

Query 9

CEE 243

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Details of the Analysis

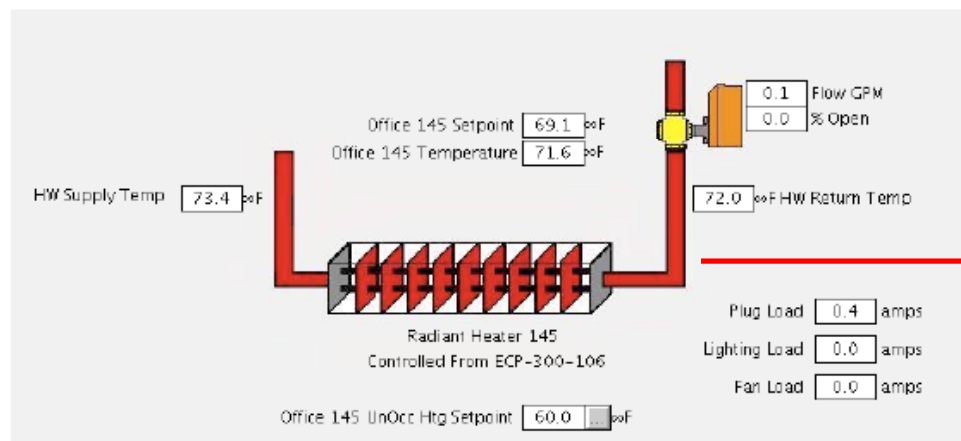
- Room Observed : Representative Office 145
- Days Observed : 01/01/09 – 01/31/09
- Points Observed :

Point ID	Point Type	Engineering Units	Classification
6550002	Space temp set point	Fahrenheit	Functional Objective
2480003	Hot water flow rate	units	System response
2480001	Hot water return temp	Fahrenheit	System response
2480002	Hot water supply temp	Fahrenheit	System response
6560001	Radiant heater valve position	Percentage open	System response
4690002	Lighting load current draw	units	User control
4690004	Plug load current draw	units	User control
4690003	Ceiling Fan Load Current Draw	units	User control
6550001	Space temp	Fahrenheit	Behavior Outcome

Representative Office 145

Representative offices in Y2E2

2 offices on the North side with radiant heating and ceiling fans



We observe that there is only heating and no cooling system

Data set

Point ID	Max	Min	Count	Avg	Std dev	Co.eff Va	First TS	Last TS
4690003	2	0	19806	.005	.105	21	2009/04/01	2009/04/31
2480003	13	1	19737	1.539	2.214	1.438	2009/04/01	2009/04/31
2480001	194	66.3	19737	79.935	19.092	.238	2009/04/01	2009/04/31
2480002	203	69.2	19737	95.661	21.427	.223	2009/04/01	2009/04/31
4690002	5	0	19806	0.455	1.056	2.315	2009/04/01	2009/04/31
4690004	8	1	19806	1.379	.734	.532	2009/04/01	2009/04/31
6560001	100	20	19652	94.716	17.428	.184	2009/04/01	2009/04/31
6550001	75	62.4	19654	69.506	1.863	.026	2009/04/01	2009/04/31
6550002	72.9	69.1	19654	69.781	1.192	.017	2009/04/01	2009/04/31

