An EnergySmart Plan

Positioning Queensland for a Diversified Energy Future 2010 – 2050

THIS REPORT HAS BEEN PREPARED BY
Smart State Council
A QUEENSLAND GOVERNMENT INITIATIVE

DECEMBER 2010

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Smart State Council

The Smart State Council was established in June 2005. It is a central advisory body that provides high level independent advice to the Queensland Government to help position Queensland as the Smart State.

Since the launch of *Toward Q2: Tomorrow's Queensland* in September 2008, the Council also provides advice on innovative measures to assist Queensland to meet the Q2 ambitions and targets.

The Smart State Council is chaired by the Premier of Queensland and comprises Government Ministers, the Queensland Chief Scientist and representatives from Queensland's business, community and research sectors.

This paper was prepared by a working group of the Council's Standing Committee. The views expressed in this paper are those of the group and do not represent Queensland Government policy.

Smart State Council
A QUEENSLAND GOVERNMENT INITIATIVE

December 2010

Dear Premier

Please find attached the Smart State Council working group report, An EnergySmart Plan: Positioning Queensland for a Diversified Energy Future 2010-2050.

Creating a clear pathway to a cleaner energy future will be among this government's greatest legacies for our children and grandchildren.

This report offers the Queensland Government a 40 year plan to build momentum for the long-term intrinsic change required to achieve a lower carbon diversified energy sector.

The report describes the key directions that will accelerate Queensland into a renewable energy future, leveraging all the powers at the State Government's disposal.

I commend it to you.

Professor Peter Andrews
Queensland Chief Scientist and
Chair, Standing Committee
Smart State Council

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This report can be accessed online at http://www.premiers.qld.gov.au/community-issues/smart-state-council/council-reports.aspx

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Executive Summary

Smart State Council

This report has been prepared by an independent Working Group of the Smart State Council Standing Committee to identify the major elements for a whole-of-Government, long-term energy policy.

The report focuses on the stationary energy sector as the primary contributor to Queensland's greenhouse gas (GHG) emissions. Approximately 35per cent of Queensland's GHG emissions are contributed by this sector.

Despite significant policy interventions, Queensland's GHG emissions continue to grow. Per capita greenhouse gas emissions in Queensland are 43.44tCO2-e, higher than the Australian national average and ranked as the highest in the world. The State faces rapid population growth which is likely to compound the current emissions profile in the face of growing energy demand. There is also little sign that Queenslanders' affection for energy intensive lifestyles and technologies is likely to be curbed. Indecision at the federal level about carbon pricing is creating uncertainty for investment markets. Over the horizon, concerns about peak oil are starting to creep into the pubic consciousness and debate.

The report recommends a course of action for government – including as an enabler of community and industry action – to achieve a cleaner Queensland energy sector over the next 40 years. The directions proposed in this report leverage all the powers at the Queensland Government's disposal – its regulatory, procurement, research and development (R&D), industry development, capacity building and community engagement functions - to build momentum for the long-term intrinsic change required to achieve a lower carbon energy sector.

The Working Group has looked beyond the short-term/immediate considerations that typify Queensland's energy policy development and system management. The decisions government takes today will however be its legacy for a cleaner future for generations to come.

The directions proposed are not entirely new. Some directions reflect actions taken by other Australian and overseas jurisdictions. Many build on current thinking in Queensland Government agencies shared with the Working Group during its consultation. The proposed directions also reflect the outcomes of a extensive consultation program (refer to Appendix 1), which has proved invaluable in canvassing a wide range of views about the issues affecting contemporary energy policy.

Most importantly, the directions proposed by the Working Group in combination represent a coherent approach tailored to Queensland's specific circumstances, and aimed at a cleaner and more secure Queensland energy sector. The Working Group proposes a range of recommendations under five headline themes:

1. Prioritising energy policy in the Queensland Government's governance arrangements to reflect the importance of energy policy to Queensland's future
2. Reducing the growth in consumer demand to avoid inefficient supply-side investment decisions and reduce emissions
3. Diversifying Queensland's energy supply mix to offset the State's reliance on fossil fuels
4. Targeting government investment in R&D better and supporting emerging technology innovation
5. Increasing Queenslanders' knowledge of the factors driving energy policy decisions, and equipping them to be accountable for their energy consumption decisions.

Conclusions and Recommendations

1. Prioritising energy policy in the Queensland Government's governance arrangements to reflect the importance of energy policy to Queensland's future

This report outlines the key elements of a 40 year energy plan (to 2050) aimed at accelerating the transition to a lower carbon energy sector in Queensland by 2050. The report identifies directions for State-based action to clearly signal Queensland's intention for a lower carbon energy sector, and to maintain momentum on this pathway by addressing key policy imperatives to secure the State's longer-term energy future.

Recommendation 1: It is recommended the Queensland Government progress an immediate investigation of the policy directions outlined in this report for consideration and inclusion in a new State energy policy aimed at accelerating Queensland's transition to a lower carbon economy over the period to 2050.

Energy policy must be the responsibility of one of the most senior Ministers, leading advice to Cabinet across government interests in energy policy. Administrative arrangements should be reviewed with the goal of creating a focussed energy cluster within government, or ideally a Department of Energy, into which the various policy and programs related to energy are collected.

Recommendation 2: It is recommended that the Queensland Government focus its leadership around energy policy, with:

- **the Premier, Deputy Premier or Treasurer assuming responsibility for energy policy in recognition of its critical importance to the State's economic, social and environmental prosperity;**
- **an Energy Cabinet Committee – led by the Minister for Energy – to be formed to manage the interconnection between portfolio interests, and provide coherent advice to Cabinet on proposed energy policy directions; and**
- **a separate energy cluster to be created in the Department of Employment, Economic Development and Innovation (DEEDI), or as a standalone Department of Energy, to lead a focussed response to Queensland's energy policy challenge across all agencies.**

Regardless of administrative arrangements, significant capacity building is required to reclaim policy leadership around energy. A proven approach to capacity building is a staff exchange or secondment process.

Recommendation 3: It is recommended the Queensland Government commence as a priority, a trilateral program of secondments - between government, industry, universities and research centres – aimed at rebuilding knowledge capital and developing capacity for integrated energy policy.

2. Reducing the growth in consumer demand to avoid inefficient supply-side investment decisions and reduce emissions

Disproportionate growth in peak demand in the residential sector - that is in the 3-4 hour period in the mid-afternoon to early evening as hundreds of thousands of people simultaneously come home and begin their evening activities which generally use electricity - is driving unprecedented levels of network investment. Ergon and ENERGEX will each spend $6 billion (that is $12B combined) in capital expenditure over the next five years to cope with extraordinary consumption during a fraction of the year, rather than the average consumption over the course of the year. To put this into perspective, ENERGEX has over $900M in assets that are only used for approximately 3.5 days per year. (Mark Paterson, ENERGEX, The SPRA Standard) per cent

It is clear from trials being conducted in Queensland and elsewhere, that demand management and energy conservation have a real capacity to act to defer or change the mix of supply-side investment decisions. Population growth in Queensland and Queenslanders' lifestyle demands are likely to far outweigh the gains made to date and even projected in the short-term from energy efficiency and conservation initiatives, in the absence of broader uptake/implementation of a more focussed and coordinated approach to Government policy interventions.

Population and electricity demand growth forecasts for Queensland over the next two decades will make it impossible to achieve demand mitigation goals one person at a time, or one building at a time as is presently the focus for government interventions via building standards and engagement campaigns. With the State population forecast to double by 2031, the potential magnitude of Queensland's escalating electricity demand and the consequent emissions growth requires a far stronger policy response and public relations/media strategy from the Queensland Government.

2.1 A new technology and pricing regime is needed

Given the current inefficiency of top-end energy demand, and the lack of price signals relating to this extreme peak demand, many of the directions proposed in this report are aimed at offsetting the increasing burden on Queensland's electricity network. Immediate investment will be required to ensure the distribution network copes with a level of distributed generation not anticipated in historical network planning. It is also increasingly recognised that the distribution network of the future will need to offer greater flexibility to network operators and consumers in managing demand at an individual, corporate and community level.

The Working Group understands that pricing policy is a politically-charged issue. Nevertheless, it considers alternate options for pricing – including moving away from price regulation towards price monitoring as has been done in Victoria, and introduction of dynamic pricing - need to be investigated for their ability to help drive down inefficient power consumption in Queensland.

The Working Group is also concerned that large-scale opportunities for mobilising action and building community capacity for creating a lower carbon future may be lost by targeting action just at the individual level. Queensland has seen through recent water shortage responses what can be achieved when the community has the motivation and information to effect long-lasting change, with water consumption rates still half of what they were pre-drought despite the now full dams.

Recommendation 4: It is recommended the Queensland Government commence the work program now that will ensure a pricing and technology regime is fully implemented by 2020 that sends a clear signal to Queenslanders and Queensland businesses about the true costs of their energy consumption, and equips them with the tools and provide the incentives that will enable them to manage their consumption habits and reduce the cost of their energy purchases relative to the existing averaged and flat tariff structures.

- **The proposed regime will at the very least investigate "smart" technologies and metering, building requirements, welfare/hardship measures, a shift from price regulation to price monitoring, and limited form dynamic pricing (that is, time-of-use plus critical peak pricing).**
- **It is recommended the Queensland Parliament Environment and Resources Committee be tasked with investigating a move from regulated to deregulated prices within the constraint of Queensland's uniform electricity pricing policy.**

2.2 Managing urban development

The infill and new development precincts required to accommodate a substantial proportion of the State's new population represent the most significant opportunity in decades for accelerating uptake of environmentally sustainable design (ESD) and for building cleaner energy communities. Approaching building design and standards at the precinct level will also help accelerate the pace of energy efficiency uptake and lifestyle, and maximise opportunities to showcase (i.e. make visible) and build cachet for an energy efficient lifestyle.

Recommendation 5: It is recommended that the Queensland Government initiate a State of 'Green' Growth Precincts initiative aimed at large-scale enhancement of the built environment to accelerate introduction of energy efficient design and lifestyle, whereby:

- **precinct level design standards are developed and mandated, and**
- **best practice in ESD is required in transit-oriented development and the four new Queensland cities that will accommodate the largest proportion of Queensland's new population growth.**

2.3 State Government needs to lead by example

Capital works and lease fit-outs for all Queensland Government buildings could require the integration, not just of energy efficiency and demand management technologies, but of localised generation where it is economic to do so. A Queensland Government Precinct embedded generation plant, for example, would be a major statement of intent by Government as would integration of embedded generation into hospitals and other government buildings.

Recommendation 6: It is recommended the Queensland Government mandate the integration of localised generation capability into owned and leased space, and look to iconic implementation such as a Queensland Government Precinct master plan as a statement of intent and demonstration of leadership, where it is economic to do so.

3. Diversifying Queensland's energy supply mix to offset the State's reliance on fossil fuels

Queensland's future energy generation mix requires a far more diversified base than is presently the case – including to ensure that as the State realises its ambitions for renewables to comprise a greater proportion of Queensland's generation portfolio, emissions reduction ambitions are not compromised by fossil-fuelled baseload. However, it is not apparent to the Working Group that the Queensland Government is addressing the big ticket decisions, or even fully exploiting its own capacity, to accelerate Queensland toward a diversified generation sector.

3.1 Government needs to give a strong market signal for investment in renewable energy

A key strategy for sending a strong market signal supporting investment in renewable energy is the establishment of an emissions threshold which is technologically achievable with current generation equipment. Investors need a clear signal that Queensland is only interested in lower emissions generation projects.

Recommendation 7: It is recommended that the Queensland Government establish an emissions threshold of no more than 0.7 t CO2-e per MWh for all new power station plant (with periodic review of the threshold aimed at further reductions over time), and that energy projects meeting this threshold should be fast-tracked under streamlined planning processes.

3.2 Government should use its resources to leverage the development of renewable energy and associated technologies and services

By leveraging the financial resources of the State, local entrepreneurs, suppliers and investors in Queensland's low emissions and renewable energy industry will be able to overcome a key impediment to these projects – that is, long-term supply contracts Power Purchase Agreements with investment-graded clients. In so doing, Queensland projects will become more attractive to project developers and financers relative to the "lower hanging fruit" in other States.

Recommendation 8: It is recommended that the Queensland Government initiate a competitive tendering process for a significant Queensland Government electricity load with long-term contracts (for example, a large agency such as Queensland Health) – incorporating a sizeable renewable sourcing requirement.

3.3 Government needs better hedges against continued reliance on coal and gas

In the current absence of any acceptable alternatives, coal and gas will continue to be major contributors to Queensland's energy generation sector over the next 40 years. However, the Working Group wants to see the Queensland Government implement a plan aimed at reducing risk associated with coal and gas-fired generation.

Its ownership of the majority of the State's coal-fired generation assets presents an immediate opportunity for the Queensland Government to lead in embedding hybridisation at its plant,to reduce emissions. Hybridisation through solar and algae is considered an effective pathway immediately available for transitioning existing coal-fired plant to a lower carbon operational environment.

The Queensland Government also needs to hedge against the risk that CCS ultimately will just not be commercially or technologically viable. Emerging sequestration technologies should be investigated for their viability. Understanding the technical and regulatory requirements that would enable deployment of nuclear generation in Queensland, will ensure a future government is equipped to act on comprehensive information should CCS - or any other low emissions baseload option – fail to eventuate in the longer term.

Recommendation 9: It is recommended that the Queensland Government initiate a three-pronged approach to reducing the State's reliance on fossil fuels, including:

- **building on existing Queensland projects at Callide and Tarong power stations to develop a systematic plan for the integration of solar thermal and algae technologies to augment existing conventional power plant and reduce their emissions**
- **strengthening the Queensland Government's investment in lower emissions coal R&D (in addition to CCS) to include investigation of emerging sequestration methods (e.g. soil, seawater, algae, plantations, agriculture) that will store or offset emissions from fossil fuel-fired plant**
- **investigating existing long-term options for low-emissions baseload alternatives to coal and gas, and specifically the regulatory and technical requirements that might enable nuclear generation to at least form an option for Queensland's future energy generation portfolio by 2050**

3.4 Energy hubs support regional development

The strong geographical 'organisation' of energy resources in Queensland presents an opportunity for government to focus regional development activities around industrial capacity and associated research capability built around specific energy resources. Energy hubs would create focus for building critical mass around emerging generation technologies, and the associated potential in that area for distributed generation, commercial and industry growth, research and export opportunities. Energy hubs would further strengthen regional job creation and strengthen access to research capability as universities develop distributed research capability.

Recommendation 10: It is recommended the Queensland Government chart the State's unique endowment of abundant energy assets and resources to identify and support the formation of energy hubs in regional Queensland to stimulate regional development with industrial capacity built around energy. It is further recommended the Mackay biomass region be the initial priority region, with investigations into the viability of other identified energy hubs to be initiated as a priority.

4. Targeting government investment in R&D better and supporting emerging technology innovation

New approaches are needed to attract and support investment into technological innovation in the energy sector. An important first step is for the Queensland Government is to develop an investment framework for R&D and technology innovation that creates accountability.

Recommendation 11: It is recommended that a framework for State Government's investment in energy technology innovation and R&D be formulated as a priority, with short- and longer-term goals to guide investment. It is recommended that R&D Queensland be tasked to provide independent advice to Government on directions for the State Government's investment in energy technologies in line with goals articulated in the technology framework.

Embedding commercial-ready innovation into the supply chains of major customers has proven, an effective and low-cost technique that does not require the picking of winners as the market determines demand.

Recommendation 12: It is recommended the State Government initiate immediate action to create the market for energy innovation by embedding market-ready innovation in the supply-chain and procurement decisions of publicly-owned or controlled entities – including Ergon, ENERGEX, government-owned corporations (e.g. QR, ports), public services (e.g. hospitals, schools) and government departments - as a means to rapidly commercialise viable technologies while achieving increased efficiencies and greater value for money.

To further build the knowledge-base capabilities of Queensland in energy policy, technology and innovation, the Queensland Government should examine approaches to support the development of excellence in energy science, technology and engineering, especially in regional energy hubs. Grants and subsidies are one pathway for stimulating innovation through bankable viability to successful commercialisation.

Recommendation 13: It is recommended the Queensland Government support the development of excellence in engineering and scientific capabilities (both through universities and the private sector) in energy technology, leveraging the skill base of domestic and foreign students and professionals, and supporting the export and domestic use of such capabilities. Support should be directed not only to renewable energy technologies but also coal, gas and the nuclear fuel cycle.

