher Radios

The Wattwatcher has multiple wireless capabilities. The Smart Meter compatible ZigBee radio at 2.4GHz communicates with Smart Meters (if present): Utility supplied meter data and tariff is available via this source.

The radio at 433 MHz is compatible with Wattwatcher devices and some off the shelf OEM products e.g. low cost 'standby' power switches.

4.2.1 ZigBee

The Smart Meter ZigBee-HAN is a network controlled by the Utilities, who will determine who or what can join. The constraints are still to be decided and are likely to vary across retailers.



Wattwatcher includes a ZigBee radio to maintain a presence in the Smart Meter context.

This context mandates the use of the 2.4 GHz ISM band, also used by 802.11 wireless LANs, Bluetooth device networks, DECT phones, and other ISM licensed devices. The effect of mixing in millions of ZigBee devices into the same band is yet to be determined.

4.2.2 ISM band 433MHz wireless

Wattwatchers basic radio network is based on flexible digital wireless technology. The most simple configuration of a Wattwatcher system is a display and meter box current sensor; these two devices are connected with this radio on a coded address basis and do not suffer interference or corruption.

This network is not subject to Utility control, and enables a range of applications not otherwise available to the consumer.

433 MHz ISM is well established as a suitable band for low power domestic radio devices; it doesn't carry the same traffic as the 2.4GHz ISM band. The Wattwatcher radio hardware can 'talk' to a wide range of off the shelf remote controls.

4.3 Wattwatcher Display

Wattwatcher displays have 'moved on' from the traditional IHD mono-colour low cost fixed-content LCD devices.

The Wattwatcher display exploits the graphic concept of a car dashboard. There are one or more screens: Eye catching icon based Watto's Wheel display and a graphics screen for detailed text, numbers, and other graphic objects.

Wattwatchers has created an interactive visual system giving positive reinforcement or encouragement in real time, *so the feedback relates to the consumers own pattern of consumption*. The graphics display is consistent with the requirements of various Australian and International government initiatives.

Using the latest silicon technology allows Wattwatchers products to use long life rechargeable batteries instead of toxic disposable cells or always on power packs.

4.4 Wattwatcher Devices

Devices connect via the Wattwatcher radio. A home might include one or more displays, power measurement device (Smart Meter, or Wattwatcher current-sensor), controllable power switch, or an environmental sensor.



Some useful OEM devices exist already like wireless power switches. The Wattwatcher radio can be programmed to 'talk' to many OEM devices. These protocols can either be built-in, or the remote control devices used after technical cooperation with manufacturers.

Displays are capable of executing a wide range of applications. There is 'cross over' between home automation and energy. For instance, opening and closing windows based on air temperatures can reduce HVAC use.

4.5 Wattwatcher Bridges

Bridging devices connect and relay the Wattwatcher radio to other physical communication layers. The Wattwatcher display includes a bridge between the 'native' low power radio and external devices.

A Wattwatcher system wired or wirelessly connects to the internet via an internet-connected PC; a Wattwatcher USB radio provides end to end wireless connection. In the future, other physical layers may be useful: digital radio, an FM radio CSA channel, pager networks. Bridges provide a degree future proofing for the network.

Bridges can control a range of existing appliances by providing the remote control signal, and linking to the WW radio. This way, a thermostat can be adjusted without physically interfering with the legacy HVAC equipment. This avoids the kinds of problems experienced in air conditioner trials: no interference with existing installations, no site visits required.

4.6 Wattwatcher Information

The Wattwatcher is effectively a small interactive screen connected to the internet through the home PC.

These screens will be accessible from the Wattwatcher server; the applications of such a direct means of communication are considerable.



4.7 Application Data

A Smart Monitoring environment may involve many applications that manipulate and display data related to energy use. Data appears in two forms: real-time, and logged.

