

# Building Operator Certification – Level I



*A Partnership of the  
NYC Department of Education  
Division of School Facilities,  
International Union of Operating  
Engineers, and the  
City University of New York*



Dennis M. Walcott, Chancellor



Class 29

# Class Announcements

**Welcome to Class 29**

**Countdown to Complete:**

**Yes, folks, next week is  
the last week of class.**

# Class Announcements

## Project submission this week

- **Final Project 2C Due Today** - Please Turn-in Now
  - Put this in your Project Folder

**Make sure that all of your Projects are complete because they are required for your BOC Certification.**

See your 'Project Folder' for any missing projects.

- > Ask the Instructor to review and "sign-in" any missing projects that you are adding to the folder



# Class Announcements

## The Exam next week

- Questions based on building scenarios
  - > Identify the appropriate measures
  - > Calculations - savings & costs
- We supply the calculators.
- No cell phones allowed.

# Stay in Connection with BOC Custodians

## CUSTODIAN ON-LINE COMMUNITY

- We have a Custodian Support Network
- To stay in touch with your classmates
- To share ideas with your friends in the BOC Course
- Tips from the instructors and others on the network
  
- This is for YOU, only for the Custodians who have taken this BOC Class with us.

See this at: <http://bocdoe.ning.com>



# Today's Objectives and Topics

- Managing & Influencing Behavior Change
- Managing High Demand
  - > how to recognize, what to do
- Exam Review
  - > measures & calculations
  - > Practice reading scenario-based problems
- Evaluation (computer lab)

# Pop Quiz on Class 28

1. What does ECM stand for?
  - a. Energy control management
  - b. Energy conservation measure
  - c. Early cycle maintenance
  - d. Excommunicated martyrs
  
2. If an ECM cost \$10,000 to put into action & it saves \$1,000 / year, calculate the simple payback.
  - a. \$1,000
  - b. \$10,000
  - c. 5 years
  - d. 10 years
  
3. What is the improvement if an ECM increases efficiency from 74% to 84%?
  - a. 7.4%
  - b. 10%
  - c. 11.4
  - d. 13.5%

# Pop Quiz on Class 28

4. You have 100 fixtures with 2 F34 lamps. If you reduce the lighting on-hours by 3 Hrs/ day for each of 170 occupied days /year, how many KWH would you save?
- a. 3,814,800 KWH                      c. 346.8 KWH  
b. 3,815 KWH                          d. 2040 KWH
5. Your boilers optimized start-up time is?
- a. It depends on the outdoor temperature  
b. It depends on the boiler cycling  
c. 6:00 am  
d. 7:00 am
6. When the ECM of an energy audit is installed on a heating system or HVAC system at your school, you should:
- a. Check the equipment is operating as intended  
b. Make sure system has no problems with the system flow or distribution  
c. Make sure the controls are working and are not bypassed  
d. All of the above



# Electric Energy Savings

How can we control the electricity usage in the classrooms?

**\$100,000 in Awards to 10 Green Cup Challenge in NYC !**

**See the first one on this page ! Click on it**

<http://www.greenschoolsalliance.org/news.html>

**The National Winner is PS 166**

**See how they did it ! Click on it**

<http://gothamschools.org/2010/05/26/taking-the-green-cup-challenge/>

**Your school can apply in January** <http://greencupchallenge.net>

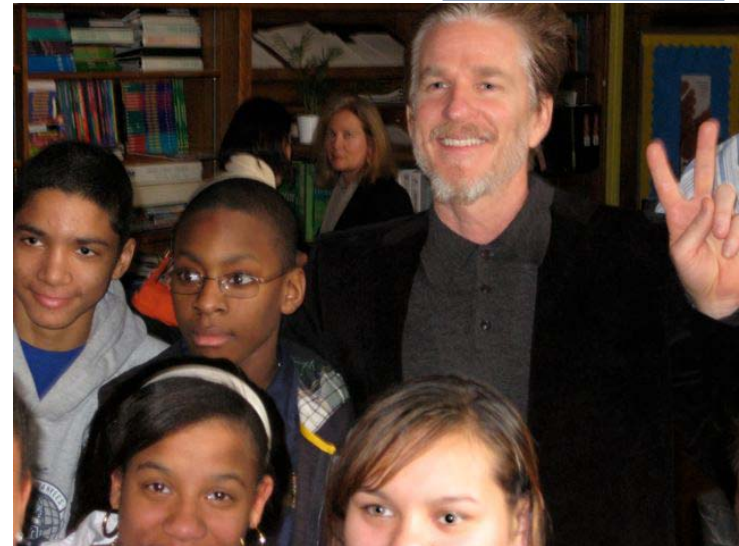


# Behavior Change : who to talk to and when

Knowing Key Players: Who participates in behavior change?

