

The Energy Hub Management System: Enabling and Empowering Energy Managers

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environment.uwaterloo.ca

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Behavior, Energy & Climate
Change Conference (BECC),
2 December 2011*

Outline

- presentation purpose
- context
- logistics and description
- innovations
- next steps

What is the issue?

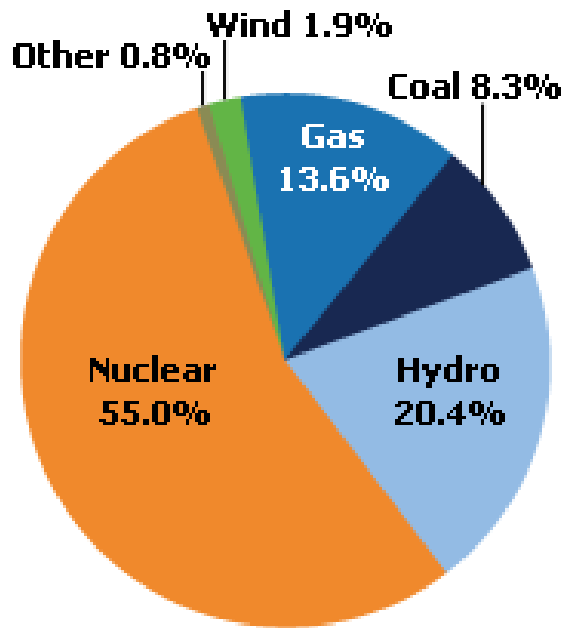
- Can 'better tools' help householders move us towards a sustainable energy future?
 - Conventionally: residential energy management has been like 'driving in the dark'
 - Key tools: real-time information and optimisation results

Purpose

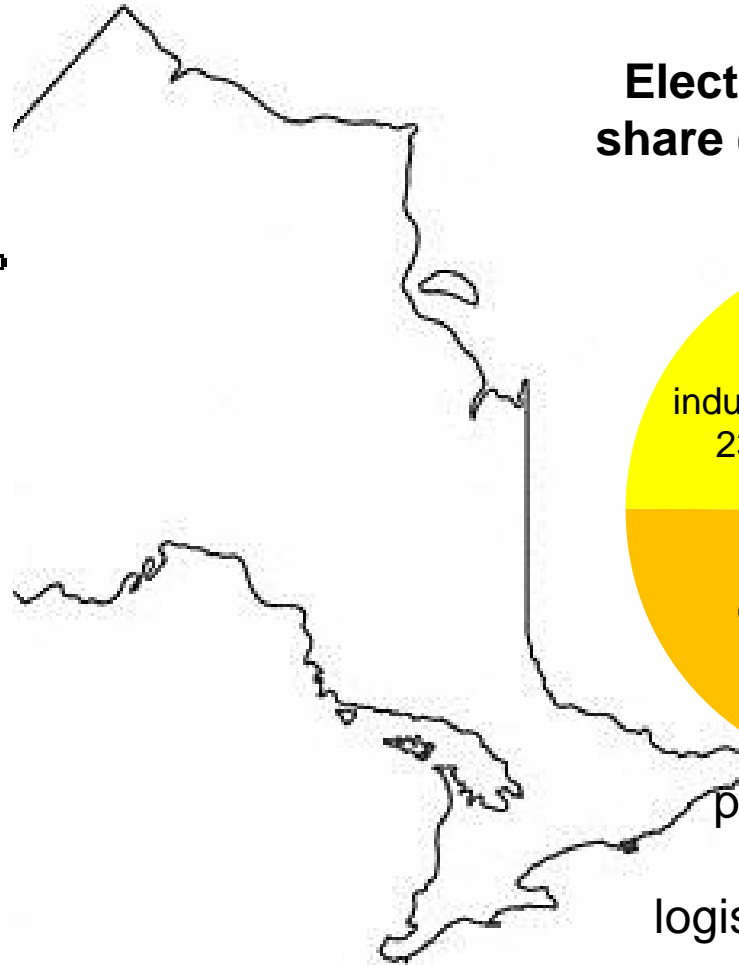
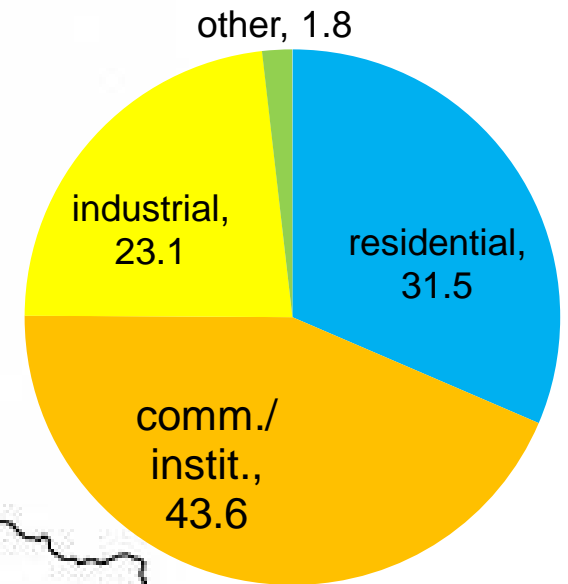
- This presentation aims to provide an overview of the Ontario (Canada)-based ‘Energy Hub Management System’ project, particularly highlighting its innovative work in the residential sector

