



Monday, December 21, 2015

To the Yukon Development Corporation's Next Generation Hydro teams,

Re: YCS comments on Yukon Development Corporation's Next Generation Hydro

Thank you for the opportunity to comment on the technical and engagement work of Yukon Development Corporation's *Next Generation Hydro* project.

The Yukon Conservation Society's comments will be general in nature, as we have not had adequate time to review all seven reports that were released simultaneously three weeks ago.

At least two of these reports (on transmission) were scheduled to be released in June of this year, and the remainder to be released in September. In fact, all the remaining six technical papers, plus the new Context paper, were released the last days of November. Despite the significant change in YDC's schedule, stakeholders were not afforded the same schedule shift or any extra time to provide feedback to the process on the workshops and technical studies.

Stakeholders at the final technical workshop were told we had two weeks to provide input to the final discussion paper. Clearly, this is not enough time to review the materials and provide meaningful feedback. Despite this unreasonable expectation, YCS has endeavoured to compose and submit comments that we wish to be included in the final discussion paper verbatim and for the record.

Technical Paper: *Putting Next Generation Hydro in Context: Other Solutions to Meet Yukon's Long Term Energy Future*

This paper appears to be a late addition to the work tasked of Midgard Consulting. Presumably, it is (one of) the reason(s) for the delay of the release of all the other remaining technical papers and the postponement of the final technical workshop by two months.

For the first half of the Next Generation Hydro process, Yukon Development Corporation and the NGH teams repeated that smaller, alternative renewable energy sources were not its jurisdiction or purview, and that Yukon Energy Corporation would be looking at projects less than 10MW for a 0-20 year timeframe.

YCS commends YDC for the course correction, and for responding to overwhelming stakeholder input by including this high level (yet overly simplistic) investigation into alternative scenarios to meet the capacity and energy gap 50 years into the future.

Despite having seven technical papers to present at the final two-day workshop at the end of November, YDC chose to allocate the entire first day to presentation and discussion of this Context paper. YDC states that the conclusion of this paper is that a Next Generation Hydro project still warrants further investigation. This study does not, however, support the conclusion or even make a compelling case that a Next Generation Hydro project is the best option to move forward to meet future energy needs.

The four scenarios contemplated in the Context paper are: 1. Meet all future demand with LNG, 2. Meet all future demand with a Next Generation Hydro project, 3. Meet all future demand with a suite of renewable energy alternatives (including 11 small hydro projects with reservoir/storage) and, 4. Meet all future demand with a suite of renewable energy alternatives (including one pumped storage project and six small hydro projects with storage reservoirs).

By all accounts, at the end of the first day after the breakout sessions to dive deeper into the four scenarios presented, the stakeholders unanimously preferred

Scenario Four (renewables with pumped storage). More accurately, stakeholders favoured a modified Scenario Four that would take into account new (and existing) technologies that will change energy production, storage and consumption over the next 30 years, and that would allow for the limitless possibilities of combinations of diverse energy sources.

As YDC representatives facilitating the breakout sessions frequently reminded workshop participants, Midgard's Scenario Four still requires six rivers to be dammed and new reservoirs created.

YCS representatives, and other workshop participants that we spoke with, do not believe that will be necessary. Scenario Four as presented includes only one pumped storage hydro facility, which reduces the small hydro (with reservoir storage) projects from 11 (in Scenario Three) to six. What would the inclusion of two pumped storage projects enable? Run of river hydro projects instead of small hydro with reservoir storage projects? More solar? What would other technologies, such as Electric Thermal Storage (storing electrical energy in off-peak times in the form of heat) allow? More wind and other intermittent renewables?

The Context paper and the reaction to it have shown that a diverse alternative scenario to a big hydro project is viable, appropriate and desirable. Breakout session work showed that in a diversified and distributed scenario, the possibilities are extensive and not restricted to the two renewables options explored.

YCS takes issue with a few concepts/assumptions in the *Context* paper.

