COMMONWEALTH OF AUSTRALIA

Official Committee Hansard

SENATE

RURAL AND REGIONAL AFFAIRS AND TRANSPORT REFERENCES COMMITTEE

Reference: Investment of Commonwealth and state funds in public passenger transport

TUESDAY, 9 JUNE 2009

CANBERRA

BY AUTHORITY OF THE SENATE

TO EXPEDITE DELIVERY, THIS TRANSCRIPT HAS NOT BEEN SUBEDITED

INTERNET

Hansard transcripts of public hearings are made available on the internet when authorised by the committee.

The internet address is:

http://www.aph.gov.au/hansard

To search the parliamentary database, go to:
http://parlinfoweb.aph.gov.au

SENATE RURAL AND REGIONAL AFFAIRS AND TRANSPORT

REFERENCES COMMITTEE

Tuesday, 9 June 2009

Members: Senator Nash *(Chair)*, Senator Sterle *(Deputy Chair)*, Senators Heffernan, McGauran, Milne and O'Brien

Substitute members: Senator Back for Senator Heffernan

Participating members: Senators Abetz, Adams, Back, Barnett, Bernardi, Bilyk, Birmingham, Mark Bishop, Boswell, Boyce, Brandis, Bob Brown, Carol Brown, Bushby, Cameron, Cash, Colbeck, Jacinta Collins, Coonan, Cormann, Crossin, Eggleston, Farrell, Feeney, Ferguson, Fielding, Fierravanti-Wells, Fifield, Fisher, Forshaw, Furner, Hanson-Young, Humphries, Hurley, Hutchins, Johnston, Joyce, Kroger, Ludlam, Lundy, Ian Macdonald, McEwen, McLucas, Marshall, Mason, Milne, Minchin, Moore, Parry, Payne, Polley, Pratt, Ronaldson, Ryan, Scullion, Siewert, Troeth, Trood, Williams, Wortley and Xenophon

Senators in attendance: Senators Hutchins, Nash, O'Brien and Sterle

Terms of reference for the inquiry:

To inquire into and report on:

The investment of Commonwealth and State funds in public passenger transport infrastructure and services, with reference to the August 2005 report of the House of Representatives Standing Committee on Environment and Heritage, Sustainable Cities, and the February 2007 report of the Senate Standing Committee on Rural and Regional Affairs and Transport, Australia's future oil supply and alternative transport fuels, including:

a. an audit of the state of public passenger transport in Australia;

b. current and historical levels of public investment in private vehicle and public passenger transport services and infrastructure;

c. an assessment of the benefits of public passenger transport, including integration with bicycle and pedestrian initiatives;

d. measures by which the Commonwealth Government could facilitate improvement in public passenger transport services and infrastructure;

e. the role of Commonwealth Government legislation, taxation, subsidies, policies and other mechanisms that either discourage or encourage public passenger transport; and

f. best practice international examples of public passenger transport services and infrastructure.

WITNESSES

Committee met at 1.06 pm

CHAIR (Senator Nash)—I declare open this Senate Standing Committee on Rural and Regional Affairs and Transport. The committee is hearing evidence on the committee's inquiry into investment of Commonwealth and state funds in public passenger transport infrastructure and services. I welcome you all here today. This is a public hearing and a *Hansard* transcript of the proceedings is being made.

Before the committee starts taking evidence I remind all witnesses that in giving evidence to the committee they are protected by parliamentary privilege. It is unlawful for anyone to threaten or disadvantage a witness on account of evidence given to a committee and such action may be treated by the Senate as a contempt. It is also a contempt to give false and misleading evidence to a committee.

The committee prefers all evidence to be given in public, but under the Senate's resolutions witnesses have the right to request to be heard in private session. It is important that witnesses give the committee notice if they intend to ask to give evidence in camera. If a witness objects to answering a question, the witness should state the ground upon which the objection is taken and the committee will determine whether it will insist on an answer having regard to the ground on which it is claimed. If the committee determines to insist on an answer, a witness may request that the answer be given in camera. Such a request may, of course, also be made at any other time. Finally, on behalf of the committee I would like to thank all those who have made submissions and sent representatives here today for their cooperation in this inquiry.

[1.07 pm]

ALEKLETT, Prof. Kjell, President, Association for the Study of Peak Oil and Gas

CHAIR—Do you wish to make an opening statement before the committee asks questions?

Prof. Aleklett—I am Professor of Physics at Uppsala University in Sweden. I have a research group called Global Energy Systems. I have prepared some presentation to maybe help us discuss the same things. I think that is important. I call this opening statement 'Can global energy resources supply business as usual scenarios in the future,' because that is what discussed very much, and let us see what we can say about that.

Before giving any details, we have to learn what one barrel of oil is, because that is the measure that is used very frequently, and one barrel of oil is 159 litres, and it contains 1,600 kilowatt hours when it comes to energy. A typical supertanker has something like two million barrels of oil, and, if you take a country like Japan, it needs to import oil equal to one supertanker every tenth hour. This is an enormous amount of energy that is transported around the world.

We also must know why we are addicted to oil. I was invited in October 2005 to give a seminar on Capitol Hill in the United States and I called this seminar 'A world addicted to oil'. At this seminar the aides to the senators, the government and even to the President were present, and I kind of smiled when the President a couple of months later said in the Address to the Nation 'We have a serious problem: America is addicted to oil'.