Electricity in Ontario

Energy Output by Fuel Type (2010)

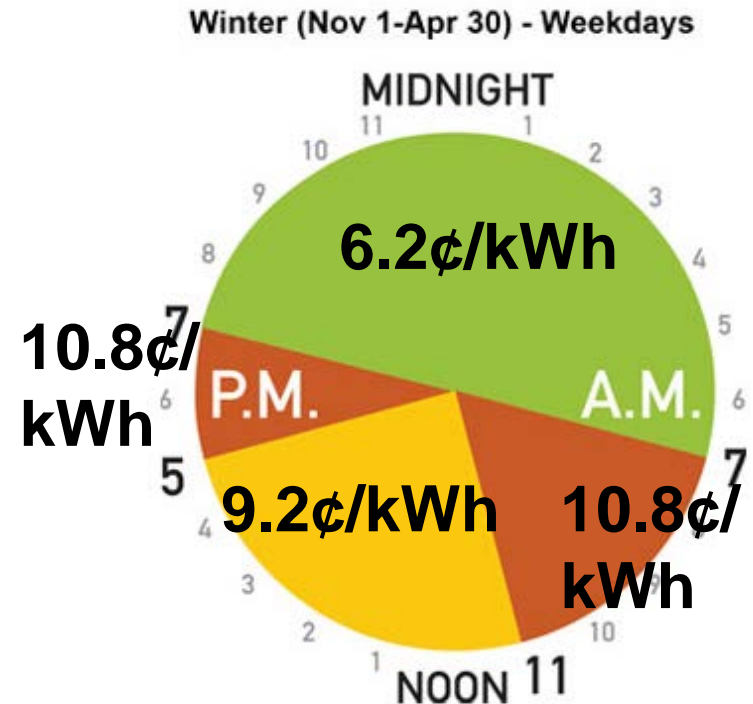


Electricity demand, by share (percentage, 2008)



Opportunities in Ontario

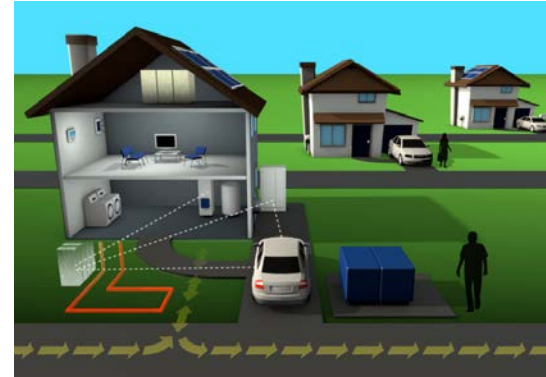
- Large-scale deployment of interval meters
 - More than 4 million residential locations
- Mandatory time-of-use rates



