Pay for Performance Case Study
3 Years of Performance

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ACEEE Summer Study 2018

Pay for Performance Overview & Sample Contract Structure

ENERGY 350

Building Owner

- Agree to purchase energy savings at a rate slightly less than energy
- Allow EE project within building
- Agree to length of term
- No capital investment

Fund & Implement EE Project

Provide ongoing PPA Payments

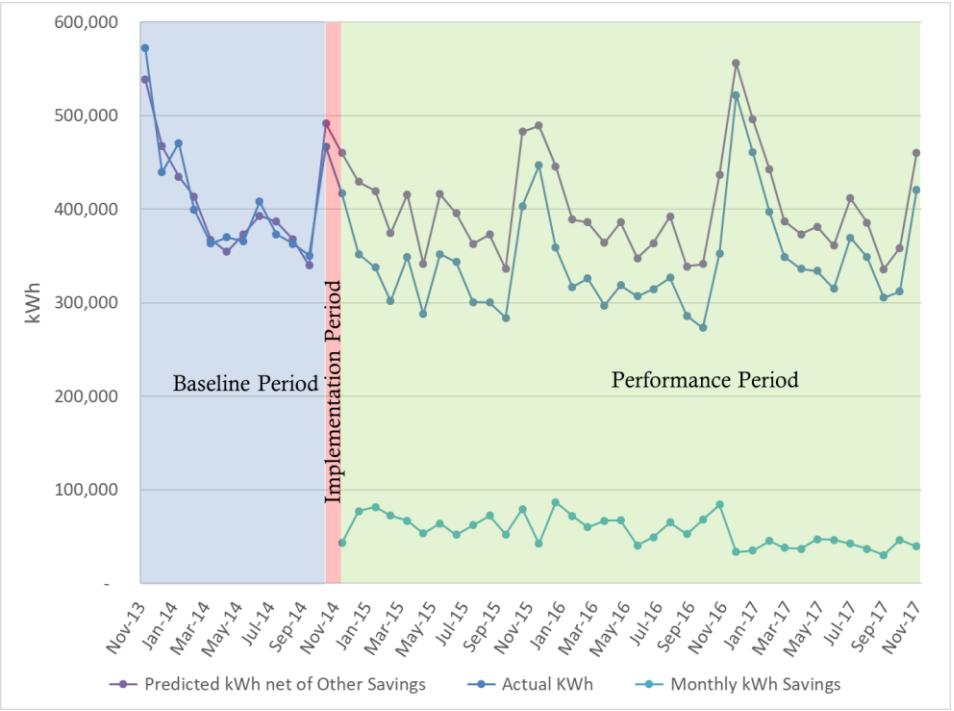
Project Developer

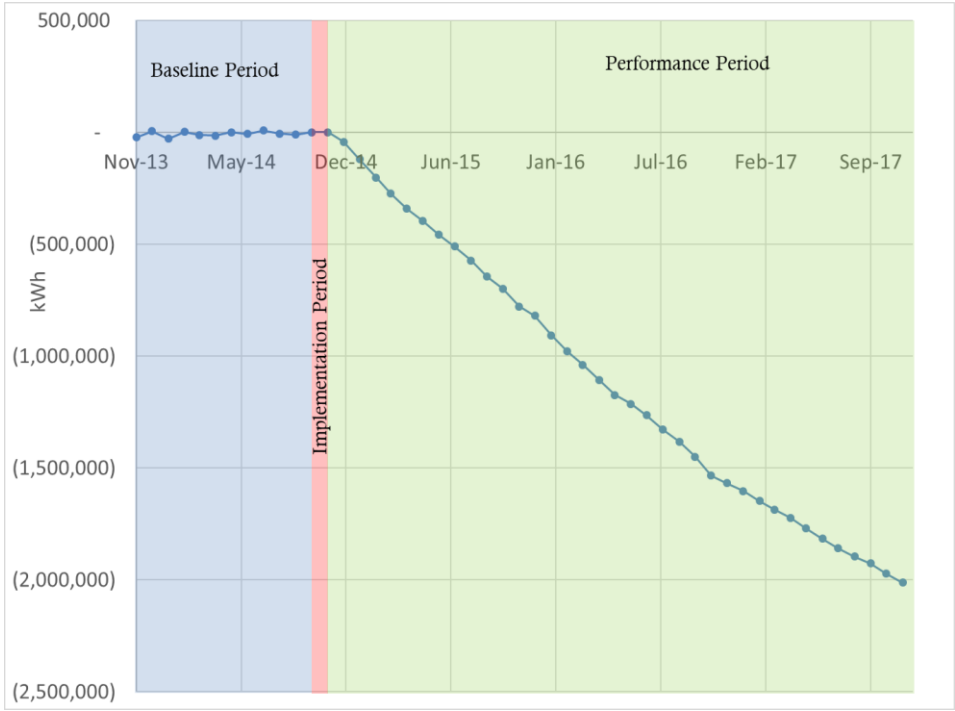
- Scope EE/RCx project
- Work with Program Administrator to procure incentives
- Fund and manage EE project implementation
- Maintain savings for term of contract

