OTTAWA, Tuesday, February 28, 2017

**Senator Griffin:** Thank you for your presentation and thank you for waiting for us. It was a long afternoon. If you were to identify a couple of things that the Government of Canada could do to best help you make further progress regarding your industry, what would those one or two things be?

*One or two things that the Government of Canada could do to help the Canadian Oilfield Service, Supply and Manufacturing sector is to recognize the global competitiveness of the oil and gas industry and ensure that taxation and policies are favourable to attract capital investment, recognizing that carbon tax, corporate tax, property tax, GST, etc. are not mutually exclusive but added together with the cost of a project to calculate ROI when investors are considering Canada as a place to invest.*

**Senator Galvez:** Thank you very much for your presentation. It's very positive that you are looking into all these new innovative and green technologies. My understanding is that your members work on the upstream oil and petroleum industry, so you are in the drilling, exploration, equipment and environment. Because this is relatively new, how are your workers getting the specific training they require to be up to date with changes in the technology? That's the first part of my question.

*Technology is often developed by the companies themselves rather than brought in and adopted from an outside source, therefore most companies train in-house.*

**Senator Galvez:** In your speech and in the documents that were provided, you talk about oil and gas as general terms. However, we know that if we talk about gas, now we talk about unconventional gas, tight gas, medium tight. We talk about Bakken, Eagle Ford, Permian Basin. These are very deep, very different mixtures of gases. One thing is to keep doing the infrastructure -- the pipelines and excavation -- but the other thing is the handling of these different products, and the same thing when we talk about petroleum. We have conventional petroleum and unconventional petroleum, and the ones that come from the tar sands are very different. In terms of training in environmental handling and in getting new technologies for handling spills -- because pipelines will continue to be used and there will eventually be spills, over the lifetime of pipelines -- do you also have training for emergencies and the handling of these different products that are now available on the market?


*In addition, the Alberta Energy Regulator (AER) has a stringent regulatory framework that is governed by principles aimed at protecting the public and environment from harm through responsible petroleum operations. These principles are embodied in the many AER Directives that together form the components of*
the Emergency Management System—prevention, mitigation, surveillance and enforcement, and investigation and which all companies must follow.


Directive 071 supports the following three core principles:
1) The AER regulatory system ensures that appropriate emergency response plans (ERPs) are in place to respond to incidents that present significant hazards to the public and the environment.
2) The AER regulatory system ensures that there is an effective level of preparedness to implement ERPs.
3) The AER regulatory system ensures that there is the capability in terms of trained personnel and equipment to carry out an effective emergency response to incidents.

https://aer.ca/rules-and-regulations/directives/directive-071

In addition to training provided for employees by individual companies, the industry also offers a variety of training programs through Enform, the safety and training arm of the upstream petroleum industry. www.enform.ca Many of the training courses offered by Enform are recognized world-wide and with over five decades of training experience, Enform offers over 100 courses in a variety of formats including classroom; hands-on training with full-scale equipment and simulated environments; and on-line courses. Enform has a rigorous process in place for the review of all course offerings to ensure that content is current and reflective of the latest technological developments and operating procedures. Various regulatory agencies such as the Alberta Energy Regulator and provincial occupational health and safety regulators prescribe the training levels for many positions in the oil and gas industry.

The federal and provincial Transportation of Dangerous Goods Regulations stipulate the training required for all those involved in the handling of dangerous goods covered under those Regulations. This training includes spill handling and reporting requirements, and emergency response procedures. All workers involved in the handling of the various products produced by our industry are required to have training under the Workplace Hazardous Materials Information System (WHMIS). This system, which is soon to be replaced by the Globally Harmonized System (GHS) provides training in the safe use and handling of hazardous materials used in Canadian workplaces. In addition to this regulated training, all of our members provide training to their employees that is specific to the types of products used in their individual workplaces.

Senator Fraser: Thank you. I have a couple of questions, Mr. Salkeld. The first one everybody else around the table may already know the answer to but I don't. What is microseismicity?

Summary explanation of micro-seismicity from: ESG solutions, a Spectresis Company: https://www.ESGsolutions.com/technical-resources/microseismic-knowledgebase/microseismic-monitoring-101

“Micro seismic monitoring is the passive observation of very small-scale earthquakes which occur in the ground as a result of human activities or industrial processes such as mining, hydraulic fracturing enhanced oil recovery, geothermal operations or underground gas storage. Micro seismic science grew out of
earthquake seismology and focuses on micro-earthquakes (i.e. magnitude less than zero). These micro-earthquakes are too small to be felt on the surface, but they can be detected by sensitive equipment such as geophones and accelerometers.

