

# **The Energy Drill!**

## **Enhancing energy education with action and technology**

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# energydrill

- **What is the Energy Drill?**
- **The Pilot**
- **Results**
- **Challenges & Lessons Learned**
- **What's next?**



# energydrill

- Demand Response program in schools
- Pilot program
- 2006-2007 school year



what is the  
**energy drill**



# Like a Fire Drill...

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- Instead of a fire...
- Instead of a bell...
- Instead of everyone...
- Instead of evacuating...
- Instead of trudging back to class...

# Pilots

2005/6

2006/7



# A UNIQUE Demand Response Program

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- Typical Demand Response:

“mechanisms to manage demand from customers in response to supply conditions, for example reducing consumption at critical times”

- DR in province of Ontario generally critical time response with real-time assessment

- Immediate and urgent

# A UNIQUE Demand Response Program

## ➤ Schools: a UNIQUE audience in a UNIQUE environment

- Busy schedules
- Teachers need time to prepare
- Students require order and routine, not chaos!
- Students are at various levels of understanding, ability, judgement, responsibility
- Lots of participants
- Participants 'difficult' to reach
- Learning activities can not be compromised
- Educational opportunities go hand-in-hand



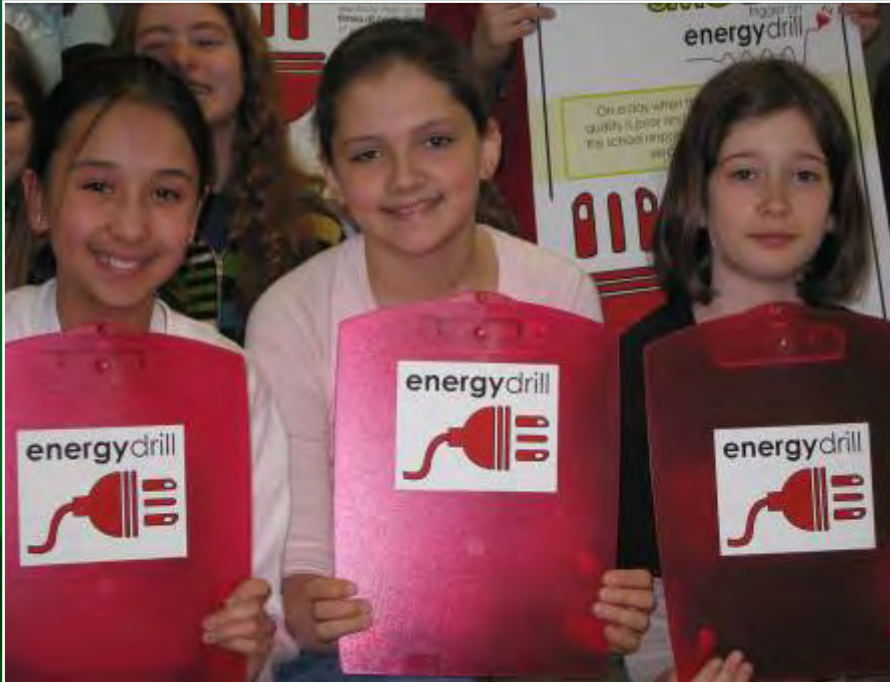


# A UNIQUE Demand Response Program

- **Schools require a UNIQUE demand response program**
  - Day ahead notification, with forecasted indicators of supply constraints as triggers
  - Rehearsed, predetermined response with checklist prompts
  - No-cost, repeatable response
  - Full day response minimizes urgency so spreading the message is easier
  - Full day response encourages participation when possible
  - Only non-essentials were turned off
  - Integrated educational messages
  - Flexible program design encourages ownership



# School recruitment



- 8 schools
- 3 school boards
- 2 high schools
- Letter of commitment
- Designated Energy Teams
- Program kick-off

# Education Plan

## 7 Key Messages

- Electricity use burns fossil fuels
- Electricity use affects local air quality
- Electricity use contributes to climate change
- When we use electricity matters
- Electricity costs money
- Electricity is a highly valued resource that we need to manage wisely
- Electricity management is everyone's responsibility together

# Determining the Triggers

## 4 Triggers

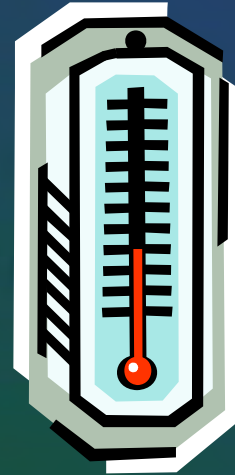
- **Liaison with IESO**
- **Considerations:**
  1. Indication of need
  2. Frequency
  3. Accessibility
  4. Messaging



