
Submission to

# Queensland Parliament
# Environment and Resources Committee

## Enquiry into Energy Efficiency Improvements

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# Energy Answers Background

This company provides consultancy and design services primarily focussed on energy and resource efficiency to a small number of commercial enterprises and is also active in the renewable energy field, including as the main consultant to the Growcom Banana Waste 2 Energy Project at Kennedy.

An example of the company's work is development of the Grid Electric Precision Farming Platform that is expected to deliver energy savings in the order of 40% and energy cost savings of >70%, )along with water savings around 25%) to overhead lateral-move irrigators.  This system is being developed jointly with Davco Farming, with partial funding provided by the Queensland Sustainable Energy Innovation Fund.

Energy Answers is an accredited Ecobiz facilitator.

## Scope

This submission is in response to issues raised in the publication by the committee “Paper 1, 2009” and seeks top address the April 2009 terms of reference of the committee of inquiry. In order to more fully address the four main points for consideration by the enquiry, some suggestions outside the invited “Areas for Comment” are also respectfully submitted.

Medium to larger scale opportunities are the focus of Energy Answers work and measures such as promotion of compact fluorescent lights to households are outside our scope and not addressed herein. Comment herein will be directed at perceived opportunities and barriers affecting businesses and medium to large scale users and confined to those opportunities believed to be economically viable for the user. Suggestions will be made with reference to impact on the wider energy supply infrastructure and wider public benefit, not only that of the end user.

# What is Energy Efficiency?

The committee has felt a clear need to define scope of energy efficiency and differentiate it from energy conservation. Acknowledging the importance of clearly defining scope, in order to complete a particular task, I ask the committee's indulgence to allow me to invoke and apply the words of Albert Einstein;

**“It is impossible to solve a problem with the same level of thinking that created it.”**

I submit that the true, though unstated, goal sought in framing the committee's terms of reference was actually the more efficient use of the natural, human and financial resources usually associated with the use of energy, without the loss of utility or benefits derived. The key performance indicator should be seen as the total resources used per unit of benefit, on a whole of system basis. This is an important distinction that allows the most powerful policy benefit, through the implementation. Financial, social and resource efficiency benefits to the community are far better from systemically efficient design than high technology “Bandaids”.

Example 1

Choosing to drive less may be seen as energy conservation, but designing public transport systems to efficiently move people between their daily destinations can provide far more systemic energy efficiency than equipping the masses with individual hybrid vehicles. On a recent visit to Los Angeles, I saw some wonderfully efficient hydrogen fuel cell vehicles but the high technology is overpowered by the fixed long distance commutes imposed by the city infrastructure. High efficiency cannot outweigh unnecessarily high work requirements. Efficiently performing wasted effort serves no purpose. Good public transport system design negates the need for enormous road infrastructure upgrades and saves heavily in all areas of resource use, without reducing the benefits derived. Even those whose tasks require individual transport benefit through reduced congestion and pollution.

Example 2

The Townsville seminar was told of electricity supply authorities removing and replacing electrical mains to new suburbs because electrical demand intensity outstripped even the forward-looking growth estimates of relatively few years ago. Installation of distributed cogeneration, using reticulated gas in reciprocating engines or micro turbines, could facilitate use of waste heat recovery for water heating absorption chilling and defer additional investment in electricity transmission and distribution infrastructure, within the suburb and all the way back to the centre of electricity generation. Total system efficiency with heat recovery can exceed 80%, and have 25% of the carbon intensity of providing the same services with grid electricity. (Calculated with values from NGA Factors 2008) New generation capacity can be built adjacent to load, providing network support and reduced carbon intensity, also being consistent with Queensland policy to promote the use of natural gas. **This option offers particular benefits with the increasing gap between peak and base load but is beyond the core business and capacity of electricity distribution providers and the policy settings do not exist to encourage other parties into the sector.**

Conclusion;

True “Energy efficiency” is a systemic improvement, not an add-on. It can be assisted by the plethora of wonderful new technologies becoming available but must become integral to government policy before we will reap the true benefits. Government has much scope to positively effect energy efficiency, and simultaneously improve the much sought after “triple bottom line”, through well-designed holistic policy.

