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Yukon Electrical Company Limited
2013-2015 General Rate Application

Heard before the
Yukon Utilities Board

November 4-7, 2013

Final Argument of
the Yukon Conservation Society

Introduction

The Yukon Conservation Society (YCS) intervened in the Yukon Electrical Company Limited 2013-2015 General Rate Application to ensure that YECL operations and future plans, for which it is asking electrical customers to pay, include reducing negative impacts to the environment from energy use by reducing our dependency on fossil fuels to generate electricity.

YCS is very concerned about the negative environmental and climate impacts of YECL's continued and growing fossil fuel dependency to generate electricity in the Yukon, and the direct effect this increased dependency through the introduction of Liquefied Natural Gas (LNG) will have on the ability to develop renewable energy in the Yukon.

YCS has identified three areas of interest with respect to the Application: the Watson Lake Bi-Fuel Project (Business Case #6), Automated Meter Reading – Whitehorse and area (Business Case #27), and Demand Side Management (Business Case #30). Each of these is addressed in YCS's Final Argument.

Executive Summary

YECL cannot guarantee that LNG prices will remain lower than diesel. YECL has not shown that natural gas is cleaner than diesel. The claim that the primary driver for the Watson Lake Bi-Fuel Project is to reduce emissions rings hollow. The ratepayer should not pay for YECL to experiment with another fossil type that will only continue our dependency on fossil fuels, not develop clean renewable energy to displace those fuels.

YECL is asking ratepayers to pay $3.9million for AMR meters that will result in two or three fewer Yukon jobs, and have a predicted saving of only $2million over 25 years. This is not a clear benefit to Yukon ratepayers or to the environment. There are examples in other jurisdictions where meters play an important role in consumers' ability to take charge of their electricity use, to work with utilities with the common goal of reducing consumption of financially and environmentally costly fossil fuels.

YECL's proposed AMR meters are not intended, nor set up to allow, for time-of-use rates or load management programs such as those to reduce the peak impacts of hot water heating and space heating. YCS does not support the cost of the proposed AMR meters being added to the rate base unless new meters can facilitate and complement demand side and load management programs in the future.

The DSM Plan will reduce YECL's and YEC's overall energy sales, including reduced hydro electricity sales, which may result in reduced profits for both utilities and increased costs to ratepayers. The DSM Plan does not specifically address hot water heating and space heating, which are the two biggest loads identified in the Conservation Potential Review. YCS believes that the DSM Plan is inadequate, but because we understand and promote that efficiency and conservation must be the top priority in energy resource

planning, we begrudgingly support the DSM Plan.

However, it must be noted that YCS, other stakeholders and interveners did, and still do, want more. The Yukon Utilities Board should direct that future iterations of the DSM Plan be aimed clearly at specifically reducing the use of fossil fuels and maximizing renewable energy by shifting loads, particularly those of hot water heating and space heating.

Fossil Fuels, Climate Change and Yukon Solutions

We are all aware of the climate impact of consuming fossil fuels. Scientists warn that we are headed for dangerous climate instability in two to three decades if we continue with a business as usual approach to fossil fuel use. They agree that we must act now to reduce our fossil fuel consumption to avoid reaching dangerous thresholds that would trigger feedbacks – the impacts of which we may not be able to weather. As a society, we should be planning to make renewable energy our new normal.

Although many countries have emerged as leaders in renewable energy, not enough progress is being made on the world stage, as some countries want others to make the effort to reduce greenhouse gas emissions. But the great problem in many developed nations and jurisdiction within them is that their economies are entrenched in the extraction of fossil fuel (e.g. Alberta and Alaska).

In the Yukon, we have an advantage with our small population base and relatively little dependency on the fossil-extraction industry to support our economy. We presently import fossil fuels for most of our energy needs, but also have vast untapped renewable energy resources in the forms of wind, solar, hydro, biomass, geo-exchange, etc.

There is a great opportunity to use renewable energy to replace oil and other fossil fuels not only for electricity, but also for space heating, and to use renewable energy to power local transportation. We also have a financial advantage as a northern jurisdiction that can attract funds to develop innovative renewable energy projects. First Nation governments are interested in developing a sustainable economy, which can only be fueled by local renewable energy sources like wind, solar and low impact hydro and biomass.

The Yukon has an important knowledge sector we can nurture to develop a renewable energy industry. The Yukon Research Centre and the Cold Climate Innovation group are focused on technology development and have access to important funding. The Energy Solutions Centre and Yukon Housing Corporation have set national trends in innovative ways to implement energy efficiency. Within our population base, we have experts in wind, solar, hydro, geothermal, building technologies, and communications, etc.

