Query 8

Query overview

This query integrates and summarizes your analysis of measured Y2E2 energy performance data, interpreting its importance using predictions and communicating your findings and analyses in a meaningful way. Your objective is to maximize diagnostic precision, actionability for Y2E2 operators and explanatory clarity for operators, future students and for the broader industry. Please use the best and most suitable analytical and visualization methods that you have experienced in the class.

Due Date

Midnight Wednesday, June 1. Please submit your analysis through your group's wiki page and, as requested, the CourseWork dropbox.

Summarize your findings and recommendations

Add an abstract to your section of the wiki that summarizes your findings, which in general are that some systems and components work well given their assumed functional intent and some others (may) not. Include a simple annotated table that summarizes your findings and includes references to detailed explanatory sections in the wiki.

Background

Class wiki and data manual: https://www.stanford.edu/group/CIFE/cgi-bin/energy/index.php/Main_Page

Y2E2 point list: http://www.stanford.edu/class/cee243/Data/Y2e2PointList_Sorted.htm

Y2E2 system components file: http://www.stanford.edu/class/cee243/Data/Y2E2System-Component.htm

For clarity and maintainability, your content can reference sections in the data manual or one of the data lists, copy data from one of those sources, or report results of your own investigation. Please try to centralize in one place all the information relevant for status diagnosis for each system in a way that a human and potentially a computer agent can easily access.

Add content to your section of the wiki that analyzes design and operating phase interventions and communicates findings and analyses in a meaningful way

1. For each assigned system and a few associated points for each:
   - System or component description, e.g., AHU1 or Hot Water Supply Temperature
   - ID, e.g., 1127
   - Point source, i.e., one of: Control, Sensor measurement
   - On one or a small set of SEE IT graphs of 2011 measured data that you annotate to show:
     - *Functions* of the system or component: show any bands of functionally intended (green), questionable (yellow) and unintended (red) behavior that may apply.
     - Performance status with respect to function, i.e., one of: Green, Yellow, Red, unknown, N/A, which may vary with mode

  - *Modes* of operation in the functional intent (green areas) if any *and,* if there are different modes, annotation to explain context for the mode, e.g., associated with occupancy schedule or relationship to another factor such as outside air temperature
  - Trend lines and lines or outlines to identify mode boundaries
- For systems and a few points for which there are 2009 data that the building engineer identified as problems, show SEE IT graphs of the 2009 and 2011 data respectively that you annotate to show comparable regions.
  - Add annotations to that explain the extent to which the problem seems to be fixed (e.g., completely; partial; none, or new problem).
- Date/time of most recent status assessment, e.g., noon July 1, 2010
- Status assessment rationale: Add short annotations that explain your reasons for identifying any green, yellow or red data regions as you did;
- Mode: i.e., constant, variable or N/A
- Mode rate of change: e.g., +-1%/10-minutes, N/A
- Units, e.g., ^{o}F
- Setpoint value or values, e.g., 74 ^{o}F summer hours
- Deadband, e.g., +- 2 ^{o}F occupied hours; +- 4 ^{o}F unoccupied hours; N/A
- Minimum normal value, e.g., 60 ^{o}F
- Maximum normal value, e.g., 180 ^{o}F
- System diagram that includes your component or system and annotate it to highlight the point(s) on which you focus
- Object hierarchy for this system or component
- Comments

2. Query 7 asked you to compare measured and predicted data for *Y2E2* given different assumptions, using e+ to show overall one of building chilled water, steam and electricity use over time and, for a component, to plot 1-minute time series predicted data of one of chilled or hot water or electricity over the first full week of April 2011. It asked you to assess the S*ignificance* of the predictions with comments on your analysis of about the relative fraction of the energy use of the entire system relative to the building as a whole. The objective of this question is to elaborate your analysis of significance.