5. Increasing Queenslanders' knowledge of and engagement with the factors driving energy policy decisions, and equipping them to be accountable for their energy consumption decisions

5.1 Building energy communities in Queensland

Community engagement and informed public debate is crucial to achieve energy policy outcomes. The Queensland Government has had recent success with respect to water restrictions and the ClimateSmart program. It has been less successful in engaging the community in the debate over the constraints, limitations, problems and opportunities presented by the imperatives of balancing energy, economic growth, climate change and environmental policy.

This task will require a sustained, creative and evolving approach over a considerable timeframe. The opportunity exists to build on the Queensland Government's already considerable investment in supporting consumer action. The ClimateSmart initiative and Ergon Energy and ENERGEX's EC&DM trials have already helped Queenslanders involved in these initiatives develop knowledge capital and effect behavioural changes.

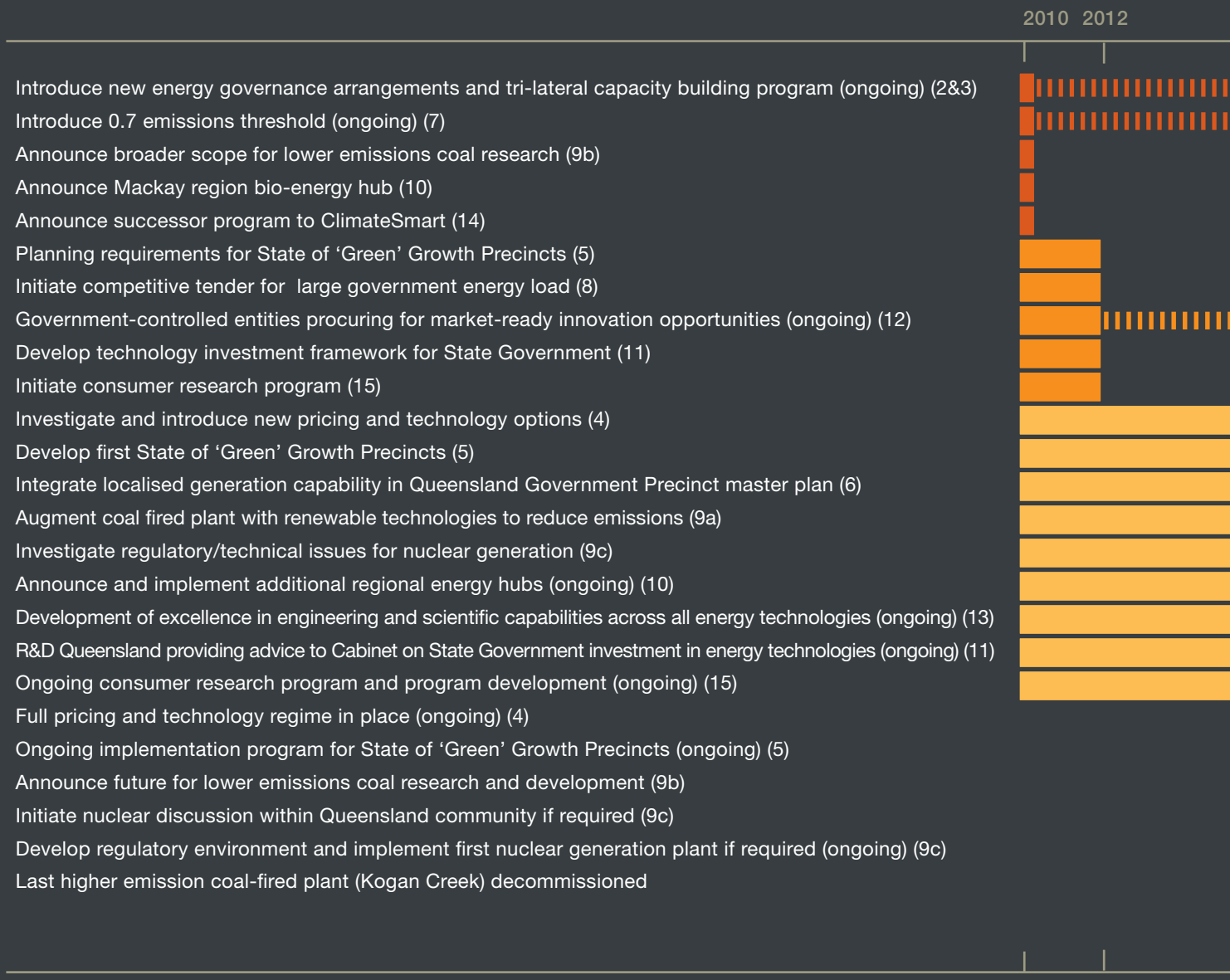
Recommendation 14: It is recommended that the Queensland Government develop a new engagement and capacity building initiative utilising subscribers to the ClimateSmart initiative to build energy communities for energy efficient lifestyles and demand management practice .

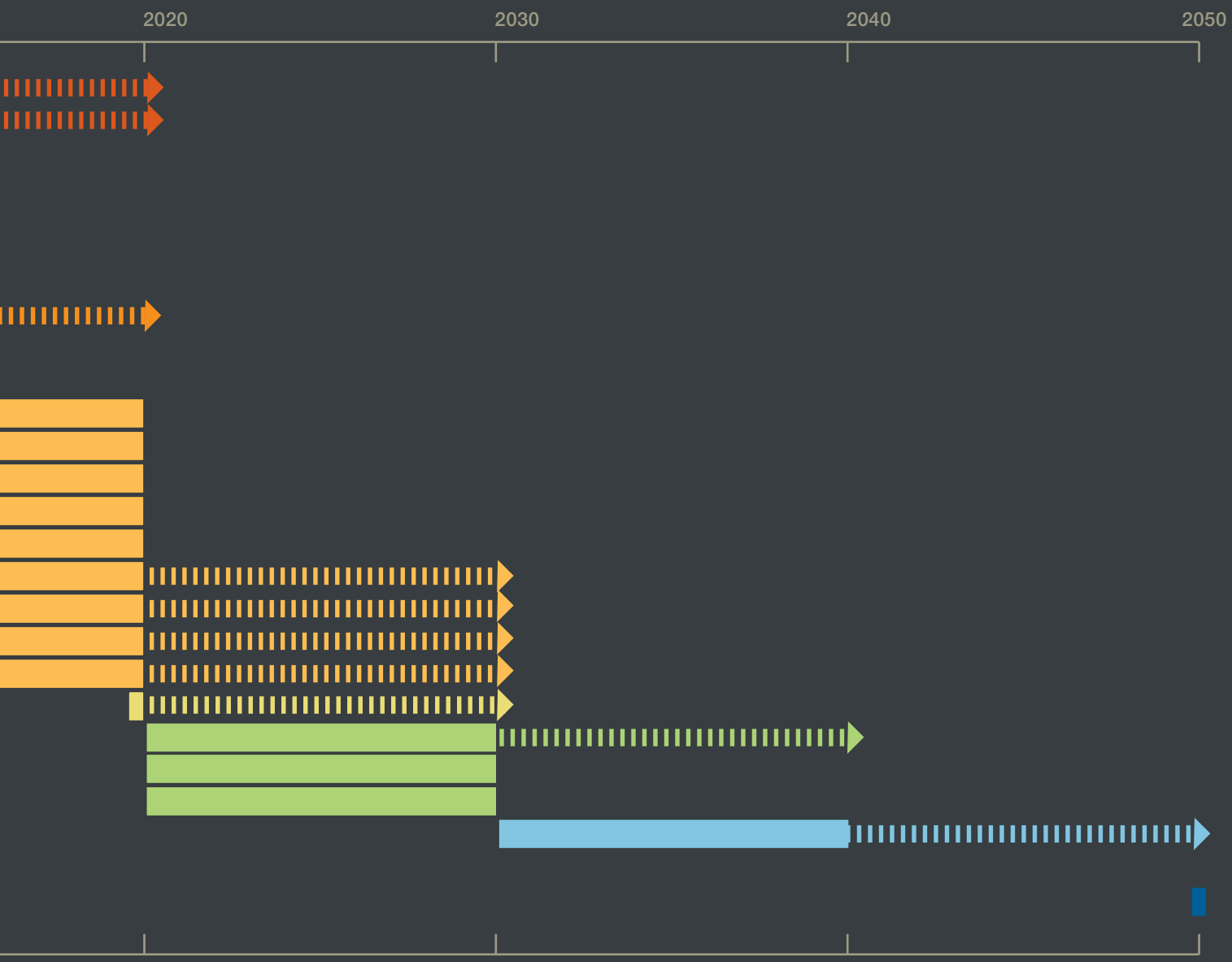
5.2 Better understanding Queenslanders' relationship with energy

While there is a growing body of research about consumer behaviour and responses in relation to energy consumption, there is limited specific research about consumption behaviours in Queensland. Understanding how Queenslanders are motivated around their energy choices needs to be a priority for the Queensland Government.

Recommendation 15: It is recommended that the Queensland Government initiate research to identify target audiences and the messages and initiatives that will motivate them to change their energy consumption patterns.

A 40 year plan for accelerating Queensland's the transition to a lower carbon energy sector by 2050 (3)

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Introduction

"…the transformation of traditional patterns of energy supply and use is inevitably complicated – by the close interconnections of energy supply and use with economic interests nationally and in various regions; by the relative cost-effectiveness of new technologies; by the extent of disruption that might be caused to major stakeholders, both domestically and abroad, from the emergence of new resources and technologies; and by the broad scale and scope of the work of reducing greenhouse gas emissions while maintaining access to affordable energy. **Some of these challenges are not new… But the urgency of addressing all of them simultaneously is unprecedented.**" – The National Academies, America's Energy Future: Technology and Transformation, 2

A complex policy environment

The Queensland Government – like modern economies around the world – is being constrained by environmental, economic and social policy considerations as it attempts to balance these competing interests in achieving a cleaner but secure energy supply. The Global Financial Crisis (GFC) has highlighted the fragility of these policy settings as countries' environmental intentions are outweighed by more pressing economic and social priorities. Yet there continues to be a push for environmental costs to be factored into policy decisions. Domestic energy policy is also highly exposed to the global marketplace and international governance arrangements, not only in relation to climate change action, but also to international benchmarks for generation fuels as competing export opportunities arise for the State's resources in international commodity markets.

A global scan highlights the complexity for countries the world over as governments balance the key objectives of maintaining secure energy supply, minimising the cost of energy supply, and minimising the environmental impact of production. For example:

> the United States government has just announced it will not be pursuing an emissions trading scheme at a national level, and regional and state-based systems are under pressure

> China spent billions of dollars of stimulus funding during the GFC on renewable generation projects, yet continues to build a substantial portfolio of coal-fired, gas-fired and nuclear generation plant to meet the requirements of a growing industrial and consumer base

> Spain's significant commitment to solar generation is in jeopardy due to pressure on their domestic economy

> the United States has committed to spend US$8 billion on nuclear generation projects.

> the German Government has recently reduced feed-in tariffs, and is considering further tariff reductions and a cap on installations, as the rapid uptake of solar PV creates overwhelming requirements for back-up generation.

Nowhere is this complexity more evident than in Australia. The climate change policy agenda that has been the strongest driver for Australian energy policy in the past decade – at both State and Federal levels - has become increasingly contested. It would now appear far 'riskier' for governments to take definitive action on climate change as the public struggle with the science, the lifestyle implications and the cost of these actions. Nevertheless, this issue is not off the political agenda with governments appearing to tacitly acknowledge that the community remains concerned about the impacts of human-induced climate change. Minority parties representing significant environmental concerns are filling the void in this discussion as the larger parties desert definitive climate change action.

Even in the absence of government action in the policy space, the consistent advice from industry is that they are preparing for definitive carbon constraints. Consultation indicates a carbon price is already being factored into industry modelling (generally based on the previous Australian Government's commitment to a 2012/13 timeframe for commencing an emissions trading scheme). Industry consultation has identified that carbon pricing is critical to shifting the investment environment toward cleaner supply options. Yet uncertainty in climate change action is affecting investment decisions, with project financiers, now far more risk-averse in the wake of the GFC, unlikely to be interested in projects that cannot demonstrate extended supply contracts with investment-graded clients.

"…Without a price on carbon, there is a lack of certainty for the purposes of investment in capital intensive assets such as those required in the electricity sector. If anyone has any doubts about that, they should speak to the electricity operators in Australia at the moment, because they argue very strongly that without a price on carbon we will be unable to make the necessary investment decisions going to the energy security of Australia in the foreseeable future." – Martin Ferguson, Australian House of Representatives Official Hansard, 19 October 2010, p.756 Growth state

Growth state

Queensland is the fastest growing and most energy intensive state in Australia. Queensland has the highest consistent net population growth in Australia over time, putting pressure on infrastructure, public services, energy supply and water resources and associated prices. South-east Queensland is Australia's fastest growing region and in the next 20 years its population is expected to grow from 2.8 million to 4.4 million people.

Queensland faces the challenge of mitigating growth in GHG emissions while ensuring access to competitively priced energy. Coal (and increasingly gas) has created enormous economic benefit for Queensland, with the State's wholesale energy prices the lowest in the country (Australian electricity prices being among the lowest in the world).

Queensland has a significant percentage of Australia's various energy resources. Although a smarter and cleaner use of coal is inevitable, clean coal is only part of the long-term solution. Lower emission fuels and processes such as natural gas and coal seam gas will assist in providing power solutions as an alternative to current coal-fired plants. Queensland also has abundant supplies of other energy minerals such as lithium (currently only produced in Western Australia), thorium and uranium.

Queensland has focussed on clean coal, seeding Zerogen to develop capability and knowledge of carbon capture and storage. Queensland possesses a range of renewable energy resources, although some are yet to be proven commercially or at utility-scale. These include, in particular, solar, geothermal and wind energy. Queensland has more geothermal potential than South Australia, more corporate capability in cleantech than Victoria, and Australia's best potential for solar technologies, in addition to our vast energy mineral capability. And despite popular belief, Queensland has non-trivial wind resources, as Roam (2010) recently highlighted.

Renewable energy generation will provide additional alternative generation capability. It is expected emerging technology will eventually allow for energy storage and use as baseload of intermittent renewable energy resources. In the meantime, renewable energy technologies may provide viable solutions for remote and rural communities and reduce grid expansion costs.

There is significant technological innovation in Queensland companies and research institutions, much of which could be further developed, marketed and exported. Just a small sample of examples serves to illustrate the breadth of Queensland's innovation capital, with:

> James Cook University the world leader in algae as a biofuel

> the University of Queensland, Queensland University of Technology and Griffith University all having significant, world-class research capabilities in clean energy, cleantech and low emission technologies

> a global technology innovator in utility scale low-emission energy storage currently based in Brisbane

> development scale distributed generation design based in the Sunshine Coast

> a company in south-east Queensland leading the world in the development of low emission diesel gensets and transport engines

Queensland is however losing clean energy investment to South Australia and Western Australia, and cleantech investment to Victoria. This was highlighted during the Australian National Carbon Conference, held in Brisbane in August 2009. The Premier of South Australia, Mike Rann, has targeted his state to be a major site for investment in clean energy, especially in geothermal, solar and wind. The Victorian Premier, John Brumby, has declared his intention to entrench Melbourne as the cleantech capital of Australia (if not Asia), as well as to be the Australian leader in wind power.

Queensland's existing resources, institutions and corporates position the "Smart State" to be a leader in knowledge-intensive industries around energy resources and supply. Queensland's world-class teaching and research institutions, and creative innovators create an environment for comparative advantage based on the size, regional nature and resources of the State, including for example, decentralised generation co-located with heavy industry, ports and mining, as well as promoting distributed generation based on renewable energy in rural and remote communities.

Queensland's population and energy resource distribution is ideal for the development of "energy hubs" to capitalize on the diverse supply potential of energy resources. Leveraging the potential of regional Queensland is critical to create the diversified energy economy on which the State's lower carbon future will rely.

Section 1: A plan for the future

1.1 The clear priority for the future… Energy policy must be at the forefront of Government considerations

There is no more important policy area facing government than getting energy policy right – not just in 2010 but for 2020, 2030 and 2050. While there will be much change in the next forty years, 2050 is not just some vague time in the future, and 2020 is only just tomorrow. New ideas balancing lifestyle (jobs, transport, housing, family lifestyle choices which are comfortably provided by abundant energy) with environmental concerns (greenspace, climate change, recreation) will help frame the political debate in Queensland over the next decade, and well beyond. We not only have the obligation of decisive action on behalf our children and grandchildren, we owe it to ourselves and the legacy we wish to leave future generations.

