Thermal Permitting Project

Yukon Conservation Society

March 29

With thanks and gratitude

Yukon Energy recognizes that this project takes place on the Traditional Territories of the Kwanlin Dün First Nation and the Ta’an Kwäch'än Council.

Today's discussion

- Introductions
- Yukon's electricity system
- Project overview
- Air and noise
- Next steps
- Open Q&A

Goal:

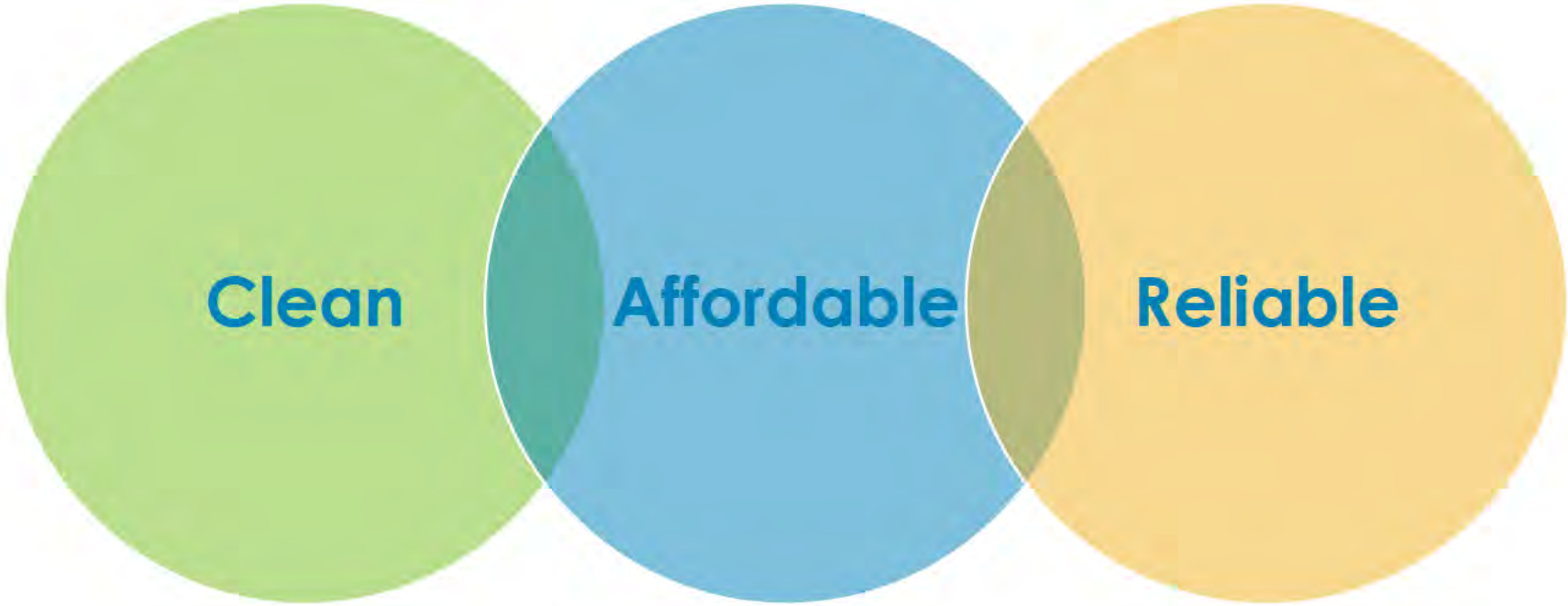
Yukon Energy needs to renew its air emissions permit in Whitehorse.

We are here today to share information about the project, answer your questions and gather your feedback.

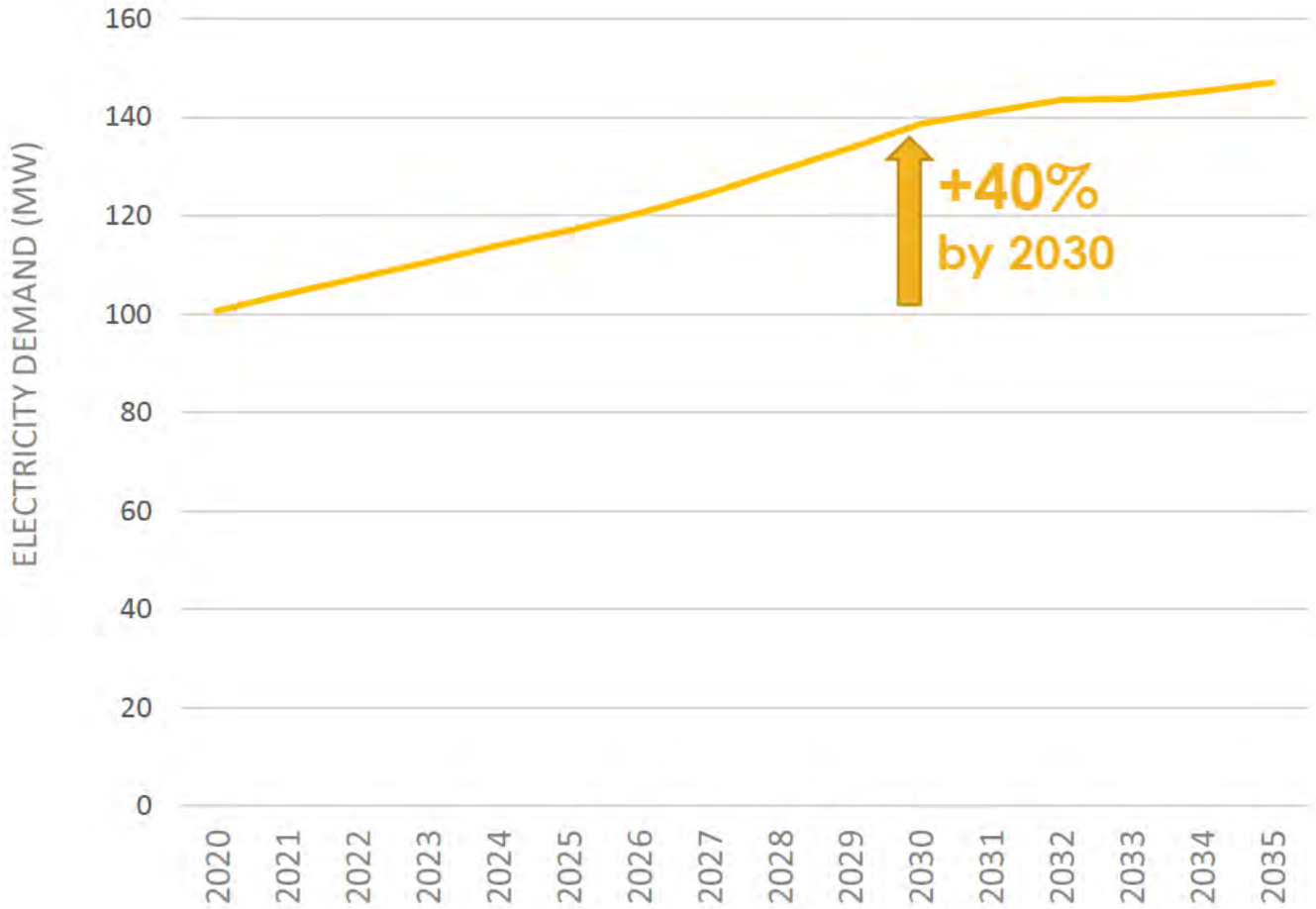
Yukon's electricity system

Our plans for the future

Our 2030 Vision



Demand for electricity is growing



Why?

