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Committee on the Northern Territory's Energy Future

Public Hearing Transcript

10.15 am – 11.00 am, Friday, 14 February 2014

Litchfield Room, Level 3, Parliament House

Members:
Mr Gary Higgins, MLA, Chair, Member for Daly
Mr Kon Vatskalis, MLA, Deputy Chair, Member for Casuarina
Mr Gerry McCarthy, MLA, Member for Barkly
Mr Gerry Wood, MLA, Member for Nelson
Mr Francis Kurrupuwu, MLA, Member for Arafura

Witnesses: Dr Stephen Schuck: Manager, Bioenergy Australia

Mr CHAIR: On behalf of the committee, I welcome everyone to the public hearing into key challenges and opportunities associated with meeting the Northern Territory's future energy needs. I welcome to the table via videoconference Dr Stephen Schuck, who is the Manager of Bioenergy Australia.

Thank you for coming before the committee. We appreciate you taking the time to speak to the committee and look forward to hearing from you today. This is a formal proceeding of the committee and the protection of parliamentary privilege and the obligation not to mislead the committee apply. This is a public hearing and is being webcast through the Assembly's website. A transcript will be made for use of the committee and may be put on the committee's website. If, at any time during the hearing, you are concerned that what you have to say should not be made public you can ask the committee to go into closed session and take your evidence in private.

I ask you to state your name for the record and the capacity in which you appear, and if you can make a brief opening statement before proceeding to the committee's questions. Could you please state your name and the capacity in which you are attending?

Dr SCHUCK: I am Stephen Schuck, the Manager of Bioenergy Australia, and I am appearing on behalf of Bioenergy Australia.

Mr HIGGINS: Would you like to make an opening statement?

Dr SCHUCK: The purpose of the submission I put to the committee is to basically alert you to what we regard as fairly large prospects for bioenergy, both in Australia and the Northern Territory, and to alert the committee to the various elements of bioenergy - it is a form of indirect solar energy which can provide for all heat, power and transportation fuels. It differs in the power side from some of the intermittent forms of renewable energy such as solar and wind inasmuch as it can provide base load power, an important aspect. It is regarded under the Kyoto Protocol as being carbon dioxide neutral. I provided in the submission some analysis called Life Cycle Analyses to show how it compares to some other energy technologies.

I have given an indication in the submission of the scale and depth of bioenergy. Renewable energy provides about 13% of global energy supplies and, of that 13%, bioenergy globally provides about 10% - as in percentage points. I have broken that down in Figure 1 of the submission.

I have also drawn the committee's attention to a national road map led from the Clean Energy Council and referenced in the submission. This is basically a copy of that report which is freely available on the web. Table 2 is basically an excerpt from that road map showing the really large potential of bioenergy. That particular road map was aimed primarily at stationary power.

The other element of bioenergy I will come to is liquid transportation fuels.

I used some data from Geoscience Australia, the Australian resource – I will grab a copy but it is referenced in the submission. It is fairly substantial report from a few years back showing bioenergy is providing just under 900 MW of installed capacity across Australia and also showing the very low contribution in the Northern Territory of only 1 MW of capacity at that time.

One of the other features I wanted to bring to the committee's attention was the comparison of just planting trees for carbon - basically carbon offsets -and also more actively managing the carbon, and that was attached to the submission and I have a hard copy here. I do not know how well this shows up on your screen, but that was sent along as an electronic copy.

One of the graphs I wanted to particularly show was you can either plant trees and sequester carbon, which is all well and good, but basically bioenergy could go beyond that. Actively managing the carbon the carbon content in the biomass could offset fossil fuels. That was shown in Figure 5 of the submission – 4 and 5.

I will read through a number of the technologies to show the scale and breadth. In particular, I have provided some examples of different scales of bioenergy plants for stationary energy ranging from one in the United States that is 36 MW, another 25 MW in the Netherlands which does not use cooling water, it uses basic dry cooling.

There is another plant to show the scale and sophistication of bioenergy, the Alholmens Kraft power plant in Finland, which is 240 MW of electricity capacity, and one on the outskirts of Copenhagen, Denmark the Avedore 2 unit which is a multi-fuel unit known as ultra-super critical unit at about 600 MW of electricity capacity within a co-generation or combined heat and power plant.

Also mentioned in the submission are other technologies such as gasification and pyrolysis and some of the biochemical conversion technologies. I mentioned greenhouse gas balances and wanted to alert the committee to the good carbon dioxide performance which is often - an important element nowadays in energy supplies is the greenhouse gas contribution. I mentioned some of the industry issues and in the submission we have gone to biofuels. There is huge push on at the moment internationally in developing a so-called advanced generation or second generation biofuels, moving away from vegetable oils and starches, to go for more widely available materials and residues and urban wastes with some of the development there in different kinds of fuels. I also mention there is a fair push towards aviation jet fuel.

