Yukon Energy Corporation (YEC) LNG Project Application for Part 3 Certificates

Information Requests of YEC
from
Yukon Conservation Society (YCS) and Leading Edge Projects Inc. (LE)

Section 1 Introduction

YCS/LE-YEC-1-1	Page 1 "*The Project will modernize Yukon Energy's Whitehorse Thermal Generating Station ("WTGS") ...*" and "*The Project scope will involve replacing two diesel generating units scheduled for retirement in the existing WTGS by 2015 (9.1 MW total nameplate capacity) and the installation of LNG truck offloading, storage, vapourization and related infrastructure in the Expanded Site Area.*": (a) Please confirm that installing new diesel generators would also modernize the WTGS. (b) Are the "Project" and the "*Project scope*" as described on page 4 the same?
YCS/LE-YEC-1-2	Page 1 "*...replacing two diesel generating units scheduled for retirement ... (9.1 MW nameplate Capacity)...*": (a) Please confirm that the 2011 Resource Plan rating for these two generators is 8.0 MW. (b) Please explain and justify the reduction in ratings from the 2006 to 2011 Resource Plans for the EMD generators in Whitehorse as well as the Caterpillar generators in Whitehorse, Faro, Dawson City, and Mayo (total reductions 2.09 MW). (c) Are the differences in (b) due to differences between the manufacturer's maximum continuous ratings and a shorter term peaking rating? Do these generators also have higher manufacturer's ratings based on non-continuous usage (e.g. a stand-by rating or a 1 hour rating), and if so please specify and list all the manufacturer's ratings for each engine. Please justify why the higher non-continuous ratings should not be used for emergency back-up capacity calculations as opposed to base load operations.
YCS/LE-YEC-1-3	Page 1 "*...Yukon Energy continues to pursue potential near-term hydro enhancement projects, including Mayo Lake Enhanced Storage and Marsh Lake (Southern Lakes) Storage. For future consideration when higher long term grid loads can justify such developments, Yukon Energy is also pursuing wind development that could range up to 20 MW at Techo ... as well as potential future hydro generation at various potential greenfield sites*.": (a) Please provide the full details of the financial analysis that is used to compare renewable sources of energy and capacity with the Project including but not limited to the length of the evaluation period, the

	weighted average cost of capital, debt amortization periods, any unit energy calculations, any net present value analysis and treatment of fuel and carbon price risk including all details of the methodology used. (b) Please provide a detailed description of all the facilities that were included as part of the Project to do the comparative analysis? (c) Please provide Yukon Energy's long term natural gas, diesel/oil and carbon price forecasts. (d) Please confirm that 60-70% of the cost of generating electricity from the natural gas fired thermal units will be the cost of re-gasified natural gas. (e) Please confirm that both Mayo Lake and Marsh Lake enhanced storage would be subject to the same potential drought conditions for the purposes of producing energy as discussed in this application (e.g. on page 20). Would reliance on these projects not exacerbate diesel (or LNG) generation requirements during drought years (like 1996-2000) compared to other forms of generation not subject to the risk of drought? (f) Please provide a detailed update on Yukon Energy's actions since Yukon Energy's last GRA with respect to advancing a potential wind development project at Techo. (g) Please explain Yukon Energy's approach in selecting and advancing other potential new hydro sites with respect to mitigating the effect of the drought periods with respect to producing energy experienced in the present hydro facilities.

Section 3 Project Description

YCS/LE-YEC-1-4	Page 4 "*...TKC and KDFN were invited to become partners ... substantive progress toward developing economic and business opportunities for the two First Nations relative to the Project. This has also included discussion regarding a possible investment in the Project by TKC and KDFN through negotiation of a Partnership Agreement*.": (a) Please provide copies of the Partnership Agreements (and any other agreements with respect to this project) with the TKC and KDFN. (b) Please describe in detail the economic and business opportunities discussed. (c) Do the economic and business opportunities involve or contemplate any natural gas (vapourized LNG) or LNG for transportation or other purposes being supplied from the Project's LNG storage facilities to locations outside the Expanded Site Area? If so please detail any and all arrangements or the possible/potential arrangements. (d) Do the economic and business opportunities involve or contemplate any payment streams to Yukon Energy? If so please provide the details.

	(e) With respect to a possible investment in the Project please indicate whether TKC and KDFN would provide some debt, equity, or both toward the proposed Project cost of $38.8 million. (f) Please confirm that the return on equity and the interest rate on debt for TKC and KDFN would be as ordered by the YUB for Yukon Energy in the most recent GRA. If not please provide the debt and/or equity returns they will receive. (g) Please provide evidence that both First Nations support the Project.
YCS/LE-YEC-1-5	Page 5 (and elsewhere) Re modular gas generating units: (a) Please explain how and why Yukon Energy selected "modular" units in preference to other generator / building options including but not limited to such as gas generator units housed in a pre-engineered building. (b) Please explain why Yukon Energy did not select dual fuel (natural gas – diesel) generating units. (c) Please explain why Yukon Energy did not select generating units that could be fuelled by LNG in combination with diesel in order to avoid the cost of re-gasifying LNG. (d) Please provide the advantages and disadvantages of all the options considered and evaluated. (e) Please provide a copy of the Request for Proposal (RFP) or Request For Expression of Interest (RFEI), or the relevant documentation of the process, if other than one of these, that Yukon Energy used in the solicitation of potential candidates for a gas generator supplier. (f) Please list the suppliers that responded and explain how and why GE was selected.
YCS/LE-YEC-1-6	Page 5 Re footnote 5: *"... provision for three initial LNG storage tanks (499.5 m^3 for a total of 6 days storage) and the potential to add in future two additional smaller storage tanks (240 m^3) to retain 6 days storage with the third gas-fired module.*": (a) Would there always be 6 days of storage for the first two gas-fired modules? (b) For the third gas-fired module? (c) What is the estimated cost of building "*two additional smaller storage tanks…*"? Is this cost included in the $4.4 million amount for the installation of the third gas-fired module referenced on page 4? (d) Are these additional tanks required to provide 6 days of storage for the first two gas-fired modules? (e) For the third gas fired module? (f) Are there any other LNG storage facilities in the Yukon that Yukon