# Why Businesses Are Not Investing in Energy Efficiency

The Townsville seminar (and very likely the Brisbane seminar) had displays and discussion of a wide range of energy efficient products and yet heard of an unwillingness or inability of businesses to move forward into more energy efficient technologies. The wide range of energy efficient options available, but minimally taken up, demonstrates that the problem is not a lack of technically suitable products.

Prioritisation of Management Time

It is the belief of the author that a significant barrier to individual businesses making energy efficiency related investment is the lack of understanding of the options available and the perception (often entirely rational in view of competing priorities) that researching and implementing energy efficiency improvements is not the highest value use of limited management time. A business manager will rarely have the time available to investigate all options available and for the majority of businesses energy is not a dominant cost and will never be seen as "core business". Unfortunately, this barrier often prevents even the simplest and most cost-effective energy efficiency improvements that involve only practice change and can give useful return for virtually no investment.

Prioritisation of Investment Money

When a business does the research to identify and cost significant energy efficiency upgrades, there will typically be competing investment options. Many small businesses operate with an informal expectation of a high internal rate of return and often rates of return that would appeal to governments for energy efficiency measures will not be enough to attract business investment. Add to the investment decision any uncertainty that the promised benefits will be delivered and it is hardly surprising that energy efficiency upgrades struggle to attract investment funds from business.

Purchasers Not Understanding the Benefits of Energy Efficiency

This problem often occurs through a lack of understanding and interest in technologies, options and costs by the purchaser and at other times by the nature of a transaction and the time at which the final user of a product becomes responsible for decision making. New homeowners would formerly be presented with a package and often not realise that they receiving electric hot water heating until installation of a standard electric heater was already committed and retrofitting difficult. The ban on new standard electric water heating prevents this but imposes unnecessary cost on very small or rarely used systems.

Example 1

Purchase by a business of a new piece of refrigeration or pumping equipment. Both of these types of equipment have technical details commonly poorly understood by end users. Suppliers tend to have a better understanding of available options and the life-cycle costs of low-capital low-efficiency options versus the higher-capital higher-efficiency options. The author has been told by several suppliers that they deliberately quote less efficient low-capital options in the belief (often correct) that the customer will choose the lowest initial cost item. A result of this is the installation of undersized piping (water and refrigeration), condensers and evaporators, locking in poor energy efficiency often for >20 years.

# System Efficiency Versus Component Efficiency

Useful progress in component efficiency has been made by measures such as the Minimum Energy Performance Standards (MUPS), which dictate certain levels of efficiency before components like electric motors can be sold. At the more complex level of designing efficient systems, proscriptive measures like MUPS can have only limited benefit because of the need to individually select the correct components and assemble an efficient system.

Example 1

This pumping installation shows a common Burdekin district practice of delivering water over the top of an irrigation cylinder. Often the required delivery level is 2-3m lower than actual delivery meaning that around 10kWh/ML is used on totally wasted effort. Pressure installations can be worse. One pumping installation analysed by the author used the same large pump to deliver 30 l/s to an overhead irrigator and 100 l/s to furrow irrigation, despite the vastly different pumping duties. An estimated 70,000kWh/year, or 64% of the total electricity was wasted by poor pump selection and system design. The one pump was used to avoid buying a second unit, with a payback of <1 year. Only education and specific design can correct such issues but there is much opportunity for significant energy saving, with primarily positive economic and social impact.

**Government can assist through offering education to service providers and consumers.**

Example 2

The Cooler Schools Program has been instrumental in helping schools provide more comfortable conditions for students and teachers but has also caused a sharp increase in energy use by schools. Remembering that energy efficiency is not about reduced use by having less utility, there is still much that can be done to deliver the same benefits, with around half the internal lifecycle costs and much less strain on public infrastructure.

Having been involved in preparing a grant application, I sought to install a water chiller and storage to use high efficiency chillers (COP >6) and off-peak electricity. I was advised that the funding authority would not approve such a system. The school then installed split system air conditioners, using more than twice as much peak electricity for the same amount cooling. The result now cost the school around four times as much to run and adds to the growth of peak load over base load. Within the school, the extra load on electrical distribution wiring may required wiring upgrades, which is 100% subsidised by the scheme. Outside the school, the system dictated by the program places additional strain on peak generation and transmission capacity.

