Good day.

I would like to make a submission regarding the Energy Strategy Issues Paper.

I am a research scientist with over 20 years' experience, including several years at CSIRO in the fields of energy technologies, and have been part of teams making submissions in this area to both the Tasmanian and Victorian state governments, as well as reports to the Federal government. However, I am making this submission as a private individual.

Whilst I have a large body of references to back up my statements below, for brevity I will only provide directly relevant examples and web page links. If required I can provide more detailed information.

General Comments

Less than a month has been provided in which to make submissions regarding this issue. Bearing in mind this is to result in a strategy reaching 20 years into Tasmania's future, this seems like an incredibly short amount of time for submissions and discussion.

Whilst I was investigating what is currently available on stage government websites I found that there is some confusion about who is meant to be doing what in the energy arena; rather than there being one area responsible such as the Office of Energy in State Growth, the Climate Change area in DPAC seems to have some overlapping responsibilities, as well as to a certain extent Environment and Housing Tasmania. It would be good if the relevant information was available in the one area, or at least that there was a central page that linked to all of the relevant pages.

Bearing in mind that this is an "Energy Strategy" paper, is seems exceptionally unusual that there is virtually no discussion on one of our primary forms of energy usage, that being liquid fuels. Petroleum and Diesel are hardly mentioned at all.

Liquid Fuels

Whilst we may eventually have the technology to replace liquid fuels, even if the technology was commercially available tomorrow, the change-over would take over a decade, so to ignore this issue seems exceptionally strange. Substantial work has already gone into the related issue of potentially reduced access to liquid fuels via the Tasmanian Oil Price Vulnerability Study, but links to this study seem to have been removed from Tasmanian government websites. As such I have also attached this document as part of the submission. Similarly there was much of benefit to Tasmanian policy makers contained within the UTAS Peak Oil risk management study. There have also been a number of reports from CSIRO on the potential for local production of liquid fuel replacements using algae and crop residue; if Tasmania is indeed to become the "food bowl" for Australia the potential for using crop "waste" for energy purposes could be substantial, in liquid or other forms.

I would also like to raise a couple of other issues regarding liquid fuels. It has been known for some time that the motors used in the majority of vehicles are exceptionally inefficient with respect to distance travelled per unit of fuel (measured in either miles per gallon (mpg) or L/100km). Cars that achieve well over 100mg (or under 2.35 L/100km) are easily achievable (see e.g. http://www.376mpg.com/?page_id=6). The companies that make these

vehicles have, for various reasons, chosen to focus on power, rather than fuel economy, with the exception of a few concept cars and prototypes that never seem to make it into commercial production, and/or are incredibly expensive (see e.g. http://www.csiro.au/Outcomes/Climate/Reducing-GHG/aXessaustralia.aspx and http://www.caradvice.com.au/256634/volkswagen-xl1-cost-111000-euros/).

Tasmania obviously lacks the infrastructure to create new vehicles from scratch (although potentially a partnership with the Victorian government to use the increasingly abandoned vehicle plants in Geelong could be entered into), but there are after-market solutions to reducing fuel usage that could be investigated, in addition to the use of electric vehicles which thanks to improvements in battery and superconductor technologies are becoming increasingly competitive with liquid fuel vehicles in terms of range, recharge/refuel time and cost.

An example of an after-market solution that can be achieved is the installation of a device (generally costing between $1000 and $2000) that can reduce fuel consumption by around 30%. These devices result in the more efficient breakdown of long-chain molecules in liquid fuels before they enter the engine. These include the use of electrolysis (for generating hydrogen from water), plasma, or small-scale catalytic cracking. Larger improvements can be gained by the replacement of sizeable parts of the engine system, e.g. use of the MYT engine (http://www.angellabsllc.com/cmparison.html). These technologies can also be applied to static internal combustion engines, e.g. diesel generators used for electrical production.

As such, investigation into the technologies could prove fruitful; initially for vehicles that have heavy use (bus fleet, truck fleet, taxis). Thinking medium to long term this could also be a method to economically stimulate the NW coast – vehicles from the mainland could come over via the Spirit to be retrofitted in Devonport or nearby if a conversion plant was established there.

Thermal Efficiency

Specifically in relation to the questions put in the issues paper - with regards to questions 8 and 9 concerning the improvement in building thermal efficiency, and reducing household energy bills - in Tasmania the primary costs are for heating due to poor thermal efficiency; as such insulation is the best response. The federal government's initiative in this respect obviously resulted in several issues, but there are other things that can be done.

