



Parliament of Australia

Report of the Parliamentary Field Visit
to
Canada and the United States

23 October to 4 November 2015

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ISBN 978-1-74366-473-5

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Members of the Parliamentary field visit

Parliamentary field visit Leader
The Hon Scott Buchholz MP

Dr Denis Jensen MP

Parliamentary field visit Secretary
Ms Pauline Cullen

Introduction

This report outlines the key activities and observations of the Parliamentary Field Visit (field visit) to Canada and the United States of America between 23 October and 4 November 2015.

The field visit format is designed to allow parliamentarians to explore and examine a particular issue in depth through meetings with dignitaries, officials, representative organisations, NGOs, members of the public, and site inspections.

Objectives of the Parliamentary Field Visit

The theme of this visit was 'energy security'. The aim was to develop a thorough understanding of the how countries such as the United States and Canada are developing their domestic policy position to transition to self-reliance on energy within 10 years.

The field visit was aware of decisions taken by the United States to become self-sufficient with respect to energy and wished to explore some of the implications of such a decision in more detail. Canada's proximity to the United States and its own energy requirements were also of interest to the field visit. The field visit was particularly interested in how fluctuations in the price of energy can have an effect on the nation's productivity, considering the experience in Australia of the effect of the fluctuation of diesel prices.

Program

The program included meetings with officials, representatives of energy companies such as coal, nuclear and solar, energy associations, government and regulatory groups and research organisations as well as site visits to a power station and LNG terminal.

The field visit appreciated the many people and organisations who gave their time and expertise. Appendix A features more detail of those the members met with during the field visit.

The visit was supported by the Australian Parliament's International and Parliamentary Relations Office (IPRO) and the Department of Foreign Affairs and Trade (DFAT). During meetings and site visits the field visit was accompanied by DFAT officers stationed in Canada and the United States. The guidance of these officers was very much appreciated, particularly Ms Stephanie Aeuckens in Canada, Ms Kelly Ralston and Ms Daniela Rees in Houston and staff in Washington DC and Los Angeles.

The field visit members would like it noted that the format of the field visits is quite different to that of a bilateral delegation or a committee visit to a country. They encourage DFAT to ensure that their officers are aware of the difference between a

delegation and a field visit and take this into account when planning a program. Field visit members found at times during this visit that the program did not appropriately focus on the topic of 'energy security' and considered valuable time was spent on visits or meetings that had little relevance to the topic and were more suited to a delegation visit.

Field visit members also found that the knowledge of the DFAT officers in relation to the topic of the field visit, varied significantly, which also impacted on the quality of the program in some locations.

Canada

The field visit visited Canada from 23 October to 28 October as the first leg of the parliamentary field visit. In Canada the field visit visited Vancouver, Edmonton and Calgary.

Canada is one of the world's largest producers of energy and one of the highest per-capita energy consumers. Canada is the world's fifth-largest oil producer and has the world's third-largest proven oil reserves. It is one of the highest producers of uranium and the third largest producer of hydroelectricity in the world. It is also a significant producer of petroleum, natural gas, and coal.

Following two years of decrease, Canada's total energy consumption increased in 2010. Most of the energy consumed (41 per cent) was refined petroleum products, while natural gas accounted for 31 per cent and electricity, 24 per cent. Despite 15 per cent growth in consumption, coal comprised just 1 per cent of total consumption, since over half (55 per cent) of the coal mined in Canada was exported.

The transportation sector consumed the most energy in 2010—34 per cent of the energy used—followed by the combined residential and agricultural sectors (20 per cent), manufacturing (19 per cent), commercial and public administration (15 per cent), and mining, oil and gas extraction (10 per cent).

Among the provinces, Ontario, Alberta and Quebec consumed the most energy—74 per cent of total energy demand in 2010. Energy consumption

increased in 2010 in all provinces, except Newfoundland and Labrador (-14.0 per cent), Quebec (-2.1 per cent) and Manitoba (-1.5 per cent).

The National Energy Board (NEB) of the Government of Canada notes in *Canada's Energy Future 2013*:

...enough energy supplies will be available to meet Canada's growing energy needs for the foreseeable future. Over the next 20 years, the NEB projects energy production levels increasingly greater than domestic needs, resulting in growing amounts of energy available for export.¹

CANADA AND THE UNITED STATES

The United States is Canada's major trade market for energy products and services. Canada sends around 98 per cent of its total energy exports to the United States, meaning that Canada is the largest supplier of energy exports to the world's largest economy. Canada also exports significant amounts of uranium and coal to Asia, Europe and Latin America.

GEOGRAPHIC ISSUES

Despite being a net energy exporter, Canada also imports large/small amounts of energy products. It is both an importer and exporter of coal and petroleum because its major coal and oil fields are located in Western Canada, particularly in Alberta, far removed from its main population and industrial centres in Ontario and

¹ <https://www.neb-one.gc.ca/nrg/ntgrtd/ft/2013/index-eng.html#smmr>

Quebec, and many of its oil refineries cannot handle the types of oil produced in Canada (oil sands).

VANCOUVER

The field visit received a briefing in Vancouver from the Honorary Consul and AusTrade Manager Mr Kevin Lamb, who provided an overview of the relationship between Australia and Canada.

He noted that there was interest in aluminium, mining software, products such as saddles and noted that interest in meat and meat products vary. Wine has been a strong seller, as has food because Australia is an off-season supplier.

Mr Lamb noted that working holidays between Canada and Australia are very popular. He outlined some of the benefits of the working holiday program which encourages cultural exchange and closer ties between arrangement countries by allowing young people to have an extended holiday supplemented by short-term employment.

EDMONTON

TransAlta – power generation

The field visit members visited the Keephills 3 power plant located about 70 kilometres west of Edmonton, Alberta and five kilometres south of Lake Wabamun.

Keephills 3 is a 495-gross-megawatt (MW) (450 MW net) coal-fired generating facility which began commercial operations in September 2011 as one of Canada's largest and

cleanest coal-fired facilities and one of the most advanced facilities of its kind in the world.

