YUKON ENERGY

Liquefied Natural Gas Workshop Report

(Photo from Cam Brown's presentation)

January 18th 2012, at the Gold Rush Inn in Whitehorse

1. Introduction

At the Yukon Energy Charrette in March 2011, Yukon Energy brought together governments, Yukoners and energy experts from across Canada for three days to discuss and share information on resource options for Yukon's energy future. One of the key outcomes from the charrette was Yukon Energy's commitment to continue engaging stakeholders, governments and the public in planning for the future. To meet that commitment and plan in public, Yukon Energy is holding energy workshops on a series of topics and resource options. The Liquefied Natural Gas (LNG) Workshop is Yukon Energy's third workshop.

The information gathered from the workshops and public meetings will be used to inform and direct the work of Yukon Energy and its consultants in carrying out the resource options planning.

This is the report from the LNG Workshop and Public Meeting held on January 18th, 2012 in Whitehorse.

2. Workshop Objectives

The following workshop objectives were developed:

1. Examine LNG in the context of Yukon Energy's planning principles: reliability, affordability, flexibility, and environmental responsibility;
2. Identify the environmental and socio-economic issues and opportunities in relation to LNG in Yukon;
3. Educate the participants as to how LNG fits within the Draft YE Resource Plan;
4. Understand the regulatory framework for LNG; and
5. Understand the technology and the individual parts and locations of the LNG supply chain.

3. Workshop Participants

Over 65 invited and interested workshop participants attended the half day session. Participants represented the following stakeholders, governments and industry:

Government of Canada

City of Whitehorse

Kluane First Nation

Vuntut Gwitchin First Nation

Yukon Conservation Society

Yukon Utilities Consumer Group

Government of Yukon (Oil and Gas, Forest Management, Building Safety, Business and Economic Development, Yukon Geological Survey)

Village of Carmacks

Whitehorse Chamber of Commerce

Yukon Cold Climate Innovation Centre

Council of Canadians	Access Consulting
EnCana	Selwyn Resources
ATCO Midstream	Adanac Molybdenum Corporation
Northern Cross Yukon	Dimok Timber
Dempster Energy Services	Western Copper and Gold
Kerr Wood Leidal Associates	Interested Public
Yukon Electrical Company	

The workshop was also attended by Yukon Energy staff and consultants. The public meeting in the evening was attended by 35 people.

4. Presentations

The workshop provided the opportunity for Yukon Energy to share the findings from the LNG Transition Option Background Paper with the participants as well as for key stakeholders, partners and governments to present their information. The following presentations were delivered at the workshop and are posted on the Yukon Energy website at www.yukonenergy.ca/energy/public_engagement/lng/.

a) ***LNG Fundamentals***. Alan Hatfield PE, Vice President LNG Technical Services Braemar Wavespec, Houston, Texas.
b) ***Transforming Resources into Mines; the Casino Mine Story.*** Cameron Brown, VP Engineering, Western Copper and Gold.
c) ***LNG Transition Fuel Option for Yukon***. Cam Osler, Intergroup Consultants Ltd.
d) ***Developing Yukon's Natural Gas***. Presentations by David Thompson, President Northern Cross and Rob Daub, CEO Dempster Energy Services.
e) ***Regulation of LNG Energy in the Yukon.*** Ron Sumanik, Acting Director, Oil & Gas Resources, YG.
f) ***Examining the Environmental Impacts and Opportunities of LNG for Yukon.*** Don McCallum P.Eng., Morrison Hershfield.

5. Workshop

Following the presentations the participants were organized into facilitated groups ranging from 6 to 8 people. The groups were asked to discuss and record their ideas and comments with the intention of the work being shared with the participants, the public and included in Yukon Energy's LNG feasibility and planning work.