**Government must adopt energy efficiency systemically if the true benefits are to be captured.**

# Energy User Charges Do Not Reflect True System Cost or Benefits

Energy economics have always been distorted by the significant external costs borne by the community and not applied to the end user. While these extend to pollution and community health, comment here will be confined to the cross-subsidised cost within the electricity generation, transmission and distribution sector.

Electricity growth in Australia is a long term trend and has recently been characterised by peak load growing significantly faster than base load. Much of this growth is driven by the use of air conditioning and yet there is no feedback to the end consumer for the additional costs being imposed on the system as a whole, to meet very narrow peaks on extremely hot days. The graphs below, reproduced from the Powerlink Annual Planning Report 2009, shows how 10% of all electricity transmission infrastructure exists to serve peaks lasting less that 1.5% of the time and that these peaks are associated with cooling load.

Figure 3.11: Cumulative Annual Load Duration 2007/08

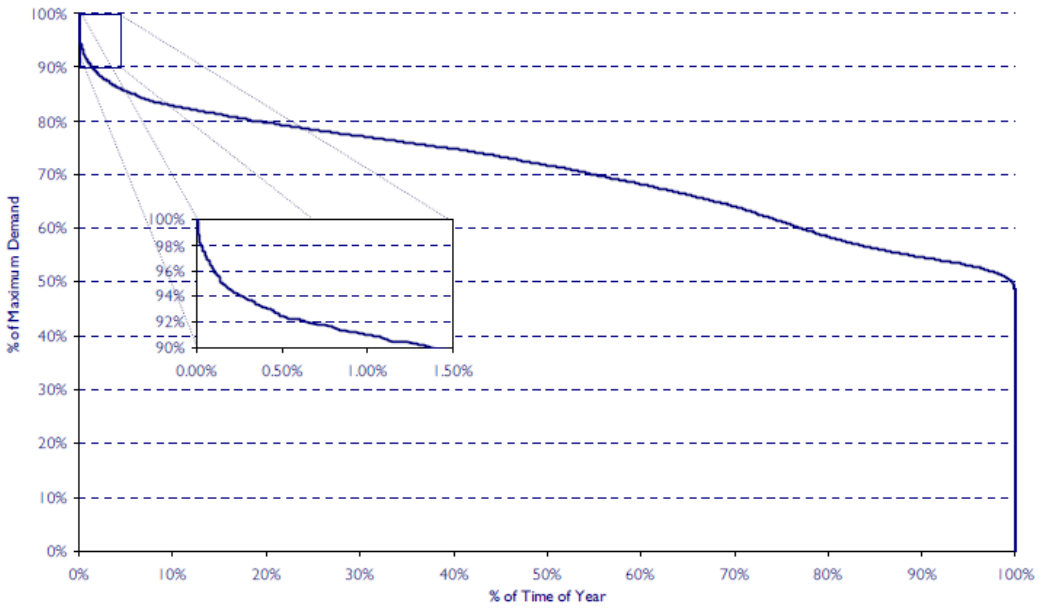
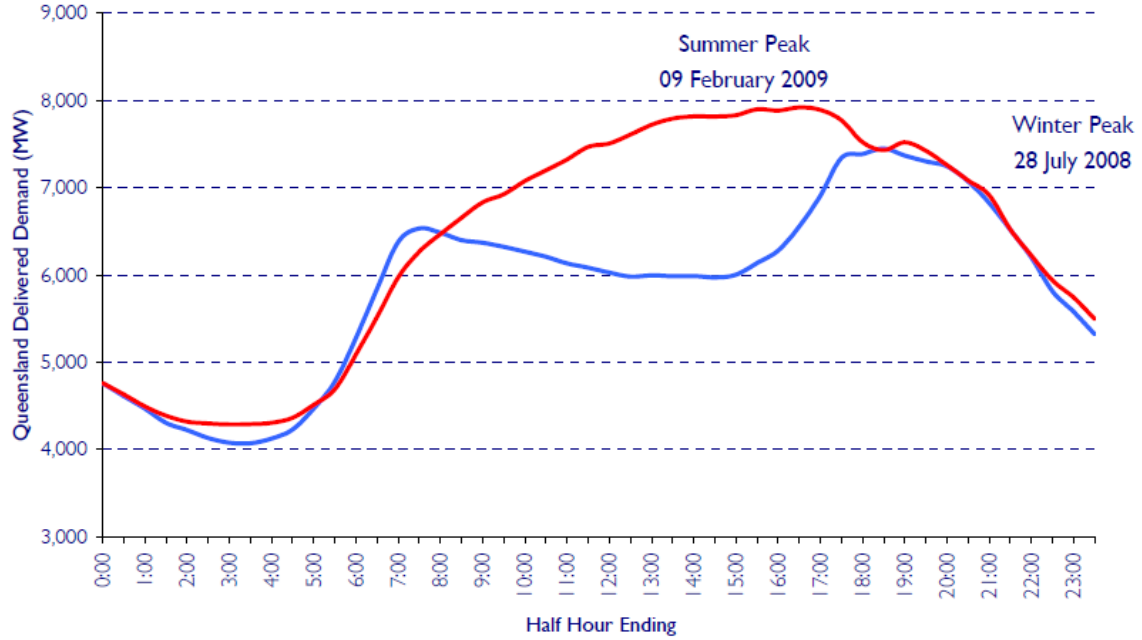


