



# Solar Domestic Hot Water Workshop

Ottawa Smart Energy Fair 2004  
Canada Museum of Science and Technology  
April 17, 2004

# Agenda

- 💧 Introduction
- 💧 Advantages of Solar Hot Water Heating
- 💧 Locally Available Solar Hot Water Systems and Products
- 💧 Potential Solar Energy at Your House
- 💧 How to Get a Solar Hot Water System
- 💧 Questions



# EcoEnergy Choices Ottawa (ECO)

- ⦿ Non-profit, community-based group
- ⦿ Dedicated to reducing greenhouse gas (GHG) emissions through energy conservation and green energy projects
- ⦿ Staffed entirely by volunteers including:
  - ⦿ Professionals in the renewable energy field
  - ⦿ Engineers
  - ⦿ Homeowners interested in having their own SDHW systems
- ⦿ Independent and objective



# ECO Solar Hot Water Project

- Act as a catalyst for adoption of Solar Hot Water heating in Ottawa
- Identify and overcome barriers through education and support:
  - Product Information
  - Site Analysis
  - Buying and Installation Process



# Advantages of Solar Hot Water Heating

- ⦿ Insulates from fuel price increases
- ⦿ Save 50% of annual fuel costs for hot water heating
- ⦿ Save GHG emissions
- ⦿ Reduce electrical grid stress, blackouts, and smog
- ⦿ Cost-effective homemade renewable energy



# Locally Available Technologies

Ivana Vouk

# Introduction

- ⦿ Common heating options are becoming increasingly expensive
- ⦿ The sun is a FREE source of Energy!!!
- ⦿ Solar Hot Water systems make sense
- ⦿ Today's systems can endure Ottawa's harsh climate: freezing winters and scorching summers



# SHW Makes Sense

*“Heating water is one of the most efficient uses for renewable solar energy. Energy capture and conversion rate for this system can be as high as 90% for water heating usage. Contrast this with the best photovoltaic panels at approximately 15%.”*

