



Green Energy Education

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Wednesday March 17th, 2010**



Seminar Outline

- 1) Introduction
- 2) The Problem
- 3) Conservation Issues
- 4) Solar Solution
- 5) Education: Curriculum Outreach
- 6) Future Projections
- 7) Questions

QUESTION 1:

When will we be completely depleted of non-renewable resources, such as natural gas, on earth?

a) 18 years

b) 27 years

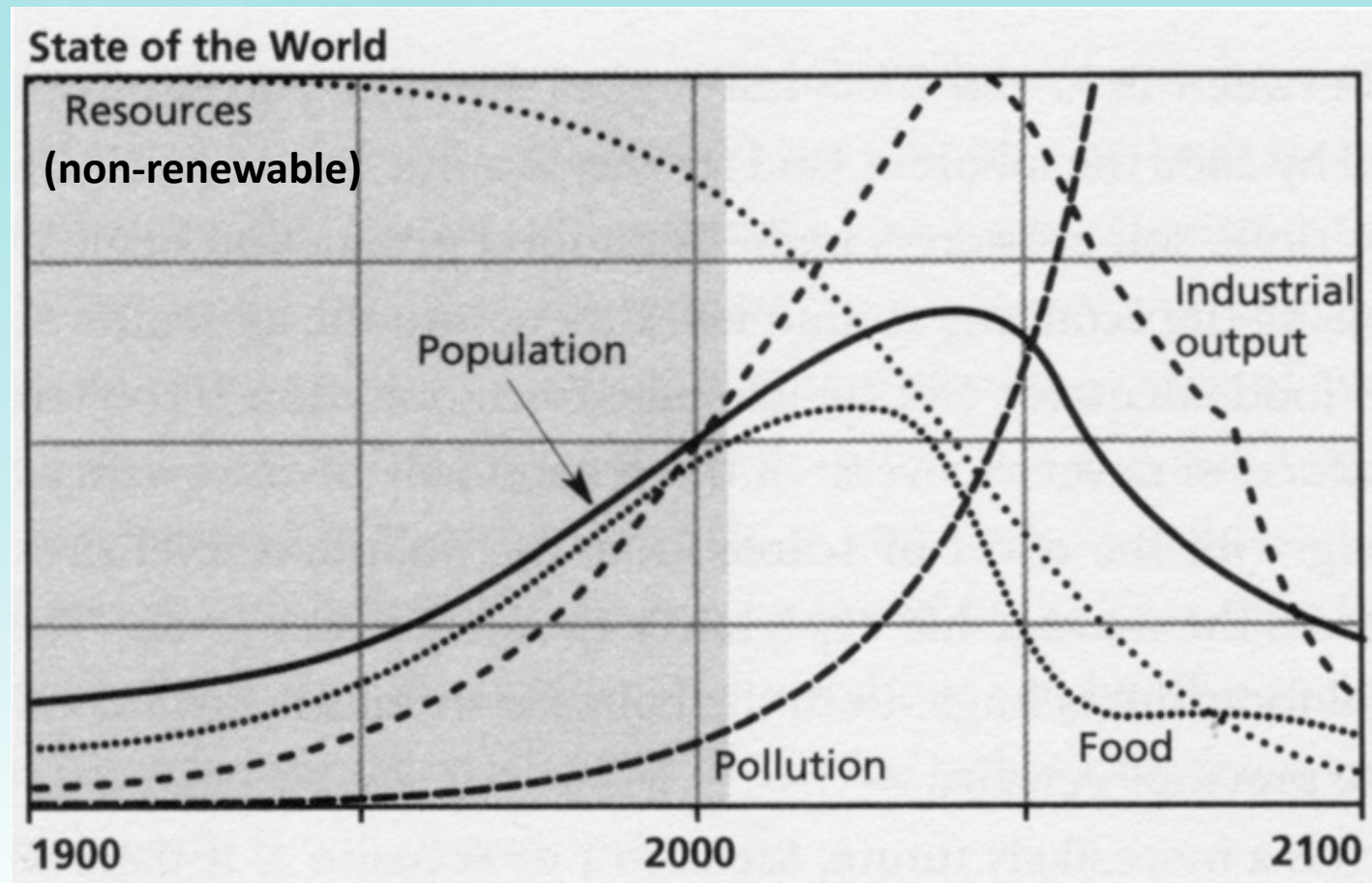
c) 35 years

d) 42 years

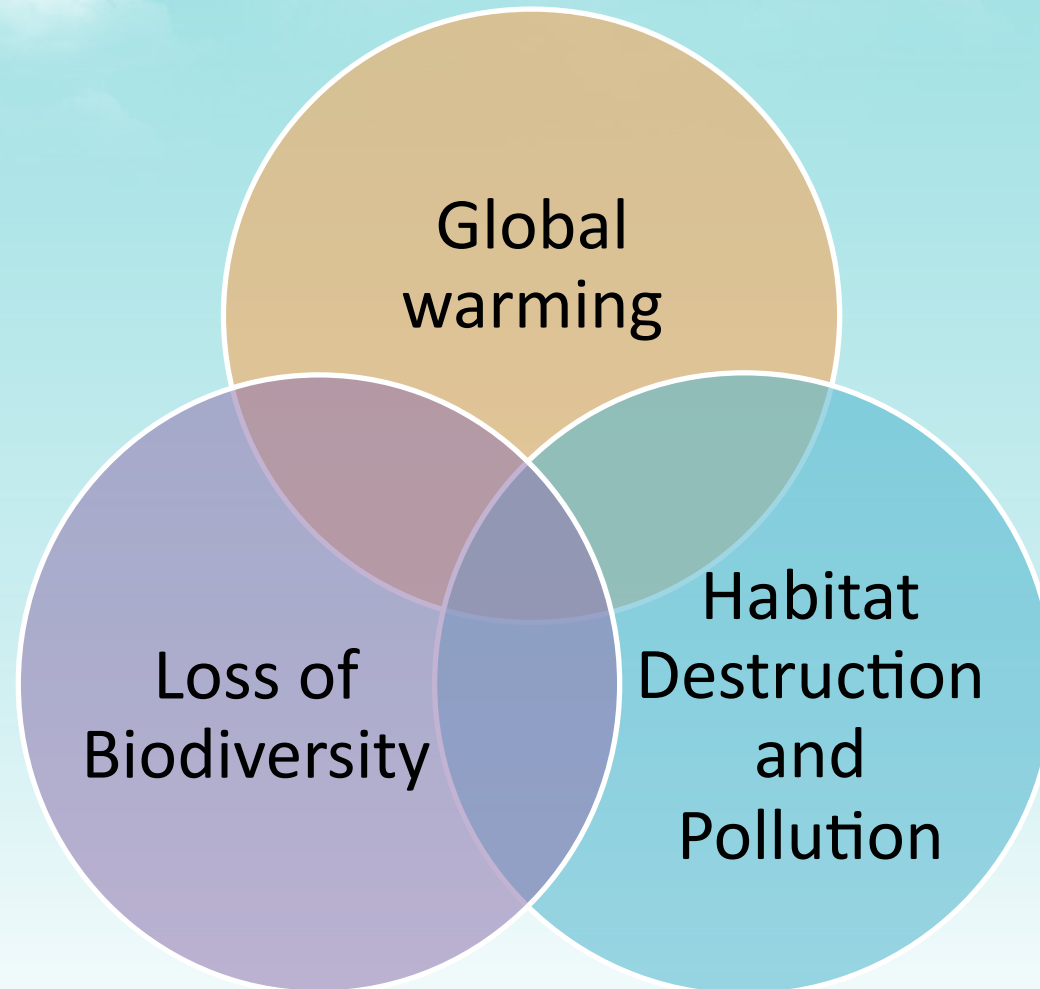