Keephills 3 uses supercritical boiler technology, which features higher boiler pressure and temperatures and a high-efficiency steam turbine. This will result in lower CO₂ emissions per MW compared to a conventional coal plant.

As part of the visit, the members were given a tour of the Whitewood mine reclamation site. The Whitewood Mine was the source of coal for TransAlta's Wabamun power plant and began operation in 1962. When the Wabamun power plant was fully retired on March 31, 2010 the mine ceased operations. Since mining began in 1962, TransAlta has reclaimed 100 per cent, or 1,900 hectares of land mined at Whitewood.

The newly reclaimed land will have the potential to accommodate a variety of end-land uses including agriculture, recreation, commercial and wildlife/wetland habitat. These options are being explored as time elapses while the reclaimed land is undergoing certification with the Alberta Energy Regulator.

Highvale Mine is one of three TransAlta-owned surface coal mines, and Canada's largest surface strip coal mine, covering more than 12,600 hectares.

Surface coal mining involves salvaging of topsoil and subsoil for later replacement, then removing overlying rock layers to expose and extract coal reserves, followed by reclamation of the mined area. Highvale operates four draglines for this purpose.

Approximately 13 million tonnes of low-sulphur-content thermal-grade coal are mined at Highvale each year and delivered to TransAlta's Sundance and Keephills and Keephills 3 thermal generating plants.

TransAlta staff provided the field trip members with a valuable perspective on modern electricity generation from coal to mining to regeneration. The presence of Australian staff at the plant was a testament to the high regard that Australian technologies and processes are held internationally.



Mr. Buchholz and Dr Jensen, Keephills 3 Power Station, Wabamun

Alberta Government

The field visit received a briefing from the Alberta provincial government. Representatives from Alberta Energy, Alberta Environment and Parks, Alberta Jobs, Alberta Aboriginal Relations, Alberta Economic Development and

Trade provided an overview of some of the current issues in Alberta as well as the synergy between Alberta and Australia.

The roundtable discussion focused on a range of areas including pipeline infrastructure challenges and safety concerns, Alberta's climate change strategy overview, managing community concern around impacts of rapid development – Aboriginal relations perspective, Trans Pacific Partnership and managing and addressing skilled labour shortages.

It was noted that Alberta maintains a regular visiting program to Australia and that Australia and Canada share a lot of similarities in respect to trade and markets.

Waste Management

The Edmonton Waste Management Centre (EWMC) is a collection of advanced waste processing and research facilities which is owned and operated by the City of Edmonton Waste Management Services. A tour of the facilities provided an insight into how the site is carefully managed to increase the use of as much of the waste as possible.

The city of Edmonton is currently diverting 50 per cent of residential waste from landfill primarily to recycling and composting. The waste to biofuels and the chemical facility will enable the city to increase that diversion rate to 90 per cent.

In tandem with the EWMC, is Enerkem. Enerkem makes transportation fuels and chemicals from garbage instead of petroleum. Enerkem's patented

technology chemically recycles the carbon molecules contained in non-recyclable municipal solid waste into clean fuels and renewable chemicals.

Enerkem Alberta Biofuels is the world's first commercial biorefinery to use municipal solid waste to produce methanol and ethanol. The facility is the result of more than 10 years of efforts to scale up Enerkem's technology from pilot and demonstration, to full commercial scale.

The field visit members were interested in the capacity of the bio refinery and whether the technology is suited to be scaled up to deal with the significant amount of municipal waste that exists.

Clean Energy Research

Canmet ENERGY is a federal government research and technology

organisation with a focus on clean energy research and technology development.

Canmet manages science and technology programs and services, supports the development of energy policy, codes and regulations, acts as a window to federal financing and works with a range of organisations to develop more energy efficient and cleaner technologies.

The tour focused on treatment of the tailings from the oil sands mines and research into techniques to reclaim as much as possible from the tailings. Its goals are to make oil sands and heavy oil a cleaner energy option for Canada and to ensure that Canada is receiving maximum value for the environmental cost already incurred for its oil sands and heavy oil production.

Tailings from oil sands mines are a significant issue in Alberta both in terms



Receiving a briefing on the roof of Keephills 3 Power Station, Wabamun

of size and impact on the local environment. Tailing ponds cover 176 square kilometres and hold enough liquid to fill the equivalent of 390,000 Olympic-sized swimming pools.²

The technology was of interest to the field visit members as a planned visit to the Fort McMurray oil sands was unfortunately unable to take place. Members were able to gain some idea of what the tailings looked like and the scale of the issue in treating them to remove any valuable remaining oils and making the resultant product as clean as possible.

CALGARY

Energy Experts

The field visit members attended a dinner with several energy experts. Their expertise ranged from petroleum production, environmental, energy and natural resource production through to competitive strategy, innovation, sustainable development and corporate governance in the global energy and natural resource sector respectively.

The field visit members appreciated the frank and honest discussion with the energy experts and felt that they provided an excellent perspective on the energy security topic.

Liquid Natural Gas

The field visit members met with representatives from Woodside, an Australian-based oil and gas company and Chevron an American multinational energy corporation.

Members were briefed on the proposed Kitimat LNG project, which is a co-venture between Chevron Canada and Woodside Energy International Limited.

The project consists of the development of natural gas resources found in shale and tight rock in northern British Columbia and transportation to Kitimat on the west coast through an existing and to be developed pipeline.

The project progress is subject to ensuring a cost competitive LNG solution, given the competitive pressure from US shale gas.

Alberta Energy Regulator

The Alberta Energy Regulator (AER) ensures the safe, efficient, orderly, and environmentally responsible development of hydrocarbon resources over their entire life cycle. This includes allocating and conserving water resources, managing public lands, and protecting the environment while providing economic benefits for Albertans.

