

INDEPENDENT POWER PRODUCTION AND THE AVOIDED COST OF DIESEL IN NUNAVUT

A Response to the Utility Rates Review Council on Qulliq Energy
Corporation's Proposed Commercial and Institutional Power Producer
Program

July 2020

Disclaimer

The following report includes publicly available information on pricing and costs incurred by various departments within the Government of Nunavut, including the territorial utility, Qulliq Energy Corporation, with regards to electricity generation and consumption in Nunavut. While we have provided sourcing information for all specific numbers included in this report, the calculations reflected in this report are meant to guide the Utility Rates Review Council in their review of the power purchase pricing structure included in Qulliq Energy Corporation's Commercial and Institutional Power Producer program.

There are likely additional costs incurred that are not readily available to the public and as such, all costs and pricing included in this report should be vetted and confirmed prior to incorporating into any policies.

While we have endeavoured to explain our calculations within this report, we would be pleased to share details of those calculations with the Utility Rates Review Council if doing so would prove useful to the Council.



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Introduction

Qulliq Energy Corporation (“QEC”) has recently applied to the Utility Rates Review Council (“URRC”) to implement a Commercial and Institutional Power Production (“CIPP”) Program. This will allow existing commercial and institutional users of electricity to generate and sell renewable electricity to QEC. As the Inuit Development Corporation representing Inuit in the Qikiqtani Region, Qikiqtaaluk Corporation (“QC”) has a vested interest in seeing a fair and equitable CIPP program to ensure benefits to communities and Inuit are prioritized.

As a wholly-owned subsidiary of QC and Nunavut-based renewable energy developer, Nunavut Nukkiqsautiit Corporation (“NNC”) has concerns that the CIPP Pricing Structure in the recent application does not accurately reflect the true avoided cost of diesel electricity generation in Nunavut. Consequently, commercial and institutional power producers will not be adequately compensated for their renewable electricity generation.

The proposed pricing structure in QEC’s CIPP application is solely based on the avoided cost of purchasing fuel. This compensation suggests that there will be no impact on costs or revenue with the integration of renewable energy in the Territory. This, however, is not true. While it is correct that there should be no increase in operational costs as a result of integrating renewables, there should be **direct cost savings** as a result of this integration.

NNC has prepared this report outlining a pricing structure we feel is more reflective of the true avoided cost of diesel, delivers on the obligations of the Nunavut Agreement and parallels power pricing structures in other jurisdictions across Canada. This report considers both QEC and the Government of Nunavut (“GN”) Petroleum Products Division (“PPD”) incurred savings through the integration of renewable energy. Furthermore, pricing structure value added components are recommended to promote equality across the Territory, prioritize benefits to Inuit and transfer GN electricity subsidy program savings to further boost renewable energy economics.

Qulliq Energy Corporation Costs

QEC Incurred Costs

According to QEC's 2018-19 Annual Report available on the QEC website, the following are QEC's operational and capital costs.

Table 1.1 – Annual Incurred Operational and Capital Costs per kWh by QEC

	2018-19 Operational Costs (QEC Annual Report)	Cost per kWh
<i>Plant Operations (less production fuel costs)</i>	\$ 16,377,000	0.0833
<i>Production Fuel</i>	\$ 50,166,000	0.2553
<i>Technical Support Operations</i>	\$ 28,615,000	0.1456
<i>Program Support Services</i>	\$ 35,931,000	0.1828
<i>Capital Estimate*</i>	\$ 38,735,000	0.1971
TOTAL	\$ 169,824,000	0.8641

*This Capital Estimate is based on QEC's 2018-19 Annual Report and represents QEC's capital expenditures net of recoveries. No financial information has been obtained regarding the future capital expenditures required. A more detailed analysis would likely indicate that the representation of capital expenditures above is understated.

These operational and capital costs can be converted to a cost per kilowatt-hour ("kWh") by taking the total electricity generation for the Territory into account. The total electricity production was estimated based on the average annual electricity demand increase, calculated from the 2014-15 to 2017-18 electricity rates (actual and forecasted) reported in QEC's most recent General Rate Application ("GRA"). The average annual increase of 1.65% was then projected to 2018-19 to estimate a total electricity generation of 196,529,481 kWh.