Unlike traditional 3D seismic technologies which measure acoustic reflections from an energy source, micro seismic monitoring is a passive method, meaning that it listens for seismic energy which is already occurring underground. Passive seismicity is also commonly referred to as “induced seismicity.”

Passive methods provide a continuous 4D record of seismicity in the monitoring region, rather than individual snapshots in time obtained by conventional 3D seismic methods. Micro seismic results are often delivered in real-time, and can literally offer a video recording of what is happening deep underground as a result of industrial operations.”

Senator Fraser: My second question has to do with the concerns you expressed at the end of your presentation about the cumulative burden about this tax and that levy and this regulation all adding up. Have you done any work to assess the impact of carbon taxes, if any, on your members, in particular on the competitive position of the Canadian industry as it sells its final product outside Canada?

PSAC recently survey its members on the carbon tax with 40 percent indicating they were experiencing a negative impact from the tax. The impact for the services sector on the whole is reflected in the amount of capital that its customers, the E&P companies, choose to spend in Canada. Their decision of where to invest is based on the place with the best return on their investment. The return will take into account all costs of development and production including regulatory and taxes. As taxes are reduced in the US for example, Canada’s biggest competitor, Canadian oil and gas becomes less competitive. Canada also has an increased
cost of transportation of the oil/gas to market. For example, eastern Canada imports its natural gas from the US.

Senator Wetston: Thank you for your comments today and your presentation. I have a couple of questions around your approach. I think I have a good understanding of PSAC and what you do. As I read your presentation, I'm sort of looking at your upstream petroleum industry, exploration, production, seismic, drilling and all of these services that are necessary for oil and gas extraction. Most individuals today talk about innovation. Everybody is an innovator today it seems. I'm looking for the results of your innovation. I'm trying to understand how you measure it and how you come to that conclusion. Indeed, I'm sure many of your members are innovative and have achieved a great deal. Could you elaborate a bit more on that?

A key measure of innovation is that up until the early 2000’s, it was thought that Canada only had about nine years of natural gas supply left and that oil production had peaked. Innovation married the technologies of horizontal drilling and hydraulic fracturing to enable the development of reservoirs of natural gas and subsequently, oil, from shale and tight reservoir formations that previously were not feasible to produce from or uneconomic to produce. This innovation vastly increased our reserves and production so that Canada now has 100-200 years of supply of natural gas and ‘conventional’ or non-oil sands oil, has seen resurgence.

A few other examples of innovation include drilling bit technology that has reduced overall drilling days, downhole tools that allow an operator in Calgary to steer a drill bit hundreds of kilometers away in northern Alberta in real time, and greener drilling and fracturing fluids that reduce environmental impact.

Considerable funds are invested in R&D and innovation in our sector, although not all of that is reflected officially as companies do it as a normal course of business rather than always using the federal Scientific Research & Experimental Development Program which PSAC members report as onerous for field work. However, the federal government’s Science, Technology and Innovation Council reports in its State of the Nation 2017 Canada’s Science, Technology and Innovation System: “While the mining, quarrying, and oil and gas extraction industry has typically had a relatively low R&D intensity, R&D investments in the industry increased by 74 percent from 2007 to 2015. Over the past 16 years, R&D investment in the oil and gas extraction industry rose dramatically, increasing almost fourteen fold from 1999 to 2015.”

The same report gives the following example: “In the Alberta oil sands, Saltworks is using its SaltMaker, a low temperature evaporator crystallizer, to produce fresh water from Steam Assisted Gravity Drainage (SAGD) evaporator blowdown waste water. Successful SaltMaker pilots were completed with Suncor Energy and Cenovus Energy, demonstrating true Zero Liquid Discharge of SAGD waste water. The reliable crystallizer plant concentrates the blowdown to produce a solid waste for landfill disposal and high quality fresh water for reuse by the oil and gas industry. The results are reduced wastewater discharge, freshwater withdrawal and greenhouse gas emissions in comparison with conventional treatment technologies.”