Let us look at this problem, because many people do not understand why we are addicted to oil. To be able to understand that we must know how much energy is stored in oil. If you take one hundred millilitres—that is, a small cup of coffee—that has the energy content of one kilowatt hour, and is equal to the work that you have to do to pull a car from the basement of the Eiffel Tower to the top by hand. If the car weighs 1,200 kilos that is exactly the work of one kilowatt hour. When a human person works for one day, that is equal to 0.5 kilowatt hours, so to bring the car to the top of the Eiffel Tower would take two days. If you fill your car with 50 litres of gasoline that is equal to bringing 50 cars to the top of the Eiffel Tower, or you can put 1,000 people before your car to pull it for one day. The work that 1,000 people can do by pulling your car in one day is equal to 50 litres of gasoline. So it is an enormous amount of energy and that is why we are so addicted to oil.

During the last 20 years we have had an increasing use of energy in the world: oil, natural gas, coal and some other things. The other things are hydro, nuclear, biomass, solar and wind. We all know that there has been a dramatic exponential increase in the use of solar and wind. But if we look at the global scale when it comes to use of energy, today we are still just discussing how thick the line should be at the top of the graph. One must understand that even though solar and wind are very important for the future, so far they provide just a small fraction of today's possibilities and for the coming years.

Where can we find fossil fuel? If we count uranium as fuel that we cannot get back—even though it is not fossil—you can see on the slide the 10 countries in the world that have the most fossil energy: the United States—most of that is coal; then Russia, that has coal, natural gas and oil; then China, which has mostly coal, and at number four is Australia with uranium, coal, natural gas and very little oil. I used to say that these countries that provide the fossil fuel are the drug dealers. If using the fossil energy is like using drugs, these are the ones that are providing the market for the fossil fuel to be consumed. So this must be a double responsibility for the future when we talk about climate: the ones that are using it and the ones that are producing it. That is something that we should start to discuss also.

In 2005 the Prime Minister of Sweden, Goran Persson, listened to what we said at Uppsala University and he decided that there should be a commission appointed by the Swedish government to decide what to do to make Sweden less dependent on oil by 2020. After the Second World War, Sweden increased its use of oil dramatically. At that time we were a poor country but in 1970 we were the third richest country per person. You can see here on the graph that it was the use of oil that made Sweden rich. In 1970 we used more oil per person than any other country in the world. Since then we have started to use less oil and that has happened because we use less oil for producing electricity and heating our houses. But when it comes to transportation we are still increasing our use of oil. We have a small yellow ribbon here on the slide which shows electricity—electric trains and so on. Electricity is said to be the future transportation fuel but it has a long way to go to be very important. We also have some ethanol in our system.

When we discuss the future I think it is important to treat fuel for transportation separate from fuel for the rest of society. Otherwise you might misunderstand a decline in the use of oil and think there is no problem, but you may still have an increase when it comes to transportation—and transportation is a leading term when it comes to growth in the economy and so on. For instance, from 2000 to 2006 there was an increase in the use of oil in Sweden and that is the same increase that we had globally for the use of oil. From 2001-02 until 2007 we had an increase in the use of oil of 10 per cent, and I will come back to this increase a little bit later.

This is the recommendation for the commission—that Sweden's society as a whole should be able to make 20 per cent more efficient use of energy by 2020 and at the same time create intensified, cost-efficient prosperity that is sustainable in the long term. By 2020, in principle, no oil should be used for heating residential or commercial buildings. Road transport, including transport in agriculture, forestry, fishery and building sectors should reduce the use of petrol and diesel by 40-50 per cent by 2020. And industry should reduce its use of oil by 25-30 per cent by 2020. This is the recommendation to the Swedish government from this commission. And as you see, it is quite a strong downturn when it comes to the use of oil. The question is, of course, if it is possible to achieve this.

I would like to say some words about my research group because what I am trying to do is to make you believe that the research we are doing is of importance. You must trust someone. You might trust some agencies and you might trust researchers and so on, but what I like to do is to present my case as a researcher. I say what I say because we have done research on this—it is based on more than just thinking. I have a group of around 9 or ten people who are working with these issues.

In 2007 I was very glad when the OECD asked me to write a report about my opinion about the future use of oil globally. The thing was that they asked four people in the world to make these kinds of reports. One represented the International Energy Agency, one has been working together with the US Energy Information Administration, the third had been an adviser to the World Bank and fourth person they chose was from Uppsala University. That is how they graded the work that we do at the Uppsala University. I think that is a very strong sign that they think we are doing something that is good.

We have today a world that is guided by international agencies of different kinds. We have an Energy Information Administration in the United States. We have the International Energy Agency that in reality is not an international agency—it is an agency of the OECD countries. So it is only OECD countries that can be members. And then we have the oil producing countries, through OPEC, that are also saying things. And you can see on the graph, on side we have a grey haired professor with his students that are saying, 'Peak oil'. We have another situation facing us—we have a limit when it comes to the production of oil.