If – as the Working Group has been told repeatedly by senior industry, government and academic representatives, and as is presented in the media – energy policy is one of the major challenges of our times, why is it not then the highest priority of government? The Working Group acknowledged the Queensland Government is working to address long-standing and emerging energy policy issues. The Working Group has however found a coherent, integrated and comprehensive plan for the State's energy future elusive, if not absent. Queensland's energy policy is too important to the State's economic, social and environmental prosperity to be anything other than the Queensland Government's most important policy priority.

1.2 A plan for change…

Queensland's transition to a lower carbon future has started under strategies such as the *Queensland Renewable Energy Plan, ClimateSmart 2050* and *Toward Q2: Tomorrow's Queensland*. However, the Queensland Government's response to immediate political pressures to be seen to be delivering on 'green' strategies and projects appears to the Working Group to be at the expense of a clear, long-term vision for Queensland's energy future that balances environmental responsibility with key considerations around energy security, economic growth and equity.

This plan identifies the specific areas where government action will achieve the "biggest bang for the Queensland Government's buck" in achieving a lower carbon future via investment and market signals, R&D investment and capacity building. While this plan creates a 40 year horizon for achieving Queensland's lower carbon energy future, many of the directions require action to be taken now to ensure this transition is successfully achieved. The report identifies where immediate action is required to realise long term goals.

It is clear to the Working Group that a lower carbon future requires governments to take tough decisions. The Working Group is under no illusions that these decisions will always be popular. It is clear to the Working Group that the community and industry need to be under no illusions either about just what it will take to achieve secure, lower carbon energy supply into the future. The report therefore recommends substantive action for community engagement and capacity building as part of a long term plan for transforming the State's energy future to counter community inertia in the face of contested climate science and the costs of climate action.

The Federal Government's role in energy policy has expanded in recent years, particularly within the context of climate change action. This report does not aim to establish parallel policy directions where policy responsibility clearly falls within the remit of Federal Government. Rather, the directions outlined in this report anticipate (to the extent possible) likely Federal Government action, for example, carbon pricing. They are also mindful of the desirability of national consistency , for example, in relation to energy efficiency programs. The report also identifies where the scale of national action is critical to plugging emerging policy gaps, for example the opportunities for low emissions baseload power generation.

Neither does the Working Group intend to subvert market imperatives underpinning the National Electricity Market. The recommended directions point to opportunities for government to create long-term investment and market signals, rather than focussing on government program intervention.

It is unclear, however, just how long it will take to resolve key policy settings within the contested environment for climate change action resulting from the 2010 Federal election. Other states have acted ahead of the Australian Government to forge energy plans for their State – for example, Victoria has released an energy white paper in 2010, white certificate schemes are in place in New South Wales and the Australian Capital Territory, and many jurisdictions (including Queensland) have introduced feed-in tariffs.

It would seem unwise for Queensland to dismiss the unique opportunities presented by its resources and broader policy imperatives to forge ahead with securing its own energy future.

1.3 Machinery of government arrangements

In any modern government, energy policy must be the responsibility of one of the most senior Ministers. In this term of the Government, the arts, health and employment portfolios have been the responsibility of the Premier, Deputy Premier and Treasurer respectively – certainly in the latter cases, a reflection of their importance to the State's economic and social prosperity. Health, Education, Transport and Main Roads all retain focussed Ministerial and administrative arrangements.

Not since the beginning of this decade, when the then Deputy Premier was responsible for the energy portfolio from 2001 to 2002, has energy policy garnered any Ministerial priority. Only in the face of political fallout from the storm-related power outages that led to the Somerville Report (2004) was a Department of Energy formed in 2004. Now, energy jostles for the attention of a more senior Minister than has otherwise been the case, but whose portfolio responsibilities are extensive (crossing over two agencies) and literally global.

In investigating the energy policy environment, the Working Group has noted a high degree of policy fragmentation, uncoordinated implementation and agency competition that is not sustainable if the pace required to achieve the transformation to a lower carbon economy is to be achieved. The formation of the Office of Clean Energy (OCE) in 2008 represented an important step forward in Government thinking around a coordinated cleaner energy future. However, in the Working Group's view it is not possible to separate clean energy policy development from other aspects of energy policy.

Recent reintegration of energy policy structures in DEEDI is a good start to achieving the focus required for achieving coherent energy policy. Revised structural arrangements should not however result in any reduction of focus or effort around cleaner energy policy. Even so, energy policy still remains fragmented within DEEDI and across the public sector, for example:

> cleantech strategies for the energy sector are being developed in DEEDI in the context of broader industry policy objectives, rather than how they support energy policy goals

> government-owned distribution businesses have significant influence in decisions about network and demand side strategies

> *ClimateSmart* investment which predominantly relates to household electricity consumption is managed by the Department of Environment and Resource Management (DERM) even though research on behavioural change in relation to energy consumption is of critical significance to the pricing and demand management policy work being managed by DEEDI

> electric vehicle policy is also vested in DERM even though strongest policy interests are in DEEDI or the Department of Transport and Main Roads.

A model like the United States' Department of Energy would secure the greatest level of focus around energy policy. Rather than seeking to disaggregate recent machinery of government changes, however, the Working Group sees as more easily achievable a standalone energy group within the DEEDI configuration reporting to a separate Minister for Energy. A single entry point for energy policy should also alleviate stakeholder confusion as they navigate various agencies' competing interests and priorities in energy policy. It should also encourage investment by allowing potential investors a clear path to decision-makers and decision-making processes.

It is also clear to the Working Group that energy policy permeates the public policy terrain. The Working Group has, in formulating this report, addressed implications around climate change policy, planning policy, transport policy, minerals policy, and community policy. Collaboration between agencies is certainly evident, but the Working Group is keen to avoid wherever possible the productivity losses associated with coordination of advice between agencies.

The Working Group realises it is not possible to integrate every conceivable aspect of energy policy within one agency structure. Negotiation of policy settings should be vested at the Ministerial level to ensure contestable issues are resolved and that the best Cabinet advice is achieved. An Energy Cabinet Committee would provide for co-ordination where energy policy unavoidably cuts across other portfolios (such as Transport and Main Roads, Infrastructure and Planning, and Environment and Resource Management).

1.4 Government capability for change

The Working Group has been alerted to the loss of capacity from government since the major energy reforms of the 1990s and early 2000s – particularly the capacity to understand complex energy policy and the potential interactions between separate policy responses. The Queensland Government must rebuild the critical mass in its energy policy unit if it is to manage the complex policy and implementation decisions that will enable Queensland to transition to a lower carbon future. Industry, universities, research centres and non-government organisations will be critical to creating the environment in which relevant knowledge is exchanged freely, and brought to bear in resolving complex policy problems. The Working Group has itself called on a wealth of expertise from industry, the community sector and academia in preparing this report, and commends the honest exchange of information and advice in this context.

Government requires significant, qualified capacity in a dedicated team to deliver energy policy - people with strong energy domain knowledge (for example, supply, demand, industry, networks, economics) and a balanced focus on energy security and future lower carbon clean energy. Options for building capacity need not be permanent and should be flexible around specific policy issues.

Officer mobility and industry placements are well-regarded tool for developing public sector employees. The highly successful Executive Development Program of the Australian Public Service run during the 1980s provides a useful model for building the capacity of government officers. The risk of 'losing' staff attracted to private sector employment conditions would need to be addressed in designing a secondment program.

Industry secondments to government are also not new in Queensland and several industry personnel have been seconded to Queensland Government energy agencies in the past decade. For example, the most recent Chief Officer for the OCE was from Ergon Energy. Industry placements within government have not however been utilised in any great scale since electricity deregulation reform in late 1990s.

The Queensland Government's investment in private research – for example, via Smart State fellowships – also presents potential for building knowledge capital around energy policy. The fellowship guidelines could incorporate a requirement for fellows working in energy-related research fields, to serve a period of time within the energy unit to ensure a tangible return on the government's investment.

Section 2: Demand

2.1 Demand profile

Approximately 30per cent of current demand is residential, compared to 70per cent in the commercial and industrial (C&I) sector. Disproportionate growth in peak demand in the residential sector - that is in the 3-4 hour period in the mid-afternoon to early evening as hundreds of thousands of people simultaneously come home and begin their evening activities which generally use electricity - is however driving unprecedented levels of network investment.

As households become more dependent on electricity, the acceptability of interruptions to supply is falling. As a result, it is necessary to design the electricity supply system to cope with the highest credible peak demand (for example, summer weekday, with extreme weather conditions), and allow for credible outages of equipment at the same time. Such extreme peak periods account for less than one percent (88 hours) of the year. However, the cost of the installation of capacity to cope with them must be recovered from significantly lower level of consumption at other times of the year, resulting in an upward pressure on prices.

Clearly, this is unsustainable and needs to be addressed. For example, in 2008-09, the peak 6per cent of electricity demand occurred for around 0.5per cent of the year (44 hours), and approximately 13per cent of demand occurred for less than 1per cent of the year. Advice from ENERGEX and Ergon Energy indicates that demand has become even “peakier” in the last 15-18 months – that is, even higher demands were being experienced for even fewer hours of the year.

By contrast, the profile of C&I demand is high but relatively flat throughout the working day due to the timing of business and industrial processes, but then drops off at close of business. Business processes and commercial imperatives may enable businesses to better manage their energy demand, despite being larger aggregate consumers of energy. C&I consumers have also, in a number of cases, implemented additional local generation capability and a range of demand management technologies which has helped reduce and smooth demand. However, there is still room for improvement in this sector. The results of the Commonwealth Energy Efficiency Opportunities program show that even large energy consuming companies reported significant energy waste, with very cost-effective remedies available. Given the large proportion of demand for which it accounts, the C&I sector offers a unique opportunity for the Queensland Government to find some quick wins around energy efficiency and local generation.

2.2 Equipping Queenslanders to reduce energy consumption

The Working Group has investigated the key areas for policy action to drive reductions in energy demand, including:

> network and metering technologies that will equip Queenslanders with immediate information about their consumption and help them be responsive to this feedback in future actions

> pricing and tariff policy that will give Queenslanders the signals about their energy consumption required to motivate changes in consumption habits

> building standards that will embed energy efficient design and practice in Queenslanders' lifestyles

> community engagement and capacity building to equip and mobilise consumer action (issues related to community engagement are addressed separately under Chapter 5: Engaging the Community).

The Working Group acknowledges the significant work being undertaken by Queensland Government agencies in each of these areas. Integrated government action is critical to create the policy and regulatory environment in which community, industry and government can achieve a lower carbon future for Queensland. The importance of an informed and motivated community to achieve a lower carbon future suggests to the Working Group that a coherent and integrated pricing and technology framework is a priority for government action.

The directions around consumer responsibility and incentives for behavioural change proposed by the Working Group largely parallel the thinking underpinning the recently released *Report of the Prime Minister's Task Group on Energy Efficiency*. The State's responsibility for pricing, network and building policy provides scope for the Queensland Government to bring about the policy and regulatory settings that will equip and motivate consumer action for a lower carbon future.

2.3 Energy Conservation and Demand Management as the first line of defence

Ergon Energy and ENERGEX's 2010/2015 regulatory proposals include a $225 million investment in energy conservation and demand management (EC&DM) initiatives (refer to Figure 1). Initial results for trials of demand management - such as the *Townsville Solar City* trial of solar PV and the *Cool Change* initiative (trialling load control of air-conditioning and Pool Filtration Demand Management devices) - are demonstrating the ability to flatten the demand curve across the day, and are also helping identify consumer responses to this type of intervention (McGowan, 2009). Consumers involved in the trial are reporting minimal discernible impact on their lifestyle, with 90 per cent of participants reporting either negligible or no impact on comfort levels.

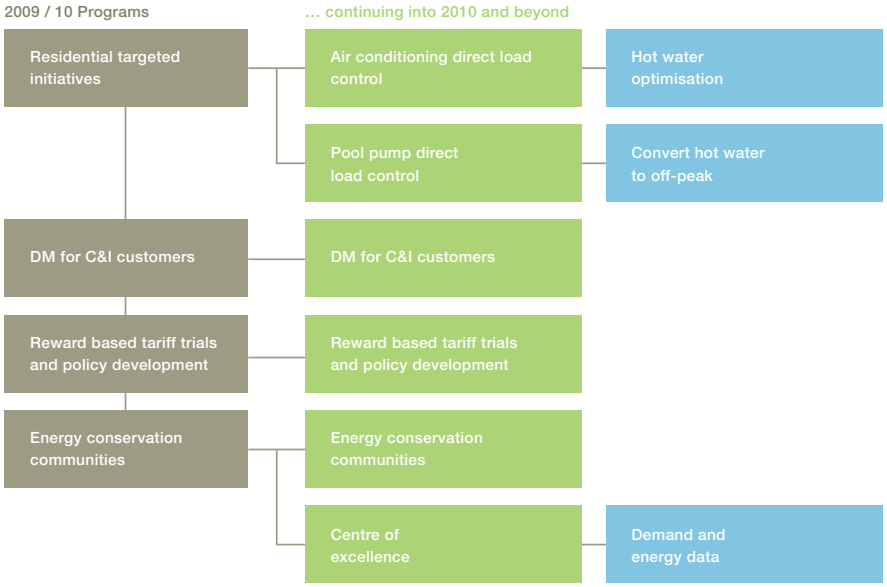


Figure 1: EC&DM programs to 2015 (Source: ENERGEX and Ergon Energy)

The C&I sector needs to be a stronger focus for demand side management given it accounts for the greatest proportion of all demand. In general the C&I sector pays a lower price for its electricity (9-12c/kWh is an average rate). Price increases will however have substantial and disproportionate impacts on small-to-medium sized enterprises operating on marginal business plans. The potential impacts for macro-economic imperatives around economic and employment stimulation suggest that demand management should be a priority for this sector to reduce consumption increases associated with business growth. Businesses understand and fear these

"storm clouds on the horizon" but in general do not have the capacity or knowledge to begin the necessary process changes to insulate themselves. From a demand management (as well as supply) perspective, the C&I sectoral opportunity to reduce consumption is a white space of policy and intervention.

Research by CSIRO has shown that Australian organisations most likely to adopt demand management or distributed generation are relatively large, with large energy consumption. However, many small businesses also appeared likely to adopt. While financial payback periods have some influence on organisational decision making, safety, efficiency and reliability were typically the most important features of demand management and distributed generation technology for the C&I sector.

CASE STUDY – James Cook district cooling reduces emissions and costs

In 2009, James Cook University partnered with Ergon Energy to construct Australia's largest district cooling system at their Douglas campus in Townsville, incorporating chilled water thermal energy storage, with a centralised chilled water cooling plant. The system satisfies the cooling requirements of 36 of the 55 major buildings at this Campus.

During the day, when cooling is required, chilled water from the storage tank is piped throughout the campus, through a distribution network of 7.8 km of underground piping, which is then fed into fan coil units within each of the 36 of the 55 major buildings on site. During the night, when there is low demand for cooling, the central chilled water plant is run, chilling the water returning to the plant from the campus, from 15°C back to 6°C. Night time cooling means that the university can take advantage of off-peak tariff periods, reducing electricity costs. In addition, the lower ambient air temperature at night means less energy is requiring for chilling. Cooled water is then stored in the TES tank for use the following day.

The main benefits of the district cooling system are:

- **Reductions in energy use - the central system delivers an estimated annual saving of 10 800 MWh annually in 2010, and has significantly reduced the universities average peak load**
- **Large reductions in greenhouse gas emissions – the system delivers an estimated annual saving of 12 000 tonnes in 2010**
- **Reductions in electricity costs – the system delivered an estimated annual saving of $1 400 000 in 2010**
- **Long life span - the plant has an estimated economic life of 30 years.**

District cooling systems are useful on sites where there are a large number of buildings – schools, hospitals and universities are some examples of facilities with large building stock that could make use of similar cooling systems.

JCU is planning to implement a similar system at its Smithfield campus near Cairns. Ergon Energy is currently exploring the feasibility expanding the district cooling system to include the adjacent Townsville Hospital.

2.4 Lifestyle and technology choices

Increasing penetration rates for household energy-intensive appliances used in every aspect of Queenslanders' lifestyles over the past decade (refer Table 1) highlight the burden consumers' pursuit of convenience and comfort is placing on Queensland's energy supply. Air-conditioning and pool filtration present the greatest current challenges for the distribution system, and are the focus of demand mitigation activities by Queensland's electricity distribution companies. While water heating systems also present a challenge, accounting for around a quarter of total energy use, replacing conventional electric systems with solar/heat pump is expected to significantly reduce electricity requirements.