The Yukon has the potential to become a leader in developing a renewable energy industry and economy in Canada. Yukon Electrical Company Limited needs to play a better role as a leader, an industry innovator and a partner with First Nations,

communities and the knowledge sector to facilitate the development of a sustainable economy, and to ensure we don't cause further climate destabilization and environmental destruction associated with the extraction and combustion of fossil fuels for energy.

Watson Lake Bi-fuel project (Business Case #6)

Watson Lake Liquefied Natural Gas (LNG) Bi-Fuel project is a fossil fuel substitution plan to create a market for natural gas in the Yukon. It will present an obstacle to the development of renewable energy in Yukon's diesel communities.

What YCS learned during this process is that YECL plans to burn LNG at the Watson Lake generating facility to offset more expensive diesel fuel and supposedly to reduce local emissions. We also learned that technologies exist to make diesel generators less polluting, but YECL has not installed them in Watson Lake or in any other off-grid diesel community it services.

YECL is asking the ratepayers to pay for an investment in fossil fuels in order to save YECL roughly 13 per cent in 2020 – provided gas prices remain lower than diesel, which cannot be guaranteed. Basic supply and demand principles suggest that once LNG pipelines, plants and ports are built on the coast of British Columbia to ship currently landlocked natural gas to Asia, the price of LNG will rise significantly as it garners world market prices that are currently triple present regional prices.

YCS is concerned with LNG because its lifecycle emissions and impacts do not support LNG as a clean alternative to diesel fuel. The SENES report "Literature Review: Air Contaminant Emissions from Dual-Fuelled and Conventional Diesel Generator Operations" (November 2012) submitted by YECL in YCS-YECL-2-1 states that emissions of unburned hydrocarbons can be expected to increase by 2500 to 6000 times in dual-fuel operations as compared with diesel-only operations. These unburned hydrocarbons (HC) resulting from the combustion of natural gas and diesel together will be methane – a potent greenhouse gas with a significantly greater global warming potential than carbon dioxide. Other HCs include Volatile Organic Compounds, many of which can have detrimental environmental and human health impacts.

Habitat destruction, water contamination and methane emissions from extraction, processing, liquefaction, transportation and storage of LNG make it as bad as, if not worse than, other fossil fuels for the environment and for the climate. The current common method of hydraulic fracturing or fracking to extract shale gas consumes and contaminates vast quantities of fresh water and releases fugitive methane emissions that contribute to climate change.

Proceeding with the Watson Lake Bi-Fuel Project would defer the development of renewable energy and negatively affect the evaluation of renewable energy development in other diesel communities in the Yukon. Entrenching our system in LNG would present a false economic obstacle to the development of renewables because of the current

natural gas prices setting the predicted benchmark cost per kilowatt hour at an unrealistic and unsustainable low.

As an example, the proposed price for LNG-produced electricity would be about $0.21/kWh. Diesel at this moment is considered $0.35/kWh. In the case of the Destruction Bay and Burwash Landing diesel grid, a wind farm developer would have to compete with the predicted lower, avoided cost of LNG rather than the present higher avoided cost of diesel. YCS questions this cost prediction for LNG, and sees it as merely a way to thwart the development of renewable energy.

Recommendation: Because the Watson Lake Bi-Fuel project is a pilot project, because it would further entrench the Yukon's off-grid communities to the consumption of another fossil fuel that will defer and obstruct the development of renewable energy solutions, and because YECL cannot commit to proving that the net emissions will be of a local or global benefit, the project should not be allowed into the rate base.

Automated Meter Reading – Whitehorse and area (Business Case #27)

YECL has proposed to install Automated Meter Reading (AMR) technology meters and is asking ratepayers to cover the costs. These new meters will allow YECL to eliminate two to three meter reader jobs. The AMR meters are not "smart", they do not measure time of day variable rates and the pay back is 30 years. YCS does not support the cost of these new meters being added to the rate base because they cannot accommodate efficiency and conservation programs designed to manage loads to reduce fossil fuel consumption.

Stakeholders and interveners in this hearing stated interest in more ambitious and accessible efficiency and conservation measures than those proposed in the DSM Plan. This interest was apparent during the stakeholder engagement as part of the Plan's development and again in the cross-examination questions at the YUB hearing specifically around the uncertainty of the abilities of the proposed AMR meters. Interveners want to know whether the AMR meters will be able to accommodate time of use price rates to reward consumers who reorganize their consumption to off-peak times, or whether the meters would be obsolete should these programs come to fruition.

