

# Smart Grids and Renewable Electricity

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Electricity Generation Using Renewable Energy  
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# Purpose and outline

- Purpose
  - to explore the ways in which ‘smart grids’ can promote increased use of renewable electricity
- Outline
  - Context
  - Definitions
  - Smart grids and renewable electricity
  - Sample project
  - Mutual learning
  - Summary and discussion

# Context



# Definitions: I. Smart Grids

- means different things to different people!
- US Department of Energy,  
*The Smart Grid: An Introduction*
  - “An automated, widely distributed energy delivery network, the Smart Grid will be characterized by a two-way flow of electricity and information and will be capable of monitoring everything from power plants to consumer preferences to individual appliances. It incorporates into the grid the benefits of distributed computing and communications to deliver real-time information and enable the near-instantaneous balance of supply and demand at the device level.”
- some key elements

# Definitions: II. Renewable Electricity

- again, means different things to different people!



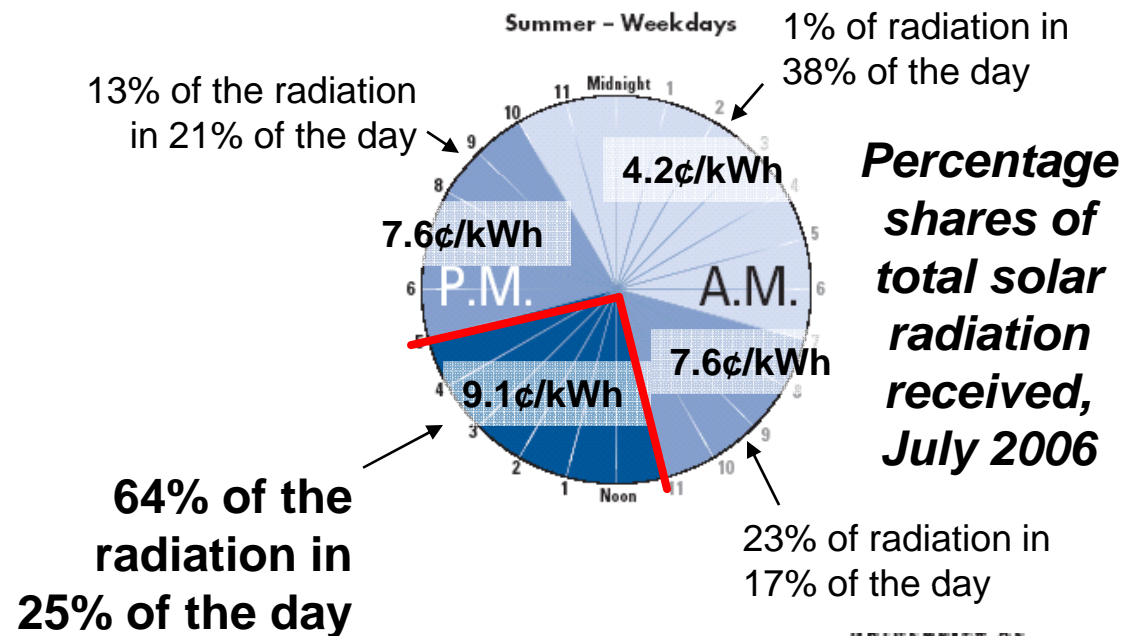
