



GREEN CORRIDOR

DEFINING THE AMBASSADOR BRIDGE ENVIRONMENTAL GATEWAY

UNIVERSITY OF WINDSOR SCHOOL OF VISUAL ARTS

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Environmental Sustainability through Art and Science

Alternative Energy Technologies for
the Ambassador Bridge Environmental Gateway

Presented by:

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Prof. Rod Strickland
U of W School of
Visual Arts

Noel Harding
Distinguished Visitor
University of Windsor

ECOSE
HOUSE







What is the Ecohouse ?

- **an opportunity to develop a real eco-efficient model for living, using both conventional and inventive products and techniques.**
- **a model for a more sustainable house, demonstrating sustainable technologies in action and setting a new standard for resource efficiency in Windsor**



STAGE 1 – BUILDING ANALYSIS

- **Ontario Building Code review**
- **Visual survey of structural damages**
- **Energy Audit**
- **Electrical / Mechanical Code review**
- **Plumbing / sewer review**
- **Insulation inspection**
- **Air quality / contaminants**
- **Future purpose of house**



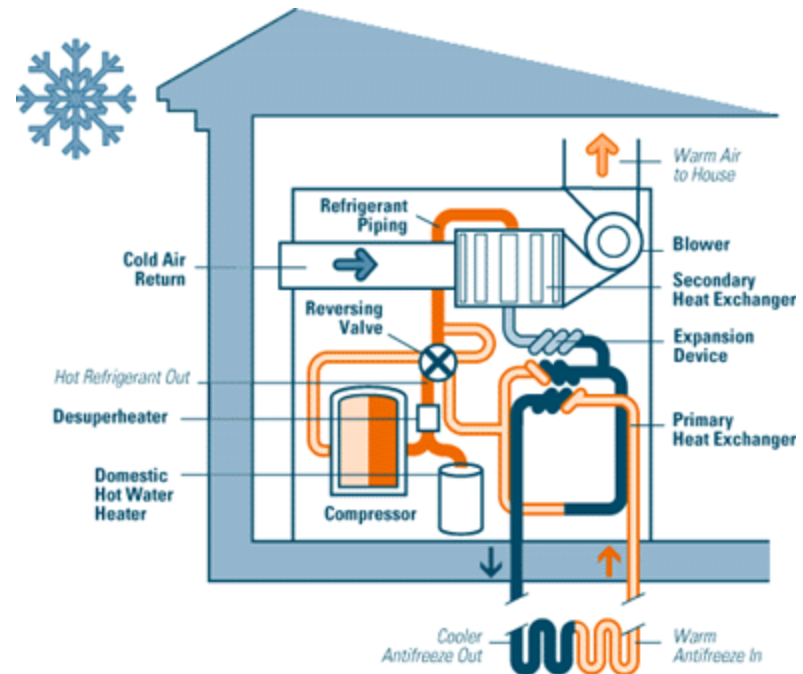
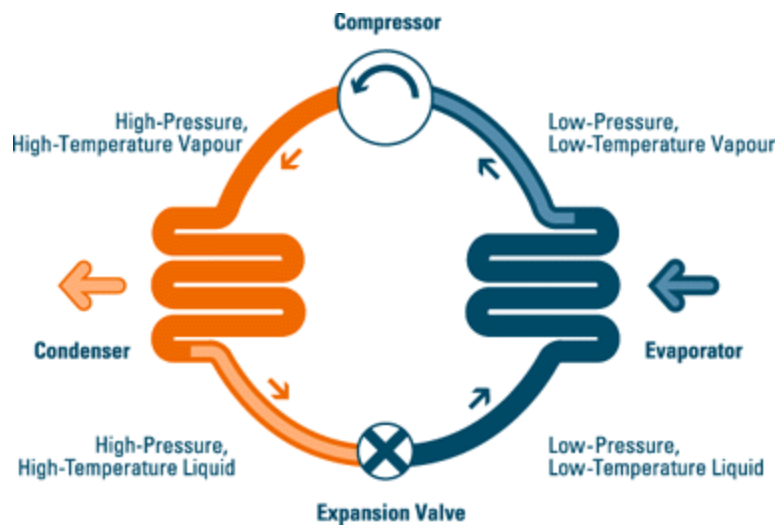
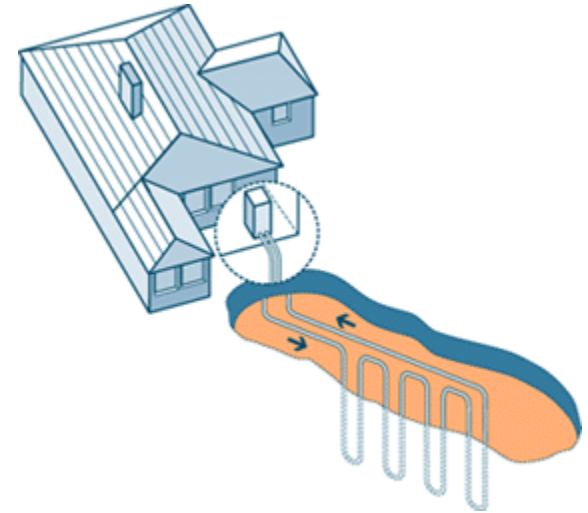
STAGE 2 – ECO IMPROVEMENTS

