



Seminar #3

“Nuclear Energy Finance: The UK Experience”

Jonathan Dart, British Consul General

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Introduction

Mission

To provide an unbiased, objective platform for the informed discussion of important energy issues thereby encouraging deployment of better, more sustainable decisions.

Mindfirst™

Mindfirst Inc. (M1) was founded in 1999 to provide strategic planning services for growing businesses focused on taking advantage of opportunities in the areas of clean energy, clean technologies and sustainability opportunities. M1 has developed a significant database of organizations, contacts, best practices and analytics, which it mines to facilitate business development, investment, partnership and other activities. Most recently Mindfirst™ has created and organized seminars and conferences with a view to help inform energy discussions.

Future of Nuclear™

The first Future of Nuclear™ (FoN) conference was held in Toronto on October 9, 2013 at MaRS™ Discovery District to address the need for an unbiased, objective discussion regarding the future of nuclear power. The conference targeted industry executives, stakeholders and affiliates, as well as those who are generally concerned about nuclear power and associated policies/practices. Participants in the conference expressed a need to explore the complexities of nuclear power issues in more detail. This led to the creation of the FoN Seminar Series, which is a series of luncheon seminars discussing nuclear energy related topics over the course of 2014.

- The first of six seminars, held on January 21st 2014, featured Assistant Deputy Minister from Ontario's Ministry of Energy and Infrastructure, Rick Jennings, who spoke about Ontario's recently released Long Term Energy Plan (LTEP) and the role of nuclear energy as part of that plan.
- The second seminar featured the following speakers who provided different perspectives on the topic of "Human Resource Requirements of Nuclear Refurbishment":
 - Mark Arnone, Vice President, Refurbishment Execution, Ontario Power Generation
 - George Bereznai, Professor and Director, Industry Training Program, University of Ontario Institute of Technology
 - Patrick Dillon, Business Manager, Provincial Building and Construction Trades Council of Ontario.
- The third seminar featured British Consul General Jonathan Dart who spoke about the UK nuclear experience.

Top 10 Learnings

A survey is conducted at the end of each Future of Nuclear™ seminar to gain additional insights from the event. An open-ended question was asked of participants in the questionnaire, “What was the most important insight, ‘takeaway’ or actionable information that you learned at today's Seminar?” The responses to this question are extracted and summarized in this section with edited commentary from Mindfirst™ associates based on research to support and clarify the expressed views. For the purposes of summarizing The Top 10 Learnings from this Seminar, the responses were categorized into seven main points.

Chatham House Rule (CHR): an enabler of open conversation

Selected quote(s) from seminar attendees

- “Chatham House Rules truly enabled conversation as participants and speaker alike invoked it a number of times. This creates a culture of understanding and trust amongst seminar participants, who may one day be partners on an energy project.”

Discussion

CHR promotes open conversations because it establishes a moral code amongst the participants such that comments are not attributed to the speaker. This creates a rich dialogue in which everyone is free to contribute his or her insights on a given topic, as they may vary from their affiliated organizations and employers. More information about CHR can be obtained from its website.¹

Climate change is an economic issue

Selected quote(s) from seminar attendees

- “In a post-Fukushima climate, it was refreshing to see that the British government is vocal about the connection between climate change and economics and that it views nuclear as an important component of that mix.”

Discussion

There is an inextricable link between climate change and economics - energy is not just an environmental issue. The British Climate Change Act of 2008 established targets to reduce carbon by 80% from the 1990 levels. This act has been legislated and each ministry prepares a plan that is audited externally. Put simply: high-carbon emissions are bad for business.

¹ <http://www.chathamhouse.org/about-us/chathamhouserule>

Financial risks of nuclear power

Selected quote(s) from seminar attendees

- “I always knew that there were risks involved with nuclear, but it was helpful to have them broken down concisely and into simple terms.”