The AER provided an insight into the differences in what they do as a regulator, and how they are on a process of continual improvement. The AER noted that all applications and decision making processes are publicly available as they consider transparency a vital part of their role.

The AER noted they are trying to find ways to minimise impacts on communities and foster collaboration between energy companies. One example is shared transport facilities,

²<http://www.thestar.com/news/atkinsonseries/2015/09/04/tailings-ponds-a-toxic-legacy-of-albertas-oilsands.html>

where companies come to arrangements to share an existing road.

Oil Sands Alliance

Canadian Oil Sands Innovation Alliance (COSIA) is an alliance of oil sands producers focused on accelerating the pace of improvement in environmental performance in Canada's oil sands through collaborative action and innovation.

The visit heard that through COSIA, participating companies are able to capture, develop and share the most innovative approaches and best thinking to improve environmental performance in the oil sands, focusing on four Environmental Priority Areas, being tailings, water, land and greenhouse gases.

The Chief Executive of COSIA noted that member companies have shared 777 distinct technologies and innovations which cost over \$950 million CAD to develop.

The field visit members appreciated the briefing on the alliance, noting that collaborative alliances such as this can work to bring rewards to all parties.

United States

The field visit then travelled to the United States from 28 to 4 November on the second leg of the trip. The program was centred around Washington DC and Los Angeles and included visits to Houston and Louisiana.

Australia and the United States have a strong relationship, based on a range of similarities in their culture and strong bilateral arrangements.

The Department of Foreign Affairs and Trade note that there are strong formal structures of co-operation between Australia and the United States spanning foreign policy, defence and security, intelligence, development, energy, environment, education, law, trade and investment.³

The Alliance and the Australia-US Free Trade Agreement (AUSFTA) are central in a relationship that also benefits from widespread collaboration across government, academia and business.

The United States is one of the world's largest producers of energy and the second highest per-capita energy consumers.

The primary energy production statistics for the United States are as follows:

Natural gas	30 per cent
Coal	23 per cent
Oil	25 per cent
Renewable	11 per cent
Nuclear	10 per cent

³ <http://dfat.gov.au/geo/united-states-of-america/Pages/united-states-of-america-country-brief.aspx>

The industrial sector consumed the most energy in 2014—32 per cent of the energy used—followed by the transportation with 28 per cent residential (22 per cent), and commercial (19 per cent).

Energy independence

The United States has moved towards a higher level of energy independence over the last 10 years. In 2005, less than 70 per cent of oil consumed by Americans was produced by US oil. More recently, due to innovations in hydraulic fracking, the number is up to 89 per cent.⁴

There has also been a drop in net petroleum imports over the same period of time from 60 per cent to 25.2 per cent. Consumption of all liquid fuels including diesel, jet fuel and heating oil has dropped about 9 per cent, with gasoline use falling to 12 per cent.⁵

Proponents of energy independence consider that it can bring many economic and national security benefits.

WASHINGTON DC

Center for Strategic and International Studies

The Center for Strategic and International Studies (CSIS) is a bipartisan, non-profit organization headquartered in Washington, D.C. The centre's 220 full-time staff and large network of affiliated scholars conduct

⁴ <http://www.businessinsider.com.au/americas-path-to-energy-independence-in-charts-2015-9?r=US&IR=T>
⁵ http://www.nytimes.com/2012/03/23/business/energy-environment/inching-toward-energy-independence-in-america.html?_r=0

research and analysis and develop policy initiatives that look to the future and anticipate change.

The CSIS provided a briefing for field visit members on the implications on lifting the 40-year-old bans on oil exports, which subsequently were passed by Congress and signed into law in December 2015.

With respect to nuclear, the CSIS noted that decommissioning prices are a factor that has not yet been fully explored.

The CSIS noted the issue of storage as being significant in relation to solar energy. They also discussed the 'breaking' of the electricity system, with people being able to go feed electricity back into the system and the implications on the grid of situations such as this.

The field visit members were interested about some of the observations and conclusions of CSIS and felt that there was opportunity for some of them to be further challenged.

Bureau of Land Management

The Bureau of Land Management (BLM) administers more public land – over 245 million surface acres – than any other Federal agency in the United States. Most of this land is located in the 12 Western states, including Alaska. The BLM also manages 700 million acres of sub-surface mineral estate throughout the nation. The BLM-administered land lies mainly in the western states

The BLM clarified that in respect to who owns the rights to the land, unlike Australia, in some of the US states it is

possible for the landowner to own both the surface and below ground rights.

The practice of fracking on federally managed lands was explained as well as strategies to keep those who live in the vicinity to be kept updated on the process. It was also explained that a hydraulic fracture fluid spill is significantly more dangerous than water and that they have set up systems to ensure that any leakage is immediately registered.

The BLM also provided sincere thanks to Australia for sending 184 firefighters during the most recent highly severe wildfire season. They indicated that there would be a more formal thanks coming to the governments of Australia but wanted to register their gratitude to the field visit members.

Geothermal Energy

The Geothermal Energy Association is a trade association composed of U.S. companies who support the expanded use of geothermal energy and are developing geothermal resources worldwide for electrical power generation and direct-heat uses.

The GEA noted that the energy policy in the USA is very complex, where the energy use is governed by the States but laws relating to taxation come from the Federal Government.

The GEA noted that many geothermal industries are working in other regions such as Asia and the Pacific.

They indicated that due to the focus on renewables in some of the western states, they will need to use geothermal energy to meet these requirements.

They noted that in the US, solar and geothermal energy 'jostle' for the equivalent point of energy generated. GEA consider that the addition of geothermal energy to the US power market adds stability.

GEA noted that there is an increased demand for geothermal heat pumps, noting that the efficiency of the cooling side is high and could assist in paying off a \$20K (USD) system in 3 to 5 years.

The field visit members were interested in the way that the Geothermal Energy Association has positioned itself in the energy discussion. They felt that although there were no real parallels with the Australian experience, it provided another perspective on energy that the field visit members had not actively sought in planning this visit.