Case Study – 1000 Broadway

- Energy Star Building (270,000 sft)
- Had implemented a number of capital projects prior to PfP, even LED lighting
- All electric, water cooled DX, VAV systems, DDC controls
- We saved 14% of energy use
- Energy Star score went from 80 to 92
- Project included minimal capital equipment
- Savings have been measured and verified at the meter
- Building manager billed the expense to the triple net - means the tenants paid for it!

1000 Broadway Results

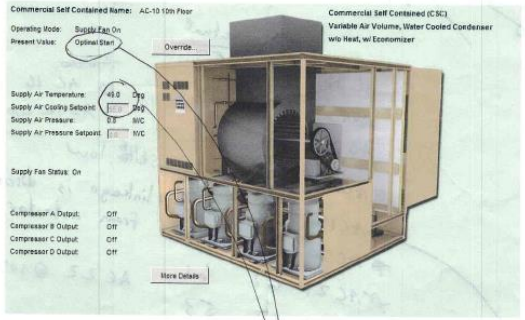




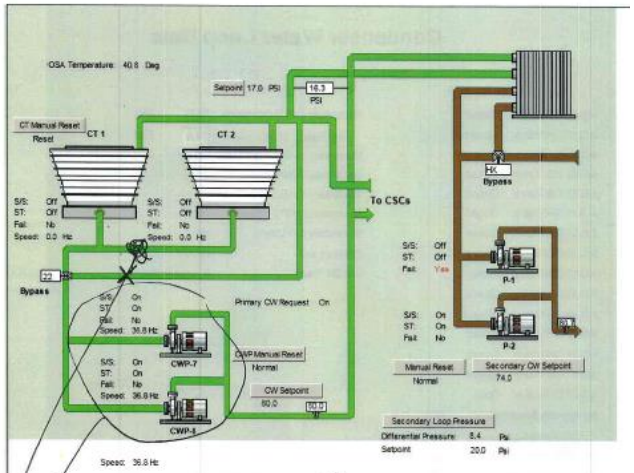
The Tough Reality of Building Tuning

Measures are nuanced and tough to identify & implement

More Grinding it out with RCx!

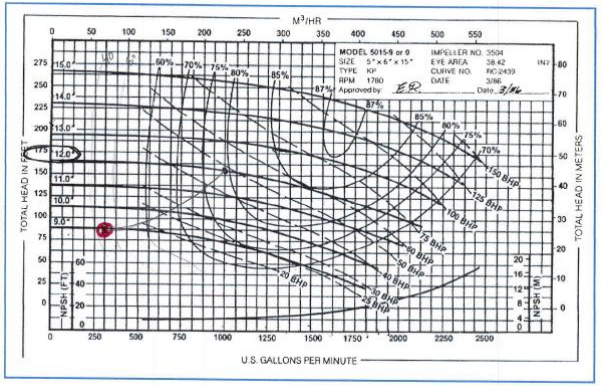


It's in optimal start mode & programmed for a morning warmup temp of 70. Why ~~are we at~~ is the SAT SP 55? This is making it hard to warm up the building.



Can we isolate this?

Need to sequence these.
One should suffice most of the time.



Conditions of Service			Motor Data		
Flow:	Temp:	Suct. Press:	HP:	Voltage:	Eff:
TDH:	S.G.:	Dis. Press:	RPM: 1750	Phase:	S.F.:
Fluid:	Visc.:	Diff. Press:	Encl.:	Hz:	

GPM	HEAD	EFF	BHP
325	80'	45%	14.6
500	100'	58%	21.3
750	125'	71%	33.7
1,000	155'	80%	48.9

RCx Isn't Easy!