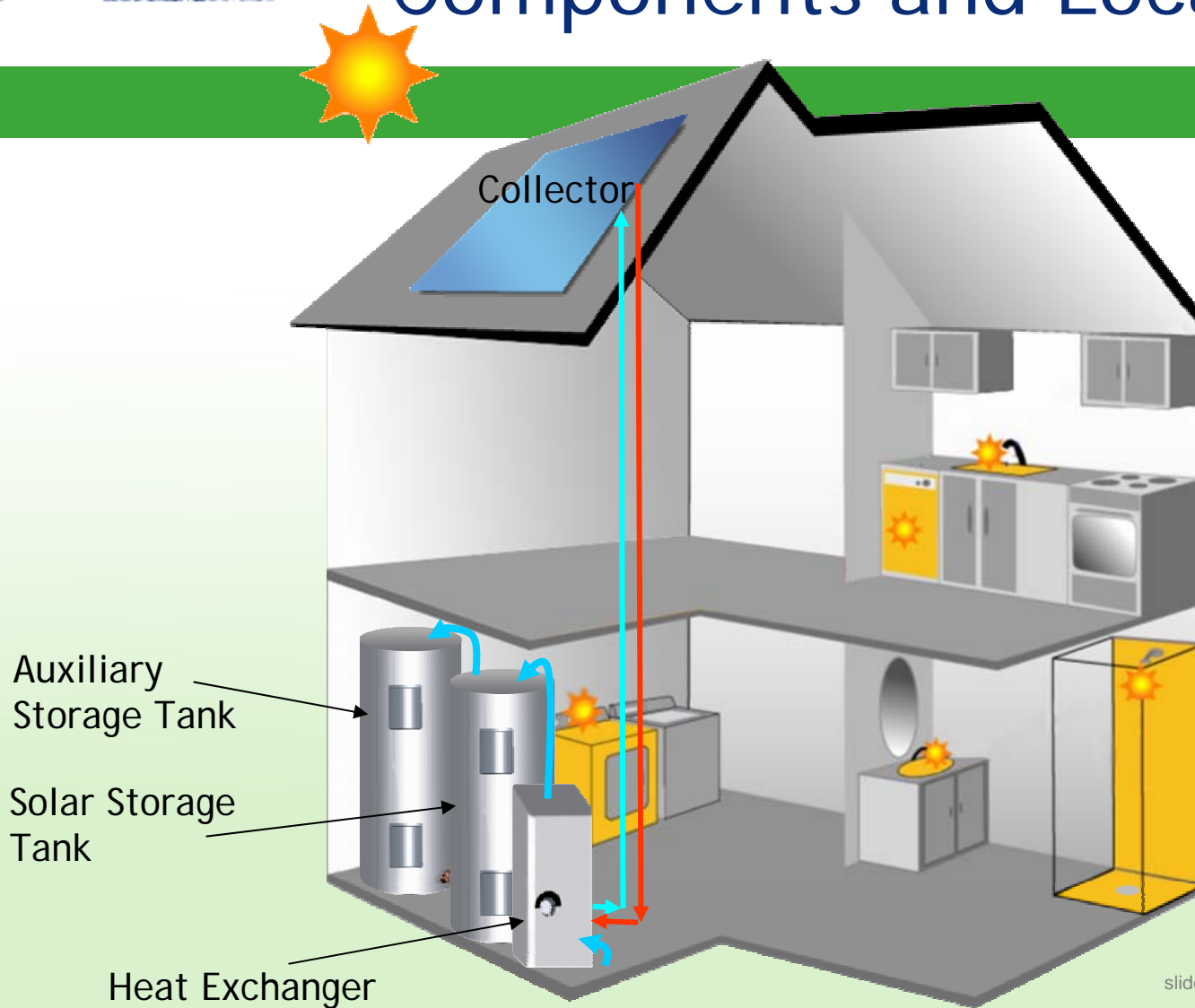
Bill Kemp,  
Renewable Energy Handbook for Homeowners



# Overview

- 💧 Basic components and their location within your home
- 💧 Capacity
- 💧 Maintenance
- 💧 Design Differences
- 💧 Cost
- 💧 Warranty and Life Time

# Typical System: Components and Location





# Capacity

Typical solar domestic hot water systems supply 50% to 60% of a family's hot water needs

# Historical Issues Addressed

- ⦿ In the past, SDHW systems have encountered freezing and overheating issues
- ⦿ Modern systems have addressed these issues
- ⦿ Freezing resolved with glycol or temperature sensors
- ⦿ Overheating resolved by self-limiting features included in design