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Opportunities in Ontario

- Smart Grid Forum
- October election



ONTARIO PC

Home

Tim Hudak

Our Team

Issues

News

Take Action

Tim Hudak Will Unplug Mandatory Smart Meter Tax Machines

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Partnership



Ontario Centres of
Excellence
Where Next Happens



MILTON HYDRO



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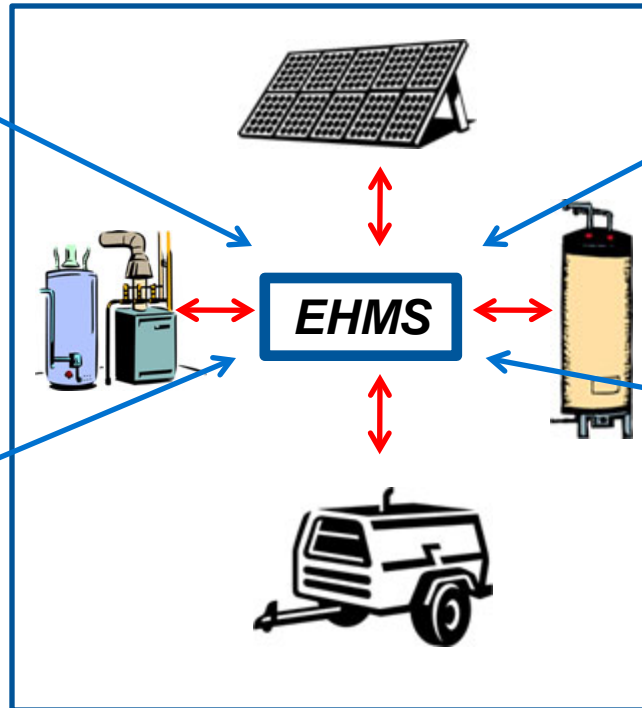
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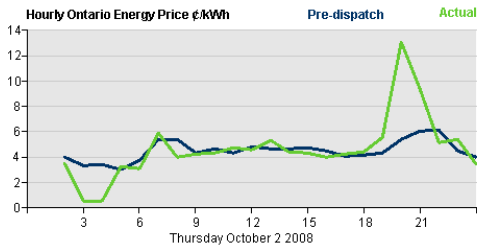
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Vision