QEC Avoided Costs through Integration of Renewable Energy

In the proposed CIPP Program, the only cost savings QEC identified is the avoided requirement to purchase diesel fuel and lubricants. They have failed to identify any additional cost savings derived from the integration of renewable energy. For example, QEC will see cost savings related to operations and maintenance ("O&M") requirements on existing generation equipment, leading to a reduction in equipment O&M costs, as well as travel and accommodations connected to such O&M. Moreover, integrating renewable energy will reduce the demand on current infrastructure thereby reducing running time and extending equipment lifespan. QEC will therefore see savings on capital requirements for future power plant expansion and generator replacements.

To estimate QEC's avoided costs with the integration of renewable energy, only costs associated with energy generation is considered. Capital and operating costs associated with distribution of electricity as well as general corporate operational costs were not included in the below avoided cost calculations, as QEC will continue to incur these costs regardless of the level of renewable integration. The below table outlines the avoided costs on a per kWh basis that will be realized with the integration of renewable energy.

Table 1.2 - Avoided Cost per kWh that QEC will Realize with Renewable Energy Integration

Power purchase rate components	% of costs related to energy generation	2018-19 energy generation expenses	Estimated Savings – Avoided Costs (\$/kWh)	Notes
Plant Operations	70%	\$ 11,463,900.0	\$ 0.0583	Based on the QEC 2018/19 General Rate Application, about 70% of QEC's non-fuel operational costs (Plant Operations, Technical Support Operations) are allocated to electricity generation.
Production Fuel	100%	\$ 50,166,000.0	\$ 0.2553	100% of the production fuel costs would be offset by renewable energy integration. This is also promoted in QEC's proposed CIPP program.
Technical Support Operations	70%	\$ 20,030,500.0	\$ 0.1019	Based on the QEC 2018/19 General Rate Application, about 70% of QEC's non-fuel operational costs (Plant Operations, Technical Support Operations) are allocated to electricity generation.
Program Support Services	0%	-	-	Assumed minimal impacts to Program Support Services with the integration of renewables. No avoided costs.
Capital	88%	\$ 34,086,800.0	\$ 0.1734	Based on the QEC 2018/19 General Rate Application, about 88% of QECs capital costs are allocated to electricity generation.
	TOTAL	\$ 115,747,200	\$ 0.5890	

Petroleum Products Division Cost Savings

PPD Incurred Costs

The GN PPD imports, stores and distributes all of Nunavut’s fuel products. They sell diesel fuel to QEC at cost, with no markup for either profit or overhead costs. Annually, PPD imports about 212,800,000 litres of fuel products via marine vessel¹.

In 2018/19, QEC purchased about 50,196,000 litres of diesel fuel from PPD representing 23.59% of all fuel imported. Incurred PPD costs related to electricity generation were grouped into three categories: operations, capital expenditures and environmental costs. Operational costs include commissions, salaries, wages, employee benefits, O&M, amortization, bad debt expenses, contract and consulting services, and travel and relocation related expenditures. These costs are reported in PPD’s 2016-2017 Annual Report available on the GN website. Capital costs were calculated by averaging the capital costs reported (actual and estimates) in the 2020-21 Capital Estimates. Environmental costs include 2017 fuel spill cleanup liability costs reported in the PPD 2016-2017 Annual Report.

Similar to QEC’s incurred costs, PPD’s costs related to selling fuel to QEC for electricity can be converted to a cost per kWh by taking the total electricity generation for the Territory into account (for 2016/17: 191,736,000 kWh²).

Table 2.1 – Annual Incurred Operational Costs per kWh related to Selling Fuel to QEC for Electricity

Cost category	PPD total 2016-2017 expenditure	Cost related to fuel for electricity	Cost per kWh
<i>Operational costs</i>	\$32,903,000.00	\$7,761,273.44	\$0.0405
<i>Capital expenditures**</i>	\$7,612,750.00	\$1,795,721.80	\$0.0094
<i>Environmental costs***</i>	\$1,336,000.00	\$315,140.30	\$0.0016
TOTAL	\$41,851,750.00	\$9,872,135.54	\$ 0.0515

**This Capital Estimate is based on PPD’s average capital costs reported in their 2020-21 capital estimates and represents PPD’s capital expenditures net of recoveries. No financial information has been obtained regarding the future capital expenditures required. A more detailed analysis would likely indicate that the representation of capital expenditures above is understated.

***Environmental costs represent the 2017 fuel spill cleanup liability costs reported in the PPD 2016-17 Annual Report. It appears that a complete accounting of environmental liabilities, historic and future, has not been undertaken.