Metering data in a Wattwatcher system originates in Smart Meters, current sensors, and elsewhere. Wattwatcher current sensors log data and pass it to the Wattwatcher display and/or a PC where it is also logged. When a Wattwatcher USB-connects to a PC, the PC can review its logged data and update each other as required.

Time stamping and encrypting the blocks of data ensure security and continuity. If the system is required to handle 'meter quality' data for billing then the entire protocol can be updated.

Real-time data can be 'streamed' to the internet independently.

SMS is built around the idea that meter data is 'in the meter' and can only be securely collected by a dedicated communication system connected to the meter.

This is simply no longer true. If the data can be extracted from the meter in electronic form there are many ways to securely return this data to a billing agency.

4.8 Applications and Benefits

Who wants another little box in the house? Why not do the energy display and management on a PC?

Experience has taught the market that PCs make poor appliances. The poor uptake of the 'media PC' is an example of this; who wants to wrestle with Windows to show a movie or adjust room temperature. For the same reason, we have a little box to manage our home security alarm.

Smart Monitoring applications execute on any of the Wattwatcher devices that are a part of the connected environment; these devices include displays, PCs, and web connected servers

For consumers, this means they can implement a Wattwatcher system that's right for their current environment yet adaptable to future applications.

Peaks and Critical events on the grid happen all the time, any time and manually managing response to peak each day will test consumer patience and persistence. Customers changing their behaviours will need all the help they can get, and the Wattwatcher provides the essential platform for energy automation.



4.8.1 Logging Applications

Logging applications execute on all Wattwatcher devices: any action or event can be time-stamped and recorded. Typically, electric current will be measured and the results stored in a device in the fuse box and then transmitted by radio to a display that also records the data. Later, the data may pass to a PC and then to a server via internet or other physical means.

This progressive hand-over of data is secured such that the data can be protected but identified with a particular owner and time.

For the consumer, this means real time and historical information and to associate consumption with things they do and the actions they have taken.

The emancipation of data means that metered data no longer has to be collected and delivered from a meter by an exclusive, expensive, dedicated, secure network built only for that purpose (as is the case for Smart Meters as currently planned).

Consumers will benefit from getting this information and empowerment now, without relying on AMI to come along whenever...

4.8.2 Energy Display Applications

Display applications run in the Wattwatcher displays and use data from a number of sources.

Buttons on the displays drive menu systems that support configuring and selecting what is shown. Multiple applications may share a display; multiple displays may share an application.

This means a Wattwatcher can accumulate information from a single source and grow to connect with lots of appliances and sensors, giving consumers a single point of energy use visibility.

Given that the most urgent task is reduction in energy use, the Wattwatcher application displays consumption in real time. The display backlights turn off to save energy; it turns on to attract attention, activated by a motion sensor or event change. Digital information about consumption, price, emissions and messages provide consumers with interactive real time information.

4.8.3 Other Display Applications

Wattwatcher displays, once internet connected, are in principle a general display mechanism available for messages from anywhere.

This class of web connected applications includes promotion, utility messaging, public transport issues, weather, social networking, stock market prices or any other service.



4.8.4 Load Control: Power Switch

Another class of Smart Monitoring applications involves load control via power switching. Wattwatcher can control switches that completely remove power from appliances in standby and control lighting or loads. Tariff data may be an input to these applications to provide price based load control decision making in real time.

Simple load control may involve managing a single load such that it is turned off during peak.

A more sophisticated application is Aggregated Demand Side Management, which is currently not supported in the NEM. Aggregation can provide large blocks of discretionary load across multiple houses. *Such schemes automate consumer participation in the "market derived value" of such activities, and an application is Australia's 1.2 million pool pumps.*

4.8.5 Load Control via Remote Control Emulation

Appliances don't always resume where they left off after losing power, for instance HVAC and washing machines. This makes remote control through the power inlet problematic.

Retrofitting appliances with a means of control is generally not viable in the face of warranty and support issues. This is a significant problem when attempting to automate load control of air conditioners; however, there are ways around the problem.

