TECHNICAL WORKSHOP # 2

YUKON ELECTRICITY DEMAND FORECAST & NEXT GENERATION HYDRO SHORT LIST

Summary and Feedback Report

Updated April 20, 2015

YUKON DEVELOPMENT CORPORATION

NEXT GENERATION HYDRO powering our future

TIPPING POINT strategies

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INTRODUCTION

This report summarizes what was said at Yukon Development Corporation's Next Generation Hydro Workshop called *Yukon Electricity Demand Forecast and Next Generation Hydro Short List.* Held on January 29-30, 2015, this is the second of three engagement workshops scheduled in Phase 1: Project Identification of the Next Generation Hydro Project. Each workshop is designed to provide technical information to representatives from Government, First Nations, and stakeholder groups. A speaker event is designed to share a summary of the technical information with interested public both through a live event and an on-line video.

This workshop continued the conversation initiated at the first workshop, *An Introduction to Next Generation Hydro* and introduced the two most recent Next Generation Hydro technical papers from Midgard Consulting Inc. (Midgard). The technical process used to develop the *Yukon Electrical Energy and Capacity Need Forecast (2035 to 2065)* was presented and methods to meet the energy and capacity gap were discussed in small break out groups. The second technical report presented the results of the *Yukon Next Generation Hydro and Transmission Viability Study: Site Screening Inventory (Part 2 of 2).*

The purpose of the workshop was to discuss the information presented, review key technical concepts and provide an opportunity to share concerns, perspectives and questions. Participants in breakout sessions explored the technical topics and report information.

All feedback and input received during the workshop was recorded and compiled as a record of discussion and summarized in this document. This record of discussion will also be used in the draft "what we heard document" called the *Next Generation Hydro Discussion Paper*. This document, in conjunction with the *Next Generation Hydro and Transmission Viability Study* will be presented to the Yukon Development Corporation (YDC) Board in the fall of 2015.

All reports, a video of the speaker event and other materials are available on the website at nextgenerationhydro.ca.

TECHNICAL WORKSHOP OBJECTIVES

The overarching objective of the workshop was to inform audiences of the Directive, the technical process, hydro and energy concepts and the release of technical papers: *Yukon Electrical Energy and Capacity Need Forecast (2035 to 2065)* and *Yukon Next Generation Hydro and Transmission Viability Study: Site Screening Inventory (Part 2 of 2).* Additional goals included:

- Reviewing the Next Generation Hydro Directive;
- Inviting a broad range of technical representatives from governments and organizations;
- Providing an overview of the *Yukon Electrical Energy and Capacity Need Forecast (2035 to 2065);*
- Providing an overview of the *Yukon Next Generation Hydro and Transmission Viability Study: Site Screening Inventory (Part 2 of 2);*
- Reviewing concepts related to energy and capacity;
- Providing an opportunity to discuss the Short List sites identified and capture early interests and concerns for each;
- Introducing the methodology Midgard will employ for the next phase of work;
- Reviewing the engagement methodology and future opportunities to participate; and
- Providing an opportunity for discussion on information shared through breakout groups.

OVERALL ATTENDANCE

There were 55 on day one and 64 participants on day two of the workshop from:

- Access Consulting
- ATCO Electric Yukon
- Canadian Parks and Wilderness Society
- Canadian Wildlife Service
- Champagne and Aishihik First Nation
- City of Whitehorse
- DanKeyi Renewable Resource Council
- Dena Nezziddi Corporation
- EDI Environmental Dynamics Inc.
- Environment Canada
- Experiential Science 11 Students (Day 2 only)
- First Nation of Na-cho Nyäk Dun
- Kluane First Nation
- Kwanlin Dün First Nation
- Laberge Environmental Services
- Laberge Renewable Resource Council
- Little Salmon Carmacks First Nation
- Mayo District Renewable Resource Council
- Selkirk Renewable Resource Council
- SLR Consulting
- Ta'an Kwäch'än Council
- Teslin Tlingit Council
- Trondëk Hwëch'in
- Whitehorse Chamber of Commerce
- YG - Economic Development
- YG - Energy Mines & Resources
- YG - Energy Solutions Centre
- YG - Water Resources Branch
- Yukon Chamber of Commerce
- Yukon Conservation Society
- Yukon Development Corporation
- Yukon Energy Corporation
- Yukon Environmental and Socio-economic Assessment Board
- Yukon Heritage Resources Board
- Yukon Fish and Wildlife Management Board
- Yukon Research Centre
- Yukon River Inter-Tribal Watershed Council

First Nations Representation:

Overall there were 23 First Nation workshop participants. They included:

Governments: Kwanlin Dün (1), Little Salmon Carmacks (2), Ta'an Kwäch'än (2), Champagne and Aishihik (3), Teslin Tlingit (1), Na-cho Nyäk Dun (2), Trondëk Hwëch'in (1), and Kluane (1).