	Energy would have access to? How much would this access cost? (g) Six days of storage seems to be a short period of time in case of emergencies like road closures, how did Yukon Energy determine that this was an appropriate amount of storage? (h) By comparison how many days of diesel storage is available at Yukon Energy's Whitehorse, Faro, and Dawson City diesel plant sites and in other commercial storage facilities in and around Whitehorse? (i) Diesel fuel can be transported by air if need be, but can LNG be transported by air? (j) Please confirm that under no circumstances would LNG or natural gas from the proposed storage and vapourization facilities be used for any purpose other than electricity generation by Yukon Energy. If not, please explain.
YCS/LE-YEC-1-7	Page 6 "*... iii.* ***Blackstart power*** *capability for the natural gas-fired generating units ...*" and Footnote 6: (a) The wording of these sections implies that a blackstart generator unit will not actually be located at the LNG facility, is this correct? If there is no blackstart generator to be located there, please explain why not. (b) Please explain why blackstart capability is required. (c) How long will it take to start the proposed LNG generators from a cold start with a blackstart generator? (d) If a blackstart generator is not located at the Project how long will it take to bring one there, connect it, and start it? (e) Please explain why LNG is an appropriate emergency back-up source of power if it is dependent on an external heat source to get it started. Please expand on Yukon Energy's definition of flexibility and reliability is in this context.
YCS/LE-YEC-1-8	Page 6 Item 4. c. "*...future conversion of existing engines to fuel blend (diesel and natural gas), and / or future installation of new gas or dual fuel engines at the existing WTGS...*": (a) Has the vapourizing equipment specified in the proposed Project been sized to satisfy the needs of the entire existing WTGS converted to natural gas generation including dual fuel conversions and including potential new gas engines in the space of the two Mirrlees units to be decommissioned? (b) If the proposed Project, including the third generating unit and two smaller storage tanks, is undertaken would Yukon Energy expect to use the LNG storage and vapourization for the proposed Project only, or would additional LNG storage and / or vapourization capacity be required for any future dual fuel conversions of other diesel generators in the existing diesel plant or natural gas-fired generator additions to the

	existing diesel plant? (c) If additional vapourization and storage is not, in Yukon Energy's estimation, required, please provide the number of days of operation of the existing WTGS converted to dual fuel plus the gas generators proposed in this project that could be sustained from the LNG storage in the proposed project. (d) If additional LNG storage and vapourization facilities are required, please provide the capital cost estimates for these facilities and explain where they will be physically located.
YCS/LE-YEC-1-9	Page 7 "*Yukon Energy is undertaking all required planning ... to obtain authorizations and approvals necessary to allow construction of the Project to commence in early May 2014 to meet the in-service target of late 2014 ...*", and page 11: (a) What is the capital cost premium that will be paid for such an accelerated construction period? Please provide an itemized list. (b) Please detail Yukon Energy's contingency plan in the event that approvals and permits are not in place to enable construction to commence in time to complete the Project for the winter of 2014-2015? (c) Please confirm that if Yukon Energy had placed an order for Caterpillar 3616 diesel generators at the time the LNG generators were ordered in Q2 2013 (at the time the LNG generators were actually ordered) the new diesel generators could have been operational for the 2014-2015 winter. (d) What is the date of the order for the GE J624 gas generators? (e) What permitting would have been required for such a like-for-like diesel replacement project? Could a YESAB application and a YUB Part 3 proceeding have been avoided? If not please explain why not?
YCS/LE-YEC-1-10	Page 7 and footnote 7 regarding the proposed new double trailer A-Train trucks: (a) Are the proposed trucks (either the A-Train or the alternative) powered by LNG engines? If not please explain what is being done with the boil-off gas during the time of the transport. (b) Please provide an update of the progress with respect to licensing these new trucks in BC and Alberta, and with their fabrication. (c) Is Yukon Energy now the only party that is actively involved in this truck development project? If not, please indicate who the other parties are and discuss whether their participation is slowing the progress of the licensing or the fabrication of these new trucks. (d) If necessary can Yukon Energy do this LNG truck project on its own and if so what are the cost and/or other implications? (e) Please provide Yukon Energy's statutory authority for this type of activity.

YCS/LE-YEC-1-11	Page 8 Table 3-1: (a) Please provide a Table similar to Table 3-1 but adding to it the following columns: (1) a column for actual in-house expenditures to January 31, 2014; (2) a column for actual third party expenditures to January 31, 2014; (3) a column for actual and projected in-house expenditures to April 15, 2014; and (4) a column for actual and projected third party expenditures to April 15, 2014. (b) What are the input and output voltages of the substation module and what is its capacity? (c) Please provide a breakdown of the $2.5 million grid connection costs into (1) the substation module; (2) the power line to the S150 substation; and (3) modifications within substation S150. (d) (Also reference pages 11, 12, and 13.) Please provide a detailed list of the firm commitments (e.g. contracts) Yukon Energy has made to date for various goods and services for the LNG project. Please include in this list any additional firm commitments Yukon Energy will have entered into between the response date to the above and April 15, 2014. (e) Please provide a list of non-recoverable in-house expenditures and third party penalties/costs that Yukon Energy would be subject to should the LNG project be cancelled with the exception of the acquisition of the property for the proposed LNG Project. (f) Please provide Yukon Energy's cost estimates (in house and third party listed separately) for each of the YESAB assessment process and for the YUB Part 3 proceeding. (g) Please list the costs that would be involved in the acquisition of the property where the proposed LNG project would be sited.
YCS/LE-YEC-1-12	Page 8 "*...Yukon Energy does not at this time have firm pricing for the third GE natural gas-fired generating unit – the $4.4 million estimate continues to be the best available information at this time*." (a) Is the $4.4 million estimate for the third GE J 624 natural gas-fired unit the installed cost including all planning, engineering, project management, owner's costs etc.? (b) Does the $4.4 million include the purchase and installation of the additional LNG storage tanks referred to in Footnote 5 on page 5 of the Application? If not what is the estimated installed costs (all costs inclusive of owner's costs) for these additional storage tanks?
YCS/LE-YEC-1-13	Page 9 "*... As the thermal generation units at Whitehorse are expected to be relied upon on an increasing basis on the integrated grid, deferring replacement of these units would expose all grid customers to unreliable generation capacity ...*": (a) Is it Yukon Energy's assertion that all existing diesel generation