If an appliance has a remote control then this interface can be used: the function of the remote control is replicated and bridged to the Smart Monitoring network.

In time, appliances will develop suitable interfaces, and new products will integrate with Smart Monitoring seamlessly.

4.8.6 Peak-Countering Load Control

Pre-emptive load control enabling acts to minimise the inconvenience of disabling loads during peak times. Given notice, air conditioners and refrigerators can be made to work harder just prior to peak.



4.9 Wattwatcher User Interface

Wattwatcher has three buttons that can be conveniently used to manage the displays, and operate and configure the system.

The Wattwatcher USB port provides battery charging and access to a browser based PC user interface. When attached to a PC, the browser is activated automatically and locates the logged data and Wattwatchers Internet site.

The site supports configuring the Wattwatcher device, code updates and other housekeeping functions.

4.10 Wattwatcher System

The opportunity exists to craft a Consumer facing network that is exactly suited to the requirements of the Intelligent Grid.

Such a network must be able to issue data and commands to tens of millions of devices at low cost and with delay measured in seconds.

The kinds of network proposals currently considered for Smart Metering cannot achieve this. A separate message must be sent to each meter; no 'broadcast' is possible.

The diagram "Level 3 Wattwatcher Command and Control" is a Smart Monitoring system extended past the limits of the home, to include 'lateral' means of communicating the events required of a highly responsive Intelligent Grid.

Such a network can send the same command simultaneously to all devices at a trivial cost for the entire broadcast with latency approaching 1 second; cost per device measured in tiny fractions of cents.

Recovering data from meters is slower, but as previously noted the requirement for speed in this direction is not apparent.

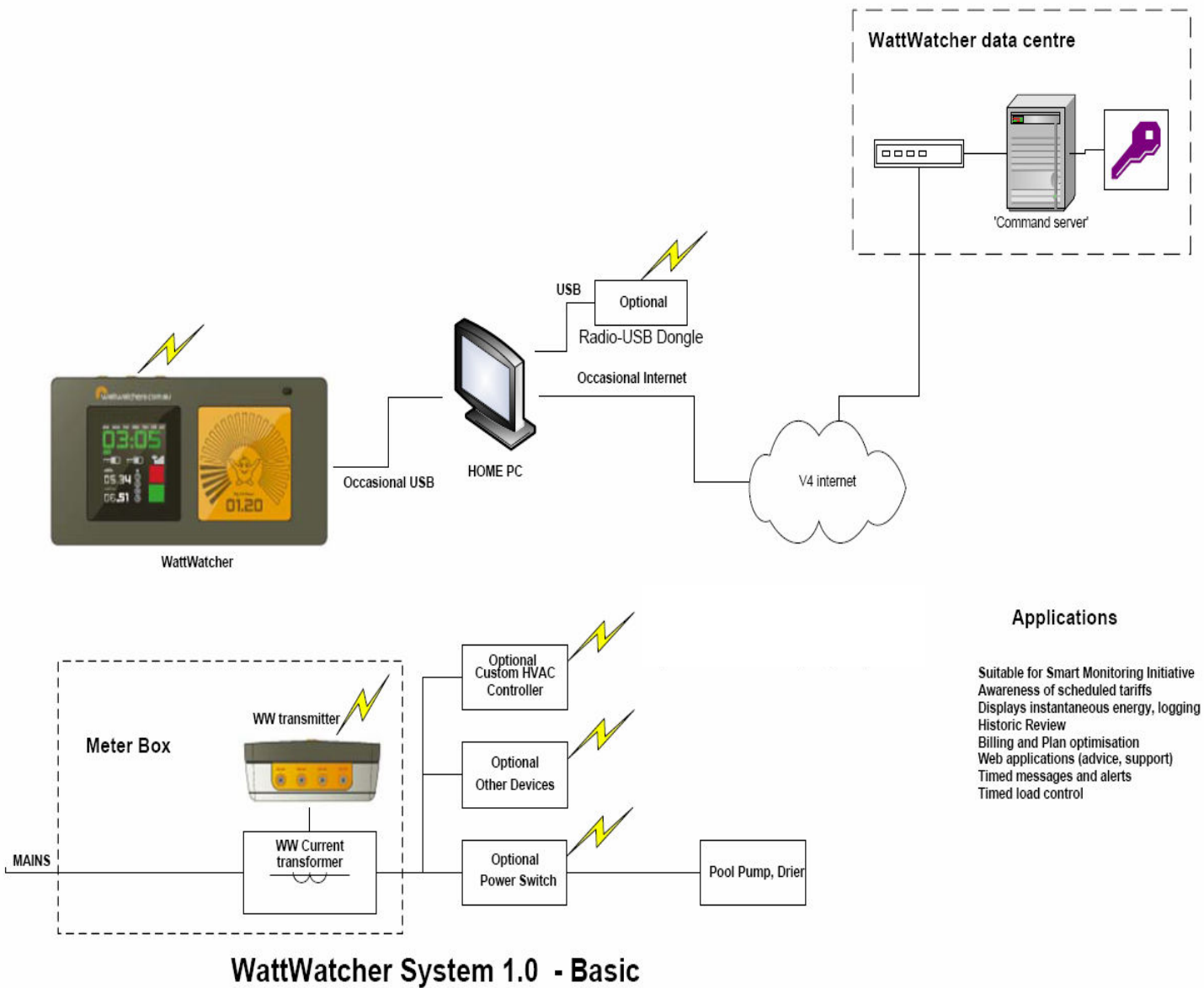
A method of address allocation and security (access control) is available that supports intelligent sub-netting; this allows broadcast to groups of meters and devices, selected by geographic location, grid connection, or other useful categories.

