

The Low Carbon Nexus

**Enabling Government, Academia and
Business Collaboration**

UK-BC Forum Report

Pan Pacific Hotel, Vancouver
27 March 2014

Executive Summary

A Forum was convened by the British Consulate General in Vancouver, on 27 March 2014, at the Pan Pacific Hotel, bringing together representatives from the UK, British Columbia and elsewhere across Canada. The aim was to share ideas on how best to advance development in the environmental business sector through policy



exchange, research collaboration, and commercial activity, with a specific focus on opportunities emerging from natural gas and Liquefied Natural Gas (LNG) development. The Forum was held under the Chatham House Rule, so this report provides a non-attributable record of the discussion. It does not represent the views of the UK, British Columbian or Canadian governments; nor does it purport to be comprehensive, but captures the key points raised, and crucially, makes recommendations for further work. It will not be feasible to take forward all the suggestions proposed in the short term, but they provide a valuable menu from which respective governments and other stakeholders can work. For more information, please feel free to contact those listed at Annex A. Four key areas were identified as challenges to be addressed in supporting growth in the environmental business sector, and four further related areas specific to LNG development. These areas also provided valuable ground for further specific exchanges and collaborations:

Environmental Business

- *Funding – How to Attract & Reassure Investors*
- *R&D and Commerce – Getting the Connection Right*
- *Collaboration – Increasing Partnerships Whilst Avoiding Duplication*
- *Market Barriers – And How to Remove Them*

LNG Development

- *Emissions – How to Reduce & Manage Them (including CCS)*
- *Water & Power – How to Reduce Consumption and Manage Use*
- *Regulation & Finance – Ensuring Development & Environment are Incentivised*
- *Community Engagement – Doing the Right Thing & Helping to Educate*

1. Clean Tech Support

1.1 Funding – How to Attract and Reassure Investors

Independent not-for-profit entities, able to bridge technology push with market pull, are key to facilitating the transition of innovation from bench to commercial viability. In Canada for example, Sustainable Development Technology Canada (SDTC) has proven successful with a track record of leveraging private sector dollars in a 1:14 public/private ratio across its portfolio of clean technology financing. Carbon Management Canada (CMC), an independent, not-for-profit business, is made up of institutes covering specific technical areas, which helps to reduce the risk of projects seeking to transition from laboratory scale to application.



Credit: Rob Faulkner

The UK has comparative but different models, using direct, facilitated and arm's-length methods of support:

- Direct: Green Investment Bank – a £3.8 billion, government-funded bank established to address market failures which currently hold back private sector investment;
- Facilitated: a £200 million fund for energy innovation, allocated to Research Councils and the Technology Strategy Board;
- Arm's-length: Energy Technologies Institute (ETI), a similar model of PPP with similar aims, industry-led and funded, but with matching government contribution.

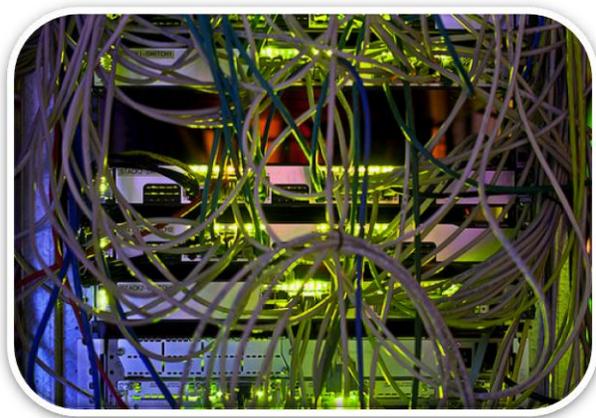
Challenges that are similar in each jurisdiction were identified:

- Attracting finance into untested technologies to help bridge the “valley of death” to commercialisation, particularly through the demonstration phase; and
- Convincing major companies to take up new technologies that have not been demonstrated at commercial scale (with the risk of those companies falling for a CATNAP approach - cheapest available technology narrowly avoiding prosecution).