Renewable Resource Councils: Laberge (1), Selkirk (2), and Mayo District (6)

Development Corporations: Dena Nezziddii (1)

WORKSHOP AND EVENING SPEAKER EVENT FORMAT

The workshop was formatted to promote participant engagement and opportunities for dialogue and feedback with technical representatives, especially those that had attended the first workshop. The workshop began with an overview of the Next Generation Hydro directive, Phase 1 project elements, including work completed and next steps. For each technical paper, the results were presented followed by a breakout session, where participants completed an exercise intended to facilitate a conversation about the technical work, key concepts, and perspectives. As well, there were two speaker panel sessions to explore topics related to the technical work.

There were two opportunities for public engagement. First, an evening speaker event was held on January 29th where shortened versions of the workshop presentations were given followed by a questions and answer session. This event was video recorded to be posted on the website. There was also a public open house after the workshop on January 30th in the afternoon. The public was invited to review the work completed by the participants and to ask questions and provide feedback to representatives from YDC, Midgard and Tipping Point Strategies.

WORKSHOP PRESENTATIONS

Day 1

Welcome and Introductions

- **Elder Jimmy Johnny, First Nation of Na-cho Nyäk Dun:** Opening Prayer.
- **Minister Brad Cathers, YDC:** Welcome and opening remarks.
- **Darielle Talarico, Tipping Point Strategies:** Workshop facilitator. Provided an overview of workshop outcomes and expectations.

Presentation #1 – Project Management Update

- **Lisa Badenhorst, Project Director, YDC:** Provided an overview of project to date, next steps and a review of engagement feedback from Workshop #1.

Presentation #2 – Yukon's Energy Picture Panel

- **Andrew Hall, President, Yukon Energy Corporation**
- **Jay Massie, Manager, ATCO Electric Yukon**
- **Ryan Hennessy, Senior Energy Advisor, YG – Energy Solutions Centre**
- **Joanne Fairlie, Chair, YDC**

The panelists each briefly described their role in the energy picture and responded to questions from the floor.

Presentation #3 – Yukon Electrical Energy and Capacity Need Forecast Draft Technical Paper

- **Michael Walsh, Midgard :** Provided an overview of the first technical paper detailing the forecast method used, including assumptions and the resulting low, baseline and high forecast scenarios outlining future winter electrical energy and capacity gaps expected 20-50 years from today.

Presentation #4 – Forecasting the Future Panel

- **Forest Pearson, Senior Geological Engineer, Morrison Hershfield**
- **John Streicker, Climate Change Specialist**
- **Michael Walsh, Midgard**

The panelists were asked the following questions:

We need to plan for the future; however it is difficult to know exactly what the future will look like. In the *Yukon Electrical Energy and Capacity Need Forecast (2035-2065)* paper there is some discussion of possible future factors that might contribute to the forecast scenario outcomes. To explore these factors further our panel will take a look at the following questions:

1) In the future do you think the electrical energy consumed per person will be more or less?
2) In the future what role do you think fuel switching to electricity will play on electrical demand?
3) In the future how might climate change affect our residential/commercial use of electricity?
4) In the future how do you think industrial demand will affect electrical use?

Breakout Groups: Meeting Yukon's Future Electricity Needs

After the presentations, participants were divided into six smaller groups and led through an energy planning exercise. The intent of the exercise was to gain understanding of the concepts of energy and capacity, along with the trade-offs, such as cost and footprint associated with various renewable and non-renewable energy sources.

At the end of the breakout group session, each facilitator presented the themes of the conversations and outcomes of the planning exercise at their stations.

Day 2

Presentation #5 – Site Screening Part 2 Results – The Short List

- **Peter Helland, Midgard:** Provided an overview of results of Part 2 of the Site Screening Inventory Report and discussed next steps for technical work.

Breakout Groups: Review of Short Listed Sites

Participants returned to their breakout groups from the previous day to discuss and compare two of the shortlisted hydro sites. Groups were asked to determine if the sites could meet the energy gap in 2035 and if it was scalable to meet the 2065 need. They were also asked to assess trade-offs, pros and cons and explore what we know about the sites to date.

At the end facilitators, reported back to the broader group on their discussions. They also relayed the content of discussion regarding the tradeoffs and pros and cons of the site and the Next Generation Hydro project in general.

Public Open House

Members of the public were invited to an Open House the afternoon of Day 2 of the workshop. All materials, reports, results of the break out group exercise and YDC staff were available. Participants were welcome to engage in discussion with YDC representatives and learn about the Next Generation Hydro project and outcomes of the workshop.