# Energy



- some key elements

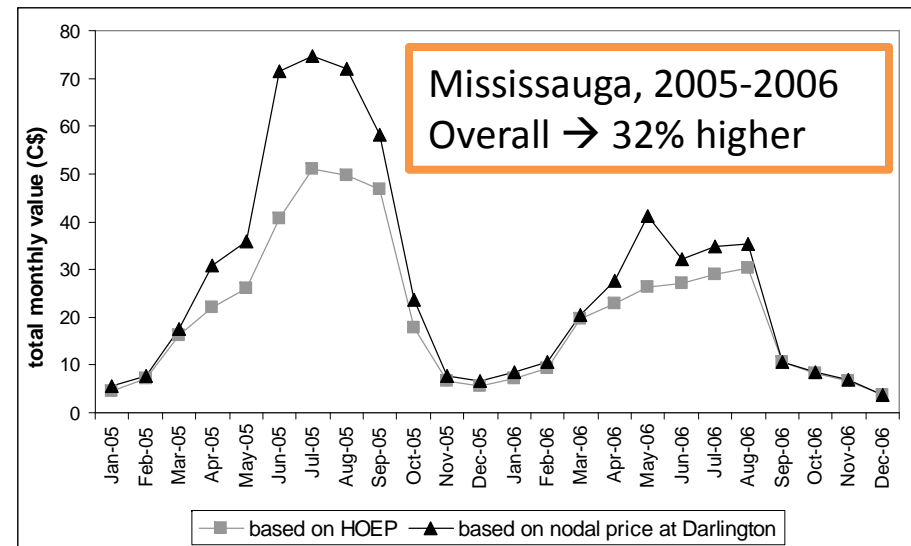
# Smart Grids and Renewable Electricity

- Merge these two areas, and there is great potential for advancing sustainable energy systems by effectively managing variability and distributed generation
  - time-of-use prices can reward renewable resource provision (summer sun and winter wind in Ontario)



# Smart Grids and Renewable Electricity

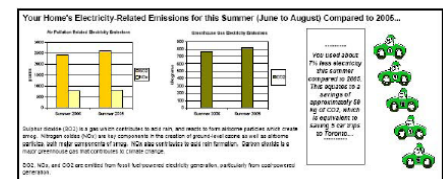
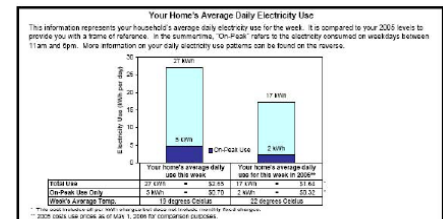
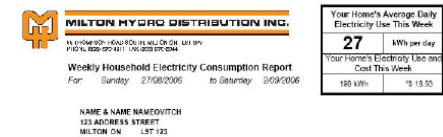
- Merge these two areas, and there is great potential for advancing sustainable energy systems by effectively managing variability and distributed generation
  - locational prices can reward embedded generation in congested areas (roof-top solar in Ontario's GTA [Greater Toronto Area])



Brown and Rowlands, *Renewable Energy*, 2009

# Smart Grids and Renewable Electricity

- Merge these two areas, and there is great potential for advancing sustainable energy systems by effectively managing variability and distributed generation
- consumer engagement – through increased information and control – empowers users and increases demand for local, renewable resources