# Determining the Triggers

## 4 Triggers

- **Extreme temperatures**
  - $-5^{\circ}\text{C}$  or less or  $26^{\circ}\text{C}$  or more
- **Smog**
  - Poor air quality forecast
- **Supply constraints**
  - IESO TLRP advisory
- **High electricity market price**
  - 18 cents per kWh or more day ahead estimate



# Spreading the message

- Integrate messaging into Energy Drill response 'Protocol'
- Training
- Ongoing educational activities
- Media
  - Movie, posters, fact sheets, stickers

Spreading the message



# Training activities



- Staff training: “Sell”
- Student presentations: “Introduce, Motivate and Engage”
- Energy Team training: “Teach”

# Unique Demand Response: The Drill

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## ➤ Measures on an Energy Drill were:

- Specific to school
- Rehearsed
- Full-day
- Possible while still functioning day-to-day
- Simple, repeatable
- No-cost

## ➤ And considered:

- What students do / do not have access to
- Safety



# Unique Demand Response: The Drill

## ➤ Demand Response opportunities:

- Reduce lighting
- Turn off computers/monitors
- Turn off / defer use of unnecessary equipment
- HVAC/BAS:
  - *Reset thermostats*
  - *Reschedule processes*



# Technology Behind the Scenes

- Notification software
- Install interval meters
- Baselineing
- Analysis and Report Card Software



# Analysis and Reporting Software

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## ➤ **Input:**

- Electricity Use data for Energy Drill day
- Baseline coefficients
- Weather data for Energy Drill day

## ➤ **Black box:**

- Comparison of Drill day peak demand to baseline 'expected' peak demand for that school

## ➤ **Output:**

- Peak demand savings
- Equivalent number of TVs turned off
- Equivalent number of cars off the road for a day

## ➤ **Not Automated!**

# CONGRATULATIONS!

on running a successful Energy Drill at Robert Baldwin Public School

Here are your results:

## Circumstances on the Energy Drill day

Energy Drill dates	Tuesday, May 15, 2007
The Energy Drill was triggered by	Extreme High Temperatures

Highest temperature on day of drill	22.4 °C
Expected peak electricity demand on day of drill	115 kW

## Results of the Energy Drill

Actual peak energy demand on day of drill	90.0 kW
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**Peak electricity demand reduction:** 17.2 kW

**Equivalent number of typical TVs tuned off:** 232.9 TVs

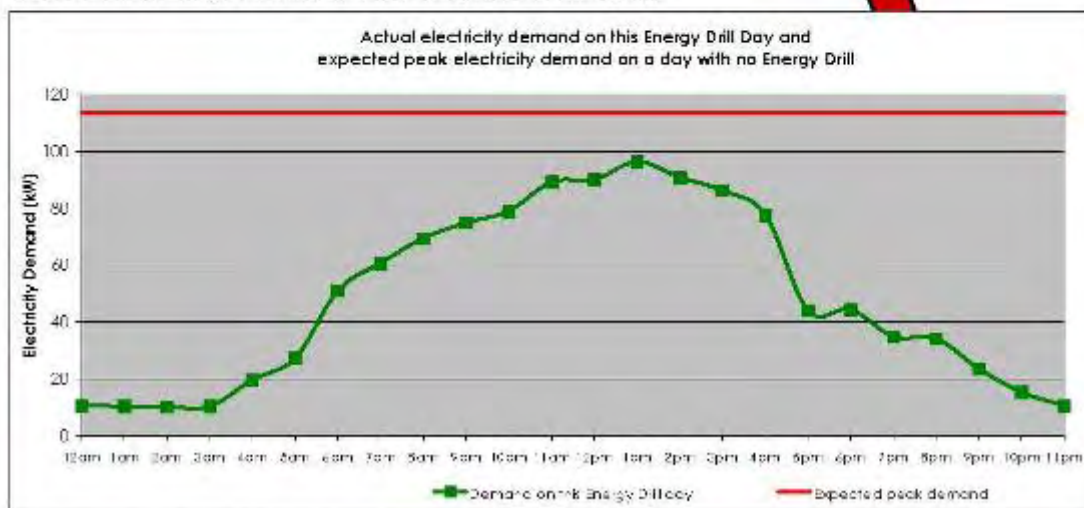
Greenhouse gases (CO<sub>2</sub>) saved per hour of peak demand reduction:<sup>1</sup> 12.1 kg

**Equivalent number of typical Canadian cars taken off the road for one day\*\*:** 1.0 cars

## Results of all Energy Drills to date

Total number of drills run to date:	4
Highest peak savings during a drill to date:	22.2 kW
Lowest peak savings during a drill to date:	4.0 kW
Average peak savings during a drill to date:	5.4 kW

The graph below shows a comparison between your school's actual electricity demand during an Energy Drill and your school's expected peak electricity demand for the day if there was no Energy Drill.