1. Limits on intermittent renewable energy will likely become unnecessary in the future (if they aren't already), because of storage technologies like pumped storage hydro.
2. Inclusion of fossil fuel for peaking and backup for both renewables portfolios seems like a red herring to try to gain favour for the Next Generation Hydro renewable option. Surely by 2065 – by 2035 and sooner if we're serious and ambitious about it – we'll have smart ways to

optimize the grid, manage loads to shift and reduce peaks, and eliminate the need to burn fossil fuels for peak loads. One obvious example not considered is Electric Thermal Storage that provides a market for off peak electrons, reduces peak demand for space heating (as opposed to baseboard electric heat which increases it), and displaces fossil fuels in the space heating sector, as well as in electricity generation.

3. The fact that YDC did not advise Midgard to include (at the very least a sensitivity analysis of) a carbon price indicates that it may not have a reasonable grasp on where the world is going: away from fossil fuels. Considering the externalized costs to the climate and the environment from the development, processing, transportation and combustion of fossil fuels, and the global consensus that a price on carbon is an effective way to level the playing field for energy sources, a carbon price is inevitable. Even if it may not be politically popular by the current Yukon government, it is very unlikely that by the year 2035 there will not be a cost of carbon built into the price of whatever fossil fuels are still used.
4. YCS does not understand why “Standalone Resource” was considered a criterion worth isolating and identifying, other than to boost the standalone Next Gen Hydro and LNG options. That a Next Generation Hydro facility is a single project that can meet the demand gap identified in the year 2065 does not necessarily make it a sensible choice – more like an underutilized asset. “[Besides LNG and NGH] The other generation types must be combined together to potentially meet the Yukon’s forecasted needs.” This statement from the paper should not be considered a disadvantage. In a smart energy portfolio, just as in ecosystems, societies and financial investments, diversity is strength. Having a number of smaller projects distributed around the grid will increase resilience and reduce risk.
5. The environmental parameters of land use footprint and GHG emissions are not helpful. Spatial footprint is basically meaningless unless the value of the land used is identified and qualified. This can pose a difficult

exercise in value judgments, much like a natural capital approach where ecosystem services such as clean air, clean water, healthy forests as carbon sinks, and the inherent and cultural value of thriving fish and wildlife populations are assigned a monetary value in an attempt to internalize the costs of losses. Inundating a river valley – a productive riparian ecosystem with salmon spawning, rearing and migration habitat, and indigenous cultural significance – would have an infinitely higher impact than covering an equal area of land with solar panels – particularly if the land area covered with solar panels is a brownfield site such as rooftops or an abandoned mine tailings area. The greenhouse gas emissions parameter did not consider upstream (including construction) emissions. This may be understandable considering time constraints, but not adequate for comparison. YCS continues to calculate the global warming potential of methane over a 20-year timeframe, which would make the LNG combustion emissions discussed in this paper five times more intensive.

6. Throughout the year, YCS has observed that YDC representatives do not appreciate the potential of solar energy in the Yukon. Maybe this is because, like hydro, solar often provides the most energy when our demand is the lowest – in the summer. However, the reality of solar is not accurately reflected in the Context paper. As a result, the most important fossil fuel displacement potential of solar energy on the Yukon's islanded grid – in late winter and early spring – is completely missed. Figure 21 is problematic and inaccurate because it assumes solar panels would be installed on a horizontal plane, whereas modules would more likely be installed at a 45-90 degree angle (depending on what season maximum solar capture is intended and the latitude of the installation). Figure 21 also shows that the future energy gap is the highest in the month of March because the spring freshet has not yet recharged hydro reservoirs. At this time of year, solar resources are powerful and can directly displace fossil fuels in electricity generation. Further, summer energy will soon become more valuable because: 1. New markets will be established (electric vehicles and a Skagway transmission line to electrify docked

cruise ships, as examples) and 2. Seasonal grid storage will shift that energy to higher demand times (pumped storage hydro).

Transmission Interconnection

It is noted that the two main Transmission papers are dated July 2015. It would have been considerate to stakeholders if YDC had released these papers in the summer and not waited until the end of November when seven papers were released concurrently, with a two-week deadline to provide comments.

It has long been the position of YCS that connecting the Yukon's independent electricity grid to the North American grid is a bad idea for several reasons. We feel vindicated and are grateful that a detailed investigation supports and reinforces our position. We take the position that the spectre of the future connection to the North American grid, often touted as a given or at least a political goal, has effectively held the Yukon back from meeting challenges and our own needs.