HVAC system

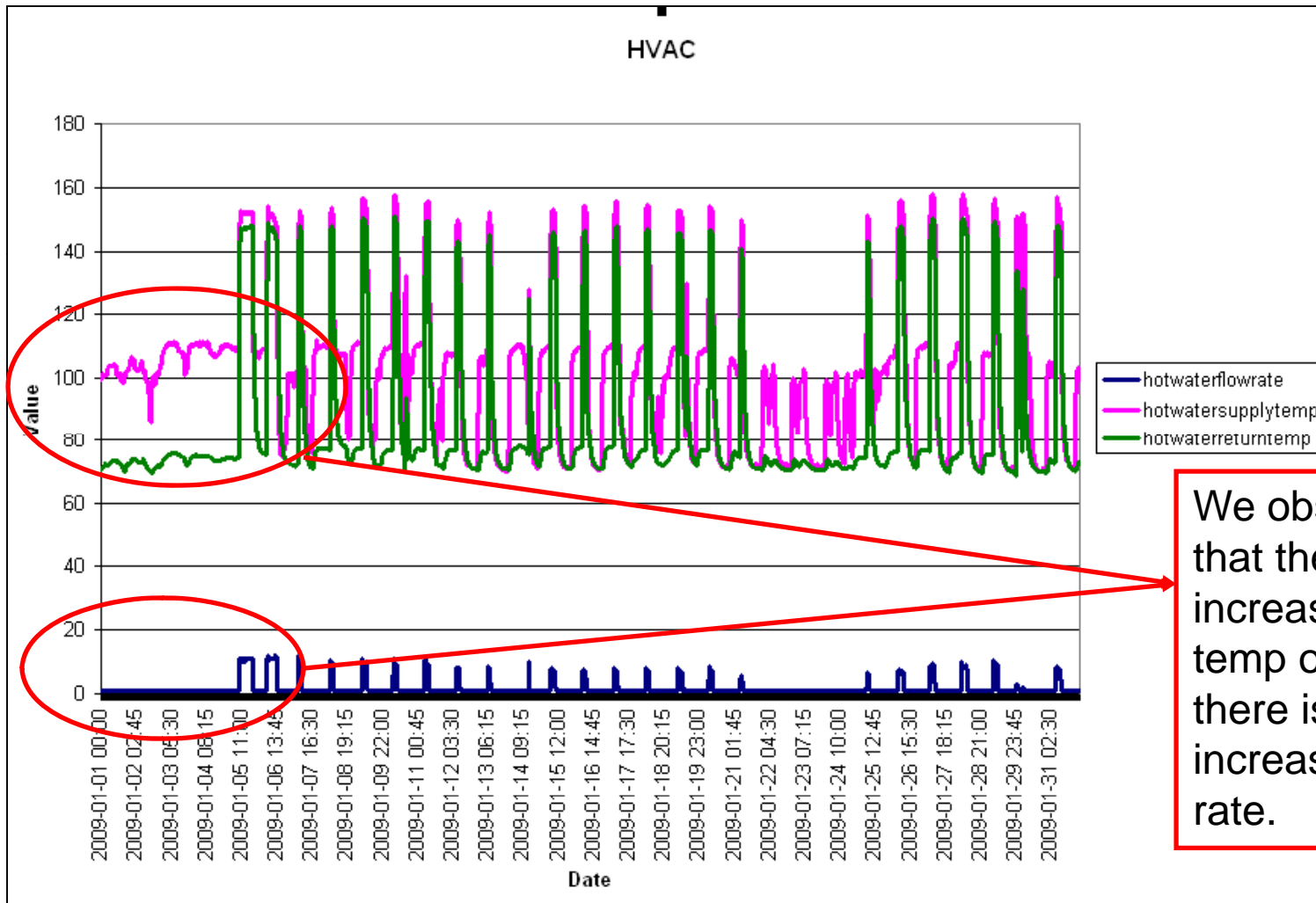
With set objective as space set point temp, the temperature of the room is moderated by the following :

- Hot water flow rate
- Hot water supply temp
- Hot water return temp
- Radiant heater valve position

The temperature observed from the above conditions is measured as space temperature.