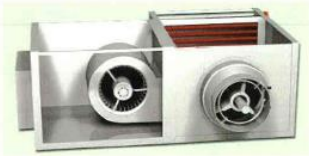
- Reduce scheduled occupied times (including exhaust fans)
  - Exhaust Fans run 4:00AM-7:00PM Mon-Fri, 8:00AM-Noon Sat – Should adjust schedule to match AHUs.
  - AHUs run 6:00AM-7:00PM Mon-Fri, 8:00AM-Noon Sat – Can we make this 7AM – 6PM? They actually go into occupied mode at 6:00, but with smart stop, they're coming on at 4:00 at least in this colder weather.
  - Can we shorten the lighting schedule?
- Enable morning warmup
- Command OA Dampers fully closed during morning warmup if OAT<50
- SAT reset
- SP reset
- Fix broken economizers – Suspect economizers include:
  - AC9 – Seems to have very high minimum OA
  - AC10 – Compressor runs in cold weather
  - AC18 – Compressor runs in cold weather
  - AC21 – Compressor runs in cold weather
  - AC23 – Compressor runs in cold weather

- Fix broken VAV dampers
  - VAV 0925 Zone 25
  - VAV 1024 Zone 46
  - VAV 1116 Zone 15
  - VAV 1302 Zone 12
  - VAV 1326 Zone 10
  - VAV 1514 Zone 14
  - VAV 1928 Zone 17
  - VAV 2020 Zone 49
- Is fl 19 zone 23 temperature sensor working right? We're cooling it heavily and it says it's 77.
- Reduce Lobby & Theater OA
- Optimize CW Loop
  - Isolate the cooling tower bypass on the primary condenser water loop.
  - Reduce primary flow through HX – Do this until we get a similar DT on each side of the heat exchanger. We could also just measure flow on each side and balance primary flow to match secondary. We should leave the primary a little more than the secondary for when the lobby & theater units need cooling.
  - Program CW pumps to sequence up and down. I think there's plenty of time when we only need one of those.
  - Reduce primary CW DP setpoint from 17 PSI to ????
  - Program the secondary pumps to lead with the good one and bring the other one on once a week for an hour to exercise it. Also make sure it's programmed so that if the lead fails, the other comes on as a backup.
- Look to Reduce Lighting Schedule – RR and hall lights run 6AM-midnight and from midnight-2AM
- AC 18 economizer linkage needs to be connected to the actuator.
- What controls BR exhaust fans? They were running at 1:00 PM on Saturday.
- What's EF-1? It runs every day from 7AM-7PM.

*We should do a lighting sweep at 8:00 PM then bring the hallway lights back on.

They don't clean Fri & we can shut lighting off at

VAV Name:	VAV-1826 Zone 39		VAV I
Active Mode:	Occupy		Parallel Fan, with Heat
Present Value:	Occupied	Override...	
Space Temperature:	72 Deg		
Unoccupied Cooling Setpoint:	85 Deg	Active Cooling Setpoint:	74 Deg
Occupied Cooling Setpoint:	74 Deg	Active Heating Setpoint:	72 Deg
Occupied Heating Setpoint:	72 Deg	Heat Active:	Yes
Unoccupied Heating Setpoint:	60 Deg	Parallel Fan Output:	On



Air Valve Position:	29.00 %	
Air Valve Flow:	156 Cfm	More Details
Air Valve Control Action:	Cooling	

- I reprogrammed the min cfm to 60.
- why does the air valve not close more?
- why does the air valve state cooling mode, yet fan & heat are on?

Economizers
-AC 9 SP 57
-AC 10 Actual 67
-AC 11

up to AC 18

	SP	Actual
AC 11	67	57
~~AC 13~~	67	51
AC 14	67	64
~~AC 15~~	67	62 → still low
~~AC 18~~	67	53 → linkage is disconnected from actuator
~~AC 20~~	67	60
~~AC 21~~	67	61
AC 22	67	53
~~AC 23~~	67	54

AC 12 → 10%
~~AC 13 → 10%~~
~~AC 12~~ is AC 16 working
is AC 12 working?
AC 22 @ 10%

* Bathroom exhaust fans are on sat at 1:00 what controls them?
* What's EF 1? It runs every day 7AM-7PM
* Need to fix

Weighing Tradeoffs of Pay for Performance

Pros

- Reduced risk for Program Administrators
- Avoids measure by measure analysis
- Encourages whole building, comprehensive approach to efficiency
- Encourages scope expansion
- Holds participants accountable to deliver savings, not just calculate them
- Encourages market to find lowest cost solutions, (RCx) not sell products

Cons

- Increased accountability for participants
- Incentives are received on an extended timeline
- A measure agnostic approach presents some challenges:
  - Is it cost effective?
  - What is the measure life?
  - Baseline by nature is considered early replacement

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Questions?

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