The International Energy Agency, when it comes to the energy outlook, is led by Dr Fatih Birol. He is the Chief Economist of the agency. He recently gave a presentation where he stated the three big challenges for the world's future. As number one, he pointed out that it is the fact that production in existing oilfields is declining dramatically. They found that the oilfields that produce oil today will, by 2030, decline by an amount of 45 million barrels per day. That is equal to the production of four times as much as Saudi Arabia is producing today. That is just the decline. We have also looked into this to see if there is anything that is right about this. When you read the *World Energy Outlook 2008* they say the following:

> The results of these analyses are intended to provide policymakers, investors and end users with a rigorous, quantitative framework of assessing likely future trends in energy markets.

What they are saying, in principle, is 'trust us because what we are saying is what should be guiding you'. That is what we are looking into. Can we trust them?

The first thing we looked at was the decline in existing oilfields. As they said, the decline of 45 million barrels per day was, for the moment, one of the bigger challenges for the world. And, yes, they were right. The oilfields are declining so much and they might even decline a little bit more. What we see now is that at least 45 million barrels of today's production will not exist in 2030. We must something different and put it in there. We have made a very detailed analysis, but I have no time to go into that. It is presented in a publication that we were asked to submit to *Energy Policy*—one of these peer-reviewed magazines that scientists used to use when they liked to present data about energy.

You can see here the different categories of oil that we have in the future. Yes, we think what they are saying about the crude oil currently produced in fields is right. When it comes to fields to develop, they are doing that in such a way that it is over-optimistic. The same thing applies to new discoveries of crude oil. Technology means that you can get out more oil at the end—the end of the oil recovery and the number they have there is right. They say the crude oil production in 2030 should be 75.2 million barrels per day, and we see it is only possible to bring out 55.1 million barrels per day. So that is 20 million barrels per day lower, compared to what they think is possible.

If we go to other non-conventional things like liquids, we see that they have also overestimated what is possible to get. In total, one can say that only 75 per cent of the oil that international energy agencies think it is impossible to get in production in 2030 can, in fact, be possible. What does that mean in reality? It means that the increase in the use of oil in the future is not possible. Just now, we have reached the peak of the oil age, and that is kind of dramatic because it means a paradigm shift. We have to make mention now of the need to enter into the new paradigm, the post-peak oil society. This is a step that is very hard to make into the future.

I will just take one example here that is affecting Australia very much, and that is aviation fuel and what this peak oil will mean when it comes to aviation fuel. The oil that is used to make aviation fuel is also used to make gasoline, diesel, and heavy fuel for shipping and so on and for heating. The fractions are kind of constant, even though you can change the percentage you get in the different fractions a little. Something like 6.3 per cent of the total oil that is put into refineries will be aviation fuel. It is in the same percentage as diesel, the middle distillates. So diesel and aviation fuel are competing with each other when it comes to uses; that is, if you use more diesel, you have less aviation fuel and so on. That is a problem. On the other hand, when it comes to the heavy fuel that is used for shipping, you see a trend now to upgrade to diesel oil. That means there will be less fuel in the future for shipping compared to what you have today. Some of the shipowners that I know are very worried about that, even to the point of reconsidering their business.

So, what about aviation fuel then? The airline industry has been very efficient when it comes to using fuel more efficiently, as you see here. We think that they can continue to have this trend into the future. On the other hand, they are planning to use much more oil in the future, as you can see in the forecast that Airbus and Boeing and others have now, when it comes to use of aviation fuel. Taking the efficiency and the demand increase, you get this low curve here on this graph saying the demand is increasing. The red curve that is below that is the International Energy Agency's forecast that we say is not possible. So, even with their forecast, the forecast that the airline industry has cannot function. Then we have the green curve, which is what politicians like to do. Politicians like to reduce the amount of oil that is used, and this reduction means that you have less aviation fuel in the future. That means when politicians agree on cutting oil production, they are also saying, 'We are cutting the aviation industry.' But they do not say this out loud, because many would be upset by that. In reality, though, that is what they are saying.

And the band here—what we think of as a lower and an upper band—represents the oil we thought it might be possible to get out through the ground. So the aviation industry in the future has a big problem. For instance, I see no reason why any airport should build a new take-off or landing strip. The increase of airports is over. That is something that has to have planning as well.

Now we move onto the economy. This graph just came out from the Energy Information Administration in the United States. You see here the energy and economic growth. They have three cases: a high case, a reference case and a low case. You can see that they cannot see any growth in the economy in the future without increasing the use of energy. That is very important. The economic systems we have today must have more energy. There has never been an increase in economic growth without an increasing use of energy. If you look at the oil part, and this is what the international agency is publishing, the relationship between GDP and oil demand is

roughly a 1.5 or 1.6 per cent increase in the use of oil when there is an increase of GDP of three per cent. This is the guiding thing for all forecasts of future demand.

From the beginning of this century—2001, 2002 until 2004, 2005, 2006—we had an enormous growth in the global economy. This growth is correlated to an increase in the use of oil of 10 per cent. Now the economy has crashed, and we now consume about 84 million barrels per day. What will happen in the next increase period? Will there be enough oil to allow an increase in GDP? Governments around the world are counting on there being enough oil because that is why they are lending out a lot of money, but it might be that this increase will not come. I would like to make it clear that I do not think it is possible to get the oil to have a new increase in GDP. There will have to be other means to get growth in the economy. If you look at the coupling of the use of oil and growth of GDP, China and India are two good examples. In China there is a one to one correlation between growth and the use of oil. The same applies to India. Below that we have sub-Saharan Africa, the poorest countries in the world—they do not get any growth in the economy and they do not have any increase in their use of oil. The correlation between the use of oil and the growth of the economy is very strong and it has always been that way.