Governments themselves remain critical to the success and uptake of clean tech innovation though, particularly through support from smart procurement practices or direct financial investment. These help to foster stakeholder buy-in and speed up the deployment of new technology, including through partnerships (as above). Policy regimes that establish long-term frameworks for relatively secure returns on investment (e.g. carbon pricing and / or taxation, tax breaks) can provide the long term clarity investors need. While a clear message was that government should focus on the framework rather than pick winners when allocating funds to support technological innovation, it was agreed that independent, “translational” bodies such as those above could be in the business of picking winners by financing the most promising technologies. This in turn reinforced the need for a thorough, quantitative assessment of the environmental benefits of a specific technology prior to funding decisions. It also argued for keeping these intermediary bodies at arm’s-length from government, whilst equipping them with solid governance structures to ensure technology financing is borne of impartial decisions and impervious to changing political climates.

1.2 *R&D and Commerce – Getting the Connection Right*

Importantly, intermediary bodies can also provide a translation and matching function between industry needs (often based on established processes), and academic R&D and innovation (whose focus on “novelty” is not always in useful or applicable to industry’s innovation requirements). This value-added can be further enhanced by building in periodic regular assessments of market needs, and shifts in these needs, during financing cycles. This would ensure financing remains in lockstep with current market demand, and academia is kept up-to-date on innovation gaps.



Credit: Claus Rebler

Since testing and demonstration of technologies are essential for validation and wider commercial uptake, it is also important for these bodies to act as demonstration financing vehicles where possible. Some successful seed-funded technologies have gone through the demonstration phase and are now on the verge of profitability, seeking investment from large multinationals interested in uptake, thus getting them into supply chains and wider

export markets. The private sector itself is already looking to create opportunities. In the UK, International Synergies convenes industry sectors to enable a virtuous cross-pollination of resource needs and waste management, providing a model of industrial symbiosis and supporting the circular economy.

1.3 Collaboration – Increasing Partnerships Whilst Avoiding Duplication

The Forum highlighted the importance of collaborating whilst avoiding duplication. In the UK for example there are a number of public sector bodies providing funding at various technology readiness levels, and navigating this complex “ecosystem” can be a challenge. The Low Carbon Innovation Co-ordination Group (LCICG) was created to bring those bodies together and minimise overlap. So far it has been successful. The LCICG launched its strategic framework¹ in February 2014, which sets out the bodies’ shared aims and objectives, provides insights into future innovation needs, and creates a framework for future prioritisation. This model has potential application in other jurisdictions.

1.4 Market Barriers – And How to Remove Them

The session concluded with the challenge of gaining market entry for clean tech. Low carbon technologies would need to be adopted at scale if the world were to keep to the 2-degree limit. Key was to understand the intended market, identify the barriers to penetration, and work to remove those barriers. The Green Investment Bank in the UK was highlighted as an example which had already been successful, by addressing specific market



Credit: RaSeLaSeD - Il Pinguino

failures holding back private sector investment in the green economy. The demonstration effect—essentially, behaviour influenced by observation of the actions of others—was another way to encourage market take-up. However, other barriers relate to public policy, as in the case of carbon capture and storage (CCS); until there was a “thou shalt”, or a clear and consistent regulatory approach across the country, companies would not adopt CCS (see below).

¹ <http://www.lowcarboninnovation.co.uk/document.php?o=29>

1.5 Recommendations

Establish UK-BC liaison to consider:

- a) Improving our methods of attracting finance into new green technology development, particularly during testing and demonstration.
- b) Encouraging major purchasers (in the public and private sectors), to adopt environmental technologies that are new to the market e.g. a green version of Export Finance.
- c) Methods of ensuring co-ordination and reducing duplication in support for low carbon economic development.
- d) Ways to reduce market entry barriers within and between jurisdictions.²

Those involved might include, as relevant:

- a) (UK) Department of Energy & Climate Change; Foreign & Commonwealth Office Climate Change & Energy Department; UK Trade & Investment; Low Carbon Innovation Co-ordination Group; Energy Technologies Institute; the Green Investment Bank;
 - b) (BC/Canada) the BC Ministry of Environment; the BC Ministry of International Trade; Sustainable Development Technology Canada; BC based Clean Tech Investment; the Climate Action Secretariat; and Carbon Management Canada.
- Formats for such liaison might include: further subject specific fora and/or individual liaison, supported or facilitated by the relevant government or authorities.

² UBC-Berkeley-Oxford have a potential collaboration on climate friendly regimes, which offers a potential source for progressing this. Also worth considering for inclusion is the Deep Decarbonisation Pathways Project, run by the Sustainable Development Solutions Network (SDSN). Canada is one of the countries involved, the UK is not.