HVAC

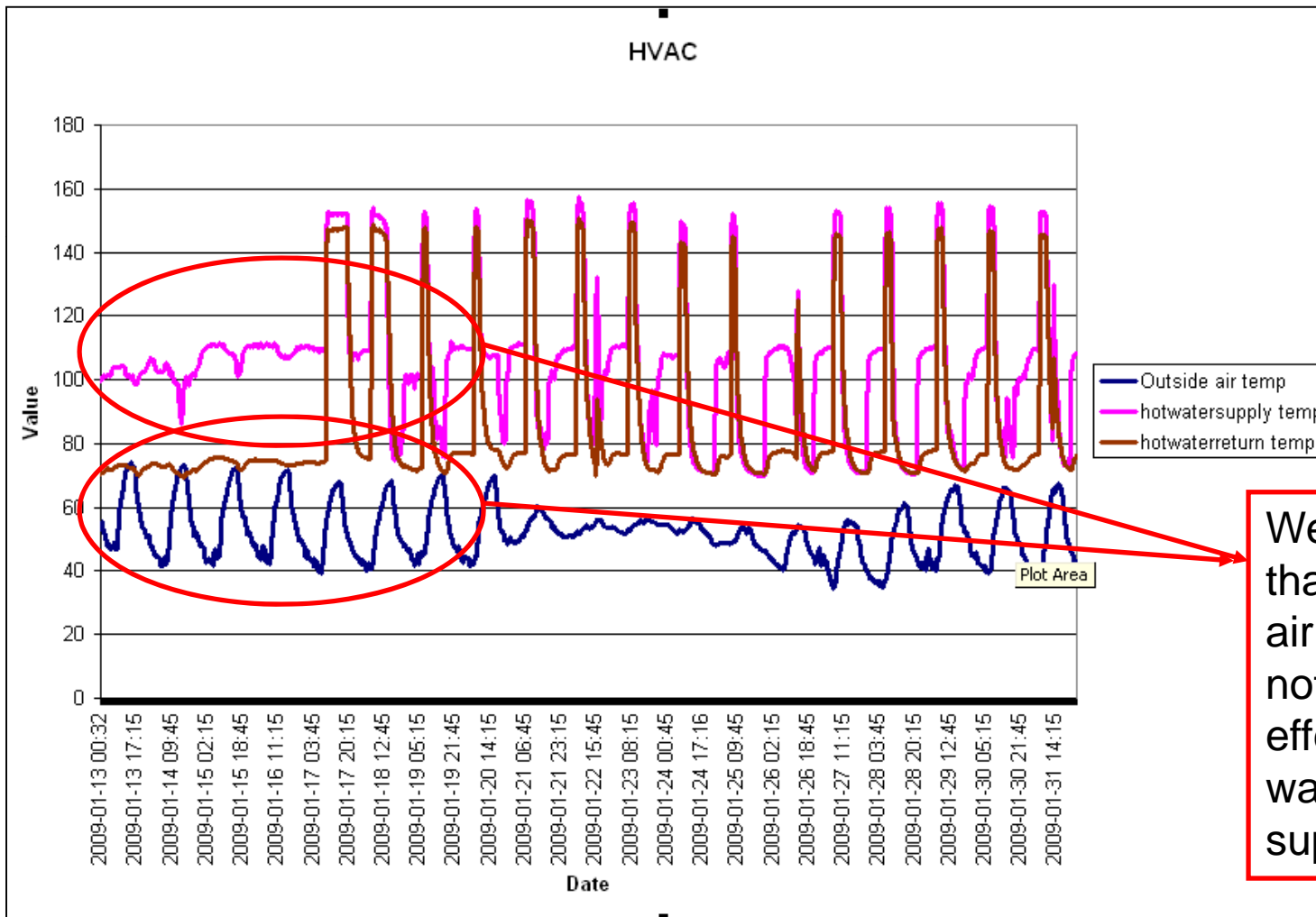
Hot water Supply temp/ Return temp/ flow rate



We observe that there is an increase in temp only when there is an increase in flow rate.

HVAC

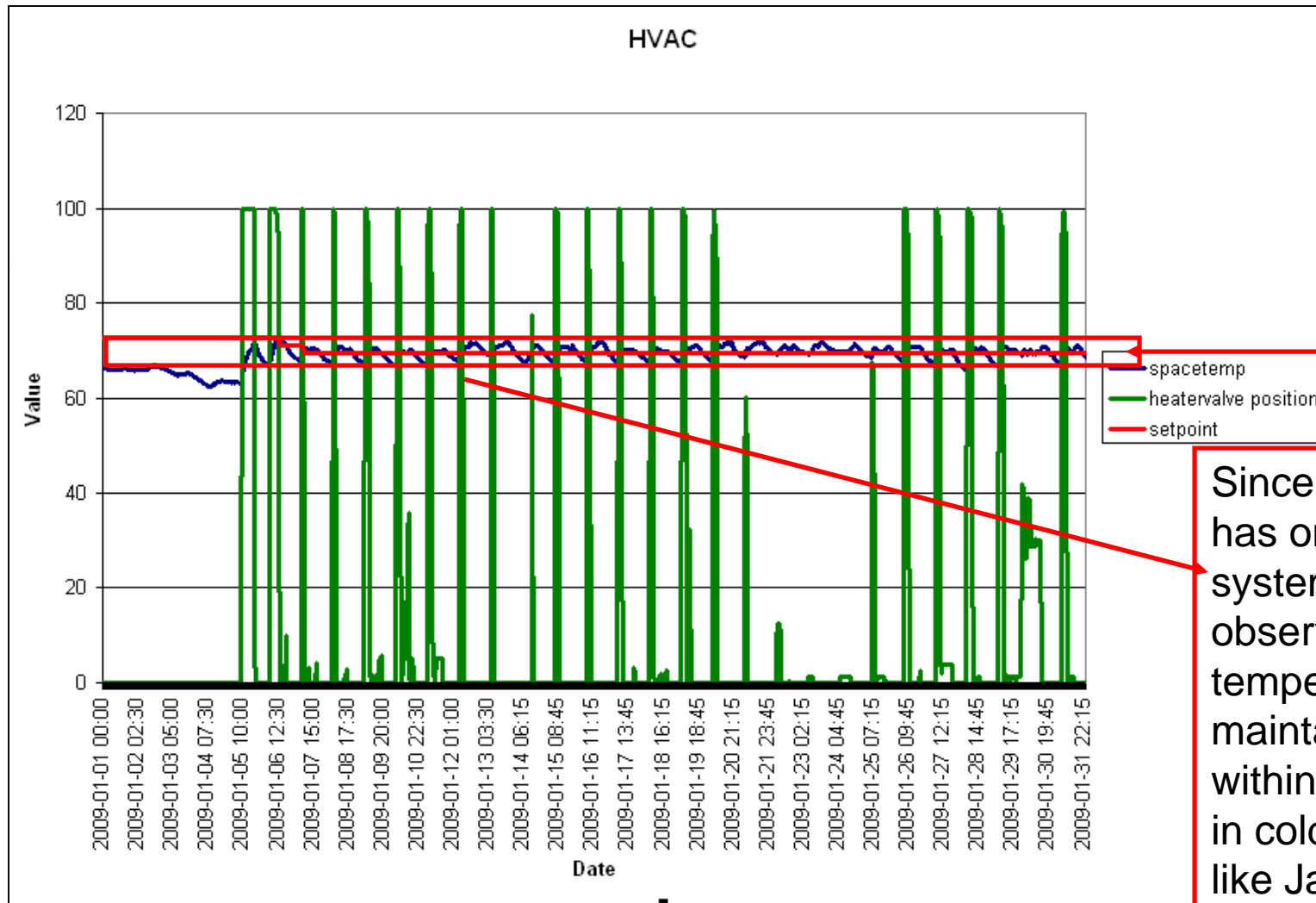
Hot water Supply temp/ Return temp/ outside air temp



