Sustainable Energy Systems Portfolio (SESP)

Carleton University
Department of Mechanical and Aerospace Engineering
Main Focus

• In this project, the main focus is ENERGY SYSTEMS.

• We all know that this is a very important and timely topic.
  – Fossil fuels are becoming scarcer.
  – The new energy systems should be cleaner and sustainable.
Main Objective

- The main objective of this design project is
  - to optimize the energy mix for a given location in such a way that the supply mix can provide the energy needs of the region using cleaner and sustainable energy systems.
  - The focus is not only on a specific energy generation method but also a system level evaluation of the problem.
Iqaluit
The main question then is what energy systems will be *the most optimum choice*, considering the needs of a remote community and local conditions.
Constraints

• The main task is then to optimize the energy portfolio for the chosen location with specific constraints.

• Major constraints for the optimization include
  – performance
  – environmental impact of the portfolio (cleanliness, noise levels)
  – availability
  – cost
  – sustainability
  – maintainability
  – storage
  – accidents and mitigation
  – ....
Integration
<table>
<thead>
<tr>
<th>Team</th>
<th>Nuclear</th>
<th>Wind</th>
<th>Solar</th>
<th>Diesel</th>
<th>Storage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assigned Capacity</td>
<td>24 MWt</td>
<td>0.5 MWe</td>
<td>1 MW</td>
<td>4 MW</td>
<td>2.2 MW</td>
<td>11.9 MW, excluding storage</td>
</tr>
<tr>
<td></td>
<td>6.4 MWe</td>
<td></td>
<td></td>
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Learning Objectives

• Understanding of the innovative and alternative energy systems and its applications

• Optimizing the energy portfolio for a specific region by considering various constraints: performance, risk assessment, environmental impact, availability, sustainability and cost

• Developing an understanding of the big picture design solutions

• Designing and testing the chosen systems to assess the performance, potential risks and their mitigation
Hardware
Project Team

- Faculty Members
  Edgar Matida
  John Gaydos
  Tarik Kaya

- External Advisors (TBC)
  Amin Fereidooni, Ph.D., NRC
  Hamza abo el Ella, Ph.D., NRC
  Vinh Tanh, Ph.D., Retired CNSC