The participants were asked to report on the following questions:

1. **What should the transition plans look like (transition from diesel to LNG and then from LNG to renewable source)?**

    a. How do we link renewable options to LNG? What do we need to avoid during the transition to LNG that would block or slow down the future transition to renewable sources?
    b. What is an acceptable length of time for the transition period and what is an acceptable length of time before transitioning back to renewable sources?
    c. How do we transition off LNG so it does not become the default energy source if Yukon Energy's objective is to produce electricity from renewable sources?

2. **Discuss a strategy for moving forward with LNG in Yukon.**

    a. What information and resources are needed?
    b. What does Yukon Energy need to do?
    c. What does Yukon Government need to do?
    d. What do First Nation Governments need to do?
    e. What does industry need to do?
    f. Who are the other stakeholders and what do they need to do?

6. Results

The following is a summary from the workshop and public meeting.

Transition Planning

Transition from Diesel to LNG Should:

- Involve a strategy based not only on economics but also on affordability, reliability, flexibility, and environmental responsibility;
- Consider a review of the entire Yukon energy system and all future energy demands;
- Involve an energy demand management program;
- Focus on local sources of LNG that will be subject to local environmental regulations, and may be cheaper and have lower environmental impacts because of shorter transportation distances;
- Consider how LNG can be integrated gradually into the existing system;
- Begin with a larger off-grid mining project that could function as an "anchor tenant"; and
- Work to develop the LNG infrastructure and market simultaneously.

Potential Barriers to the Transition from LNG to Renewable Sources Include:

- Low cost of LNG will make the move to renewable options look complicated, time consuming and expensive;
- Unforeseen industrial and residential development will require the continued use of fossil fuels;
- The cost of the transition from diesel to LNG will deplete funding for the transition to renewable sources;
- Bringing renewable options to off-grid communities and industrial users will remain difficult and expensive (especially once LNG is in place);
- Inertia may come with the development of an LNG distribution network and other users such as residential heating and powering vehicles;
- Incentives to develop LNG are in place across North America; and
- The industrial sector may not be willing to contribute to capital costs for renewable projects if they can produce energy cheaply on-site using LNG.

The LNG to Renewable Sources Transition Plan Should:

- Set firm benchmarks, timelines, and targets for renewable sources before LNG is put in place;
- Include transition timelines based on realistic estimates for the development of renewable projects;
- Consider using savings from the LNG to diesel transition to finance renewable projects:
- Consider funding renewable projects through feed-in tariffs, a method of offering cost-based compensation to renewable energy producers;
- Plan for a future that will involve a mix of energy sources, including LNG, with a gradually increasing share of renewable sources;
- Consider the potential of hydrogen assisted renewables , such as the HARP (Hydrogen Assisted Renewable Power project in Bella Coola), and bioenergy to add flexibility to the system;
- Evaluate options for connecting to the BC power grid to make capital-intensive hydro projects worth while;
- Work with new industrial users to develop small scale renewable projects;
- Consider focussing on renewable options for the base energy load while continuing to use LNG for shorter term industrial uses;
- Ensure that the future transition to renewables does not lead to uncertainty in terms of energy costs or availability; and
- Begin working now on renewable options as large capital projects may take a long time to develop.

Strategy for Moving Forward with LNG

Information and Resources Needed:

- An understanding of future energy needs both on and off grid and the seasonal and annual variation in both potential loads and current hydro capacity;
- Consideration of the most efficient location for LNG energy generation facility;
- Evaluation of the potential supply sources of LNG and potential economic and environmental differences between these sources;
- A full economic analysis including the initial investment required, pay back period, local markets, and potential risks;
- An understanding of the potential players and partnerships;
- An understanding of the current and future regulatory environment;
- Results from the ATCO LNG pilot project currently underway in Watson Lake;
- Options for retrofitting existing generators and equipment to use LNG;
- Information about options such as dual fuel systems and combined cycles using exhaust heat;
- Consideration of other potential markets for LNG such as residential heating, mining machinery, and vehicles;
- A comparison of GHG emissions associated with diesel and LNG;
- An understanding of the full environmental impacts and life cycle costs of switching to LNG; and
- Consideration of potential grants, tax cuts, subsidies, or public-private partnerships that could be used to help develop required LNG infrastructure.