We observe that the outside air temp does not have any effect on the hot water return or supply temp

Temperature in January

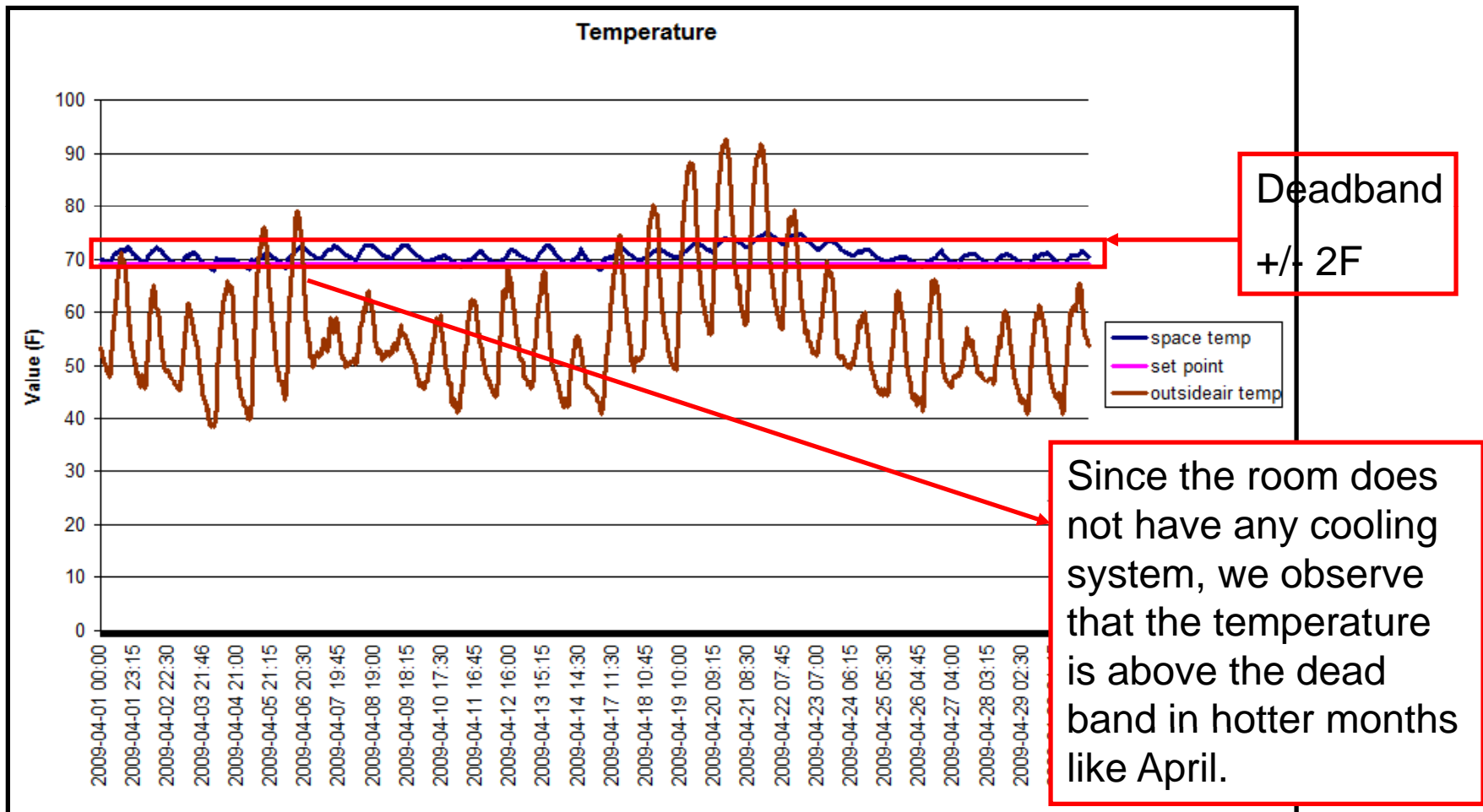
Space temp/ heater valve position/ set point temp