So what is industry saying? The Group Vice President of Toyota Motor Sales in the United States says that the fact that we are peaking in oil production is something that Toyota must consider when they plan for the future. The Swedish truck company, Volvo, have officially decided that one of their three driving lines for future production is peak oil. Many, many companies are discussing the future with us and there is a trend now for investors in Sweden to look into the future and take peak oil as a real thing when planning their investments. A couple of days after President Barack Obama was sworn in and took his oath in January, he said:

No single issue is as fundamental to our future as energy.

Those are words that you should take with you. Energy is the foundation of today's society. For instance: you have a nice house on a piece of ground, but if you get cracks in that ground, you will get cracks in the house. So if you cannot have a good energy supply for your society, then you will get cracks in your society. It is as simple as that.

I would also like to mention that besides being professor at Uppsala University I am also the President of ASPO International. That is an organisation that has groups all around the world. There is a group here in Australia also, ASPO Australia, and these groups are trying to make people aware of the fact that we are facing a new situation in the future. Very often you hear that people have said for many years that we will run out of oil but there has always been 30 years of oil and so on, and that has to do with the fact that the resource of oil is reported in different ways, so these sayings are not reality when we look into the details when it comes to oil reserves. This is the international picture when it comes to ASPO.

I would also like to mention what the former energy secretary of the United States, James Schlesinger, said at the conference in Cork in Ireland. He is still active in the United States as an adviser and so on. He said:

And therefore to the peakists—

Peakists are we who say we will have a peak in the future—

I say, you can declare victory. You are no longer the beleaguered small minority of voices crying in the wilderness. You are now main streams. You must learn to take yes for an answer and be gracious in victory.

These are strong words for a person who was energy secretary of the United States, the country that is using most of the energy and most of the oil in the world, and we are gracious and we hope that we can find ways for politicians to turn when it comes to the use of energy, because there are a lot of political decisions that must be made. These decisions must be made in such a way that politicians think they can be re-elected, because otherwise we will have a threat to democracy. The things that must be done now are for the long term. You cannot fix them in three to four years, the term that you need to be re-elected in. If we cannot seriously work this out, not solving the energy issue is the biggest threat for democracy in the future. Then it will only be countries that are not democratic that will be able to handle these things, and we have an example of a country that is trying to handle it and is doing it quite well just now that is not democratic. This is very important for the future.

There is a peak in history. The oil age is something like 200 years and we are at the peak just now, and when we started ASPO in 2002 we said there will be a peak in production around 2010 at 87 million barrels per day. That looks to be just what it will be. But data is insecure, so in our group we have the best case and the worst case and there are fluctuations and we should know that it is not possible to predict the exact number for the future, because economic factors and other factors have a big impact on the future production of oil.

We are at the peak now, on a plateau, and the question is when we will start to decline from the plateau. I do not like to say that the future is the end of the world. Instead I would like to say we have to build a new world. We have to build a new crash mat and we have to build it as thick as possible, because if we get a thick crash mat we will not be so hurt when we fall down. So I hope that politicians in Australia will start to work on this crash mat now, because if you do it now you will be very much thanked by the public later on. It is very important to be able to look forward just now.

CHAIR—Professor, thank you very much for your opening statement.

Senator O'BRIEN—That is the picture that you want to paint about the challenge and this is an inquiry about public transport, but do not feel constrained. What do you see as the solutions?

Prof. Aleklett—First of all, there is not one solution. The solution is in the mixture of everything and is different from country to country depending on what kind of transport system you have. In Sweden, for instance, trains are electric. We have electrified the railroad. We see that using railroads more in the future as reducing the need for fossil fuel for transportation, so that will be very important. That is the same for all of Europe. Other countries that do not have electrified railroads have a problem, but that is something one should plan for.

Senator STERLE—What is your source of electricity?

Prof. Aleklett—Electricity can be many things; again, there is not one solution. When it comes to electricity you have a so-called base load—that is, a certain amount that must be there all the time. Today we have base load production from coal or from nuclear power. Then you have to take care of the fluctuations—the daily fluctuations—and that you can do with hydro-

power or you can do it with natural gas fired power stations. But, of course, natural gas will also be a problem in the future.

Wind power can come in as part of the base load depending on the power allowance you have and so on.. At Uppsala University, Professor Mats Leijon has the world patent now on a completely new source and that is wave power. The first prototype is now working on the coast of Sweden and is looking very promising. For instance, they estimate wave power for Europe can be as great as 2,000 terabyte hours It is enormous. That is more than Australia uses, I guess, so wave power is really something that is important for the future. There will be bio-energy that we use and so on but I think bio should be mostly used for transportation. Ethanol is one fraction—the second generation when it comes to biofuel is important. Everything is needed. It is important as a politician to understand that energy can never be produced; energy has to be converted from one form to another and it costs different amounts of money to do that. Converting one type of energy has one price tag; converting another type of energy has another price tag. But for the industry to be able to function in the transformation period they must be equalised in some way or another, so that means that some industries should have more subsidies and others should have less. A completely open market in competition here will hurt the future of society. This is something I think is very important. I just met the adviser to President Obama in Brazil last week and he pointed out also that this is the big problem—the challenge we must face and that politicians deal with.