e) 50 years

According to The Ecologist and based on current worldwide consumption rates
http://greenliving.lovetoknow.com/Non_Renewable_Resources

The Problem: Depletion of Non-Renewable Resources

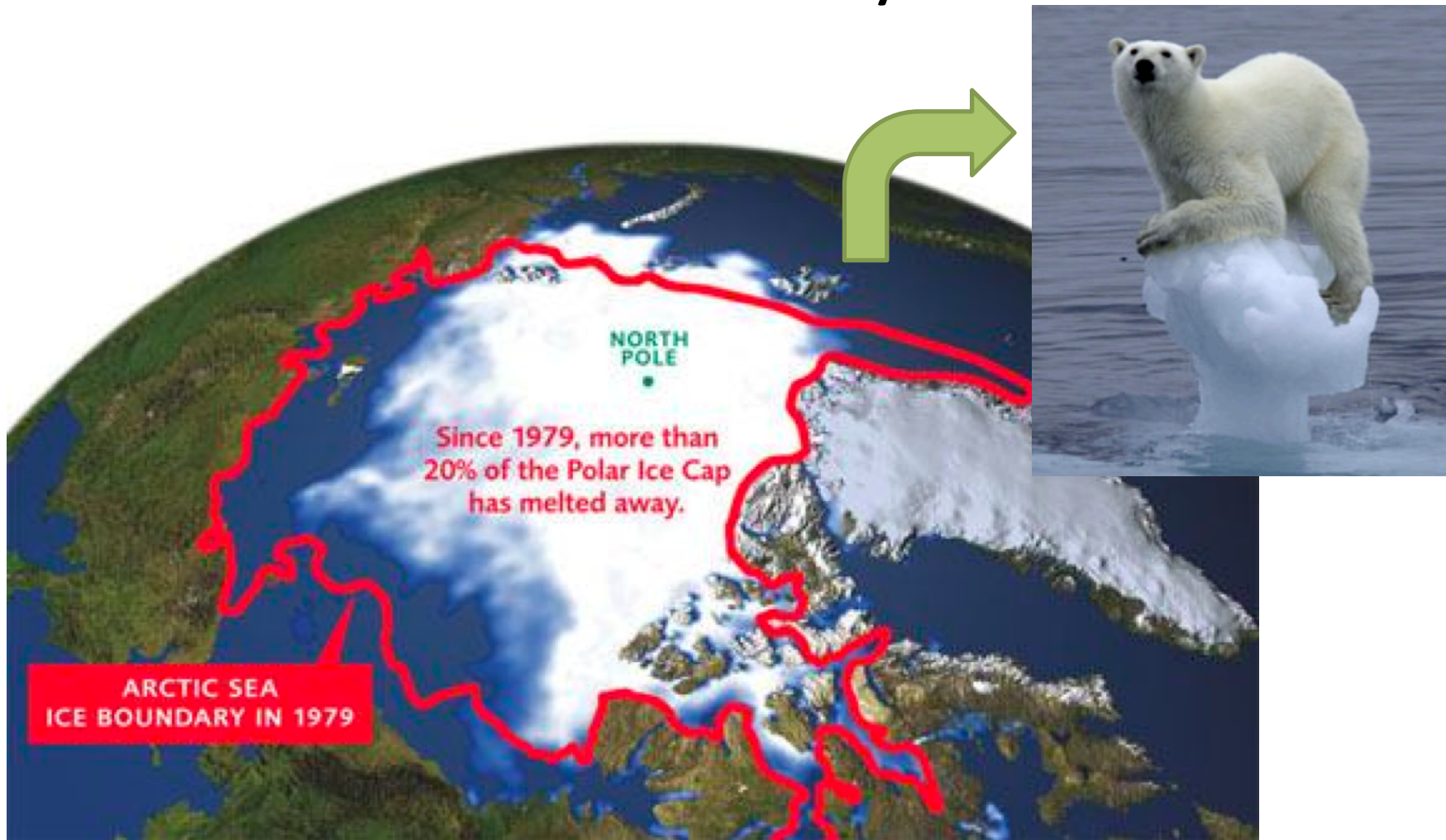


Related Energy Conservation Issues



Sources: NASA's Goddard Institute for Space Studies, Massachusetts Institute of Technology 2005 Study, Nature Magazine January 2004, National Climatic Data Center, U.S. Geological Survey, Arctic Climate Impact Assessment.