Appliances	1999	2009
SEQ homes with air-conditioning	23per cent	72per cent
(34per cent with 2 or more)		
Homes with at least one computer	48per cent	98per cent
Number of TV's in average SEQ family	1.5	3.0
(25per cent high energy use)		
SEQ homes with a dishwasher	31per cent	50per cent
Microwave ovens (less than 30per cent in 1989)	72per cent	97per cent

Table 1: Penetration rates in south-east Queensland for household appliances. Source: ENERGEX

The arrival of plug in electric vehicles (EVs) next year has been described to the Working Group as the potential new 'air-conditioning' of supply challenges. Queensland would only expect to have a very small proportion of the 750,000 EVs anticipated to be in global circulation in the near future. (Office of Climate Change, An Electric Vehicle Roadmap for Queensland – An Issues paper for public discussion, July 2010, p4.)However, supportive government policy aimed at reducing transport emissions is likely to contribute to growth in EVs on Queensland roads in the medium-term.

Unless well managed, personal EVs will largely be recharged at home during the peak demand period, when the driver gets home from work. It has been suggested that it is unlikely businesses will be keen to pay for the recharging of personal vehicles at work. It is expected they will not install charging infrastructure for personal use vehicles unless required to do so by regulation (which will likely be resisted by business as an unnecessary burden/staff cost/benefit), or if they see an opportunity to charge employees for this service.

This demonstrates the policy challenge facing Government – while seeking to reduce emissions through the adoption of 'clean' vehicles, such vehicles may significantly increase peak demand. This would require a major investment in generation and distribution capacity, and either increased utilisation of black energy or more expensive renewable energy. An alternative government response is for mandated energy storage capability which may be charged off-peak, like off-peak hot water systems, and used to charge the vehicle. This will however further increase the cost to consumers of 'going electric' thus reducing the overall demand for clean electric vehicles. There are however already offers of "smart" charging arrangements which could limit charging to periods of low household demand, low system demand, or low price.

Encouraging adoption of electric vehicles for commercial use, such as delivery and short distance business trip vehicles, which can be recharged during non-peak period, may also achieve emissions reduction with businesses being able to share recharge and storage infrastructure over a vehicle fleet. This would also delay the need for costly network upgrades to meet the demand during peak periods. However, enough uptake of commercial electric vehicles could also add to daytime load sufficiently to create a new peak problem.

2.5 Realising the full potential of Queensland's network

On the other hand, network demand during peak periods can be mitigated through increasing installation of small scale distributed generation, smart appliances and residential or precinct energy storage technology. The large-scale implementation of some of these technologies will require policy and regulatory interventions to ensure adoption. Others, such as solar PV, merely require the continuation of the feed-in tariff regime.

Likewise, the integration of precinct or residential storage capability, especially in apartment buildings and high-rise developments, will require policy intervention. This will be a challenge for Government as, although some modelling is possible, the impact of these on energy consumption rates and peak demand is largely unknown at this stage. A staged approach piloting a number of alternative interventions to gauge uptake by residential and commercial consumers and developers is recommended.

The Working Group is concerned that future investment may not be aimed at creating an energy generation and distribution network able to respond to the changes required to transition to a lower carbon future, especially given lifestyle choices and technology advancement in lower emission technologies. During the Working Group's consultation, it has been clear that Queensland's network businesses understand the challenges of creating a grid for the 21st century. However, the global pathway to this transition from the business-as-usual network augmentation does not seem clear – including how to create the environment in which necessary planning, action and expenditure by the network companies is acceptable if not a key part of their remit. Broad-scale action aimed at heading off costly network upgrades (and the impact on pricing) could create the political environment in which early transition measures, often requiring significant additional investment or incentives, could become acceptable expenditures in the minds of energy consumers.

This is not to say that isolated initiatives are not underway and will not have an impact through the principles of learn-through-doing. Queensland's understanding of network potential is increasing with initiatives such as the Townsville Solar City trial. The Federal Smart Grid, Smart Cities initiative recently provided $100 million for a major smart grids trial. The tender bid process was won by a consortium led by Energy Australia and the main test site will be Newcastle. Ergon Energy and ENERGEX also participated unsuccessfully in this bid process, and it will be interesting to observe whether aspects of Queensland's proposal for Federal funding will be implemented without this support.

The inclusion of monitoring devices as part of programs such as the ClimateSmart initiative and Brisbane City Council's Ezy Green program suggests government understands that equipping consumers with immediate feedback is critical to building community understanding of impacts of energy consumption behaviours. A community capacity building and education program, facilitated by metering information that allows consumers to understand and change their behaviours, has been credited by project managers as one of the key success factors of Townsville's Solar City initiative. The Queensland Government is however yet to fulfil its commitments under Council of Australian Governmnents' agreements to roll-out smart metering.

2.6 Pricing

The State Government has clearly signalled to the Queensland public that increases in retail prices over the past three years - and those expected over the next five years - will be dominated by the historically high levels of capital expenditure on networks to prevent failure of the system under the pressure of increasing demand, and to replace ageing assets. Ergon and ENERGEX will each spend $6 billion (that is $12B combined) in capital expenditure over the next five years to cope with extraordinary consumption which occurs during only a small fraction of the year, rather than the average consumption over the course of the year. To put this into perspective, ENERGEX has over $900M in assets that are only necessary for approximately 3.5 days per year. (Mark Paterson, ENERGEX, The SPRA Standard)

It would appear that retail price rises in Queensland of over 30per cent in the past 3 years are not significantly reducing the growth in demand for energy. Due to average tariffs, and due to Queensland's uniform pricing policy, domestic electricity tariffs do not currently reflect the underlying cost structures of the sector, let alone provide price signals for "efficient" energy consumption behaviour.

The Working Group considers pricing policy to be integral however to the government action required to change consumers' power usage behaviour. Queenslanders – like the residents of other States – complain about rising electricity prices, yet there appears to be:

> little understanding among consumers about the true costs of their consumption choices

> little appreciation that Queensland – and Australian – power prices are among the world's lowest

> little appreciation of the cost implications of continued inefficient energy use.

This needs to change if Queensland consumers are going to take personal responsibility for their consumption choices. The Working Group considers it a priority that the Queensland Government tackle the immediate political challenges of dynamic pricing and price monitoring as part of an integrated suite of reform around pricing and technology.

2.7 Welfare measures

Technology and pricing strategies aimed at driving down inefficient consumption must not disadvantage Queenslanders unable to carry this burden. For example, the Working Group has been alerted to the potential that energy draining features such as pools may make rental stock less attractive to the broader rental market, resulting in lower socio-economic groups who tend to have last choice of rental properties ending up in least-efficient (cheapest) housing.

A pricing and technology regime must include social and welfare measures that protect these Queenslanders. Equally, new policy frameworks must look for opportunities to increase energy efficient practice among Queenslanders who do not currently have the resources to contribute to the community momentum required to achieve a lower carbon future.

ESD is unlikely to gain traction in rental housing stock without suitable regulatory intervention, as investment property owners do not benefit from current incentives such as energy bill savings. The Working Group is keen to see capacity building among those who might not otherwise receive incentives to implement best-practice energy efficiency, and to mitigate the impact of price rises on those potentially least able to afford them.

Targeting the rental sector may also provide for traction among different population demographics if, as research for the Growth Management Summit in March 2010 suggests, age is a key determinant in preferences around owning/renting homes. The Summit background research indicates "older households prefer renting separate houses to apartment ownership if their income does not allow for ownership of a separate house, while younger households tend to prioritise home ownership over housing type within income constraints, leading to a greater acceptance of apartment living if this allows them to enter the property market." (Department of Infrastructure and Planning, Growth Summit Background Paper: Opportunities, challenges and choices (March 2010), p.18)

This suggests opportunities for tailoring capacity building and education according to ownership patterns, whether buildings are for investment or are owner-occupied. As well, there is an opportunity to mandate demand management and energy savings standards in the rental stock. Property owners (and developers) could be required to install energy efficient lighting, smart meters and roof insulation prior to selling or renting a property, in the same way that they are required to install water efficient fixtures, safety switches and smoke alarms. This would ensure a rapid penetration of demand management technologies given that houses are sold on average every seven years and rental turnover averages around 18 months. Any additional costs would be relatively small as a proportion of sale price, or spread out over a time in any rental increases. Landlords may however seek to recoup the costs associated with mandatory standards immediately, and push up rents, suggesting a safety net may be required.

2.8 Population growth and urban development

The looming challenge for Queensland's power supply lies in the expected growth rates for Queensland's population. The largest proportion of Queensland's expected population growth will be accommodated in the south-east corner of the State, with an additional 754,000 dwellings required in South East Queensland by 2031 (Department of Infrastructure and Planning, Growth Summit Background Paper: Opportunities, challenges and choices (March 2010), p.17).

> Infill development is expected to play a significant role in accommodating new population – for example, Brisbane City Council expects 138,000 of 156,000 (88per cent) new dwellings to be created from infill development (Department of Infrastructure and Planning, South East Queensland Regional Plan 2009-2031, p.18). New transit oriented development (TOD) communities in particular are expected to accommodate a significant proportion of new population growth in south-east Queensland.

> The new cities of Ripley Valley, Flagstone, Yarrabilba and Caloundra South will in combination accommodate around another 140,000 new households.

The first TODs are also expected to be developed on state-owned land at Yeerongpilly (2011) and the Boggo Road Urban Precinct (2012). And while the new cities will be developed over a period of decades, planning requirements are being developed in the next 10 to 11 months.

The State Government's population growth management priorities around infill (specifically TODs) and new development (specifically four new cities in south-est Queensland) therefore offer strong potential to:

> accelerate unprecedented change in Queensland's built environment on a precinct scale, supported by precinct level planning and building standards

> embed energy-efficient practice into people's lifestyle (rather than requiring them to opt in)

> increase visibility of energy-efficient building exemplars in new precincts in which Queenslanders live, work and play

> accelerate engagement around energy consumption and demand management by building energy communities among those who live and work in these new precincts.

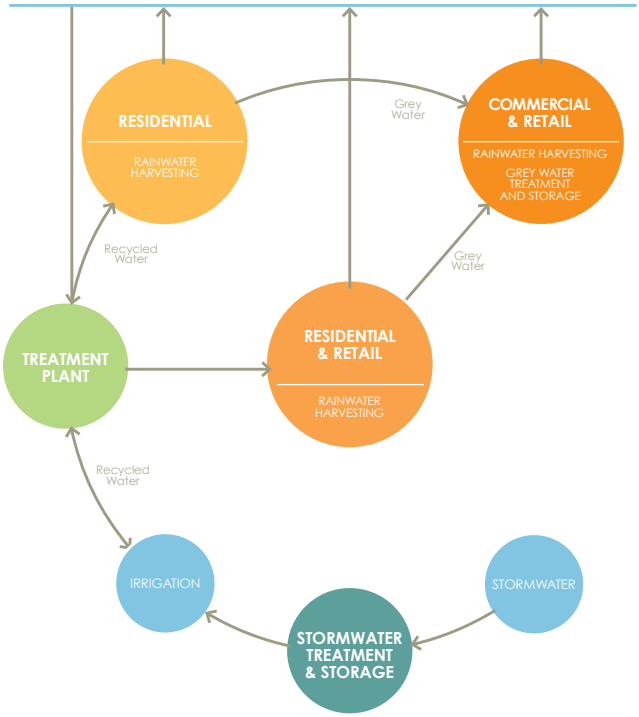
With changing building standards and regulatory requirements, 5 and 6 star rated buildings that incorporate ESD, including energy savings/sharing components, are increasingly becoming the norm. Emerging regulatory regimes such as the Residential Building Mandatory Disclosure requirement are creating premiums for ESD.

Yet demand for ESD is potentially being stifled simply because the exemplar buildings (ie. 6 star commercial buildings, retrofitted homes) are not visible in the broader community. The potential for living with ESD – including energy efficiency - needs to be far more visible to stimulate demand and help build community capacity where people live, work and play.

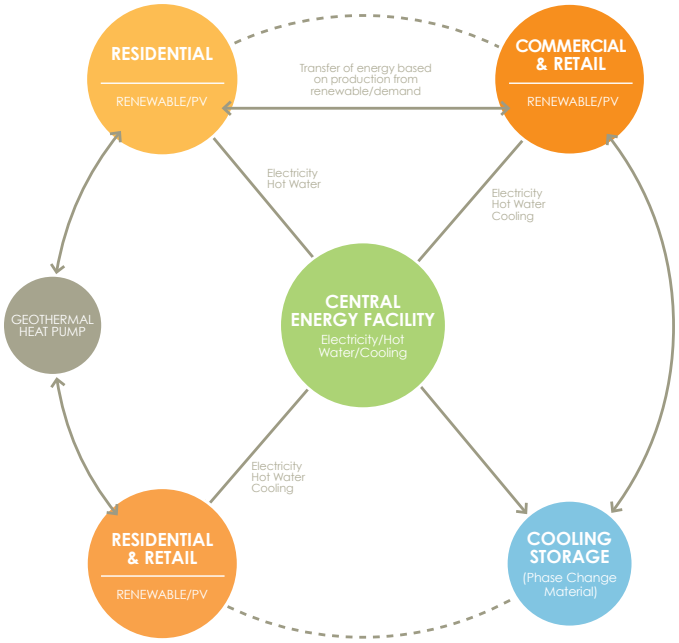
Development of these new precincts presents excellent opportunities for embedding ESD, and increasing the visibility and shared responsibility for sustainable lifestyle practices across the large populations that will be accommodated in TODs and new cities. Engagement programs aimed at building energy communities literally from the ground up could also be employed in Queensland's State of "Green Growth" Precincts. Models such as Brisbane City Council's Ezy Green scheme should be investigated for options to promote community engagement and capacity building around energy-efficient lifestyle choices in these new precincts.

The Queensland Government cannot afford to lose the opportunity to embed ESD in these new precincts, which represent possibly a once in a lifetime opportunity. The SEQ Regional Plan embeds sustainability goals aimed at reducing GHG emissions, including reducing transport usage, increasing efficient use of energy, use of renewable energy generation and low emissions technologies, and utilising sequestration opportunities (p.42-43).

Government and private sector interest in the TOD concept is already growing across the broader south-east Queensland transport network, including projects such as Varsity Station Village, Gold Coast Health and Knowledge Precinct, Eastern Corridor Renewal Strategy, Bowen Hills, Ipswich Regional Centre Strategy and Strathpine to Caboolture Transit Corridor. There is clearly strong potential for the development of ESD corridors linking TODs and new cities, marrying the State Government's emissions reduction goals across the stationary and transport energy sectors.



Precinct-wide strategy for shared water



Precinct-wide strategy for shared energy

Master planning requirements for Queensland's emerging greenfield and brownfield development needs to address interactions within the broader precinct (including between residential and commercial) to achieve maximum ESD gains across a community, and provide shared focus for residents, proprietors and workers in these new precincts. Decisive action now around embedding ESD in design principles for these precincts will reap longer term benefits with large populations of Queenslanders living in sustainable environments.

Mandatory building standards and regulatory requirements do not yet exist for precinct development despite the increasing trend to higher-density living to accommodate population growth in Queensland. Building standards for individual buildings do not articulate opportunities for maximising ESD gains between buildings, or mitigating efficiency losses between buildings (for example, extra cooling requirements to offset glare from reflective surfaces adjacent buildings).

Models for precinct standards are emerging that could inform development of mandatory precinct standards. For example, the Urban Land Development Association have developed the Residential 30 Guideline to provide practical guidance on how residential developments can achieve more diversity to meet the changing needs of the community. The Department of Infrastructure and Planning are also currently investigating model precinct standards in a form that allows them to be adopted as relevant by local governments and giving them regulatory standing in their planning schemes.

The urgency around development in these precincts also presents opportunities to work with the development industry to identify and trial exemplar practice at a precinct level as part of longer-term regulatory framework development for precinct-level ESD standards. Property developers have clearly built ESD capability in anticipation of large-scale regulatory demands that have yet to eventuate. The large developers with whom the Working Group has consulted have freely admitted that by the time standards are mandated they are hardly "(b)leading-edge", thereby largely mitigating financial risk associated with these regulatory imposts.