	capacity in Whitehorse is unreliable? Why or why not? (b) Are the Mirrlees units #1 and #2 required for any condition other than the N-1 (emergency) planning criteria? (c) What is the magnitude of this risk – in the last 20 years how many hours has the Aishihik power plant and or transmission line been completely unavailable on an unplanned basis? (d) What is Yukon Energy's view of the reliability of the diesel generation capacity in the Faro and Dawson City diesel plants? (e) Are the Mirrlees units #1 and #2 that are proposed to be retired listed as first and second in the stacking order for diesel generation units to be run when diesel capacity is needed on the grid? If not where are they in the stacking order? (f) Does Yukon Energy's reference to being 'relied upon on an increasing basis' indicate that Yukon Energy believes that diesel generation will in effect become a base load or base load like in the near future? If so please indicate when (in what year or at what level of annual energy), in Yukon Energy's view, peaking load becomes more base load-like.
YCS/LE-YEC-1-14	Page 9 and Figure 3-1on page 10: (a) Please provide the Excel spreadsheets (with the formulae intact) that yield the projected capital and O&M savings. (b) Please provide a comparative analysis for a diesel project alternative having the same fuel efficiency as the proposed diesel alternative but costing $5 million less, i.e. $28.6 million. (c) Please provide a comparative analysis for a diesel project alternative having the same fuel efficiency but costing $10 million less, i.e. $23.6 million. (d) Please list the LNG costs on a per unit volume basis (m^3 or MMBtu) and on a per kWh basis in each of the years 2015 through 2020, based on long term average water and base case load forecast, including: i. Natural gas purchase; ii. Natural gas liquefaction; iii. Transport (including premiums for spring load restrictions and for the smaller volumes required as discussed on page 38 of the Application); and (e) Please confirm that all the projected savings as set out on page 9 are based on average water conditions. (f) Please provide details of the O&M costs (operations, maintenance (including labour in each), property insurance, and any other fixed costs).

	(g) Does Yukon Energy have long term fixed price contracts for all of natural gas purchase, natural gas liquefaction, and LNG transport? If so please provide copies of these contracts and if not please explain why not and the risks associated with the lack of contracts.
YCS/LE-YEC-1-15	Page 9 and footnote 9: (a) Please provide the manufacturers' information (e.g. operating hours between overhauls, and number of overhauls to recommended retirement) and other information as well as Yukon Energy's calculations that justifies a 40 year depreciation for each of: i. The LNG storage facility; ii. The LNG vapourization facility; and iii. The GE natural-gas fired generators. (b) What variable O&M costs in $ per kWh are assumed / projected for each of the new diesel facility and the LNG Project (including storage, vapourization, and engines)? (c) Given that LNG would be a new venture for Yukon Energy please indicate the sources for the LNG O&M cost projections.
YCS/LE-YEC-1-16	Page 10 to page 13 Re LNG truck transport: (a) Please provide a copy of the RFP or RFEI (or other process if not one of these) by which Yukon Energy selected PROLOG to pursue LNG trucking options, and please provide their terms of reference. (b) Please list the firms that responded and explain why PROLOG was selected. (c) (Page 13) Please provide a copy of the RFP that Yukon Energy has issued for the design and fabrication of A-Train LNG hauling trucks. (d) Please list the firms responding and which Yukon Energy has selected and explain why. (e) Please provide copies of the RFP, RFEI, or documentation from another process if not one of these, from which Yukon Energy has selected Tridem to be an alternate trucking firm. (f) Please list the firms responding and explain how Tridem was selected.
YCS/LE-YEC-1-17	Page 10: (a) What is Yukon Energy's contingency plan in case the Jumping Pound LNG production facility cannot deliver LNG in the winter of 2014-2015?
YCS/LE-YEC-1-18	Page 11 "*With development of more efficient operations with larger and more stable loads, the estimated A-Train delivery cost from Calgary is estimated to fall to 3.7 cents/kWh ...*"

	(a) Please describe in detail what the "more efficient operations" are that are referenced here. (b) Please describe what is meant by "larger and more stable loads" and relate this to the LNG demand projected in the base case load requirements.
YCS/LE-YEC-1-19	Page 11 Re LNG storage tanks: (a) Please provide copies of the RFP, RFEI, or tender documents, and copies of the relevant specifications that Yukon Energy used to solicit a supplier for LNG storage tanks. (b) Please list the firms responding and which was selected and explain why.
YCS/LE-YEC-1-20	Page 11 Re Transformer: (a) Please provide a copy of the RFP, or RFEI, or tender documents, and copies of the relevant specifications used to solicit supplier options. (b) Please list the suppliers that responded and indicate who the successful supplier is and why they were selected.
YCS/LE-YEC-1-21	Page 12: (a) Please provide the flowchart for an Executive Committee Screening for a YESAB review. (b) Please provide updates on Yukon Energy's schedule expectations of the YESAB and YUB processes. (c) What evidence of social license can Yukon Energy provide with respect to this Project?
YCS/LE-YEC-1-22	Page 13 Re LNG vapourization equipment: (a) Please provide a copy of the RFP, or RFEI, or tender documents, and copies of the relevant specifications used to solicit supplier options. (b) Please list the suppliers that responded and indicate who the successful supplier is and why they were selected.
YCS/LE-YEC-1-23	Page 14 "*In summary, the Project, including mitigation measures set out in the project proposal, is not expected to cause any likely significant adverse effect ... This conclusion reflects careful consideration of the Project design as well as the consideration of mitigation measures that reduce or eliminate potential adverse effects* (a) Please confirm that this is still Yukon Energy's view. (b) Please confirm that YESAB received submissions that provided perspectives that differ from Yukon Energy's view.
YCS/LE-	Page 14 "*... the project is expected to provide for reduced greenhouse and*