It was not clear, despite several similar questions about the ability of the proposed AMR meters whether these meters are useful for anything else above and beyond simply automated meter reading. YCS needs to know if these meters will complement or prevent important and significant demand-side and load management programs to shift loads from diesel times to surplus hydro times.

YCS does not want ratepayers to be stuck paying for obsolete meters when necessary efficiency and conservation measures are put in place to better manage our energy resources. Ratepayers should not be asked to pay for old technology that will not meet

our needs into the future. Further, YCS believes that if the meters are as beneficial as claimed, rates should go down as a result of their installation, not go up.

Recommendation/Conclusion: Because YECL has not shown that the investment in AMR meters will have benefit to Yukon ratepayers (aside from avoided snow shoveling), the cost should not be included in the rate base. YCS wants to ensure any investment in new meters will facilitate and complement demand-side and load management programs to help consumers make smart choices, not prevent them and be rendered obsolete.

Demand Side Management (Business Case #30)

While YCS was pleased to see both the utilities working together on a Demand Side Management (DSM) Plan as per the YUB's direction, the DSM Plan does not go far enough to address the potential reductions in fossil fuel consumption that effective efficiency and conservation programs can bring to our system. The Yukon utilities need to look seriously into load management. This means: shifting daily demand to shave the peaks and fill the valleys, as well as move or enhance demand into summer when there is a surplus of hydro electricity.

There are strategies that can be employed to manage loads, and this is where our electrical utilities should be focused. Time-of-use pricing, appliance timers, seasonal rates, and secondary sales are the type of DSM initiatives that YEC and YECL should be engaged in, and engaging the public in.

New technologies like Electrical Thermal Storage would be a perfect complement to a wind energy project in our cold climate, because ETS stores electrical energy in the form of heat when the wind blows to use when the turbine blades do not turn. YCS notes the ETS section in the DSM plan but there was no application of how it would be used.

YCS looks forward to helping build upon the work that has been done to broaden the scope of initiatives to ensure the Yukon is using its energy resources in the wisest way possible.

Recommendation/Conclusion: YCS is acutely aware of the link between our fossil fuel consumption and climate change, and that our reduction and wiser use of energy is forefront in addressing negative impacts to the environment and the climate. In the spirit of co-operation, YCS would like to share with YECL, YEC and the YUB our vision of a DSM Plan that complements renewable energy development:

Wind Energy and the Winter Heating Load
Although hydro provides firm reliable power, the hydro system is seasonally inefficient. The seasonal energy availability of a hydro dam does not follow the winter load. In the summer there is always more hydro energy available than the load requires, in the winter

the hydro potential is greatly diminished by the freeze-up of the water when the load demand is highest. As a result, the hydro reservoirs have to be oversized in order to meet the maximum winter load. This oversizing means that there is always much more water spilling in the summer than can be used. These are lost revenues for utilities.

Wind energy is more abundant in the winter when the grid load (mainly heating) is highest. Wind is a perfect match for hydro, since water can be stored and hydro generators can respond to fluctuations in wind energy production. An example of this is the Aishihik facility, which has a large reservoir and response capability to stabilize wind power fluctuations. When hydro cannot meet the larger loads, the diesel plant fills the void.

An important case comparison to the above is the Kodiak Island wind-hydro-diesel battery system (http://www.kodiakelectric.com/generation.html) in Alaska, which provides 95% of the island's electricity with wind and hydro.

Another the advantage of wind energy is that it can be added in smaller increments at a lower cost than hydro. New hydro is predicted to cost closer to $0.35/kWh whereas new wind will be under $0.20/kWh. On a long ridge like Mount Sumanik, the second wind phase will cost less because the powerline and road infrastructure will already have been built in the first phase.

An effective and valuable way to accommodate the intermittent nature of wind farms is by diverting the excess wind energy to space heating.

In the Yukon, space heating makes up about 70% of the annual energy needs of a home. Presently, the majority of space heating is met by imported oil and propane. The other 30% of the home energy needs are used for lighting, appliances and domestic hot water. Those needs are usually provided for by electricity. Seasonally, the use of lighting, appliances and domestic hot water will vary only slightly over the course of the year and the average is relatively constant at about 1000 kWh per month. Space heating however will swing from virtually nil in the summertime to about 3,000 kWh per month in the colder months. Wind energy can be effectively used meet that space heating demand in the winter.