- Continued growth in population & electricity use
- Policy actions to address the climate change emergency

Our energy grid

Dawson – diesel

Aishihik Hydro: 37 MW

Mayo – diesel

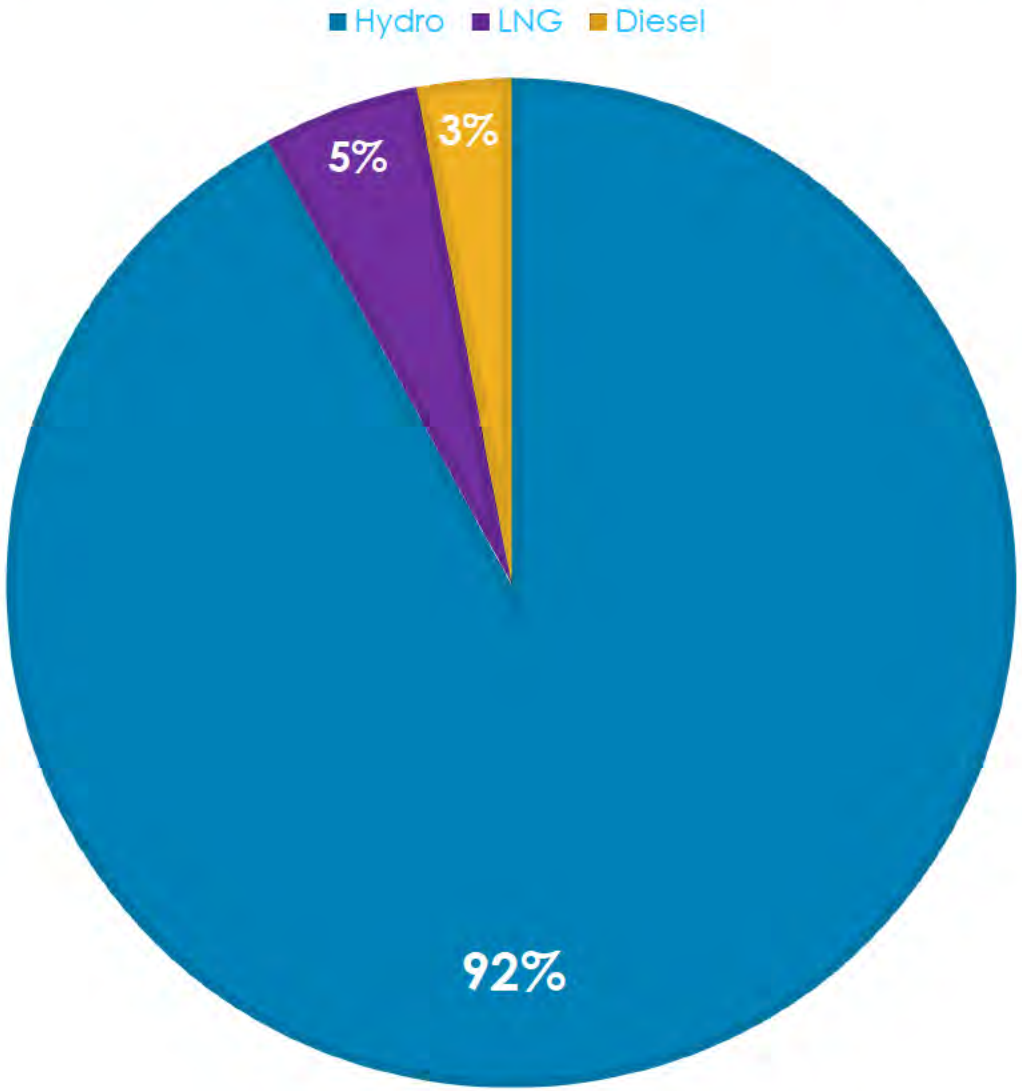
Mayo Hydro: 15 MW

Faro – diesel

Whitehorse – diesel & LNG

Whitehorse Hydro: 41 MW

Generation supply for 2022

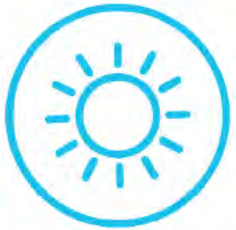


Today, over 90% of all Yukon's electricity is produced by existing hydro facilities.

As demand for electricity increases, all our available hydro power is not enough to meet Yukoners' energy needs in the winter. We use LNG & diesel to fill the gap.

Current and future projects

HYDRO RELICENSING



MICRO-GENERATION

BATTERY STORAGE

HYDRO UPGRADES

INDEPENDENT POWER PRODUCERS

ATLIN HYDRO EXPANSION

DEMAND-SIDE MANAGEMENT

THERMAL REPLACEMENT

MOON LAKE PUMPED STORAGE

SOUTHERN LAKES TRANSMISSION NETWORK EXPANSION

Diesel and LNG help to restore power quickly

Diesel and LNG are used during:

Maintenance

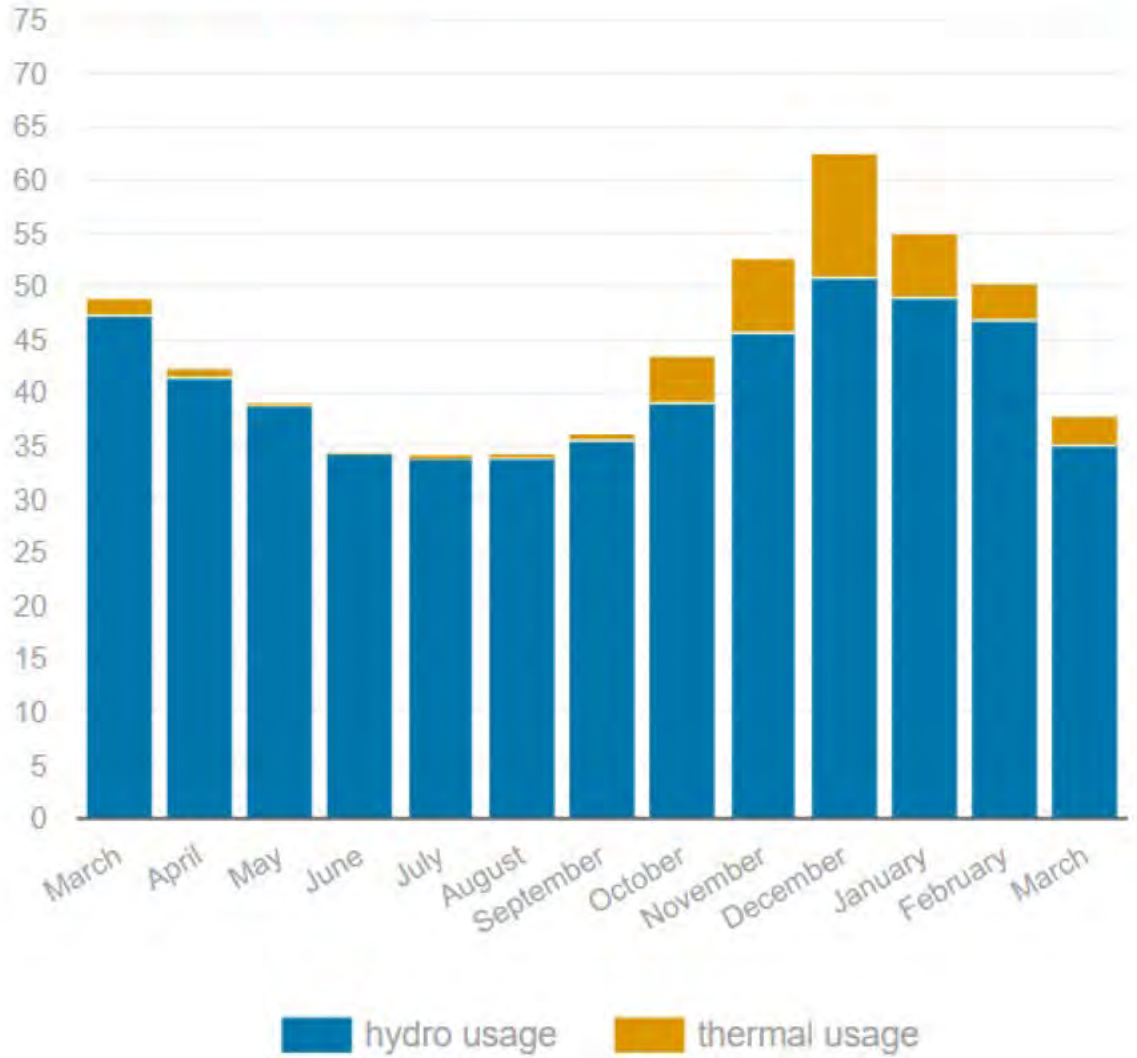
Low water

Peak demand

Unplanned outages

Meeting Winter Demand

Monthly consumption between March 2022 to March 2023 (GWh)



Thermal to Meet Emergencies

Yukon Energy is regulated to plan for N-1.

N-1 = Provide enough electricity to meet peak winter demand (coldest day of the year) without our single largest source of supply (Aishihik).

So, important to have available diesel capacity for unlikely events.

Project overview

Yukon Energy needs to renew its air emissions permit in Whitehorse

Why do we need an air emissions permit?