American Enterprise Institute

The American Enterprise Institute is a community of scholars and supporters committed to expanding liberty, increasing individual opportunity and strengthening free enterprise.

The AEI highlighted to the field visit members that horizontal drilling has reduced significantly the energy costs for natural gas and oil. The effect has been to expand the production of natural gas and tight oil (oil from shale formations). Another effect has been to shift the US from a net importer to a net exporter.

The AEI noted that there are a number of opportunities to sell gas into Asia. They project LNG prices will be higher in East Asia than elsewhere. They also note that delays in regulatory approval in British Columbia, as per the Kit mat

project, are impacting on Canada's ability to export as it can't get the LNG to the coast.

The AEI noted some issues with hydraulic fracking:

1. Ground water contamination (in the US shale resources are way under the ground water)
2. Fugitive methane emissions
3. Seismic issue due to improper re-injection of waste water
4. The effect of the fracking operations on local communities.

The field visit members shared with the AEI that there is a large amount of conventional gas in the Western State of Australia. Australia is one of the major exporters of LNG in the world and there is no need for hydraulic fracking in the west.

The AEI concluded that they would not use the term energy security or independence as they consider they are not meaningful.

Nuclear Energy

The Nuclear Energy Institute (NEI)'s outlined their mission, being to foster the beneficial uses of nuclear technology before Congress, the White House and executive branch agencies, federal regulators, and state policy forums. The NEI also communicates information and provides a unified industry voice on the importance of nuclear energy and nuclear technology.

The objective of NEI is to ensure the formation of policies that promote the beneficial uses of nuclear energy and technologies in the United States and around the world.

NEI noted that nuclear has a 19.5 per cent share of electricity fuel generation, with coal at 38.7 per cent and gas at 27.4 per cent. They note that nuclear has a lower cost for production of electricity compared to gas, coal and petrochemical. NEI also concede that there is a lot of capital expense in keeping plants up to date, with a spike post September 11.

The United States is the top nuclear generating country generating 798.6 Billion kWh in comparison to France with 418.0 Billion kWh.

The biggest growth markets are China, and the UK. As there is no UK nuclear industry, it is all outside investors.

The NEI highlighted the value of nuclear energy during the 2015 polar vortex. They noted that pipelines could not carry gas during the polar vortex and coal piles froze which had implications for electricity generation.

They contend that nuclear plants just did a phenomenal job during the polar vortex with no credit.

The NEI note that decommissioning costs are expensive particularly in single unit sites and there are economies of scale in multi-unit sites.

US Energy Outlook Roundtable, Energy Information Administration

The Energy Information Administration (EIA) provided a briefing for the field visit which was based on their annual energy outlook.

They noted that the future path of crude oil prices can vary substantially, depending on assumptions made about

the size of the resource and growth in demand, particularly in non-OECD countries.

They predict that the United States.net energy imports will decline and ultimately end, largely in response to increased oil and dry natural gas production.

The continued strong growth in domestic production of crude oil from tight formations will lead to a decline in net imports of crude oil and petroleum products.

They also predict that regional variations in domestic crude oil and dry natural gas production may force significant shifts in crude oil and natural gas flows between U.S. regions, requiring investment in or realignment of pipelines and other midstream infrastructure.

They concluded that United States energy consumption will grow at a modest rate over the projection with reductions in energy intensity resulting from improved technologies and from policies in place

HOUSTON

Houston Energy dinner

The field visit members attended a dinner with several energy experts and local dignitaries in Houston. They enjoyed the hospitality of the group and the lively discussion based around the energy situation in Houston and Louisiana and the current political environment within Texas and more broadly.

Sabine Pass Terminal LNG Export facility Louisiana

The Sabine Pass LNG terminal is located on over 1,000 acres of land along the Sabine Pass River on the border between Texas and Louisiana, in Cameron Parish, Louisiana. It is located at the widest point on the Sabine River Navigation Channel, only 3.7 nautical miles from the open water and 23 nautical miles from the outer buoy. The channel is maintained at a depth of 40 feet and is not subject to tidal limitations. The terminal has two docks.

Using the existing infrastructure Cheniere is developing a project to add liquefaction services to its Sabine Pass LNG Terminal.

The US is poised to become one of the top three LNG producers in the world. Cheniere has worked to meet this by creating a LNG terminal that allows for liquefaction and export. Cheniere has taken a range of environmental actions to protect the coast, the tidal conveyance channels and the tidal flats used by local wildlife.

Field visit members noted when visiting the site that it was built originally for import but due to innovative drilling technologies it is now an export facility.

Cheniere note that the United States has more gas supply than it can consume and there is a demand from emerging economies for LNG as it is cleaner than coal or oil.



One of the four fire-fighting tug boats at Sabine Pass Terminal LNG Export facility Louisiana

Cheniere informed members that the volume of LNG decreases by 600 times when liquefied and it can be stored and transported. It is the cleanest burning fossil fuel.

The facility was originally built as an import facility but with the changes in hydraulic drilling technology, a decision was made to consider changing it to an export facility as LNG was able to be sourced through existing pipelines. The necessary regulatory approvals were obtained before liquefaction services were added.

Cheniere also undertook environmental actions to protect coast, tidal conveyance channels as tidal flats are used by birds, alligators and snakes amongst some of the local fauna.

There was support from local community as there was a need for local employment and the company has organised transport and is considering housing in some instances.

An interesting fact of the terminal facility is that they have had fire-fighting tug boats staffed 24/7 since 2008 as part of deal to build facilities, but as yet have had no ships in dock.

The opportunity to observe the scale of a project such as this was invaluable and the field visit members were impressed with how Cheniere had been able to adapt to the changing energy market as a result of the improved hydraulic drilling technologies.

South West Louisiana Economic Development Alliance

The mission of the Chamber Southwest is to develop Southwest Louisiana by creating economic opportunity, and demanding responsible government and quality education.