2. LNG Development & Environment

2.1 Emissions – How to Reduce & Manage Them (including CCS)

Emissions mitigation is one of the primary concerns around the environmental impact of fracking operations, natural gas processing, and the running of LNG facilities. Inconsistencies in the BC regulatory regime were highlighted. For example, BC carbon pricing currently covers only emissions from combustion sources, or about 55% of the gas sector. Consequently, CO₂ from natural gas



Credit: TruckPR

processing can be vented without penalty, and though carbon sequestration is technically feasible there is no incentive to implement it. Methane venting is also not covered by the carbon tax, contributing to a substantial gap in the policy incentive. These and other “wrinkles” in the regulatory regime could have profound impacts; if enough gas were produced for all four proposed export terminals, the CO₂ released would equal about 25% of BC’s current emissions.

This said, an opportunity presents itself in the possible adoption of CCS technology, particularly when considering that in this industry (as opposed to the power generation industry for example) capture costs are already embedded in regular gas clean-up operations to reach pipeline-quality gas purity standards (CO₂ and H₂S need removing prior to gas transport). Incidentally, H₂S underground injection in a CCS scenario would also eliminate the costs currently associated with H₂S processing into elemental sulphur. With capture usually representing the most expensive portion of CCS capital costs in the power generation industry (and adding significantly to operational costs if power losses are factored in), the proposition becomes much more attractive to the natural gas industry. However, while CO₂ capture is taking place at gas processing plants, regulation is needed to incentivise its adoption at a much larger scale. Four LNG facilities in BC would result in ca. 17 Mt CO₂ being produced (lifecycle emissions); CCS could help sequester about half that amount at the upstream level.

Some industry players are voluntarily addressing carbon emissions, or open to changing the way their facilities are powered. At least one company looking to develop an LNG export facility in BC is mandated by its board to reduce its carbon intensity 15% below 2012 levels by 2017, and has an implied carbon tax over the lifetime of each of its projects. All of the company's existing export projects feature gas-powered compressors. Although it is reluctant to invest in unfamiliar alternative technology to power liquefaction at the new LNG plant (ca. 800 MW), it is open to alternative generation technologies, including renewables where possible, for auxiliary needs (ca. 200 MW). There is also an expectation that different carbon regimes will gradually harmonise as the industry develops across the globe. Socially responsible investors were asking questions about how industry would go about managing social and environmental issues. Another company had already committed to disclosing the risk of stranded assets. This represented an opportunity for businesses to get "ahead of the game," to build full cost accounting. The process had already begun with activist shareholders, and was now being adopted by mainstream shareholders. Industry needed to collaborate to mutual benefit (e.g. reducing fuel consumption, pipeline corridor sharing etc). Furthermore, nodes could be created that join up CCS operations for different LNG plants and provide for emissions re-use in the economy.

2.2 Water & Power – How to Reduce Consumption and Manage Use

Water pricing is a potential tool to drive further innovation, making interesting approaches more commonplace instead of one-off. This might apply to water use for fracking in the LNG industry and to oil and gas development more generally. Other options include recycling, recirculation, and closed loop systems for industry utilisation, in order to minimise water uptake and discharge. Also, it would be worth conducting sub-surface modelling of reservoir behaviour and fluid dynamics as part of applied research that looks at developing innovative mitigation technologies against underground seepage and contamination, as well as other aspects of above and subsurface environmental impact associated with fracking.



Credit: nahlinse

2.3 Regulation & Finance – Ensuring Development & Environment are Incentivised

Design of appropriate regulatory frameworks would greatly benefit from inclusive consultation processes, especially from roundtables with industry participants to reach a consensus on issues of common relevance (e.g. water management, permitting, monitoring and inspection), which the highly competitive nature of these projects currently does not tend to favour.

Tax regimes and carbon pricing are seen by some as the necessary condition upon which continued development of the fossil fuel industry is predicated. Whilst some uncertainty remains around the nature and extent of taxation and royalty/government revenue streams in the BC LNG, jurisdictions should be mindful of striking the right balance between revenue and competitiveness. Furthermore, industry would retain a safe advantage if full accounting, including the risk of stranded assets, were included in their investment plans for large scale projects. In addition, as part of what some view as an inevitable longer-term process, a cross-jurisdictional harmonisation approach to carbon pricing and taxation will likely offer early-mover advantages to those industry groups and jurisdictions that embrace it earlier in the game. The UK's Electricity Market Reform (EMR) provides embedded financing mechanisms that should help foster uptake of clean tech solutions and clean energy technologies.