Evening Speaker Event

The public was invited to the evening speaker event. The event was recorded and is available on the website nextgenerationhydro.ca.

- **Minister Brad Cathers, YDC:** Welcome and opening remarks.
- **Darielle Talarico, Tipping Point Strategies:** Evening facilitator and introductions to Next Generation Hydro team.
- **Lisa Badenhorst, Project Director, YDC:** Overview of project to date and next steps.
- **Michael Walsh, Midgard:** Overview of *Yukon Electrical Energy and Capacity Need Forecast (2035 to 2065).*
- **Peter Helland, Midgard :** Overview of technical process and results of *Yukon Next Generation Hydro and Transmission Viability Study: Site Screening Inventory (Part 2 of 2).*

RESULTS

Comments and input from participants at the workshop and speaker event were documented from the question and answer sessions, breakout groups and evaluation forms. These were analyzed to derive themes of participant feedback and concerns. Documentation of the breakout groups, question and answer sessions and evaluation forms were recorded.

Theme – Alternate Renewable Energy Solutions

Use Other Energy Generation Methods to Meet Needs

Some participants were concerned about the need for hydro storage and the creation of reservoirs so they discussed using other energy generation and conservation methods such as wind, demand side management, smart meters, solar, run-of-river, and pump storage to meet the energy demand gap, instead of hydro storage. Even though some of these types of energy may not be dependable (instantaneous energy) many participants held out hope they could be part of the solution.

Use Multiple Smaller Hydro Projects

Some participants questioned whether multiple smaller hydro projects could be constructed to meet the gap instead of one or more medium hydro storage project (i.e. putting all eggs in one basket).

Similarly, some participants felt it was better to have projects distributed around the grid instead of in one location. It was assumed by some that this would produce a smaller footprint than one medium hydro project with storage.

Use Energy Conservation Methods to Decrease the Gap

Some participants felt future needs could be met through the conservation of energy via public education campaigns, smart meters, demand side management programs and home upgrades.

Some participants viewed the use of more energy conservation strategies as the first step to decrease the future gap.

Use wind, Solar and Other Renewables

Some participants felt wind and solar could be used in winter to make up the capacity gap. Some discussed the use of multiple wind locations and the capture of sun from January to March as a way to make up the energy gap, recognizing some back up power source would be required.

Others were interested in the 'democratization' of energy, where individual homes would become producers of the energy they use by installing solar panels etc.

Others were interested in the use of wind in small communities, particularly communities who depend on diesel-generated power.

Cost of Alternate Methods to Meet the Gap

Some participants favored what might be more expensive projects (than medium hydro) for meeting the future gap as a trade-off for what might be a smaller footprint. For instance a series of small hydro projects (less than 10 MW) may cost more, but may have less impacts than a medium hydro project with storage.

Theme – Requirement for Thermal Energy in Portfolio

Some participants were in opposition to using thermal methods of energy generation, though most participants recognized the need for thermal as a reliable back up to renewable methods. Some participants would like to avoid thermal solutions at all costs, while others thought it might be a scalable option for meeting demand.

There was also conversation about the lifecycle footprint of thermal, as well as its green-house gas (GHG) emissions.

Theme – Benefits of Hydro with Storage

Benefits and Advantages of Hydro

Some participants discussed the benefits of developing a hydro storage project. They identified the benefits of hydro storage as: ability to produce affordable energy, ability to serve a growing population, ability to potentially create new types of wildlife habitats, ability to create recreational sites and its ability to aide economic opportunities. As well, some participants recognized that hydro storage has a long life span 50 + years and yields low cost energy. Other benefits discussed included opportunities for partnership, job creation and long-term economic benefits.

Theme – Challenges Associated with Hydro Storage

Winter Water Flows

Some participants thought that hydro is not an optimal option, as winter water flows are often low and therefore projects would require storage.

Reality of Reservoirs

Many participants were in opposition to hydro with storage because it may require creation of a reservoir (thus flooding). The discussion included concerns regarding loss of habitat, impacts to cultural activities and recreational activities and economic sites and uses.

First Nations representatives were concerned about the presented shortlist sites in their Traditional Territories and the potential impacts each of the site's reservoirs may have on existing heritage sites, and current and future cultural uses. Many of the Elders who attended the workshop shared stories about the importance of specific sites, especially near Fraser Falls. They also explained, how their Elders told them they are responsible for protecting the land for generations to come.

Some participants were concerned about other potential environmental impacts of reservoirs such as potential erosion, generation of GHGs and impacts on fish and wildlife. Others made suggestions around the potential benefits of reservoirs, such as the creation of new habitats for fish and wildlife, and the recognition of the environment's resilience.