The SWL Economic Development Alliance is supportive of the work of Cheniere and the effect on the local parish in terms of employment.

LOS ANGELES

Rand Corporation

The RAND Corporation describes its mission to help improve policy and decision making through research and analysis. They describe their core values as quality and objectivity.

They noted that California has been a leader in advancing policy solutions to environmental and energy challenges since the 1960s. California has adopted a comprehensive set of policies, to reduce greenhouse gas emissions, with particular emphasis on those associated with transportation—vehicles, fuels, and mobility.

California's Zero Emission Vehicle (ZEV) program requires auto companies to produce a certain percentage of zero emission vehicles for sale in California, such as hydrogen fuel cell, battery electric, and hybrid vehicles.

The Rand Corporation noted that a hydrogen fuel cell system is preferred because of fuelling times, explaining that Toyota and Honda are releasing their new hydrogen vehicles soon.

The Rand Corporation outlined the California energy policy being clearly related to transportation. They clarified that a percentage of sales need to be zero emission and they consider that hydrogen can satisfy this requirement in California.

In California the low-carbon fuel standard is a rule enacted to reduce carbon intensity in transportation fuels as compared to conventional petroleum fuels, such as gasoline and diesel. It was first enacted in California in 2007 and similar legislation has been adopted in other jurisdictions. The Rand Corporation noted that the low carbon fuel standard can be met in any way at a Federal level.

The Rand Corporation contends that revolutionary changes in the transport industry in California are changing the use pattern, in California and beyond.

The California Energy Commission provides funding for various alternative fuel and vehicle projects each year. They have an alternative and renewable fuel and vehicle technology program which offers a portfolio of funding pathways for vehicle manufacturers, fleet managers and fuel producers to develop and deploy alternative fuels and vehicle technologies.

Field visit members raised the issue of hybrid vehicles and what happens when you consider the energy needed to construct them and the materials used to produce the battery pack for example.

The Rand Corporation mentioned autonomous cars and the implications of them such as no more parking lots as cars will continue after dropping

someone at work. They noted that there are big differences in who has the financial capability to invest in new technologies, highlighting the capability of companies such as Google versus automotive companies such as GM. The Rand Corporation contends that it is difficult to innovate when your company is barely turning a profit.

The Rand Corporation noted that the states in the United States are all very different, a few are experimenting all the time but some are more fixed and less likely to want to change.

The Rand Corporation described that there are 30 countries building nuclear power plants and discussed the nuclear leasing program proposed by the United Arab Emirates.

Issues with nuclear energy include that nobody knows what to do with spent fuel rods and that it is difficult to make the finance work for small nuclear facilities, as the field visit members heard in Washington DC, there are significant up front capital costs.

Field visit members raised the idea of smart grids, noting that in Victoria electricity shortages will mean that supply can be limited with domestic consumers suffering electricity shortages and blackouts.

The Rand Corporation described the Californian situation which has direct load control – customers can opt-in, and can get a lower charge as a result.

California has trialed time-of-use (interval) meters, which could be used with time-of-use (t-o-u) pricing (dynamic pricing in Californian terms, which includes consideration of real

time pricing, covering price changes as wholesale prices change).

The State, with the major utilities, conducted a test to gauge customer response to variable pricing. About 2,500 small scale users across the State were given t-o-u meters and put on different pricing plans. In one plan, consumers were charged 13 cents a kilowatt hour for most hours except for 2:00 p.m. to 7:00 p.m. on weekdays, when the price went to 25 cents. On a few occasions the price was increased to 66 cents a kilowatt hour to mimic a period of special system needs. Evaluation indicated the program reduced peak demand by about 13 per cent.

The Rand Corporation noted that people opting in for such a system were able to modify their use based on real-time-pricing.

The Rand Corporation when asked about the oil market in the US and the likelihood of the commencement of oil exports contended that they were unable to answer as it was too downstream. As noted earlier, one month later in December 2015, bans on oil exports were lifted and the United States is now able to export oil.

BioLargo Inc.

Biolargo is a small company has developed what it is calling 'disruptive technology' which recycles dirty water into clean water.

The product was brought to the attention of field visit members as it has applications in healthcare, food production and mining.

BioLargo has been investigating the contaminated water issues associated with the Canadian oil sands.

Solar Reserve

SolarReserve is a solar power business that has more than 3.1 GW of 'concentrating solar power' (CSP) projects in development globally. It also has more than 2.4 GW of 'photovoltaic' (PV) projects in development globally.

It is developing combined CSP and PV solutions to provide 24 hour baseload solar power that can compete with traditional generation. Solar Reserve contends that its differentiated technology provides the solution for solar energy to operate day and night as a viable alternative.

Solar Reserve outlined their project in Crescent Dunes, Nevada.

The Crescent Dunes Solar Energy Plant located in Nevada is the first utility-scale facility in the world which will feature advanced molten salt power tower energy storage capabilities. They consider the project will deliver enough firm, reliable electricity from solar energy to power 75,000 homes in Nevada during peak demand periods, day and night, whether or not the sun is shining. The project is currently in the commissioning phase. It will be the only operating utility scale molten salt power tower in use.

US Renewables

US renewables was founded in 2003 and has \$750 million of capital under management to invest in renewable power, biofuels and renewable infrastructure sectors.

US Renewables highlighted that most of geothermal discoveries which were successful were drilling for oil and hit steam. They note that if you own geothermal or steam there can be many profits but the nature of the US market means that geothermal is not really viable in the United States. There is no guarantee that the amount of energy which is produced will justify the capital expenditure and operations costs.

US Renewables noted that obtaining a federal subsidy for drilling can be a positive.

They noted the issues with de-carbonising the fuel supply chain, highlighting the difficulty for airlines in particular as they can't decarbonise their fuel and tend put more people on planes to justify their numbers.

US Renewables consider that municipal waste is an opportunity as there is the same garbage profile no matter where you live. Similar to the process undertaken by Enerkem in Edmonton in Canada, they consider if you can capture municipal wastes at the gate, ways can be found to convert the waste to gas and turn it into fuel.