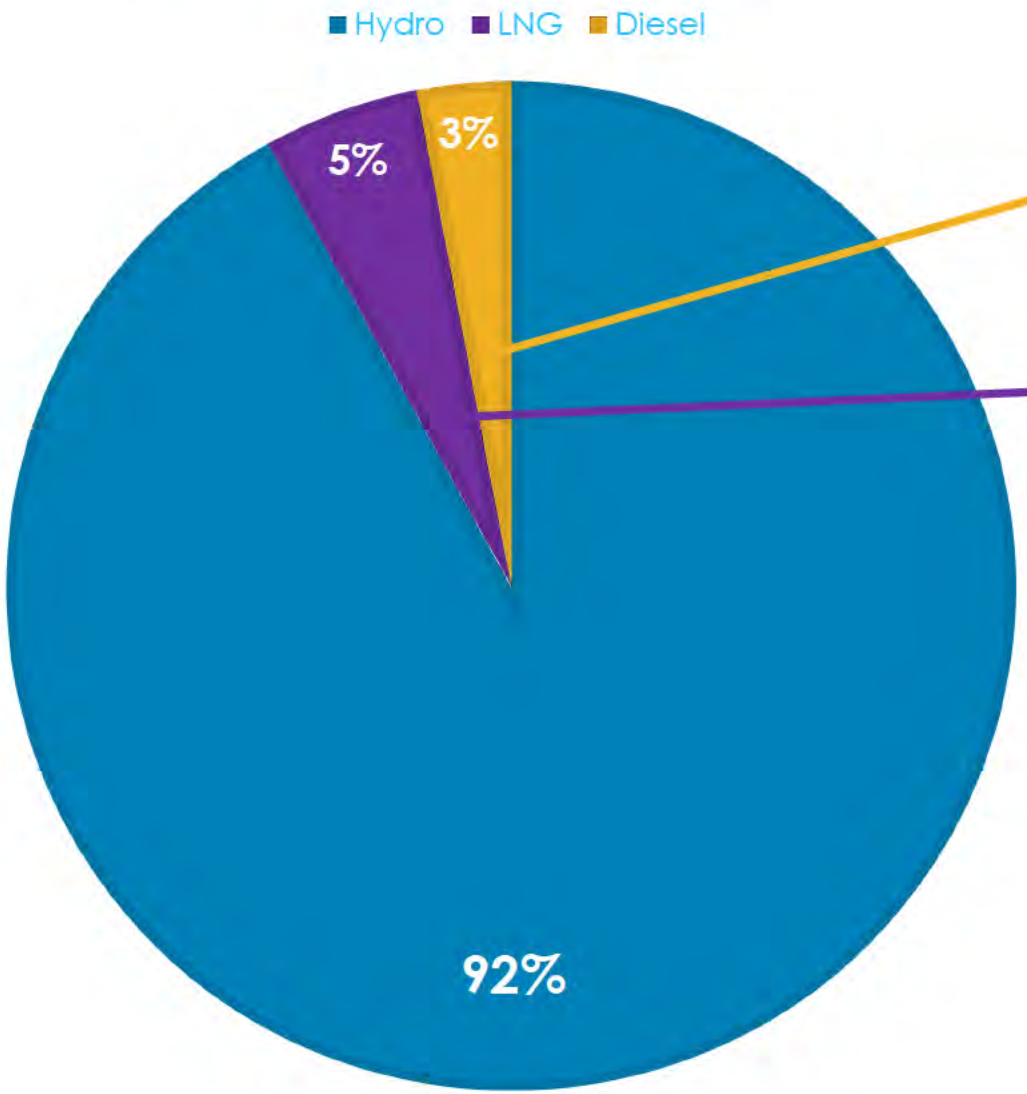
- To operate the diesel and liquified natural gas (LNG) generators at the Whitehorse Rapids Generating Station

Why is this project important?

It helps keep the lights on

during winter peaks and emergencies now and in the future.

Generation supply in Whitehorse



Of this 3%, about 53% is generated by diesel generators in Whitehorse

All LNG generation is in Whitehorse

Our existing Whitehorse permit

13.2 megawatts from liquified natural gas generators

16 megawatts from diesel generators

12 megawatts from diesel generators that can be used during emergencies

Our existing permit *continued*

- Existing permit will expire December 31, 2024
- Renewal will extend the permit for another 10 years
- Not asking to add more thermal capacity

Our permanent LNG and diesel units

- Three units

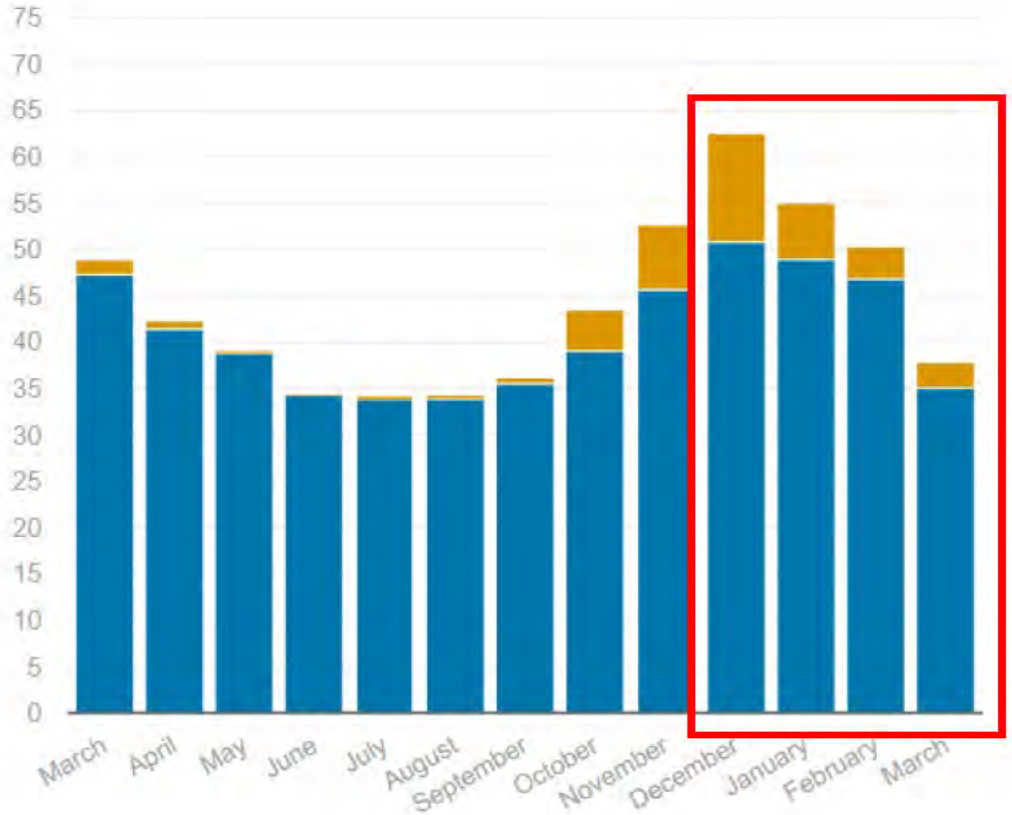
- Seven original units
- Three end-of-life units have been decommissioned
- WD3 capacity will be replaced summer 2024

Our rental diesel generators

- Rental diesel units are used when there's not enough hydro and LNG to meet electricity demand.
- Yukon Energy uses its rental diesel generators before its permanent diesel generators because:
  - It is more cost-effective
  - They produce less emissions than the permanent units

Our rental diesel generators

- For winter 2022/23, 10 units in Whitehorse (9 installed, 1 spare)
- Rental diesel generators located in Whitehorse parking lot because of:
  - Proximity to existing infrastructure
  - Accessibility
  - Available space
- Yukon Energy contracts its rental units for use between December 1 and April 30



Whitehorse air and noise

What we've heard is important

Air quality modelling

- Yukon Energy has modelled 8 different configurations of generator types, capacities and fuel sources at the WRGS.
- Preliminary results indicate that all scenarios meet the previous Yukon Ambient Air Quality Standards.