Theme – Hydro Storage and the Environment

Climate Change

Some participants discussed the uncertainties associated with climate change, such as changes in hydrology, permafrost and erosion, and how these might impact a future hydro project.

Fish, Particularly Salmon

Participants discussed the potential impacts to fish, in particular salmon. Each of the short-listed sites has some fish impacts and all but the southern-based sites would affect salmon species. Comments included recognition that what we do in the Yukon could

also impact the Alaskan salmon fishery, salmon stocks, existing enhancement projects and First Nation cultural activities.

Theme – Energy needs of Whitehorse and the Communities

Decentralize Population Growth

Some participants discussed the future of small communities regarding energy needs and population growth. Some suggested using micro-hydro to decrease off-grid communities' diesel dependence or using a hydro project to move more communities' on-grid. The use of micro-hydro in the communities might provide economic opportunities and decrease the impacts.

Some participants also commented that a future medium hydro project seems like it would benefit Whitehorse the most, as this is where most of the population growth will be; and conversely the community where the new potential facility is located may be impacted.

Theme – Transmission Options and Needs

To Watson Lake

Some participants were interested in the feasibility of a transmission line to Watson Lake and what it meant to the viability of hydro sites for the community.

To BC

Some participants wondered whether there would be an advantage to extending the transmission line to British Columbia to make up the gap, instead of developing new hydro projects. Also there was some discussion regarding the ability to sell power from the Yukon to BC and whether BC would even consider buying it.

Theme – First Nations Relations and Partnership

Need to Rebuild Trust in Energy Initiatives

Several First Nations representatives expressed the need to rebuild trust with communities based on past hydro projects and government relations. They believe that existing hydro assets have resulted in flooding and changes to the environment

(particularly at Aishihik and Mayo). First Nations' experiences during the negotiation and construction of these projects have resulted in mistrust in new energy ventures. Mayo First Nation representatives also presented strong opposition to development of Fraser Falls and Two Mile Canyon, located within Na-cho Nyäk Dun Traditional Territory.

Some participants also acknowledged the need to respect provisions within the Umbrella Final Agreement (UFA) and self-government agreements and the unsettled claims and inherent land rights of the Kaska First Nations.

Partnership is Essential

First Nations and many participants acknowledged that First Nations partnership is essential for any project to move forward. They stated the need for early and ongoing engagement with First Nations.

SUMMARY

The Yukon Electricity Demand Forecast and Next Generation Hydro Shortlist Workshop was well attended by a diverse range of participants. The workshop provided an overview of the first workshop and the results of the two most recent technical papers, Yukon Electrical Energy and Capacity Need Forecast (2035 to 2065) and the Yukon Next Generation Hydro and Transmission Viability Study Site Screening Inventory (Part 2 of 2). The participants of the workshop were presented the findings of the two technical papers, provided additional information and perspectives through expert panel presentations and in smaller break out groups explored some of the choices and trade-offs associated with energy and hydro options. Overall, the participants had an opportunity to engage and share their thoughts and concerns on a variety of topics with the key personnel associated with the Next Generation Hydro project.

As in the first workshop, many participants wanted to share their perspectives and concerns regarding the project as a whole, the future forecasted winter energy gap and the potential hydro sites left after the screening process. There were many questions raised by participants ranging from interests to concerns about meeting future energy needs. In addition to concern about specific sites, many participants were interested in discussing how other methods of energy generation, such as wind or solar, could be used to meet the energy gap. In relation to reservoir effects, some participants were concerned about the possible fishery impacts. Others recognized that every option would have different costs and footprint impacts. This demonstrated the challenges faced by energy planners.

During the second day, the results of the *Site Screening Inventory (Part 2*) were presented. The conversation moved from energy planning to the realities of the hydro sites remaining after the first phases of screening. Participants learned that none of the remaining 10 sites and 16 versions was ideal. Moving forward, work will be done to determine the versions of the sites that meet the four-legged stool test while remaining viable.

The workshop highlighted the challenges Yukon faces regarding how to best meet our future energy demand while still respecting the diverse range of Yukon perspectives and interests. One Experiential Science 11 student made a keen observation sharing that, “there is no project where everyone is benefiting and no one is upset”.

NEXT STEPS

The next steps in Midgard's technical process will be to take the 'desktop' versions of the shortlisted sites and redesign them using a 2015 lens against the Directive criteria. This will likely involve making many of the larger designs smaller to meet the Yukon 2035-2065 winter energy gap. Future technical work also includes an analysis of transmission logistics, scalability, costs, and high-level environmental and socio-economic effects. The transmission logistics and market assessment technical papers will be complete in June, while all of the remaining analysis will be released as draft technical papers for review in the early fall. This work will then be combined into the draft *Yukon Next Generation Hydro and Transmission Viability Study,* along with the *Next Generation Hydro Discussion Paper* (a record of the engagement process). These two documents will be presented to the YDC Board of Directors so they can decide if there is a viable hydro option to move towards business case development.