YEC-1-24	*particulate emissions in the project study area ...*" (a) Please describe the "project study area" and please confirm that this perspective does not take into account the greenhouse gas (GHG) emissions outside the project study area. (b) Please confirm that there are submissions to YESAB that provide documented alternative perspectives that indicate that the GHG emissions within the project study area would be higher from burning natural gas than from diesel when methane's global warming potential is considered over a 20 year timeframe. (c) Please confirm that there are submissions to YESAB that provide documented alternative perspectives that indicate that the cradle to grave GHG emissions (i.e., lifecycle emissions from upstream activities including natural gas extraction, processing, liquefaction and transportation) from burning natural gas are worse than diesel's lifecycle GHG emissions, when methane's global warming potential is considered over a 20 year timeframe. (d) According to media reports (see attached article from the New York Times) methane leaks may negate earlier claims that burning natural gas may produce less greenhouse gas emissions than burning diesel. Please comment on these reports. (e) Is it Yukon Energy's understanding that the Yukon Government *Climate Change Action Plan* intends, in effect, to "export" emissions to other jurisdictions? If not, why does Yukon Energy's GHG emissions totals not include out of territory impacts? (f) Has Yukon Energy received any formal or informal instruction or direction from the Yukon government or from Yukon Development Corporation with respect to valuing renewable energy relative to fossil fuel generation? If so please explain this direction, and if in writing provide copies of the written instruction or direction.

Section 4 Project Justification

YCS/LE-YEC-1-25	Page 17 "*...In 2012, 99% of the generation on the Yukon's Integrated Grid was from renewable sources such as hydro and wind*."; also Page 18 and Footnote 19: (a) What was the actual load in 2012 in GWh and please state what portion of this load would have been provided from long term average hydro power generation, and please state the actual hydro energy provided? (b) Please confirm that electrical rates in 2012 were based on long term average hydro generation as per YUB order. (c) Please confirm that the diesel contingency fund (DCF) has been or will be credited with the cost savings related to the higher than long term average hydro energy that served the actual load.

	(d) Please provide the annual energy produced by each of the Whitehorse Rapids hydro plant, the Aishihik hydro plant, and the Mayo hydro plant for each of the past 5 years (2009-2013). (e) How much energy did the Vestas wind turbine generate in each of the past 5 years and what capacity factors do these represent? (f) Please provide the annual energy produced by diesel generation and the actual cost for this generation in each of the past 5 years.
YCS/LE-YEC-1-26	Page 17 "*...Yukon's isolated grid has no access to external North American power grids to secure extra power when it is needed, or to sell surplus renewable generation when it occurs*" and *"...the Project will... and stimulate oil product-natural gas conversions in other sectors.":* (a) Please confirm that Yukon Energy has secondary sales customers within Yukon to which surplus renewable energy could be sold. (b) Does Yukon Energy have any programs either within or outside the proposed DSM plan to sell secondary energy when available? If so on what time scales (hourly, daily, weekly, etc.)? (c) In Yukon Energy's 2011 20-Year Resource Plan update did Yukon Energy consider the potential for secondary sales when assessing non-hydro renewable resource options such as wind? If not why not? (d) Please describe from where and when YEC received direction to "stimulate oil product-natural gas conversions in other sectors"? (e) What is YEC's plan to stimulate oil product-renewable energy conversions in other sectors?
YCS/LE-YEC-1-27	Page 18 "*... For future consideration when long term loads can justify such developments, Yukon Energy is also pursuing a wind development that could range up to 20 MW at Techo ...*". In Yukon Energy's 2011 20-Year Resource Plan update wind energy projects of both 10.5 and 21 MW were examined.: (a) For each of the 4 load scenarios presented in Appendix C/Attachment C Table C-2, please recalculate the levelized cost of energy (LCOE) from each of these two wind project sizes assuming that such projects could commence operation in the fall of 2017 and using long term average water availability. Please provide, by year, the fossil fuel generation displaced and the "surplus" wind energy (would result in "spilled" hydro energy if not curtailed). (b) Please repeat (a) above substituting the driest 5 year period on record (1996 to 2000) for the years 2025 to 2029 in the analyses. (c) How would the LOCEs in (a) and (b) above change if one-half of the "surplus" wind energy could be sold at the present secondary sales rate? (d) At what load level and fossil fuel generation requirement in each of the four load forecast scenarios presented in Appendix C/Attachment C would Yukon Energy consider that it is worth adding new renewable generation?