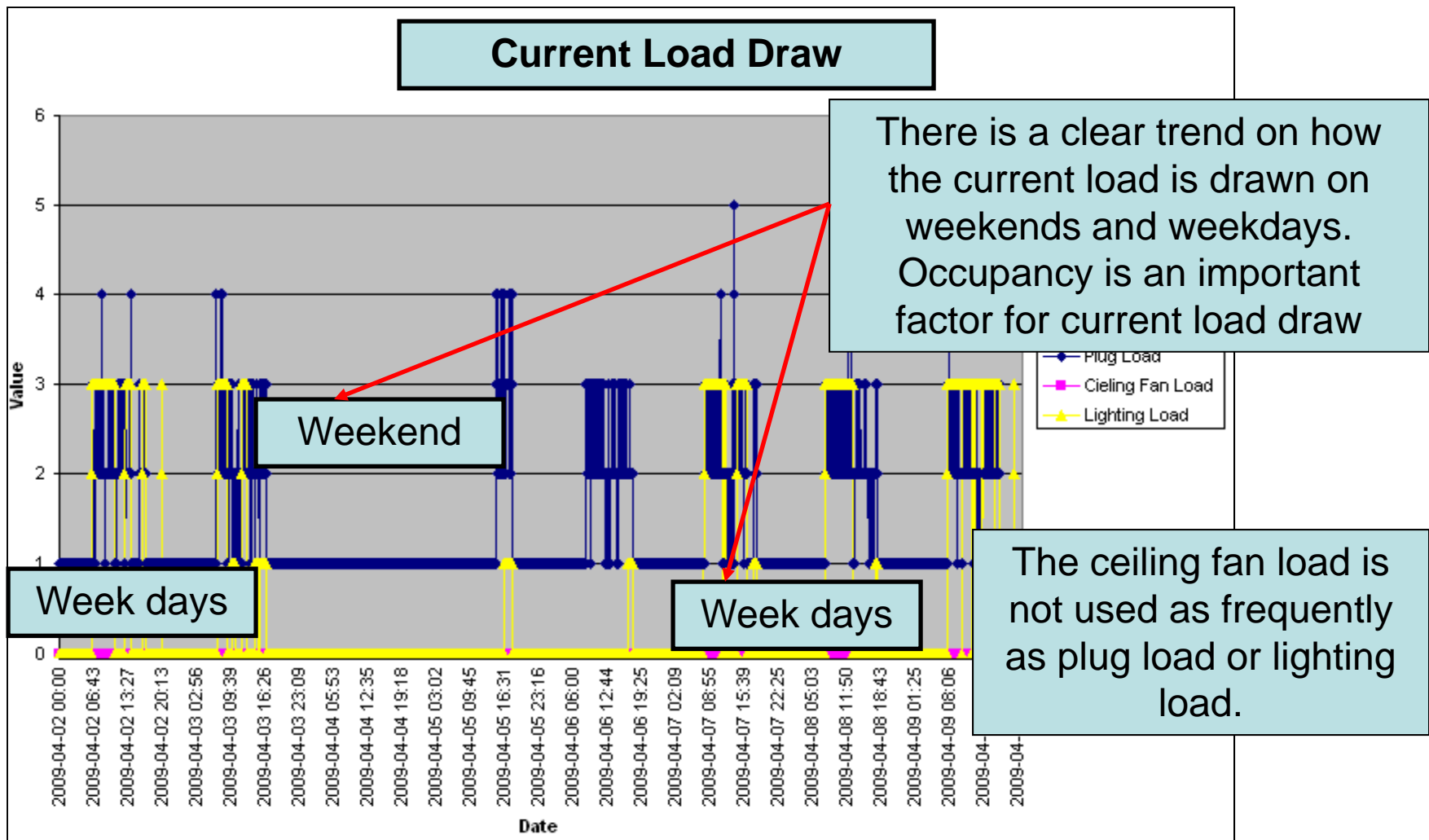
Deadband
+/- 2F

Since this room has only heating system, we observe that the temperature is maintained well within deadband in colder months like January.