# Maintenance

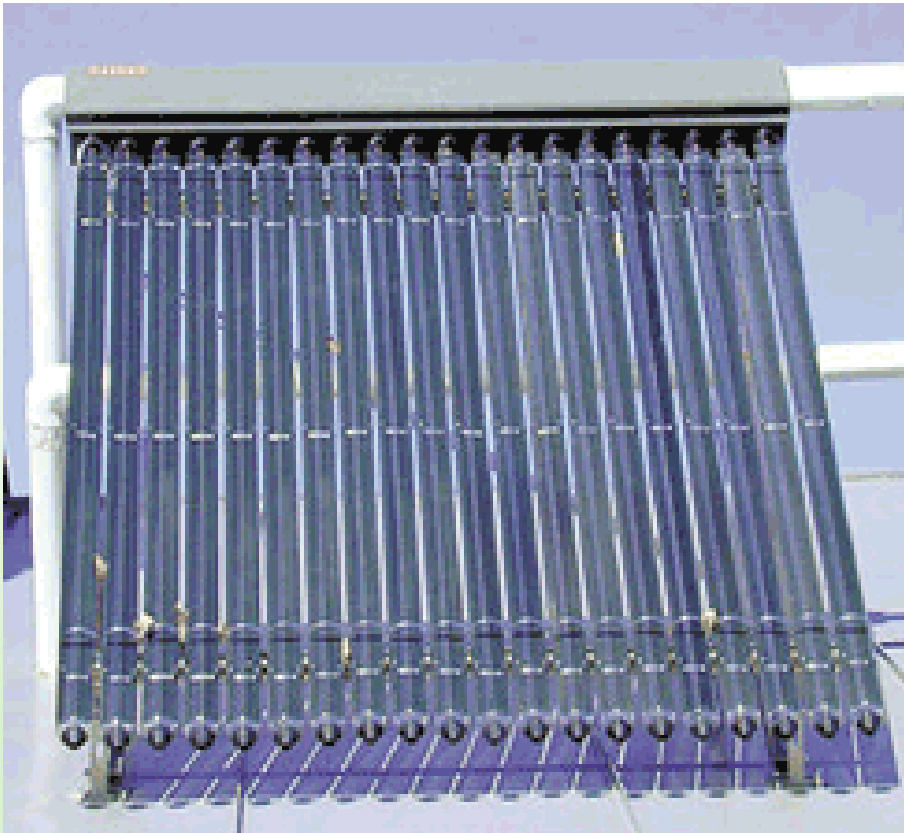
- ⦿ Replacement of glycol, generally, every 3-5 years
- ⦿ Some manufacturers recommend checking the glycol every 1-2 years
- ⦿ Manufacturer recommendations should be followed, especially regarding replacement of glycol



# Overview of Some Available Systems

- ⦿ Evacuated Tube Collectors
- ⦿ Glazed Flat Plate System
- ⦿ Drainback System
- ⦿ Concentrated Collectors

# Evacuated Tube



- 💧 Vacuum sealed tubes
- 💧 Individually set for optimum orientation
- 💧 Non-toxic, food-grade glycol
- 💧 Series of 20-30 tubes cover a 3-4m<sup>2</sup> area (2-3m<sup>2</sup> absorbing surface)

# Evacuated Tube





# Glazed Flat Plate System

- ❖ Insulated, shallow box
- ❖ Transparent, glazed window cover
- ❖ Dark, absorbing base
- ❖ Pipes circulating non-toxic, food-grade glycol
- ❖ Typical plate covers a 3m<sup>2</sup> area



# Drainback System

- ⦿ Collector has similar construction as glazed flat plate system
- ⦿ Circulating tap water instead of glycol
- ⦿ Utilizes temperature sensors
- ⦿ Water is drained out of the system when the outside temperature is within 4°F of the tank water temperature
- ⦿ Low maintenance

# Glazed Flat Plate and Drainback Systems







# Glazed Solar Concentrator







- 💧 Vertical Sun Tracking
- 💧 Parabolic, highly reflective troughs
- 💧 Absorber located along the focal line
- 💧 Absorber contains circulating glycol

# Cost

 <p>Evacuated tube</p>	<ul style="list-style-type: none"> <li>• Series of 30 tubes</li> <li>• Area ~3-4m<sup>2</sup></li> <li>• Household of 4-5 people</li> </ul>	<ul style="list-style-type: none"> <li>• System cost \$6,400 to \$10,000</li> <li>• Installation cost \$600 to \$1,200</li> <li>• Glycol check \$50</li> </ul>
 <p>Glazed Flat Plate</p>	<ul style="list-style-type: none"> <li>• 2 panels</li> <li>• Area ~ 6m<sup>2</sup></li> <li>• Household of 3-4 people</li> </ul>	<ul style="list-style-type: none"> <li>• System cost \$3,500 to \$7,000</li> <li>• Installation cost \$600 to \$1,200</li> <li>• Glycol check (if required) \$50</li> <li>• 2-3L of glycol required ~\$30</li> </ul>
 <p>Drainback</p>	<ul style="list-style-type: none"> <li>• 2 panels</li> <li>• Area ~ 6m<sup>2</sup></li> <li>• Household of 3-4 people</li> </ul>	<ul style="list-style-type: none"> <li>• System cost \$4,000 + a local dealer mark-up</li> <li>• Installation cost \$600 to \$1,200, or \$75 per hour</li> </ul>
 <p>Glazed Solar Concentrator</p>	<ul style="list-style-type: none"> <li>• 2 "wings", 5m long</li> <li>• Area ~ 7m<sup>2</sup></li> <li>• Household of 4 people</li> </ul>	<ul style="list-style-type: none"> <li>• System and installation cost is approximately \$4,000</li> </ul>