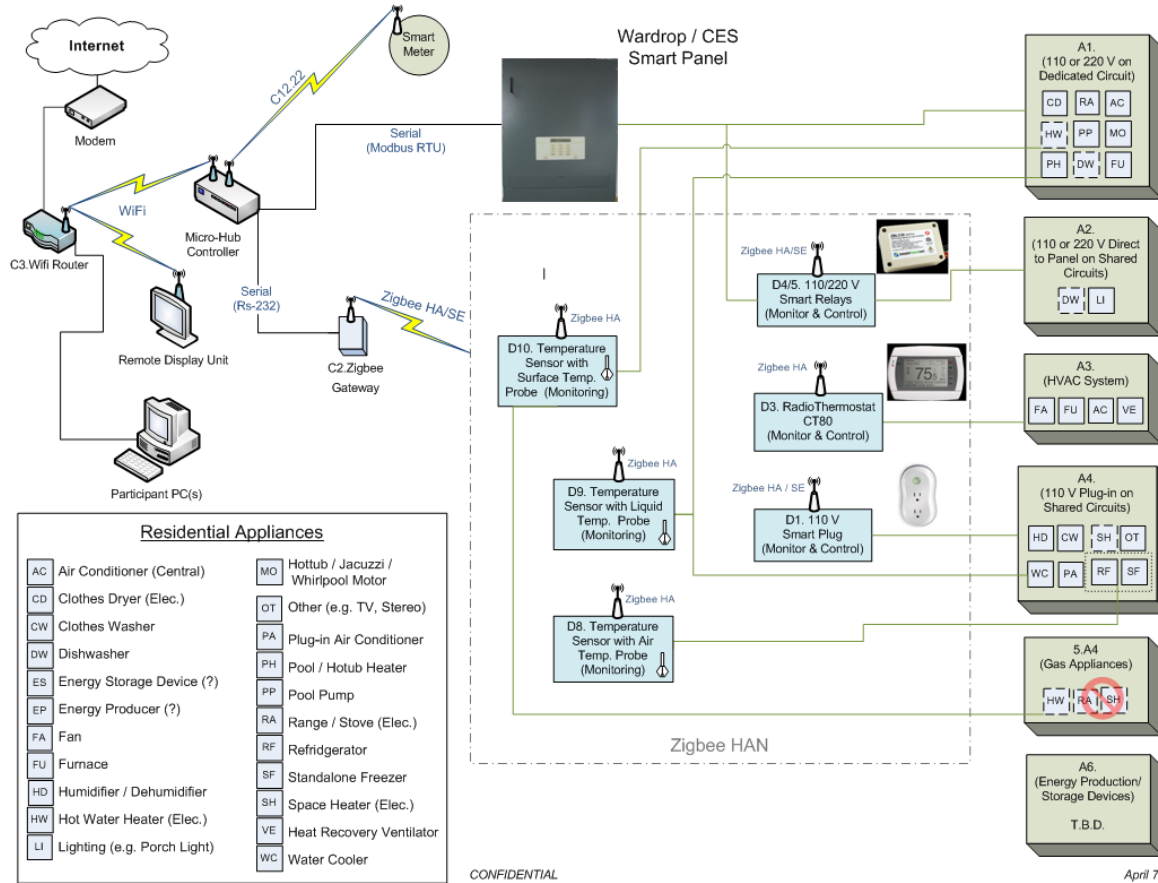
The Energy Hub Management System (EHMS) generates 'optimal' energy management schedules for managers, based upon their own priorities/preferences in light of real-time internal and external conditions.



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Operationalising the vision



CONFIDENTIAL

April 7, 2011

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'On the ground' in Milton

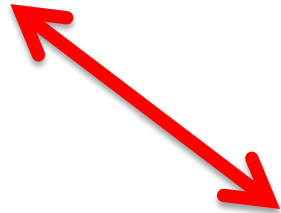
'20+5' pilots in Milton



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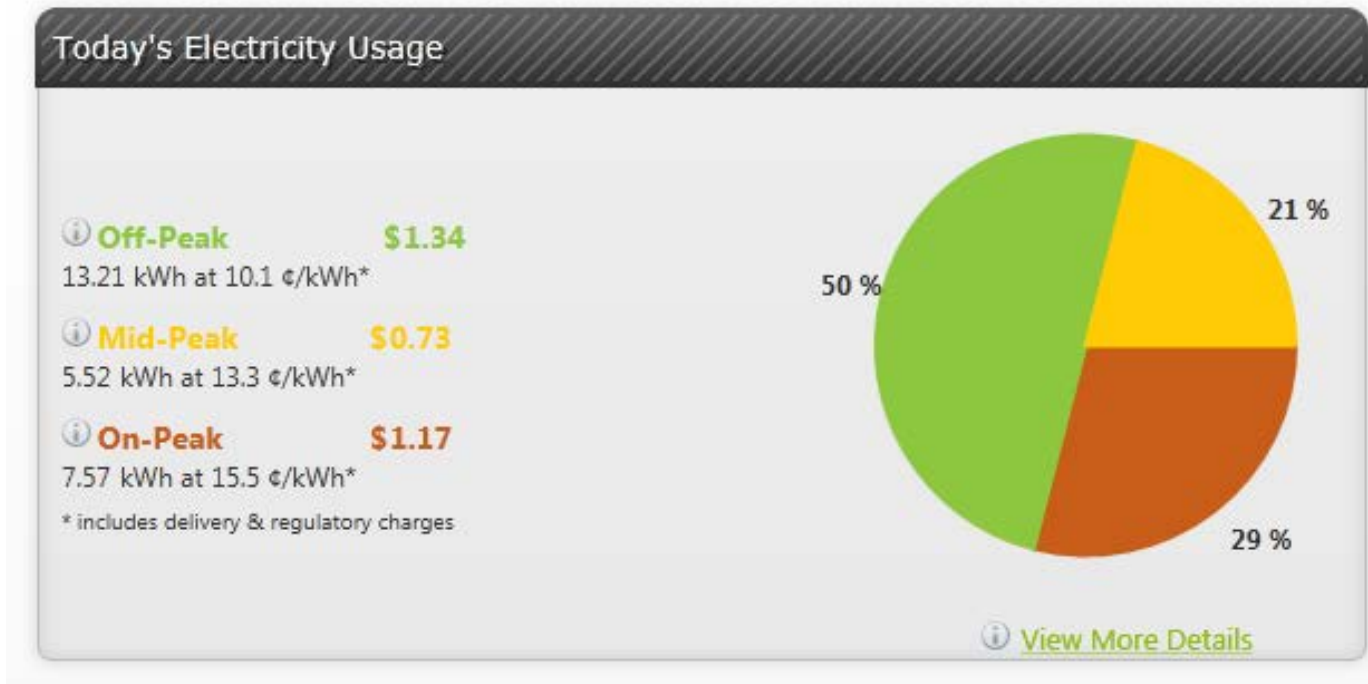
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'In the home' in Milton