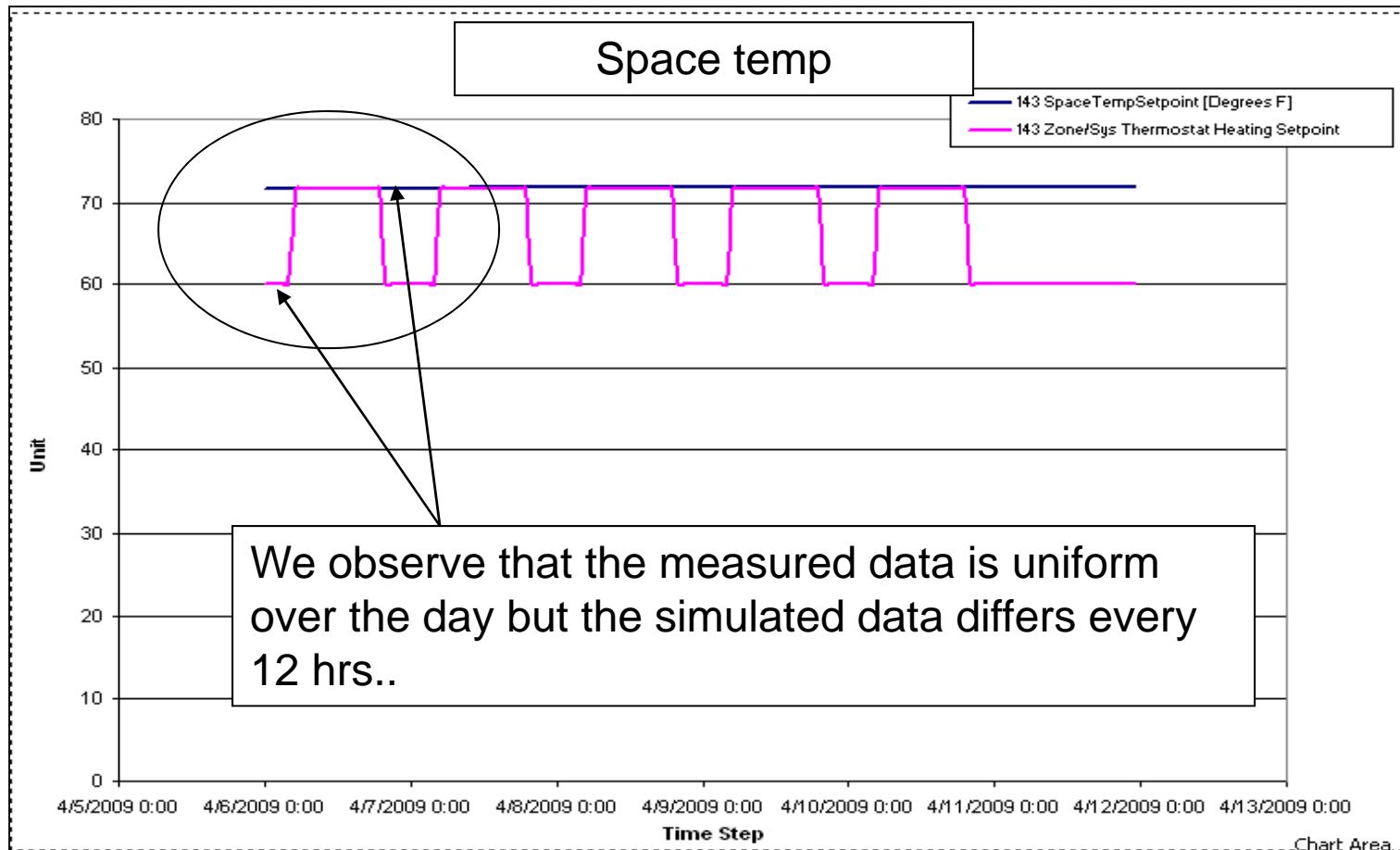
Temperature in April



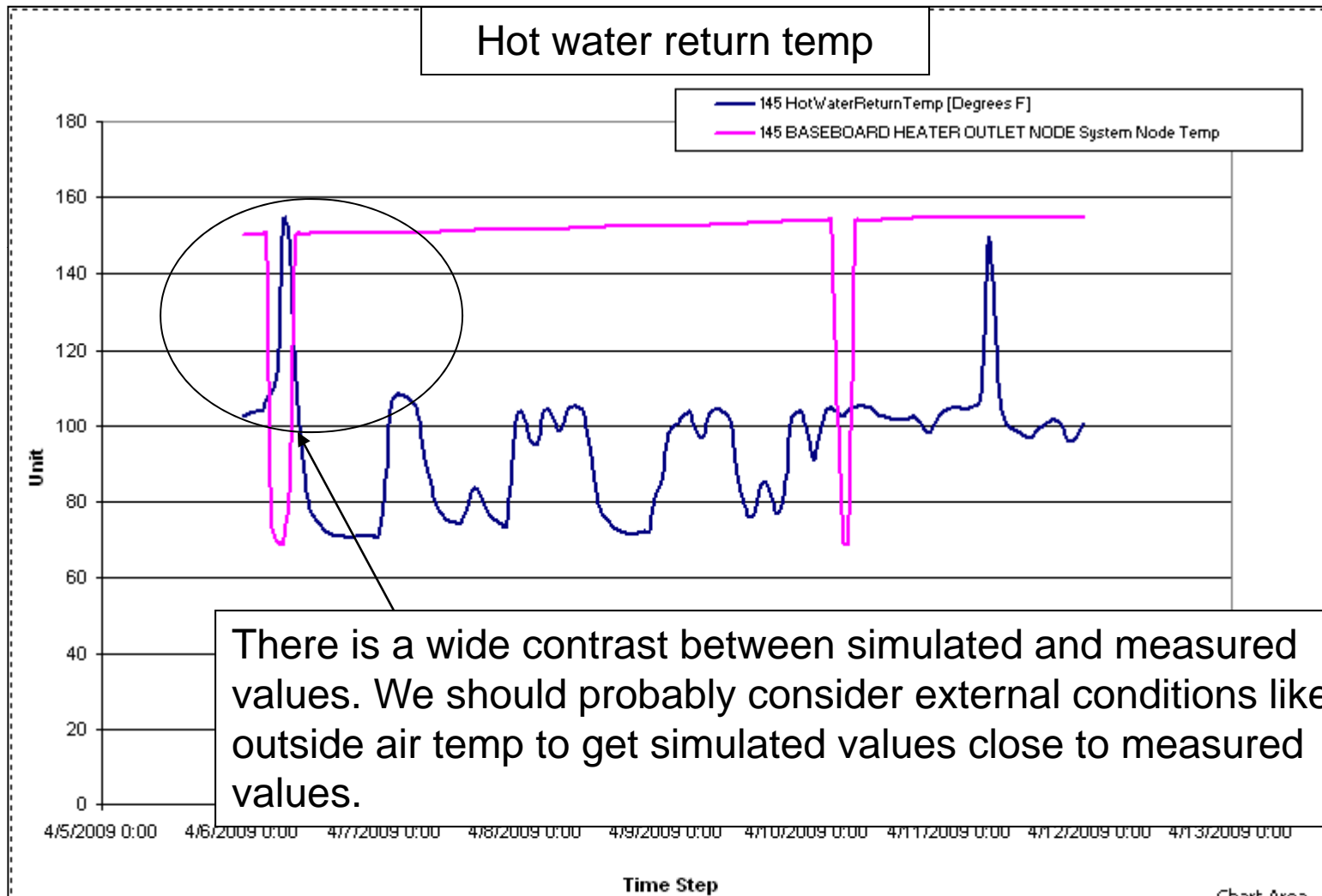
Current Load Draw



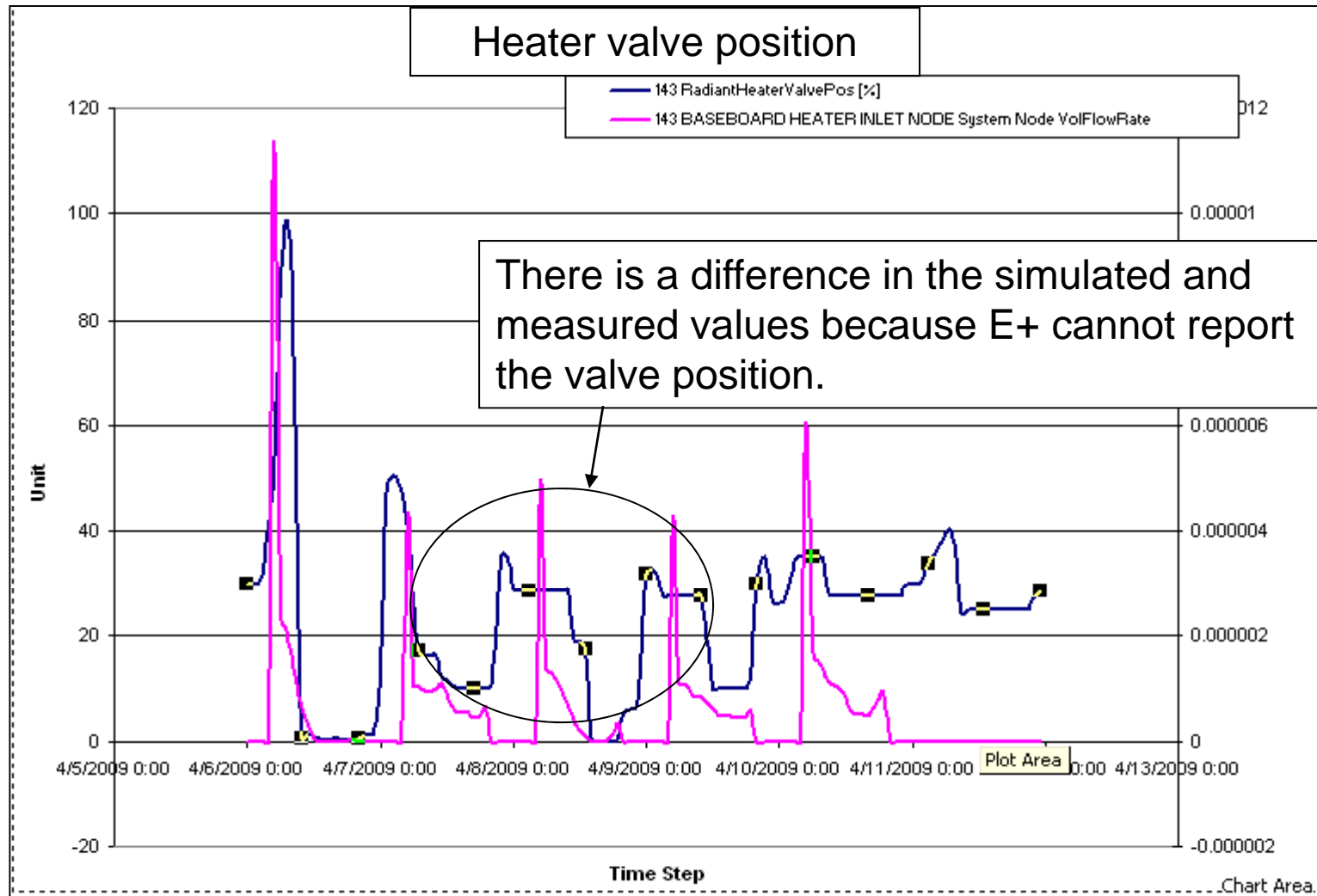
Measured Vs Simulated (Room 143)



Measured Vs Simulated (Room 145)



Measured Vs Simulated (Room 143)



Recommendations to the building owner

- The representative office 143 needs cooling system when the temperature outside is high.
- Some of the heating, cooling and current loads can be relaxed on weekends. This can save money to the building owner.

Basic BIM guide

Elements to include for modeling

Walls, Windows, Curtain walls, Doors, Slabs, Roofs, Columns, flooring, hangers, valves, pipes, heat exchangers, fans, fan silencers

Five rules

1. Check if space temperature and set point temperature are within the dead band
2. We should be able to observe trends different for weekend and weekdays
3. Check if the heating and cooling system are working in accordance to space temp (i.e) the heating or cooling system should work towards maintaining temp in dead band
4. The radiant heater valve position should be 100% open in general and varies with change in temperature
5. For parameters like current load draw, there should be a direct relation to manual draw and values observed