The space heating requirement in the Yukon is roughly equal to the present electrical demand. Electrical customers have a space heating need that could double energy sales for the utilities, that is, increase energy demand from about 400 GWh/year to 800 GWh/year. This new market is a potential economic gold mine for the utilities and Yukon people, as it will keep dollars within the territory instead of spending it on imported heating oil.

The Electrical Thermal Storage (ETS)

Wind can be more fully utilized by turning on heaters and storing the heat in a chamber that contains a material of high heat capacity. This method is called Electrical Thermal Storage or ETS for short.

The basic principle of the ETS is that it recharges bricks during a period when only wind or hydro is available. The ETS can be controlled by the utility to avoid recharging when diesel is burning. The ETS can also be used to shave the daytime peaks and fill the nighttime valleys in the daily load profile.

Two examples of this daytime peak shaving are in Nova Scotia (http://www.nspower.ca/en/home/residential/homeheatingproducts/electricthermalstorage/default.aspx) and Sudbury (http://www.sudburyhydro.com/programs_electric_thermal_storage_heating.htm). The most well known ETS technology that we are aware of is one made by Steffes (http://www.steffes.com/off-peak-heating/ets.html), which offers a standalone room unit, hydronic and forced air heaters. Another company, Dimplex (http://blog.dimplex.com/energy/electric-thermal-storage-heating-101/) also makes a room unit that comes in different sizes.

Both ETS brands are available locally in Whitehorse. These types of heaters are designed to store heat in an insulated compartment that contains high-density bricks (iron oxide ceramic clay). The ETS unit comes in a range of storage capacities from 13 kWh to 240 kWh. A homeowner would typically size the unit to meet the home's heating demand for a day. A typical home will use about 100 kWh for spacing in an average winter day. But well insulated homes could be matched with a unit sized for 2 to 4 days of stored heat. From the YEC GRA 2012, YCS Exhibit C-5-8 report entitled "Meeting Residential Space Heating Demand With Wind Generated Electricity", Larry Hughes of Dalhousie University demonstrated that in PEI, a 5.15 MW wind farm, could meet half the electric heating load of about 500 homes with conventional electric baseboards. If every home had an ETS system however, the wind farm could meet more than 95% of the heating load.

The Yukon has a similar seasonal heating demand and wind supply as PEI, which makes the ETS a good match for wind energy in the territory.

The ETS technology can be controlled by the utility to match the availability of wind energy. This would introduce the smart grid to the Yukon.

One of the advantages of the ETS is that the investment for storage is borne partially by the ratepayer/customer. Since the ETS technology is interruptible it would greatly stabilize the grid load for the utility. The advantage for YECL with the ETS technology is that the increased sales will help them pay for the investment in the making their distribution system more robust.

There would have to be a financial incentive for customers to invest in the ETS technology. The electricity rate would need to be lower when only wind or hydro is available and higher when diesel is on the margin. The rate could be divided into three tiers: lowest when wind energy is online, a medium rate when stored hydro is being used and the highest rate when diesel is on the margin.

ETS users are a very stable customer base that will bring stable revenue for the companies. It will also keep dollars here that are currently leaving the territory to purchase imported heating oil. Having this larger customer base and hence larger wind-hydro-diesel system then allows for more stability and fewer undesirable impacts when high-risk industrial customers like mines come and go.

Conclusion

The Yukon is a unique jurisdiction. We need to view the fact that we are on an isolated grid, and have isolated off-grid communities, as a benefit with opportunities, not as a drawback. The Yukon has vast wind, solar and other renewable energy potential that have not been realized by the utilities. It is frustrating to note that although reducing emissions is claimed to be the primary driver for YECL to introduce LNG to Watson Lake, existing technologies that could reduce diesel emissions, as well as technologies that could reduce the overall consumption of diesel, have not been implemented or advanced in a meaningful way.

The Yukon still has a pristine environment and clean water free from destructive oil and gas extraction practices. Can we ensure our energy choices do not compromise this?

It displays a lack of imagination and concern for the future to default to burning finite fossil fuels to meet electrical demand when free sources of energy that do not harm the land, water and air abound. The Yukon Government needs to become a more active participant in ensuring that the Yukon develops these vast reserves of renewable energy, not locks us into exploiting polluting and finite fossil fuels.

Thank you for the opportunity to intervene.

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