Future engagement activities are planned and include: visits to the communities with a shortlisted site nearby (April), the second Yukon First Nations Energy Forum (May) and a series of speaker events. In addition, Yukon Development Corporation is continuing its meetings with First Nations. Information regarding the project can be found on the website and in our monthly newsletter.

APPENDIX I:
EVALUATION FORM RESULTS

Questionnaire

1. Overall how informative were the speakers at the workshop?

   Poor 1 2 3 4 5 Excellent

2. Which session did you find the most useful/interesting? What about the session engaged your interest?

3. How did you enjoy the Thursday *Meeting Yukon's Future Energy Needs* breakout exercise?

   Poor 1 2 3 4 5 Excellent

4. Do you have any comments/suggestions about this group exercise?

5. How did you enjoy the Friday *Short List* breakout exercise?

   Poor 1 2 3 4 5 Excellent

6. Do you have any comments/suggestions about this group exercise?

7. Do you have any comments about the *Yukon Electrical Energy and Capacity Need Forecast Draft Technical Paper*?

8. Do you have any comments about the *Site Screening Part 2 Results – The Short List*?

Fourteen evaluation forms were filled out. The following is was recorded directly from the forms:

1. Overall how informative were the speakers at the workshop?

    - Average rating was 4 out of 5 (5 = excellent)

2. Which session did you find the most useful/interesting? What about the session engaged your interest?

Day 1 morning was important to understand the entire initiative; remaining discussion was reliant on providing that information and the premise that med-large hydro is best way to address capacity development needs.
Liked breakout sessions, more information available for consideration.
Friday morning presentation.
Concerned about flooding and affected land. How much land would be affected if solar/wind/… was used? The comparison would need to be "oversized" to deal with the effect generation it can produce (capacity factor).
Gap discussion.
I found it all very interesting. It's wonderful how you shared your methodology. You are awesome at how you get us to think in government boots.
I enjoyed discussing amongst others and sharing ideas.
I enjoyed the group discussion with other participants' opinions.

3. How did you enjoy the Thursday *Meeting Yukon's Future Energy Needs* breakout exercise?

    - Average rating was 4.5 out of 5 (5 = excellent)

4. Do you have any comments/suggestions about this group exercise?

Helped facilitate discussion, however was academic and should not be used to select sites.
So many factors - but when we plan for the future we cannot only consider today's options. Are great studies on energy conservations? Scary to imagine the Yukon doubling. The social fabric will change substantially for good or bad? Glad I won't be here to witness it. Yukoners should consider social value of a place.
Breaking down in more detail the 2 projects to possibly move forward group 5.

5. How did you enjoy the Friday *Short List* breakout exercise?

- Average rating was 4 out of 5.

6. Do you have any comments/suggestions about this group exercise?

Difficult to give clear knowledge as there was limited information for sites. Not enough time to discuss. Results based on info given, which may have lead to bias outcomes.
Great to have youth involved -gives me hope that they are thinking. Still believe thought should go into variables and not focus or be felt to believe that hydro is the only solution for Yukon growth.
Not enough time. People should have been assigned group to ensure a mix group.
Breakout groups were very informative lots of different points of view.
I developed a better understanding of how these projects were drafted.

7. Do you have any comments about the *Yukon Electrical Energy and Capacity Need Forecast Draft Technical Paper*?

Concern about averaging industrial load as variation around the mean brings into question its usefulness. Industrial load should be addressed by industry and not supported by building infrastructure from public funds.

A lot of information. MW capacity is a result of supporting mining industry - as a Yukoner I am concerned and have hope that mining will be fully assessed and good decisions are made beyond money and short-term gain.
Very informative.
Discuss more about what the percentages mean/stands for.
Lots of valuable information but we need to really evaluate each project before any decisions are made and all levels of governments and Yukon residents are involved.

8. Do you have any comments about the *Site Screening Part 2 Results – The Short List*?

Take NND options out of picture. Like to hear more on what environmental impacts could be in these areas.
Very good and clear information.
You can tell that many in the room do not have the same connection to the land that FN have, nor the understanding for their feelings. The nearest analogy I can think of now is - take away your electricity! Where would you be?

