Building Operator Certification in NYC

Michael Bobker, M.Sc., CEM
Director, Building Performance Lab
City University of New York

EE HUB - Philadelphia, PA 9-19-12

About BOC

- National program - NEEC
  - Regional providers + utility partners
  - ANSI-IACET accreditation
  - 135 hours of training (levels 1 + 2)
  - Project work in home facility
  - Maintenance of Certification (CEU)

- CUNY-BPL - “Authorized Provider” for NYC
  - Institutional training partners
  - 15 - 30 weeks
  - NYSERDA support

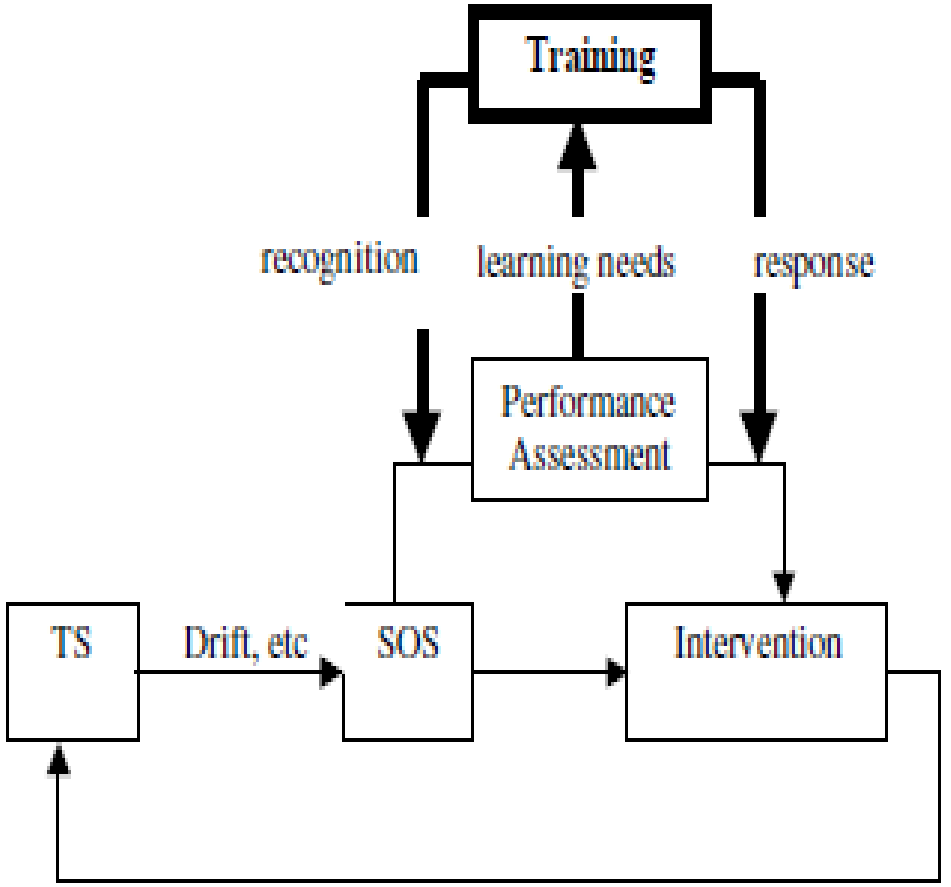
Industry Trends

- Measured performance with rankings and labels
- New technologies – performance assurance
- Systems Thinking – moving Operations beyond component repair and complaint response

Understand what competencies are being sought

Mechanism for action

- ***Preparing the Operator to be "in the loop"***
  - Feedback in On-going Cx and RCx
  - Getting the data
  - Appreciating the data
- Operating Engineers are a unique breed
  - Intuitive, not highly quantitative
  - Hands-on approach, get things done