Senator HUTCHINS—It is all well and fine to say the alternatives are coal and nuclear power but say in a country like ours both those alternative energy sources are controversial. To use nuclear power here would be sending up a real red signal to the community which would divide us. We are already fairly divided at the moment about a carbon pollution reduction scheme which deals with our huge amounts of black coal. Have you seen anywhere in the world where there has been an amicable solution to going to alternative fuels rather than the fossil fuels that we have had a dependence on for some decades?

Prof. Aleklett—The thing is we are talking about base load, and the base load must be there. So what kind of alternative fuel can you have for base load? In Europe, in principal, if you rebuilt the power lines you can have them cross countries in Europe and it might be blowing some place, anywhere, and you can get some fractional base load, but base load is a problem there. I used to ask people how it was that Denmark has 25 per cent of wind power in their system. People are suggesting it is blowing and so on, but the fact is they 75 per cent of their base load comes from coal, so if they had not had 75 per cent of coal as base load they would not be able to have any wind power. Understanding the base load is important—and for Australia, base load is coal or nuclear.

Senator HUTCHINS—So as this is a public transport inquiry, for us we would be deluding ourselves if we thought that if we could go to electric vehicles that we still would not have to have that almost three-quarters reliance on coal to use it?

Prof. Aleklett—Yes that is right.

Senator HUTCHINS—I am not sure that the advocates for all these new-beaut schemes understand that; I think they like slogans and they build on that.

Prof. Aleklett—This is very important. I can mention that I am also giving advice to politicians in Sweden when it comes to future energy and so on, and the base load discussion has been the key question and it is just because of the base load discussion that Sweden has changed their opinion now about the future and nuclear power. There is nothing any longer that says we should close nuclear power; as I said before, we should keep nuclear power. Several quarters are even saying that in the future we need to replace nuclear power stations with new nuclear power stations because we need the base load to be able to put all the renewable energy into the system.

Senator HUTCHINS—Does that include the Greens?

Prof. Aleklett—Even the Greens; they do not say we should close them but they do not agree on building new ones. So there has been a change in Sweden and I think the base load discussion has been very important in this matter as suddenly people understand that we must take care of the base load first and then we can couple things to the base load.

CHAIR—You were talking about the political parties' view towards nuclear. Have you got a sense of the general view, of the general population?

Prof. Aleklett—It is increasing in favour of nuclear power now. I think the latest poll was something like 60 to 70 per cent for.

CHAIR—Has that changed a lot over recent years?

Prof. Aleklett—Yes.

CHAIR—Why do you think it has changed?

Prof. Aleklett—You have to educate people about the basic things. I think that the discussion we have about these things is very important. I have been in public debate for a long time now and I think it is important.

CHAIR—That education may well be the key and remove that sort of fear of the unknown type of thing.

Prof. Aleklett—Yes. If we do not manage to go forward in this education we cannot keep a democratic country.

Senator O'BRIEN—We have had stationary energy effectively whether you like coal or not or nuclear or not. We have had stationary energy and the resources to power it do not look like running out any time soon.

Prof. Aleklett—Stationary energies I think are fine.

Senator O'BRIEN—The issue with oil is transport or portable energy and the problem is that we are, on the scenario you present, coming to a time where that portable energy which has been a great boon to development will be scarce and expensive, and we have a growing transport need. I have heard of some developments in energy storage which may be of great assistance.

What do you know about developments in energy storage which will assist us in how to view the vehicles of tomorrow?

Prof. Aleklett—There is a lot of research going on into energy storage in, say, small scale batteries and things like that. I mentioned Professor Mats Leijon, who has now the world patent on the new wave power energy systems. He has also, I think, a world patent for a new way of storage of solar electricity on a small scale that looks very promising. So, we do not know exactly what will happen—that is the beauty of research; when the need comes people start to think. I used to tell my young students, 'I rely on you because you are the ones that should be the smart ones that find the solutions for the future'. That brings up another thing, and that is education. It is very important to have good education in energy and energy systems so more focus on that is necessary for a country in the future than it is today.

Senator O'BRIEN—I had a man doing some work for me at my house. He had a small earth-moving business. In conversation, I established that he lived on a property with no mains electricity supply. He generated all of his energy, apart from heating, with wind and solar. He said that the development of inverter technology had made that much more effective and useful for that remote power-generation operation.

Prof. Aleklett—I think if people are aware that it is easy to save energy they will do it. Again, it is a matter of making people aware of it; getting them to be brave and stand up and say, 'We have a problem and you must be part of the solution. Everyone has to contribute in some way or another, otherwise we will have a problem.' Regarding the man you mentioned: yes, if you live on a separate property, your own property, it might be possible for you to handle these things. On my way coming here, I passed through Sao Paolo, in Brazil. In Sao Paolo, there are 24 million people—that is more than the population of Australia. They cannot get power from their rooftop. So it is also important to note that there are different problems in different cities.