Fulcrum bioenergy is a company which is looking to turn municipal solid waste into syngas and then renewable fuels such as jet fuels. Cathay Pacific and United are very interested in the future of such projects.

US Renewables noted that the decrease in gas prices has had a significant effect on the market generally.

US Renewables described the state of renewables on the US markets, contending that for years the utilities were told to invest in renewables however they were reluctant to do so. US Renewables now consider that there is a greater interest on the part of utility companies as nuclear plants and coal plants close.

They believe that the Utility companies are taking more interest mainly for diversification, noting that industrial scale solar in some places in the US can be the lowest cost power.

Field visit members raised the point that wind energy still needs subsidies which are often not taken into account. US Renewables noted that hydrocarbons are subsidised on the taxation side.

Cal State L.A. Hydrogen Research and Fueling Facility

The Cal State L.A. Hydrogen Research and Fueling Facility (H₂ Station) was formally opened on May 7, 2014. As the largest University located hydrogen fueling facility in the nation, commissioning continues and the facility is now available to Fuel Cell Electric Vehicles (FCEV's).

The station is capable of producing hydrogen onsite from renewable energy sources, using the process known as electrolysis and has the capacity to produce 60 kg per day. When FCEVs are fuelling at the station the only emissions are water vapour.

Audi, Honda, Hyundai, General Motors, Mercedes Benz and Volkswagen have all fuelled prototype hydrogen vehicles at the Cal State L.A. station. These

vehicles hold approximately six kilograms of hydrogen and take about six minutes to fill. A kilogram typically allows a vehicle to travel about 50 miles.

Discussions included regulatory frameworks governing the use of alternative energy sources, and the impact of such use.

Field visit members were given the opportunity to drive a hydrogen fuelled vehicle.



Mr. Buchholz and Dr. Jensen with Professor David Beekman, Cal State hydrogen research facility

Visit to NASA Jet Propulsion Laboratories

The Jet Propulsion Laboratory (JPL) is a federally funded research and development centre and NASA field centre located in Pasadena, California, United States.

The JPL is managed by the nearby California Institute of Technology (Caltech) for NASA. The laboratory's primary function is the construction and operation of planetary robotic spacecraft, though it also conducts Earth-orbit and astronomy missions. It is also responsible for operating NASA's Deep Space Network.

Among the laboratory's current major active projects are the Mars Science Laboratory mission (which includes the Curiosity rover), the Cassini–Huygens mission orbiting Saturn, the Mars Exploration Rover Opportunity, the Mars Reconnaissance Orbiter, the Dawn mission to the dwarf planet Ceres and asteroid Vesta, the Juno spacecraft en-route to Jupiter, the NuSTAR X-ray telescope, and the Spitzer Space Telescope.

Members of the field visit were provided with a tour of the JPL and a briefing on the projects currently underway.

EV Grid

EV Grid is looking at harnessing the power of electric vehicles and possibility of incorporating it into the power grid.

EV Grid believes that energy is key to the future. They note that power generation and usage is changing and the trends towards efficiency and innovation are important in so many ways. EV Grid notes that electric vehicles, solar power, aging infrastructure all are affecting how power needs are considered.

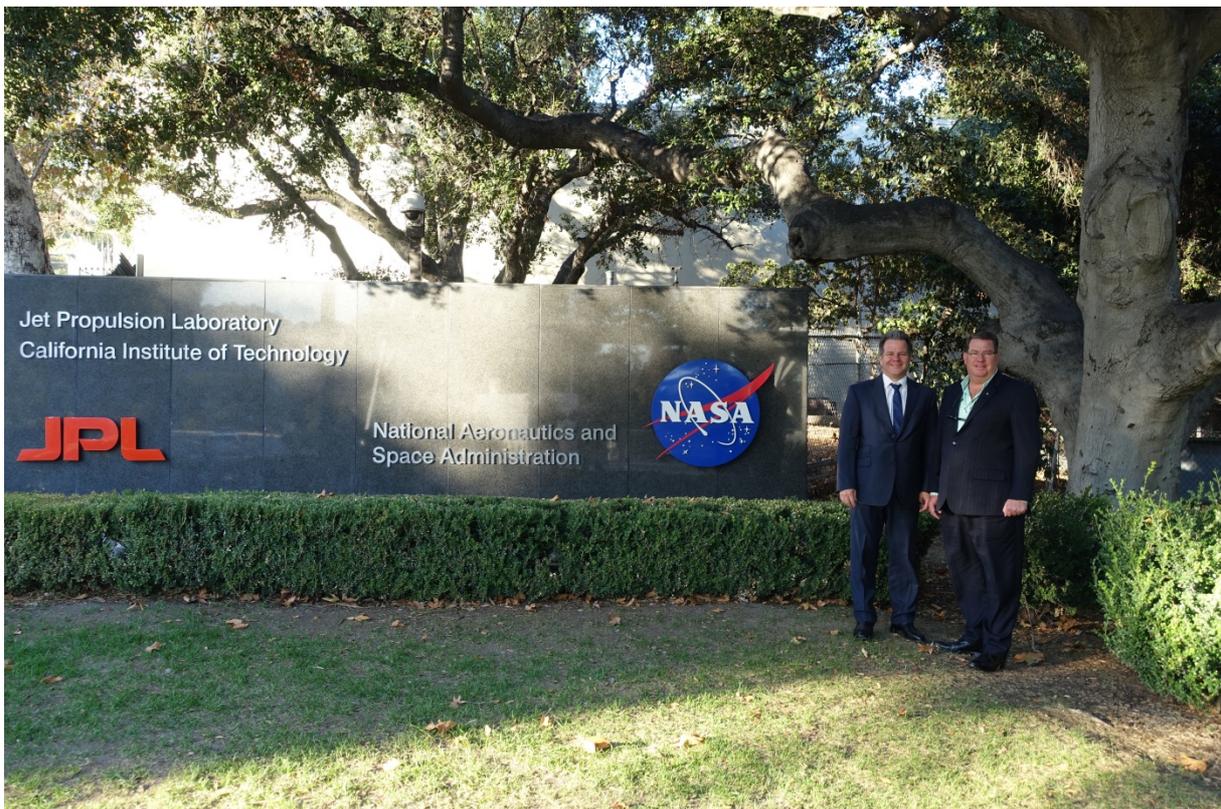
It was noted that it is crucial for utilities to manage EV charging. A smart grid is

the key to “smart” EV charging, providing the visibility and control needed to protect components of the distribution network, such as transformers, from being overloaded by EVs and ensure electricity generating capacity is used most efficiently.