Example - Development industry has significant ESD capability

"Over the last five years, Queensland's development industry has genuinely embraced environmental targets in individual buildings. Many major developers have formed in-house and consultancy research clusters, aiming not only to achieve high Green Star targets but to lead Australia in innovation, especially for energy, waste and water efficiencies. In Queensland, with its new cities and transit oriented precincts to be delivered within a decade, Queensland can lead by being the first region to implement environmental strategies on a **'total precinct'** basis. This leadership needs Government to establish purposeful objectives and targets for each precinct, from which developers are mandated to develop economically viable strategies which cater for the long term needs of all user groups, integral with minimising the environmental footprint for future generations."

– Andrew Borger, Executive Director, Leighton Properties

Even in the absence of specific precinct-level building standards, there are clearly opportunities for the Queensland Government to tap into this industry expertise. Even a high-level tendering criterion around sustainability is expected to extract innovative responses from an industry well-prepared for such an opportunity.

Similarly, the opportunity exists for the Queensland Government to lead practice in building energy-efficient practice through requirements on its agencies and facilities management requirements for the buildings they occupy. per centThe Working Group is aware that significant reductions in government agency energy consumption are being achieved under the Strategic Energy Efficiency Policy, which requires agencies to invest in energy efficiency and demand management activities. Programs such as Solar Schools are also contributing to the Queensland Government's 'virtual' generator.

Opportunities are available to the Queensland Government to embed principles in planning for government precincts, should it be economic to do so, as a further statement of intent and leadership. Master planning for the Queensland Government Precinct (incorporating the Parliamentary precinct) has strong potential to exemplify the Queensland Government's intent around building sustainable environments and communities. The City of Sydney, for example, has just recently announced a large-scale tendering process for embedding gas generation across 30 buildings in the city precinct, with the specific aim of alleviating the load on the network.

Section 3: Supply

3.1 Queensland is an energy resource rich state

Queensland has a significant proportion of Australia's various energy resources. Lower emission fuels and processes such as natural gas and coal seam gas will assist in providing baseload power solutions as an alternative to current coal-fired plants. Queensland also has abundant supplies of other energy minerals such as lithium, thorium and uranium. Renewable energy generation will provide additional generation capability. Emerging technology will eventually allow for the storage and use as baseload of such resources, and in distributed settings in the short term to reduce grid expansion costs.

3.2 Queensland will continue to supply global demand for energy resources

Although Queensland will continue to take steps to reduce its domestic carbon footprint in the supply of domestic energy, world electricity generation capability is still largely coal and gas based (refer Figure 2). Queensland will remain a major exporter and user of coal for power generation and steel production for the foreseeable future. The Premier announced only recently that she expects Queensland will increase coal production by almost 80 per cent over the next two decades - increasing the State's production of saleable coal from approximately 190 million tonnes per annum up to 340 million tonnes per annum (from address to Queensland Resources Council, 24 November 2010). Queensland will also continue to be a major exporter of coking coal in support of continued global urbanisation and industrialisation in Asia and other parts of the developing world.

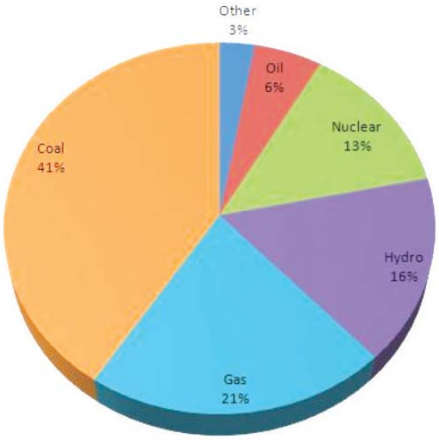


Figure 2: World electricity generation (SOURCE: International Energy Agency, 2008)

3.3 Queensland is a high carbon state

Despite the inroads made in the transition to a lower carbon generation sector - via strategies such as the *Climate Smart* coal conditions and the *Queensland Renewable Energy Plan* – Queensland's energy generation is largely characterised by higher-emission, fossil-fuelled generation. Around 83per cent of electricity generated in Queensland is from coal-fired plant, with gas accounting for 15per cent and 2per cent from renewable sources.

There is no immediate threat to Queensland's electricity supply. Slated projects are expected to meet demand forecasts to 2015/16. The Austrlian Energy Market Operator's 2010 Electricity Statement of Opportunities (ESOO) identifies a need for new capacity in Queensland by 2013-14. The ESOO identifies over 3,000 MW of project proposals in Queensland (refer to Table 2), giving confidence that the 2013-14 requirement will be met. However, most of the proposed projects are for gas–fired turbines which are quick to build, reduce GHG emissions and are currently cost-competitive with coal (though gas surplus will be reduced commencing 2014 as LNG plants start up).

Very few renewable generation projects are making it to market. Surplus capacity and competition for Renewable Energy Certificates from lower cost interstate projects is exacerbating the unattractiveness of Queensland projects in the absence of considerable government backing and indirect or direct public funding. The renewable projects that are appearing are certainly not in the numbers required to skew Queensland's emissions profile in line with the government's ambitions for reducing the State's carbon footprint.

Queensland's electricity network reflects the State's historical reliance on coal, presenting its own set of challenges for alternative fuel supply. Connection to the network will remain a challenge for many of Queensland's alternative energy resources. Opportunities for exploiting resources in isolated areas (e.g. Ergon Energy's isolated networks) and where they are in proximity to dense population centres should be investigated as a priority. Regional development presents an opportunity to innovate with distributed generation capability by exploiting Queensland's energy resources closer to growing population and industrial "hubs", reducing investment costs in large-scale expansion of the distribution grid. Large-scale deployment of alternatives to coal and gas to meet broader supply requirements will however require significant grid investment, for example, to deliver geothermal baseload potential.

Company/operator	Project	Fuel/ technology	Capacity (MW)	Commissioning date	Site	Major comp'ts	Planning consents/ construction approval/ EIS	Finance	Firm construct date Set	Status	Class
AGL Energy	Crows Nest Wind Farm	Wind Turbine	150	TBA	-	-	-	-	-	Pub An	SS
CS Energy	Swanbank F	Gas/ CCGT	400	TBA	✓	-	-	-	-	Pub An	S
ERM Power	Braemar 3	Gas/ CCGT	500	Q1, 2013	✓	✓	-	-	-	Pub An	S
Origin Energy	Darling Downs Stage 2	Coal Seam Gas/ CCGT	519	TBA	✓	-	-	✓	-	Pub An	S
Origin Energy	Spring Gully	Gas/ CCGT	1000	TBA	✓	-	✓	✓	-	Adv	S
Stanwell Corporation	Burdekin Falls Dam Hydro Power Station	Hydro	35	2013-14	✓	-	-	-	-	Pub An	SS
Stanwell Corporation	Wandoan Power Project	Black coal/ IGCC with CCS	334	2015-16	✓	-	-	-	-	Pub An	S
Transfield Services	Bowen Wind Farm	Wind Turbine	101	Q4, 2015	-	-	-	-	-	Pub An	SS
Transfield Services	Crediton Wind Farm	Wind Turbine	40	Q4, 2016	-	-	-	-	-	Pub An	SS
Transfield Services	High Road Wind Farm	Wind Turbine	50	Q4, 2012	-	-	-	-	-	Pub An	SS
Bow Energy	Blackwater Power Station	Coal Seam Gas	30	TBA	✓	✓	-	✓	-	Adv	NS
Transfield Services	Windy Hill II Wind Farm	Wind Turbine	13	Q4, 2016	-	-	-	-	-	Pub An	NS

Table 2: Advanced and publicly announced proposals – Queensland (Source: Australian Energy Market Operator, Electricity Statement of Opportunities (October 2010), p. 98)

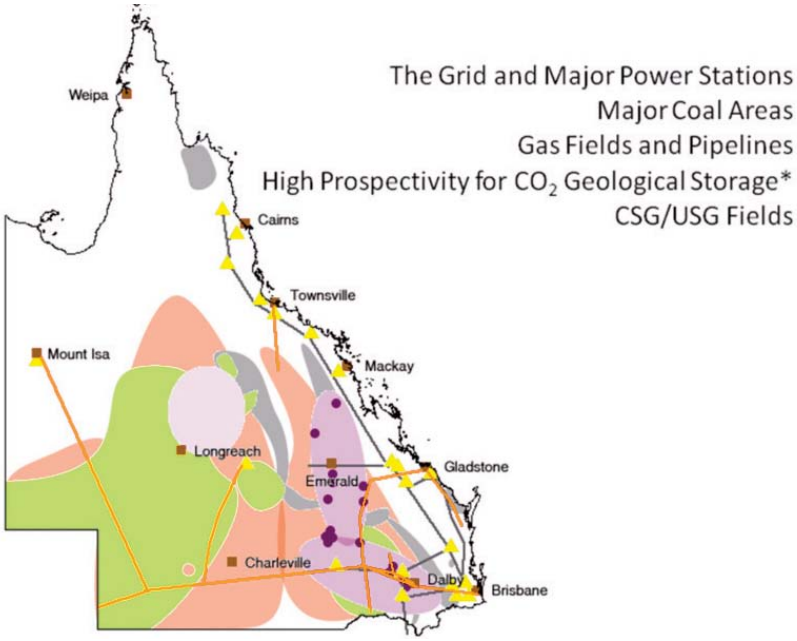


Figure 3: Queensland's Coal and Gas reserves

Coal (and increasingly gas) is a double-edged sword for Queensland's energy sector. On the one hand, this abundant natural asset has created enormous economic benefit as an export commodity, and has resulted in the attractiveness of Queensland for industry through low (wholesale) power costs. Indeed, due to the abundance of inexpensive coal-fired power, Queensland currently is a net exporter of energy to the national grid. [1]On the other hand, the abundance of coal, and increasingly gas, is chaining the State to a carbon emissions profile already skyrocketing as a result of the reliance on fossil-fuelled generation plant – an emissions profile that will only become increasingly unattractive as the price of its environmental impact becomes explicit and fully costed in a carbon-constrained future.

CASE STUDY: Government Support for Fossil Fuels Far Outweighs Support for Renewables

In July 2010 Bloomberg New Energy Finance (BNEF) reported that governments of the world provided approximately $43-46bn to renewable energy and biofuels technologies, projects, and companies in 2009. This total included the cost of feed-in-tariffs (FiTs), renewable energy credits or certificates (RECs), tax credits, cash grants, and other direct subsidies. This figure stands in stark contrast to the $557bn spent on subsidizing fossil fuels in 2008, as estimated by the International Energy Agency in its World Energy Outlook Report for 2010.

[1] Queensland currently exports enough 'maroon' electrons every day to power 800,000 'blue' houses in New South Wales

This paradox is central to Queensland's greatest challenge in achieving a lower carbon generation sector – the State's 'problem', as it has been described to the Working Group. The emissions reduction task underpinning the transition to a lower carbon generation sector is represented in Graph 1, and demonstrates how far Queensland has yet to go to achieve the generation portfolio mix required to achieve sizeable emissions reductions.

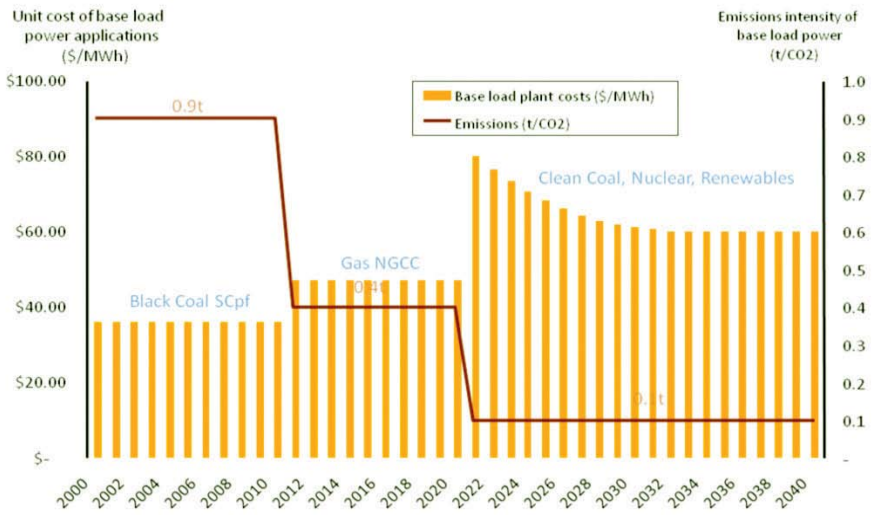


Figure 4: (SOURCE: AGL Corporate Affairs (2009) 'Energy Market Outlook' (Mimeo), Sydney. Available from mnolan@agl.com.au)

3.4 The future of coal and gas in domestic power generation

The coal conditions specified in *Climate Smart 2050* have established very clear parameters for the commissioning of new coal-fired plant in Queensland – essentially preventing anything other than low emissions coal generation or CCS-ready plant to be commissioned. Kogan Creek was the last new investment in coal-fired generation in Queensland five years ago, and general opinion shared with the Working Group is that climate change politics and its impact on financing decisions will deter further investment in coal for the time being. For example, WESTPAC has clearly articulated it will not finance coal-fired generation projects (AFR, 17/11/1, p1), though ANZ has refused to rule out this option.

In the short term, Queensland is “overweight” for baseload generation - that is, generation to meet average minimum demand, and which in Queensland is predominantly from coal and gas. This gives the State time to consider its options for longer-term ambitions for reliable, low emissions baseload technology.

The concept of hybridisation is proving an effective pathway for transitioning existing coal-fired plant to a lower carbon operational environment. Coal-fired generators have started to explore opportunities for offsetting emissions through the deployment of hybrid strategies, such as the 44 MW solar thermal booster at Kogan Creek and the use of algae at Tarong to reduce emissions. Government ownership of generation assets offers scope for embedding market-ready energy innovation aimed at offsetting GHG emissions.

Particularly in the case of Concentrated Solar Thermal (CST), many of the less proven components at the power block end of the process (e.g. the turbine, cooling and storage technologies) necessary for its use as baseload generation, would not be required in a hybrid situation where the solar steam generators are used to provide thermal energy to conventional power plant primary heating. This is a low risk, least cost option to dramatically reduce conventional plant emissions by renewable augmentation.

Example - Queensland Government invests $1 million in algae carbon capture project

The Queensland Government has committed $1 million for a groundbreaking trial which uses algae to soak up carbon emissions from a coal-fired power station. The Tarong Power Station near Kingaroy will be the first coal-fired power station in Australia to try the technology as part of the $5 million MBD Energy Limited Tarong trial. As part of the trial, MBD Energy has constructed a one hectare algal biomass display plant beside Tarong Power Station. MBD Energy has also agreed to build facilities next to power stations in Victoria (Loy Yang A) and New South Wales (Eraring Energy). The Tarong Power Station test plant, once fully built, is expected to capture about 700 tonnes per annum of CO2, the equivalent of taking 170 cars off the road. It is also expected to produce one tonne of algal biomass per day, 120 tonnes per annum of algal oil and 240 tonnes per annum of algal meal by 2012. The Algal Synthesis process involves the injection of carbon gases into waste water contained in large plastic tubes to produce oil-rich algal biomass every 24 hours. The sale of the products could offset the cost of building and operating the carbon capture technology.

However, it is the viability of CCS technologies that will have the most significant implications for achieving a lower carbon generation sector in Queensland. CCS is expected, in particular, to contribute the deep cuts to emissions that will be realised via low emissions baseload generation, as well as ensuring system security to support greater deployment of intermittent renewables. Queensland's support for CCS is perceived in some quarters as institutionalising coal as the State's major fuel source and preventing meaningful exploration of new technologies [The Australian, 21/8/2009]. Queensland's enthusiasm for any technology or mechanism for extending the usable life (and maintaining the value) of coal reserves is shared by the Federal Government through initiatives such as the CCS Flagships.

The Working Group understands the Queensland Government's vested interest in making clean/low emissions coal work as part of a diversified portfolio, and the drivers for the State's already considerable investment in CCS R&D via the Zerogen and Callide Oxyfuel .

The Working Group has, however, encountered enough scepticism about the potential for CCS to be concerned about relying on it primarily to secure Queensland's low emissions baseload future. The Working Group has heard competing claims about the viability of CCS, including its cost-competitiveness, the timeframes in which it might be available for commercial-scale deployment, and whether indeed it may be overtaken by advances in other technologies before it is even proven to be a viable technology. A major stumbling block for the CCS vision is a clear understanding of the viability of geo-sequestration (burying the emissions in the ground) and particularly the position of appropriate reservoirs near potential generation sources. With viable storage capacity yet to be identified in Queensland, there is a substantial question mark over this technology and its role in securing a future role for coal in a lower carbon generation portfolio. The Australian Energy Market Operator (AEMO) has noted that CCS is not expected to "have a significant short- to medium-term impact … and [in AEMO's view] coal generation faces real challenges." [AEMO].

