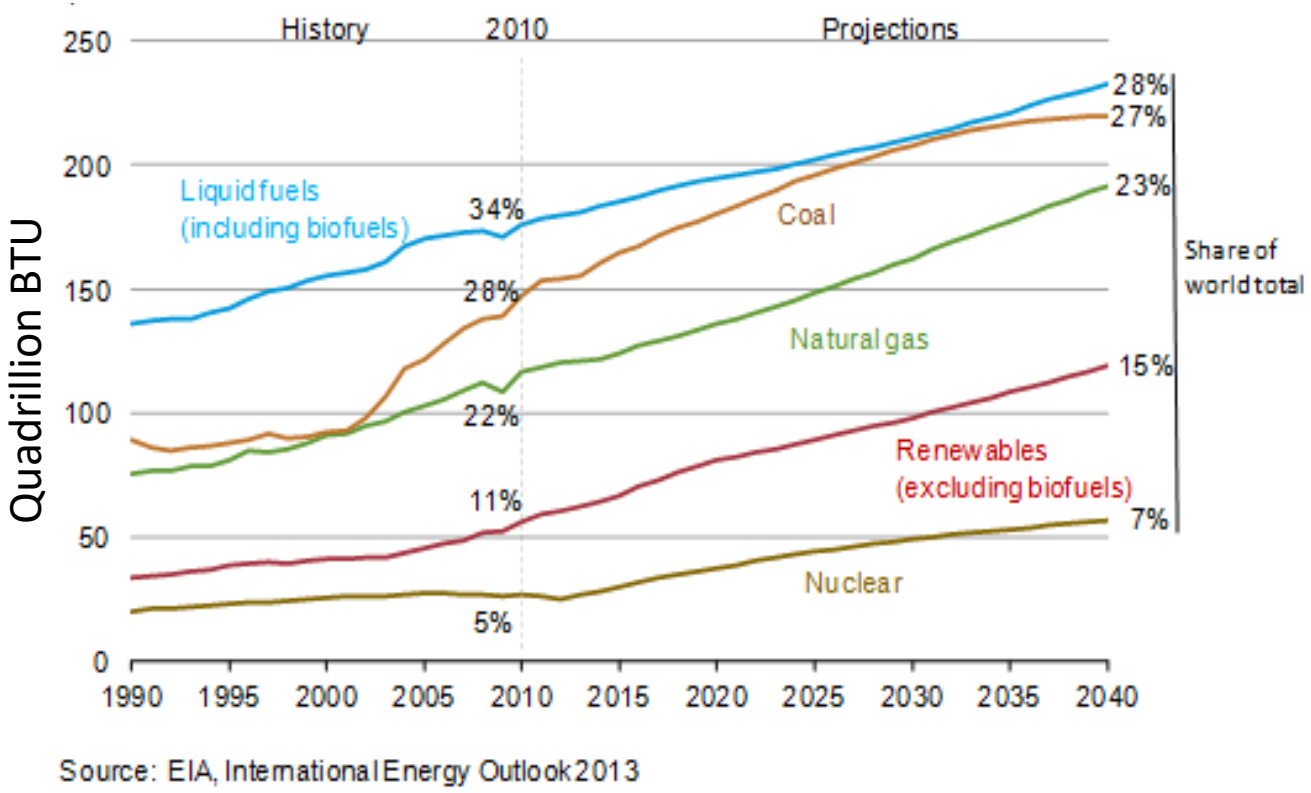
Mechanical & Industrial Engineering
Course and Option Talk – **Energy and Environment**

Why Energy & Environment?