And I have another question, if I may, in that context. I can understand your approach to environmental protection, which I don't think is the same thing as trying to achieve a low-carbon economy. They may be related but they're certainly not the same thing. It’s kind of a double-barrelled question, if I may. Could you help me with that?
PSAC member companies compete for their customers’ business by solving their problems and/or improving their drilling/production outcomes for them. For many years, that meant improving efficiencies which also often had the spin-off effect of lessening environmental impacts. Today, those same customers want increased environmental performance and reduced carbon emissions and so that is what services companies focus on. It should also be noted that Canada has one of the most robust regulatory regimes in the world and so environmental stewardship has always been important here resulting in responsible energy development and especially when compared to the rest of the world.

Senator Weston: This is a bit of a loaded question and probably not easy to answer: Do you think that through the work of your association and your members you will be able, in years to come, to achieve zero carbon in exploration, drilling, service and manufacturing? Obviously, we expect you’re going to, at some point, continue to transport oil and gas, but are you able to achieve in a zero-carbon economy?

Anything is possible with this amazing industry! It has been said by some that if we have been able to get the sand out of the oil, then we can get the carbon out the barrel.

Senator Galvez (on behalf of Senator Meredith): He wanted to know how your members are adjusting to this change in technology; I think it’s similar to what I asked. Are they happy being implicated in, hosting and engaging in these new technologies, or are you finding some resistance?

Developing new technologies and innovating is the hallmark of the services sector as they strive to help their customers with ever-improving extraction and production results, efficiencies to reduce the cost of development in this high cost basin that is the Western Canadian Sedimentary Basin (WCSB) and to meet ever-growing regulatory and environmental demands – so it is something they are used to, good at, and why they are renowned around the world for their technology and expertise.

It is a symbiotic relationship between services sector companies and producers: E&P companies have been outsourcing the equipment and expertise of the services required to drill, complete and decommission wells for years now and so the services have become a separate sector that E&P companies rely on. Service companies however need a successful E&P sector in Canada that continues to make capital investments in new exploration and development for a base for their business to be able to test and pilot new technologies with customers that know them and are willing to work them to achieve better production and environmental outcomes that they then can export around the world.

Senator Galvez: So I believe that, if your members are doing this willingly, I’m sure it’s not just because they care about the environment but because there are some economic benefits, profits. Can you elaborate on these economic aspects of changing to this technology?

Services sector companies care about the environment because they are the people who live in the areas of development, where they breathe the air and their kids play and drink the water. Having said that, just like every business, there must be profits or there will be no business. To stay in business, services companies as mentioned above, compete for their customers’ business by solving their problems and today, those problems include improving environmental outcomes and reducing carbon.
Senator Patterson: Just carrying on with that theme of motivating innovation, you mentioned carbon pricing. Does carbon pricing play a role in driving the innovations you've described in your industry?

Yes, because if we don’t innovate to reduce the cost of carbon in Canada, the E&P companies will take their capital to other jurisdictions/countries where there are no carbon taxes and overall costs are lower. This will have the significant impact of reducing the need for a services sector here in Canada along with all the jobs, economic benefits and exports that result from a healthy sector.

Senator Patterson: I have a big concern about carbon pricing myself, coming from a jurisdiction that doesn’t have any real alternative energy sources, so I'm not wanting you to sell me on carbon pricing. If it isn’t helping to drive innovations, then that's useful information, but I'd guess I'd like to ask you a little further along that line. You mentioned carbon pricing, I think, and other taxes as a burden to your members. I would imagine that many of your members operate both in the U.S. and in Canada. I know companies like Precision Drilling have big footprints in both countries. I know of that one company. I am wondering if your members have considered the implications of some of the pro-business policies being proposed by the new U.S. administration and perhaps a de-emphasis on carbon pricing in the new U.S. administration. Is that going to have some impacts on Canada in your industry do you think?

Absolutely, as services companies will follow their customers and as mentioned above, companies will invest where they can find the best return.

Senator Mockler: Thank you very much for your presentation plus answering the questions. I think you’ve enlightened certainly me, in a sense. The question to follow from Senator Patterson's is: Are we going too fast and too far in your experience, especially with what I just heard that Texans are linking with Canadian operations to say, "Come to the U.S.?”

The oil and gas industry is global and as you are likely aware, the US which has been our biggest customer for oil and gas is now our biggest competitor and is taking less and less of our production. Therefore, it is imperative that we are able to compete with the US. Factors noted above including taxes and regulations on top of the cost of development and transportation here in Canada will contribute to whether capital continues to be invested here or in the US of other parts of the world.

Senator Mockler: There's no doubt in my mind that you're monitoring your membership if you have other Texans saying, "Here's an opportunity because you're in business to make money and to create wealth." That said, are you monitoring your membership as to whether they are being catered to go to the U.S.? You've mentioned one?