	Please provide examples and LCOE pricing targets that Yukon Energy would use.
YCS/LE-YEC-1-28	Page 19 "*...thermal generation will continue to provide reliable energy supply on the Yukon grid until new renewable energy options are brought on line and used to displace energy that would otherwise need to be generated from fossil fuels*." and "*... As the requirement for default diesel generation increases, Yukon Energy will continue to assess the economics of developing additional renewable energy supply options*...": (a) Please confirm that the variable cost of LNG generation would be in the order of $0.165 per kWh ($0.135 for fuel plus $0.03 variable O&M) and that the variable cost of generation form new diesel units would be in the order of $0.276 per kWh ($0.246 for fuel and $0.03 variable O&M). If not confirmed please provide the applicable variable costs. (b) If the LNG generation project is installed as proposed and the energy cost is as projected by Yukon Energy, would new renewable energy options be developed when economic compared to the variable LNG generation cost or when compared to the variable diesel generation cost? Please explain fully.
YCS/LE-YEC-1-29	Page 20 "*The Overview of Yukon Energy's 2011 20-Year Resource Plan: 2011-2030 reviewed the variability in actual hydro and diesel generation on the grid between years, and within each year, due to variability in water availability, and how this highlights the need for reliable and flexible thermal generation to accommodate this variability*." (a) Please describe what Yukon Energy is doing to reduce this vulnerability to variations in water availability. (b) Is Yukon Energy seeking non-hydro renewable resources to diversify its portfolio of supply projects? If so what are they and when are they projected to come on-stream? (c) Is Yukon Energy seeking out potential new hydro projects with particular characteristics or attributes? If so what are the particular attributes that Yukon Energy is seeking and what potential projects have these attributes?
YCS/LE-YEC-1-30	Page 20 "*In 16% of the 31 water years (i.e., five years, reflecting for this load scenario the worst drought conditions in five consecutive years from 1996 -2000), diesel generation at the Base Case 2016 forecast load is estimated to range from 52.8 GWh to 101.4 GWh (i.e., 2 to more than 4 times the long term average at this load level)*.": (a) For each of these five driest years please list the actual monthly and annual inflows of each of Whitehorse Rapids, Aishihik, and Mayo hydro plants as well as the monthly and annual long term averages for each of the three hydro plants. (b) For each of the three hydro plants please provide a table showing the net

	annual water volume and stored energy drawdown in each of these 5 years. If there is no net drawdown of stored water and energy (from Aishihik and Mayo Lakes in particular) incorporated into the diesel generation numbers quoted please explain why. (c) What is the maximum useable water and energy storage in Aishihik Lake permitted in the present water use license?
YCS/LE-YEC-1-31	Page 21 "*... The long-term average forecast, for example, shows very low expected or long-term average diesel generation during about five months of the year (late May to late October) under each of the load scenarios. ...*": (a) This statement implies that there periods of surplus of hydro capacity and energy during the specified period of time. Please indicate Yukon Energy's plans with respect to secondary sales during the period late May to late October to obtain the maximum possible revenue for the benefit of all ratepayers? (b) Please verify that secondary sales, by requirement, displace fossil fuel use and therefore secondary sales would result in reduced GHG emissions within Yukon.
YCS/LE-YEC-1-32	Page 21 "*... A related implication is that the expected life of the thermal generation facilities on the grid will tend to be materially longer than would be expected with higher levels of annual use*.": (a) For each of the four load forecasts provided in Appendix C/Attachment C, please provide a list by year for the 40 year period starting in 2015, of annual operating hours expected from the natural gas-fired generators proposed in the applied for project.
YCS/LE-YEC-1-33	Page 22 and Table 4-2: (a) Please confirm that the forecast new peaking requirements assumes no new YECL grid-connected diesel generating capacity such as the 2 MW diesel generator YECL wishes to install in Carcross.
YCS/LE-YEC-1-34	Page 23 "*... These new generation capacity requirements on the isolated Yukon grid are forecast after full consideration of DSM initiatives by YEC and YECL to reduce ongoing load growth*." (a) Are the DSM initiatives being referred to here the DSM plan filed in conjunction with YECL's recent 2013-2015 RGA? (b) Please list the specific peak shaving and load shifting initiatives contained in this DSM plan. (c) Has Yukon Energy developed an enhanced DSM plan to focus on peak demand reduction through peak shaving and load shifting as a partial alternative to the project? If so please provide the details of this option, if not please explain why not.
YCS/LE-YEC-1-35	Page 23 Section 4.2.2 "*No feasible renewable resource alternatives to the Project*

	have been identified within the relevant time frame.": (a) Please provide a table of "base case" load forecasts used in this Application and "base case" forecasts used in the "*Overview*" (Table A-1 on page A-3), referenced in Footnote 27 on page 23, for each year for a 40 year period starting in 2015. (b) Please explain the differences between these two "base case" forecasts.
YCS/LE-YEC-1-36	Page 24 "*At forecast grid loads in Yukon Energy's 2011 Resource Plan, none of the non-hydro renewable resource options (e.g. wind and biomass were both examined) could provide levelized costs of energy over their life competitive with diesel generation*.": (a) Please justify why Yukon Energy's conclusions reached with respect to renewable resource energy supply options analyzed with the significantly lower *Overview* base case load forecasts starting in 2020 are still applicable to the current application which forecasts significantly higher base case loads from 2020 and continuing indefinitely into the future.
YCS/LE-YEC-1-37	Page 26 New diesel generator options: (a) Please provide copies of the RFPs, RFEIs, or documentation from an alternate process that Yukon Energy used if not one of these, and all relevant specifications that Yukon Energy used to solicit potential suppliers for: i. Non-modular conventional diesel-only generators; ii. Modular conventional diesel-only generators; iii. Non-modular dual fuel (diesel-gas) generators; and iv. Modular dual fuel generators. (b) For each of the above please provide a list of all the suppliers that responded, which was selected in each category, and explain why they were selected.
YCS/LE-YEC-1-38	Page 26 New higher efficiency diesel engine replacement: (a) Please explain why dual fuel engines rather than ordinary diesel engines would be specified for Mirrlees replacements? What is the estimated cost of the 6.7 megawatt Wartsila duel fuel engines? Are the (b) What cost saving could be achieved for selecting similar capacity diesel only engines? (c) What cost saving could be achieved by selecting diesel only engines approximately the same size as the Mirrlees engines for replacements, e.g. Caterpillar 3616s? (d) Has Yukon Energy developed cost estimates for a diesel replacement alternative consisting of three Caterpillar 3616s with two replacing the Mirrlees units (instead of the much larger Wartsilas that require very