For new buildings I suggest we learn from the policies of other countries. The thermal efficiency of our buildings are extremely low compared to many countries with similar climates; whilst increasing the requirements for ceiling and wall insulation et al in new houses does increase the price initially, in the long term the savings are well worth it. Similarly with glass - in many parts of Europe you are required to get at least double glazing for all new windows, and this has caused the price of this technology to fall such that it is virtually the same price as single glazing here. You can even get double glazed window panes cut to size while you wait in many hardware stores. A similar approach would be beneficial in Tasmania, if not Australia.

Whilst the adoption (finally) of 6 Star energy efficiency requirements in new buildings in May 2014 is a good start, it is still not up to par with requirements in e.g. Switzerland

(Minergie) or Germany (Passivhaus, aka Passive House). In addition to improved levels of bulk insulation (ceilings, walls, floors and doors), plus double-glazed windows with thermal breaks in the frames (or non-conductive frames, unlike the common aluminium frames surrounding most windows), there is also a requirement for air exchange with outside air with a heat-exchanger to minimise energy lose whilst ensuring "sick building syndrome" does not occur. The Strategy should at a minimum proposed a timeline for Tasmanian buildings reaching 7 and eventually 8 Star ratings.

For existing buildings, the issue is obviously a lot harder to address; however it would be beneficial at least to provide educational materials to the general public so they could work out what would be of use to them. Peter Lindemann's Home Energy Savings Guide (http://emediapress.com/book-video-catalog/home-energy-savings-guide/) is a good example of what could be provided to the people of Tasmania; it explains where the main losses are in existing homes, how to determine them, how to cheaply and inexpensively fix many of them, and gives examples of costs and rates of return on investment for the more complicated fixes. Whilst written for American households many of the suggestions are relevant to our houses.

The documents at http://www.climatechange.tas.gov.au/households/saveenergy_savemoney are a good step in this direction, but I would suggest the following changes:

1) Update the guides (and other parts of the website). For example references are made to 5 Star vs 6 Star building requirements. Updates should be made to the files every year or two to take into account changes in standards and technologies.
2) In the vein of the aforementioned Home Energy Savings Guide, either expand the "Change Your Power Habits" guide or create a new guide that suggests to householders what they can do by themselves (or with the help of an appropriate professional) to reduce energy losses, not just with a one line suggestion but with a step-by-step guide where appropriate, plus a rating on how difficult this is to do, what would be the average cost, and what would be the expected pay-back period. Whilst there are some good suggestions in this guide, it does not make it clear which are the "low hanging fruit" that should be addressed to get the "best bang for your buck".
3) Advertise the site more – there should be obvious links to it from Service Tasmania, it should have higher priority (or just appear which it doesn't sometimes) in search results from Service Tasmania and LINC Tasmania on climate, energy efficiency, insulation, building, etc. There should also be direct links from many other state government websites, including the State Growth energy page. Ideally links from related NGO websites should also be requested, e.g. from Sustainable Living Tasmania.

New Energy Technologies

The rest of my submission covers new energy technologies and their potential effect, benefit and issues, which addresses to some extent many of the questions posed in the Issues Paper.

Over the last 30 years especially a number of energy technologies have been in gradual development and look to be coming to market within the next few years. Whilst they appear to be radically different in some respects, the majority of them have a few basic things in common - an exceptionally high energy density production in a small volume, and the need for little if any "fuel". Chief amongst these is cold fusion - dismissed as junk science after its

initial discovery (for reasons which I will not go into here), it has now been demonstrated and individually verified by three companies which have substantially financial (and in at least one case government, Canada) backing, and initial products which could go commercial as early as the end of the current year. An additional company has had independent verification for its products and whilst not claiming to be using cold fusion, has created a similar product and so can be considered to be in this general arena. Whilst I can go into more details on these technologies (and possible scientific explanations) if required, in this submission I wish to concentrate on what these technologies could mean to Tasmania (and the rest of Australia).

Traditionally over the last century the production of energy (in the form of electricity especially) has been the domain of large infrastructure projects in highly centralised areas, requiring substantial outlay in capital expenditure, and ongoing maintenance. There have also been issues regarding the supply of "fuel", be it fossil sources such as coal which are potentially running out, and result in extensive emissions to the atmosphere and environment (many of them toxic), conventional nuclear and their corresponding risks and disasters (Three Mile Island, Chernobyl, Fukishima Daiichi), or water (potential lack of supply with drought, methane emissions from drowned organic matter, dam breaches which can cause serious damage downstream). Also, the centralised nature of this power means that outages (caused by weather, fire, solar activity or deliberate sabotage) can affect a large body of people, and repairs to same can leave the population without electrical supply for long periods of time.