# Warranty and Expected Life Time

 <p>Evacuated tube</p>	<ul style="list-style-type: none"> <li>•5-8 years warranty on collectors</li> <li>•30 years expected life time on collectors</li> </ul>
 <p>Glazed Flat Plate</p>	<ul style="list-style-type: none"> <li>•5-10 years warranty on collectors (some manufacturers include warranty on the whole system)</li> <li>•20 years expected life time on collectors</li> </ul>
 <p>Drainback</p>	<ul style="list-style-type: none"> <li>•10 years warranty</li> </ul>
 <p>Glazed Solar Concentrator</p>	<ul style="list-style-type: none"> <li>•10 years warranty</li> <li>•20 years expected life time</li> </ul>

# Water Conservation

- 💧 Choose water saving appliances
- 💧 Use low temperature washing cycles
- 💧 Use appliances for full loads only
- 💧 Replace showerheads to low-flow ones
- 💧 Install low-flow aerators on conventional faucets
  - 💧 Some showerheads and aerators also have a shut-off valve or button, to stop the flow of water while lathering and shampooing



# Solar Assessment

Eric Thomson



Solar at my home ??





# Solar Self Audit

**Roof Orientation:** S SW SE E W

**Roof Slope:** Flat Average Steep

**Roof Area:** 8 ft x 8 ft ( 2 panels) 4 x 8 (1 panel)

**Shading on roof:** None Partial Heavy shade

**Daily Hot Water Use**

**Family of 4 ---- 225 litres/day**

**Family of 2 ---- 155 litres/day**

**Water Heater: Electric - Natural Gas - Propane - Oil**



# Solar for Large Family, Small Family

	<u>Family of 4</u>	<u>Family of 2</u>
<b>Solar equipment installed cost</b>	<b>\$4000 – \$5000</b>	<b>\$3000 – \$4000</b>
<b>Electric bill savings</b>		
<b>first year</b>	<b>\$400/year</b>	<b>\$220/y</b>
<b>10th year</b>	<b>\$670/year</b>	<b>\$380/y</b>
<b>Greenhouse gas reduction</b>	<b>3.3 tonnes / year</b>	<b>1.8 t/y</b>

Roof faces South, 1:3 slope

Electric water tank, 6% power inflation



# Solar Collectors in Many Directions

<b>Collector facing</b>	<b><u>South</u></b>	<b><u>SW,SE</u></b>	<b><u>W, E</u></b>	<b><u>South, 45deg tilt</u></b>
<b>Electric savings 10th year</b>	<b>\$670/y</b>	<b>\$650</b>	<b>\$580</b>	<b>\$710</b>
<b>Greenhouse gas reduction tonnes / year</b>	<b>3.3</b>	<b>3.2</b>	<b>2.8</b>	<b>3.5</b>

Family of 4, shallow slope  
Electric water tank, 6% power inflation



# Solar Hot Water - Savings for Various Fuels

	<u>Electricity</u>	<u>Propane</u>	<u>Natural Gas</u>	<u>Oil</u>
<b>Energy savings</b>				
10th year	\$670/y	\$750	\$360	\$450
<b>Greenhouse gas</b>				
reduction	3.3	1.1	1.0	1.3
tonnes / year				

Family of 4, shallow slope  
South facing, 6% power inflation

# Solar Site Assessment

For partly shaded  
homes



Assess best collector site & direction  
Contractor uses Solar Pathfinder  
ECO calculates YOUR solar savings