Good regulation is key to differentiating from other jurisdictions. More data availability and transparency, building in full cost accounting into LNG development plans and making those available, methane venting, and setting <1% methane target, are all potential examples. Furthermore, jurisdictions could benefit from using LNG-based revenue to support related environmental technology development.

2.4 Community Engagement – Doing the Right Thing & Helping to Educate

Other impacts that characterise the onshore shale gas industry are social in nature and impinge on community life. Factors include the increased volume of traffic and population and how these affect local infrastructure and service industries; negotiations around economic benefits; health and environmental impacts on the local population; land and water use permits and conservation; and



Credit: Kamaljith K V

issues around skilled labour supply and/or shortage. Policy development in support of shale gas/LNG industry must take into account all of these aspects at various stages of the process and negotiation, and do so earlier rather than later, if the developments are to obtain the social licence. As an example, short-sighted policies around immigration and Temporary Foreign Workers (TFW) allowances created a shortage of skilled labour in the Australian LNG developments which have caused ballooning budget overshoot and unsustainable escalation of labour costs. The BC and Canadian Federal governments are taking a proactive approach and have recently agreed to a series of measures on immigration fast-tracking for TFW that industry has been received very positively.

Relations with First Nations should be a top priority, including discussion of treaty rights. Without First Nations support, projects will not go forward and investors will move abroad to less risky opportunities. Moreover, community compensation goes beyond monetary and must include a meaningful, long-term share in real equity, particularly in terms of job creation, social benefit, and long-lasting economic benefits as well as through direct participation/stake in the satellite industries that will support the natural gas developments. It is desirable that regulators, government and industry develop a coherent narrative, and approach social engagement jointly rather than in fragmented, unilateral initiatives that may result in conflicting messaging and public distrust. Trustworthiness is key. Irresponsible fracking has resulted in moratoriums in jurisdictions such as California, Germany, and France. Having an adequate number of well-trained inspectors ensuring that operators are doing the right things is crucial.

2.5 Recommendations

Establish UK-BC liaison to consider sharing approaches to policy and regulation around:

- a) Emissions management, including using CCS³
- b) Water management
- c) Community engagement
- d) Regional co-operation, such as the Pacific Coast Action Plan on Climate & Energy, and the EU Emissions Trading Scheme.

³ CMC are currently testing deep extraction and shallow reinjection for natural gas.

Those involved might include, as relevant:

- a) (UK) Dept for Energy & Climate Change; Foreign & Commonwealth Office, Climate Change & Energy Dept; UK Trade & Investment; Low Carbon Innovation Co-ordination Group; Energy Technology Institute; the Green Investment Bank;
 - b) (BC/Canada) the BC Oil & Gas Commission; the Ministry of Environment; the BC Ministry of International Trade; the BC Ministry of Natural Gas Development; Sustainable Development Technology Canada; the Climate Action Secretariat; and Carbon Management Canada.
- Formats for such liaison might include: further subject-specific fora and/or individual liaison, supported or facilitated by the relevant government or authorities.
 - LNG developers, working with regulators and government, could consider adopting equivalents to Alberta's Grand Challenge and/or a Canadian Oil Sands Innovation Alliance (COSIA)-equivalent approach to natural gas and LNG development.
 - Organise bilateral trade missions to develop environmental business partnerships in support of natural gas and LNG development in both BC and the UK, particularly working under the Joint Statement signed by UK Minister of International Trade Lord Livingston and BC Minister of International Trade Teresa Wat.