Yukon Energy Needs to:

- Work closely with the Yukon Government and other potential partners including the City of Whitehorse, First Nations, customers, the public, fuel providers, and industry in Alaska, British Columbia, and NWT;
- Develop a plan for LNG that can be implemented in stages and that balances industrial and residential customers, as well as on-grid and off-grid users;
- Develop a credible business plan that considers life-cycle costing, the capital investments required, and the potential market;
- Understand the regulatory environment;
- Ensure that costs to customers will not increase;
- Use the waste heat for district heating;
- Focus on bringing LNG first to communities, First Nations, or off-grid industrial users that are ready now;
- Develop a culture of energy efficiency and conservation;
- Finalize partnerships and commit to moving forward with LNG;
- Consider focussing on residential energy needs, with options to sell surpluses to mines when available; and

- Develop and implement a public education plan focussed on the benefits and impacts, trade-offs, and potential costs of the transition to LNG.

Yukon Government Needs to:

- Develop regulations that are based on full cradle-to-grave impacts, with a consideration of the best practices from other jurisdictions;
- Understand Yukon's natural gas resources and the potential benefits and impacts of development;
- Bring together a project team including representatives from the federal government;
- Ensure that regulatory staff get sufficient technical training;
- Foster effective leadership and work towards buy-in from politicians and managers;
- Work with and encourage the private sector;
- Understand the implications of international trade agreements;
- Evaluate options for subsidies or public-private partnerships to get LNG infrastructure started; and
- Set high ethical, environmental, and safety standards for LNG operations in Yukon.

Industry Needs to:

- Ensure that there is a firm commitment from customers and a stable market before investing in LNG infrastructure projects;
- Consider all types of potential partnerships;
- Train employees in LNG facilities and operations;
- Carry their fair share of the risk associated with transition to LNG; and
- Consider opportunities for mines in the same area to share LNG resources.

First Nations Need to:

- Consider opportunities to access low or no-interest loans for LNG infrastructure; and
- Explore the full range of potential partnerships.

7. Summary

The workshop participants and the public recognize that LNG has the potential to be a good near-term transitional energy source for Yukon between current diesel use and future renewable options. LNG costs less and has lower air emissions than diesel; it offers flexibility, and can be developed to meet forecasted loads by 2014 if planning began immediately. Natural gas for the liquefaction process can be sourced from currently available gas reserves in BC, however it was also noted that the development of Yukon gas could decrease transportation distances/costs, create local jobs, and the extraction methods would be subject to Yukon regulations.

Participants at the workshop have suggested that prior to moving forward with LNG, Yukon Energy develop a plan which includes a mix of renewable energy sources and clearly outlines

the transitional nature of LNG. This plan should include an implementation plan in the context of balancing the needs of industrial, residential, on-grid and off-grid customers. A long term commitment from large industrial users and Yukon Energy will be required before investments in LNG infrastructure are made. Yukon Energy will need to work closely with potential partners including the Yukon Government, City of Whitehorse, First Nations, rate payers and customers, fuel providers, and industry in Yukon BC, NWT and Alaska. Subsidies, incentives, and public private partnerships may be useful in getting LNG infrastructure projects underway.

There is concern that the transition from LNG to renewable energy sources will be difficult because compared to LNG, renewable options may look difficult, expensive, and have long development timelines. In order to ensure the timely transition to renewable energy sources, plans for renewable projects, and firm benchmarks, timelines, and targets for renewable sources need to be in place before work begins on LNG infrastructure. Connecting to the southern grid and using the financial savings of switching to LNG to fund future renewable sources should be considered.

Yukon Energy thanks all those that participated in the workshop and public meeting. The presentations from the workshop experts along with the responses to the workshop questions are being incorporated into Yukon Energy's evaluation of the LNG options. Yukon Energy is committed to working with its partners, sharing information and to keep talking.