Of course everyone should do as much as possible. It might even be that we need to change our lifestyle. I am surprised that in Stockholm, in Sweden, some young people do not care about getting their driver's licence any longer. They think, 'We don't need it.' They rely on public transportation instead. So, good public transportation is very important, especially in big cities. When it comes to traffic planning, this is something that should be there. Before building too many things, infrastructure for public transportation should be there.

There are new, interesting systems. For example, at Uppsala, a company from South Korea has built the first so-called pod cars: personal vehicles on rails. The interesting thing is that the infrastructure for building that system is much cheaper than any other rail systems, because individual wagons have such a small weight and quite a high capacity. Some cities are now planning to build these systems, which can be part of the traffic solution. But electricity, again, is the key thing.

Senator O'BRIEN—It would be interesting to know how an individual rail-transport system works. Have you got a reference for this committee at all?

Prof. Aleklett—Yes, I can give you references to web pages for that. You have a system of rail that is always moving. You go to a station and you push a button and say, 'I'd like to have a car.' Then, an empty car arrives, you get into it, you say the station you would like to go to, and

it does not stop at any other place until it comes to that station. It is a much faster mode of transport between point A and point B than that found in other systems. Everything is computerised and it works very nicely. The Korean company chose Uppsala, in Sweden, because of the fact that we have a winter climate and, also, that we have very strong regulations for it to function. It is now approved as a transport system, with all the securities and so on, in Sweden.

CHAIR—You mentioned early in your briefing reducing the use of oil by 40 to 50 per cent in road transport, agriculture and other areas. What do you see that being replaced with?

Prof. Aleklett—Personally, the biggest problem for the future that I see is the agriculture industry, because we need food on the table. If you do not get food on the table, the global population will be smaller in the future. Today, we are just eating oil; all of us are eating oil. The energy that you have in food is lower than the energy used to produce it. I have the number for the United States, and I will use this number. If you take just the fossil fuel used on the farm to produce 1,000 units of food energy, you need 1,600 units. If you then add the transport of the food, processing the food, buying the food from the store, cooking the food and so on, you end up multiplying that figure by seven. So, to have 1,000 calories of food on the table, you will spend 7,000 calories of fossil fuel to produce it. So we are eating oil and that is a big problem. What I am recommending now, in Sweden and in other places, is that we must make production of food fossil-free. That is the first step we must take. Whatever you plan to do, make the farmers a little more important than they are today, because, honestly, they are the ones that make us survive.

For instance, before, food was produced on the farm using biofuels. In the 19th century in Sweden, we had horses. If you look at the energy content of the production on the farm, around 20 per cent was needed to feed the horses, in order for them to survive and work. That is reflected in other systems also. I heard someone say that, here in Australia, 25 per cent of the energy produced on the farm was needed to run it. In the future, we might need to use a fraction of the biological production on the farm to produce the energy for the farm to run. That is the first thing we must secure, because we need food. Then we have to see what kind of system we have to build around that.

CHAIR—It is fascinating when you talk about the growing world population and the ability to be able to feed that growing population. It is all intertwined. Intermingled with that is the decline in oil, and what, actually, are the solutions? It is very, very serious.

Prof. Aleklett—I think the situation is very critical. I was quite surprised when I found out that, for instance, the Wallonia parliament in Belgium has decided to now have a standing committee on peak oil to look into the future for the country. That is the first parliament in the world that has made that decision: 'We must have a standing committee on peak oil or energy shortage.'

Senator STERLE—That is why we have to get away from this nonsense of ethanol.

CHAIR—Why? It is not nonsense at all.

Senator STERLE—It is absolute nonsense.

Prof. Aleklett—A fraction of it is good, but ethanol cannot solve the world.

Senator STERLE—You would have flown across this great country—I take it you have come from Perth across to here and I hope you did it in the daytime—and you look out and see that we have drought and we have no water. This committee was told the same thing by the Iranian expert Dr Ali Samsam Bakhtiari: that to talk about ethanol in Australia is ridiculous—it takes four litres of water to produce one litre of ethanol.

Prof. Aleklett—But only a fraction of that amount is used in Brazil, so it depends on where you produce it.

Senator STERLE—Let us talk about Australia.

Prof. Aleklett—You cannot produce it in Australia—that is right.

Senator O'BRIEN—I agree.

Prof. Aleklett—Again, each country has to look into the problem that country has for the future. I propose that you should try to have a standing committee on this problem so that you do not need to fight. Every part of society will be affected, so why not tackle it together. It was interesting that, when they decided to have this committee in Belgium, all parties agreed that it was the right thing to do; there was no-one that said, 'No.'

CHAIR—It is very interesting.

Senator STERLE—Yes, I was talking on the same thing because we have got so many issues about farming in Australian, and they are dead set issues—water and farming lands disappearing and drought and all sorts of stuff. I direct my comments against ethanol wholly and solely to Australia because we have so many other problems that our farming community and our production community are facing.

Prof. Aleklett—We are just at the stage of checking the last part of a report that my group has done when it comes to whether agriculture can support both fuel and food. This is a very detailed report and I am willing to send over a copy to you when it is completed.