Air quality modelling

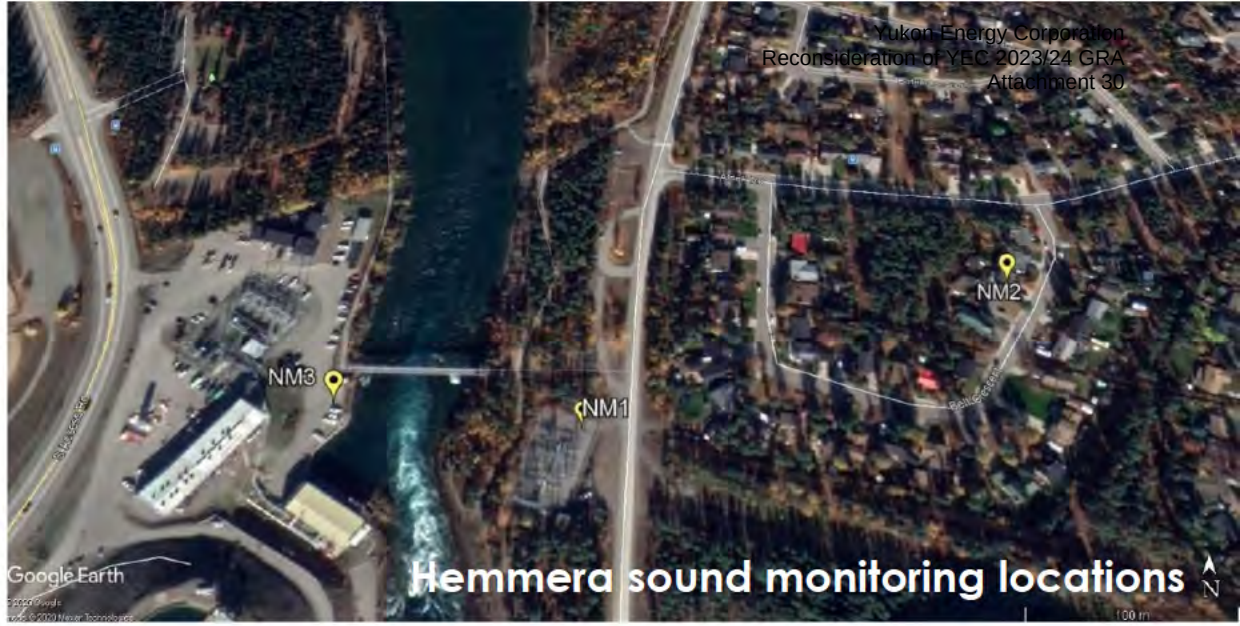
- Permissible levels under the Yukon Ambient Air Quality Standards are expected to decrease in 2025.
- Yukon Energy is exploring options as to how it can reduce its air emissions in Whitehorse to comply with new standards.
- Modelling results will also inform human health risk assessment.

Air quality
Potential emission reduction

- Replace 5 MW of diesel capacity in Whitehorse with new, cleaner diesel generators in summer 2024
- We are also considering:
  - application of best-in-class emissions management technologies on permanent and mobile generators
  - limiting use of older, less-clean diesel units to emergency situations

Sound monitoring

- No noise regulation in the Yukon applicable to the WRGS.
- British Columbia Oil and Gas Commission's Noise Control Best Practices Guideline is commonly used in the Yukon.
- Hemmera initiated sound monitoring for Yukon Energy in Riverdale in 2020.
- Yukon Energy conducts regular sound monitoring at the substation on Nisutlin Drive.



Sound
monitoring (2020 Hemmera study)

- In April 2020, we had to run our permanent diesel units because of:
  - low water levels
  - one of our LNG generators was out of service
- Why only 4 diesel generators were running during time of monitoring
- Study was a response to community concerns
- Outcome of study was to install permanent monitoring

Sound
monitoring results

	Long-term noise monitoring (Nov 2020-Oct 2021)	Short-term noise monitoring (April 22, 2020)
Daytime noise level with WD4 to WD7 operating	61.0 to 63.9	66.1
Daytime noise level with 8 rental units operating	49.7 to 54.3	-

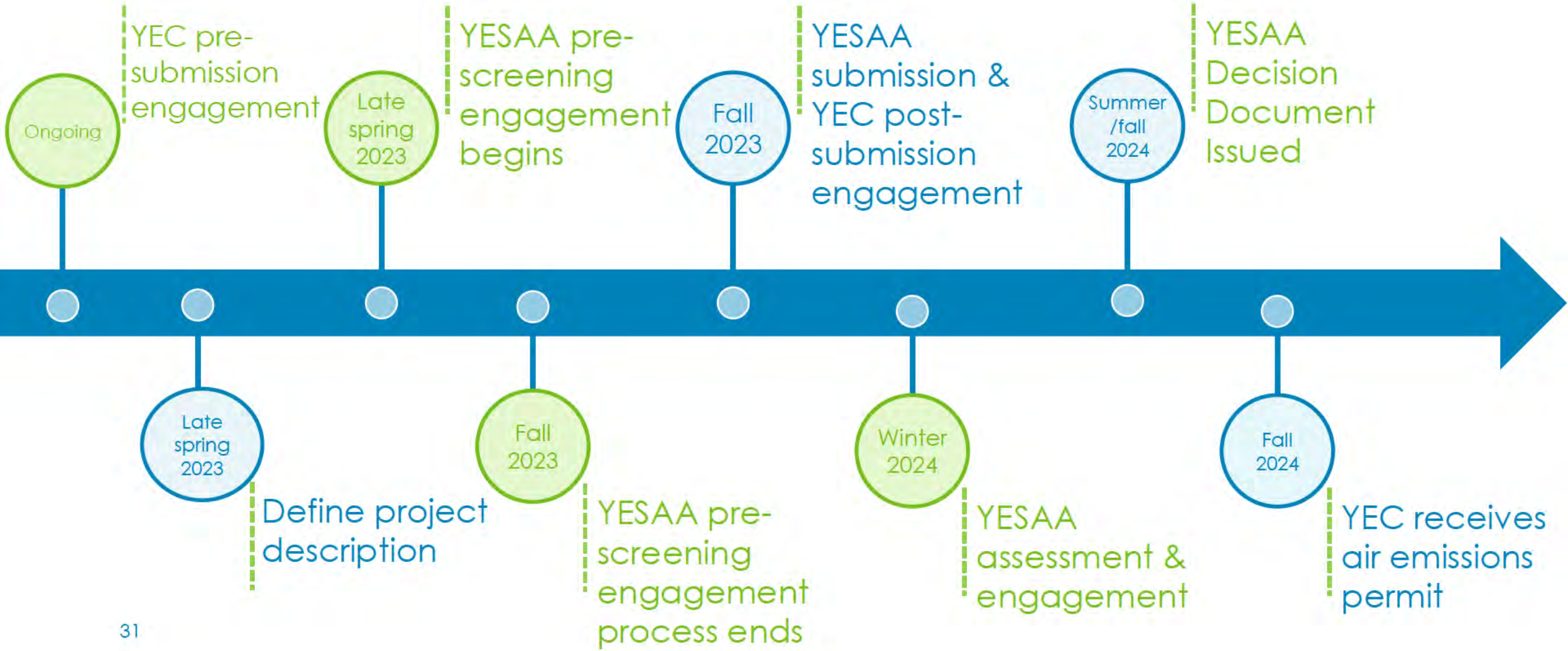
Sound
potential mitigation

- Ongoing noise monitoring data for the WRGS will be used to complete a noise impact assessment to support the YESAA project proposal.
- Mitigation in progress:
  - replace 5 MW of old diesel capacity in Whitehorse with new, quieter diesel generators in summer 2024
- Mitigation being explored:
  - Mufflers for intake and exhaust air

Next steps

Project schedule and what's coming up

Project schedule



How to provide feedback

1. Provide your comments today

2. Submit a question or comment
   - Email YECWhitehorseThermalPermit@stantec.com

3. Complete the form
   - At yukonenergy.ca/thermalpermit

4. Participate in the YESAB Pre-submission Engagement Process

Deadline for comments to be considered in Yukon Energy's Project Proposal is August 31, 2023.

Questions

Thank you for your time

#2 Miles Canyon Road
Box 5920, Whitehorse
Yukon Y1A 6S7
yukonenergy.ca

March 31, 2023 File: 2515.03.01

Elizabeth Barker, Environnemental Protection Analyst
Yukon Government, Department of Environment, Standards & Approvals Section
Box 2703
Whitehorse, Yukon Y1A 2C6

(via email to: elizabeth.barker@gov.yk.ca)

Dear Ms. Barker,

RE: AIR EMISSIONS PERMITS NO. 60-010-01 THROUGH 60-010-04 – PART 6 – 2022 ANNUAL OPERATIONAL REPORTING

Pursuant to the above referenced permits and their respective monitoring and reporting requirements I am pleased to provide the following information regarding our electricity generation using diesel and natural gas from the Faro, Mayo, Dawson City, and Whitehorse Rapids generating stations in 2022.