The idea that someday we would connect to the North American grid – to purchase/import electrons when we need them and to sell electrons when we have surplus – has inhibited innovation in the Yukon for too long. The false and defeatist narrative that an isolated grid is a problem rather than an opportunity has created an expectation that we are unable to function without interconnection to an insatiable market to help us meet shortfalls and export excess.

The results from both the **Transmission Market Benefits Assessment** and the **Jurisdictional Transmission Line Technical Logistics Analysis** show that a transmission connection is uneconomic, has minor reliability benefits, would require building new generation dedicated for export, and has high implementation costs relative to the transfer capacity it would enable.

A long distance transmission line is not an alternative to new generation, because new generation would still be required for export to attempt to justify and pay for it,

and because after the steep costs of construction, we would still have to pay for the electrons we import.

Midgard's conclusion on jurisdictional transmission interconnection is decisive and unequivocal.

“Both scenarios [BC connection and Fairbanks, Alaska connection] demonstrate significantly negative net economic benefits and are therefore uneconomic strategies.”

YCS is happy that we can finally move beyond this barrier to innovation and figure out ways that we can make our islanded grid (“isolated” to YEC, and “independent” to YCS) work for us. We can meet our growing needs in all seasons, create economic development opportunities for many communities and develop a diverse range of renewable energy sources to strengthen our grid. This would increase our energy security and resilience while displacing fossil fuels in GHG-intensive sectors.

YCS does see potential mutual benefit in connecting the Yukon's independent grid with Skagway's microgrid. Midgard did not investigate this option because Morrison Hershfield recently studied it. YCS sees value in further exploration of this option to help the Yukon and our Southeast Alaskan neighbours meet our inversely proportional seasonal energy needs.

Positive and Negative Environmental and Socio-Economic Effects – Technical Paper – SLR Consulting

The title of the paper, and the direction received by the consultants, was clearly to put a positive spin on big hydro projects. It makes some simplistic assumptions that in some cases are not accurate. The paper assumes that key environmental issues are known and understood by the scientific community, regulatory bodies and the hydroelectric industry. However, there have been no large riverine hydroelectric projects in North America above the 60th parallel. The effects of flooding on large areas underlain in part by frozen ground are unknown, and there are no natural

proxies on which the scientific community can base scientifically valid conclusions and advice.

The consultants assume that some fish species end up doing well, others decline and some are minimally affected. The claim that mitigations can be put in place or that facilities can be designed and operated in a manner that avoids or minimizes serious harm to fish is wishful thinking. Serious harm to fish is legislatively defined in the Fisheries Act as “death”. Anything less than death is implicitly not serious harm, even if in reality the harm is very serious indeed.

In the Reservoir Water Management table, Average Drawdown and Full Supply Level are provided for each proposed dam, but the Minimum Operating Level is not. This leaves room for interpretation and understanding of the ultimate drawdown for each project.

It does not appear that fish migration – particularly salmon – has been considered in the Fish and Fish Habitat Analysis. This is a serious omission, as salmon are a migratory fish protected by the international Pacific Salmon Treaty and the Yukon River Salmon Agreement. Salmon are struggling, and have a history of being negatively impacted by Yukon dams.

The Yukon has other non-salmon migratory fish known to inhabit the Pelly River: inconnu, broad whitefish and Arctic Grayling. Bull trout and Northern Dolly Varden’s use of the upper Pelly and Stewart Rivers is not acknowledged.

YCS is surprised at the paper’s limited understanding of Socio-Economics, and the choice to scope it at the construction phase only. YCS finds it shocking that the consultants can draw the conclusion regarding a dam on the Pelly River at Granite Canyon just above Pelly Crossing that would flood out almost 9,000 hectares of Selkirk First Nation settlement lands, that “Adverse effects on community well-being in local communities is expected to be low.”

Well-being can be defined as health, happiness, prosperity, etc. We do not understand how the consultants define well-being, and how a community’s well-

being might be considered unaffected as a result of such a significant and devastating environmental, socio-economic and cultural sacrifice.

The net result of these combined deficiencies, omissions and distortions makes it difficult to render any value from this paper.

YCS would like to draw attention to the Wildlife Conservation Society's paper *Potential Impacts and Risks of Proposed Next Generation Hydroelectric Dams to Fish and Fish Habitats in Yukon Waters*. YCS is aware that WCS submitted this paper as its comments on the NGH process. This paper is detailed and useful when considering negative effects to fish of Next Generation Hydro dams.