CHAIR—That would be really interesting because Senator Sterle raises a very good point. I am taking it that he is making those comments in the context of food versus fuel which then opens I guess a bigger social question of what directives should there be given to agricultural producers to produce a certain type of food or fuel. So it actually leads to the bigger question of whether or not we are going to direct agricultural producers to do things in a certain way. I think it is that next step as well, because you talk about ethanol in terms of food versus fuel but all the research that has been done is that ethanol is going to come from things that are not food and that is going to mean that ethanol probably will be in a much better place when it is not actually a food derivative.

Prof. Aleklett—But we are not there yet. We are talking about ethanol from cellulose and that can also be bigger. But there are places on the planet that are very suitable for producing green stuff and they should produce green stuff. There are other places on the planet and they can

produce other things. For instance, you can produce wool here hopefully in a very efficient way, and so we still will be dependent on each other and we must find ways to cooperate and to find solutions.

I think that we should engender trust in the younger generation because the younger generation are the ones that find completely new solutions. They have ideas that we cannot think about and of course that is the way it should be because we had ideas that our parents never thought about. So I think that it is very important for us to find ways to involve younger people in these issues—different kinds of groups—and frankly say, 'Hey, we have a problem in the future and we know that you who are young must be part of this. We must have your help to find a solution.' I think that they will be extremely glad and be willing to work like crazy. I can just see all my young students I have in my research group. They see the problems for the future and they are eager to work like crazy. It is not just 40 hours a week; I can assure you they put in much, much more.

CHAIR—As fascinated as we all are with these rather extraneous subjects I suppose the point of this really is the public transport inquiry. In a previous inquiry we touched on the role of public transport and the public transport sector we should have, taking into account the declining availability of oil. Are there particular areas around the globe that you see implementing excellent public transport systems that do indeed take account, then, of a lesser reliance on oil?

Prof. Aleklett—Old cities in Europe are very tight when it comes to public space available. They have no choice but to put in public transportation; they cannot handle more than a certain amount of traffic. Take London, for instance. The tax that you have to pay to drive in there was necessary otherwise London would not function. You need these arrangements for cities to function in the future. Take again Sao Paulo: when we arrived there early in the morning we left the airport at 7 o'clock and it took 2½ hours to get to the hotel. Going back to the airport in the morning two days later it took 30 minutes, so just think about the facts and how much waste in the workforce there is through having people just sitting and waiting in a car.

Senator HUTCHINS—That is what you find. If you cannot afford to live near where you work then you are going to be travelling by public transport or by private vehicle. When you were talking earlier about young people in Sweden not taking out their car licences, we would have a similar situation here in our big cities when people live in the city. They are well off; they live close to work and there is excellent public transport because once upon a time the inner city used to be where the workers lived and there has been urban renewal so now those workers have been pushed to the outer suburbs and they have got to travel by train and bus if they want to use public transport. Do you see that phenomenon elsewhere in the world and do you have to subsidise public transport fares, and is that going to be feasible with this shock coming? I do not think people are prepared to pay the price of energy that you are saying we should be expecting.

Prof. Aleklett—I am not an expert in transport. I can just comment on what I know, and that is the Swedish system in principle. If we take the city of Stockholm: per month you pay one fee and then you can use the public transport system as much as you like. Some use it less and some use it more but you should not have a fee per travel; you should have a fee per month. Of course, that means the taxpayers are paying part of that but on the other hand if people cannot get to their work there will be no taxes. You do not subsidise the person, you subsidise the fact that you will get more taxes in the future.

Senator O'BRIEN—How much does it cost a month?

Prof. Aleklett—In Stockholm I think it costs around $100.

Senator O'BRIEN—One hundred Australian dollars?

Prof. Aleklett—One hundred and twenty or something like that; it is in that range.

Senator STERLE—So we are looking at you Professor because the Swedes led the way in diesel engine technology and fuel consumption back in the late seventies and eighties and what the Swedes did with introducing Saab, through Scania, and Volvo into the road transport industry in Australia was a massive step forward because the Americans had had control of the road transport heavy haulage sector. I do not know about farming; I do not know if it is still the American gear out there—

CHAIR—Not necessarily, no.

Senator STERLE—The fuel efficiency of the Swedish designed engines just tipped the road transport on its ear.

Prof. Aleklett—I am glad to hear that.

Senator STERLE—I know because I have had both. I have had Kenworth and Scania. My good friend Senator Hutchins would back me on this: 25 or 30 years ago it was all American gear. You are battling to find all American gear out there now and what American gear is out there—and we are talking of a country that relies wholly and solely on road transport, and rail and sea but mainly road around the regions—has had to come up to the standard of the Swedish engines and now governments are actually bringing in legislation to have certain emission controls based on the engines that the Swedes started.

Prof. Aleklett—I can tell you what has happened in Stockholm, for instance. Scania has developed a new diesel engine that can run on 100 per cent ethanol.

Senator STERLE—But we cannot have it here because we don't have the water.

Prof. Aleklett—Volvo is developing a hybrid engine for inner city buses because they save energy. And there are the hybrid engines for garbage collection because they are stopping and going and they can save something like 40 per cent of fuel by just introducing such an engine. So they are continuing to try and find good solutions. But again the electricity option is an important issue and I think that the electrification of the railroad in Australia should be very high up on the agenda.

CHAIR—The public transport systems we have around this country have been developed in an ad hoc kind of way over a number of decades. It is quite sensible when you are looking at greenfield developments or new towns to get your public transport in an orderly manner. Have there been any particular cities or towns around the world that have addressed an inefficient public transport system and replaced it with a more efficient one?