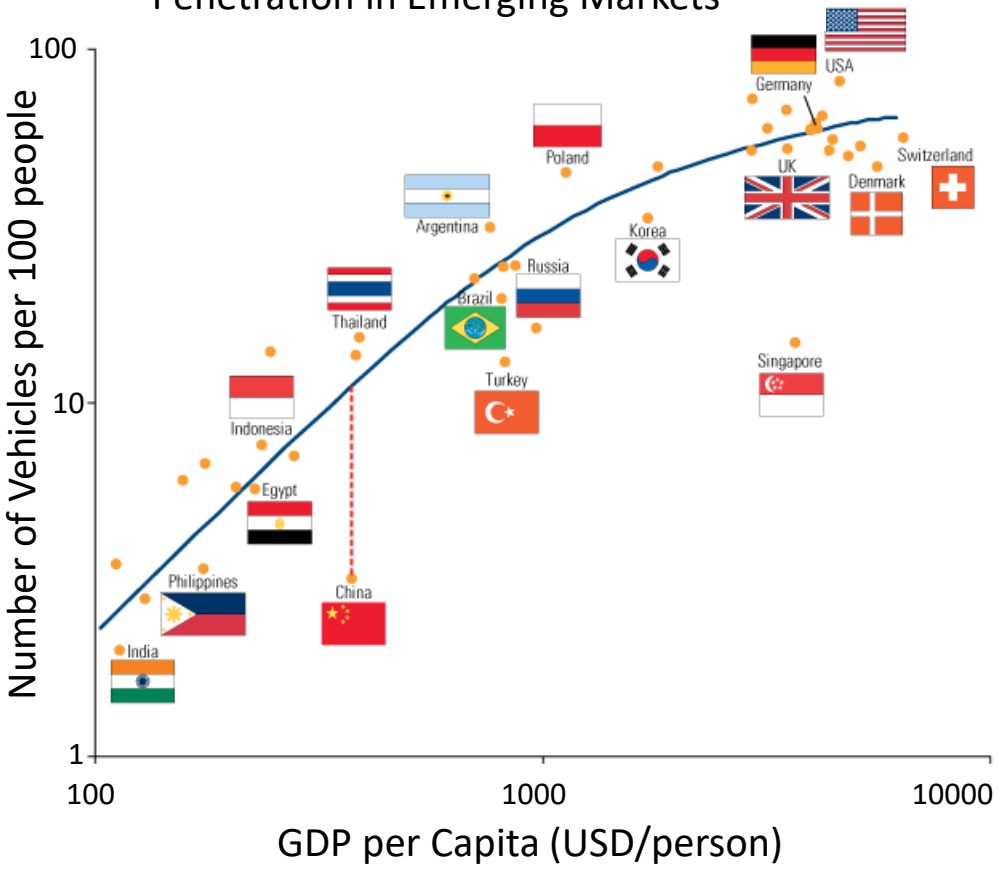


Source: EIA, International Energy Outlook 2013

Why Energy & Environment?

Beijing Fog

Catch Up Potential for Motor Vehicle Penetration in Emerging Markets



Energy needs are growing

Need creative solutions

3rd Year Curriculum Overview

FALL

- MIE301: Kinematics and Dynamics of Machines
- MIE312: Fluid Mechanics I
- MIE342: Circuits with Applications to Mechanical Engineering Systems
- MIE358: Engineering Economics and Accounting
- Natural science requirement
  - May consider CIV300 – Terrestrial Energy Systems

WINTER

- MIE315: Design for the Environment
- MIE313: Heat and Mass Transfer
- MIE334: Numerical Methods I
- Two stream option courses

4th Year Curriculum Overview

FALL

- MIE491: Capstone Design
- Two stream option courses
- One Technical Elective
- Other: HSS or CS Elective

WINTER

- MIE491: Capstone Design
- Three Technical Elective courses
- Other: HSS or CS Elective

Energy & Environment – Core Courses

3S Term – **MIE311 – Thermal Energy Conversion**

- Application of thermodynamics to energy systems
- Understand how different energy systems work
  - Examples: Electricity Generation, Transportation, Climate Conditioning

MC120 – Energy Lab

UofT Co-Gen Plant

Energy & Environment – Core Courses

4F Term – **MIE515 – Alternative Energy Systems**

- Fundamentals of alternative energy sources and technologies that extract that energy
- Course delivered completely online
  - Examples: Solar, Wind, Tidal, Geothermal, Energy Storage, Smart Grid

www.morgansolar.com

dearchimedes.com

www.hydrostor.ca

Notable Technical Electives

Pickering Nuclear

www.opg.com

MIE407/MIE408 – Nuclear Engineering I/II

- Overview of nuclear fission reactions and application in Generation IV nuclear reactors.

MIE516 – Combustion and Fuels

- Fundamentals of combustions theory.
- Design of combustion systems for gaseous, solid and liquid fuels.
- Use of alternative fuels (biofuels, hydrogen, etc.)