# Solar Site Assessment

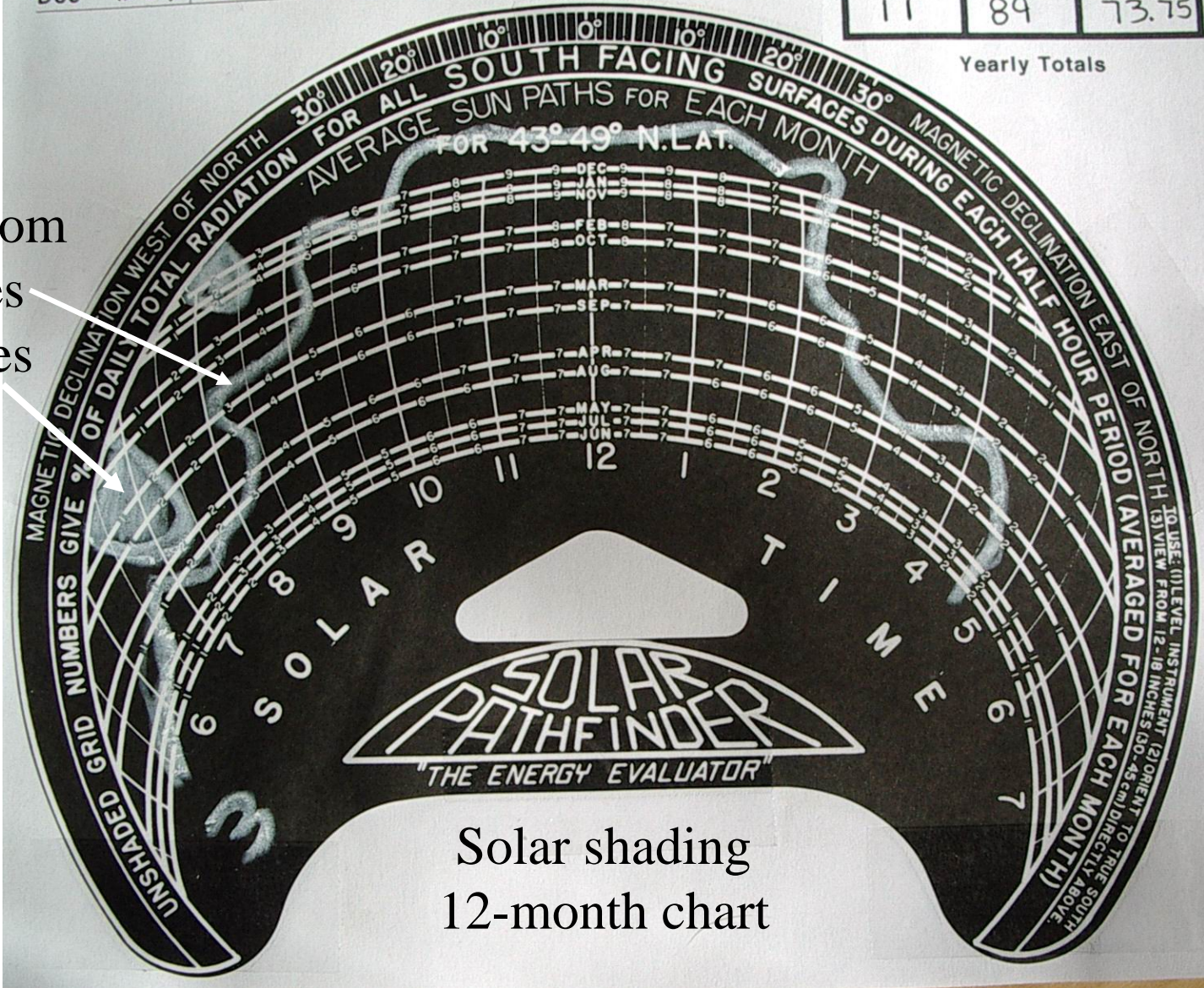


Oct	1	2	3	4	5	6	7	7	7	6	5	4	3	2	1					
Nov	1	2	3	4	5	6	7	8	8	9	9	8	8	7	6	5	4	3	2	1
Dec	1	2	3	3	3	3	4	4	4	4	4	4	3	3	3	2	2	1	1	1