   Please estimate the *CO2 abatement potential* of some change that you suggest that might make the predicted data either better or worse. Specifically:
   - Plot estimated value of change, i.e., incremental cost of change (see assumption below) versus incremental CO2 produced (CO2 generated over two years without change or repair less CO2 generated with change). Assume:
     - Some cost to make a change, something like $1000 (one day's work), $10,000 (a few days of work and a small purchase) or $100,000 (a month's work and a big purchase);
     - 1.3 lbs CO2 to generate 1 kWh electricity;
     - 125,000 pounds CO2 to generate 1 billion Btu;
     - 12,000 Btu for 1 ton of heating or cooling.
   - Annotate the business significance of major areas in your abatement potential incremental cost versus CO2 savings graph, e.g., the positive savings / saved CO2 quadrant represents a business "go" of higher or lower priority.
3. Show SEE IT graphs that represent system performance from the perspective of one or a small set of related points. Identify the important features and implications of each graph and of comparisons between related graphs:

- Show graphs of at least two different time periods and different ways to visualize single points and sets of data to enable believable diagnostic classification; comment on the relative strengths and weaknesses of each.
- Suggest guidelines for best practices in how to do status classification and how to represent system data to enable simple and believable classification.
- Use outlines (boxes, circles, etc.) to identify data or regions of interest; use arrows to link comments with outlines.

4. Add a title for each section of your wiki that summarizes the component or system that you analyzed and your classification as green/yellow/red light status.
   - An example heading (format Header 2) might be, Hot Water Supply and Hot Water Return Temperature status Red
   - Note that the contents section for your work on the wiki now summarizes all the components and systems that you looked at over the quarter *and* the status of each that you classified.
5. Add a *Guide for users* page to your wiki that explains how to:
   - Browse the Contents page to quickly see a summary of all the components and systems and your classification of their operating status at one moment in time;
   - Choose where to spend time to improve building energy use;
   - Interpret sections in the wiki that describe components or systems to which you gave a green, a yellow and a red light status classification. To each, add comments that explain the way a building engineer might look at the data, your analysis and the rationale for your analysis.
   - Explain how the diagnostic process you followed can be used more generally to interpret data over time for Y2E2 and other buildings with a computer-based energy building management system;
   - Organize the wiki so it is helpful for your successors and the building operations group; add hyperlinked references to other content within your system descriptions, your wiki guide and the data manual. Incorporate comments from graded queries and new insights to update the existing wiki.
   - Edit the data manual to incorporate new additional details and understanding of the system.

Summarize your findings, assessments and conclusions for the class

6. Submit the PowerPoint deck for your May 31 final presentation through the Coursework Dropbox (15 minutes plus five minutes for questions):
   - For one system that you investigated, summarize your:
     - Functional intent: summary from data manual
     - Designed form: System diagram that includes your component or system that you annotate to highlight the point(s) on which you focus and associated Object hierarchy for this system or component
     - Behavior: measured data shown as a SEE IT graph that you annotate to show (as appropriate) any modes, setpoint and deadbands, minimum and maximum normal values, traffic lights to show regions of green/red/yellow performance
   - For your work overall, explain:
     - How to use the wiki to understand your work and the building features
     - General comments and recommendations for the building, the university as an owner, the industry, teaching and research

ORID Analysis

7. ORID analysis (1 point). In the wiki, please briefly summarize

CEE243 Query 8: integrate and summarize analysis of measured data, its importance and methods to communicate your findings

- Objective: What facts did you see this *quarter*? What factual statements can you make based on the data?
- Reflective: What surprised you? What encouraged or discouraged you?
- Interpretive: What sense to you make of what you did this quarter?
- Decisional: What are our proposed next steps? What is your action plan for next steps?

Group Assignments

Group	Last Name	First Name	Representative Office	Large Systems and utilities	Fan Coil Units	Electrical	Previous Problems
Group 1	Lam Tsai	Stan Richard	393	Chilled Water Loops (Main and Tempered)	Basement (1-4)	Lighting	6, 14, 16, 17, 20
Group 2	Yu Pharr	Meng Adam	341	Hot Water Loops (Main and Tempered); Steam	Basement (5-8)	PVs	7, 10, 15, 18, 25
Group 3	Viuker Wiesen Pincheira	Jordana Cody Felipe	371	AHU1; Water	1st and 2nd Floor	Plug Loads	8, 12, 13, 19, 24
Group 4	Adams-Doolittle Mazzotti Hoff	Jesse Gino Ryan	145	Radiant Slab & Natural Ventilation; Electricity	3rd Floor and Server Racks	Other Power	9, 11, 21, 22, 23, 40