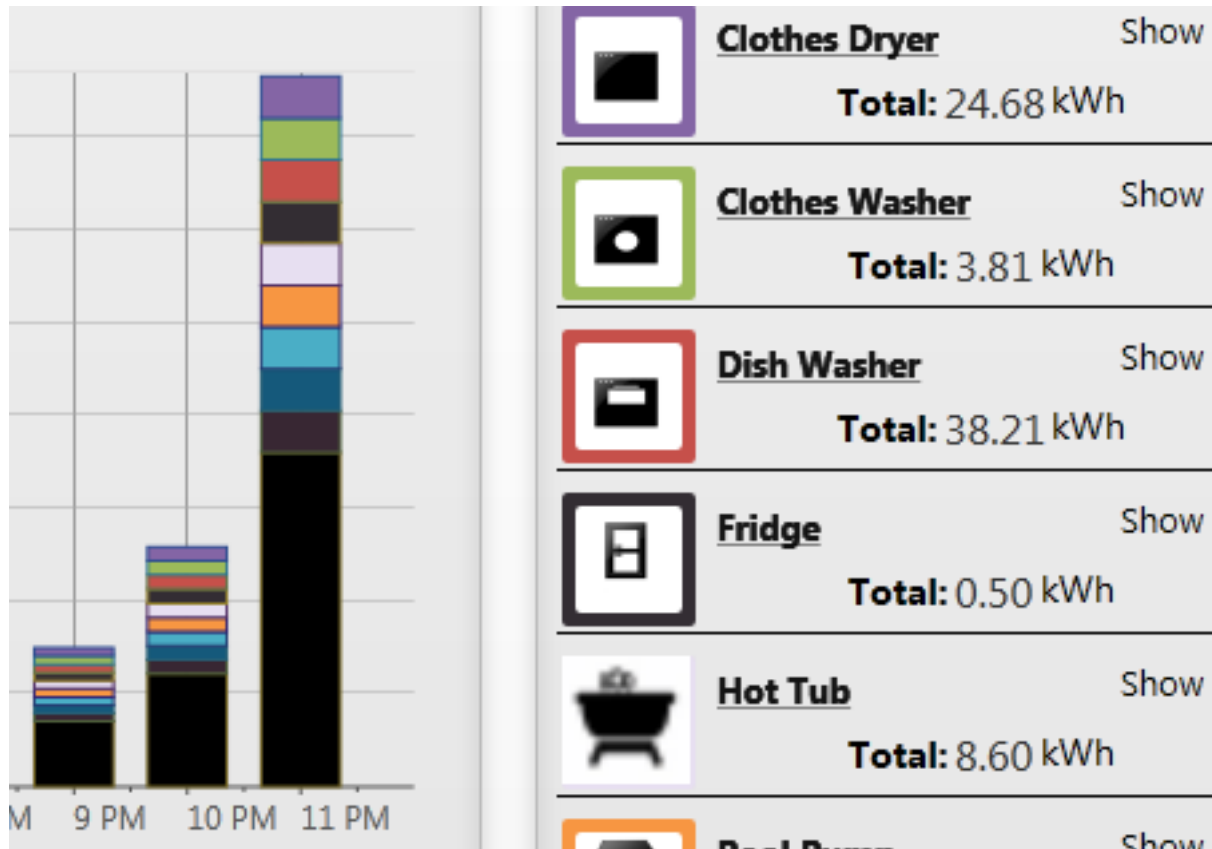
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Monitoring phase