Current Example: Loss of habitat and biodiversity



Why Should We Care?

1. Human Value Perspective

- I. Utilitarian-resources are direct use to humans
- II. Intrinsic-inherent value of biodiversity

2. Economic Perspective

- I. Long-term benefit >>> cost
- II. Government rebate incentives-promotes social welfare and environmental initiatives

Sustainable and Renewable Resources:¹



- Solar Energy-Solar Panel



- Geothermal



- Hydropower



- Wind Power



- Biofuels/Bioenergy

<http://www.greenpacks.org/wp-content/uploads/2008/10/wind-power-in-england.jpg>
http://www.finfacts.ie/irishfinancenews/article_1013649.shtml
<http://www.easterncct.edu/sustainenergy/energy/hydropower.htm>
<http://www.greenfieldenergyco.com>

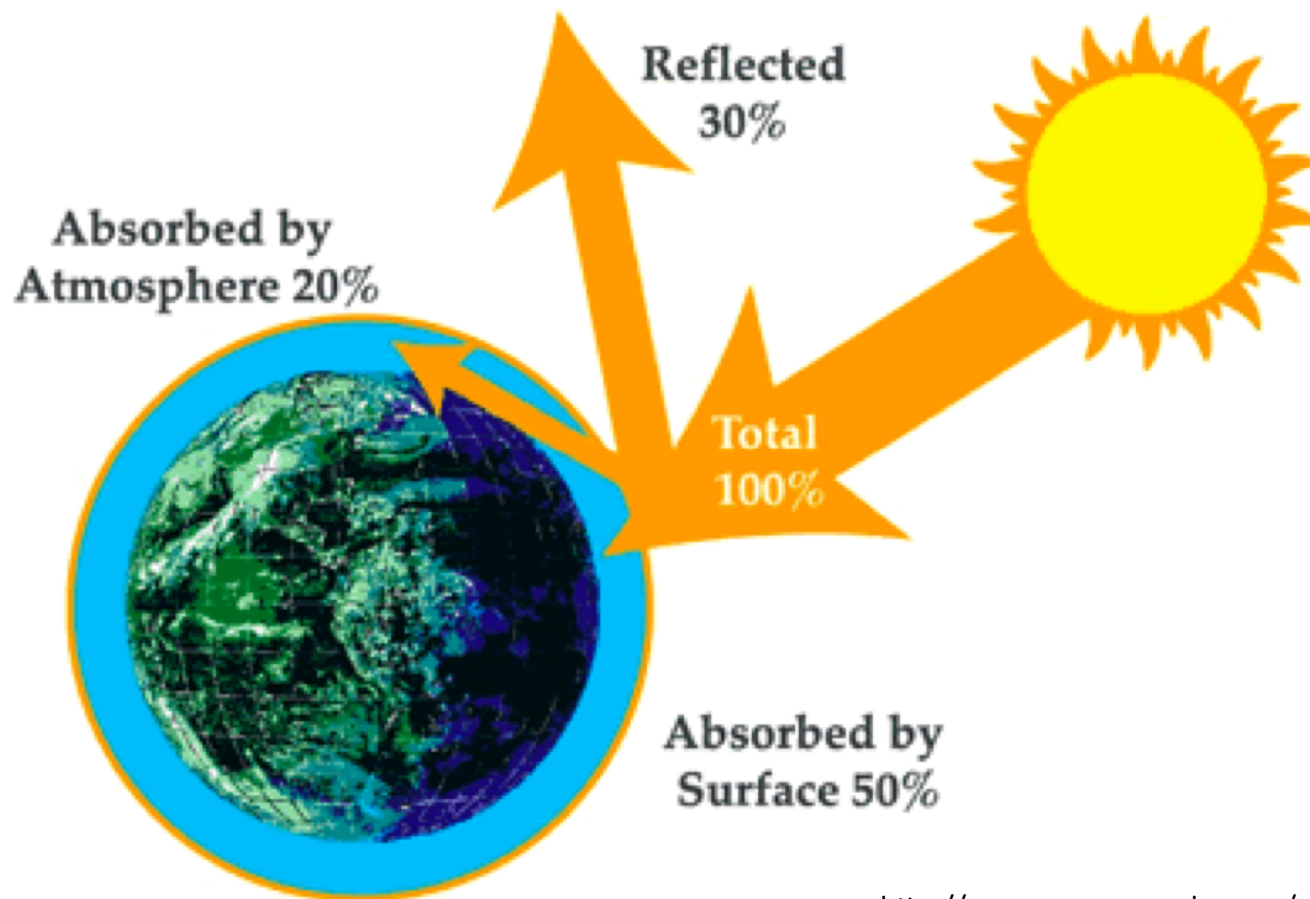


QUESTION 2:

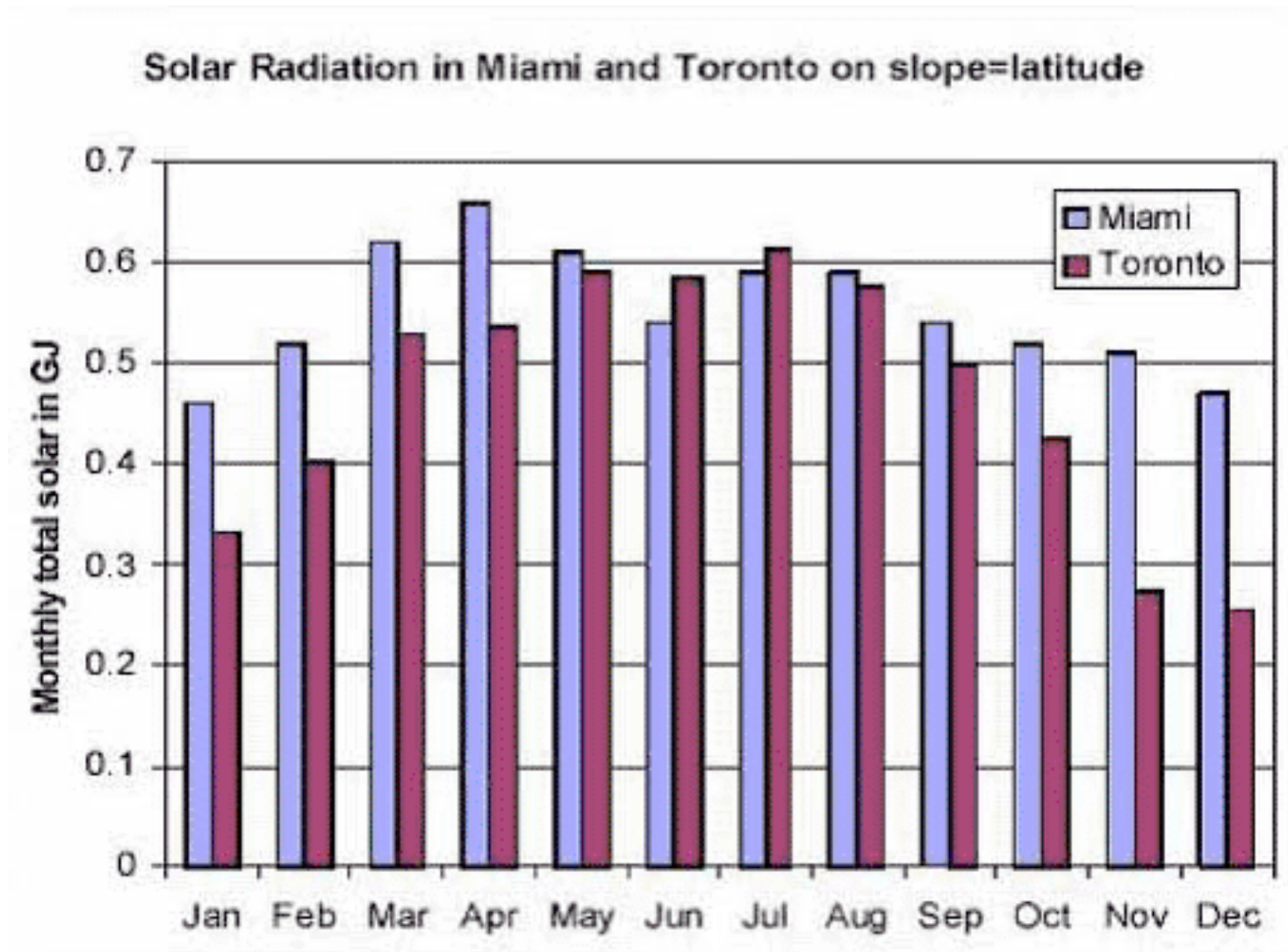
True or False

One hour of solar radiation is enough to supply one day of the energy demand worldwide?¹²