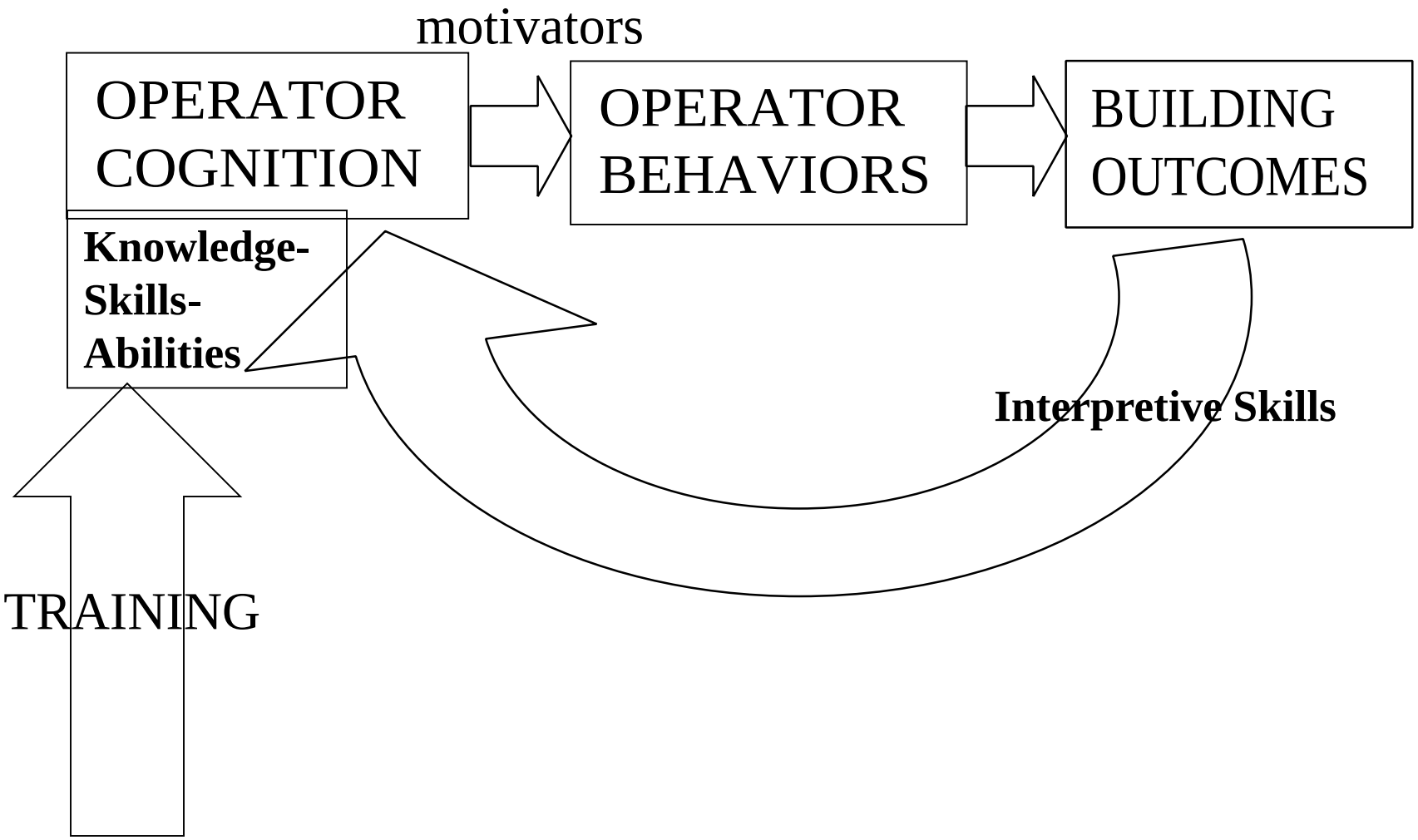
Transformative Goal

Operators' New Mission

Instilling efficacy, not preaching

Greening the grizzly skeptic

Logic Model & Improvement Process

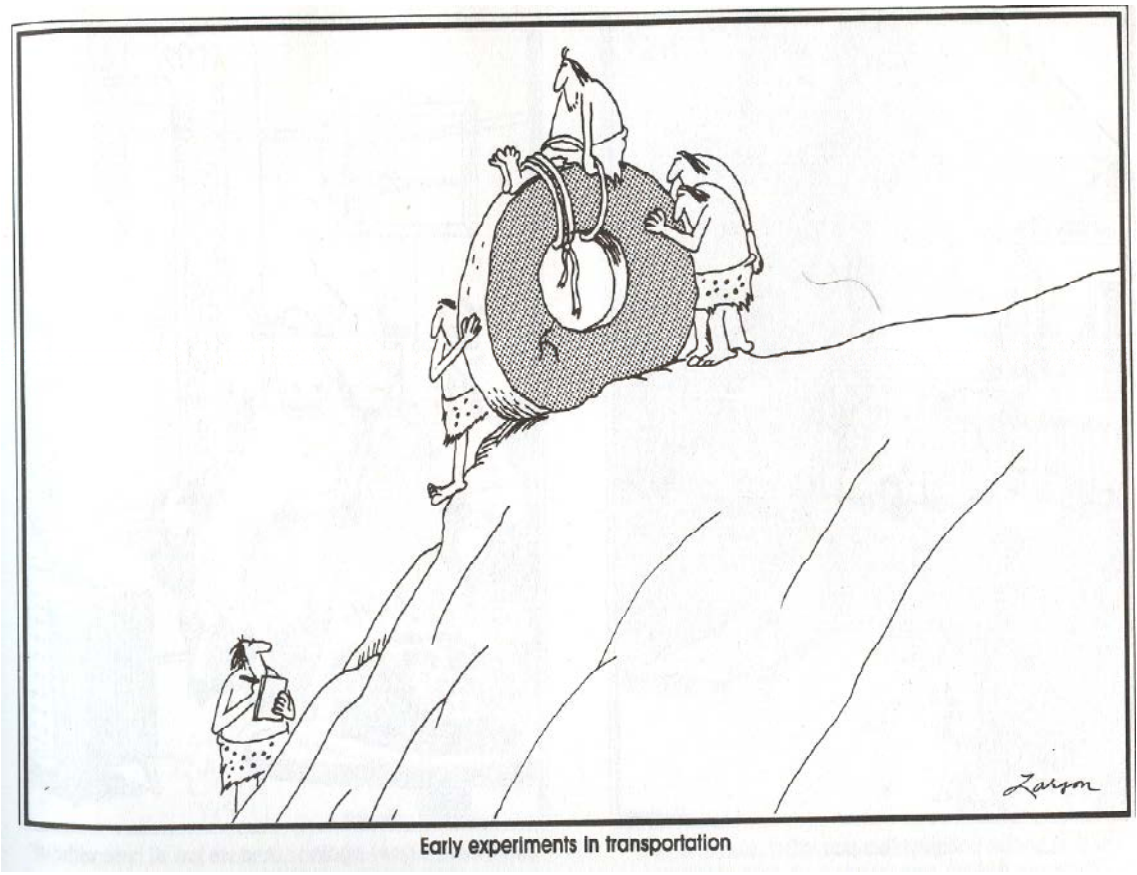


Instructional Design based on Skill Sets for -

- Understanding Energy & IAQ dimensions of system operations
- Documenting systems, conditions, operations
- Using energy and other data for measuring and interpreting of performance
- Working quantitatively, visualizing data
- Identifying and describing improvement opportunities, working in organizational teams

Pedagogy

- Science concepts
  - Physics-based processes
- Quantification
  - Units of measure & measurement tools
  - Use of formulae, calculations, spreadsheets
- Practical Projects
  - Schematics
  - Controls
  - Energy Data
  - Improvements