- Principal
- Teachers
- Teachers' Union
- Office staff
- Students
- Parents – PTA
- Security Guards
- Cleaning Contractors
- After-school programs
- Kitchen staff
- Neighbors
- *And last but not least...your DDF*

How might the system-wide GREEN CUP CHALLENGE play a role in your behavior change tactics?



# Behavior Change –

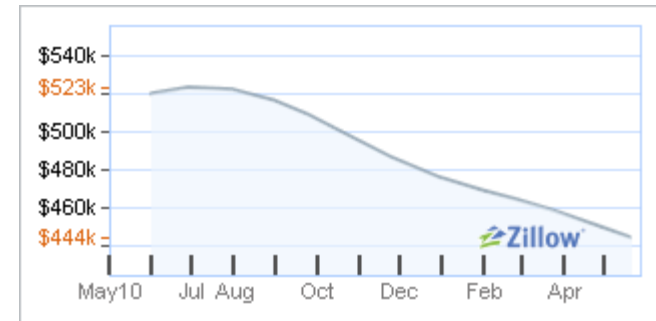
## *Why, When & How to Consult*

- > Invisible Actions vs Visible Actions
- > Impacting IEQ Conditions
  - Consult when people's environments are going to change
  - How people perceive change
  - Breaking bad habits
- > Areas within other people's authority
  - Teachers and their classrooms
  - Kitchen

# Behavior Change

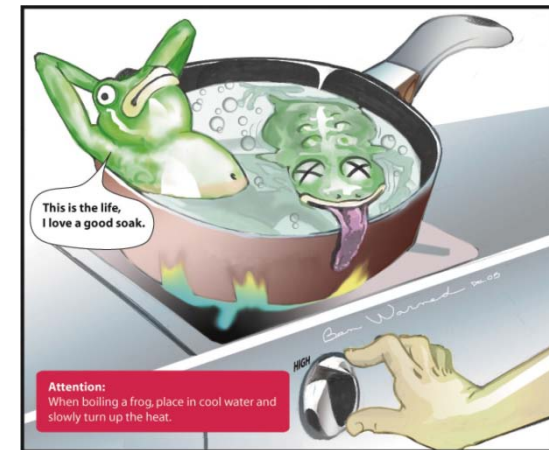
How to consult and provide on-going information?

- > Reach out to individuals
- > Have a meeting
- > Public information - bulletin boards, announcements, newsletter
- > Be visual and graphic - posters, pictures
- > Not a one-time thing: Feedback
  - Public displays
  - Recognition
  - Events & follow-up meetings



# Behavior Change

- Changing conditions dramatically or gradually?
  - > Sometimes sudden change is what you want - make the frog jump
    - Make a statement, get attention
  - > But sometimes gradual is better -
    - Temperature reduction
    - Getting windows to be kept closed
  - > Give people small, specific, incremental things that they can do and then build on as part of a larger framework



# Behavior Change

You seem to always knows what's for lunch in the cafeteria. The kitchen has an outside air supply fan and a range exhaust hood. You measure CO<sub>2</sub> during lunch prep and, with both fans running, read 1,800 ppm in the kitchen and 1,600 ppm in the cafeteria. You also notice that the kitchen doors stay partially swung open into the cafeteria.

*Discuss this situation.*

*Is kitchen ventilation working properly?*

*Is the CO<sub>2</sub> reading low or high? Acceptable or unacceptable?*

*Do you think the kitchen is under negative pressure or positive?*

*What might you suspect is going on?*

*Who would you have to consult to address the situation?*

# Announcement

If you came to class late, you are responsible for:

- Material from start of class, which will be on the exam
- Your name is in attendance

# Break



# How would you handle this?

Windows are commonly opened in your building during winter, due to over-heating. You take temperature readings over several weeks and find rooms ranging from 78 degrees to 84 degrees (**average 81 degrees**).

You determine to improve your room temperatures by re-setting your thermostats, with a target of 74 degree average.

You use 56,000 therms of gas annually, 1,000 therms in May.

Your school is open for 10 months, and no activities in July and August.

*Assuming change in average room temperatures from 81 to 74 (and no other changes to your systems), how much gas would you expect to save per year?*

*Who would you talk to about your plans?*

*Would you change the thermostat settings all at once or gradually?*

# Managing Electric Demand

Review: What is Electric Demand? Why important?