Mr Gage, the CEO of EV Grid notes that integrating a level of battery capacity in the grid has to be done in a very intelligent, sophisticated, complex way, otherwise all these batteries will just be random loads on the grid without any control, and the grid will be in chaos. They note that there needs to be an increase in the level of sophistication in utility companies

With a smart grid, utilities can manage when and how EV charging occurs while suiting customers, collecting EV-specific meter data, applying specific rates for EV charging, engaging consumers with information on EV charging, and collecting data for greenhouse gas abatement credits.

Field visit members appreciated the opportunity to drive an electric powered Mini Cooper.



Mr. Buchholz and Dr Jensen at the NASA Jet Propulsion Laboratory, Los Angeles

Conclusion

Members were very pleased to participate in the Parliamentary field visit to Canada and the United States of America.

There has been a significant change in the natural gas market over the last ten years which has impacted the energy security in countries such as Canada and the United States of America.

A high amount of gas wells were being drilled and liquefied natural gas (LNG) imports from abroad were increasingly supplementing the North American gas supply. There was an expectation of a supply-constrained natural gas market, with high gas prices and moderate gas demand growth.

Field visit members heard consistently that in a matter of a few years, technological advancements in natural gas drilling and well completion methods have caused a reversal in the landscape for natural gas in North America. Instead of a tight supply and demand balance, it has moved to a market in which natural gas supplies are considerably more abundant at lower costs. These techniques have allowed gas to be recovered from areas that were previously thought to be technically impossible or not profitable.

The change in the landscape from the increase in gas production has meant that there are many changes to the energy security aspect in both the United States and Canada. One of the most significant was the overturning of the 40 year oil export ban which took place not long after the field visit took place, catching some commentators

such as the Rand Corporation by surprise.

The field visit was able to explore the idea of energy security in each of the two countries visited in some depth, and concluded the trip with a greater understanding of the challenges being faced by those countries, and of the nature of Australia's own energy needs.

The impact of these changes on the domestic Australian environment is likely to be limited. The impact of increased gas production and oil exports will have an effect on US energy security and there are likely to be advantages for Canada but at this stage, not Australia.

Parliamentary field visits such as this allow parliamentarians the opportunity to look at an issue in some depth, and have mutual exchange of information with other countries on the issue at hand. It is a valuable opportunity that was appreciated by all participants.

Mr Scott Buchholz MP
Parliamentary field visit Leader

March 2016

OFFICIAL VISIT PROGRAM

CANADA

SUNDAY 25 OCTOBER – Vancouver, British Columbia, Canada

- Consular briefing
 - Mr Kevin Lamb, Honorary Consul & Austrade Manager
 - Ms Stephanie Aeuckens, First Secretary

Depart Vancouver/Arrive Edmonton

MONDAY 26 OCTOBER – Edmonton, Alberta, Canada

- Site visit to TransAlta Keephills 3 power plant, Edmonton
 - Tour of Whitewood Mine Reclamation Site
 - Viewing of Highvale Mine (active mine site)
 - Lunch, overview of operations
 - Tour of Keephills 3 plant

TUESDAY 27 OCTOBER – Edmonton, Alberta, Canada

- Roundtable with representatives from Alberta Government Ministries
 - Mr Fabricio Lima, Director, Trade and Investment, Southeast Asia and Oceania, Alberta Economic Development and Trade (Chair)
 - Mr Mike Fernandez, Executive Director, Market Diversification Branch, Alberta Energy
 - Mr Horacio Cuevas, Senior Manager, International Energy Policy, Alberta Energy
 - Mr Steven Flavel, Director of Generation, Transmission and Wholesale, Alberta Energy
 - Ms Kate Rich, Executive Director, Air and Climate Change Policy Branch, Alberta Environment and Parks
 - Ms Sarah Dixon, Analyst, Advocacy, Alberta Environment and Parks
 - Ms Sue Welke, Executive Director, Labour Market Information, Intelligence and Initiatives, Jobs, Skills Training and Labour
 - Mr Stan Rutwind, Assistant Deputy Minister, Consultation and Land Claims, Aboriginal Relations
 - Mr Hubert Eng, Senior Director, Life Sciences Industries, Innovation and Advanced Education
 - Mr Daryl Hanak, Executive Director, Trade Policy – International Development and Trade, Alberta Economic Development and Trade
 - Ms Martha Rogaliski, Senior Trade and Investment Officer, Southeast Asia and Oceania, Alberta Economic Development and Trade (Chair)

- Ms Nancy Terris, Senior Trade and Investment Officer, Southeast Asia and Oceania, Alberta Economic Development and Trade (Chair)
- Visit Enerkem waste-to-biofuels plant at Edmonton Waste Management Centre
- Visit CanMET Energy research labs

Depart Edmonton /Arrive Calgary

- Dinner with energy experts
 - Mr Martyn Griggs, Manager, Oil Sands, Canadian Association of Petroleum Producers
 - Mr Ken Green, Senior Director, Centre for Natural Resource Studies, Fraser Institute
 - Mr Harrie Vredenburg, Suncor Energy Chair, International Resource Industries and Sustainability Centre (IRIS), Haskayne Business School, University of Calgary