Figure 3.10: Summer and Winter Peaks 2008/09




Demand side management offers the ability to defer billions of dollars worth of investment. The air conditioning loads that are contributing to peak load growth are compatible with energy storage and provide opportunity to shed peak electricity load by incorporating chilled water or ice storage that is both much more efficient than split system air conditioning and shifts load to off-peak. A perfect example of the viability of this approach is the James Cook University/Ergon project to install district cooling and defer major feeder line upgrades. **This type of project could be far more widely implemented by the private sector, to great public benefit, if mechanisms existed to allow operators to share some of the financial benefits deriving from network support and to facilitate financing of projects.**

# Fostering an Energy Efficient Service Sector

A major opportunity to facilitate business uptake of cutting edge energy efficiency opportunities is to remove the perceived risk and uncertainty about new technology from those who are currently failing to take up those opportunities and place them in the hands of those who truly understand them. This can be achieved through fostering the growth of the energy efficient service provider sector, specifically those who are prepared to Build-Own-Operate major upgrades and sell the resulting services to business at a reduced cost, reflecting the energy savings but still allowing a profit and return on investment to the operator.

Businesses operating in this field have the time, motive and resources to seek out and adopt the most suitable range of technically appropriate energy efficient solutions and remove the burden of doing so from over-stretched management in normal businesses. As specialists in their field, this sector would have the capability to partner with electricity service providers to provide network support and directly assist in deferring network upgrades. Government accreditation might be considered to give the wider business sector further confidence in this sector.

Financing Build-Own-Operate projects in the current market is extremely difficult. Most of the equipment involved is considered “tertiary equipment” and not currently accepted by financiers for security, seriously impeding the growth of this sector. Embedded generation, off-peak cooling and other similar measures could contribute great benefit to Queensland’s energy and resource efficiency, simultaneously reducing financial costs.

**Government has major opportunity to contribute to energy efficiency and sustainability, while addressing a growing electricity network challenge, by developing appropriate policy to facilitate and grow a professional Energy Efficiency Sector. Funding is already available, if network augmentation can be deferred by application of more holistic solutions.**

# Transport

Two major opportunities exist to reduce energy use in Queensland. Improved public transport has already been used as an example in the section titled “What is Energy Efficiency?” and will not be covered again here.

Long distance, heavy road transport is a major user of diesel fuel and other resources and presents a real opportunity to reduce resource use. The major part of energy use in long-haul operations is to overcome rolling resistance to the tyres on level ground. Steel railway wheels on railway tracks have around 10% of the rolling resistance of truck tyres on bitumen. Practical reasons dictate that there is a limit to which rail transport can be used but Queensland is far from capturing even these benefits. As part of a recent scoping study for a client, I requested quotation to transport 180,000 tonnes per annum, in full train loads, each way between two fixed points >300km apart, with existing sidings on the main north-south rail line. The quotation received was more than three times the known cost to transport the goods on company operated trucks, despite the clear labour, energy and other resource efficiency enjoyed by rail. If the task had eventuated, it would have been forced onto our roads at roughly ten time the energy cost and enormous external cost to the community.

Causing our railways to operate efficiently may seem outside the scope of this committee but is an example of government opportunity to achieve true systemic efficiencies through the exercise of good policy.