

# Energy Drill!

Unique demand response  
in schools

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# energydrill

- **What is the Energy Drill?**
- **Demand Response in schools**
- **Unique program design**
- **Pilot results**
- **Program design as driver of results**
- **What's next?**

# energydrill

- Electricity Demand Response program in schools
- Pilot program in 8 Toronto area schools in 2006/7
- A uniquely designed program that is evolving into a second pilot
- Eventual roll-out across all schools in the province



**MILTON HYDRO**

what is the  
**energy drill**?



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# Like a fire drill...

## ➤ Instead of a FIRE

- Need for demand response

## ➤ Instead of a BELL

- An e-mail

## ➤ Instead of EVERYONE

- Energy Teams

## ➤ Instead of EVACUATING

- No-cost, predetermined electricity demand reducing measures

## ➤ Instead of TRUDGING BACK TO CLASS

- A results feedback loop and an education plan

# What is demand response?

- Traditional Demand Response (DR):
  - “participants take immediate action to reduce demand in direct reaction to supply conditions, typically over a short period of time during which supply is constrained”
- DR can be requested by ISO
- DR intended to mitigate adverse impact of shortages of energy under stressed system supply conditions



# Why demand response in schools?

- Schools combined demand is significant
- Educational programming: build a culture of responsible energy management
- A key population for the future
- **BUT!**
- Schools are a UNIQUE audience
- Typical DR poses problems to schools
- Schools need a UNIQUE DR program
  - To allow DR
  - To make DR successful

# Demand response issues in schools

## 1) Typical demand response is immediate and sudden

- Difficult for schools to react immediately
- Teachers are busy and require time to prepare response
- Students are accustomed to routine
- School activities vary day-to-day
- Certain activities cannot be interrupted





# Demand response issues in schools

## 2) The need for a demand response event needs to be communicated quickly

- All school occupants need to know
- Communication systems in schools can be limited

## 3) A demand response event is short-lived

- Need time to accommodate changes in activities
- All school occupants need a chance to participate

# Demand response issues in schools

## 4) Demand response measures can be technical and may be automated

- Participants are of varying levels of understanding and ability
- Younger students need an easy, predetermined response
- Students don't have access to all equipment
- Need minimal disruption
- Automation of response 'hides' DR and educational opportunities are lost

# Demand response issues in schools

## 5) Demand response measures can create less comfortable conditions

- Lower light levels, temperature
- Safety and health concerns
- Children's tolerance often low

## 6) Demand response is just a set of actions without messaging

- Need programming for educational benefit

# UNIQUE program design

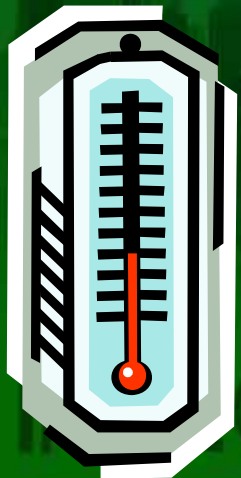
## A) Day-ahead notification

- Addresses immediate, sudden nature of DR
- Allows teachers to plan response
- Addresses need for quick communication
- **BUT!**
- How can DR 'react' with advance warning?
- Must react to **PREDICTORS** and **INDICATORS** of the need for DR



# UNIQUE program design

- Must FORECAST
- PREDICTORS are correlated with high demand:
  - Extreme Temperature
  - Smog
- INDICATORS indicate the coming need for DR:
  - Supply constraints
  - High market price of electricity
- TRIGGERS



# UNIQUE program design

## B) Full-day response

- Addresses need for quick communication
- Addresses short-lived nature of DR
- Addresses issue of less comfortable conditions (more tolerable conditions over long time rather than less tolerable conditions over short time)
- Allows more flexibility in response
- Allows for wider-spread participation
- Ensures response covers true time of need
- Includes full-day and time-of-day measures

# UNIQUE program design

## C) Response includes variety of measures at different levels

- Turning out lights to HVAC adjustment
- Students to custodial staff
- Interactive, manual measures
- Automated HVAC measures



# UNIQUE program design

## D) Pre-determined, no-cost response

- Allows response to be rehearsed
- Allows schools to participate without cost

## E) Flexibility allowed to schools

- Allows schools to tweak their response based on their needs, overall and Drill to Drill
- Avoids disruptive turning off of essential equipment