www.hydrogenics.com

MIE517 – Fuel Cell Systems

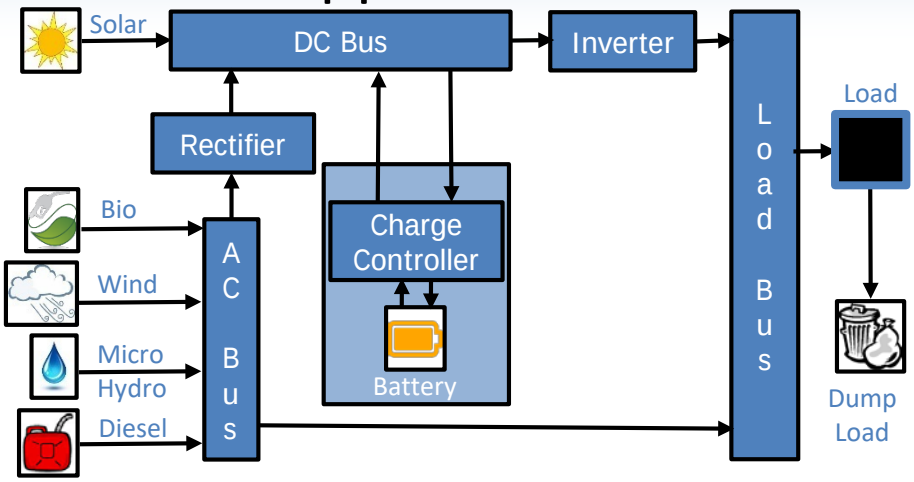
- Fundamentals of hydrogen and high temperature fuel cells.
- Applications in transportation and stationary power generation.

Energy & Environment – Thesis & Capstone Opportunities

- Capstone Projects – Winds of Change

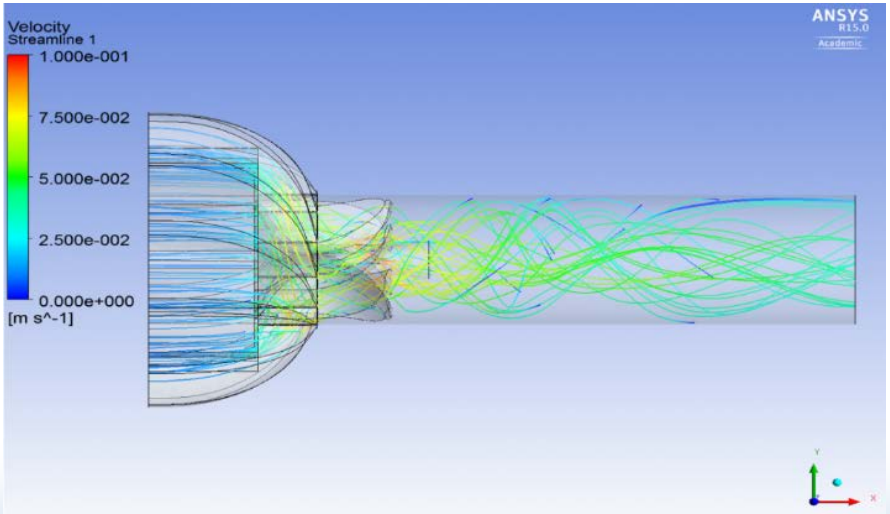
Energy & Environment – Thesis & Capstone Opportunities

Thesis Opportunities



Micro-Grid Configuration For Remote Communities

Design and Optimization of Pico-Hydro Generator for Water Disinfection



Energy & Environment – Where you can apply your knowledge

Power Generation

Portlands Energy Centre

- Natural Gas
- Combined-Cycle
- 550 MW (2009)

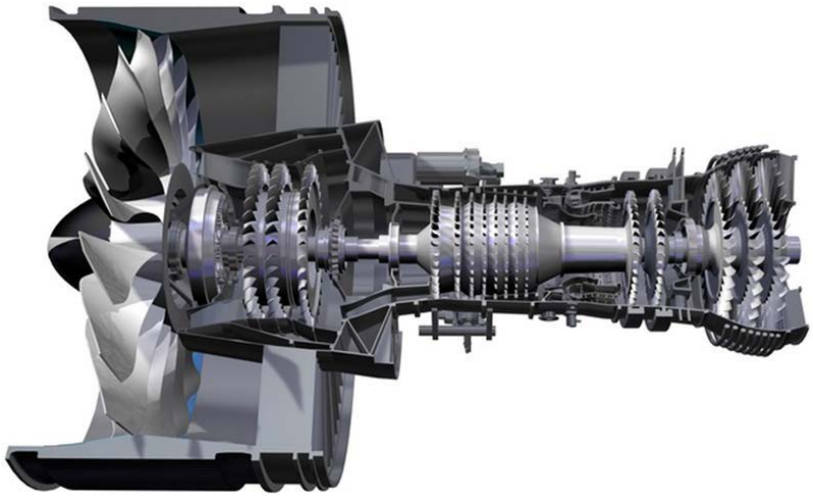
Sarnia Solar Plant

- Canada's Largest Solar Plant
- 97 MW (2010)