Introduction: Solar Power



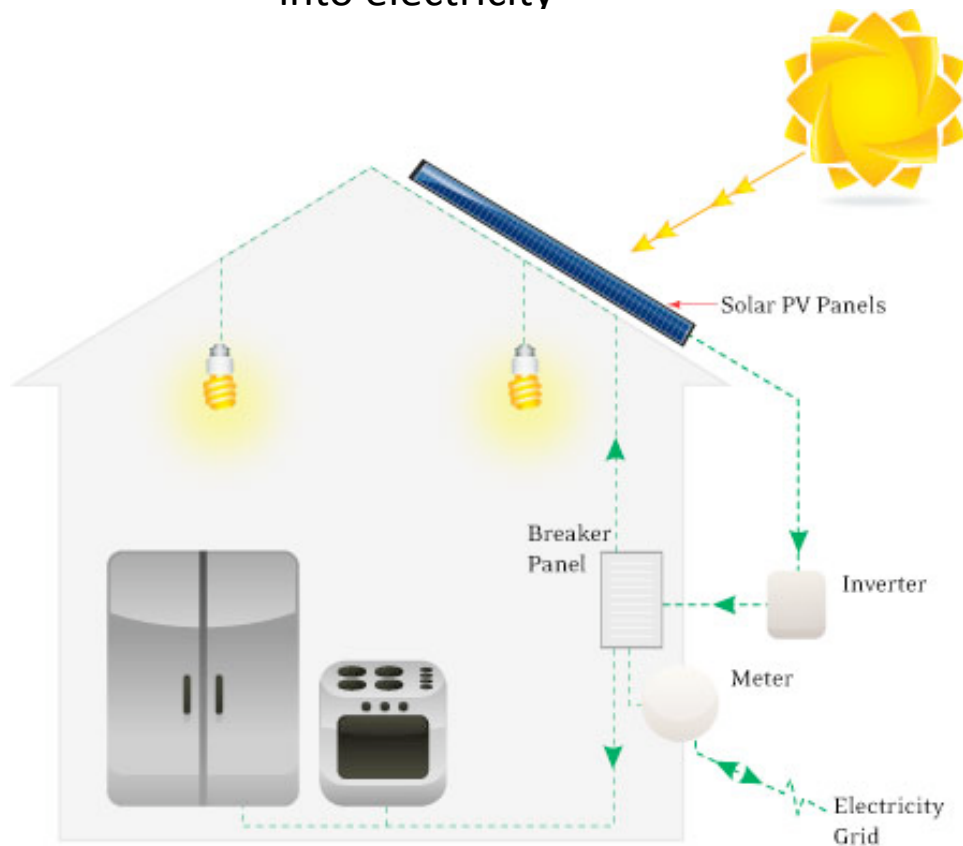
Do we have enough sunlight in Canada?⁶



Types of Solar Technologies:⁴

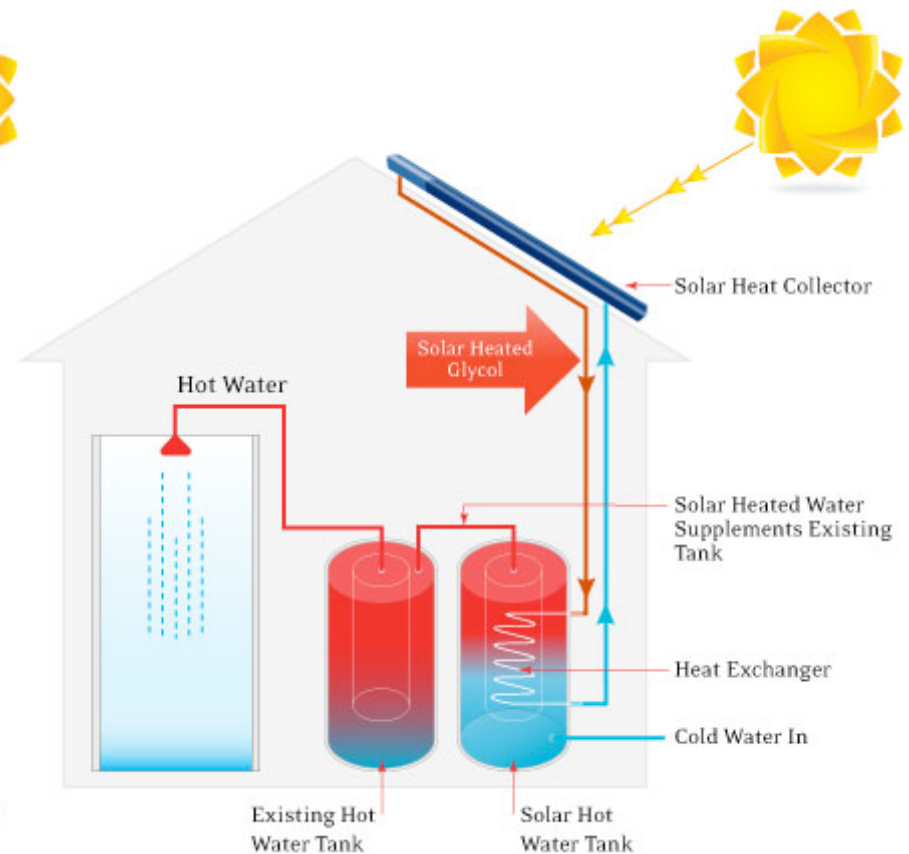
1. Solar Photovoltaic (PV)

- Silicon panels
- Directly converts solar energy into electricity



2. Solar Thermal

- Solar collectors and water tank
- Evacuated tubes vs flat panel



Application Markets⁶

1. Residential



http://www.globesolarenergy.com/php_file/p_gallery.php

2. Commercial



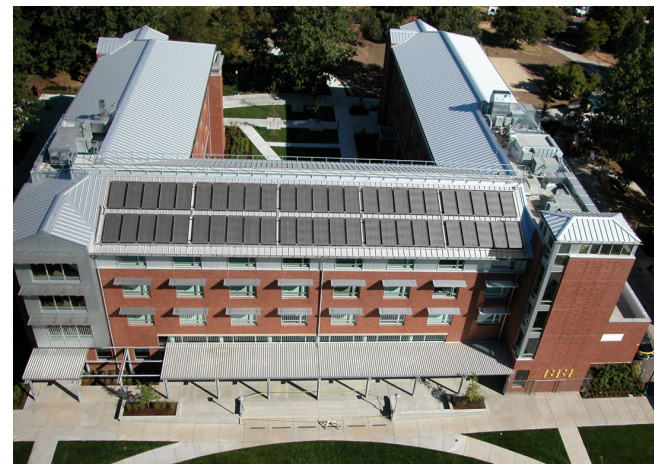
http://www.globesolarenergy.com/php_file/p_gallery.php

3. Swimming Pools



<http://www.poolsolarpanels.org/photo/solar-heating-system-above-the-ground.jpg>

4. School Institutions



http://www.globesolarenergy.com/php_file/p_gallery.php

BENEFITS OF Solar Panels



1. Sustainability



- i. Clean and renewable
- ii. Decrease greenhouse gas¹² emissions
- iii. Generate power where it's used
- iv. Offset Peak Demand
- v. Reduces land use¹²
- vi. Glycol-free systems-safe⁶
- vii. Maintenance free⁶

2. Technology Efficiency

Current Development:

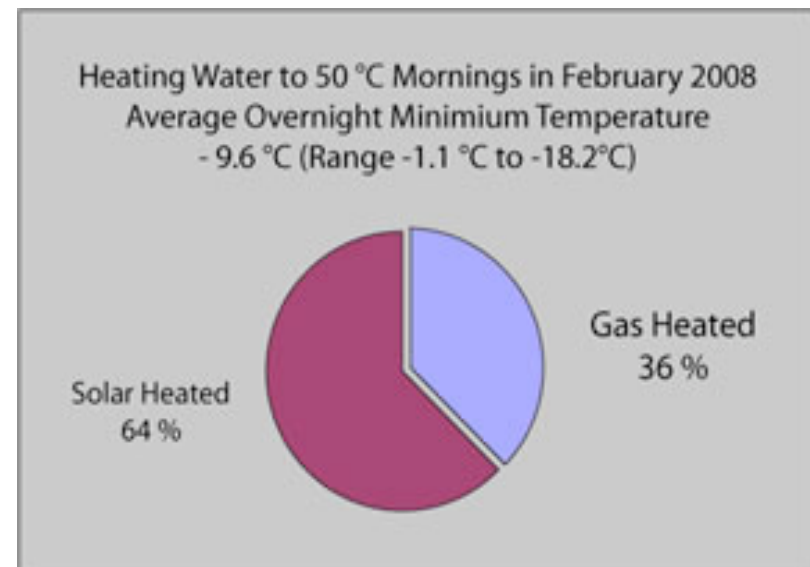
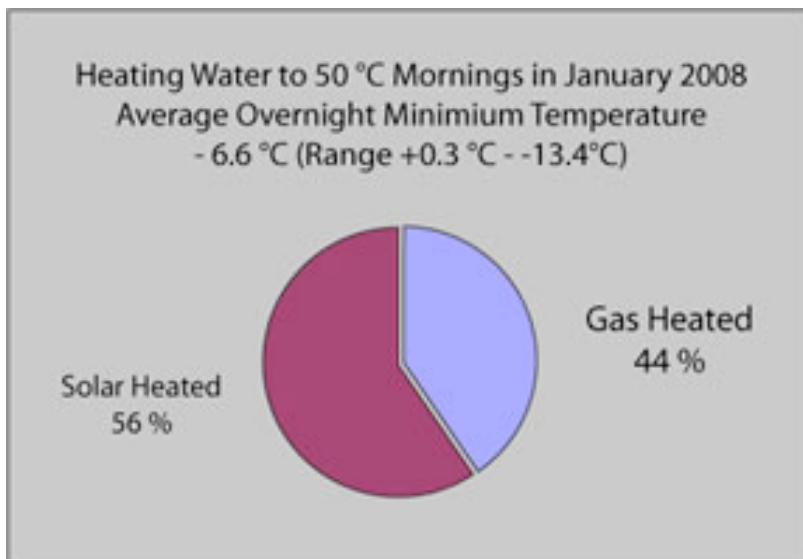
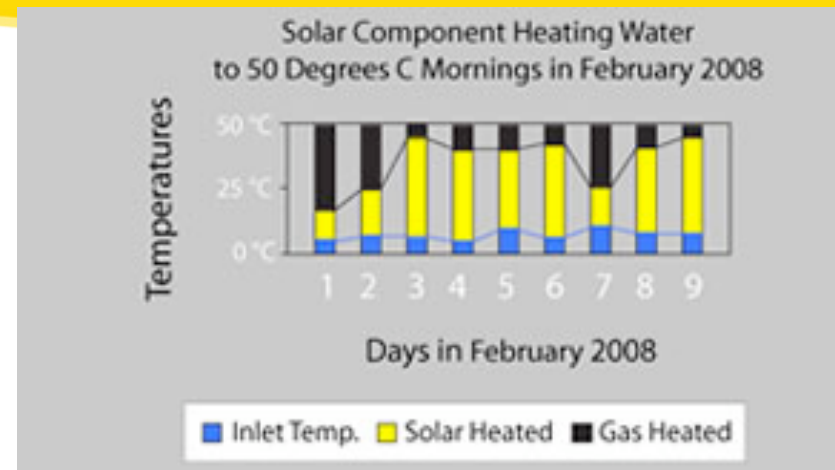
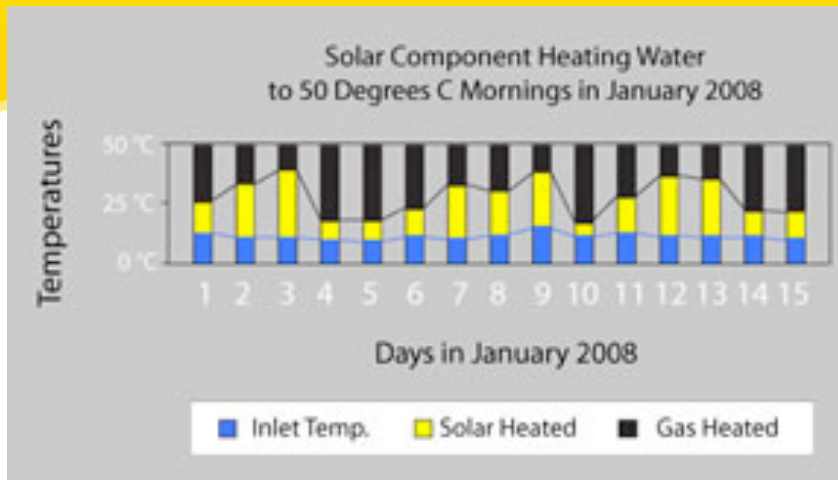
- Reduced construction materials⁹
- Better storage system⁹
- solar heating-60-70% of energy for water heating⁶



Future Projections:

- Thermal: 97% peak visible light absorption⁹
- PV cells set to reach 80% efficiency⁹

Case Study: Solar Efficiency (Residential)