PPD Avoided Costs through Integration of Renewable Energy

With increased renewable integration, QEC’s fuel purchases from PPD will decrease. With decreased fuel sales, PPD will see some reduced O&M costs, and reduced capital requirements for the expansion and replacement of bulk storage facilities. Further, the PPD will see cost savings through the reduction in environmental liabilities.

¹ Petroleum Products Division 2016-2017 Annual Report

² Qulliq Energy Corporation 2018-19 General Rate Application

Table 2.2 - Avoided Cost per kWh that PPD will Realize with Renewable Energy Integration

	% of costs related to procurement, sale and storage of fuel	Expenses (based on 2016-17 Annual Report)	Estimated Savings – Avoided Costs (\$/kWh)
<i>Operations</i>	100%	\$ 7,761,273	\$ 0.0305
<i>Capital Expenditures</i>	100%	\$ 1,795,722	\$ 0.0094
<i>Environmental costs</i>	100%	\$ 315,140	\$ 0.0016
TOTAL		\$9,872,136	\$0.0515

Total Avoided Costs through Integration of Renewable Energy

The total direct avoided costs of diesel electricity production with the integration of renewable energy would be the combination of QEC's savings and PPD's savings. The avoided cost estimated in this exercise is therefore \$0.6404/kWh.

Table 3.1 – Total Avoided Cost per kWh that will be Realized with Renewable Energy Integration

Contributor	Avoided diesel electricity costs (\$/kWh)
<i>QEC</i>	\$ 0.5890
<i>PPD</i>	\$ 0.0515
TOTAL	\$ 0.6405

Proposed Components for a Nunavut Power Pricing Structure

NNC encourages a power pricing structure that promotes a fair compensation for cost savings realized and is tailored for Nunavut. A power pricing structure that recognizes the true avoided costs of diesel electricity production, prioritizes and promotes benefits to Inuit, promotes renewable energy equally across the Territory, and passes on cost savings to all Nunavummiut through reduced electricity rates would deliver on the obligations of the Nunavut Agreement.

Avoided Costs Components

In many jurisdictions, the full avoided electricity production costs are included in the power pricing structure and therefore full avoided costs are passed on to the renewable energy producer. A purchase pricing structure tailored to Nunavut would see some of these avoided costs passed on to customers.

QEC's electricity rates are based on their revenue requirement of providing services with a fair return on equity. Therefore, if operational expenses decrease, the savings are passed on to customers either through adjusting electricity rates or refunds on power bills.

To pass on avoided costs to customers, NNC is proposing the power pricing structure includes only 60% of QEC's and PPD's avoided costs.

Value Added Components

To further tailor the power purchase structure to Nunavut and to prioritize benefits to Inuit, NNC proposes to include an Inuit Ownership Value, a Locational Value, and a GN Subsidy.

Inuit Incentive

Other Canadian jurisdictions provide incentives within their power purchase rate structures to promote Indigenous and local ownership of renewable energy installations. Often an additional rate per kWh is added for Indigenous ownership. Including an Inuit Ownership Value component to the power pricing structure responds to the Nunavut Agreement principles to ensure the rights and benefits of resource development to Nunavut Inuit are prioritized.

NNC is promoting the Inuit Ownership Value be included to reflect a similar value structure to that of the Nunavummi Nangminiaqtunik Ikajuuti (NNI) policy. This would see projects with 100% Inuit ownership compensated at a higher rate per kWh than those with lower rates of Inuit ownership. Projects without any Inuit ownership would not receive this value in their power purchase price.

The proposed Inuit Ownership Value was extrapolated based on the Indigenous Ownership Adder included in the Ontario Feed-In Tariff (FIT) Program. The FIT Program includes a \$0.015/kWh for any project that has at least 51% or more Indigenous ownership.

To calculate an Inuit Ownership Value appropriate for Nunavut, a similar percent ownership category structure is used as in the NNI policy. To determine the maximum Inuit Ownership Value (for projects with 100% Inuit Ownership), an average percent difference of the electricity rates and cost to install solar systems in Ontario compared to Iqaluit, Nunavut was used multiplied by the Ontario FIT Program indigenous adder of \$0.015/kWh. The other two Inuit Ownership categories are adjusted proportionately based on this maximum value.