Learning-By-Doing

Structure DOING

- *Observation*
- *Data*
- *PROJECTS*

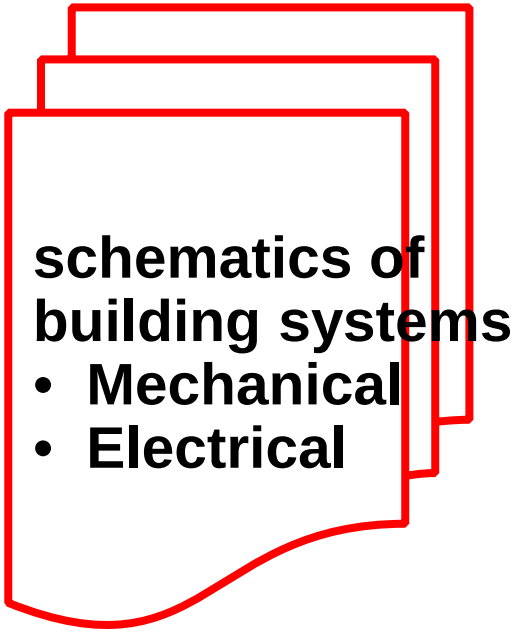
Observe and DRAW Building Systems

Energy data feedback from benchmarking data

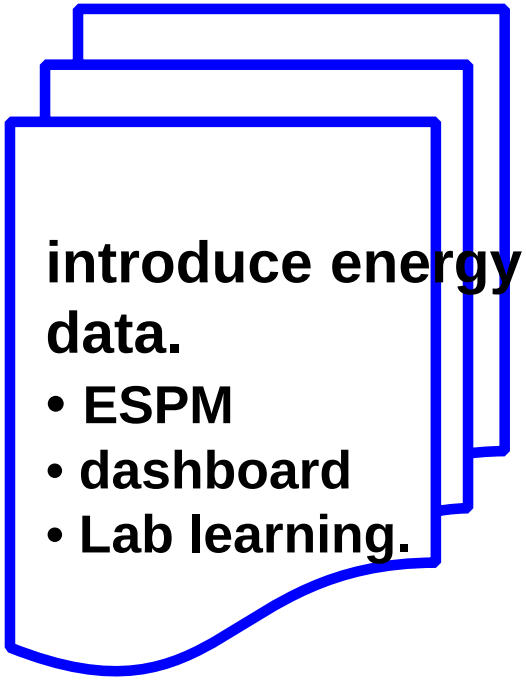
Plan improvements

Project- based learning

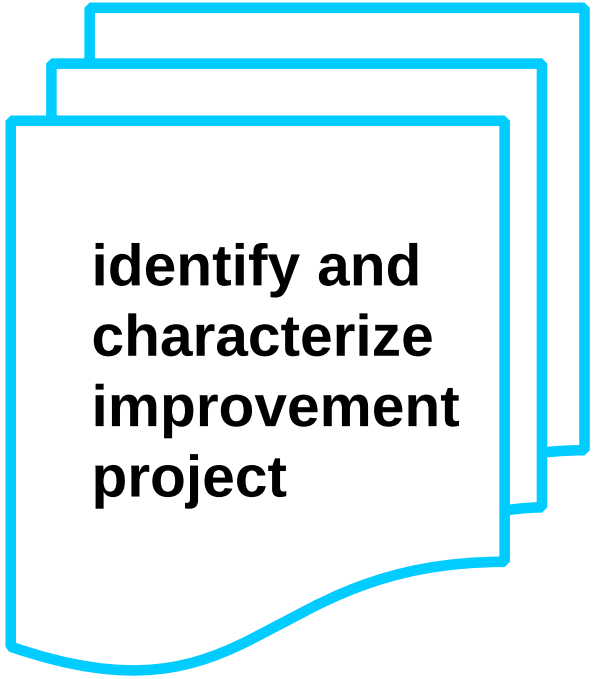
Initial



Second level



Conclusion

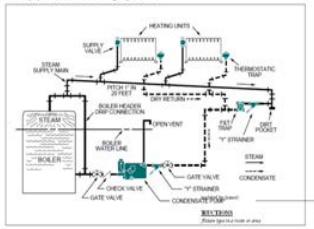


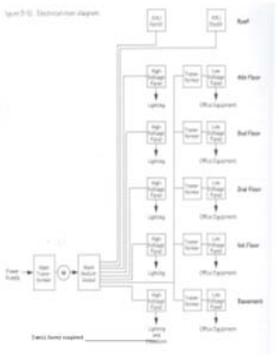
Structuring Observation, Encouraging DOING in home facilities