WEDNESDAY 28 OCTOBER

- Breakfast discussion on LNG
 - Ms Natalie Poole-Moffat, Head of Corporate Affairs – Canada, Woodside Energy Ltd
 - Mr Darren Flynn, General Manager, Canada Downstream, Woodside Energy Ltd
 - Mr Marc Douglas, Senior Advisor, Government and Stakeholder Relations, Kitimat LNG (Chevron)
- Meeting with Alberta Energy Regulator
 - Jim Ellis, President and Chief Executive Officer
 - Call Hill, Executive Vice President
- Meeting with Canadian Oil Sands Innovation Alliance (COSIA)
 - Dr Dan Wicklum, Chief Executive

Depart Calgary /Transit Toronto/Arrive Washington DC

UNITED STATES OF AMERICA

THURSDAY 29 OCTOBER

- Embassy briefing
 - Mr Peter Heyward, Minister Counsellor Congressional
 - Mr Anthony Murfett, Minister Counsellor, Industry, Science and Education
 - Ms Fiona Bastian, Deputy Director, Industry and Science

- Mr Jaeson Wells, First Secretary (Trade)
- Mr Rory Linehan, Senior Research Officer (Trade, Energy)
- Overview of US Energy Policy Meeting - Centre for Strategic and International Studies
 - Ms Sarah Ladislaw, Director and Senior Fellow, CSIS
 - Ms Jane Nakano, Senior Fellow, CSIS
- Fracking on Federally Managed Lands Roundtable – Bureau of Land Management
 - Mr Subijoy Dutta - Petroleum Engineer, BLM
 - Mr Timothy Spisak (By Phone) - Senior Advisor - Conventional Energy, BLM
 - Mr Bryce Barlan - Program Analysis Officer, BLM
 - Mr Matthew Spangler - Public Affairs Specialist
 - Mr Colin Strylowski - Management Analyst

FRIDAY 30 OCTOBER

- Geothermal Energy in the US Meeting, Geothermal Energy Association
 - Mr Karl Gawell, Executive Director, GEA
 - Mr Benjamin Matek, Industry Analyst & Research Projects Manager, GEA
 - Ms Rani Chatrath, Marketing, Events, & International Initiatives Coordinator, GEA
- Economic Benefits of Fracking Meeting, American Enterprise Institute
 - Mr Benjamin Zycher, Resident Scholar, AEI
- Nuclear Energy in the US Roundtable, Nuclear Energy Institute
 - Mr Daniel Lipman, Vice President, Supplier and International Programs, NEI
 - Ms Carol Berrigan, Senior Director, NEI
 - Mr Nima Ashkeboussi, Senior Project Manager, NEI
 - Ms Suzanna Phelps, Director, NEI
 - Mr Jerry Hiatt, Certified Health Physicist, NEI
- US Energy Outlook Roundtable, Energy Information Administration
 - Mr Adam Sieminski, Administrator, EIA
 - Mr John Conti, Assistant Administrator, EIA
 - Mr Chris Namovicz, Senior Renewable Energy Analyst, EIA
 - Mr Paul Holtberg, Director, EIA
 - Mr Sam Napolitano, Director, EIA
 - Ms Erin Boedecker, Team Lead, EIA
 - Ms Katie Dyl, Operations Research Analyst, EIA

SUNDAY 1 NOVEMBER

Depart Washington DC/Arrive Houston

- Dinner with business and community representatives from Houston
 - Ms Kelly Ralston
 - Ms Daniela Rees
 - Mr Richard Ryan
 - Ms Laura Ryan
 - Mr Peter Hartley
 - Ms Kathy Buchanan

MONDAY 2 NOVEMBER

- Site tour of Sabine Pass Facility and briefing with Cheniere representatives
 - Mr Mark Stubbe, Senior Vice President Marketing and Trading, Cheniere Energy
 - Mr Jason French, Senior Director Government and Public Affairs, Cheniere Energy
 - Mr RB Smith, VP South West Louisiana Economic Development Alliance

Depart Houston/Arrive Los Angeles

TUESDAY 3 NOVEMBER

- Briefing by Los Angeles Consulate Staff at Hotel InterContinental
 - Mr John Brenton, prior Vice Consul
 - Ms Jamie McPherson, Vice Consul
 -
- Meeting on Energy Security with RAND Corporation
 - Ms Karen Edwards, Project Associate RAND
 - Ms Ana Narayanan, Associate Engineer RAND
 - Mr Lloyd Dixon, Director of RAND Centre for Catastrophic Risk Management and Compensation
 - Mr Chris Guo, Associate Economist RAND
 - Ms Debra Knopman, Principle Researcher RAND
 - Mr Tom LaTourrette, Senior Physical Scientist RAND
 - Ms Robin Meili, Senior Management Systems Analyst RAND
 -
- Working lunch BioLargo
 - Mr Dennis Calvert
 -
- SolarReserve Meeting, Santa Monica Offices
 - Mr Bill Gould, Chief Technology Officer
 - Mr Josh Fields, Senior Development Manager

WEDNESDAY 4 DECEMBER

- Meeting with US renewables group, Santa Monica
 - Mr Lee Bailey, Founding Partner, US Renewables Group
 - Mr Jim McDermott, Founding Partner, US Renewables Group

- Tour of the Hydrogen Highway, CalState University
 - Mr Keith Malone, Communications and Legislative Outreach Officer, California Fuel Cell Partnership,
 - Staff of the CalState Hydrogen Fuel Facility

- Working lunch with CalState University Staff & Hydrogen Highway staff

- NASA Jet Propulsion Laboratory meeting
 - Mr Dean Wilberg, Manager, Commercial Communications Partnership Office, JPL
 - Mr Rao Surampudi, Asst. Division Manager for System Formulation, JPL
 - Mr Issa Nesnas, Principle Member, Technical Staff, JPL

- Meeting with EV GRID at Consulate
 - Mr Tom Gage, CEO, EV Grid

Depart Los Angeles/Return to Australia