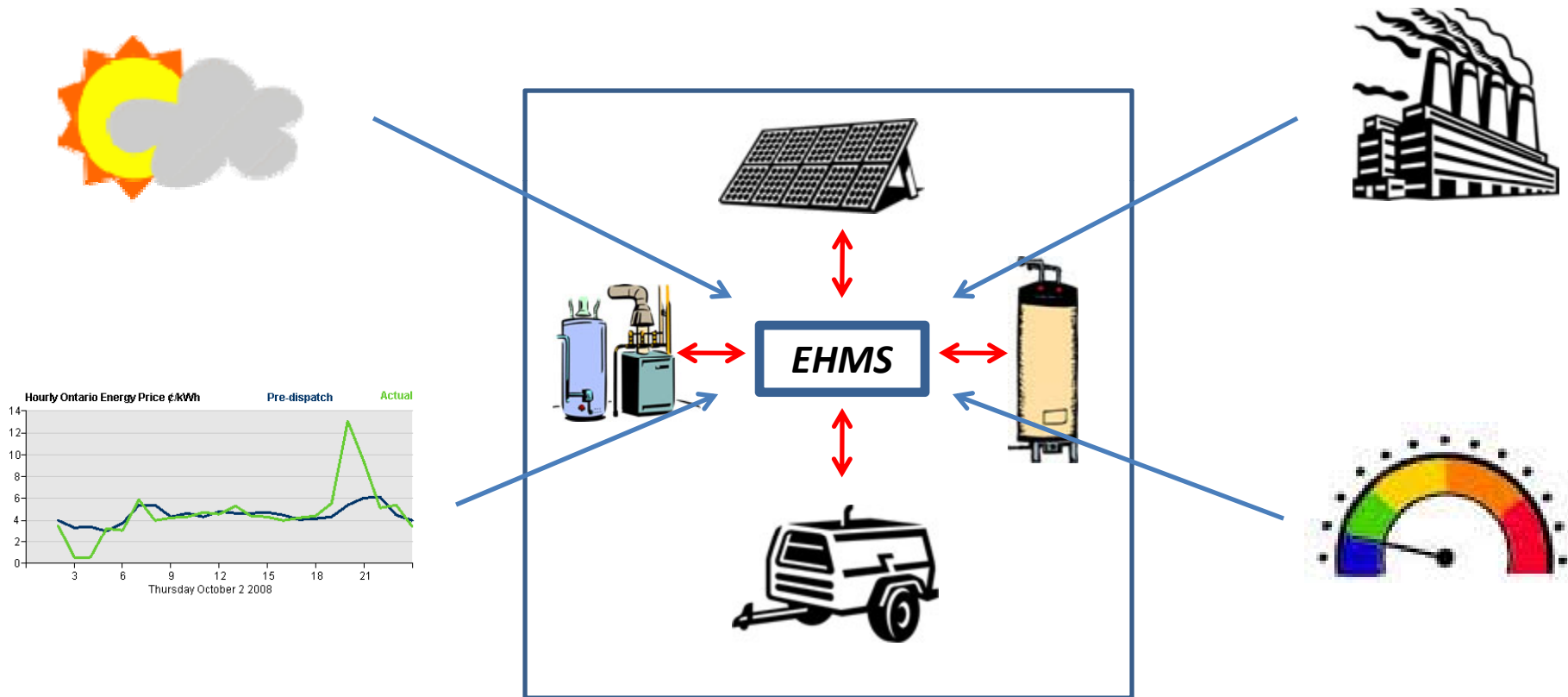


# Smart Grids and Renewable Electricity

- Merge these two areas, and there is great potential for advancing sustainable energy systems by effectively managing variability and distributed generation
  - but any transition is challenging ...
    - inertia is powerful
    - moving reformers in the same direction (toward the same goal) is not always easy

# Sample project

## *Vision for the Energy Hub Management System project*



# Sample project

## *Partners for the Energy Hub Management System project*

- University
  - University of Waterloo
- Utilities
  - Hydro One
  - Milton Hydro
- Private sector
  - Energent
- Government
  - Ontario Centre for Energy
  - Ontario Power Authority