3. Affordable: Green=Free

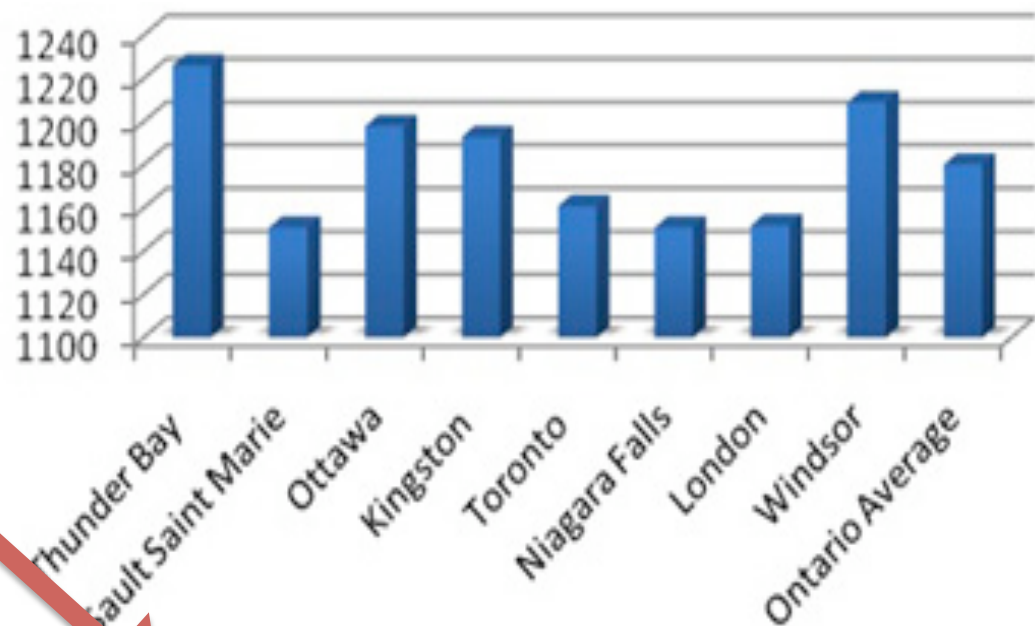
- Solar panels costs from \$3000-6000
- federal and provincial government rebates
- shorter payback time
- Sun's energy ALWAYS free



Local Implementation

Solar Potential Across Ontario (per installation)¹³

City	kWh/year
Thunder Bay	1226
Sault Saint Marie	1151
Ottawa	1198
Kingston	1193
Toronto	1161
Niagara Falls	1151
London	1152
Windsor	1209



• Power Purchase Rate 80.2 cents / kWh

Source: Natural Resources Canada, PV Potential and Solar Resource Maps of Canada

Example: Toronto District School Board

- Rawlinson Public School in West Toronto has a system installed¹³
- In 2009-system produced 1160 kwh¹³





QUESTION 3:

True or False

Kingston is expected to become the greenest city in Ontario?

Importance at Local Level

Kingston:

- Expected to be next greenest city of Canada

Everbrite Solar Company:

- \$500 million dollars to build manufacturing plant in Kingston

Queen's University:

- Dr. Joshua Pearce
- Research (focused on solar panel development)



Green Education

I.N.S.P.I.R.E.

Implementing New Sustainable Programs In Renewable Energy

Education: Our Hope

- Limestone District School Board (Kingston)
- Curriculum-based outreach
- Emphasis on secondary schools
 - grades 9-12
 - subjects: biology, environmental studies, geography, technological studies, social sciences and humanities

I.N.S.P.I.R.E. Education

Curriculum Development:

Teachers:

- Unit Lesson Plans
- Resources
- Local fairs, workshops, debates etc.

Students:

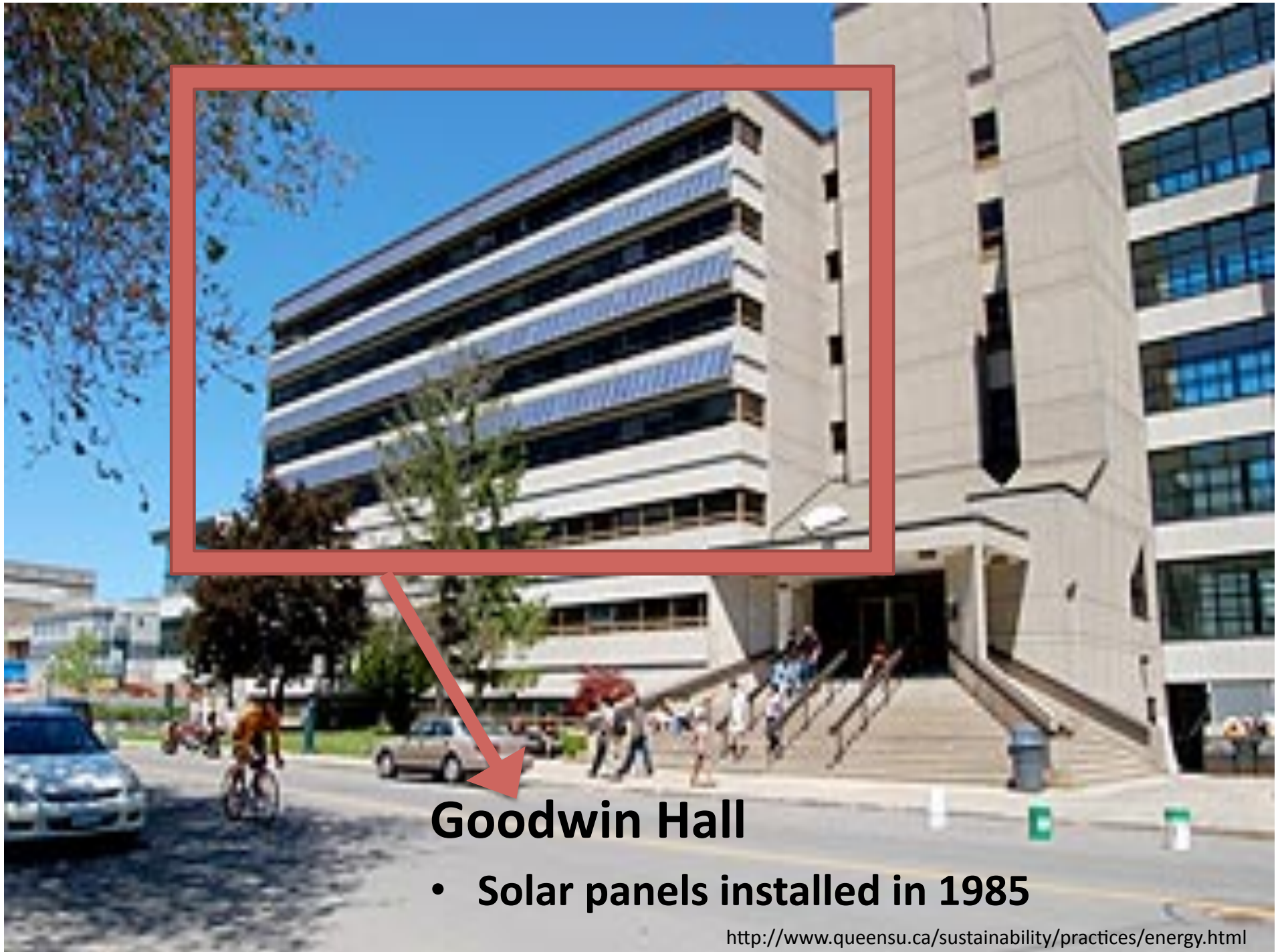
- Independent Study Project (ISP)
 - Construction of a model of sustainable h
 - Research paper on solar panels
- Field Trips-Queen's University