While this wider system of communication is not required to achieve the primary goal of Wattwatcher system, it is a viable and low-cost solution that achieves the stated aims of Smart Metering, given the internet roll out.



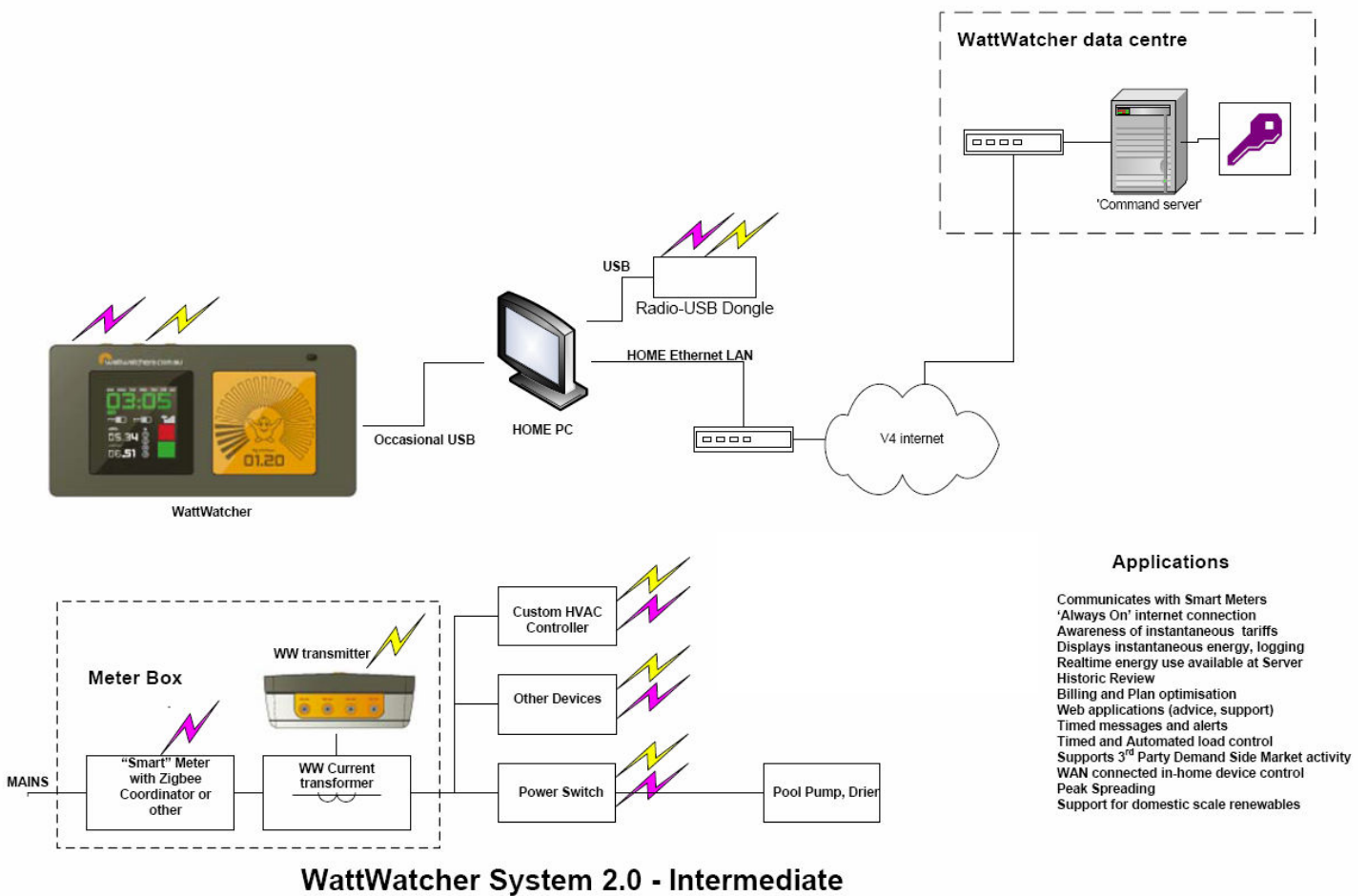
The Wattwatcher System can be described in three communication levels as follows:

- Level 1: Basic
- Level 2: intermediate
- Level 3: Command and Control



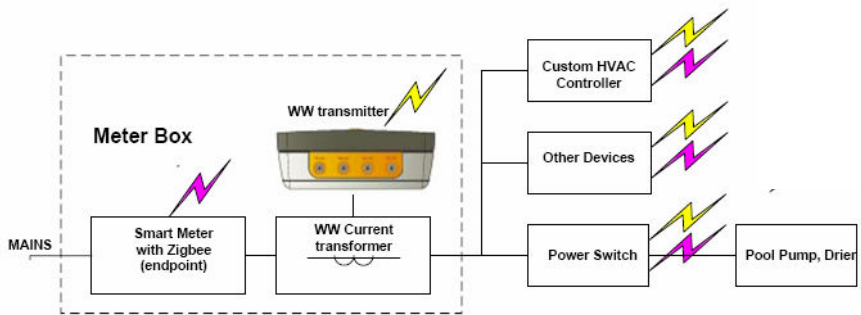
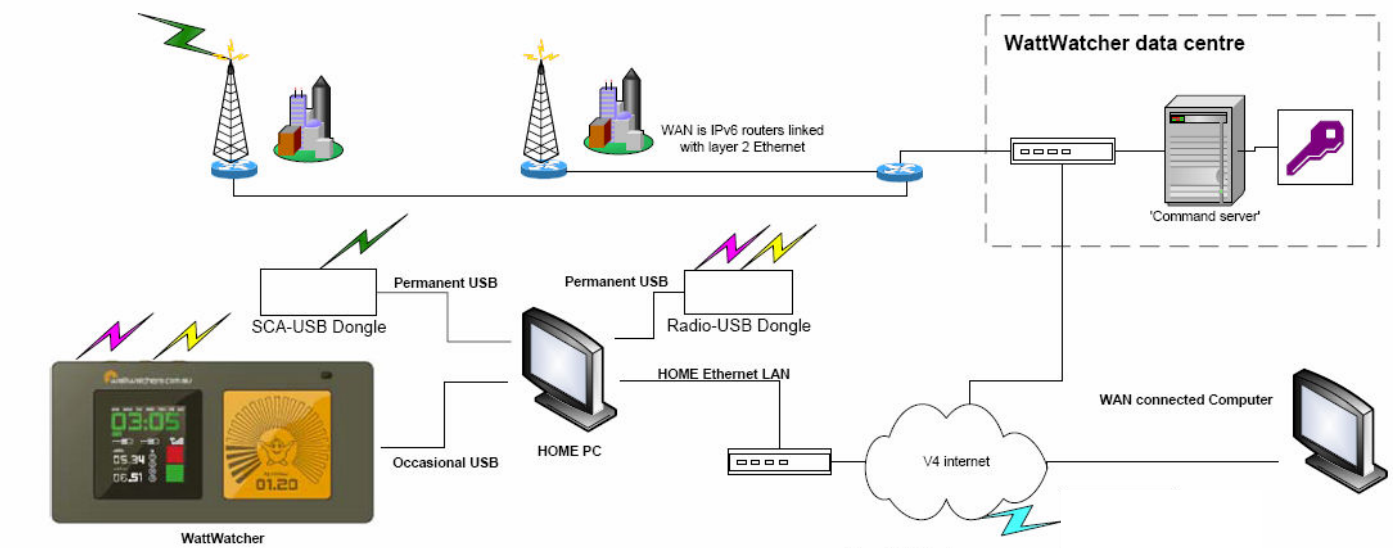
Applications

- Suitable for Smart Monitoring Initiative
- Awareness of scheduled tariffs
- Displays instantaneous energy, logging
- Historic Review
- Billing and Plan optimisation
- Web applications (advice, support)
- Timed messages and alerts
- Timed load control



Applications

- Communicates with Smart Meters
- 'Always On' internet connection
- Awareness of instantaneous tariffs
- Displays instantaneous energy, logging
- Realtime energy use available at Server
- Historic Review
- Billing and Plan optimisation
- Web applications (advice, support)
- Timed messages and alerts
- Timed and Automated load control
- Supports 3rd Party Demand Side Market activity
- WAN connected in-home device control
- Peak Spreading
- Support for domestic scale renewables



Applications

- Communicates with Smart Meters
- 'Always On' internet connection
- Awareness of instantaneous tariffs
- Displays instantaneous energy, logging
- Realtime energy use available at Server
- Historic Review
- Billing and Plan optimisation
- Web applications (advice, support)
- Timed messages and alerts
- Timed and Automated load control
- Supports 3rd Party Demand Side Market activity
- WAN connected in-home device control
- Peak Spreading
- Coordinated community responses
- Services to all market participants
- Widespread Demand Side removes variance
- Support for Utility Scale renewables

WattWatcher System 3: Command and Control



5 HSMI: Carbon Reduction

This section details the use of the Wattwatcher system to be used for the HSMI Home Research Project and Trial.

It does not describe the Research Project itself, which is subject to stakeholder agreement.

5.1 Overview

Each house is equipped with a Wattwatcher display, and a Transmitter (that monitors energy coming into the house). The transmitter uses a clip-on current transformer (CT) to detect current. This hardware includes a time of day clock and calendar, and records time-stamped energy use.

The Transmitter is powered from the CT, and Display powered from a rechargeable battery and is recharged by being connected to a PC USB port or USB charger with a short cable.

The act of connecting the display to the PC opens a browser and navigates to a Wattwatcher site configured to manage the information.

The site supports all phases of the trial; initial registration, regular reports on progress, automatic reviews of logged data, support details, reports and analysis, benchmarking, and ongoing events.