- **Geothermal heating**
- **Distributive power**
- **Green roof**
- **Net metering**
- **Plumbing (Grey water)**
- **Plumbing (Fixtures)**
- **Solar Water heating**
- **Passive lighting**
- **Energy efficient lighting**

ECO HOUSE

STAGE 2 – ECO IMPROVEMENTS

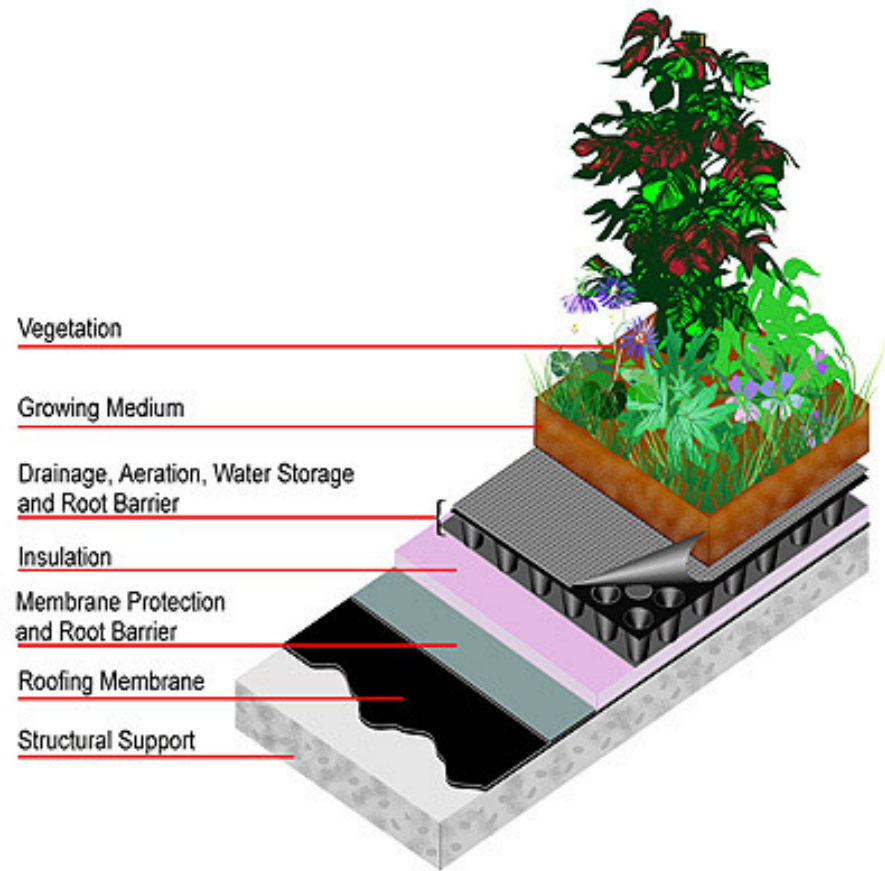
- Geothermal Heating / Cooling





STAGE 2 – ECO IMPROVEMENTS

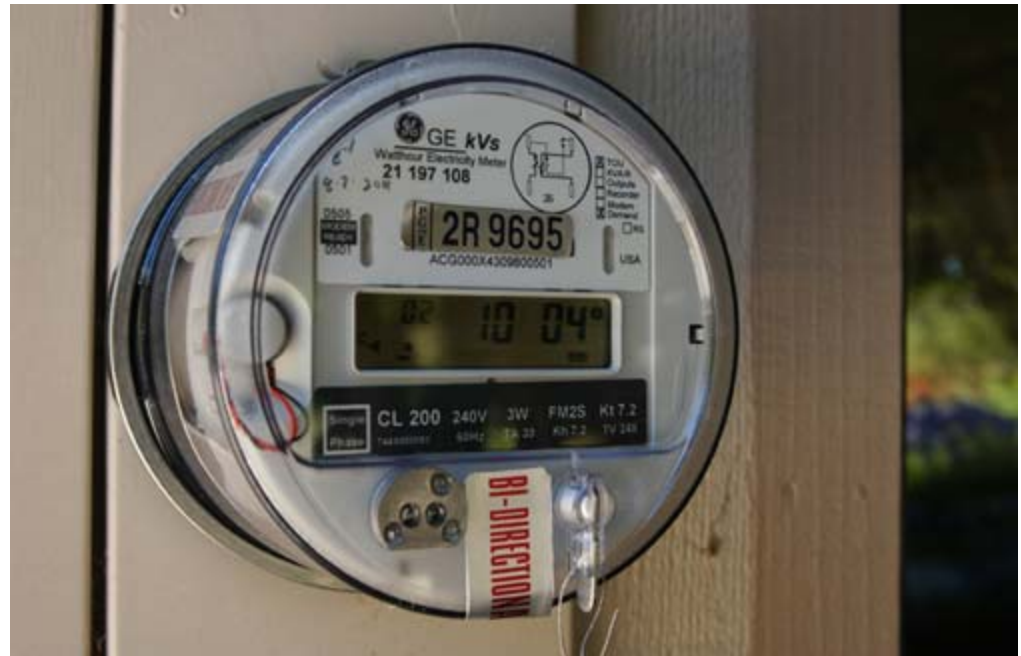
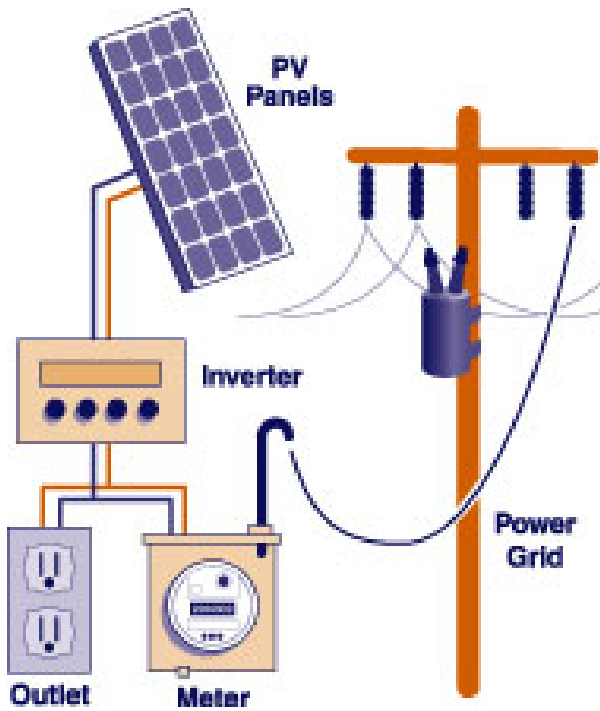
- Green Roof



ECO HOUSE

STAGE 2 – ECO IMPROVEMENTS

- Net Metering





STAGE 2 – ECO IMPROVEMENTS

- **Plumbing - Fixtures**





OPPORTUNITIES FOR INOVATION

- **Green House**
- **Composting toilets**
- **Alternative insulation**
- **Net metering**
- **Solar array**
- **Hydroponics**
- **Expansion of house**

Nature Bridge



Aerotecture.Ltd.

BUILDING INTEGRATED NATURAL ENERGY SYSTEMS WORLDWIDE

www.aerotecture.com

- Vertically Oriented
Aerotecture Turbine





Sustainable Energy Project Group

- Mark Bartlett, Project Coordinator-*(Canadian Auto Workers (CAW) Local 444 Environmental Rep*
- Pete Thomas -*CAW Local 200 Environmental Representative*
- Adam McLeod- U of W 4th year Mech.Engineering
- Mike White- 4th year Mechanical Engineering
- Rob McLean –*CAW Windsor Regional Environment Council)*
- Jim Corman- U of W Labour Studies
- James Burch –*Electrician (CAW Local 444)*

Sustainable Energy Project Group *Goals*

- Determine suitable turbines for a Detroit river site
- Determine which will meet the lighting needs of the Ambassador Bridge
- Arrange a demonstration of River Turbine technology for Summer of 2005
- It is hoped that this project may spawn a new “Green Industry” for the Windsor area

Renewable Energy Benefits

- cleaner air
- more reliable, cost-effective electricity system
- Nearly \$14 billion in economic benefits by installing 8,000 megawatts of wind energy alone.
- tens of thousands of new jobs, and the development of a vibrant industry

Renewable energy will create thousands of jobs!