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Monitoring phase



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Goal-setting tool

Electricity Goal-Setting for the month of April

Appliances	Allocated	Actual Usage	% of Allocation Used	Tracking
 Clothes Dryer	30 kWh	34.44 kWh	115 %	
 Clothes Washer	40 kWh	14.80 kWh	37 %	
 Dish Washer	30 kWh	10.69 kWh	36 %	
 Refrigerator	54 kWh	51.89 kWh	96 %	
 Stove	25 kWh	22.10 kWh	88 %	
 Other	421 kWh	384.37 kWh	91 %	

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Control phase

The screenshot displays the 'Energy Hub Management System' interface. At the top, a green header contains the system name and user information: 'Welcome residential-master | Account Settings | Logout'. Below this is a navigation menu with options: Home, Optimizer, My Appliances, Goal-Setting, Comments, Help, Project Information, and Contact us / Support. The main content area is titled 'System Preferences' and is divided into two columns. The left column, 'System Objective', contains three sliders for 'Reduce Energy Usage', 'Reduce Energy Costs', and 'Reduce Carbon Footprint', each with a 'How important is reducing your...?' label and 'Not Important', 'Important', 'Very Important' markers. The right column, 'System Settings', includes a 'Reduce Peak Power' section with an 'ON' toggle and a 'Reduce peak power by 10%' input field, and a 'Current Optimizer Mode' dropdown set to 'Weekend & Holiday'. A bottom navigation bar shows 'System Preferences', 'Appliance Preferences', and 'Appliance Schedule'. The system status bar at the bottom indicates 'Today is April 29, 2011 | System Status | Mid-Peak | Optimizer Mode: W...'. The Windows taskbar at the very bottom shows 'Done' and system icons for Internet, Protected Mode, and 100% zoom.