9. Additional comments provided by participants on the evaluation forms.

Problematic that YDC will likely not receive social license because is constrained by directive to focus on medium-large hydro as central focus to address energy needs. Not fault of YDC decision makers but is a political problem from Ministers directive. Need to do everything possible to address energy needs, conservation, reducing consumption, before accepting and supporting development of hydro.
Community consultation has to be in plain language - exactly what will things look like with hydro in this area? Benefits to community, what will be lost? Do some research and tell them what will be lost - if rely on community it will fail - "you don't know what you're doing" have to build trust.
NND representative sounded very reasonable and business like. Wants representation by being a partner.
All info should be made publically available including GIS files to allow for better analysis by the public.
Great to have grade 11 and FN Elder perspectives.

In context of Detour Canyon: looks like a small project will not harm land and wildlife, but in fact there will be a lot of Moose habitat used for calving that will be under water (which will eliminate them). Our Chinook are on the concerned species list and many of us are engaged in enhancement and restoration projects. This totally negates our projects - I would rather see less invasive projects sought after. It frightens me!
Will our ideas be shared with the planners of the project? There are other ways of producing energy such as wind and solar.
I am saying no to any project that will impact any sacred/traditional or cultural value. Impacts on salmon in any way are a no because our current hydro dams have impact on those tributaries/rivers.
I'd like to know if studies will be done that examine the formation of deltas in new reservoirs over the next 100-200 years. Deltas can be high quality wildlife habitat and may mitigate other negative impacts.

APPENDIX 2: BREAK OUT GROUP - FACILITATOR NOTES

Session 1: Energy Planning Exercise

Groups of 7-12 participants were asked to engage in an energy planning exercise where they had to meet a set energy and capacity gap using various energy generation methods (ie. hydro storage, run-of-river, solar, wind and thermal). The following are the notes taken by the group facilitators during the game discussions.

- Small run-of-river hydro – FN partners adaptable (built in series) in many locations.
- Wind: winter potential, concerns (birds), more wind now? Costly maintenance?
- Other ways to meet gap: electric thermal storage, smart grid, home upgrades (insulation), and ways to change behaviors
- Solar: good Feb – April (low reservoir level), for houses (good savings)
- Hydro – old school.
- Storage – can serve large population.
- Overbuild for reduced emissions, large hydro and large wind to system simplicity.
- Didn't want fossil fuels and wanted to build 150GWh – wanted to keep footprint small.
- Wanted a balanced approach without thermal. Independent project at a FN community scale – local benefits.
- Wanted a suite of options to maximize storage. Storage is important, run-of-river is valuable for meeting summer transportation needs.
- Small wind to ensure flexibility and scalability.
- Solar on a human scale – supports democratization of energy.
- Anticipating the effects of cost – understanding that capital costs are limiting for renewable energy.
- Choose a fossil fuel as a capacity decision – won't necessarily be used.
- Doesn't think the trade-offs were made – thermal is a smart way to build capacity – instantaneous demand is a fact of life.
- The same choice should be made through DSM and peak shaving.
- Could not add thermal, too much wind was required – opted instead for large hydro – trade-off was 2 large hydro with storage.
- Didn't like picking up thermal – range of options was limited.
- Wind is natural, natural gas can be managed – we need storage for reliable generation.
- Still need DSM – thermal use can be managed by turning lights off, using energy efficient light bulbs etc.
- Believes in solar but understands its expensive and needs batteries.
- We already have run-of-river and we don't need more – traditional resources and economy is more important.

- Tried to capture what Yukoners want from energy generation – community benefits, wind and solar.
- Recognizing large hydro and storage are necessary.
- Included thermal to capture the peak.
- Need storage, trade-off was building in thermal- quick capacity builder.
- Diversified from hydro to balance/reduce impacts on fish and habitat.
- Footprint needs to be lifecycle/full-cost (e.g. Thermal has greatest footprint).
- Need to consider job creation and other economic ± / not just about cost.
- Where is biomass, geothermal, DSM
- Where is FN culture, TK in this equation? Needs to be there.
- Trade-offs: GHGs and footprint; looking for employment/sustainable communities; if hydro storage then increase capacity of existing; need to address FNs concerns first.
- Whole lifecycle not represented (solar manufacturing GHGs not taken into account).
- When numbers are close the decision is more difficult.
- One solution is challenging vs. multiple solutions possible.
- The valuation of GHG footprint is not obvious/priority.
- People have different thoughts and perspectives – all logically arrived at.
- Need to be on grid to care/wind and thermal are good in the bush with propane.
- No one wanted to use thermal – working towards a renewable options, everyone used wind in scenario planning.
- Where is pump storage?
- Economics of a reservoir – compared to down south, benefits are different with different life styles.
- Build trust – share truth about a project.
- Smaller run-of-river over storage (eg. Rancheria, Atlin).
- Erosion is a major issue.
- Up front capital and reality of the dollar.
- Do we want our way of life to change?
- The value of the land – "we all live off the land"
- Scalability, maybe smaller scales for each community.
- Centralized vs. decentralized population growth? Generates community employment.
- Need to challenge assumptions to reduce energy consumption.
- Think about how we use energy.
- High priority should be fuel switching – heating with electricity.
- Localized generation of electricity by individual houses and communities.
- Technology for storage is changing.
- Directive/not what but hydro above 10MW.
- Need financial incentives for individual use of renewables.