16	84	78
18.5	81.5	77
11	89	73.75

Yearly Totals

Shade from  
maples  
& pines



Solar shading  
12-month chart



# Solar Site Assessment

For partly shaded homes

Finds best collector site & direction

Contractor uses Solar Pathfinder

ECO calculates YOUR solar savings



ECO offer:

\$250 Solar Site Assessment for \$100  
(limited quantity)



# Making it Happen

Renée Lazarowich

# Making it Happen

- ⦿ Evaluate your location and requirements
- ⦿ Evaluate available products
- ⦿ Understand maintenance requirements
- ⦿ Gather quotes from distributors / installers
- ⦿ Obtain necessary permits
- ⦿ Proceed with installation and inspection
- ⦿ Enjoy your sun-heated hot water (and reduction of GHG emissions!)

# SDHW Permits in Ottawa

- ⦿ City of Ottawa Plumbing Permit Requirements:
  - ⦿ Submit application and piping diagram
  - ⦿ Remit fee (\$75 to \$100)
  - ⦿ Provide proof of CSA certification for equipment
  - ⦿ Pass plumbing inspection
  - ⦿ Pass installation code (including building code for structural loads if necessary)

# CSA Certification

- ⦿ CSA standard for SDHW systems is in the process of being updated
- ⦿ Harmonized with US and Europe
- ⦿ Process should be in place by June 2004
- ⦿ We are expecting that systems meeting the new CSA standard will be available on the market this summer

# Get Ready!

- 💧 You can be ready once permits are available:
  - 💧 Evaluate your location and requirements
  - 💧 Evaluate available products
  - 💧 Understand maintenance requirements
  - 💧 Gather quotes from distributors / installers

# ECO Would Like to Help

- 💧 Support for homeowners:
  - 💧 With a strong interest in purchasing a SDHW system
- 💧 By:
  - 💧 Organizing potential consumers
  - 💧 Disseminating information
  - 💧 Facilitating interaction with installers, distributors, and current users



# ECO SHW Consumer Group

- 💧 Assistance with Solar Potential Analysis
- 💧 Collective request for price bids from contractors
- 💧 Assistance interpreting quotes
- 💧 Information about available rebates
- 💧 Up to date information on permits and certification
- 💧 Keep the process for installation permits on track
- 💧 Stimulation of the SDHW industry in Ottawa
- 💧 **Independent and objective**





# Consumer Group - Opportunities

- ⦿ More detailed solar analysis
- ⦿ Discounted Solar Site Assessment (sun path tests)
- ⦿ Possible price reductions for systems through volume discounts
- ⦿ Contribute knowledge, skills and energies
- ⦿ Learn from others, including current users
- ⦿ Become an informed consumer!



# Consumer Group - Limitations

- ⦿ ECO or the SDHW-CG will not:
  - ⦿ Guarantee any product
  - ⦿ Guarantee the solar resource at any house
  - ⦿ Guarantee to any contractor the number of sales
  - ⦿ Guarantee the date for availability of equipment or permits
  - ⦿ Subsidize the cost of any installations
  - ⦿ Pay the expenses of the Consumer Group



# Consumer Group - Meeting

- 💧 Date: Thursday, May 6, 2004  
Time: 7 - 9 pm  
Place: CentrepoinTE (Ben Franklin Place)  
Room 2A
- 💧 Key Items:
  - 💧 Speeding up the Permit Process
  - 💧 Getting Quotes from Vendors
  - 💧 Opportunity to ask for more detailed Site Analysis
- 💧 Please RSVP

This project is supported by the  
EcoAction Community Funding Program



# Questions?