1. The attached table summarizes the total annual operating hours and electricity produced for all sources at each site, the emission rates for various common air contaminants, and the estimated total emissions from each unit based on their emission rates and hours operated.
2. The estimated percentage of operational hours where each source was operated, but where no electricity was produced is very difficult to estimate for various reasons. A rough estimate suggests up to 5% of the reported 2022 engine run times could account for average unit operation with no electricity generation.
3. All applicable maintenance conducted on the fleet in 2022 was in accordance with the unit manufacturer's instructions and recommendations. No overhauls were completed in 2022.
4. The accounting methodology for fuel inventory at the natural gas generating station is based on a mass balance of fuel delivered, fuel in storage, fuel utilized for power production and heating, and any fuel released during a venting episode or spill/release. For the purposes of monitoring and reporting under the air emissions permit, Yukon Energy considers all uncombusted fuel vented and/or otherwise released/spilled as fugitive emissions. Fugitive emissions of methane in 2022 associated with venting episodes and direct releases to onsite containment totalled approximately 203 kg and 0 kg, respectively (based on 234 fuel deliveries totaling 4,343,177 kg of LNG delivered). All venting emissions were associated with fuel deliveries, which each result in an estimated release of roughly 0.8 kg of LNG depending on each discrete delivery volume.
5. Mobile generators located at the Whitehorse Rapids Generating Station and Faro Generating Station are included in the attached summary of operations. All sites operated within approved capacity limits, except for the Whitehorse Rapids Generating Station, which had five (5) temporary exceedances of authorized site capacity in 2022, as detailed below.
    - The generating capacity exceedances at the Whitehorse Rapids Generating Station (WRGS) occurred during a period of very cold temperatures in late December 2022, per Part 7 of our Air Emissions Permit (AEP 60.010.04) this was reported earlier to YG Environment.
    - Background: On December 19 and 20, 2022 Yukon Energy was facing very high system/customer demand, with temperatures in the Yukon ranging from -50°C to -40°C. As a normal course of action the System Operator looked to balance generation across the various stations on the system to ensure compliance with the requirements of our various permits. Under the harsh conditions, however, we experienced temporary failures of some units on the system to respond to calls for generation. As such, Yukon Energy was forced to utilize some of its back up thermal generating capacity at the WRGS to meet demand. This operational response to ensure continued service to our customers resulted in a few short-term exceedances of the permitted generating capacity at the facility.

yukon energy
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Box 5920, Whitehorse
Yukon Y1A 6S7
yukonenergy.ca

- Exceedance Details: The periodic generating capacity exceedances at WRGS during this time is summarized below:

Date	**Start Time** (hh:mm)	**End Time** (hh:mm)	**Capacity Average Exceedance** (MW)	**Duration** (hrs)
December 19, 2022	12:10	12:15	~ 1	0.1
December 19, 2022	18:00	23:00	~ 4	5
December 20, 2022	02:00	05:30	~1	3.5
December 20, 2022	07:10	23:10	~ 4	16
December 20-21, 2022	23:45	00:05	~ 1	0.3

Please contact me by telephone at 867.393.5350 or by email: travis.ritchie@yec.yk.ca if you have any questions, comments, or concerns with this report.

Thank you for your time and consideration in this matter.

Yours Sincerely,

Travis Ritchie
Director – Risk & Compliance

Attachment: Table 1 - Summary of Yukon Energy 2022 Thermal Electricity Generation and Emissions Intensity

c. Aparna Verma, Manager, Geothermal & Petroleum Resources, Government of Yukon (via email)

yukon energy

Table 1 - Summary of Yukon Energy Corporation 2022 Electricity Generation and Gaseous Emissions from Diesel and Natural Gas Sources

Facility	Unit ID	Total 2022 Operating Time (hrs)	Total 2022 Energy Produced (KWh)	Emission Rates[1] (g/kWh)							Total Annual Emissions (tonnes)						
				NO_2	N_2O	SO_2	CO	$PM_{2.5}$	VOC	GHG ($CO_{2\,eq}$)	NO_2	N_2O	SO_2	CO	$PM_{2.5}$	VOC	GHG ($CO_{2\,eq}$)
Whitehorse	WD4	191	413,000	8.82	0.0045	0.014	0.52	0.13	-	697.5	3.64	0.0019	0.006	0.21	0.06	-	288
	WD5	192	426,016	8.82	0.0045	0.014	0.52	0.13	-	697.5	3.76	0.0019	0.006	0.22	0.06	-	297
	WD6	190	415,500	8.82	0.0045	0.014	0.52	0.13	-	697.5	3.67	0.0019	0.006	0.21	0.06	-	290
	WD7	317	828,030	8.82	0.0045	0.014	0.52	0.13	-	697.5	7.31	0.0037	0.012	0.43	0.11	-	578
	WG1	2,042	8,158,100	1.85	0.0017	0.003	4.06	0.02	0.91	451.0	15.09	0.0139	0.024	33.12	0.16	7.42	3,679
	WG2	1,886	7,694,800	1.85	0.0017	0.003	4.06	0.02	0.91	451.0	14.24	0.0131	0.023	31.24	0.15	7.00	3,470
	WG3	2,420	9,699,400	1.85	0.0017	0.003	4.06	0.02	0.91	451.0	17.94	0.0165	0.029	39.38	0.19	8.83	4,374
	YM10	427	741,609	8.82	0.0045	0.014	0.52	0.13	-	697.5	6.54	0.0033	0.010	0.38	0.10	-	517
	YM11	413	626,345	8.82	0.0045	0.014	0.52	0.13	-	697.5	5.53	0.0028	0.009	0.32	0.08	-	437
	YM12	287	489,209	8.82	0.0045	0.014	0.52	0.13	-	697.5	4.32	0.0022	0.007	0.25	0.07	-	341
	YM13	384	669,690	8.82	0.0045	0.014	0.52	0.13	-	697.5	5.91	0.0030	0.009	0.35	0.09	-	467
	YM14	430	767,634	8.82	0.0045	0.014	0.52	0.13	-	697.5	6.77	0.0035	0.011	0.40	0.10	-	535
	YM15	252	444,647	8.82	0.0045	0.014	0.52	0.13	-	697.5	3.92	0.0020	0.006	0.23	0.06	-	310
	YM16	443	788,302	8.82	0.0045	0.014	0.52	0.13	-	697.5	6.96	0.0035	0.011	0.41	0.11	-	550
	YM17	318	567,629	8.82	0.0045	0.014	0.52	0.13	-	697.5	5.01	0.0026	0.008	0.29	0.08	-	396
	YM18	427	737,159	8.82	0.0045	0.014	0.52	0.13	-	697.5	6.50	0.0033	0.010	0.38	0.10	-	514
	YM19	275	490,571	8.82	0.0045	0.014	0.52	0.13	-	697.5	4.33	0.0022	0.007	0.25	0.07	-	342
Plant Total		**10,893**	**33,957,641**	-	-	-	-	-	-	-	**121.44**	**0.0813**	**0.194**	**108.08**	**1.64**	**23.25**	**17,387**
Faro	FD1	28	58,862	8.82	0.0045	0.014	0.52	0.13	-	697.5	0.52	0.0003	0.001	0.03	0.01	-	41
	FD7	645	900,040	8.82	0.0045	0.014	0.52	0.13	-	697.5	7.94	0.0041	0.013	0.46	0.12	-	628
	YM20	384	679,331	8.82	0.0045	0.014	0.52	0.13	-	697.5	5.99	0.0031	0.010	0.35	0.09	-	474
	YM21	265	437,325	8.82	0.0045	0.014	0.52	0.13	-	697.5	3.86	0.0020	0.006	0.23	0.06	-	305
	YM22	210	341,431	8.82	0.0045	0.014	0.52	0.13	-	697.5	3.01	0.0015	0.005	0.18	0.04	-	238
	YM23	480	860,156	8.82	0.0045	0.014	0.52	0.13	-	697.5	7.59	0.0039	0.012	0.45	0.11	-	600
	YM24	179	297,206	8.82	0.0045	0.014	0.52	0.13	-	697.5	2.62	0.0013	0.004	0.15	0.04	-	207
	YM25	245	433,839	8.82	0.0045	0.014	0.52	0.13	-	697.5	3.83	0.0020	0.006	0.23	0.06	-	303
	YM26	417	746,249	8.82	0.0045	0.014	0.52	0.13	-	697.5	6.58	0.0034	0.010	0.39	0.10	-	521
Plant Total		**2,851**	**4,754,438**	-	-	-	-	-		-	**41.94**	**0.0214**	**0.067**	**2.47**	**0.62**		**3,316**
Mayo	MD1	114	85,890	8.82	0.0045	0.014	0.52	0.13	-	697.5	0.76	0.0004	0.001	0.04	0.01	-	60
	MD2	51	34,860	8.82	0.0045	0.014	0.52	0.13	-	697.5	0.31	0.0002	0.000	0.02	0.00	-	24
	MD3	86	63,210	8.82	0.0045	0.014	0.52	0.13	-	697.5	0.56	0.0003	0.001	0.03	0.01	-	44
Plant Total		**251**	**183,960**	-	-	-	-	-	-	-	**1.62**	**0.0008**	**0.003**	**0.09**	**0.02**	-	**128**
Dawson	DD1	427	271,970	8.82	0.0045	0.014	0.52	0.13	-	697.5	2.40	0.0012	0.004	0.14	0.04	-	190
	DD2	516	385,281	8.82	0.0045	0.014	0.52	0.13	-	697.5	3.40	0.0017	0.005	0.20	0.05	-	269
	DD3	676	509,775	8.82	0.0045	0.014	0.52	0.13	-	697.5	4.50	0.0023	0.007	0.26	0.07	-	356
	DD4	824	675,093	8.82	0.0045	0.014	0.52	0.13	-	697.5	5.96	0.0030	0.009	0.35	0.09	-	471
	DD5	839	1,001,205	8.82	0.0045	0.014	0.52	0.13	-	697.5	8.83	0.0045	0.014	0.52	0.13	-	698
	YM1	110	94,500	8.82	0.0045	0.014	0.52	0.13	-	697.5	0.83	0.0004	0.001	0.05	0.01	-	66
Plant Total		**3,392**	**2,937,824**	-	-	-	-	-	-	-	**25.92**	**0.0132**	**0.041**	**1.52**	**0.39**	-	**2,049**
System Total		**17,388**	**41,833,863**	-	-	-	-	-	-	-	**190.93**	**0.1167**	**0.305**	**112.16**	**2.68**	**23.25**	**22,880**