Session 2: Shortlisted Sites Tradeoff Exercise

An exercise was developed and executed on day two of the workshop as a means of exploring potential sites and their ability to meet one of the available future winter energy gaps. Groups of 5-12 participants picked a gap target from one of the scenarios and picked one or two of the shortlisted sites and discussed the trade offs associated with the site (fit to gap, winter energy capability, scalability, and distance to transmission). It was not an exercise to determine if one site was better than another. The following are notes from the flip charts for each of the following sites per group.

Upper Canyon Group

- Group selected the baseline scenario.
- Combination of dams to meet load.
- Transmission line distance is 290 km.
- Flooding by reservoir, fisheries issues, and heritage values.
- Kaska final agreement not yet achieved.
- Compensation issues for loss of cabins etc.
- Group determined borderline acceptability

NWPI

- Northwest Power Investigation – should be renamed to indicated is located on the Teslin River.
- Distance – is the transmission corridor realistic?
- We should have some idea of accessibility along with other considerations.
- What is the scalability and what are the impacts of a larger scale project?
- If NWPI low makes sense now will NWPI (med-high) make sense later?
- Not much is actually known about this site.
- Winter energy: hydrologically is hydro capable of withstanding increased variability associated with climate change? Why are we trying to meet winter demand with hydro given the challenges?
- Footprint: very cognizant of salmon impacts, flooding of settlement land, increased accessibility (road access) will enable increased hunting, increased permafrost thaw as hydrology changes, and downstream impacts are not captured in the footprint (Alaskans and TRTFN).
- Need to make sure existing problems aren't made worse – salmon recovery in Teslin Lake.

- Assessment: numbers would be better way of showing problems and trade-offs.
- Show where we are today and how much change will happen.

Detour Canyon

- How big? Thinking about Fish Lake to Whitehorse Rapids.
- Historically mines have helped build infrastructure, today we need to work with communities.
- Group selected low baseline to move forward with discussing Detour Canyon feasibility.
- There is no project where everyone is benefiting and no one is upset – where is the bridge?
- Planning the future with the tools/view of today.
- Is the sky falling?
- Can we compare cost of energy to amount of loss?
- Planning for innovation and public policy (societal change)
- Detour Canyon can meet mid-low scenario and can be scaled to meet long-term need.
- Importance of planning with all ages.

False Canyon

- Scalable; run-of-river, Frances Lake storage, and 3 projects on Frances Lake (reduced impacts).
- Challenge is distance to transmission line, land tenure (all under Kaska, more than interim protection), and Frances Lake camp well used.
- Need to engage with Kaska.

Two-Mile Canyon

- Impact of construction?
- May want multiple projects for security. Don't put all eggs in one basket.

APPENDIX 3: PRESENTATION COMMENTS AND QUESTIONS

DAY 1

The following is a sample of the questions and comments raised during the workshop.

Presentation 1: Project Management Update

Mainly members of the Mayo RRC spoke:

- We need to meet, we need to work together, we understand that we are trying meet the future needs. I see problems with the process. We feel invited after you have made your selection. You have already narrowed the choices without us.
- Could there have been no go zones as part of the selection process to respect First Nation priorities? This would have saved us money and a lot of grief.
- Fraser Falls is a no go zone for us. Fishing camps are there. This is an important place. Maybe there will be windmills.
- No one ever talked to us about the Mayo dam, discussion needs to happen or it is going to happen the same as Mayo dam. There should be First Nations discussion with all First Nations members not just leadership and the technical team. You don't know the land the way we do, you have not experienced it. Flying over it does not give you the same experience. Hard times are coming and we must learn to survive off the land and protect it so we can survive.
- My grandpa surveyed all of Mayo area back in the day. Fraser Falls was the best site. There is a grave- site up there. There is a wetland as well where all the animals come – there are many ducks, beavers etc.
- The old people they knew that the government would come and try to push us, they said to stay strong, to protect it.
- My mother was a dreamer that was her gift and all that she dreamed came true. She dreamed that they could come and ask for this land.
- Elders showed pictures of camp. Peter Mather took the original photos. The fish camp is below, the falls above there is a healing lodge and the slough.