Energy & Environment – Where you can apply your knowledge

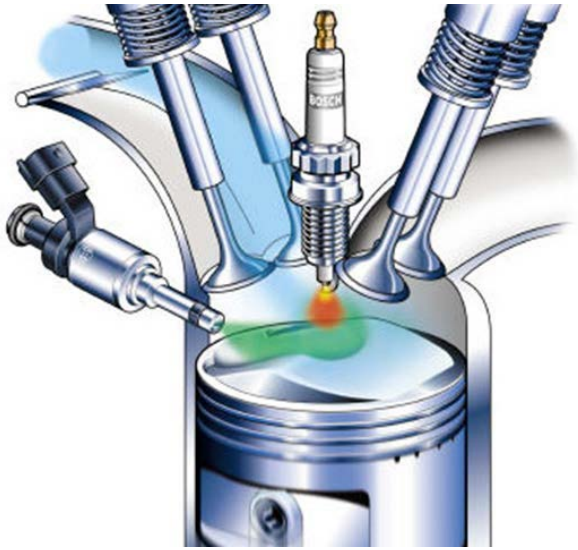
Transportation

Pratt & Whitney



PW1000G Engine

Ford Motor Company



Ford Motor Company
Eco-Boost Engine

Energy & Environment – Where you can apply your knowledge

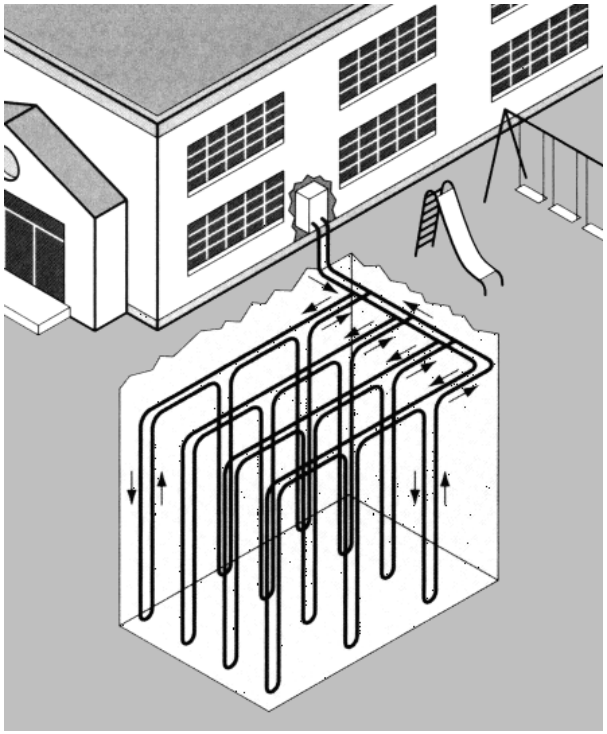
Climate Conditioning

Passive Solar Heating

County Trail House

http://www.solares.ca/County.php?p=Home

Ground Source Heat Pump

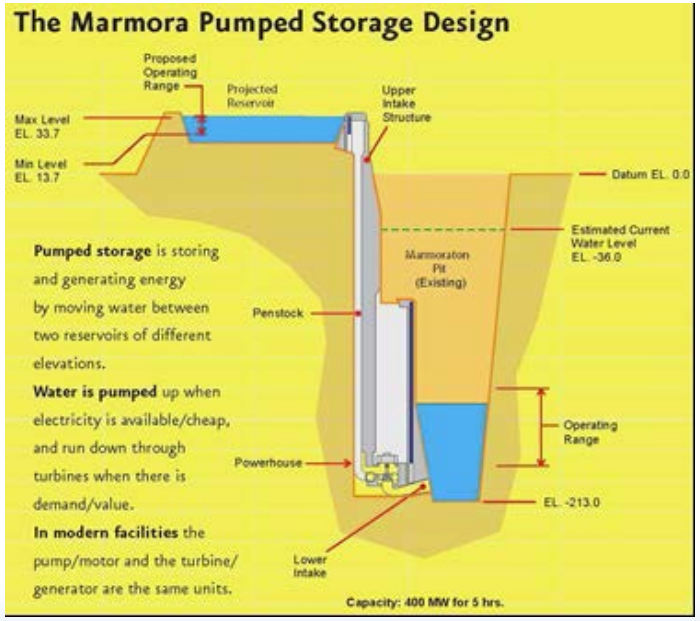


http://www.geo4va.vt.edu/A2/A2.htm

Energy & Environment – Where you can apply your knowledge

Environmental Impact/Risk Assessment

- Mamora, Ontario
- Former iron ore mine (closed 1979)
- Proposed for pumped hydro storage



http://www.northlandpower.ca/Assets/Document/ProjectDocuments/Marmora%20Pumped%20Storage/Marmora_Pumped_Storage_spread.pdf

Energy & Environment – Where you can apply your knowledge

UofT – Hub of Energy Research

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING
Institute for Sustainable Energy