Notes:

1 Source of CAC emissions rates from diesel is the stack testing results prepared by Levelton Consultants Ltd on behalf of Yukon Energy in 2011 and previously submitted to Yukon Government. CAC emissions from the natural gas-fired generators is per manufacturer specifications. Emissions from diesel generation from the National Inventory Report (Environment Canada) average approximately 697.5 tonnes of CO2e per GWh (or 697.5 g/KWh). Natural gas GHG emissions are approximately 451 tonnes of CO2e per GWh (or 451 g/kWh).

Part 1 — Proponent Contact Information

Proponent's Name

Yukon Energy Corp

Project Title

Mayo Secondary Thermal Generation Project

Mailing Address

Street Address or P.O. Box

No. 2 Miles Canyon Road

City/Town/Village

Whitehorse

Territory/Province

Yukon

Postal Code

Y1A 6S7

Country

Canada

Contact

Are you the primary contact person for this assessment?

- ○ Yes
- ◉ No

Contact Person

Travis Ritchie

Phone

8673935350

Email

travis.ritchie@yec.yk.ca

If you are working on behalf of the proponent as an agent, the project's proponent must sign an agent consent form to give you permission to act on their behalf.

- ☐ Yes, I'm an agent

Part 2 – Requirement For An Evaluation Under YESAA

Specify the Parts and Item numbers from Schedule 1 of the Regulations * which apply to your proposed project.

** Assessable Activities, Exceptions and Executive Committee Projects Regulations*

Part

4. Energy and Telecommunications

View Schedule 1 of the Regulations to determine which Part(s) your project qualifies for. The Item and Proposed Activities numbers can also be found here.

Item

2b

Proposed Activity(s)

Construction and operation of a fossil-fuel fired electrical generating station.

Part

13. Miscellaneous

View Schedule 1 of the Regulations to determine which Part(s) your project qualifies for. The Item and Proposed Activities numbers can also be found here.

Item

8

Proposed Activity(s)

Construction and operation of a storage tank system for petroleum products.

Specify which of the following circumstances apply to your proposed project.*(Check all applicable)*

- ☐ Proponent applied or intends to apply for funding from Housing, Infrastructure and Communities Canada.
- ☐ Proponent intends to work in or near a waterbody (i.e. within 30 m of the high water mark of a waterbody) and the waterbody is navigable. (To determine if a waterbody is navigable, please refer to Transport Canada's assessment tool found here)
- ☐ Proponent is a federal agency or federal independent regulatory agency

  Name of Agency:

- ☐ Proponent is a territorial agency, municipal government, territorial independent regulatory agency or first nation and an authorization or the grant of an interest in land would be required for the project to be undertaken by a private individual.

Proponent requires an authorization or the grant of an interest in land to undertake the project from (list all applicable):

Select agency type:

a territorial government agency

Agency (Department)

Environment - Standards and Approvals Branch

Authorization (describe)

Air Emissions Permit

Select agency type:

a territorial government agency

Agency (Department)

Yukon Fire Marshall

Authorization (describe)

Fuel Storage Tank Permit

Part 3 – Project Location

Latitude and Longitude of proposed project

Coordinates | Current format: 61.1063

Latitude	63.6536
Longitude	-135.9072
Latitude	63.6537
Longitude	-135.9063
Latitude	63.6532
Longitude	-135.9050
Latitude	63.6528
Longitude	-135.9069

Assessment District
Mayo

First Nation Traditional Territory
First Nation of Na-Cho Nyäk Dun

Settlement Land
No Settlement Land

Watersheds and Drainage Regions
Yukon River Drainage Area, Stewart, Upper Stewart

NTS Map Sheet Numbers
105M12

Regional Land Use Plans
No Land Use Plans

Communities within Project Boundary
No Communities

Closest Communities
Mayo: 7.0 km

Part 4 — Project Location and Details

- (●) **I would like to provide project details using the online project proposal form**
- ( ) **I would prefer to upload project documents that include all of the required information**

Describe the purpose of the proposed project.

The principal purpose of the Project is to ensure there is sufficient generation capacity to meet near term peak winter energy demands and to have sufficient dispatchable capacity in the case of an N-1 emergency on Yukon's electrical grid. Though not related directly to the Project's purpose and need, it will also provide a redundant source of electricity supply close to the community of Mayo in the event of a regional transmission line or local hydro electric generation failure.

Yukon is an islanded grid and consumers are not able to get electricity from neighbouring utilities in the event of an emergency. Yukon Energy uses the N-1 planning criterion. N-1 considers the loss of the single largest source of winter electrical generation; currently the Aishihik Generating Station (37 MW) occurring at a time of peak (non-industrial) demand on our coldest winter day. The N-1 criterion is a standard utility planning criteria used to ensure system reliability during the largest single point failure on the system. Yukon Energy needs to have enough thermal capacity online each winter to meet N-1.

Schedule delays associated mainly with supply chain issues have pushed the in-service date for capacity-increasing projects already underway into 2024 and beyond. At present, to meet Yukon Energy's capacity needs in winter, a third site for mobile rental diesel generation is required outside of Faro and Whitehorse. Existing thermal generating stations in Faro, Whitehorse, Dawson City, and the Village of Mayo do not have sufficient space or transformation capacity to house additional mobile generators at this time.

The main drivers for additional diesel mobile/rental units are incremental load growth, a reduction in the design temperature for meeting customer demand in winter (i.e., capacity requirements considering decreasing winter air temperatures), scheduled asset retirements, and delays to other capacity projects, as mentioned above. Under these conditions another site for thermal generation is required to house the additional capacity required on the system in winter. The existing Mayo Hydro Generating Station site offers the necessary land and nearby transformation capacity required to meet the Project's purpose in a timely and effective manner.

Part 5 — Project Description

Describe all applicable aspects of the planning, construction, operation, ongoing restoration activities, decommissioning and reclamation phases of the proposed project. Upload a Site Plan or Diagram.

Yukon Energy is planning to install a secondary thermal generation site approximately 7 km north of the Village of Mayo and 4 km north of the Mayo Airport for backup purposes. The project would be located at the existing Mayo Hydro Generating Station, to meet peak demand and support emergency supply requirements, as an interim measure while renewable energy and other capacity replacement projects are being developed. The proposed diesel generators will not run continuously and are only intended to provide electricity quickly during loss of hydro generation, peak hours of winter energy demand, or emergencies.

Project activities will include:

• Operation: Operation of EPA Approved Tier 2 Caterpillar 3516C Diesel Generators (specifications attached), up to a maximum operating capacity of 4.9 MW, during peak demand (winter) and during emergencies to complement hydro power and other thermal resources on the Yukon's electrical grid, also known as the Yukon Integrated System (YIS).

• Construction: Installation and commissioning of up to five (5) rental diesel generators at 1.8 MW each, connections to transformation at Yukon Energy's S249 substation and two fuel storage tanks on previously disturbed Yukon Energy-owned lands at the Mayo Hydro Generating Station. Two (2) of the up to five (5) units installed at site are intended to be available only as back up in case of emergencies (e.g., failure to start of another unit).

• All laydown activities and siting during construction will be on a previously cleared area that will require minimal site civil activities, including some site grading, compacting, and the installation of a standard grounding grid. The diesel generators will be housed in containerized mobile trailer units and placed on a gravel pad at the site. The construction phase is expected to take several months in Q3 and Q4 of 2023, with operations starting late 2023 with the onset of winter conditions (likely December 2023).

• At this time it is unclear for how long the generation capacity at this location will be required. As such, the temporal scope of the project is tentatively established as ten years. Yukon Energy has committed to re-engage FNNND and the Village of Mayo in spring 2024 and report how this generation capacity was used during winter 2023-24.

