Poster display

- approximately 16 panels, 21 x 28 cm each
- arrange in logical order and place in a way that leads the viewer through a 'story'
- text should be font size 16 or more... vary the size and arrangement to add to the impact
- limit amount of detailed text, display should be designed to enhance conversation where you can share and expand on ideas
- use graphs or tables where appropriate; these too should be simple and clear
- remember the sustainability context

Energy Part 2

To comply to Kyoto

Reduced consumption
Emissions trading
Mitigation – capture and/or use of carbon dioxide
Alternative energy sources

Alternative energy sources that have the potential to promote environmental sustainability

Hydro
Solar
Wind
Alternative fuels
Biomass
Ethanol
Biodiesel
Biogas
Hydrogen

No single alternative can respond to all needs

Kyoto Protocol
Takes effect February 16, 2005

By 2012, Canada to reduce carbon dioxide emissions by 6 % below 1990 levels

Stephane Dion (Globe and Mail, November 19, 2004)
- 'the top issue for our quality of life'
- 'a priority for me is to be sure that Canada will be a champion'
- 'what we need to do is comply with our obligations to reconcile sustainability between humankind and the planet'
Hydroelectricity

Macro

- No carbon dioxide GHG
- Renewable
- Minimal disruption (micro)
- Combined with irrigation

Micro

- No carbon dioxide GHG
- Renewable
- Minimal disruption (micro)
- Combined with irrigation

Plus

- No carbon dioxide GHG
- Renewable
- Minimal disruption (micro)
- Combined with irrigation

Minus

- Major disruption (macro), human, agriculture and habitat
- Methane and other harmful releases
- Capital and running cost

Solar

Passive (for various types of heating)

Active (for production of electricity)

Plus

- Renewable, unlimited
- No harmful emissions
- Low cost (passive)
- Most appropriate in tropical settings

Minus

- Major cost (money and materials) for active PV technology
- Limited applicability of passive forms
- Limited by sunlight

Wind (for production of electricity)

Plus

- No emissions
- Moderate capital cost, easy implementation
- Local, small scale, reduced transmission issues
- Worldwide possible applicability

Minus

- Limited to windy locations, and not continuous
- Present costs not competitive
- Appearance, noise, birds?

Alternative fuels

Biomass (direct use)

Plus

- Renewable, replaces limited and expensive supply of fossil fuels
- May make use of waste products
- Suitable for domestic use - heating and food preparation
- Local, widely distributed
- Small or large scale

Minus

- Harmful emissions – GHG and many others
- Inconvenient and cannot be used for mobile applications
- Equity issues
- Forest depletion issues – biodiversity, land cover

Alternative Fuels

Biomass-derived ethanol as fuel or fuel additive

Plus

- Renewable, based on biological feedstock
- Possibility of using waste material as precursor
- Reduced harmful emissions (ozone etc. due to oxygenating ability)

Minus

- Limited production efficiency
- Land use for food or fuel?
- Other resources required – fertilizers, pesticides etc.

Alternative fuels

Biodiesel (fuel or fuel additive)

Plus

- Renewable biomass based
- May use local resources such as waste oil feedstock
- B100 reduces diesel emissions substantially, B20 less

Minus

- Limited production efficiency
- Feedstock often valuable as food source (soybeans)
- Problems with cold weather and engine maintenance
- Cost
Alternative fuels
Biogas (biomass-derived methane)

Plus
• Renewable, often based on waste materials
• Small and large (industrial) scale
• Very clean fuel, replacement for direct burning of biomass
• Produces agriculturally useful secondary waste
• Most appropriate in tropical countries

Minus
• Capital cost for individuals
• Need for steady supply of inputs
• Not suitable for mobile equipment

For discussion
As an employee in the Department of Energy Resources in the federal government, you are asked to prepare a report recommending whether the emphasis in government funded research should be directed toward
• biofuels like ethanol and biodiesel
  or
• solar energy
Where would you recommend that funds should be directed?

Global annual energy consumption 350 EJ
Canadian annual energy consumption per capita 365 GJ
about 5 or 6 x the global average

A simple calculation related to global equity

HIC
Commute 10 km each way daily (250 days per year)
20 km / 12 km L⁻¹ x 250 d y⁻¹ x 3.9 x 10⁷ J L⁻¹ = 16.3 GJ

LIC
Prepare 2 meals daily for a family of 6 using wood fuel
(0.5 kg wood per person per day)
3 kg d⁻¹ x 365 d x 1.5 x 10⁷ J kg⁻¹ = 16.5 GJ