I also mention the job creation prospects for bioenergy. Unlike other forms of renewables which are more along the lines of fit and forget for solar and wind, we have ongoing requirements for procurement for bioenergy plant from feedstock for fuels. It shows the graph slightly dated but it gives a good indication of an indicative analysis.

I also have a word about Bioenergy Australia. We are a national forum – an information and networking forum. We were originally set up by parts of the federal government. About two years ago, we set up as a separate legal entity, but we still have a fairly substantial government involvement in Bioenergy Australia, including from the Rural Industries Research and Development Corporation, the Department of Industry, and also CSIRO is involved in Bioenergy Australia.
One of our main activities is participating in the International Energy Agency's bioenergy program which brings us some very good information to Australia. We participate in four tasks: one on climate change effects of biomass and bioenergy systems; one on commercialising liquid biofuels; one on bio-refining, basically trying to get extra value-added products from biomass; and one on biomass feedstocks for energy markets. That is, basically, a bit of a summary and an opening statement.

Mr CHAIR: Thank you for that. One thing I did notice was in your overview you talked about the power production via biogas, wood waste, and you have a reference there to other forms. Can you tell me what those other forms allude to?

Dr SCHUCK: For power, you have the thermal processes, basically using anything that can burn. You have, basically, wood waste, agricultural-type straws, a large proportion of the urban waste stream. Those are some of them. In the biogas, you have the liquid wastes. There is material such as sewage and animal manure, for instance, which are examples of technology that work through biochemical conversion to biogas.

Mr CHAIR: The next thing I would like to find out is with biodiesel, I know, we are getting into renewable energies. But, how does the pricing of biodiesel compare with straight diesel? Is there a cost saving?

Dr SCHUCK: The cost of biodiesel is largely determined by the feedstock prices. That would be fairly volatile over several years. You would have to ask the specific producers where they are acquiring their feedstock from.

The lowest cost product of biodiesel generally is using vegetable oil collected from places like restaurants such as McDonalds and so on. That is then cleaned up and then processed in biodiesel plants. I believe there is one in Darwin that is either being commissioned or close to commissioning.

For biodiesel there is a variety of feedstock which will determine the cost of the end product. At the one end, you have low-cost feedstock such as waste vegetable oil and possibly tallow, and at the higher end you have the virgin vegetable oils such as canola oil or possibly palm oil.

The conversion technology, as I said, is well known, and biodiesel itself can be used fairly seamlessly with petroleum diesel.

Mr CHAIR: I will start to look at policy issues. What policy initiatives, investment incentives, or regulatory considerations do you think the committee should consider in encouraging this sort of renewable energy project development in the Northern Territory?

Dr SCHUCK: I guess bioenergy covers such a wide spectrum. Perhaps if I can talk about the stationary power sites first of all?

Mr CHAIR: Yes.

Dr SCHUCK: At a stationary power…

Mr CHAIR: …sort of renewable energy project developments in the Northern Territory?

Dr SCHUCK: At a stationary power level we have a federal scheme running – the renewable energy target which appears to have bipartisan support but is under fairly constant review. At the state level or the Territory level one of the policy options possibly to be considered is a feed in tariff applicable to bioenergy. What is happening in some other states is feed in tariffs have been established largely around photovoltaic cells and have largely ignored bioenergy. World-wide there are numerous feed in tariff schemes which are more customised towards bioenergy, both at different scales and also for different feed stocks.

For instance, you tend to have in some jurisdictions - for biogas you would have - certain thresholds for plants below a certain size - get a certain feed in tariff above a certain size. Then you would have urban waste, the biogenic component of urban waste, again a different scale, and then for biomass minerals, so possibly for energy crops. If biomass is used in conjunction with fossil fuels it is hybridised and is known as something like biomass co-firing with coal, again because the plant itself was not specifically established for the biomass component and possibly the feed in tariffs would be lower. At the policy level feed in tariff is certainly something to consider.

At the liquid fuel side – sorry, going back to stationary power. The other element of the national renewable energy target, it is virtually an electricity only target rather than concentrating on energy services. The only exception is solar hot water systems which basically have been providing offsets as well and have been regarded as reducing electrical load. What has been omitted from our national renewable energy target which is, as I said, essentially a national electricity target, is the thermal energy and that can be either using biomass for industrial heat or the heat component of cogeneration. When you produce electricity from a fuel about one-third of the energy in the fuel lands up in the electricity and the other two-thirds is dissipated as heat. Some of that heat can be captured for industrial use, possibly for use in greenhouses, glasshouses etcetera.