Emerging opportunities around other sequestration technologies suggest that a more diversified approach to low emissions baseload – coal, gas or otherwise – may be a more prudent hedge for a lower carbon future. The Working Group has been alerted to opportunities in soil, vegetation and seawater sequestration that are worth pursuing in parallel with the current R&D focus around CCS. These sequestration options are certainly not without limitations or questions about their technological and commercial viability.

The perceived potential around these (and maybe other) emerging technologies suggests they warrant and will benefit from an R&D investment similar to that currently afforded to CCS. A more broadly-based R&D investment across all sequestration options is considered more likely to deliver the commercially viable low-emissions baseload option that will underpin the long-term transition to a lower carbon generation sector in Queensland.

It is however possible that none of the sequestration options will work. Queensland's alternatives, should CCS or any other sequestration option not prove viable, are limited. Either the State accepts the emissions and pricing risks associated with growing the gas-fired generation fleet for this purpose, or look for alternative low emissions baseload options.

Gas has been the success story for lowering carbon emissions in the short term, with significant investment in gas plant since the commencement of the State's 13% Gas Scheme in 2005. There are currently 23 Accredited Power Stations with a total capacity of 3,511 MW. Of this, 2,776 MW was installed since May 2000 (i.e. has been developed as a result of the scheme). Around 27.35 million certificates have been registered under the Scheme, representing 27.35 million MWh of generation and around 12.1 million tonnes of avoided CO2 emissions.

The reliance on another – albeit 'cleaner' – fossil fuel for electricity production reduces but does not discharge Queensland's emissions liability or task. Significant growth in power industry demand for natural gas is forecast. Over-reliance on gas could potentially see emissions from gas-fired generation mushroom.

International competition for gas also has the potential to price this resource out of the domestic market. Notwithstanding the Government's policy of ensuring gas supply is available for domestic purposes, it is anticipated producers would seek similar pricing for reserves used for domestic supply. Recent experience has demonstrated the volatility of commodity markets and the unpredictability of pricing trends and benchmarks. As Western Australia has discovered, the best laid plans for energy policy and industry development reliant on even the strongest available resource can easily be derailed by externalities beyond the control of any one government.

Example - Western Australia's reliance on gas – a cautionary tale

Western Australia is highly reliant on natural gas. Natural gas supplies 51% of Western Australia's primary energy, and fuels 60% of the State's electricity generation. Just 40 per cent of the State's generation is from coal and renewable energy sources.

The Western Australian gas supply market is also highly concentrated. Two operating entities hold close to 100% of gas reserves in developed fields. The current joint marketing arrangements for the North West Shelf joint venture significantly reduce competition by reducing the number of independent producers selling into the domestic market.

Any change in the availability and price of gas has a direct impact for Western Australian industry and households. Western Australia's gas prices have almost tripled in the past few years, with retail prices doubling in the same period.

The current gas supply market is undermining the State's competitiveness as a place to invest as energy prices escalate. Coal-fired generation projects are also becoming more competitive, and mothballed coal-fired plant has been recommissioned in recent times to secure supply.

The loss of almost 35% of gas supply as a result of the Varanus gas explosion in 2008 highlighted the State's reliance on continuous supply of gas for industrial processing, manufacturing, residential use and electricity generation. Gas supplies to the south west of the State were reduced by a third. The Federal Government intervened to authorise the release of emergency fuel reserves to mitigate the risk of a shortfall in transport fuel when many large gas users switched to diesel for power generation.

3.5 Baseload alternatives

The Working Group considers it imprudent to discount other options for low emissions baseload, particularly given that no clear contingency plan appears to be in place in Queensland.

CST technology is emerging as a potential baseload power source. The energy generation part of the CST equation is well developed (with plant having been operational in the USA for over two decades). However, its application for baseload provision relies upon storing thermal energy for use outside sunshine hours. Large-scale deployment is hindered by the relatively high cost of the basic plant (~$4/W capacity) which is further increased if storage is added. The Federal Government's Solar Flagships program will aim to build one large CST plant (of order 200MW) by 2015, potentially attached to one of Queensland's existing coal-fired power stations. This learn-through-doing exercise will determine the short-to-medium term future of CST power in Australia.

Presently, however, geothermal and nuclear energy offer the two best known opportunities for low-emission baseload electricity generation. However, as with CCS, neither is presently available for large-scale commercial deployment in Queensland.

Geothermal energy is the subject of significant commercial interest in Australia, focussed in South Australia and Queensland. Hot fracture rock geothermal energy (whereby water from a surface source is cycled across geologically hot rocks by fracturing those rocks between an injection and an extraction well) is the approach predominantly being pursued in Queensland. Hot fracture rock geothermal energy is however technically very immature and unproven commercially.

Hot aquifer geothermal generation (whereby existing hot water bodies at lesser depth than hot fracture rock is tapped) is utilised for power generation in Queensland (1.8MW at Birdsville). This method is conventional technology and is proven both commercially and technologically, although it does produce less energy per well. By 2008, total installed global capacity of conventional geothermal power generation exceeded 10GW with the USA, Philippines and Indonesia having the largest installed base. Geological surveys point to some hot aquifer geothermal resources in western Queensland - with the attendant transmission connection issues similar to those for all geothermal resources in Queensland). Hot sedimentary aquifers are however being targeted through the current call for tenders around Birdsville and other regions in western Queensland, and through the Coastal Geothermal Energy Initiative around Barcaldine (Eromanga/Galilee Basins) and Roma (Surat Basin).

Queensland enjoys a comparative technological advantage in geothermal energy through the establishment of the Queensland Geothermal Centre of Excellence. This research centre funded by the State Government and based at the University of Queensland will create core competency in Geothermal Engineering in a clear attempt to exploit the State's natural resource advantage.

The Working Group also supports the Queensland Government's investment in exploration activities (for example, under the Coastal Geothermal Exploration initiative) in anticipation of geothermal eventually forming part of Queensland's generation mix., The Working Group is of the view that there is a more important role for the State Government in pursuing Federal funding for costly network connection once geoethermal generation is commercially viable. Access to funding under the Federal Government's "Connecting Renewables" initiative, which will see $10 billion allocated over the next 10 years to connect renewable projects to the grid, will be critical to the successful deployment of geothermal projects in Queensland.

The Working Group is concerned that nuclear is not under active consideration to understand its potential as part of Queensland's future lower carbon generation portfolio. There are now over 440 commercial nuclear power reactors operating in 30 countries, with 376,000 MWe of total capacity, providing about 14 per cent of the world's electricity as continuous, reliable baseload power, and their efficiency and safety is increasing. 55 further nuclear power reactors are under construction, equivalent to 16per cent of existing capacity, while over 150 are firmly planned, equivalent to 45 per cent of present capacity. While nuclear generation is not considered likely for Queensland in the short- to medium-term, it needs policy consideration given that the State has significant uranium deposits, and the capacity to build knowledge and capability in the nuclear fuel cycle.

The Working Group is well aware that nuclear generation is highly contested within the scientific, environmental and broader community. The absence of regulatory frameworks providing for nuclear energy generation will require significant political, policy/regulatory, technical and community acceptance issues be resolved ahead of initiating a debate on this issue in Queensland. However, in light of significant technology advances, greater international acceptance, and changes in community sentiment, the Working Group considers nuclear energy generation warrants further science-based dialogue between the Queensland Government and the community.

Interestingly, the timeframes for both nuclear and geothermal options parallel the timeframes in which CCS is currently forecast to be commercially deployed. Hot fracture rock geothermal technologies are not expected to be commercially viable until toward the end of this decade at the earliest. The Working Group has heard various estimates for nuclear generation deployment of between 8 and 20 years, meaning from a standing start in 2011 the earliest Queensland would be in a position to deploy nuclear generation is 2019, and more likely closer to 2030.

However, the clear difference between nuclear power and CCS is that the former is well proven with defined costs and progressive improvements (such as the next generation of fast breeder reactors) leading to safer, more efficient, cheaper plant producing very small amounts of waste. Queensland's issue (and indeed Australia's issue) is that we have no skills in the sector, having virtually abandoned the nuclear sciences and engineering several decades ago. The Working Group is not recommending the deployment of nuclear energy generation in Queensland, but believes it prudent to explore the issue around what would be required to implement such an option should the Government and the people of Queensland wish to do so.

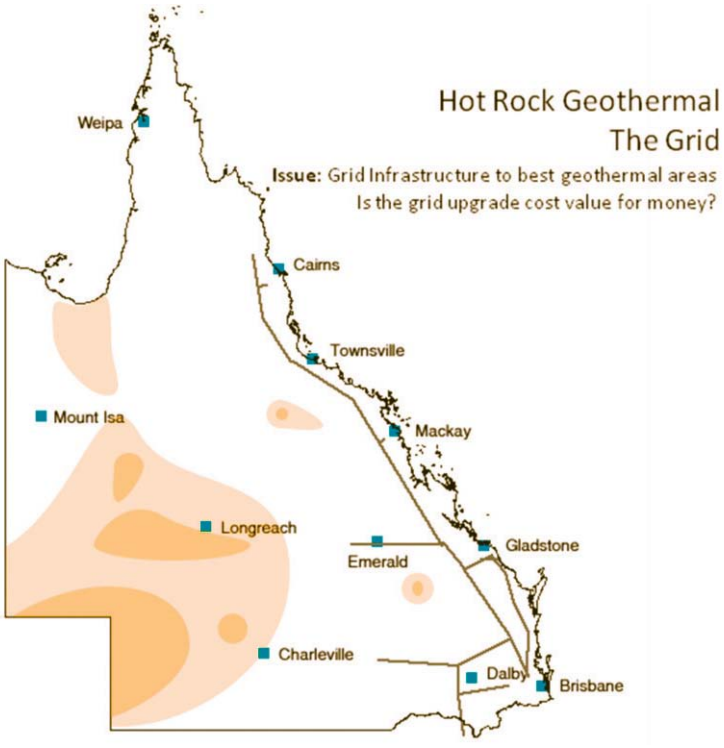


Figure 5: Queensland's Hot Rock Geothermal Resource

3.6 The future for renewable generation in Queensland

Even allowing for increasing demand, the Queensland Government's ambition that renewable resources account for 20 per cent of energy generated in the State would require a significant displacement of fossil-fuelled generation. Currently, generation from renewable sources accounts for just 2 per cent of all generation supplied into the grid. The two biggest challenges to deployment in Queensland of renewable generation – that is, cost-competitiveness with coal and gas, and the distance of better-quality resources from the transmission grid (and the corresponding impact for transmission connection) – continue to frustrate the development of large numbers of commercially viable renewable generation projects in Queensland. As proponents of the Solar Flagships program have now discovered, the legislative framework is not designed to accommodate the simple connection of renewable energy plant into the grid. Although Queensland has renewable energy resources available, the issue largely comes down to "at what cost?" and "who pays?".

As Figure 6 shows, renewable energy sources remain far from cost competitive with coal and gas. Relatively mature technologies such as PV , CST and wind are only now beginning the descent down the cost curve driven by the economies of scale in production. For example, the cost of a PV panel has halved in the last 24 months and now wholesale prices below $2/watt are common place. It is expected costs may halve again by 2015. However, the Working Group has received consistent advice that there is no expectation that renewable technologies will achieve cost-parity with utility-scale fossil-fuelled generation in the short- to medium-term, particularly in the absence of interventions such as carbon pricing or renewable energy targets.

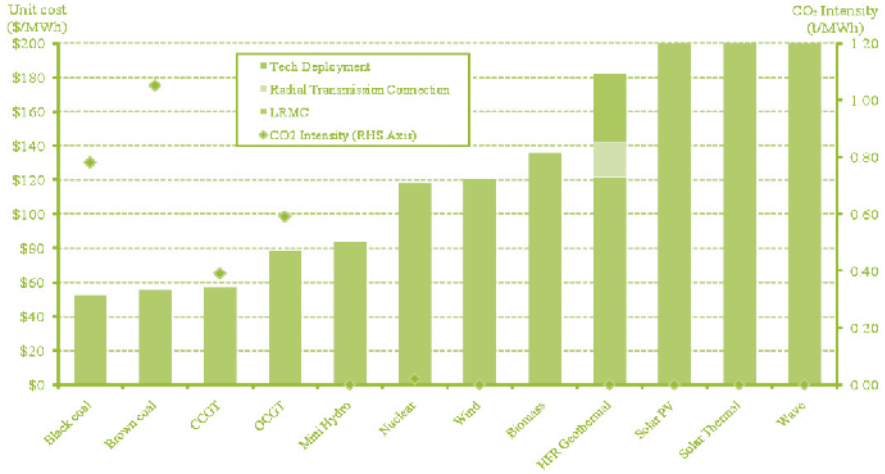


Figure 6: : LRMC of Generating Plant in the NEM (ex Carbon) (SOURCE: Simshauser, 'The hidden costs of wind generation in a thermal power system: what cost?' (Paper no 18), 2010)

The Federal Government's 20% Renewable Energy Target has stimulated significant deployment of renewable generation. It is considered unlikely that any generation technology not presently commercially viable will contribute to achieving 20 per cent target (apart from potentially some solar under the Flagships program).

To date, investment in renewable generation has largely been in wind technologies and some hot aquifer geothermal capability in South Australia and Victoria, with very little investment in Queensland. Projects in southern States represent the low hanging fruit for attractive renewable generation investment, ticking all the boxes for proven strong resources, mature technologies, closest unit costs to underlying wholesale market prices, and proximity to transmission networks.

Nevertheless, mapping points to strong renewable resources across Queensland, and there are many examples across the State of the deployment of renewable generation projects. As noted in a recent Roam (2010) report, Queensland has significant renewable energy resources located in close proximity to the existing grid. While not as economic as some resources in southern Australia, the Queensland resources have the advantage of grid location. Best sites are obviously being exploited right now in Southern Australia because good resources are close to grid and population. As these are gradually exhausted however, Queensland resources will start to become economic because lower wind speed is lower cost than high wind speed, but extensive transmission augmentation is required.

Roam (2010) also noted that Queensland will eventually make a significant contribution to the 20% Renewable Energy Target.

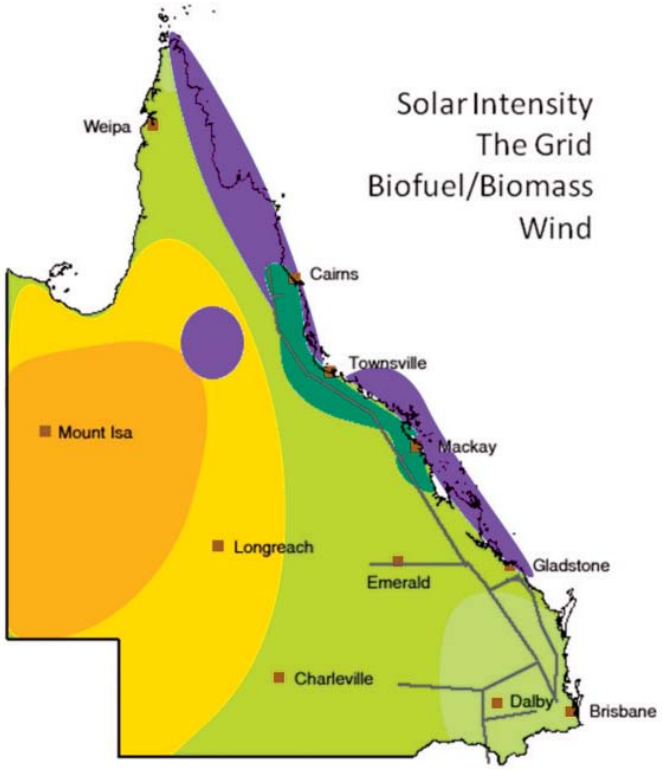


Figure 7: Queensland's solar resource (Data Source: Department of Employment, Economic Development and Innovation)

The Queensland Government's support for the renewable energy sector has been undeniably strong. However, with the exception of wind and solar projects aimed at offsetting diesel consumption in isolated communities which appear to have successfully merged cost benefits, resource and opportunity considerations, for the most part government investment appears aimed at "picking winners".

The government must trust the market more to deliver appropriate low emissions solutions, and direct stimulus toward invigorating investment in the renewable generation sector where the market determines it is possible. The ability to stimulate the renewables sector is well within the State's capacity via its procurement and regulatory power.