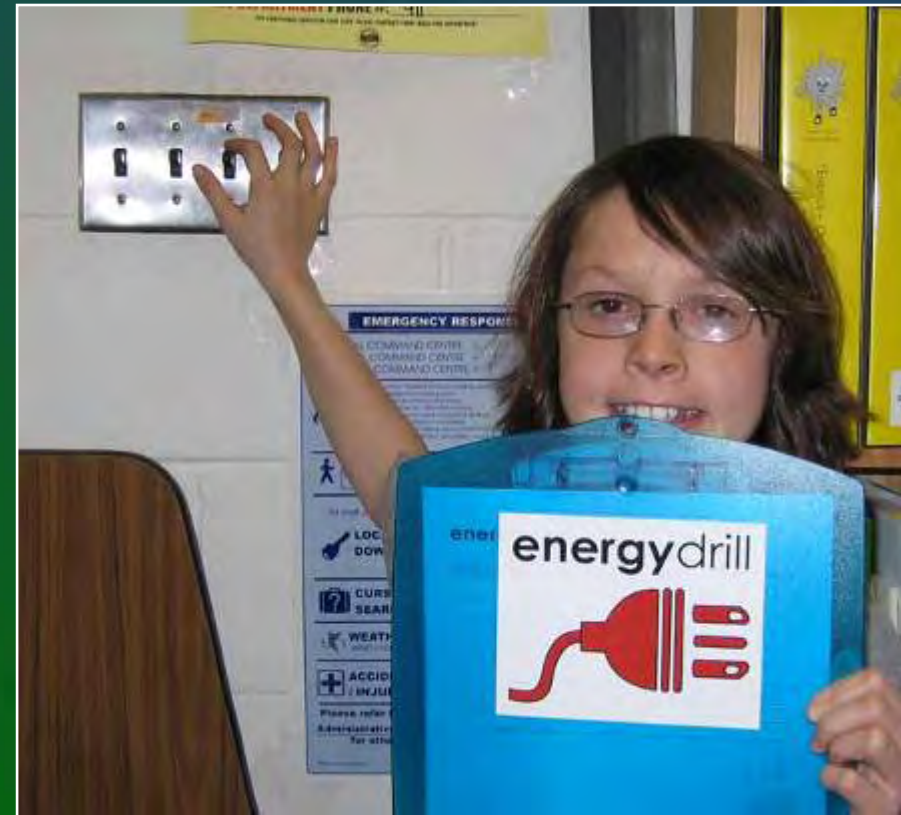
<sup>1</sup> Based on the average television drawing 76W while tuned on for viewing from a distance (energy.nrc.ca/energy) (1000W = 1kW)

<sup>2</sup> Based on a 2007 ton of refrigerant (cooling) gas and electricity generated on a typical Ontario day of 0.274 kg CO<sub>2</sub>/kWh from [www.ec.gc.ca/energy](http://www.ec.gc.ca/energy)

<sup>3</sup> Based on a vehicle's average fuel consumption of 8.2L/100 km (24 mpg) and 4.27 kg CO<sub>2</sub>/L of gas from [www.ec.gc.ca/energy](http://www.ec.gc.ca/energy)

# Results - General

- Very positive response from all participants
- Strong educational opportunities
- Interested students
- School wide learning
- Empowerment!



# Results – Surveys

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- Grade 4-8 student results
- **Knowledge** – Electricity can pollute the air we breathe (47% pre -> 70% post)
- **Attitude** – I want to be an energy conserver (61% pre -> 64% post)
- **Beliefs** – My school is a good 'energy conserver' (36% pre -> 75% post)
- **Behaviour** – I always turn off computer monitors (22% pre -> 45% post)

# Results - Technical

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- **Results of successful drills only; per school per drill:**
  - Peak demand savings range up to 30%, avg 5.4%
  - Peak demand savings up to 90kW
  - TVs off range up to 1209, avg 213
  - Cars off the road range up to 5.4, avg 1
- **Across nearly 5000 Ontario schools:  
130 MW peak savings**
- **Greater potential considering permanent culture change, more action**

# Challenges & Lessons Learned

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- **Timelines - competing priorities in schools**
- **Working with teachers**
- **The importance of the Energy Champion**
- **Flexible program design**
- **Action-oriented!**
- **Results feedback is important**
- **Technical difficulties**
  - Baseline coefficients
  - Reporting and analysis
  - Lower results than possible
- **Program potential**
- **Permanent culture change**



# What's next?

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- Expanded pilot
- Integrated curriculum
- Build on success of ACTION!
- Use TECHNOLOGY to improve upon technical aspects (baselining, savings and reduction analysis and results)
- Aggregation of DR to an incentive earning portfolio
- Eventual roll-out across all Ontario schools

# What's next?

- In-class monitoring and feedback module



# What's next?

- Potential for remote monitoring, feedback and control



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# Thank you!

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