The other element missing from our national target is a target for renewable heat, be it biomass or possibly derived from solar energy. For instance, I think in the UK they have a renewable heat obligation – I think it is in now – and that qualifies, and when you have a heat obligation you can extend the use of biogas. For instance our national target at the moment requires the biogas to be produced for electricity which provides the incentive, but the other alternative is to produce biogas from say animal manure or human sewage or wet waste and that biogas, which is half carbon dioxide and half methane approximately - the carbon dioxide can be stripped off or used for beverages, for instance, and the biogas, the methane component can be injected into gas pipelines or reticulation systems as a renewable gas which then basically can be used or consumed for heat. We are basically missing that incentive in Australia by not providing for renewable heat.

In regard to other policies, on the liquid transportation fuel there have been quite a few analyses at the federal level and a lot of - like excise and those kind of incentives at the federal level, but the other possibility is for some kind of a Territory mandate. As you would probably be aware, New South Wales has had a biofuels mandate which has been in two components. One has been on the ethanol side and the other has been on the biodiesel side.

What is also happening in Australia is because biodiesel - we have gone for a much lower level of sulphur in our diesel for our national standard - by removing the sulphur it has affected the properties of petroleum diesel and biodiesel can fill in for that by putting back what is known as lubricity. It is basically like a lubricant property in diesel. So, much of the diesel has really small levels of biodiesel in it – usually about 2%.

I guess what I was going to suggest is that one possible policy option is to try to have some kind of mandate or at a slightly lower level. A purchasing policy of the Northern Territory government possibly where fuel is available is to mandate that those biofuels are used to try to stimulate the actual market for such fuels.

Mr CHAIR: Okay. You mentioned waste before. I presume you are talking about sewerage facilities. Is the usage of sewerage facilities for this type of thing that prevalent in Australia at all?

Dr SCHUCK: Yes. Of bioenergy, the largest form of bioenergy by capacity in Australia is bagasse - the sugar cane residue - but after that it is biogas. That is split up into two areas: one is landfill gas where the gas from garbage that is put into big holes and covered, is captured through an extraction system and runs spark ignition engines. Companies such as Energy Development Ltd, AGL, and LMS have been quite prevalent in that.

However, many of the larger sewage treatment plants around Australia have been capturing some biogas and running it. So, the plants typically are between several hundred kilowatts and a few megawatts capacity. The big sewage treatment plants, for instance, round the big cities such as Sydney are in the North Head sewage treatment plant, Malabar, Cronulla, all have captured the biogas. There are two in Brisbane at Luggage Point and Oxley Creek which produce it. In Adelaide, Bolivar Waste Water Treatment Plant has a turbine that runs on biogas.

Biogas is a low calorific value gas - a natural gas because of the carbon dioxide that comes with it which can be stripped off and purified. In some places such as Los Angeles there is a landfill which catches the biogas, strips off the carbon dioxide, so you basically have bio-derived methane. They actually liquefy it, so you have liquefied natural gas which is of a biological origin. They use that for bulk transport fuels.

Mr CHAIR: Are you still there, Stephen?

Dr SCHUCK: Yes I am. I trust I can be heard okay.

Mr CHAIR: Okay, we just cannot see you, so you can misbehave. Moving on from those sewerage facilities, you were talking about large facilities. What about small-scale biogas facilities that may be economically viable in some of our remote communities?

Dr SCHUCK: Yes, that is certainly a possibility. Worldwide, there are a vast array of small biogas digesters in countries such as Vietnam, Nepal, India, and China where they are basically at the community level where animal manure and even some of the excrement from humans is added to these digesters and produce small levels of electricity. So biogas, in particular, is very much scaleable.

There has been work at the University of Adelaide, for instance, which has looked at small poly digesters which are really just bags of pig manure. They do not produce much energy but they certainly do recover some of it. The beauty of that is not only do you get some energy but the digestate, which is the residue left behind, is very similar to standard compost and can be used in that way. There is just about a continuum of scales from very small digesters about half a shipping container size, many of which can be dug into the ground, right through to larger industrial schemes.

There is certainly a possibility. The problem may be at small scale you do not have enough capacity. But, with the new technology that is being introduced into some of the smaller sewage treatment plants around Australia using what is called micro-turbines. These are little plants at about 50 KW scale so they are the size of two very large suitcases and they produce 50 KW and run on biogas. There is one going in to Cessnock in the Hunter Valley New South Wales. A company named Aquatech Maxcon had an exhibition stand at the most recent Bioenergy Australia annual conference so those technologies exist.

Also at that smaller scale is a technology called organic rankine cycles, and you can think of them as a commercial refrigerator running backwards. You put the heat in and get the energy out rather than putting the energy in and getting the cooling out. Again, it is scaled at the 200 KW scale so those combinations are possible.