Teaching Tools – 1

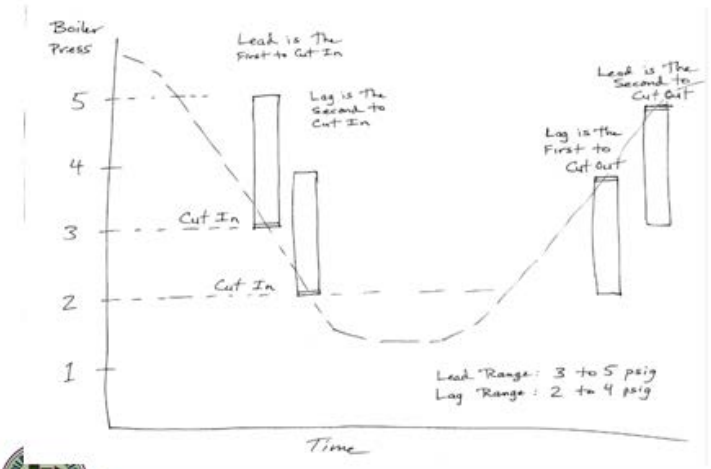
What students have to do:

Schematics, Sequences & Schedules





Simple Diagram of Boiler Lead-Lag Control



Instruments

Using Carbon Dioxide to estimate ventilation

Use data in projects

Teaching Tools - 2
What students have to do: energy use histories

2 tables:

- Use by type
- End-use allocation

TABLE 1 SUMMARY OF ANNUAL ENERGY USE BY ENERGY TYPE GROSS FLOOR AREA = ____ SF

FOR THE YEAR SEPT 1, 2009 - AUGUST 31, 2010 UNLESS OTHERWISE NOTED

	unit	QTY	MMBTU	$	unit cost	$/MMBTU	MMBTU / SF	$ / SF	% of BTU	% of Cost
Electricity	kwh		0		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Nat Gas	therm		0		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Fuel Oil, #__	gallon		0		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Steam	mlb				#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
other					#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Total			0	0		#DIV/0!	#DIV/0!	#DIV/0!	100%	100%

NOTES:
1. MMBTU of all energy types are calculated at the Site Value
2. Building area (SF) is gross square footage, including basement

		per million	
kwh	3414	0.003414	kwh
nat gas	100000	0.100	therm
oil, #2	140000	0.140	gal
oil, #4	145000	0.145	gal
oil, #6	152500	0.153	gal

TABLE 2 ANNUAL ENERGY USE BY END-USE FUNCTION

FOR THE YEAR SEPT 1, 2009 - AUGUST 31, 2010 UNLESS OTHERWISE NOTED

	[illegible]	default %	adjusted %	MMBTU	MMBTU/SF	% of TOTAL MMBTU	$	$ / SF	% of TOTAL $
OIL, GAS, STEAM									
HEATING		70%							
HOT WATER		20%							
COOKING		10%							
OTHER		0%							
SUB-TOTAL		100%	100%						
ELECTRICITY									
LIGHTING		45%							
MOTORS		25%							
COMPUTERS & OFF EQUIP		10%							
AC		10%							
KITCHEN-REFRIG		10%							
HEATING & HOT WATER		see Note 1							
OTHER		0%							
SUB-TOTAL		100%	100%						
TOTAL						100%			100%