Forecasting the Future Panel

One person made a comment to the panel as follows:

- Wind on mountaintops is a good match for winter energy. Hydro, as you have said, is not always.
- More than half the meters in Canada are now smart meters, there is a lot happening around smart grids. Industry is going here, we need the support and the emphasis.
- There is lots of talk about smart meters and islanded grids. Municipalities are islanding themselves as a way to protect themselves against grid failure.
- There are 4500 electric cars in Canada and over 750 charging stations and they are perfect for the commuter market like we have here.
- We must stop using fossil fuels for all energy for the sake of climate change.

EVENING PUBLIC SPEAKER PRESENTATION

At the public speaking event approximately 6 people asked questions of the following themes:

- Why are we going all hydro when winter energy is our problem and you said water freezes in the winter? What about peak shaving? Why is there nothing about DSM (Demand Side Management) in this paper?
- Why 20-50 years out?
- Why are there no other renewables in this solutions
- Your study looked at on-grid communities but most of your sites are near Watson Lake, which is not on the grid. How do you account for that extra load to the grid or is their demand so little it doesn't matter?
- Were there any comparative studies for cities with similar populations and climates?
- Needed a public opportunity to say which sites were a go or no go. We shouldn't spend a dollar on sites that shouldn't move forward.
- We don't see the work you have done on salmon.
- Did we limit ourselves by only looking at the 200 sites that were studied in the past? 10MW sites could have been interesting.
- We have talked a lot about impacts but not about benefits, what about the opportunity to fuel switch and significantly reduce GHGs in the territory? Have you looked at other energy sources like solar and wind?
- Why no off grid communities – this needs to be part of the vision, part of the sell for why hydro?

- This needs to be a conversation about GHGs (greenhouse gases). What could we do to mitigate climate change? What is a little flooding, in terms of fuel costs and global impacts of fuel (self-sufficiency for the territory)?
- Could you add current demand to the graph (hydro and diesel separated) (Gap graph)?

DAY 2

Site Screening Results (Part 2 of 2)

The following comments and questions were made:

- Individual · Why no socio-economic effects and benefits studied yet? Did you add up the scenarios so you could compare the four-legged stool?
- MAYO RRC – We don't feel we've been involved in the process. We are saying no, absolutely, no to Fraser Falls. We did consultations with EDI in 2010 on Fraser Falls with a community meeting. The answer was absolutely no. We are tired of telling you to keep your hands off, there is no discussion about these two sites (Fraser Falls and Two Mile Canyon) for us. My trap line is in the Fraser Falls area.
- MAYO RRC – Mayo River dam is flooding and worrying our community and the salmon can't make it up the river because the water is too low. We need to protect our lands. We will take you up there and show you why. The answer is no.
- MAYO RRC – I don't know why you didn't hear from us.
- MAYO RRC – We know Fraser Falls is a high priority for you, it is close to town and the cost is low.
- MAYO RRC – Yes we want you to come to the camp. It is so important to us and the younger generations need to learn these survival and living off the land skills.
- MAYO RRC – We want to teach everyone how to live off the land.
- MAYO Councillor – Don't wait until a lot of your work is done to call us. The process has shown that our rights and agreements will be respected and that we have a strong voice. We hope to see respect given. Fraser Falls will come off this list and our agreements.
- MAYO RRC – No one came to talk to us. I don't know how involved YEC has been in this, they aren't all bad but we have had serious issues since Mayo B opened. NCPC promised us a fish ladder when Mayo was first built. They never did it. YEC is following through on that now, which is good.

- MAYO RRC – We need to be involved at the beginning, we can work together who knows what technology will be around in the future.
- MAYO RRC – We know there is a need for energy and we need to figure out how to get it.
- MAYO RRC – Get the real stakeholders in the room, we just had a community meeting. There was a resolution passed and we said no to Fraser Falls and Two Mile Canyon.
- Selkirk RRC – Very important spot at Granite Canyon, the needle, it is beautiful and mother nature gifted it to us. Our ancestors told us to stand strong and protect this place. There are trails and old trade routes up there. We are working on salmon enhancement in the area. We would like to see you come up as well to the community to know what is going on.
- MAYO RRC – Our elders feel that the water will back up and come into Mayo at Fraser Falls. The river is our bread line that is how we live. You've been bothering us for decades. We are tired of saying no.
- YCS – How does Midgard plan to reconcile reducing the historical designs for hydro projects to better meet or fit the projected future energy and capacity needs, while also contemplating connection to the North American grid for export purposes?
- Individual · Where is cost, I don't think you should build what you can't afford?
- Mayo RRC · Mayo and Mayo B are disasters · $300 billion for 5MW and messy flooding issues. Boots on the ground is so important. Don't let anyone build a dam until they show you the high water mark in reality not conceptually on maps. Mayo has been a man-made controlled system for decades and yet they still blame the flooding on Mother Nature. It is stressful to know our community could flood at -40, we need proper consultation, feds funded last one and it went way too fast.