Conclusion

YCS has appreciated being a stakeholder in the process and taking part in the Next Generation Hydro workshops. These events have been great opportunities to connect with and learn from other energy stakeholders from around the Yukon, including Renewable Resources Councils, First Nations governments, representatives from the utilities, and the territorial and federal governments.

As YDC team members frequently point out and Midgard stated in its Context paper, "all of the generation scenarios have certain advantages and disadvantages that make the decision about which generation types to pursue a selection among tradeoffs."

This is true. YCS would like to see environmental harm minimized and community economic development opportunities maximized when meeting our energy needs.

Our takeaways from the technical work and from the engagement workshops are as follows:

There is no business case for any of the remaining six Next Generation Hydro sites because of economic, technical, environmental and socioeconomic reasons. Further,

First Nations consent for a big dam in their traditional territories is tepid if not completely absent. Unless a First Nation expresses interest in moving forward with any of these potential sites in its traditional territory, none of the sites should be pursued further.

We must learn lessons from other North American jurisdictions about additional project costs in the form of compensation and mitigation. The Northern Flood agreement in Manitoba requires expensive compensation to affected First Nations. The Bonneville Power Administration must pay \$500 million yearly for fish and wildlife mitigation. YCS does not know whether these costs were figured into the financial evaluation of the existing Next Generation Hydro sites – which hardly presents an economic case to move forward even without compensation and mitigation costs.

Yukon Development Corporation should not force this idea upon First Nations governments or development corporations, but rather listen to indigenous people and nations to learn how they want to be engaged, and what kinds of energy project they want to be involved with.

Although some of the findings and outcomes may not have been anticipated or welcome by those who instigated the NGH project, Yukon Development Corporation should be congratulated for taking on this work. It was a valuable exercise to estimate future electricity demand (despite the fuel switching omission), review previously identified hydro sites and projects, and embark on this engagement exercise. The studies, workshops and public speaker events no doubt helped to increase the energy literacy of Yukon people and stakeholders, and help us all think of the most appropriate way to move forward.

It is important for Yukon Government and YDC to accept that a big hydro dam in the Yukon and connecting the Yukon's independent transmission infrastructure to BC are not viable projects.

Big hydro dams are yesterday's technology and not appropriate for tomorrow's needs. YCS believes that the Yukon has renewable energy resources – from small

hydro, pumped storage, wind, solar, and biomass, to distributed storage like ETS and grid scale batteries – as well as the human resources to power the transition to a sustainable, innovative and self sufficient energy future.

Where do we go from here? – YCS Recommendations for Roles and Priorities

Yukon Development Corporation

- Because of the environmental harm (to salmon and other fish as well as wildlife and habitat), the absence of First Nation support and social license, and unfavourable economics of Next Generation Hydro projects, abandon further investigation into the six remaining sites.
- Assist in developing capacity within First Nations governments and development corporations to build and partner in renewable energy projects. Learn from Taku River Tlingit First Nation and Lutsel K'e Dene First Nation who are both northern Indigenous Independent Power Producers.
- Work with Yukon Government Climate Change Secretariat and Energy Solutions Centre to design policies to ambitiously reduce fossil fuel consumption in space heating and transportation, and in off-grid/diesel communities, to create new markets and economic development opportunities for renewable energy projects.
- Investigate the potential of Electric Thermal Storage as a space heating complement to reduce GHGs and integrate wind energy.
- Investigate the implications of widespread adoption of EVs for short and long range travel, including the effect of the mobile, intermittent yet predictable storage contained within the batteries of EVs, as well as the electrification of the Alaska Highway and other transportation routes in and through the Yukon.
- Incorporate the effect of a carbon tax, at several rates, on all of the investigated scenarios.
- Prior to embarking on the next stage of study and consultation, engage with stakeholders to set the parameters and the scenarios to be investigated.