- 25,000 jobs in the renewable energy sector by 2010
- 77,000 jobs by 2020.
- 45,000 jobs created in wind industry in Germany
- 2,500 jobs through wind power in Texas
- Denmark is the world's number one exporter of wind turbine technology.

Small Hydro Power Potential

- Natural Resources Canada has developed an inventory of more than 3,600 potential small hydro sites throughout Canada, with a technical potential assessed at about 9,000 MW.
- Québec and Ontario have the largest undeveloped small hydro resources, followed by British Columbia and Newfoundland.

INSTREAM ENERGY GENERATION TECHNOLOGY

- AKA- free-flow hydropower technology or kinetic hydro energy systems
- generate electricity from the kinetic energy present in flowing water
- operate in rivers, manmade channels, tidal waters, or ocean currents
- do not require dams

Environmental and Navigational Acceptability

- *The environmental review of many of these technologies for the BC Hydro study indicated that:*
- the physical and environmental impact of turbines “is expected to be relatively small”.(1)
- and that “ducted turbines as a opposed to open blades, are believed to be better able to include protection for fish and floating debris”.(1)

UNDERWATER ELECTRIC KITE (UEK)

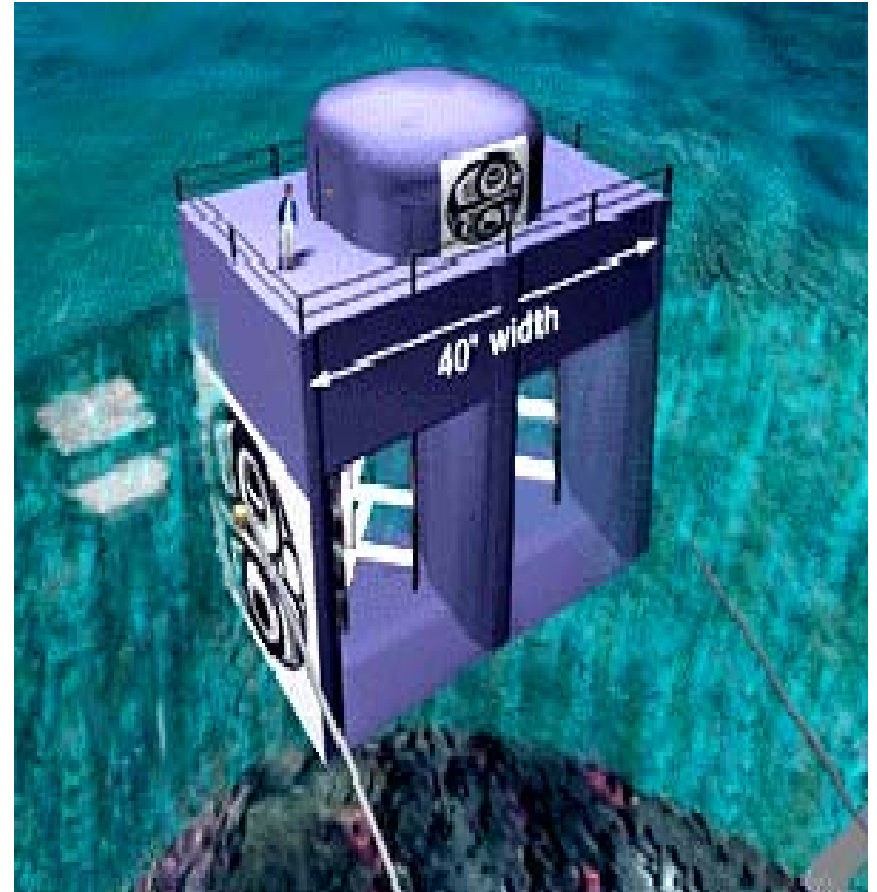


UNDERWATER ELECTRIC KITE (UEK)

- Installed in a free stream river or tidal current
- A self-contained moderately buoyant turbine/generator - minimum infrastructure
- Suspended like a kite within the tidal stream
- Multiple turbines can be clustered together into a "farm"
- Turbine is anchored to seabed on a plate from which they can be removed for maintenance
- Can be attached to existing structures e.g., a bridge, on a floating platform or a barge

Blue Energy Canada Ltd.