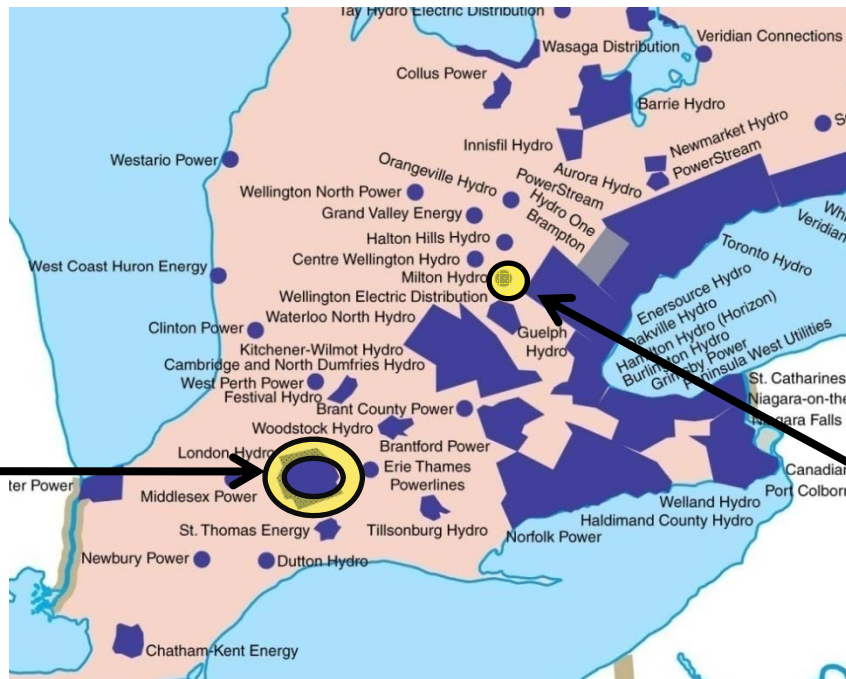


# Sample project

## *Products for the Energy Hub Management System project*

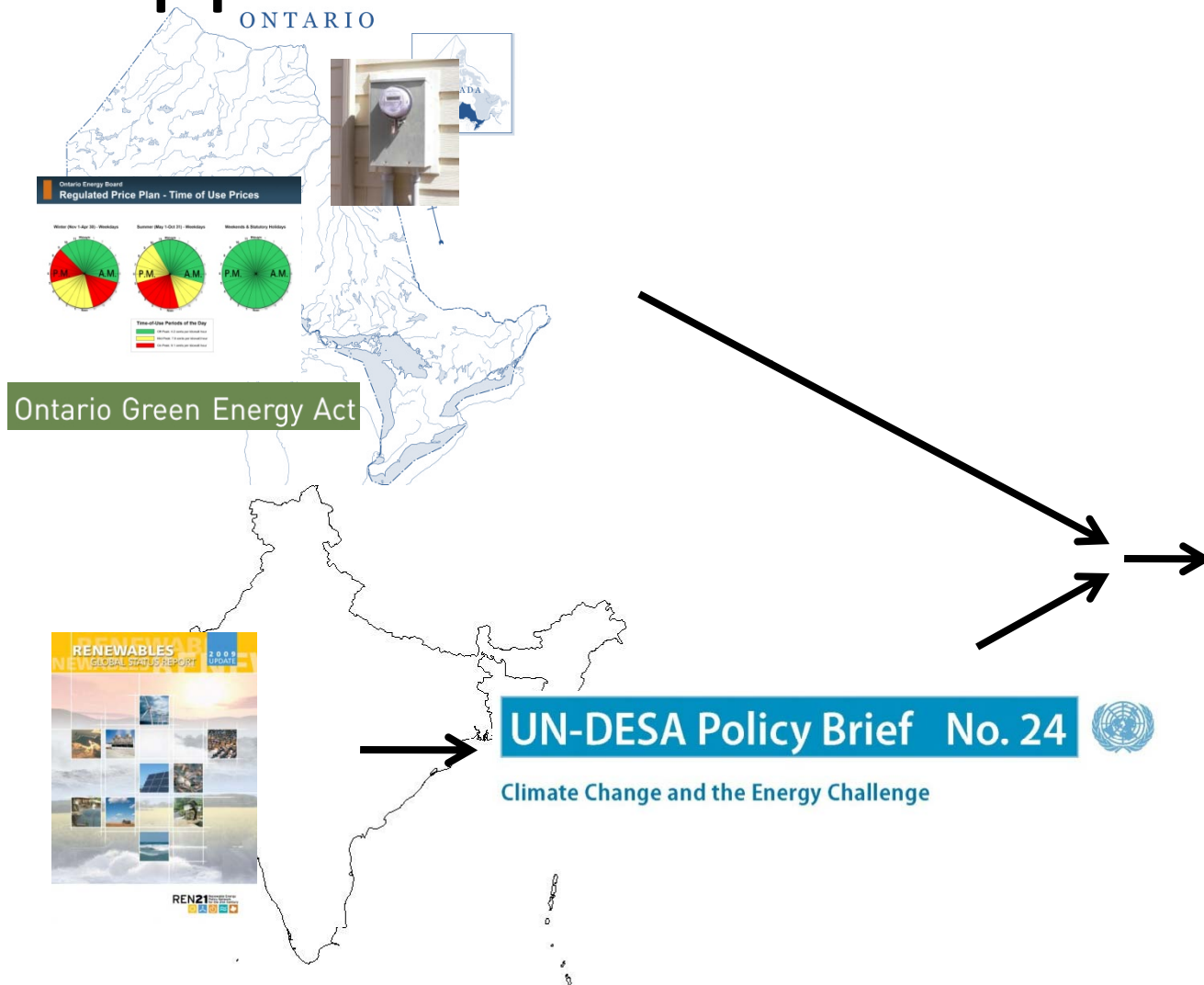


5 agricultural  
5 commercial/  
institutional  
5 industrial  
pilot projects



50 residential  
pilot projects

# Opportunities for mutual learning



# Summary and discussion

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Key website:

<http://www.environment.uwaterloo.ca/research/greenpower/>