	significant balance of plant costs) and a third unit to be located in a pre-engineered building that can be expanded in future as needed on the proposed LNG project site, or at the Mayo road substation, or at the Faro diesel plant? If so please provide the capital cost breakdowns in tables similar to Table 3-1. If not please explain why these options have not been examined. (e) Has Yukon Energy developed cost estimates for a diesel replacement alternative consisting of two Caterpillar 3616s replacing the Mirrlees units and using 2 or 3 modular Caterpillar units similar to the one proposed to be installed in Carcross by YECL) on the proposed LNG project site, or at the Mayo road substation, or at the Faro diesel plant? If so please provide the capital cost breakdown in a table similar to Table 3-1. If not please explain why this option has not been examined. (f) Has Yukon Energy developed cost estimates for a diesel replacement alternative as per (e) above and installing an appropriately sized renewable energy project such as wind to reduce the diesel consumption, particularly in winter? If so please provide the capital cost breakdown in a table similar to Table 3-1. If not please explain why this option has not been examined. (g) Has Yukon Energy developed cost estimates for a diesel replacement alternative consisting of two Caterpillar 3616s replacing the Mirrlees units and implementing a more aggressive DSM plan focused on peak shaving and demand reduction to defer or eliminate the need for a third diesel generator (or LNG generator)? If so please provide the capital cost breakdown in a table similar to Table 3-1. If not please explain why this option has not been examined. (h) What is the estimated cost of the 6.7 MW duel fuel Wartsila engine-generator units? (i) Are there any material differences in the efficiencies of the duel fuel 6.7 MW Wartsila units and the natural gas only or diesel only fired engine-generator units? (j) Has Yukon Energy considered a diesel replacement alternative consisting of purchasing dual fuel (natural gas – diesel) units and deferring natural gas substitution until there is greater certainty with respect to natural gas pricing in an LNG exporting environment? If not please explain why this option has not been examined.
YCS/LE-YEC-1-39	Page 27 "*Opportunities to reduce diesel generations emissions would be deferred ...*": (a) Is it not true that new diesel generators are both more fuel efficient and produce lower emissions than the existing diesel fleet? If true, please explain what Yukon Energy means by the referenced statement.
YCS/LE-	Page 27 Footnote 41:

YEC-1-40	(a) Please provide all the detailed cost and other analyses used in Yukon Energy's assessments that arrived at the conclusion that the Mayo Road substation would not be cost effective or practical alternative project location.
YCS/LE-YEC-1-41	Page 29 "*... The annual fuel costs estimates in Table 4-3 also assume operation of these new units to enhance hydro storage for use in wintertime...*" and page 30 "*Operation of the new gas-fired generation capacity can be used, however, to assist in storing water at Aishihik and (to a much lesser extent) at Mayo during the summer ... thereby allowing added hydro generation capability to be utilized in peak winter months ...*": (a) For each of the months of June, July, August, and September please provide, in table format, the following actual 2013 data (with Alexco) and the projected 2014 data (without Alexco and with Fish Lake #1), and the projected 2016 data (base case): i. The available Whitehorse Rapids and Mayo hydro capacities, in MW, that must either be used or spilled; ii. The monthly average load in MW; iii. The average daytime peak load in MW; and iv. The average minimum night time load in MW. (b) If gas fired generators can usefully generate power in the summer that results directly in water storage in Aishihik Lake (or Mayo Lake) for winter usage, would other forms of renewable energy generation available in summer (e.g. solar PV or wind) not also result in stored water that can be used in winter?
YCS/LE-YEC-1-42	Page 32 Table 4-3: (a) Please provide the Excel spreadsheets, with the formulae intact, from which the figures in Table 4-3 are derived. (b) To more fully understand the fuel price risk please provide new versions of Table 4-3 which incorporate the following assumptions: i. The diesel alternative capital cost $5 million lower, i.e. $28.6 million; ii. The diesel alternative capital cost $10 million lower, i.e. $23.6 million; iii. The natural gas purchase costs for each of $5.50, $6.50, $7.50, and $8.50 per MMBtu; iv. Separately number (i) and (ii) above repeated with each of the prices in (iii).
YCS/LE-YEC-1-43	Page 35 Table 4-5: (a) To more fully understand the fuel price risk please provide and expanded

	Table 4-5 to include gas purchase costs of $5.50, $6.50, $7.50, and $8.50 per MMBtu.
YCS/LE-YEC-1-44	Page 36 Table 4-6: (a) Please provide an expanded Table 4-6 with diesel capital cost options that are $5 million and $ 10 million lower that provided for, and with gas prices that range up to $8.50 per MMBtu (in $1.00 per MMBtu increments).
YCS/LE-YEC-1-45	Page 37 LNG fuel price risk: (a) Please provide the annual average AECO natural gas prices for each of the last 20 years. (b) Please provide the monthly average AECO Natural gas prices for the last 10 years. (c) Please provide Australia's annual average natural gas price for the last 20 years (convert to Canadian dollars). (d) Please provide Australia's monthly average natural gas prices for the last 10 years (convert to Canadian dollars). (e) Does Yukon Energy believe that Canadian natural gas prices will increase as natural gas liquefaction plants and exports are developed as they have done in Australia? If not please provide Yukon Energy's reasoning as to why not.
YCS/LE-YEC-1-46	Page 37-38 LNG Fuel Costs Savings Sensitivity: (a) Please provide the volumes of annual LNG consumptions required to overcome the 18% and 10% premiums in the early years for the A-Trains and Tridem trucks respectively. (b) At what level of grid load would this premium disappear? In what year does Yukon Energy forecast this grid load will occur? (c) Is this premium not a disincentive for Yukon Energy to displace LNG generation with renewable energy? (d) Is this premium stipulated in contracts or proposed contracts for trucking? If so please provide copies of these contracts.
YCS/LE – YEC – 1-47	Page 41 Figure 4-2 and "*These forecasts*": (a) For the purposes of Figure 4-2 what assumptions did the U.S. Energy Information Administration ("EIA") make about the rate of substitution of natural gas fired generation for coal fired generation in the U.S.? (b) For the purposes of Figure 4-2 what assumptions did the EIA make about the rate of substitution of natural gas as a transportation fuel for oil as a transportation fuel in the U.S.? (c) For the purposes of Figure 4-2, what level of LNG exports from the U.S.