- Flow acceleration from ducting and head capture provide a significant improvement in efficiency and energy extraction.
- The turbines can be used as individual units in a “free stream” mode (Figure 10) or banked into a Tidal Fence (Figure 11)



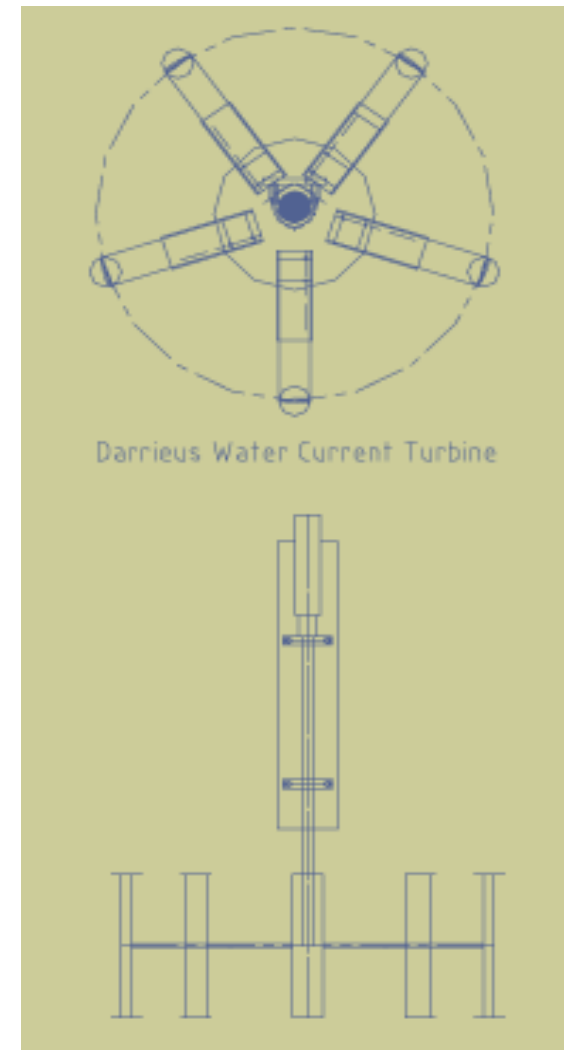
Blue Energy Canada Ltd.

- Blue energy has proposed the potential combination of tidal fence power generation with bridges (Tacoma Straits)
- This involves the potential for cost sharing and revenue generation
- Marine transportation through a fence a challenge
- Turbines in a tidal fence scenario have the gear box and electrical system above water level.



Alternative Hydro Solutions Ltd.

- Free Stream Darrieus water current turbine suited for small and medium river sites.
- Greater diameter than depth enables more area to be swept in a shallow stream and therefore more power production
- Easy maintenance - electrical components and bearings are above water
- Increased efficiency over propeller turbines
- Turbine typically rotates at 45 to 90 rpm (peak efficiency between 55 to 70 rpm).



Green Corridor Demonstration of AHS Vertical Axis Turbine



River Turbine Demonstration

- Arranged Demonstration of Vertical Axis Darrieus-type Turbine in the Detroit River
- Successful “proof of Concept” demonstration
- Extensive press coverage and community interest generated

References

1. BC HYDRO, BC Green Energy Study - Phase 2 - Tidal Current Energy, Triton Consulting, October 24, 2002
2. BLUE ENERGY CANADA INC.- URL: <http://www.bluenergy.com>
3. PEEHR- URL: <http://www.peehr.pt/>
4. MARINE CURRENT TURBINES LTD- URL: <http://www.marineturbines.com>
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7. THE ENGINEERING BUSINESS LIMITED- URL : <http://www.engb.com>
8. VERDANT POWER-URL: <http://www.verdantpower.com>
9. Cover Photo: USGS- [URL:http://www.landsat7.usgs.gov](http://www.landsat7.usgs.gov)



www.greencorridor.ca