Mr CHAIR: One area someone is looking at using biogas or biofuels is in the Douglas Daly area where you have mahogany plantations and they want access to power for their mills. Can you give me an idea of what tonnage of raw material would be required to have a 3 MW biomass facility?

Dr SCHUCK: I can quote two rule of thumb figures. One relates to the capacity of a plant and the other relates to how much energy it produces. As a very simple rule of thumb, 1 kg of fresh weight biomass, like woody biomass such as woodchips or saw dust, will produce 1 kW-hour of electricity after it has been processed in a power plant. For a 3 MW plant you need roughly 30 000 tonnes per annum of biomass. The other rule of thumb is 10 000 tonnes per annum will provide for a 1 MW plant, so three times that for a 3 MW plant. That is about 30 000 tonnes per annum of fresh weight biomass.

There are other tonnages. Typically fresh sawn biomass would be something like 45% to 55% moisture content on a wet weight basis. Obviously, the water does not burn and adds to the weight of the biomass. By drying the biomass you have a product with greater calorific value and for the haulage you are not transporting water which has no particular value. There are possibilities of, for instance, solar drying at remote locations then combining the biomass. The rule of thumb for biomass is a typical transportation distance for woody biomass is generally 50 km to 100 km radius for economic procurement.

However, there have been developments in recent times which have thrown that conventional wisdom out the window because biomass can be pre-treated to form wood pellets. If you had woody biomass you could convert it in something very similar to a large industrial mincemeat making machine – into little pellets similar to the size of a small finger. You have then changed the bulk density of your biomass from 200 kg per cubic metre to closer to 650 kg per cubic metre. Suddenly you have changed the economics of the transportation, which is one of the limitations of bioenergy. There is now a global trade in wood pellets of around 15 million tonnes per annum. In fact, they have been brought from British Colombia, on the west coast of Canada, into Europe for some specific reasons in that case.

Some powers stations in Europe have been converted from coal to run exclusively on wood but what it really comes down to is the economics. In the longer term we talk about things like peak oil - when the oil runs out - we have global climate-type issues. When we need options we possibly need to go to dedicated energy crops, possibly wood crops, different types of grasses and so on - high yielding grown differently to plantation timber for logs, lumber, veneer logs and so on because they would generally be grown at 2000 stems per hectare instead of several hundred.

Mr WOOD: Thank you.

Mr CHAIR: In the Northern Territory we have a lot of invasive weeds like mimosa, but previous research options undertaken for biofuels and biomass facilities in the Northern Territory suggests plant reliability can be an issue where the source materials become too heterogeneous. To what extent is this still a problem given technology advances in recent years?

Dr SCHUCK: Yes, I am aware of early work going back probably more than 10 years - an attempt to use *Mimosa pigra*. There was a proposal for a small *Mimosa pigra* power plant in the Northern Territory. For various reasons that did not go ahead, but I guess you have two aspects. One is the heterogeneous nature of your feedstock. In other words, if you are mixing woody weeds – I think you have *Acacia nilotica* across parts of the Northern Territory. You have different feed stocks - some say sawdust should be very homogeneous, be uniform, then you would also have heterogeneous feed stocks such as a big portion of your urban waste. A lot of that has been overcome. It depends on how the technology is matched to the fuel. I would say the engineering is probably the easy bit; the long-term reliable supply of the biomass is probably more the confounder than the technology itself.

There are myriad types of technologies for combusting heterogeneous fuels, for instance fluidized bed combustors can cope with a really wide range of fuel as opposed to a grate boiler which may be fine-tuned to a specific fuel. If one has the fuel specification I am sure some engineering companies would be very able to match a technology to that fuel.

The big parameter is a reliable supply and does that plant run as base-load or does it just run on an opportunistic basis. The homogeneous nature of the fuel and the other component is the moisture content of that fuel. That is a determinant, but the technology is not really the barrier.

Mr CHAIR: Thank you for that. Thanks again, Steve. Is there anything you would like to say before we finish with you this morning?

Dr SCHUCK: Yes, Bioenergy Australia was originally set up by parts of the federal government and had participation from many jurisdictions. However, the Northern Territory has not really been a participant in Bioenergy Australia. We function as an information and networking forum to try to provide authoritative advice, particularly through our participation in the International Energy Agency's bioenergy program. I particularly welcome - if a Territory government agency could possibly send a representative to one or two of our meetings and our annual conference so they could get some exposure to the world of bioenergy and possibly feed that back through their bureaucratic channels, back to the top of government and, hopefully, to inform committees such as yours.

Mr CHAIR: We will take that on board. Thank you very much Steven. I am sure we will be in contact again.

Dr SCHUCK: Thank you for the opportunity.