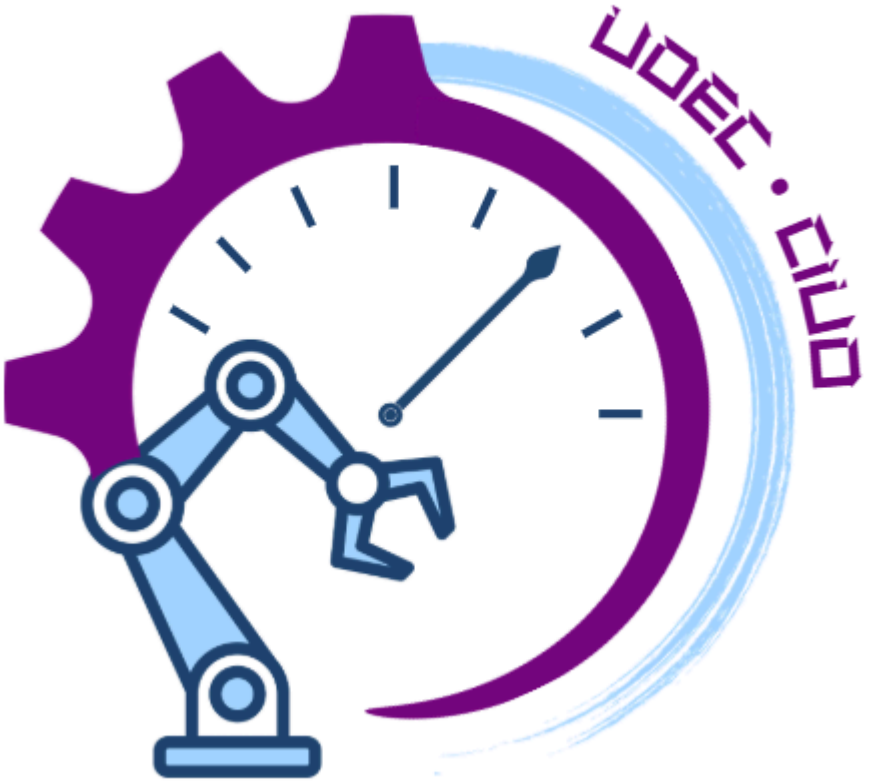


university of OTTAWA

ENGINEERING COMPETITION

Engineering Consulting Competition 2026

uOttawa Engineering Students' Society

VP Internal

competition@uottawaess.ca

This document outlines requirements and expectations for competitors in the Consulting category at uOEC 2026. Please read this document carefully and in full.

Overview

Competitors are challenged to develop a feasibility conceptual plan/recommendation for a large-scale engineering problem. The proposal must present their solution to the judge (acting as clients), balancing technical information with feasibility, finance, sustainability, and risk management.

Scenario

Background
Qulliq Energy Corporation (QEC), owned by the Nunavut government, is responsible for generating, transmitting, and distributing power throughout the territory. QEC runs 25 diesel plants in 25 communities. Roads or electrical lines do not link these communities, and there is no backup system. Almost all of the power is generated using diesel fuel imported in the summer and stored for year-round usage. [1][2]

Current Power Generation Cycle?
Purchasing and Transport: The government of Nunavut buys diesel fuel from eastern regional markets and ships it north during the summer shipping window.

Storage and Generation: Fuel is then moved to all communities, which have mass storage tank farms to meet year-round demand. Fuel is piped directly into local diesel generators, which transform mechanical energy into electricity and distribute it to residences and commercial buildings. [2]

Challenge associated with diesel generation?
Even though Nunavut is 100% reliant on diesel fuel, there are big risks that come with diesel that impact the environment, our financial situation, and the social and cultural health of our communities:

- Since diesel fuel is imported to the Territory, diesel spills into the seas are likely to occur, seriously harming habitats and the animals and plants that rely on them.
- Burning diesel fuel also emits hazardous air pollution, which damages the soil, water, and plants that Nunavut's wildlife depends on.
- The cost of diesel fuels continues to rise. This results in regular rises in power bills in Nunavut, which consume more and more of their monthly budgets. [2]

Objective

Qulliq Energy Corporation (QEC), in collaboration with the City of Iqaluit, has retained your engineering consulting firm to develop a 10-Year Integrated Renewable Energy and Energy Storage Master Plan for Iqaluit. The primary objective of this plan is to achieve a 40% to 50% reduction in annual diesel fuel consumption used for electrical power generation by the end of Year 10, while serving as a scalable microgrid roadmap for Nunavut's 24 other remote communities.

The choice of clean energy technologies is completely open and unconstrained (e.g., wind, solar PV, battery storage, geothermal, and hydro). However, teams must justify their selection based on Arctic climate survival (-50 Celsius extreme minimums and “black-sky” events, prolonged polar blizzards with zero solar and wind availability), physical logistics, environmental impact, and lifecycle economic return.

Rules and Constraints

The maximum number of individuals for an Engineering Consulting team is four (4).
Internet use is permitted during the competition for research and preparation.
There is no fixed budget, but the team must show their final expenditure, as well as how fuel savings offset initial capital lost.
Your consulting team is tasked with designing a new renewable energy system. The design report and presentation should address topics including:

1. **Design feasibility & technicality**
    - Target performance metric of 40%-50% reduction in annual consumption by the end of Year 10.
    - Maintain backup generation redundancy, ensuring 100% uninterrupted power during severe Arctic weather.
    - Competitors should clearly outline key operational milestones across the timeline.
    - The proposed system will meet both electrical and heating demand in winter conditions.
    - Scientific research with reliable sources to support the procedures.