• Storage of diesel fuel with two portable double-walled 75,000 litre storage tanks. The fuel storage tanks will be installed with spill prevention measures, including secondary containment and continuous monitoring to detect a loss in pressure, and recovery system. The estimated winter period average fuel requirement is for less than 1 B-train truck load (~62,000 litres) per week between December and April.

• Existing Yukon Energy staff in Mayo will operate the units as required, with the potential for some additional local hiring for a few additional on-call operators and fuel delivery supervisors. The units will also be connected to Yukon Energy's SCADA system and will be configured to operate remotely, as required.

• Decommissioning/closure: The units will be seasonally decommissioned until such time as they are no longer needed on the YIS. Depending on the engine supplier's needs the units may be relocated offsite for use with other customers during the non-winter period or left in place for use the following winter.

Project location and site layout maps are attached.

Part 6 — Existing Environmental and Socio-economic Conditions

Describe the environmental conditions in and around the project area including land, water, air, vegetation, wildlife, fish etc.

The project is located within the Yukon Plateau North ecoregion of the Boreal Cordillera ecozone. Moist sites are dominated by black spruce with moss or lichen understory, while white spruce, aspen and/or lodge pole pine are found in more well-drained sites. Mixed canopy forests are common due to frequent forest fires. Willows, sedges and aquatic vegetation dominate the margins of small lakes and wetlands. (YESAB, 2020)

The Project area is located adjacent to the Mayo River, which flows into the Stewart River. The Project site is located approximately 175 m east of the Mayo River. Peak discharge into the Stewart River watershed occurs in May to June, from snowmelt. Water levels tend to peak between mid May to the end of June.

The Mayo River is prominent spawning habitat for Chinook salmon, however most fish do not reach further upstream on the Stewart River than Fraser Falls. Lake trout spawn in September in lakes including Mayo Lake, Janet Lake, Minto Lake. Fish species that are found in the Mayo area include arctic grayling, northern pike, longnose sucker, lake chub, burbot and slimy sculpin (EDI, 2009).

Mammal species known to occur in this ecoregion include, but are not limited to, grizzly and black bears, woodland caribou, moose, wolverine, marten, wolf, lynx, red fox, beavers and other small mammals. This ecoregion also provides breeding habitat for a number of raptors, songbirds, forest birds and waterfowl. A wildlife key area overlies the Project area, for raptor reproduction (birth, nest) for the summer (June to August; GeoYukon). (YESAB, 2020).

Describe the socio-economic conditions and the extent to which people use, work, recreate or travel through the project area.

The Project is located approximately 5.6 km north of the Village of Mayo, along the Silver Trail Highway. The Project site is also that of the Mayo Hydroelectric Generating Facility, which has been in operation for over 70 years. The Village of Mayo is located at the confluence of the Mayo and Stewart rivers. The Village of Mayo and the Project are located within the Traditional Territory of the First Nation of Na-Cho Nyäk Dun. The average population of the community of Mayo is 450. The economy of Mayo is focussed on providing services to the community and surrounding area. Government services, including First Nation and territorial, make up half of the jobs in the village. The Project is located outside of the community and municipal boundaries of Mayo.

Placer mining, exploration, and mining are prevalent in the area (Village of Mayo, 2023). The majority of placer mining in the area occurs in the Minto Creek, Duncan Creek, and Davidson Creek areas. These creeks all flow into Mayo River or Mayo Lake, as they are part of the Mayo River watershed.

The Project overlies Trapping Concession 84 and 407, and Outfitting Concession 7. Based on a desktop review, using the GeoYukon digital map database, there are no designated historic sites, heritage routes, or heritage sites located within the Project area, or in proximity.

Part 7 — Environmental and Socio-economic Effects and Mitigations

Describe potential positive and adverse environmental and socio-economic effects of the proposed project. For each potential adverse effect, provide a mitigation to minimize or avoid the effect.

Assessors determine the significance of adverse effects based on specific criteria and the relevant context of the project. Provide your understanding of these criteria and their context as they relate to any adverse effects related to your project or proposed mitigations.

Effect:

VALUED COMPONENT 1 - AQUATIC SPECIES AND HABITAT Potential Effect 1: Deterioration of water quality through leaks or spills Degradation of surface water quality resulting from a leak or a spill could impact aquatic species and habitat. It is unlikely that a leak or spill would reach a waterbody as there is no surface connection, unless the spill is large and not contained or not properly remediated. Degradation of groundwater quality resulting from a spill could impact surface water quality if contamination reports to a surface water body. Because the nearest water body (Mayo River) is located approximately 175 m away from the project site, the risk of contamination affecting water quality in a surface water body only exist if a spill is not properly remediated.

Mitigation:

The fuel storage tanks will be installed pursuant to non-discretionary codes and standards including a variety of spill prevention and response measures, such as secondary containment, continuous leak detection, and a recovery system. In addition to non-discretionary legislation respecting fuel storage and handling, Yukon Energy has several Environmental Work Practices that will be strictly adhered to, including: • Fuels, lubricants and coolants • Spill Response • Spill Prevention • Hazardous and special waste management

Significance:

With the implementation of the above mitigation measures there are no expected residual effects.

Effect:

VALUED COMPONENT 2 - TERRESTRIAL SPECIES AND HABITAT Potential Effect 1: Soil/vegetation contamination through leaks or spills White the Project site is already disturbed and has been in active use since the original development in the early 1950s, the project does have the potential for soil and vegetation contamination from a fuel, lubricant, or coolant leak or spill. This effect would be localized unless the spill is not properly contained or remediated.

Mitigation:

Design and operational mitigation measures outlined in the previous section apply to this potential effect as well (see VC #1, above).

Significance:

With the implementation of the above mitigation measures, there are no expected residual effects.

Effect:

VALUED COMPONENT 2 - TERRESTRIAL SPECIES AND HABITAT Potential Effect 2: Habitat avoidance due to increased site activity during construction and noise during construction and operation Human activity and associated noise during construction or operation of the Project could result in wildlife avoiding habitats near the Project Site. The project is located within a key wildlife area for raptor reproduction (birth, nest) for the summer (June to August). Habitat avoidance related to project construction period activities may result in increased energetic demands for individuals, deflection to habitats with reduced quality nesting, or increased mortality due to lower quality security cover of alternate habitat. The project is located on the site of an existing industrial development with frequent daily human activities, including the use of vehicles and other machines continuously year-round. The generators are only expected to operate in winter, which does not overlap with critical habitat use by raptors and other birds.

Mitigation:

The site is fenced and not used extensively by wildlife. Construction is anticipated to happen over several months in Q3 and Q4 2023, which mostly outside the bird nesting period for the area. There is significant suitable habitat for terrestrial wildlife outside the immediate project area for wildlife to utilize. Generator operation will be sporadic during the winter (outside of the raptors nesting period) and generators will be enclosed, dampening noise emissions to some degree.

Significance:

Some direct site avoidance by wildlife is expected, but not predicted to be significant.

Effect:

VALUED COMPONENT 3 - HUMAN HEALTH Potential Effect 1: Reduced Ambient Air Quality from Diesel Emissions Diesel generators produce air contaminants in combustion gases, including criteria air contaminants (CACs) such as carbon monoxide (CO), coarse and fine particulate matter (PM10 and PM2.5), nitrogen dioxide (NO2) and sulphur dioxide (SO2). Potential adverse effects on human health include irritation of the eyes, and of the respiratory system. In Yukon, the Yukon Ambient Air Quality Standards (YAAQS) are used to determine allowable exposure limits and regulate emission rates. Effects on human health result from the cumulative interaction of emissions from Yukon Energy and all other sources or air contaminants (vehicular traffic, home heating, other industrial activity) in the airshed. Yukon Energy and YESAB have previously assessed the potential effects of diesel generator operations on ambient air quality in Faro (2021-0115) and Whitehorse (2011-0241). The Faro air dispersion model (WSP, 2020a) evaluated the effect of diesel generation capacity of up to 15.5 MW within a few hundred metres of the nearest sensitive receptor. The cumulative predicted concentrations were found to be below the YAAQS for all CACs, except for 1-hour NO2 concentrations. The NO2 exceedances were found to be spatially limited to a confined area surrounding the facility, with a low frequency of occurrence (0.21% of the time, i.e., approximately 18 hours per year) at the maximally impacted Faro town receptor. No exceedances were predicted at the nearest residence or sensitive receptor (380 m from the facility). The Whitehorse air dispersion model (SENES, 2011) found that the cumulative effect of CO, SO2 and NO2 emissions from Yukon Energy's diesel facilities, in combination with background concentrations of those contaminants (available from the Whitehorse NAPS station), would not result in the ambient air quality standards for CO, SO2 or NO2 being exceeded anywhere in Whitehorse, at any time, in any Scenario, including even under the extreme (and very unlikely) "worst case" operating conditions represented by Scenario 3. Note that Yukon Government updated the 1-hour NO2 YAAQS in 2019 from 400 µg/m3 to 113 µg/m3, therefore modelling results under the worst-case scenario didn't exceed the 1-hour NO2 YAAQS in place at the time (2011), but would be in exceedance of the new 1-hour NO2 YAAQS in localized areas, under worst-case meteorological conditions. Note that the referenced assessment of the Whitehorse Rapids Thermal Generating Station was for a generating station with over 20 MW of installed pre-tier diesel generators. The SENES study also found that under the extreme (and very unlikely) "worst case" operating conditions represented by Scenario 3, Yukon Energy's incremental contribution to air quality in Whitehorse would remain within the Yukon PM2.5 standard everywhere in Whitehorse, except, on two days of the year only, at the maximum point of impingement (POI) on the western edge of the Yukon Energy facility property line (where members of the public are not likely to be present except for very brief periods of exposure), as a result of building downwash effects on the plumes from the facility. Because the planned generation capacity of the present Mayo project (4.9 MW) is much less than that of the worst-case scenarios modelled for Faro (15.5 MW) or Whitehorse (>20 MW), and because the nearest residence or sensitive receptor in Mayo is located farther away from the generators (greater than 1,000m) than in the case of Faro (380 m) or Whitehorse (340 m), the effects on ambient air quality at sensitive receptors of operating the backup diesel generators in Mayo are expected to be of much smaller magnitude and much lower frequency than in the two cases previously modelled. The air dispersion models predicted occasional short duration exceedances of the NO2 and PM2.5 YAAQS in localized areas for Faro and Whitehorse, but those facilities include generating capacities that are 3 to 6 times greater than what is being proposed for this Project. As such the potential for significant adverse effects to air quality are considered negligible.

Mitigation:

Yukon Energy's use and reliance on its diesel facilities will be constrained by the terms and conditions of its Air Emissions Permit, as well as the requirements of relevant legislation that applies to the project, including the Environment Act and the Air Emissions Regulations. Compliance with the conditions of the air emissions permit are expected to mitigate the potential for environmental and/or human health effects to result from Yukon Energy's occasional use of the thermal generators installed for this project. Furthermore, as outline in the Project Description, Yukon Energy expects that these units will be near the very bottom of the YIS stacking order for thermal resources with most thermal generation being dispatched nearer the largest load centre, which is Whitehorse.

Significance:

There is potential for residual adverse effects on air quality. Direction Negative: Effects represent a real or potential decrease in quantity, quality or other attributes of the environmental component. Magnitude Low: Measured or estimated effect results in a noticeable affect to the environmental component (i.e., quantity, quality or other attribute) compared to existing conditions. Effects are within the understood range of natural variation and may require specialized mitigation. In this case the cumulative air emissions in the project area are expected to remain below the Yukon Ambient Air Quality Standards. Geographic Extent Local: Effect occurs within the Project Study Area. Duration Long-term: Effect persists beyond the construction. Reversibility Reversible Short-term: Effect can be reversed quickly after the activity ceases. Frequency Sporadic: Effect that occurs at sporadic or intermittent intervals during any phase of the Project Probability Possible Overall Significance determination - Not Significant

Effect:

VALUED COMPONENT 3 - HUMAN HEALTH Potential Effect 2: Increase in noise levels Elevated noise levels in any environment can lead to annoyance, stress, sleep disruption, decreased ability to concentrate, lowered learning performance, and other adverse health effects in humans (enHealth Council, 2004). For this project noise levels may be elevated during construction and/or operation. Noise during construction will originate from equipment, tools, or installation of the Project infrastructure. Noise during operation will originate from the intermittent use of the diesel generating units and will primarily be noticed through the exhaust system of the unit. The diesel units will be housed in containers that will provide some measure of insulation to reduce noise disturbance. It is possible that noise generated by the Project could disturb local residents specifically if noise is generated outside of normal work hours (i.e., Monday to Friday, 7:00h to 22:00h) or on weekends. Construction activities will occur during normal work hours in an existing industrial setting. Additional ambient noise generated during construction is expected to be avoided or reduced if mitigation measures presented below are implemented. The effect on noise levels is expected to be not significant during construction; therefore, noise during construction is not carried forward as a residual effect. Yukon Energy and YESAB previously assessed the effect of diesel generators operation on noise levels in Faro (2021-0115). The noise impact assessment (WSP, 2020b) evaluated to change in noise levels for an increased capacity of 15.5 MW compared to the existing sound level in Faro, and found that the increase would be less than 1 dBA at the nearest community receptor. The typical threshold for an increase in sound level that is considered to be "barely perceptible" by the human ear ranges from 1 to 5 dBA (Health Canada, 2011). The operating capacity of the proposed Mayo Project (4.9 MW) is much less than the modelled scenario for Faro (15.5 MW) and well below the 42 MW of total thermal generation installed at Whitehorse Rapids, therefore the magnitude of effects on noise levels is expected to be much smaller than in Faro and Whitehorse despite the likely low ambient sound levels in this rural setting. However, because noise levels are measured on a logarithmic scale, and the relative increase due to project activities compared to baseline is smaller when baseline levels are higher, effects in Mayo may not be proportionally less. Baseline noise levels in Mayo are not known, so to ensure conservative effects assessment, this effect is carried forward in the assessment of significance of residual effects. Yukon Energy has also maintained a noise monitoring program at the Whitehorse Rapids Generating Station. Results indicated that at Yukon Energy's Riverside substation near homes on Nisutlin Drive (approx. 250 metres from the diesel plant) noise levels were higher than levels permitted by the British Columbia Oil and Gas Commission (BC OGC) and Health Canada, but that near homes on Bell Crescent (approx. 450 metres from the diesel plant) noise levels were lower than BC OGC and Health Canada guidelines (Hemmera, 2020). The acoustic monitoring program also identified that YEC's older permanent diesel engines installed at Whitehorse Rapids had higher sound levels that the mobile rental diesel engines in use at the station.

Mitigation:

No significant adverse noise effects are predicted, but Yukon Energy will monitor the maintenance of the diesel generators and will ensure that all equipment operating during construction is in good working order and equipped with appropriate noise mufflers. Generators will be enclosed inside containers and the distance of the noise source to the nearest receptor being greater than 1,000 m combined with the presence of significant forest cover is expected to avoid any significant adverse effects.

Significance:

There is low potential for residual adverse effects on noise levels. Direction Negative: Effects represent a real or potential decrease in quantity, quality or other attributes of the environmental component. Magnitude Low: Measured or estimated effect results in no noticeable effects to the environmental component (i.e., quantity, quality or other attribute) compared to existing conditions. Effects are within the understood range of natural variation. Effects are predicted to be under thresholds established by the British Columbia Oil and Gas Commission (BC OGC) and Health Canada. Geographic Extent Local: Effect occurs within the Project Study Area. Duration Short-term: Effect occurs during relatively short periods of operations (minutes to hours in most cases, with a few days at maximum). Reversibility Reversible Short-term: Effect can be reversed quickly after the activity ceases. Frequency Sporadic: Effect that occurs at sporadic or intermittent intervals during any phase of the Project Probability Possible Overall Significance determination - Not Significant

Effect:

VALUED COMPONENT 4 – RELIABLE ENERGY SUPPLY Potential Effect 1: Difficulty Meeting Non-Industrial Customer Demand in Winter As an islanded grid with no connection to another electrical grid, without the project there is a potential for the utility to be unable to meet on non-industrial customer demand during winter months potentially resulting in distributed or rolling blackouts. Effects associated with an unreliable or insufficient electrical system in winter can include infrastructure damage due to freezing, operational disruptions to institutions such as hospitals, governments, and schools, as well as local businesses. Human health and wellness effects associated with the ability to provide sufficient heat and lighting during freezing conditions may also occur.

Mitigation:

The Project will support the provision of reliable back-up electrical energy for the grid during periods of peak demand or in emergencies when sufficient power is otherwise unavailable.

Significance:

The Project will result in a positive effects on society in Yukon in the context of this valued component.

Part 8 — Additional Information

Provide information respecting any matter a decision body has asked the Designated Office to take into consideration under paragraph 42(1)(i) of the Act.

Additional information or documentation specific to the activity being proposed can also be included in this section as it may assist in evaluating your project proposal.

Information could include:

- Applications for authorizations or permits required to undertake the project.
- Record of any public participation and comment. Include details on people and organizations involved, comments and issues raised and any subsequent changes to project planning.

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