Prof. Aleklett—Sorry, I am not expert enough to discuss that. Again, the issue of peak oil is still not a well-known issue. I have a collaboration with the School of Architecture in Stockholm. They have a master course about how to create cities after peak oil. They look into the kind of planning we need to have. They must be first, because what the architects plan for the future is something that will stay in place for a very long time. As for Australia, I would say, for instance, 'How would you plan Canberra without fossil fuel?' And you would just give a prize for the best solution even if it you do not enact it, because it might end up changing people's way of thinking. So you can do things like that. That is part of the education of the public.

CHAIR—Absolutely. I suppose my question was really, 'Are there any towns or cities that, in recognising peak oil, have moved to change their systems?' It is probably something you cannot answer. I am trying to make that link of those towns and regions that do realise it is an issue and are trying to change accordingly.

Prof. Aleklett—There are probably more changes because of climate change. You see the two things have, in principle, the same solution. When we talk about climate change, we say, 'We have to do this because we cannot use much oil in the future because of the climate.' What I am saying is that we have to do it because we do not have the oil for the future. The two things are, in principle, the same thing. A few weeks ago, I was in Geneva at a conference there. I discovered that Geneva was now putting in trams over the whole city to reduce the number of cars in the city. That is one example of a city that is really doing something. I guess the reason for that was climate change not peak oil.

Senator STERLE—If I can go back to the previous inquiry we did about three or four years ago on peak oil, I cannot think of the exact words you used, Professor, but you said something like, 'Depending on who you talk to, we are at peak oil or we are not at peak oil.' Experts in the field are clearly saying to us, 'We have reached peak oil.' But if you talk to the other experts, being the oil companies and OPEC, we are nowhere near it. All we really can take from that is that now is the time to see how we can best utilise efficiency in our public transport systems.

Prof. Aleklett—You should all ask yourself, 'Who is the monster?' If you take an oil company, for instance, and you look into what the most important number is in the yearly report for that oil company, it is, of course, how much they are selling. But the other number that is very important is 'How much do we have in our reserves at the end of the year?' If oil companies cannot replace what they have produced, they are in big trouble. Therefore, they have developed a system of reporting that is, I think, not honest for the public. For example, if a discovered oilfield is not put into production, it is not reported as a resource by an oil company. So an oil company only reports the parts of the fields that are in production. That means that, for a long time, it has been easy to just pull things out of stock into production. If you look into the reality most of the oil in the world was found during the sixties. During this period they discovered something like 48 billion barrels of oil per year in new oil discoveries. The consumption at that time was eight billion barrels.

Senator STERLE—Per year?

Prof. Aleklett—Per year, yes. Of course, if they had put in their books that they had found so much oil, the value of what they sold would be nothing. So they decided that they cannot report all that; they can just report the fraction that they are really using to produce the fuel they are

producing. Today we are in a completely different situation; the use of oil today is 30 billion barrels per year and the discovery trend now is 10 billion barrels per year. We still have in our reserves enough for some years from now, but take for instance the oil in Iraq. I had a talk with a former oil minister over there and he said that the right number should probably be 115 billion barrels in reserves—let us say 120 to be a little bit optimistic. One hundred and twenty divided by 30 and what do you get?

Senator STERLE—Four.

Prof. Aleklett—Four; that is four years of global oil consumption. So Iraq's reserves, maybe the second largest oil reserves in the world, can only support the world in oil for four years. Saudi Arabia, six; Russia, two. I can just continue to add country by country. Another thing I used to say to people is that Russia is the second largest exporter of oil in the world for the moment. If you were a Russian leader and you looked into how much oil Russia needed over the next 30 years, you would discover that you cannot continue to export oil because then you would not have enough oil; you would need to import oil in the future. Then you ask yourself, 'We are now the second largest oil exporter in the world, who should we import oil from in the future?' People say the Middle East should increase their export of oil, but they are thinking exactly that way: 'We keep oilfields for our future generations because that is the only way for them to get food on the table in the future.'

Senator STERLE—But, Professor, would the truth be that taking into consideration the world's insatiable appetite for oil, currently where we stand now with all the other options—other fuels such as gas and liquid gas and all sorts of things like hydro—we still would not be able to meet the world's energy needs at this stage would we? Or would we?

Prof. Aleklett—We are now facing the biggest problem the world has ever faced—

Senator STERLE—I am sorry; I was not trying to put you in a position where it would be on the front page of the *Canberra Times* tomorrow that you said something , but currently where we are at is what I am trying to get to if the supply of oil was to stop tomorrow.

Prof. Aleklett—We could put it like this: if in the future we need as much oil to produce food as we need today—oil and natural gas—then the future global population will be smaller than it is now.

Senator STERLE—Thank you.

CHAIR—There being no more questions, I think we are done. Thank you very much, Professor, for being here today.

Prof. Aleklett—Thank you ladies and gentlemen and if ever you would like to discuss something please come back to me. With today's technology I can be sitting in Sweden and discuss things with you, so please come back to me.

CHAIR—Thank you very much; we appreciate that. I declare the hearing adjourned.

Committee adjourned at 2.14 pm