Discussion

Nuclear power plants take a lot of up-front capital and time to build with a promise of lower operating costs. Therefore, over the life of a reactor, the *levelized unit cost of electricity* (LUEC) is competitive with those of other sources. In contrast, natural gas plants are relatively inexpensive to build in a short period of time (1-2 years) but are highly sensitive to the price of natural gas for ongoing operations. The shorter time horizon for payback from other (unclean) energy sources makes it difficult to fund new nuclear projects, although the long term returns may be higher and pose a smaller burden on the environment. This is why government steps in to shoulder the risk. A summary of the risks is provided as follows:

1. Catastrophes - Liability to the utility is capped at \$1 billion with Government accepting the rest.
2. Permitting - Utility shoulders this risk but Government has streamlined a "generic design assessment" process to evaluate proposals.
3. Market - Government shoulders this risk by offering a "strike price" (fixed price) contract to utilities.
4. Financing - The lowest available Government bond rates are offered for capital financing.
5. Construction - Risk is entirely shouldered by the utility.
6. Operation - Risk is entirely shouldered by the utility.

Thus, there is a clear delineation of risks that remain with the Government vs. those that remain with the developer.

UK electricity costs are 50% more than Ontario's

Selected quote(s) from seminar attendees

- “I was unaware how cheap our energy prices are in Ontario in comparison to other developed nations.”

Discussion

The strike price offered to Électricité de France (EDF) and Areva to build Hinkley Point B is \$170/MWh, which is over 50% more than what Ontarians pay.² Even then, cost of electricity in the UK is the lowest in Europe.

Although cost of electricity is high in UK, there does not appear to be a lot of fear. Contrary to popular belief, the manufacturing sector has not died in the UK - it has advanced to manufacture those goods where the cost of electricity is relatively a much smaller fraction of the overall cost of goods sold.

Favorable investment environment

Selected quote(s) from seminar attendees

- “It would be great to see Ontario businesses export to the UK.”

Discussion

The UK offers a favorable investment environment for both domestic and foreign players. The Canadian pension funds are investing in the UK with \$20 billion.

In the nuclear sector, the UK has taken a long-term view of the importance of nuclear energy for their economy and job creation. The UK has been able to offer guarantee schemes by taking advantage of its high government credit rating. For example, Hinkley Pt. C is prequalified. Furthermore, the UK boasts a strong nuclear supply chain with companies such as: Cavendish Nuclear (formally Babcock), Balfour Beatty, AMEC, and Rolls Royce. With a high strike price, it is evident that the UK is 'open for nuclear business'. Subsequent strike prices will be lower.

Issues concerning a diverse nuclear fleet

Selected quote(s) from seminar attendees

- “It was interesting to learn that a diverse nuclear fleet may not be advantageous to a country.”

Discussion

Being agnostic about the reactor technology may not be favorable for the UK in the long run. The UK nuclear regulators have no more capacity to review additional applications. The reality is that a complex technology like nuclear affects the entire supply chain and regulatory infrastructure. Economies of scale are difficult to achieve with a diverse set of reactors. Lessons learned from one can be more readily applied to another if there is a homogeneous fleet.

² Ontarians pay 11.2 cents/kWh mid-peak.

Putting faces to the names

Selected quote(s) from seminar attendees

- “Networking with an incredible group of people, again, was where I learned the most.”

Discussion

The three (3) seminars on the Future of Nuclear have attracted a diverse group of people interested in various aspects of the energy business: regulators, consultants, utility executives, bankers, and international government officials. All participants bring deep knowledge in their field, so it comes as no surprise that everyone values this exchange.

UK demand figures

Selected quote(s) from seminar attendees

- “It was great for me to wrap my head around the demand figures.”

Discussion

As fossil fuel resources experience a steep decline, the UK is looking ahead to expand 48 GW of renewables and 16 GW of current nuclear commitment with potential for more. Following are some important numbers:

- 22.5 GW minimum demand.
- 35 GW averaged demand.
- 57 GW peak demand.
- 10.5 GW current nuclear capacity

The increasing R&D into energy storage, electrical vehicles (28M cars on road) and heat pumps will all increase the demand for electricity.

Serious about nuclear disarmament

Selected quote(s) from seminar attendees

- “I did not know that pre-existing nuclear grade plutonium can be used as a nuclear fuel to generate power.”

Discussion

Plutonium is a valuable byproduct of the nuclear fuel cycle as reactors generate power. When re-processed, the plutonium may be used for weapons or blended with uranium to create a mixed oxide fuel

(MOX). MOX may be used in reactors, thereby depleting the overall stockpile of plutonium that could increase the risk of nuclear proliferation.