	did the EIA assume? (d) Are the U.S. and Canada an integrated natural gas market? (e) For the purposes of Figure 4-2, what level of LNG exports from Canada did the EIA assume? (f) For the purposes of Figure 4-2, what level of decline rates in shale well production did the EIA assume? (g) For the purposes of Figure 4-2, what level of investment in shale well production in the U.S. did the EIA assume? (h) For the purposes of Figure 4-2, what level of return on investment in shale well production did the EIA assume? (i) Is it true that major natural gas producers in the U.S. such as Devon Energy, EOG Resources, Chesapeake Energy and Encana are diverting there financial resources away from drilling dry shale gas to wet shale gas and oil production? (j) If financial resources are diverted away from drilling dry shale gas will there be a tightening of the overall natural gas supply in North America. (k) Given that Yukon Energy has identified natural gas as a substitute for oil meaning diesel, would Yukon Energy expect others to do the same thing? (l) What impact does Yukon Energy think this winter's run up in Henry Hub natural gas prices to a peak of about to $5.60 per MMBtu have on medium to long term natural gas prices in North America? (m) What is meant by "*These forecasts*"? Please provide "*These forecasts*".
YCS/LE-YEC-1-48	Page 42 "*LNG development will reduce ratepayer exposure to severe and periodic drought related cost risk. ...*": (a) Please confirm that any reduction in cost risk is dependent on the LNG power generation cost being lower than diesel generation cost. (b) Please confirm that new renewable energy generation in which there is no fuel cost (e.g. hydro, wind, solar PV) would reduce ratepayer energy related cost risks compared to LNG generation.
YCS/LE-YEC-1-49	Page 42 "*The project's LNG development cost savings could be enhanced ... or district energy heat sales are realized from LNG*.": (a) Please detail Yukon Energy's plans with respect to LNG based district heating. (b) Does Yukon Energy have the statutory authority to pursue any line of business other than the generation, transmission and distribution of electricity? If so please provide the relevant documentation. (c) If Yukon Energy does not have LNG based district heating plans please provide a detailed explanation as to why district heating should be

	referenced in this Application. (d) Please provide and discuss details of the possible lower cost gas prices that are referenced here.

Section 5 Consultation

YCS/LE-YEC-1-50	Page 43 "*LNG was identified in Yukon Energy's 2011 20-year Resource Plan as a potential source to displace near-term grid diesel requirements. It has been examined as a new fuel option that retains flexibility for power generation as well as diversity for energy use opportunities*.": (a) Please detail the energy use opportunities referred to and any role that Yukon Energy's might have in them. (b) The impression the readers get from this passage is that LNG will displace renewable energy generation that might otherwise be developed. Please discuss whether Yukon Energy's expectation is that LNG will displace more than the diesel generation that would be required (i.e. new renewable energy projects) in the absence of LNG generation.
YCS/LE-YEC-1-51	Page 44 "*November 20, 2013: The public review period was extended to December 20th to accommodate additional proposal information Yukon Energy submitted to YESAB on November 13, 2013*.": (a) Please confirm that what Yukon Energy is referring to here is submission to YESAB of a redesigned project to reflect the fact that Yukon Energy could not reach an Agreement with White Pass with respect to a lease (or purchase) of their property which Yukon Energy had assumed would be available to them. (b) Please confirm that YESAB, on receiving the redesigned project proposal, had do perform another adequacy review to ensure that their assessment could be done.

Appendix C/Attachment C Updated Near-Term Grid Load Scenarios

YCS/LE-YEC-1-52	Page C-1: (a) Please provide a table of actual year over year non-industrial load growth from the time Yukon Energy assumed operations from NCPC in 1987. Please indicate where communities were added to the grid or other significant step changes in the number of customers occurred. (b) Please provide a table similar to Table C-2 projected out to 2054 (the full 40 year projected life of the Project) that provides Yukon Energy's projected peak demand forecasts and required installed capacity requirements to meet the N-1 planning criteria.

	(c) In Yukon Energy's history has there ever been a five period in which load growth averaged 2.45% as proposed for 2016 to 2020? (d) In Yukon Energy's history has there ever been a five period in which load growth averaged 2.82% as proposed for 2021 to 2025? (e) In Yukon Energy's history has there ever been a five year or greater period in which load growth averaged 3.13% such as proposed for 2026 and beyond? (f) Please provide the annual year over year load growth percentages net of DSM/SSE. (g) What is Yukon Energy's projection of winter load growth (reflecting changing patterns in electric heating) compared to summer load growth? (h) How has the higher increase in winter load growth affected Yukon Energy's calculations of diesel requirements in Table C-2? (i) How does Yukon Energy propose to deal with any disparity between winter and summer growth? (j) Please confirm that the base year for Marbek Conservation Review Potential study work referenced in Footnote 2 was 2010. (k) Is Marbek's particular expertise in load forecasting, and have they performed updated load forecasts based on more recent actual growth experience? (l) Given the rate increases customers have experienced over the last two years, the slowing mining economy, and significantly reduced home lot sales in the Whitehorse area, please provide detailed justification for Yukon Energy's projected non-industrial load growth.
YCS/LE-YEC-1-53	Page C-1 Sensitivity of project economics to load growth: (a) Please provide additional versions of Table 4-3 based on the following load growth scenarios: i. Non-industrial net (after DSM and SSE savings) load growth of 2.0% from 2016 forward; ii. Non-industrial net load growth of 1.5% from 2016 forward; and iii. Non-industrial net load growth of 1.0% from 2016 forward.
YCS/LE-YEC-1-54	Page C-5 Table C-2: (a) Please extend the Base Case of Table C-2 to 2054, i.e. the full 40 year projected life of the proposed Project.
YCS/LE-YEC-1-55	Page C-7 Future diesel retirements: (a) When Whitehorse diesels #4 through #7 are retired in due course will

	building space allow them to be replaced with larger capacity generators (e.g. Caterpillar 4.4 MW 3616s)?