NOTES

Spreadsheets

Teaching Tools - 3
What students have to do: Project Characterization

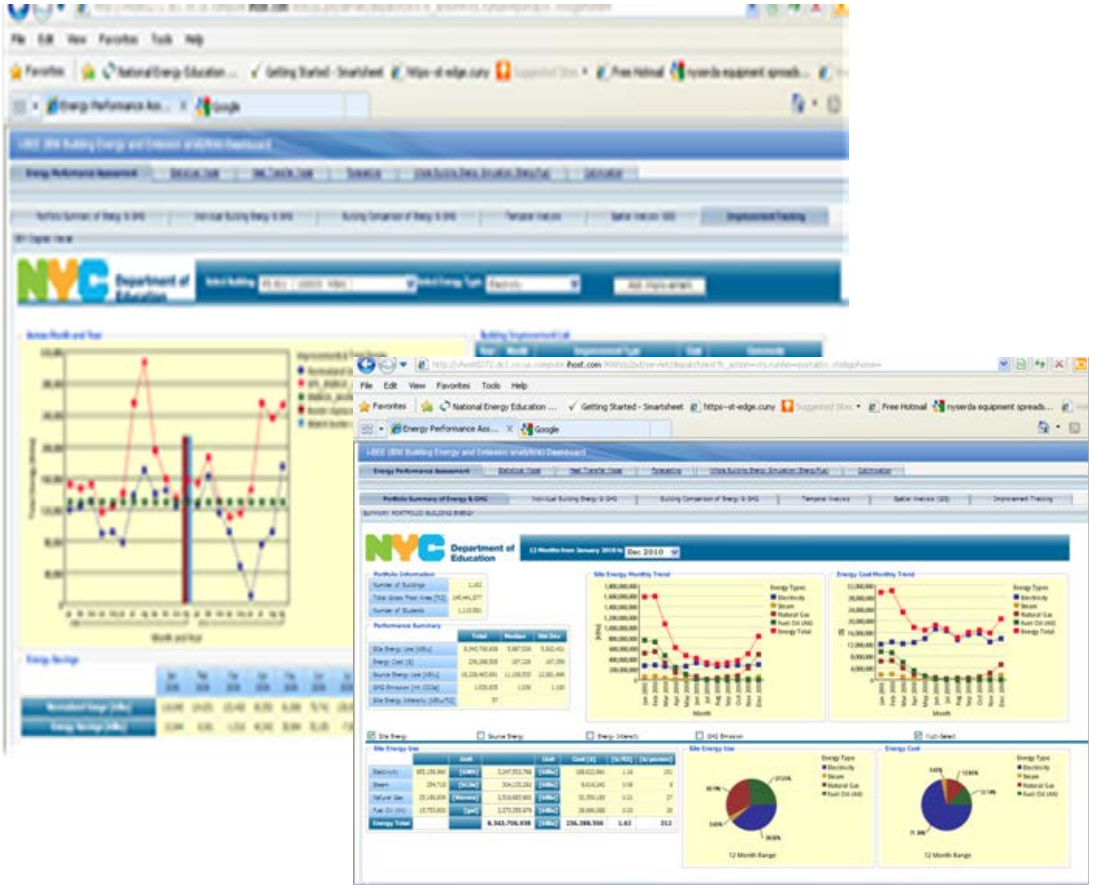
Brief Description of measure	
Problem Addressed:	
Expected Impacts Energy:	
Expected Impacts IEQ	
Pre-project Measurements	
Project Steps	
Observable Outcomes	
Project Requirements:	
Materials	
Manpower (internal)	
External resources	
Space access	
Timeframe	
Cost Estimate	
Internal manpower, __ man-hours @ $50 per hour =	
External manpower, __ man-hours @ $75 per hour =	
Materials (itemized)	
Supervision & overhead, 10%	
Contingency, 10%	
Total Estimated	

Support COMPARISON

Conditions

Actions

Outcomes



- Graphic data plots
- Peer groups
- Event recording

Creating a user-friendly data interface with IBM Research "Smarter Planet" program

Transformation

It

takes

T I M E

- 30 week experience
- Progressive development of skills, thought-processes

Long-term On-going Process

- Communities of Practice
  - Social media
  - Events
    - maintenance of certification “fair”
- Evaluation
  - longitudinal research

Directions

- On-line “blended” learning
- Coordination with other organizational levels
- Specialized offerings
    - *Retro-commissioning & Re-tuning*
    - *High-tech facilities*
    - *Controls, Controls, Controls*

Thank you for your attention.

Let’s Work Together.

Michael Bobker
CUNY Building Performance Lab
michael.bobker@baruch.cuny.edu