We have heard from members that incentives and inducements are being offered to encourage them to move to the US.

Senator Mockler: I’m sure that you’re aware the federal government is committed to reducing their emissions by 30 per cent below 2005 levels by 2030. According to Environment and Climate Change Canada, the emission gap needed to reach this goal is 219 megatonnes of carbon dioxide equivalent. With your
experience in the industry, do you believe that this target is achievable? Following that, do you believe that
the public has a sense of the scope of the challenge involved? Society is divided, and to move forward, we
need a social licence.

It is a lofty goal. More the question might be whether the cost to achieve the goal will make the sector
uncompetitive and drive capital investment away that will take with it jobs and many other economic
benefits. This should be considered along with the impact that Canada’s reduction will make to global
emissions or whether it would be better for Canada to supply oil and gas to parts of the world where coal and
wood are being used. This could have a more significant reduction of global emissions.

Results of a December 2016 Survey of PSAC Member Companies:

- 14% of PSAC member companies have (or are) in the process of incorporating renewable, alternate
ergies processes or sources into their products or services offerings
- 23% of PSAC member companies are investigating clean-tech technologies to incorporate into or replace
  current equipment processes
- 35% of PSAC member companies use Canada's Scientific Research & Experimental Development (SR&ED)
  program
- 43% of PSAC member companies have applied for patents in the past two (2) years related to clean-tech
  initiatives and processes
- 46% of PSAC member companies have developed new technologies over the last two (2) years related to
  clean technologies
- 55% of PSAC member companies have developed new operational innovations over the past two (2)
  years.
- 58% of PSAC member companies are investigating and plan on investing in new clean technology
  initiatives and processes

The Chair: I have maybe a couple of questions, and then we will go to our next witnesses. Is Canada the
only place in the world where the oil and gas industry works that is imposing these kinds of measures?
Personally, I don't think that is true. I think the measures might be different in different places, but the
Shells, the Exxons and all those big companies -- are there parts in the world where they say, "You go ahead
and do whatever you want to do" with their drilling? I don't quite think so; I think there is something within
the companies themselves that when you talk about going from diesel engines on drilling rigs to electric, that
isn't just because of a carbon tax. That's because there's a value to doing that. There is a value
environmentally for the company, because they want to sell their product at the end of the day, but there's
also a value because it's likely cheaper once you sort it all out. Tell me, are we the only country that is saying
some of these things you have to do around the world where the oil and gas industry works?

It's true as mentioned, that many innovations create efficiencies that reduce costs also reduce
environmental impacts however, it's the overall cost of development against prices which are global and
therefore return on investment that will determine where capital is invested.
The Chair: [...] Thank you for coming and talking to us. I'd like you to maybe think about some things that the oil and gas industry is doing to reduce greenhouse gas emissions. You gave us a couple of examples. I appreciate that, but the one you talk about — the drilling rig — I'm quite familiar with it. I used to supply them with fuel, so I know how much they used to take. If you could give us examples of those things industry is doing, that would be great. I would think industry is doing almost all those same things in Texas as they are in Canada. If you could get that back to the clerk, I would certainly appreciate it. Thank you very much

http://www.capp.ca/responsible-development/air-and-climate/greenhouse-gas-emissions  “The oil and gas producing and service, supply and manufacturing companies actively work to reduce GHG emissions through project design, operational excellence, innovation and technology.

One way the oil and gas industry looks to reduce emissions through operational excellence is by the use of Waste Heat Recovery Units (WHRU). An example is Talisman's Bigstone Plant Waste Heat Recovery Unit, which was designed to transfer waste heat produced by gas turbine compressors and use it to heat liquids required to process gas. By transferring and re-using the waste heat, Talisman is able to reduce its fuel gas consumption thereby reducing GHG emissions.

http://www.capp.ca/responsible-development/air-and-climate/climate-change  Through Canada's Oil Sands Innovation Alliance (COSIA), there are a number of initiatives underway, examples of which include:

Vacuum Insulated Tubing: Insulated tubing in wells reduces heat loss in steam assisted gravity drainage (SAGD) operations, requiring less steam, and therefore making wells more efficient.

Gas-Turbine Once Through Steam Generator: A fit-for-purpose co-generation technology that produces electricity at the same time as producing steam that has the potential to reduce operators' reliance on electricity from the Alberta power grid, which may result in a net reduction in carbon intensity per-barrel of product.