Other / General

YCS/LE-YEC-1-56	(a) Please provide the final budget, report and results of Yukon Energy's 2011 Energy Charrette. (b) Please provide the final budgets, reports and results of the subsequent "mini-Charrettes" on biomass, waste-to-energy, DSM, LNG, and wind.
YCS/LE-YEC-1-57	(a) Please provide all the Yukon Energy Board of Directors resolutions with dates and associated materials pertaining to the LNG project.
YCS/LE-YEC-1-58	(a) Please provide the date and agenda for the Electrical Thermal Storage and Load Management workshop that Yukon Energy is co-sponsoring.
YCS/LE-YEC-1-59	(a) Please provide the analyses and supporting materials from Yukon Energy's 2011 Resource Plan that led to the conclusion that the levelized cost of wind energy would be $0.40 per kWh. (b) Please provide the data obtained from the meteorological wind assessment tower installed at the Techo site since its installation. (c) Please provide the unredacted Wind Assessment Feasibility Study Final Report dated January 2009 about wind potential on Mt Sumanik.
YCS/LE-YEC-1-60	(a) What activities is Yukon Energy undertaking to electrify Yukon's economy with renewable electricity? (b) Does Yukon Energy have a mandate with respect to 'sustainable development' and if so please describe Yukon Energy's understanding of the meaning of the term.

Study Finds Methane Leaks Negate Benefits of Natural Gas as a Fuel for Vehicles

By CORAL DAVENPORTFEB. 13, 2014

Inside

Launch media viewer
A natural gas installation in Colorado. Drilling and production can cause leaks of methane, a greenhouse gas 30 times more potent than carbon dioxide. Kevin Moloney for The New York Times

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WASHINGTON — The sign is ubiquitous on city buses around the country: “This bus runs on clean burning natural gas.”

But a surprising new report, to be published Friday in the journal Science, concludes that switching buses and trucks from traditional diesel fuel to natural gas could actually harm the planet’s climate.

Although burning natural gas as a transportation fuel produces 30 percent less planet-warming carbon dioxide emissions than burning diesel, the drilling and production of natural gas can lead to leaks of methane, a greenhouse gas 30 times more potent than carbon dioxide.

Those methane leaks negate the climate change benefits of using natural gas as a transportation fuel, according to the study, which was conducted by scientists at Stanford University, the

Massachusetts Institute of Technology and the Department of Energy's National Renewable Energy Laboratory.

The study concludes that there is already about 50 percent more methane in the atmosphere than previously estimated by the Environmental Protection Agency, a signal that more methane is leaking from the natural gas production chain than previously thought.

"Switching from diesel to natural gas, that's not a good policy from a climate perspective," said the study's lead author, Adam R. Brandt, an assistant professor in the department of energy resources at Stanford.

But the study does conclude that switching from coal-fired power plants — the nation's largest source of carbon pollution — to natural gas-fired power plants will still lower planet-warming emissions over all. Natural gas emits just half the carbon pollution of coal, and even factoring in the increased pollution from methane leaks, natural gas-fired plants lead to less emissions than coal over 100 years, the study found.

The report adds weight to efforts by New York and other Northeastern states to push the federal government to regulate methane emissions. Currently, there are no federal regulations on methane emissions from oil and gas production, although some states are considering such rules.

The finding on trucks and buses is a blow to years of public policy efforts to switch the vehicles from diesel to natural gas, an effort aimed at decreasing pollution as well as America's dependence on foreign oil.

President Obama praised natural gas production in his last two State of the Union addresses, and has noted that natural gas production creates jobs while natural gas-powered electricity is more climate friendly than coal. But environmentalists say that natural gas production comes with the hidden climate risk of methane leaks from drilling wellheads, valves and pipelines.

The report's authors conclude that the leaks can be reined in if oil and gas companies invest in technology to prevent methane from escaping into the atmosphere from gas wells and production facilities. That recommendation is in line with a petition sent by New York and other Northeastern states urging the E.P.A. to create federal methane leak regulations.

The regulations would require that oil and gas companies install equipment at wellheads to capture the leaks, use valves in production facilities that do not allow methane to escape and have regular inspections.

"This report justifies E.P.A. taking action on regulation of methane pollution and to focus that regulation on existing wells," said Mark Brownstein, chief counsel for the American climate and energy program at the Environmental Defense Fund.

The oil and gas industry has consistently resisted new regulations. Natural gas developers say that it is in their interest to capture methane since it is a component of natural gas and can be sold as such. Allowing it to escape causes them to lose money.

“The industry has led efforts to reduce emissions of methane by developing new technologies and equipment, and these efforts are paying off,” Carlton Carroll, a spokesman for the American Petroleum Institute, which lobbies for oil and gas companies in Washington, wrote in an email. “Given that producers are voluntarily reducing methane emissions, additional regulations are not necessary.”

Friday’s report is one of a series of closely watched and sometimes hotly disputed studies on the environmental impacts of natural gas production. Natural gas producers celebrated a September report published in The Proceedings of the Natural Academies of Science that concluded that methane leaks from hydraulic fracturing sites are, on average, at or lower than levels set by the E.P.A.

However, that study also found that on some fracking rigs, valves allow methane to escape at levels 30 percent higher than those set by E.P.A. The authors of Friday’s study say that despite the good news in that report, methane appears to be leaking elsewhere in the natural gas supply, production and transportation chain. For example, the authors said, methane could be leaking from facilities where natural gas is stored, compressed or transported.