Table 4.1 – Difference in Electricity Rates and Costs to Install Solar PV

	Ontario	Nunavut (Iqaluit)	% difference
Electricity Rates (\$/kWh)	\$ 0.1010	\$ 0.5886	483%
Cost to install solar (\$/W DC)	\$ 1.60	\$ 3.80	138%
		AVERAGE	310%

Table 4.2 – Proposed Calculation of Inuit Ownership Value based on Percent Difference of Electricity Rates/Installation Costs Compared to Ontario Indigenous Adder

% Inuit Ownership	Proposed value	Notes
51-75%	\$ 0.023	50% of max value
76-99%	\$ 0.035	75% of max value
100%	\$ 0.047	310% the Ontario FIT Indigenous Ownership Value

Locational Value

Given the vast geographic span of the Territory, construction and operational costs vary considerably across the territory. A project in Iqaluit would have very different economics than if that same project advanced in Grise Fiord. This needs to be considered in the power purchase rate.

A drawback of a unified territorial power purchase rate is that it does not factor in this difference in project economics across the territory. Projects in communities with lower construction and operational costs would have a more favourable return on investment, and projects in more remote communities would be challenged to make the economics work.

To ensure equity across all 25 communities in Nunavut, NNC proposes that a Locational Value be included in the power pricing structure. A Locational Value included in a power pricing structure would ensure power producers are being reasonably compensated for the additional costs associated with projects in more remote communities, thus equalizing project economics across communities. This is in line with other jurisdictions with similar variances in quality of infrastructure and operational costs across a region.

To estimate a Locational Value, solar projects in Iqaluit³ and Grise Fiord⁴ were compared to determine a Power Purchase Rate that would provide similar rates of return. Iqaluit and Grise Fiord were selected because these communities represent the communities in Nunavut with the lowest and highest cost of living, and therefore installation and O&M costs, respectively.

Using a rudimentary analysis, the same base power purchase rate was applied to both projects and a Locational Value was added to the Grise Fiord analysis to achieve the same Internal Rate of Return (“IRR”) for both projects. With a base rate of \$0.5200/kWh (which is the lower limit that was calculated for a fair Power Purchase Rate [see Page 15]), the Iqaluit project had an IRR of 6.33%. To achieve the same IRR for the Grise Fiord project, \$0.07/kWh had to be added to the base rate.

To determine a Locational Value for each community, NNC used the GN Northern Allowance rates as a reference to determine the percent difference in the cost of living of each community compared to Iqaluit. A Locational Value was then calculated for each community based on the Grise Fiord ratio of percent difference to Locational Value.

³ Qikiqtaaluk Properties Inc Project: 100 kW rooftop solar installation

⁴ Solar Energy Study for Grise Fiord, Nunavut. Sanjin Banjac, 2018: 300kW ground mount solar installation with pricing adjusted for a building installation

Table 4.3 – Locational Value Calculation based on Cost of Living and Equitable Project Internal Rates of Return

Community	Rate
Iqaluit	\$0.0000
Rankin Inlet	\$0.0126
Pangnirtung	\$0.0146
Kimmirut	\$0.0148
Cambridge Bay	\$0.0169
Sanikiluaq	\$0.0190
Kinngait	\$0.0215
Arviat	\$0.0220
Whale Cove	\$0.0236
Naujaat	\$0.0248
Kugluktuk	\$0.0253
Igloolik	\$0.0272
Qikiqtarjuaq	\$0.0274
Clyde River	\$0.0287
Chesterfield Inlet	\$0.0293
Coral Harbour	\$0.0298
Sanirajak	\$0.0308
Pond Inlet	\$0.0331
Baker Lake	\$0.0334
Arctic Bay	\$0.0376
Gjoa Haven	\$0.0408
Kugaaruk	\$0.0419
Resolute Bay	\$0.0485
Taloyoak	\$0.0555
Grise Fiord	\$0.0700

To avoid having 25 different Locational Values, communities were grouped into four tiers based on their Northern Allowance rates. An average Locational Value of all communities within each tier is the proposed Locational Value to include in the power pricing structure.

Table 4.4 – Locational Value Tier Structure

Tier	Locational Value
Base	\$0.0000
Tier 1	\$0.0147
Tier 2	\$0.0268
Tier 3	\$0.0422
Tier 4	\$0.0627

GN Subsidy Value

It has been reported that the GN spends an estimated \$60.5 million each year to subsidize the use of diesel fuel (for electricity and heat).⁵ Electricity subsidies are typically applied directly to customer electricity bills or customers can apply for a refund through certain subsidy programs.