3.7 Adoption of an emissions threshold as a supply-side signal

It is inconceivable the Queensland Government would elect to commission another coal-fired generator – CCS-ready or not. No new coal-fired plant has been commissioned in the last five years. Yet even so, other Australian State governments continue to commission new, and recommission previously defunct, coal-fired plant to address increasing energy demands in a cost-effective way. The New South Wales Government has publicly supported further coal developments and . New South Wales is also proposing to support future coal-fired generation through running a coal mine itself. Western Australia has also allowed development of Bluewaters project.

Clearly this is a decision that would not be taken lightly given climate science politics and the interests of the community and investment markets. Equally, it is clearly not impossible that other imperatives might make it expedient to permit new coal-fired plant.

With inbuilt latitude in the Queensland Government's policy for coal-fired plant to be built in anticipation of commercial-scale CCS, the Working Group is keen to discourage "silly" investment decisions around coal. A stronger signal to community than the current "CCS readiness" clause will also provide greater certainty for investment decisions for Queensland's energy generation sector.

The Working Group has received consistent advice that a carbon price – in whatever form that takes – is already being factored into Australian businesses' financial models. It is also the case that a carbon price is required to stabilise the investment environment for new energy generation projects. Financing for energy projects has become enormously difficult to secure since the GFC, with mixed carbon policy signals making both renewable and fossil fuel energy projects unattractive for varying reasons.

The opportunity exists for Queensland to fill the void created by the Federal Government's indecision on carbon pricing, with clear opportunities for the Queensland Government to be bolder in sending signals that will create markets for renewable generation investment.

An emissions threshold of no more than 0.7 t CO2-e per MWh for all new power station plant is suggested as a significant reduction in current emissions which is technologically achievable with current generation equipment in a financially viable manner. The proposed emissions threshold would provide a clear signal to the market that Queensland is open for business in the lower carbon generation sector – acting to clarify and enhance the certainty for investment decisions for Queensland's generation sector.

A 0.7 t CO2-e per MWh threshold is lower than the Victorian Government's "Green Door" threshold of 0.86 t CO2-e per MWh, as well as the national energy efficiency strategy proposal for a 0.8 t CO2-e per MW. However, such a threshold is not considered likely to create any immediate threat to secure supply. All existing plant in Queensland other than coal-fired is expected to meet this standard. Existing open cycle gas turbines would meet this threshold, with gas technologies providing a safeguard for lower emissions baseload options. This threshold could

also be reduced over time - as technological advances, market economics, and plant life cycle considerations allow – to impose even greater discipline on generation investment decisions in Queensland aimed at achieving greater reductions in the State's carbon footprint.

Queensland should consider rewarding investment in projects that are below the threshold with streamlined planning processes already in place for significant State projects and high value mining projects. Some large projects may already be eligible for this treatment based on state significance criteria Conversely, the Coordinator-General's process might be onerous for smaller projects. These issues would need to be addressed in determining an appropriate planning regime for low emission projects.

3.8 Leveraging the resources of Government

The Working Group believes the State Government also has yet to deploy its greatest asset to stimulate investment in energy resources in Queensland, especially in renewable energy sources – its purchasing power. The Queensland Government holds the investment rating financial institutions currently crave, and in combination with a long term supply contract, has the potential to be attractive in the currently highly risk-averse financing environment.

A large procurement activity will pump-prime the investment environment for renewable energy projects by addressing the key impediments to renewable projects – that is, long-term supply contracts with investment-graded clients, and in so doing increasing the attractiveness of Queensland projects relative to the "lower hanging fruit" in other States. The Victorian Department of Energy went to the market early in 2010 with an electricity procurement contract incorporating a 25 per cent renewable requirement. Anecdotal advice indicates this procurement activity generated significant interest in the industry and diverted interest from projects in other states. Similar contract offerings for long-dated (20+ years) contracts for renewable energy have been made by Melbourne Water, the Melbourne Desalination Project and Adelaide Desalination Plant, among others, all of which have had the effect of stimulating investment in new renewable energy plant in their respective jurisdictions.

The most attractive element of this proposal is that the majority of risk remains with the industry, who will determine the best way to meet the contractual requirements. This proposal also makes the market responsible for picking the winners on commercial grounds. There is also potential to flush out viable renewable projects that may have been unknown to government in the absence of an environment that makes them commercially attractive.

The government bears some risk in pursuing this option, including sunk costs associated with conducting the procurement, and the perceived and real costs associated with affording preferential treatment to renewable generation sources in pursuit of policy objectives aimed at reducing the State's carbon footprint. The Queensland Government has used its procurement power to secure better deals, for example in telecommunications, and in this sector has also used aggregated loads to achieve other policy objectives around broadband access.

3.9 Regional development

State procurement will have powerful benefits for regional Queensland. The energy resources that will drive Queensland's lower carbon future lie, still largely unexploited, in the far-flung corners of the State. While disproportionate population growth in the south east corner is driving energy demand increases, regional Queensland will be critical for the diversified energy economy on which the State's lower carbon future will rely.

The strong geographical 'organisation' of energy resources in Queensland presents an opportunity for government to focus regional development activities around industrial capacity built around specific energy resources. The designation of energy hubs would create focus for building critical mass around emerging generation technologies, and the associated potential in that area for distributed generation, commercial and industry growth, research and export opportunities. While the strains of population growth are not likely to be as pronounced in regional and rural Queensland, areas outside the south-east corner represent opportunities for demonstrating and incubating generation projects.

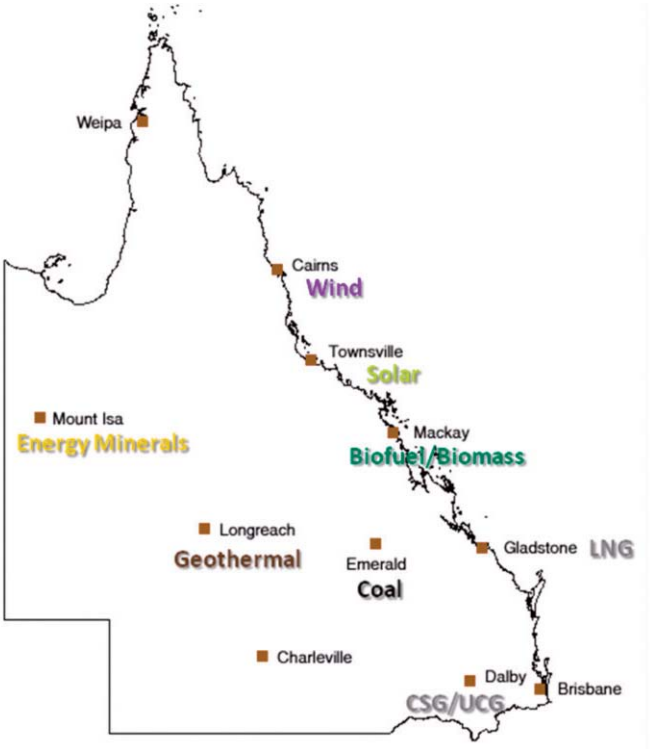


Figure 7: Potential Energy Hubs in Queensland

The creation of energy hubs would help build capacity in regional Queensland in parallel with the directions for investment signal and market development outlined in this report. The creation of energy hubs would require focussed government action around:

- building capacity on the ground for innovation in emerging energy technologies – both renewable and fossil fuel given a role is anticipated for both in a diversified generation sector
- encouraging the decentralisation of research – both public and private - to regional centres identified with potential as energy hubs to build critical mass in these areas
- realising broader macro-economic opportunities for binding energy industry development and the government's regionalisation goals in relation to population management, employment and skills development
- actively engaging regional communities to build acceptance and capacity to support realisation of benefits from energy industry development.

Building knowledge-based businesses and capability around a range of energy resources will help position Queensland at the forefront of providing services to the mining and energy sectors globally, regardless of the change in the mix of fuels used in energy generation.

Mackay has been identified as an initial focus for government investigations around the energy hub concept. Bagasse currently accounts for 70 per cent of Queensland's renewable generation and is clearly the most mature renewable energy technology utilised in Queensland. Unlike hydro, bagasse presents significant growth opportunities with advances in both fuel sources and the technology. The process of building critical mass has already commenced with a mature energy technology still with growth potential around emerging fuel and technology options, a strong industry base courtesy of the mining boom in the area, and the emergence of a more focussed R&D effort with the opening of QUT's Mackay Renewable Biocommodities Plant. Lifestyle issues that will also have bearing on the success of the energy hub concept, particularly those in more remote parts of Queensland, and are also less pronounced in the Mackay region.

Cities around the world have also built their sustainability credentials through localised generation and demand side action to build energy communities. For example, cities in the 30 European Union countries now signatory to the Covenant of Mayors, are actively working towards a 20per cent reduction in GHG emissions by 2020, through actions around built environment (including new buildings and major refurbishment), municipal infrastructure (district heating, public lighting, smart

grids), land use and urban planning, decentralised renewable energy sources, public and private transport policies and urban mobility, citizen and, in general, civil society participation, and intelligent energy behaviour by citizens, consumers and businesses. (source: http://www.eumayors.eu/home_en.htm) Brisbane City Council is pursuing similar strategies under its Green Heart environmental sustainability program, which aims to make Brisbane a carbon-neutral city by 2026.

The Working Group also consider Townsville is well-positioned as an energy city, based on its successful Solar City project and investment in large-scale energy-efficiency practice in key institutions like the local university and hospital. The opportunity clearly exists for the city's energy credentials to be an even stronger focus of the Townsville Futures Plan.

CASE STUDY: Indonesia to Expand Geothermal Use to Power Regional Development Across the Country

Indonesia has arguably the world's greatest geothermal potential, and possesses significant coal bed methane resources as well as hydro potential in respect of renewable energy. However, Indonesia is also amongst the world's largest emitters of greenhouse gases. Indonesia's Copenhagen Accord commitments include a voluntary 26 per cent reduction in emissions by 2020. Indonesia has identified the potential for an additional 15-16 per cent reduction in emissions with the support of other parties.

Indonesia, has already 1,189MW of installed geothermal capacity out of government identified total geothermal resources of 28,453 MW. The Indonesian Government plans to increase capacity by 250per cent to 2,897 MW by 2014, with a further doubling by 2025. The plan will be supported by just announced US$1.8 billion funding, comprising development grants ($300m) and lending ($1.5bn) from various Climate Investment Funds. The focus of much of the development of geothermal energy is to provide power to regional cities and centres beyond existing baseload capacity supplying the grid on Java servicing the larger cities. Favourable power tariffs, long Power Purchase Agreements and the availability of carbon credits makes investment attractive for commercial investors alongside Government action.

The development of geothermal is in the context of The National Action Plan Addressing Climate Change prepared in 2007 (the NAP), which is a general guide to be used by multiple Indonesian institutions to provide for a co-ordinated and integrated approach to addressing climate change. The NAP is referred to as a "dynamic policy instrument". It is supported by Ministry policies, for example the Ministry of Public Works recently released National Action Plan on Mitigation and Adaptation to Climate Change specific to Public Works which includes policies, strategies and programs to lower impacts of climate change in the public works sector. The NAP lists the regulatory efforts to be implemented for tackling climate change in categories including short–term and long-term implementation.

Panax, a Brisbane-based, ASX listed company has two joint venture projects in Indonesia which are expected to deliver 30MW in Flores to the regional centre of Ende to replace diesel powered generators, and 6MW for off-grid power for underground mining operations at Dairi Prima in Sumatra. Panax, one of a number of Australian companies developing projects in Indonesia, uses the commercially and technologically proven Hot Aquifer geothermal power production process. Panax has geothermal operations in South Australia, Indonesia and India.

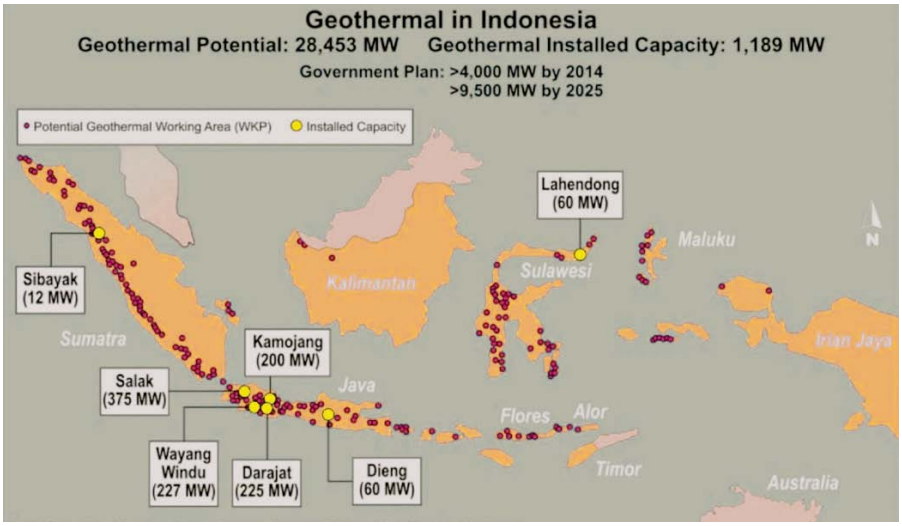


Figure 8: Geothermal in Indonesia (Source: http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTFper cent203per cent20Semi-Annualper cent20Operationalper cent20Reportper cent20nov82010.pdf dated 12 November 2010)

Section 4: Investing in Queensland's energy future

4.1 Queensland Government's investment in R&D and technology

The directions for energy supply and demand recommended in this plan highlight the Working Group's priorities for R&D investments to accelerate delivery of Queensland's lower carbon future. R&D investment in low emission generation technologies, network strategies, community capacity building and systems integration are expected to support the directions proposed for a long-term plan for Queensland's lower carbon energy sector.

The Working Group has however been concerned about the ad hoc investment in technologies by the Queensland Government in the absence of any policy framing for these decisions, and the perceptions this creates about government "picking winners". The opportunities for creating market and investment signals recommended in this plan are specifically aimed at creating the environment and incentives for industry to flush out opportunities.

'Our responsibility as a nation is not to seek to select the best energy mix but to **invest in appropriate research and development activities** which enable the market to determine the appropriate energy mix over time.' – Martin Ferguson, Australian House of Representatives Official Hansard, 19 October 2010, p.756

4.2 Learning by doing

The Queensland Government's practice of "learning by doing" via demonstration projects to trial emerging technologies has received strong support from industry representatives with whom the Working Group has consulted. This model for capacity building around emerging energy technologies has also been supported for its ability to build critical mass around energy hubs. These projects are clearly seen as demonstrating that applied research will build capacity and skills for Queensland's diversified energy sector. The Working Group supports continuation of this approach.

The Queensland Government needs to be vigilant for opportunities to leverage Federal Government funding for these projects. The considerable funding that will flow through the Australian Centre for Renewable Energy (ACRE) should be a particular focus for the Queensland Government given its primary objective is to promote the development, commercialisation and deployment of renewable energy and enabling technologies and to improve their competitiveness in Australia. ACRE has already allocated $32 million in funding to Kogan Creek's Solar Booster initiative. ACRE funding is however going to other Australian States, and Queensland needs to be competitive in securing access to this money.

The Queensland Government has significant capacity, via agencies and government-owned businesses, to stimulate demand for the innovation that will be critical to achieving a lower carbon future. Agencies and government-owned corporations are already required to seek opportunities for enhancing the energy credentials of their buildings. There are however further opportunities to use purchasing decisions to embed market-ready innovation into the built environments, and to support the practices, of agencies and government-owned businesses, as a means to accelerate the commercialisation of viable technologies.

The Queensland Government's considerable capacity to support the investigation and development of technology and service capabilities in a range of energy sources needs to be well directed. The Working Group is aware that DEEDI has been looking at ways to better frame government technology investments to meet government priorities. This attempt to impose a disciplined approach to government investment is commended to make sure limited resources are deployed to best effect, and ensure accountability around public spending.

CASE STUDY - RedFlow: A Queensland success

RedFlow develops and sells advanced energy storage systems into the rapidly growing electricity utility and renewable energy markets. The cost-effective storage of electrical energy – i.e. batteries that have the capacity to store tens to hundreds of kilowatt-hours of power (enough to run a household or small community for several hours) - helps connect non-continuous renewable energy sources such as wind or solar to the grid, and to smooth out peak loads. Through some innovation support and by becoming embedded in the supply chain of Ergon Energy, which is deploying thirty “plug and play” energy storage systems to reduce peak demand on stressed assets in their Single Wire Earth Return (SWER) and rural electricity networks, RedFlow has attracted investment and export orders. RedFlow plans to list on the Australian Stock Exchange on 14 December 2010.