The new forms of technology are vastly different. Energy densities are comparable or higher than that of nuclear fission, but without any of the corresponding risk or danger, and whilst the devices can be complex, compared to existing systems they appear to have the potential of being dramatically cheaper - potentially a 90% or higher reduction in cost per unit power, and also thanks to extremely small amounts of "fuel" requirements a similar reduction in cost per unit energy. This reduction also means a drastic reduction in size requirements for a unit required to produce a given amount of power. What this eventually could lead to is energy generation being completely decentralised - every device that uses electricity could come with its own power source that lasts for years, including vehicles. Homes could be run off a single unit on-site that requires "refuelling" twice per year, if that. However, this is likely to be a number of decades away, and in the meantime there will obviously be a changeover period, with gradual decentralisation.

For example, rather than being dependent on a small number of dams and related large-scale hydro-electric systems (plus the odd gas-fired power station), the Tasmanian power system could end up becoming a number of moderate scaled units that are virtually self-sufficient and located at each electrical substation. This would lead to a gradual reduction in the price of electricity, with the expenditure necessary to maintain large-scale infrastructure being reduced, although once again this would be over a relatively long time-scale, with initial infrastructure expenditure on the new devices offsetting much of the savings. The main benefits would be in terms of overall grid reliability due to decentralisation, and also potentially the ability to produce dramatically more electrical energy, in addition to being able to more cheaply delivery power to remote areas, with overall reduction in energy costs in the long term after the infrastructure costs are offset.

If the State was, like Canada, to invest in the technology relatively early, then this could result in the attraction of new businesses, especially seeing as all of the new technologies are "green" and have little, if any, carbon emission issues. Potentially Tasmania could even become to energy technologies what Silicon Valley has to computing. Alternatively, if the

State was slow to adopt these technologies, then we would stand to significantly lose out economically - the "green" advantage our power has would be nullified, and there would be no incentive to "export" our electricity to the mainland if these technologies were already in place over there.

Recommendations

Based on the above I would suggest the following; I've put what I consider to be the most important recommendations first.

1) The aforementioned new energy technologies represent not only a large opportunity for the State, they also provide a great risk to the economy in the form of the State-owned electricity provider, and could do so in as little time as the next few years. Hence I urge you to seriously investigate these new technologies, as follow-on effects from their utilisation could render any other energy strategy determined for the next 20 years meaningless.
   This would involve at the very least discussions with the companies close to market, examination of third-party results, and analysing the cost/benefits of these technologies for Tasmania. Potentially it could lead to trialling prototypes, licensing some of these technologies and even building units within Tasmania.
2) Investigate after-market fuel-reduction technologies for vehicles and generators. To begin with this could involve a cost/benefit analysis, and trialling a number of these technologies on vehicles and generators. Potentially it could lead to licensing some of these technologies and building/installing units in Tasmania.
3) When purchasing new government fleet vehicles consider giving priority to those with better fuel economy, and investigate whether it would be suitable to purchase a number of fully electric vehicles (e.g. for city use), or have a few vehicles converted into being fully electric.
4) Update and enhance the guides linked off http://www.climatechange.tas.gov.au/households/saveenergy_savemoney (regularly) and advertise them more, with links from State government websites, and requests to related NGO websites to link back to the site as well. In the same vein, have a central page that preferably has all energy related information either listed on it, or linked off it, even if these links are to other departments; this would presumably be hosted in the Office of Energy in State Growth.
5) Investigate building policies of cold-climate nations with a focus on thermal efficiency; introduce changes beyond the 6 Star requirements for new buildings based on what has worked overseas and what is suitable for Tasmanian conditions, with a timeframe for the introduction of 7 Star and 8 Star energy requirements being proposed.

Bearing in mind the above recommendations could cover a range of existing departments, and if split across different areas it could be difficult to get a cohesive strategy working, I would also recommend that a team of people be set up to manage the research into and implementation of the above recommendations.

This team would be responsible for ensuring that the Energy Strategy, once it is decided, is acted upon, and have suitable rights and resources to do research, discuss products with companies, trial products, make policy recommendations that lead to energy efficiency improvements in buildings and vehicles, and recommend potential opportunities for the government and State as a whole to benefit from licensing technologies and developing commercial opportunities. The team would also develop programs and funding opportunities, and collaborate with suitable people and institutions to advance these goals. They would also be responsible for regularly reporting to government on advancements in technologies relevant to this field, along with the associated risks and opportunities.

As the Energy Strategy is for the following 20 years, this team would be required to operate over a similar time period, and be responsible for the preparation and implementation of future Energy Strategies. These would need to be updated as appropriate (probably every 5 years at most), especially if new technology becomes available that could have a substantial impact on the Strategy.

Thank you.

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