Nuclear safety: a paramount requirement

Selected quote(s) from seminar attendees

- “As industry insiders, we live and breathe nuclear safety. To outsiders, we may come across as dismissive when we do not spend too much time discussing safety. I learned from the rich roundtable conversation after the talk that those not intimately familiar with the nuclear regulatory system can become anxious if safety is not discussed in more detail - even when the topic is not specifically about nuclear safety.”

Discussion

Nuclear safety is the mantra of the nuclear industry. Strong safety culture is implemented within nuclear facilities in many different ways (e.g. starting every meeting with safety, management reinforcement, regulatory oversight, etc). However, it is equally important to appreciate all of the other intricacies of the nuclear industry (e.g. economics, finance, political climate). The topic of discussion in this seminar was to understand the UK experience with nuclear, which encompasses far more than safety alone.

Acronyms

FoN

Future of Nuclear™

MOX

Mixed Oxide Fuels

Registered Participants

The contents of this report were created from inputs obtained in surveys and do not, in any way whatsoever, reflect the views of the organizations that the registered participants listed below belong to.

Last Name	First Name	Title	Organization
Godfrey	Michael	NPP Business Development	Westinghouse
Hemmingsen	Helen	Trade Officer	UK Trade & Investment
Hill	Krista	Partner	Torys LLP
Jennings	Rick	Assistant Deputy Minister	Ministry of Energy
Kelly	Julian	CTO	Thor Energy
Lake	Konata	Associate	Torys LLP
Lever	David	Partner	McCarthy Tetrault
Macpherson	Stuart	Senior Business Analyst	Ontario Power Authority
Masuda	Mickey	COO	HOPE Innovations Inc.
McLennan	Ian Angus	Associate, Marketing and Media	Mindfirst Inc.
Movchovitch	Emanuel	Manager, Policy & Analysis	Ontario Power Authority
Murray	Paul	EVP, Power	Aecon
Newall	Paul	Consultant	Power Workers' Union
O'Neill	Sean	Partner	McCarthy Tetrault
Oberth	Ron	President	Organization of Canadian Nuclear Industries
Ritchie	Joan	Consultant	Independent
Roger	Don	Partner	Torys LLP

Romoff	Mark	President and CEO	The Canadian Council for Public-Private Partnerships
Sandor	Keith	Senior Business Analyst	Ontario Power Authority
Scongack	James	VP, Corporate Affairs	Bruce Power
Shanker	Shobhit	Research Associate, Nuclear	Mindfirst Inc.
Tarbiat	Raooof	Senior Engineer	AMEC-NSS
Vehovec	Henry	President	Mindfirst Inc.
Walker	Lori	Senior Strategist, Corporate Strategy and Business Development	Bruce Power
Wilson	Phil	VP, Corporate Strategy and Business Development	Bruce Power

Credits

Authors

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Future of Nuclear Advisory Board

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- Robert Bodner, Independent Consultant, Hatch
- George Bothwell, Former SVP, Government Relations, Atomic Energy of Canada Limited
- Jason Cameron, Vice President and Chief Communications Officer, CNSC
- Milt Caplan, President, MZ Consulting
- Paul Dinner, Consultant, Mindfirst, IAEA
- Michel Fortin, Director of Strategy and Member Services, OSEA
- Lee Harrison, IQ Partners Inc.
- Krista Hill, Partner, Torys LLP
- Colin G. Hunt, Publisher and Editor, Nuclear Canada Yearbook

- Eric Jelinski, Lecturer, Nuclear Engineering, University of Toronto
- Ronald Kwan, Assistant Deputy Minister, Corporate & Electricity, Ontario Financing Authority
- Dr. Richard Lester, Head of Department of Nuclear Science and Engineering, MIT
- Dr. John Luxat, Professor of Nuclear Safety Analysis, McMaster University
- Hugh MacDiarmid, President, VISEX Corporation
- Rick Maltese, Blogger, Deregulate the Atom, The Energy Reality Project
- Brian Monaghan, Independent Consultant
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- Shobhit Shanker, Analyst, AMEC NSS
- John Sprackett, Staff Officer, Power Workers' Union
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