5.2 Trial Management

The display will be configured to prompt the householder to connect to the web and complete a weekly review.

During this process, the logged data is automatically uploaded to the site for analysis, presentation, and comparison.

The internet connection and the web site automate this process, provide a high degree of visibility on trial progress, enables changes to the trial, and will make comprehensive trial reporting available at low cost.



5.3 System for Behaviour change

The Wattwatcher display paradigm does not rely on numbers, but instead uses the well proven and familiar concept of the car dashboard to convey easy to understand and meaningful information at a glance.

It is remotely programmable, and various information presentations will be tested for maximising behavioural change and consumer involvement.

The Wattwatcher display is interactive, and a sensor turns on the display backlights, attracting attention when relevant, and saving energy when nobody is near the display.

The Display and Transmitter are linked by a radio network; the transmitter sends data to the display when the energy level changes. The time taken from a change in energy to a change in the display is one second.

Based on the requirements of the trial, different behaviours can be enabled. For instance, some systems will behave as if that household was equipped with a Smart Meter.

5.4 System Reports

This trial environment will be used as a test bed for consumer response to a number of different billing and behaviour changing scenarios. The detailed energy data can be run through a variety of plans to evaluate revenue effects.

A comprehensive set of reports will be available, automated through the site.

Progress reports and evaluations will be available on the site throughout and at the conclusion of the trial.

Access to the site will be by registration and email verification.



6 Conclusion

Smart Monitoring is a key consumer domain for market participation, social networking and the creation of 'energy-consciousness' as a social norm.

This submission has provided extensive information on the Wattwatcher enabling system, which is expected to retail for under \$200 per unit, in order to underscore the clear potential for Australia to move to an innovative, consumer controlled, low-cost, Smart Monitoring regime.

Further, real-time measurement technologies are fundamental for establishing energy-conscious behaviours. The benefits and control of the technology sets of Smart Metering, IHDs and Smart Monitoring will have a significant effect on early-action carbon savings.

Finally, Web-enabled Smart Monitoring is both a catalyst for taking action and a channel for information and engagement in wider energy efficiency issues. This may include government rebates and incentives, community action, Load Control programs, PV, Solar Hot Water, CHP (Combined Heat and Power), Greenpower and 'bundled' offers.

Developing 'Smart Monitoring' solutions for energy efficiency - which give consumers real-time capacity to monitor and respond to their electricity use - is an opportunity to achieve fast results against emission reduction targets.

This submission recommends a technology to immediately achieve consumer engagement, independent of utility-controlled SMS - which will take 5-10 years to rollout - yet able to link with and enhance Smart Metering as and when it is deployed.

The Wattwatcher is an Australian innovation that puts together expertise in behaviour change and technology. At fractional cost, the technology can be framed as an advance on Smart Metering Systems (SMS), which is expected to cost around \$4 - 5 billion.

The Wattwatcher technology will underpin a planned Home Research project to be conducted over the next two years, as part of a Household Smart Monitoring Initiative (HSMI).

In conclusion, we submit that:

- Unlocking the available early-term gains in energy conservation and efficiency while low-emission technologies develop is the essential path to maximising an Australian long-term goal,



- Supporting the fast-tracking of Smart Monitoring nation-wide would be an appropriate application of funds that may be raised by the Australian Government through auctioning of emission permits at the introduction of the ETS, *and*
- Smart Monitoring offers all households an opportunity to better understand and respond to the rising costs of their electricity use, and this will be especially important for low-income households.

CONTACT - For further information or a presentation on the Household Smart Monitoring Initiative, please contact:

- Christopher Bean 0418 640402
chris@wattwatchers.com.au
- Jon Keeble 0407 842840
jon@wattwatchers.com.au
- Murray Hogarth 0417 267235
murray@wattwatchers.com.au
- Paul Wiszniak 0401 125 435
paul@wattwatchers.com.au