Yukon Government

- Embark on a new planning process for a Climate Change Action Plan and Energy Strategy for Yukon with absolute targets to reduce territory-wide emissions and plan for ambitious actions for each sector to achieve goals.
- Work with YDC to design policies and programs to meet targets, and to displace imported fossil fuels with local renewable energy resources. These policies must include a price on carbon, and other incentives and education to help consumers make better choices despite the current low cost of fossil fuels.
- Investigate current fossil fuel consumption in each sector.
- Identify what reductions can be achieved through conservation and efficiency, then design ambitious and innovative policy and programs to reduce energy demand in all sectors.
- Ramp up efforts in policy and programs for electrical efficiency and demand side management – remember: ‘Negawatts before megawatts’
- Accept the findings that large-scale and long distance transmission interconnection is uneconomic, and stop promoting and pursuing it.
- Accept the findings that new large hydro has unacceptably high environmental impacts, lacks social license and is uneconomic, and stop promoting and pursuing it.
- Mandate the Yukon Utilities Board to conduct regulatory reviews that incorporate sustainability and environmental considerations

Yukon Energy Corporation

- Continue to work to identify renewable energy potential in the Yukon and plan for a 20-year horizon.
- Ensure that the investigation into Yukon’s geography to identify potential small hydro and pumped storage locations is thorough and comprehensive.
- Establish, repair and foster meaningful working relationships with First Nations to build capacity in renewable energy planning and development.
- Work with First Nations to identify renewable energy projects in respective traditional territories.

- Engage and work collaboratively with First Nations and continue to explore the potential of the Yukon-Skagway transmission connection. Identify and, if appropriate, move forward potential energy projects along the route.
- Continue to work to identify market opportunities for renewable electricity.
- With partners, move forward potential small-scale projects to 'shovel-ready' status to meet incremental growth in the market, as government rolls out policy and programs to displace fossil fuels.
- Investigate a time-of-use rate structure, differential rates, and load shifting.
- Investigate Electric Thermal Storage (ETS) as a way to integrate wind energy and reduce fossil fuels.
- Work with ATCO Electric Yukon on the above two points, as well as the potential for creating a smart grid in the Yukon.

The Ultimate Goal: Multi-agency coordinated action to reduce GHG emissions

Coming out of COP21 in Paris is a global consensus that fossil fuels must not be extracted and burned. All countries have received new marching orders to decarbonize our economies and societies. The environmental, social and economic consequences of not doing so will be catastrophic. Shifting away from fossil fuels may be a greater challenge in the north where our climate, isolation, small population and the status quo have some people thinking we don't share the same responsibility as everyone else in the world to address climate change. Not so.

The opportunities in and outcomes of climate change mitigation and adaptation will be worth the effort, and the Yukon Development Corporation can play an important role. Many agencies need to work together to accomplish a common goal. The foundational agreement on which to base all work moving forward must be: A rapid shift to a low, ultimately zero, carbon economy and society. All hands must be on deck for this great effort to ensure it is done right, with commitments to reconciliation with First Nations, decolonization, energy democratization, and waste reduction built in to all actions moving forward.

The Next Generation Hydro exercise was worthwhile to help raise awareness around energy tradeoffs, to move beyond the transmission connection idea, and to establish that there is not First Nation consent or social license to proceed with a big hydro project. The process also showed that there are other options, and that support for alternatives is widespread.

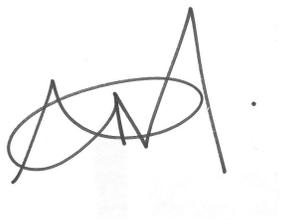
The Order In Council (OIC2013-201) Hydroelectric Power Planning Directive (referred to by YDC reps throughout the NGH process as “The Directive”) leaves room to explore the path with more benefits and fewer sacrifices.

“(2) The goal of the project is to ensure, together with supporting renewable and, to the minimum extent feasible, non-renewable sources of electrical power, an adequate and affordable supply of reliable and sustainable electrical power in Yukon.”

The Directive allows the Next Generation Hydro teams to recommend to the YDC Board and Yukon Government that we need to plan coordinated market development and incentive programs, alongside preparing ‘shovel ready’ energy projects to supply this demand with clean, green, socially acceptable, appropriately sited, diverse renewable electricity.

Thank you for the opportunity to provide comments. Please do not hesitate to contact me if you have questions or would like to discuss further.

Sincerely,

A handwritten signature in black ink, appearing to read 'Anne Middler', with a small dot at the end of the line.

Anne Middler

YCS Energy Analyst

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