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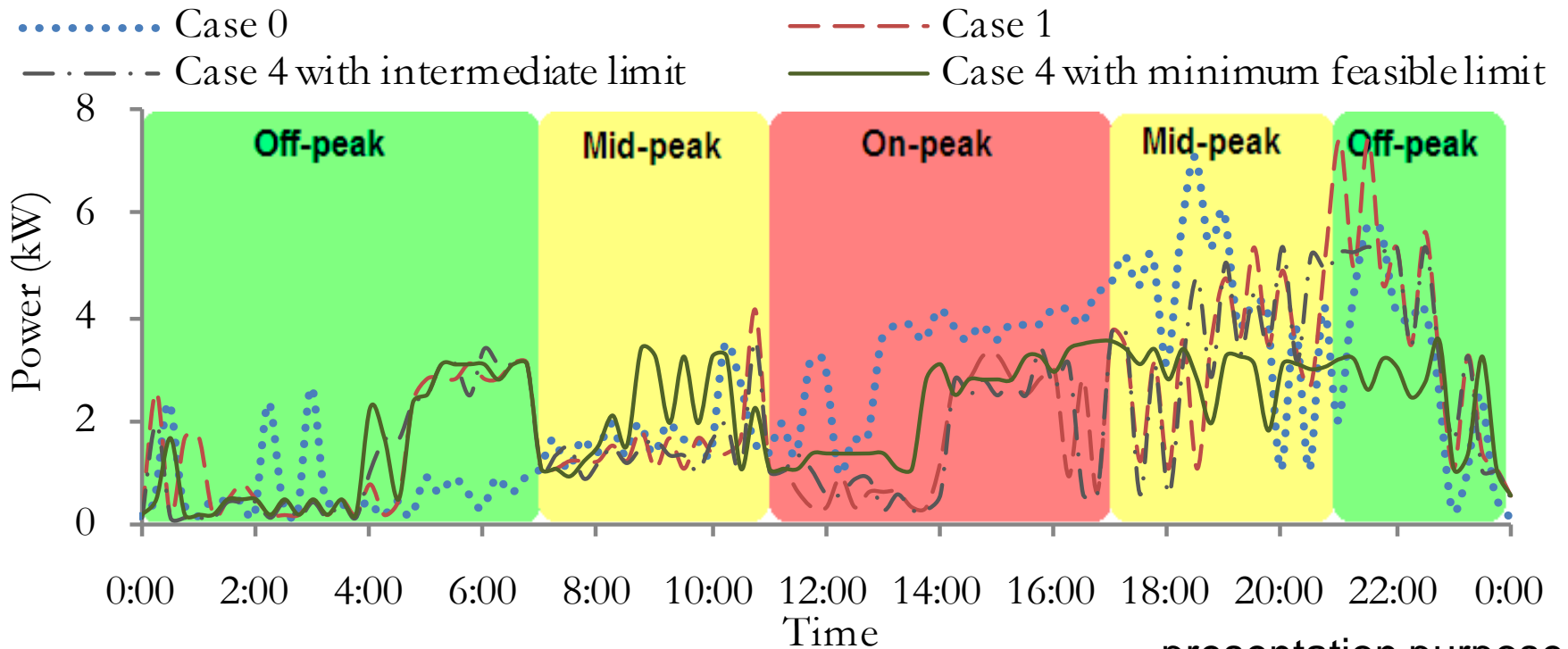
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Replicate 'lab results'?

Objective	Constraint	Result
Minimise cost	Comfort	20% reduction
Minimise consumption	Comfort	13% reduction
Minimise carbon	Comfort	23% reduction
Minimise all three, equal weighting	Comfort and 33% reduction in peak demand	15% lower cost, 11% less energy consumed, 15% fewer CO2 emissions

Replicate 'lab results'?



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Next steps

- 1) through to January 2013
- 2) a non-residential component
- 3) EHMS II

Continuing the discussion

- Project principal investigator
 - Prof. Ian Rowlands
 - University of Waterloo; irowlands@uwaterloo.ca; tel: (519) 888-4567 x 32574
- Project website
 - <http://environment.uwaterloo.ca/research/greenpower/energyhub/index.html>
- Commercialisation partner
 - Energent Inc., www.energent.com,
Gord Ellis (gellis@energent.com)

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References

- Slide 5: http://www.polyvore.com/ontario_canada_outline_map/thing?id=9591542;
http://www.ieso.ca/imoweb/media/md_supply.asp
- Slide 6:
<http://www.ontarioenergyboard.ca/OEB/Consumers/Electricity/Electricity+Prices>
- Slide 7: www.ontariopc.com/news-releases/tim-hudak-will-unplug-mandatory-smart-meter-tax-machines/; news.ca.msn.com/ontario/toronto/tim-hudak-vows-to-slash-hydro-rates-if-elected; <http://www.ieso.ca/smarthomeroadmap/>
- Slide 9: www.fotosearch.com/clip-art/smog.html;
www.ieso.ca/imoweb/siteShared/demand_price.asp?sid=ic;
www.aperfectworld.org/weather.htm; airqualityontario.com/reports/summary.cfm;
www.fotosearch.com/clip-art/
- Slide 11:
<http://www.worldatlas.com/webimage/countrys/namerica/province/onzmaps.htm>;
http://atlas.nrcan.gc.ca/site/english/maps/reference/outlineprov_terr/ont_outline_names/referencemap_image_view
- Slide 12: <http://safeplug.com/>;
<http://shop.radiothermostat.com/product.sc?productId=10>