4.3 A framework for investment

Development of a technology framework will be strengthened by a mechanism to assess R&D and technology spending against government objectives. R&D Queensland performs a similar role in relation to the government's considerable R&D investment. R&D Queensland could therefore be positioned to undertake this additional function pending resolution of issues around domain knowledge and Cabinet reporting arrangements.

Expert knowledge would need to be brought into these discussions, probably entailing external representation. Though not typically a feature of committee meetings, external representation is key to R&D Queensland forums which have provided discussion around priority R&D areas. An R&D Queensland forum around energy presents an additional opportunity for harnessing the expertise of industry, academia and research bodies in setting directions for the Queensland Government's investment in energy-related R&D and expenditure by agencies and government-owned business on technology innovation.

Investment in R&D will also contribute to capacity building in Queensland's scientific and engineering industries, as well as allied professions. The Working Group is concerned that the scientific and engineering capacity that will enable Queensland to access the benefits of new technologies and resources may not exist currently at the scale required. The Working Group considers capacity building in this sector just as important to achieving a lower carbon energy future as building community capacity to embrace these new technologies and industries.

The development of excellence in engineering and scientific capabilities will achieve greater focus in the context of resource hubs aimed at accelerating deployment of specific resources in particular regional areas. The proposed investigation of resource hubs outlined earlier includes a proposal to decentralise relevant research activities. The Working Group has been alerted to potential issues associated with devolving undergraduate studies on a regional basis. There is strong potential however for development of postgraduate academic programs focussed on systems integration. This academic program would address concerns raised with the Working Group about inter-disciplinary gaps affecting graduates' abilities to understand the full range of issues affecting the energy industry.

Section 5: Engaging Queenslanders in their energy future

5.1 Community engagement

Perhaps the boldest action any government could take is to actually engage with the community about the real costs of a clean, secure and abundant energy supply. Governments need to be part of a dialogue about energy policy that is already drawing focus from the media, specifically in relation to the cost of climate change action to achieve carbon emission abatement (for example, ABC 7.30 Report on 26 October 2010 and Keith Orchison in The Australian on the same date).

The Working Group has been reminded constantly in consultation that Queenslanders' support can only be secured for a new energy future, if they are actively engaged in discussions about the decisions required to transition to a lower carbon energy sector. Clearly, consumers also vary in their understanding of drivers for energy policy, and knowledge about the implications of their consumption decisions. The Working Group has received a clear message that equipping Queenslanders with information and building their capacity for change are the keys to building community momentum for the actions required to achieve a lower carbon future.

The Working Group has noted the Queensland Government's increasing willingness to engage in franker discussion with Queenslanders about a range of energy policy issues - in relation to consumption choices, supply options and emerging technologies. Yet still the energy policy field remains contested. For example, Felton Valley landowners currently are at odds with coal seam gas companies seeking to exploit the resources on their land, with government mediating economic and environmental priorities. As noted earlier, consumers also continue to resist rapidly increasing electricity prices.

More is required if Queenslanders are going to understand the magnitude of the task, the implications of their actions and lifestyle choices, and what they can do to contribute to the task outlined in this plan. Queenslanders need to be given clear signals, incentives and tools that enable them to manage their energy consumption, and equipped with information and engaged in the debate about how emerging technologies can support this transformation.

The Working Group therefore strongly encourages the Queensland Government to take every opportunity to promote discussion about these issues. Initiatives, such as the recently-announced LNG enforcement unit to respond to landowners' safety, land access and environmental concerns, are valuable mechanisms for ensuring Queenslanders' concerns about utilisation of energy resources are being addressed. The Working Group urges the Queensland Government to facilitate discussions about utilisation of energy resources early in industry development processes, rather than allow community concerns to fester.

This plan is itself a strong signal to the Queensland community of the immediate and bold action required to propel the State into a lower carbon future that creates opportunity and does not disadvantage the State or its people. The publication of a plan to 2050 based on this report provides an ideal opportunity to launch the discussion around the directions recommended by the Working Group.

The Working Group understands aspects of this discussion will be politically fraught. Equally of concern though is that, in the absence of this debate, the pace required for the transition outlined in this plan will not be achieved by relying on the community's (passive) acceptance and eventual adaptation to a lower carbon future.

The *ClimateSmart* and *EzyGreen* initiatives have utilised tools such as monitors to support changes in consumption behaviour. The Working Group are recommending directions aimed at embedding energy efficiency in more built environments, and building knowledge and capacity in communities utilising 'smart' technologies (i.e. meters/grids) and distributed energy generation.

Community building is at the core of the Queensland Government's priorities for the new precincts slated under the *Growth Management Queensland* framework. The precinct strategy recommended by the Working Group is also aimed at building energy communities in TODs and Queensland's new cities based on higher visibility of energy efficiency and conservation opportunities in the built environments in which more Queenslanders will live, work and play, as well as the communal nature of the new precincts. The proposed resource hubs will also build capacity within these communities, including through increased industry expertise, devolved research capacity, and employment, education and skilling opportunities. The Working Group also recognises the importance of engaging the community early in relation to new technologies.

5.2 Consumer research

There is a growing body of research around understanding consumer values, motivations and priorities in relation to how they consume energy and the importance they ascribe to the outcomes of their actions, for example in relation to environmental impacts. As would be expected, this research is showing just how complex consumer behaviour is in relation to energy consumption and the gaps between values and actions.

Research has shown that household consumption is heavily influenced by broader social and cultural constructs. A family's social status (i.e. income, education, age and home ownership) combined with their concern for the environment, belief in climate change and other related issues directly impacts on their overall lifestyle choices (Williams et al., 2010). Recent work by Schandl and colleagues to understand lifestyle and consumption patterns of Australian households based on these factors identified nine lifestyle groups. Direct per-capita emissions of Australian households for each lifestyle group have been calculated and confirmed a positive income-CO2 relationship. Initial results suggest there is a threshold where higher income enables households to make particular choices to reduce, rather than increase, their emissions (Williams et al, 2009).

Gardner and Ashworth (2007) developed a framework for societal acceptance of distributed energy based on the underlying premise that people's values, attitudes and beliefs will drive their intentions, subsequent action and eventual long-term acceptance of distributed energy and reductions in consumption (Figure 9). Although a wide array of psychological research supports this central premise, it is important to acknowledge that people's decisions are made within a broader context, where a range of external influences also have an impact. These external influences include economic factors such as cost of implementation, physical/ technological factors such as the development of and access to technology, and societal factors such as community support for low emission technology, government incentives and industry reactions.

The impact of societal factors on the adoption of distributed energy is particularly relevant since some distributed energy solutions are likely to be implemented at the community level rather than in individual households (Gardner and Ashworth, 2007). For effective policy setting in this area, therefore, it is critical to understand the motivations of consumers with regard to purchasing decisions and direct and indirect factors that influence their behaviours (van den Bergh, 2008).

Other research has found distinct orientations around energy consumption (Carr-Cornish et al., 2008). Research such as this is helpful in identifying the motivations that government might tap into in developing initiatives, education programs and tailoring specific messages for each target group. Yet there is limited understanding of how these motivations might apply in the Queensland context.

Understanding how Queenslanders are motivated around their energy choices needs to be the priority for the Queensland Government to plan the engagement and capacity building programs that will align public desire and action for a lower carbon future with Government policy and initiatives to achieve a lower carbon economy and address climate change.

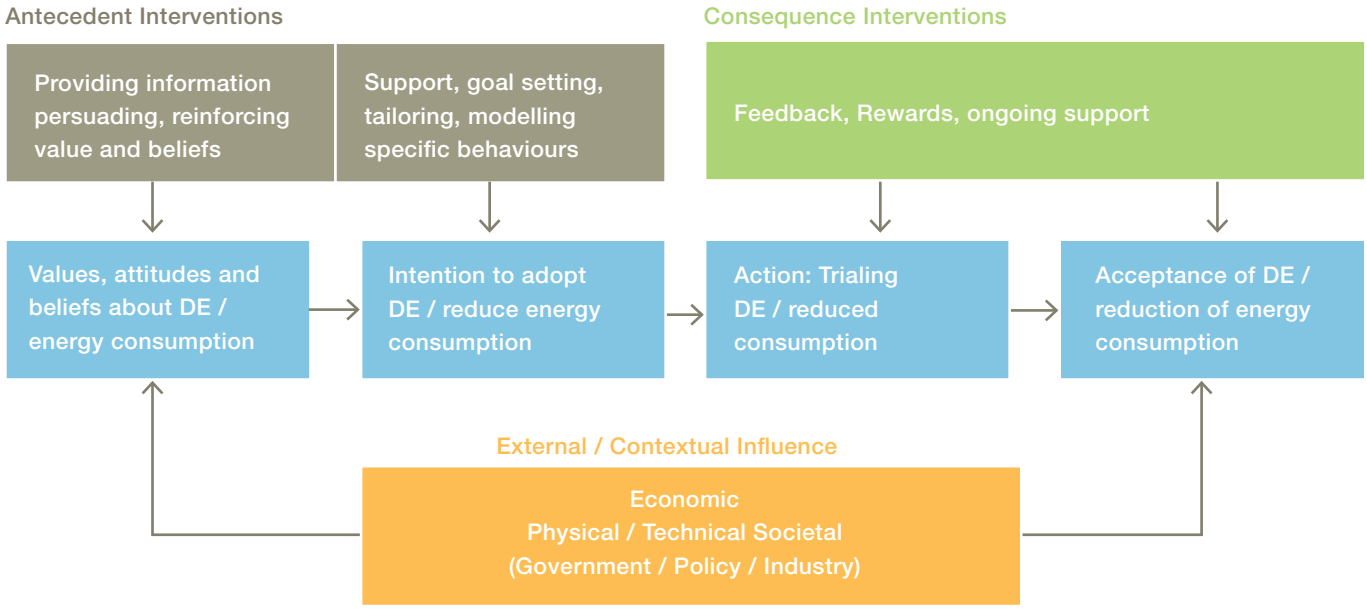


Figure 9: A conceptual Framework for the acceptance of distributed energy

5.3 Emerging opportunities for engaging Queensland energy users

The Working Group is aware of two important opportunities emerging in the short-term for the Queensland Government to build its knowledge of consumer behaviour and develop the evidence base on which to formulate new engagement and capacity building programs.

EC&DM trials being conducted by Queensland's distribution businesses are already producing valuable information about consumer responses to interventions to mitigate demand on the distribution network. For example, an evaluation of the Cool Change 2 initiative conducted by CSIRO for ENERGEX supported an overall conclusion that participation in the trial was primarily driven by two factors: the confidence customers had in the trial, and by the sense of community contribution and connection they associated with the trial (CSIRO, 2010). Some of the factors that influenced participants' decisions to participate in the Cool Change 2 trial included the perceived convenience of the trial, positive word of mouth, as well as supportive opinions of others in the household. This effect is consistent with previous research that shows people are more likely to trust and accept something if it has been tried and supported by people that they know or by people who are similar to them in some way including living in the same neighbourhood (CSIRO, 2010).

Results of Ergon Energy and ENERGEX's trials over the summer period of 2010/11 will be critical to better focus future investment in energy conservation and demand management programs. These trials will are also expected to reveal information about consumer motivations in their energy consumption choices, and ways to better engage them around management of growing consumption and demand on the electricity network.

The $60 million investment in the *ClimateSmart* initiative is also approaching its conclusion. Consultation with relevant government agencies indicates this initiative has attracted healthy subscription numbers. This suggests many Queenslanders are motivated to engage around their energy consumption behaviours and tools for reducing their demand for electricity. To date however, there appears to have been little evaluation of the effectiveness of these initiatives apart from numbers of participants.

The impending EC&DM trials and *ClimateSmart* re-investment decision represent significant opportunities to inform new directions in community engagement and capacity building with energy consumers. Through these initiatives, the Queensland Government has established relationships with a small but significant number of Queenslanders and their households, representing a powerful base from which to grow a bigger energy community across Queensland.

There is a unique opportunity to capitalise on this engagement, utilising *ClimateSmart* subscribers and EC&DM trial participants as brokers of public dialogue in their communities about the role that individuals can play in moving towards a new energy future. The energy communities built could also provide a willing body of households for ENERGEX and Ergon Energy's emerging demand side management activities, offsetting the significant costs associated with recruiting for these programs.

For example, CSIRO's behaviour change program, Energymark, brings together small groups of people, meeting at their own pace, to discuss energy technologies and climate change. Within the meetings individuals share their thoughts, anecdotes and first hand experiences. Engaging the public in this way ensures the information is more likely to be translated into action by individuals because they can relate to the concepts, discuss them openly and change their behaviours accordingly.

Participants map their carbon footprint at the beginning of the process and over a period of 12–18 months make action plans to reduce their household footprint either collaboratively or individually. There are various data collection points which provides a feedback mechanism for policy makers and the tracking of household footprints enables ongoing evaluation of the reductions made. In previous trials of the program across Australia, households have reduced their carbon footprint by an average of 19 per cent or 3 tonnes per household (Ashworth et al, 2010).

Appendices

Appendix 1: Working Group consultation

Queensland Parliament Environment and Resource Committee

Jon Davis	Chief Advisor – Energy Technology Group Rio Tinto
Paul Williams	Chief Executive Queensland Coal Corporation
Anne Syvret	Government Relations Origin
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Len Walker	Managing Director Cougar Energy
Andrew George	General Manager - Energy Markets Infigen
Alistair Webb	Commercial Manager Geodynamics
Shayne Rutherford	Executive General Manager - Strategy and Business Development Sucrogen
Andrew Lawson	Managing Director MBD Energy
James Pennay	Wind Prospect
Anthony Hall	Business Development and Strategy, Climate Change Bovis Lendlease
Rob Bartrop	Strategic Marketing First Solar
Adi Patterson	Chief Executive ANSTO
Gordon Jardine	Chief Executive Officer Powerlink Queensland
John O'Brien	Managing Director, Hill Michael Strategic Engineering Chairman, CuString
Paul Graham	Group Leader CSIRO
Andrew Borger	Executive Director / State Manager Qld Leighton Properties
Phillip Kohn	Environmental Planner Urban Land Development Authority
Rob Lord	Principal Cundall Environmental
Adam Beck	Project Leader – Communities Tool Green Building Council of Australia
Glenn Ralph	Managing Partner Floth Sustainable Building
Alison Quinn	Executive General Manager Mulpha (Sanctuary Cove) Developments

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Mark Piorkowski	Manager Advocate Local Government Association of Queensland
Peter Goggin	Director SmartGrid Partners
Dr Bertram Ehmann	Head of Energy Siemens
Dr Evan Gray	Chair, Renewable Energy Griffith University
Dr Georgina Davis	Workforce Planner - Renewable Energy Energy Skills Qld
Mark Langdon	Managing Director Earth to Air
David Finn	Managing Director Tritium
Professor Hal Gurgenci	Director - Queensland Geothermal Energy Centre of Excellence University of Queensland
Associate Professor Ben Hankamer	Institute for Molecular Bioscience, University of Queensland
Professor John Foster	Head – School of Economics University of Queensland
David Green	Executive Director Australasia Capital GPR
Brad Perry	Senior Consultant JTA Australia
Fiona Nicholls	VP External Relations Energy Rio Tinto
Terry Effeney	Chief Executive Officer ENERGEX
Matthew Dodson	Energy Conservation and Demand Management ENERGEX
Terry McConnell	Business and Industry Relationship Manager ENERGEX
Tony Pfeiffer	Group Manager - Alternative Energy Solutions Ergon Energy
Terry Miller	Manager – Network Development Powerlink Queensland
Malcolm Roberts	Executive Director National Generators Forum
Tim George	Planning Australian Energy Market Operator
Chris Turnbull	General Manager – Business Development CS Energy
Ian Fletcher	Director-General Department of Employment, Economic Development and Innovation

Alan Millis	Energy Regulator Department of Employment, Economic Development and Innovation
Pat Bell	General Manager – Energy Industry Policy Department of Employment, Economic Development and Innovation
Dave Mason	Chief Geologist Department of Employment, Economic Development and Innovation
Denis Warburton	Senior Director - National Energy Market Reform Department of Employment, Economic Development and Innovation
Greg Nielsen	Chief Officer - Office of Clean Energy Department of Employment, Economic Development and Innovation
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Adam Rogers	Director Department of Transport and Main Roads
Alan Dick	Director – Evidence and Modelling Department of Communities


Smart State Council