QUESTION 4:

Which building on Queen's University campus has solar panels installed?




Goodwin Hall

- **Solar panels installed in 1985**

Curriculum Unit Plan

Goal: develop a unit plan on biology and conservation with Independent Study Project

Lesson 1-Conservation Issues related to resources depletion and class discussion



Lesson 2-Sustainable Renewable Energy Sources



Lesson 3-Solar Energy and Technology



Lesson 4-Field Trip/Guest Speaker and ISP

Our Projections

Short Term:

- promote awareness of renewable energy and sustainability
- generate interest and passion in conservation through education



Long Term:

- Encourage youth to make connection between energy use and conservation
- Increase sustainable practices and technologies



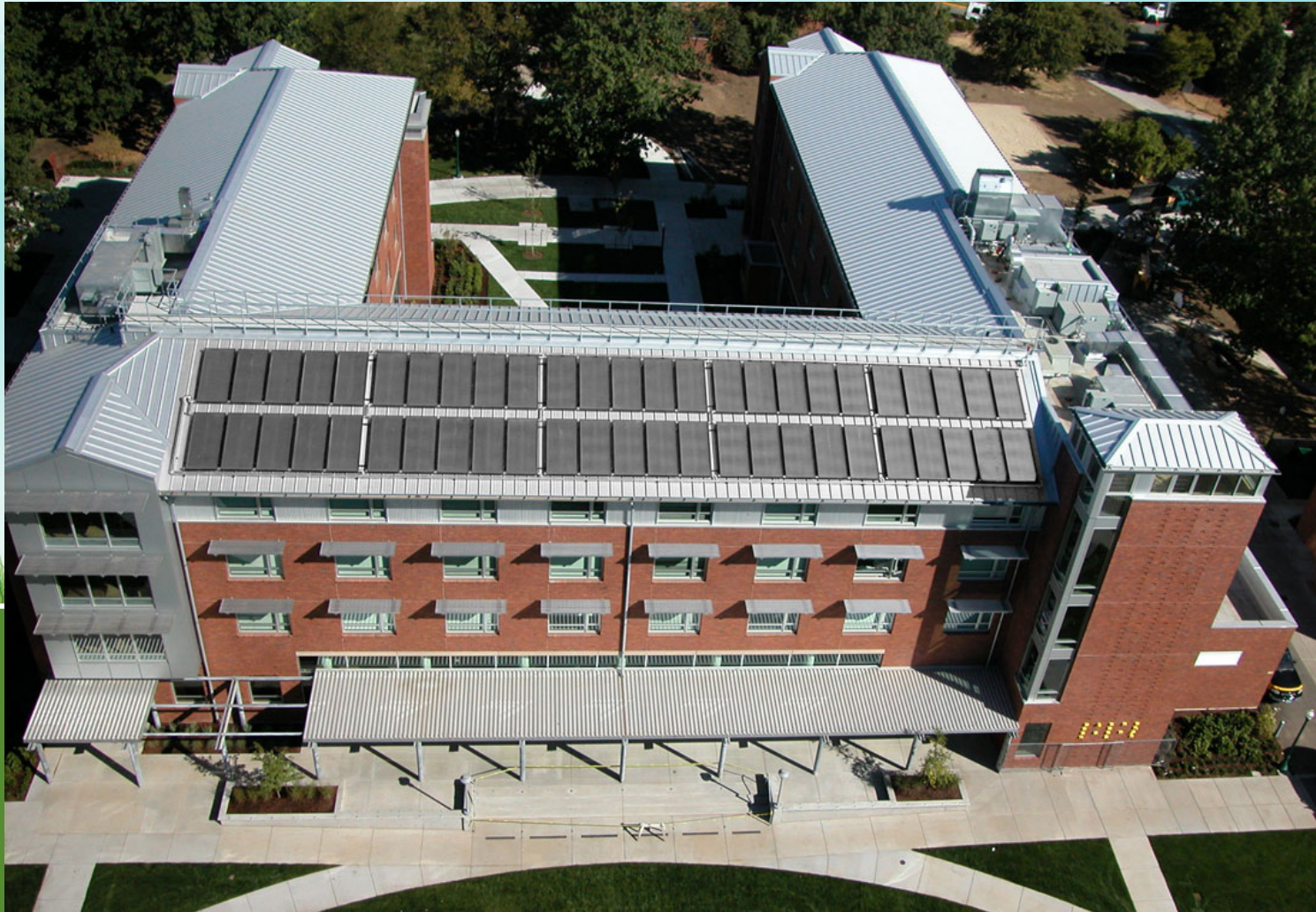
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Michelle's Home in
Markham, Ontario





QUESTIONS ?

Solar Solution

1. Intro to Solar Energy

2. Generals: Solar panels

- I. Types and Features
- II. Application Markets

3. Advantages

- I. Sustainability
- II. Technology Efficiency

4. Implementation

- Toronto (School Board, residential, commercial)
- Kingston