2. **Environmental & Social Impacts.**
    - Quantify the reduction in greenhouse gas emissions (CO2, N2O, particulate matter) corresponding to the 40%–50% diesel offset.
    - Localized environmental impacts, including permafrost and wildlife interaction during construction and operation.
    - Localized social impacts for residences during both 10-year buildout and long-term operation.

3. **Economic Analysis**:
    - CapEx breakdown (upfront cost for materials, installing equipment, and system construction)
    - OpEx (daily operations, energy consumption, regular maintenance, and repairs)
    - Cost assumptions for market pricing and scaling factor of scalable model
    - A chart with a timeline breakdown covering designed, approved, constructed, commissioned, and operational within the period.

4. **Risk Analysis & Assumptions**:
    - Technical and operational limitations
    - Potential failures and possible solutions to it

Your team’s design and organizational approach to achieving these objectives is left to your discretion.

Durations:

- Design duration is from 8:00 am to 12:00 pm.
- Teams must submit their reports and presentations by 12:00 pm or late penalty will be applied.
- Judging duration starts at 1:00 pm
    - Presentations will be randomized and announced 30 minutes before judging.
    - Presentation Duration:six (6) to eight (8) minutes maximum.
    - Question Period Duration: three (3) minutes maximum.

Deliverable

You are required to submit to the VP Internal, before the end of the design period, the following:

a. Report: A design proposal report from six (6) to eight (8) pages (not including appendices) detailing your proposed solution. The report will be made available to the judges before each team's presentation. The report must contain the following:

- Front matter, including a title page, table of contents and an abstract (maximum 250 words).
- Introduction to the topic and its context.
- The body of the report must address the points outlined in the scenario above in a clear, organized manner (appropriate use of headings is recommended).
- Conclusion must summarize the main findings and outline future recommendations.
- All research conducted must be properly cited (choice of citation style will be left to your discretion but must be consistent) and figures formatted appropriately.
- Everything counted toward your page requirement except references and appendices.

Refer to engineering reports done in your courses and/or engineering journals for specific guidance on formatting and writing style.

b. Presentation: A file containing your presentation on your proposed solution. Your presentation should follow the structure of your report and highlight the most important aspects of your solution and findings. Appropriate use of visual aids should enhance your points. Remember that your goal is to convince the judges/clients that your solution is feasible, innovative and well-rounded.

These submissions must be made to the VP Internal before your competition time elapses by email, internal@uottawaess.ca. Please note that this is a hard submission deadline, and if your submission is not received by then, your team will be penalized (refer to the rubric). Volunteers will be around counting down the time and reminding you to make your submission.

Refer to the judging rubric (provided below) for criteria to keep in mind when designing your solution and what the judges will be looking for.

Judging and Scoring

For your reference, the judging matrix is provided below.

Solution (60)	Addresses Problem Statement	/ 5
	Environmental & Social	/ 5

	Economic Analysis	/ 20
	Design Feasibility	/ 20
	Risk Analysis	/ 10
Report (15)	Clarity	/ 5
	Writing Style and Professionalism	/ 5
	Design Justification	/ 5
Presentation (25)	Voice	/ 5
	Articulation and Timing	/ 10
	Visual Aids	/ 5
	Response to Questions	/ 5
Penalties	Plagiarism	-50
	Insufficient Citation	-50
	Documents Received After Deadline	-50
	Absent Team Member	-25
Total		/ 100

Remember to familiarize yourself with the rulebook for more details on what is expected, and reach out to the VP Internal for any questions. Refer to the uOEC 2026 rulebook for general rules. Where this package and the rulebook differ, this package takes precedence.

References

[1].https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/province-territory-energy-profiles/nunavut.html

[2]. https://www.qec.nu.ca/power-nunavut

[3]. https://www.sciencedirect.com/science/article/pii/S1364032121012922?ref=pdf

[4].https://weatherspark.com/compare/y/27471~19863/Comparison-of-the-Average-Weather-in-Iqaluit-and-Toronto

[5].https://uploads.visionw3.com/sitefiles/arcticsealift.com/documents/2025/2025-TARIFS-NSSI-EN.pdf

[6]. https://blazeestimating.ca/labour-calculator/

Helpful Resources

Appendix A: Baseline Data Tables

A.1 Current Iqaluit Electrical & Thermal Status [3]

Variable	Value	Notes
Peak Electrical Demand, (MW)	10.3	Winter maximum load
Base Electrical Demand, (MW)	4.50	Summer minimum load
Average Electric Demand, (MW)	7.53	

Annual Electrical Consumption, (MWh/year)	65,000	
Annual Diesel Fuel Usage, (L/year)	19,000,000	Power generation Only
Annual Diesel Fuel Usage, (L/year)	7,100,000	Heating

A.2 Climate & Weather Conditions [4]

Variable	Value	Notes
Extreme Low Temperature, (°C)	-50	Extreme winter low
Average Temperature Summer, (°C)	7.1	June - September
Average Temperature not Summer, (°C)	-10	October - May
Average Wind Speed, (m/s)	7.2	
Solar Availability in Winter, (hrs/day)	2-4	Polar night/low sun angle October - February
Solar Availability in Summer, (hrs/day)	20-24	

A.3 Financial & Shipping [3][5][6]

Variable	Value	Notes
Purchase Price for Diesel, ($/L)	2.00	
Selling Price for Electricity, ($/kWh)	0.75	
Sealift Cost, ($/ton)	350	
Sealift Window	July - October	No heavy road access
Local Skilled Labour Cost, ($/hrs)	75	Including Electrician, Mechanical/Construction Technician