> KW

How can we recognize high electric demand?

- Unit cost of electricity
- Demand shown on original bills & DCAS report

# Managing Electric Demand

What causes high electric demand?

- > Large but steady load (pretty flat load profile)
- > Short-duration peaks of 30 minutes or longer
- > 30 minutes will register with the utility for demand
  
- > Different strategies for each type of demand
  
- > Try to identify unnecessary **simultaneous operation of equipment**
  - *BUT NOT SIMULTANEOUS MOTOR STARTING - starting spike is in milli-seconds, too short to register in the demand.*

# Managing Electric Demand

What causes high electric demand?

- What kinds of equipment
  - > Lighting
  - > Refrigeration
  - > Motors (fans, pumps, burners)
  - > Air Conditioning
- Improved efficiency of equipment will reduce demand
- Also can implement “load-shedding” to reduce demand
  - Turning off certain equipment on a prioritized basis

# Managing Electric Demand

When do we most often see high electric demand?

- May - June - (July - August - ) September
- What is equipment cycling like during these periods?
  - > Duty-cycling - normal on and off cycling of equipment to meet loads – can be controlled to reduce demand
  - > Control equipment, manually or with controls, to avoid simultaneous-on of various pieces of equipment
    - Burners for hot water – avoid firing at peak AC
    - Ventilation fans – cycle off during peak AC
  - > Morning “pull down” (or “cool down”)
    - Pre-cool with pre-occupancy operation of ventilation fans

# Managing Electric Demand

What causes high electric demand?

- > Large but steady load (pretty flat load profile)
- > “Spikey”, short-duration peaks of 30 minutes or longer
- > Try to identify unnecessary **simultaneous operation of equipment**
  - *BUT NOT SIMULTANEOUS MOTOR STARTING - starting spike is in milli-seconds, too short to register in the demand.*

# Managing Electric Demand

- What else? What other equipment?
- Kitchen
  - > Refrigerators & Freezers
    - Maintenance - refrigerant charge, coils, gaskets
    - Kitchen is closed in summer
      - Unused refrigerators or freezers running?
    - Lightly loaded – consolidate to one unit
    - Unnecessarily low temperatures – adjust?
    - Let large freezers “float” for short duration peaks?

# Managing Electric Demand

- Limiting Demand vs “Demand-Response Program”
- What is a “Demand-Response Program”?
  - > Short duration CURTAILMENT by system operator
  - > Requests load reductions at times of severe system peak
  - > Usually no more than 3 - 4 days per year
  - > Usually hottest days
  
  - > Can be Voluntary or Contract-Commitment
  - > DSF has one hundred buildings in DR program and is adding more.



# Managing Electric Demand

## How is Demand-Response actually done?

Upon notification (usually one-day in advance) by utility -

- > Load-shedding by facility staff
- > Remote-control of certain loads by utility
- > Turn-on back-up generators (short periods only)

# Managing Electric Demand

Your building has a summer session. One boiler maintains steam pressure to a hot water generator (insulated tank).

You also keep ventilation fans operating even though much of the building is not in use.

Offices are used and air-conditioned throughout the summer.

Computer labs are air-conditioned and used for morning classes.

What steps might you plan for demand reduction and/or demand-response?

# Exam Review

Your auditorium has a Blower with a 20 HP motor which can be turned off for 2 hours a day. If your school is open for 180 days a year, how many KWH would be saved?

You are operating a steam heating system that uses 50,000 gallons of #6 fuel oil per year. You have two boilers with a combustion efficiency that averages 74%. How many gallons of fuel oil would you save by improving the tested combustion efficiency to an average of 84%?

# Break

# Exam Review

- Measures
- Calculations
  - > Savings
  - > Costs
- Another Practice Problem
  
- Questions?

# Exam Review – more

What do you, as the facility operator, need to know about the savings projection from a burner replacement ECM? How will you be involved in realizing the long-term persistence of savings?

Your school has 100 radiators with thermostatic steam traps. Your Fireman can replace 3 traps per hour. He can do 5 hours of effective work per day. How many days will he need to complete this job?

# Evaluation

- This is in the Computer Lab
- Similar to the evaluation that you did at the start of the course
- This will take 15 to 20 minutes
- Come back to the class for the announcements

# Close

- Review Class 30 on BOC Website
- Go to the Online Community:  
Custodian Support Network <http://bocdoe.ning.com>
- Last Exam is next week
- Bring calculator