Acknowledgements

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- BC Minister for the Environment, Mary Polak
- UK Minister for Trade & Investment, Lord Livingston of Parkhead
- James Tansey, CEO Offsetters – for moderating the discussion
- All the participants – for their active engagement
- The BC Ministry of International Trade – for their support and co-funding
- The Pan Pacific Hotel, Vancouver – for hosting the event



Annex A: Contact Details

Rupert Potter

British Consul-General Vancouver

rupert.potter@fco.gov.uk

+1 604.683.4421 ext. 2205

Paolo Marcazzan

Science, Innovation & Energy Policy Officer

British Consulate-General Vancouver

paolo.marcazzan@fco.gov.uk

+1 604.683.4421 ext. 2212

Adrienne Yuen

Climate and Prosperity Advisor

British High Commission Ottawa

adrienne.yuen@fco.gov.uk

+1 613.364.6144

Annex B: Agenda & List of Participants

Agenda:

08:30 – 09:00	Light Breakfast
09:00 – 09:15	Introductory remarks <ul style="list-style-type: none"> - Rupert Potter, Consul General Vancouver - Lord Livingston, UK Minister of State for Trade and Investment - Mary Polak, BC Minister of Environment
09:15 – 10:15	Supporting the Clean Tech Sector From R&D to Market to Export Indicative areas for discussion: <ul style="list-style-type: none"> - How do the UK and British Columbia support their clean tech sectors? - What existing policies can be shared and what new ones are needed? - Are there opportunities for R&D collaboration or commercial partnerships? - How can clean tech companies better access the industries that need them? - What support do they need to access global markets?
10:15 – 10:45	Coffee / Tea
10:45 – 12:00	Greening the LNG Sector – A Case Study Indicative areas for discussion: <ul style="list-style-type: none"> - What are the benefits and challenges of natural gas as a transition fuel? - What do LNG developers need from the clean tech sector? - What can R&D, governments and business themselves do to better fill that need? - How can both energy security and climate objectives be met? - What can BC (looking to LNG exports), and the UK (with the Gas Generation Strategy), learn from each other in greening the industry?
12:00 – 13:00	Networking Lunch



Participants:

Moderator: James Tansey, Offsetters & Sauder Business School

1. Mary Polak, British Columbia Minister of Environment
2. Lord Livingston, UK Minister of State for Trade & Investment
3. Caroline Saunders, FCO Climate Change & Energy Dept
4. David Hodgson, Energy Sector Specialist, UKTI
5. David Keane, BG Group
6. John Adams, Sustainable Development Technology Canada
7. John Frew, SPS Lord Livingston, UKTI
8. Leonie Velthuis, UKTI London
9. Matt Horne, Pembina Institute
10. Mike Rosenfeld, Consulate-General Los Angeles
11. Neil Philcox, Blended Capital Group
12. Paul Austin, Sustainable Development Technology Canada
13. Paul Jeakins, BC Oil & Gas Commission
14. Peter Laybourn, International Synergies
15. Richard Adamson, Carbon Management Canada
16. Ross MacDonald, Clean West Capital
17. Rupert Potter, Consulate General Vancouver
18. Simon Davies, University College London
19. Tim Lesiuk, BC Climate Action Secretariat
20. Tracy Casavant, Lighthouse & NISP Canada
21. Vicky Sharpe, Sustainable Development Technology Canada
22. Wes Shoemaker, BC Deputy Minister of Environment
23. Zoher Meratla, CDS Research Ltd

Rapporteurs:

- Paolo Marcazzan, British Consulate-General Vancouver
- Adrienne Yuen, British High Commission Ottawa



Annex C: Useful Websites

BC Ministry of Environment

www.gov.bc.ca/env

BC Ministry of International Trade

<http://www.gov.bc.ca/mit/>

BC Ministry of Natural Gas Development

<http://www.gov.bc.ca/mngd/index.html>

BC Climate Action Secretariat

www.env.gov.bc.ca/cas

Carbon Management Canada

www.cmc-nce.ca

Department of Energy & Climate Change

www.gov.uk/government/organisations/department-of-energy-climate-change

Electricity Market Reform

www.gov.uk/government/policies/maintaining-uk-energy-security--2/supporting-pages/electricity-market-reform

Energy Technologies Institute

www.eti.co.uk

Green Investment Bank

www.greeninvestmentbank.com

International Synergies

www.international-synergies.com

Low Carbon Innovation Co-ordination Group

www.lowcarboninnovation.co.uk

Pembina Institute

<http://www.pembina.org/>



Research Councils UK

www.rcuk.ac.uk

Sustainable Development Technology Canada

www.sdte.ca

Technology Strategy Board

www.innovateuk.org

UK Trade & Investment

www.gov.uk/government/organisations/uk-trade-investment