# UNIQUE program design

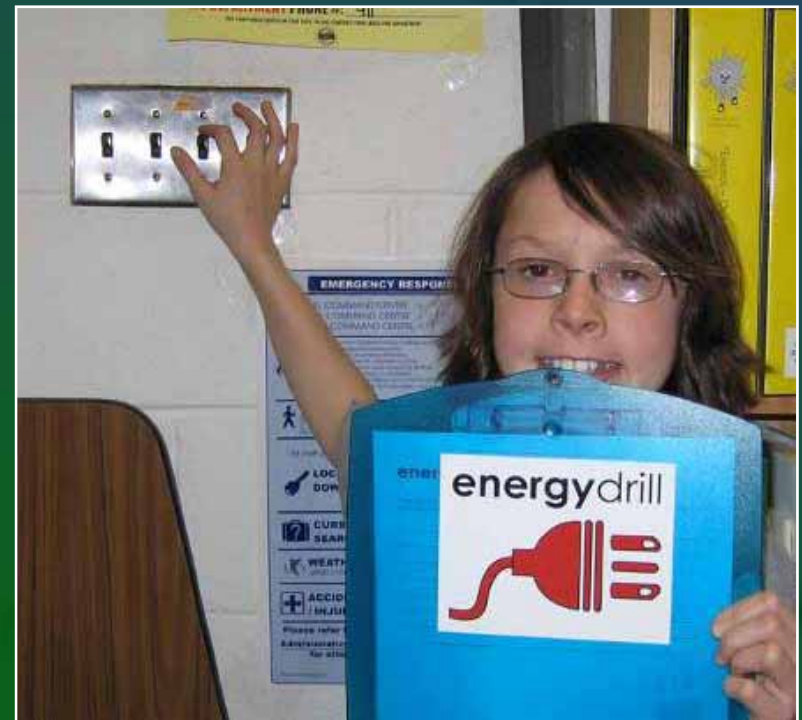
## F) Includes integrated education plan with media and social marketing

- Moves DR beyond a simple set of actions
- Includes messaging within program design
- Includes messaging within educational activities
- 7 key messages
- Movie, posters, sticker prompts, etc.
- Feedback loop using report cards



# Results - General

- Very positive response from all participants
- Due to:
  - School-wide united action persisted beyond Energy Drill days
  - Interactive, action-oriented, adaptive nature
- Strong educational opportunities
- Interested students
- Empowerment!



# Results – education and culture change

- Grade 4-8 student survey results
- **Behaviour** – I always turn off computer monitors (22% pre -> 45% post)
- **Attitude** – My school is an energy conserver (36% pre -> 75% post)
- **Knowledge** – Electricity can pollute the air we breathe (47% pre -> 70% post)
- **Beliefs** – No significant change

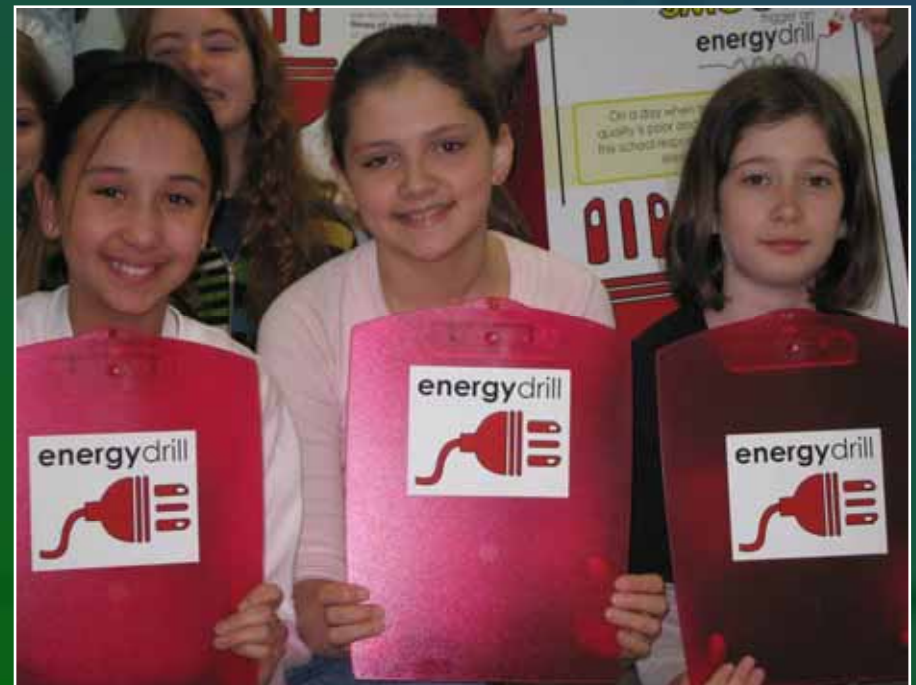
# Results – electrical demand reduction

- Difficulty in measuring
  - Interval meters
  - Immediate vs. full-day response
  - Baselines for 'expected demand'
- Peak demand reduction
  - Up to 30%
  - Average 5.4% across 8 schools
  - Average per school ranged from 1 to 15%
  - 53% success rate



## Results – program evaluation

- Over 80% of students reported participation
- Nearly 90% thought the Energy Drill was important
- Over 70% wanted Energy Drills to continue in their schools
- Program proved visible, interesting and well-received



# Program results explored

- Unique aspects of Energy Drill allowed participation
- Media, social marketing, education drove education and culture change results
- Full-day response increased kWh saved, but decreased kW peak demand reduction
- Improve electrical demand reduction
  - Accuracy of results
  - HVAC response automation
- Increase success rate:
  - Enhance feedback loop with software
  - Enhance school action organization

# What's next?

- Expanded pilot to incorporate learnings
- Build on success of ACTION!
- Use TECHNOLOGY to improve upon technical aspects (baselining, retrocommissioning, programming BAS, software for analysis)
- Integrated curriculum
- Aggregation of DR to an incentive earning portfolio
- Eventual roll-out across all Ontario schools

# What's next?

- In-class monitoring and feedback module





# Thank you!

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