Information was used for four GN subsidy programs. It is estimated the GN spends close to \$42 million each year to subsidize electricity, or about \$0.2133/kWh.

Table 4.5 – GN Subsidy Costs

Subsidy Program	Amount
<i>Nunavut Electricity Subsidy Program Department of Finance</i>	\$ 10,045,000 ⁶
<i>Public Housing Power Support Program Nunavut Housing Corporation</i>	\$ 29,200,000 ⁷
<i>Staff Housing Policy – Power and Fuel Nunavut Housing Corporation</i>	\$ 2,145,420 ⁸
<i>Income Assistance Program Family Services</i>	\$ 534,374 ⁵
TOTAL	\$ 41,924,794
GN subsidy (\$/kWh)	\$ 0.2133

If the avoided cost of diesel use is not 100% passed on to the renewable power producer, QEC will have cost savings. With 60% of the Plant Operations, Technical Support Operations and Capital avoided costs included in the rate structure, QEC would realize a \$0.1335/kWh savings (on each renewable energy kWh integrated with the grid). Assuming 20% renewable integration, this would save about \$5.2 million (3.09%) annually.

Without doing a full rate review analysis, it is difficult to determine exactly how these cost savings would impact electricity rates and in turn, impact the GN subsidies. For purposes of this discussion, assuming the 3.09% QEC savings directly translates to GN subsidy program savings, the GN would realize savings of approximately \$1.3 million annually. Applying this to an assumed 20% renewable integration (39,305,896 kWh) is \$0.03295/kWh. NNC proposes this full savings be included in the power pricing structure. This value component would make renewable projects more economical further encouraging renewable energy developments across the Territory.

⁵ Costing Energy and Fossil Fuel Subsidies in Nunavut: A mapping exercise. International Institute for Sustainable Development, 2017.

⁶ Government of Nunavut 2020-2021 Main Estimates, reported 2018-2019 Actual Expenditure

⁷ Nunavut Housing Corporation 2018-2019 Annual Report

⁸ Nunavut Housing Corporation 2018-2019 Annual Report; 27% of Utilities cost (27% based on PHPSP program electricity expenditures)

Table 4.6 – GN Subsidy Value Calculation

<i>QEC Production cost with 100% diesel</i>	\$ 169,824,000
<i>QEC Production cost with 20% renewable integrated</i>	\$ 164,577,504
<i>% savings</i>	3.09%
<i>GN subsidies</i>	\$41,924,794
<i>GN electricity subsidy savings (3.09%)</i>	\$ 1,295,213
<i>Renewable energy produced (kWh) (assuming 20%)</i>	39,305,896
<i>GN renewable subsidy (100% included in rate structure)</i>	\$ 0.03295

Closing

The GN and its Territorial Crown Corporations stand to see significant economic and environmental benefits from renewable energy integration. As such, it would be environmentally and socially responsible to ensure renewable energy policies and programs are developed to promote renewable energy generation with benefits realized to all Nunavummiut, rather than continuing to further entrench the Territory in economically and environmentally unsustainable energy generation through continued diesel fuel use.

There is an opportunity for Nunavut to become energy independent and secure local energy generation for years to come, leading to less reliance on Southern companies and less economic leakage. Requiring no capital from QEC or the GN, communities could see direct investment in their local infrastructure by Inuit-owned power producers, while simultaneously establishing cost savings directly to QEC and the GN.

With the global trend of divesting from the fossil fuel industry, Nunavut can take a leading role in re-directing investments to communities, Inuit, and all Nunavummiut through investing directly in renewable energy projects. Through the integration of renewable energy, and therefore reducing greenhouse gas emissions, significant economic and health benefits can be realized promoting greater well-being and self-sufficiency, a strong economy and a healthy environment.

NNC urges the URRC to incorporate our recommended fair power purchase rate into any programs or policies enabling renewable energy development in the Territory. In order to do so, it is recommended that the URRC undertake a territory-wide independent rate review analysis to accurately understand the true avoided cost of diesel in Nunavut. It is crucial that any program or policy developed to permit renewable energy development be done so carefully, and through a whole-of-government approach, in order to ensure communities, Inuit, and all Nunavummiut are fairly compensated for the benefits derived from renewable energy development.