



**DIGITAL REALTY**

Data Center Solutions



## **CRAH Retrofit and Energy Savings Project**

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Silicon Valley Leadership Group - Data Center Efficiency Summit

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# 2260 E. El Segundo Boulevard - A Digital Realty Datacenter



# Project Scope

- Upgrade CRAH fans for variable speed operation
- Transition from manual to automated/dynamic environment
  - Motor speeds change to meet IT equipment inlet air set points
  - Create cooling buffer and unlock stranded cooling capacity
  - Optimize operational capacity to increase capacity of existing data center infrastructure
- Rack wireless temperature sensors monitor IT equipment inlet air conditions
- Humidity sensors in each Colo room. Power sensors on each CRAH
- Data collection of 1,274 monitored points
- Reduce capacity requirements from over extended grid
- Project Team: Digital Realty, Lawrence Berkley National Labs, So Cal Edison, Vigilent



# Project Objectives

- 1** Reduce the part load mechanical demand profile and improve PUE

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- 2** Maximize cooling capacity utilizing existing CRAH units

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- 3** Delivery graphic demonstration of real-time heat profile

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- 4** Develop and implement improved rack management practices with existing customers

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- 5** Improve ROI through use of grant award funding (Lawrence Berkeley National Laboratory) and public utility rebate program (Southern California Edison)

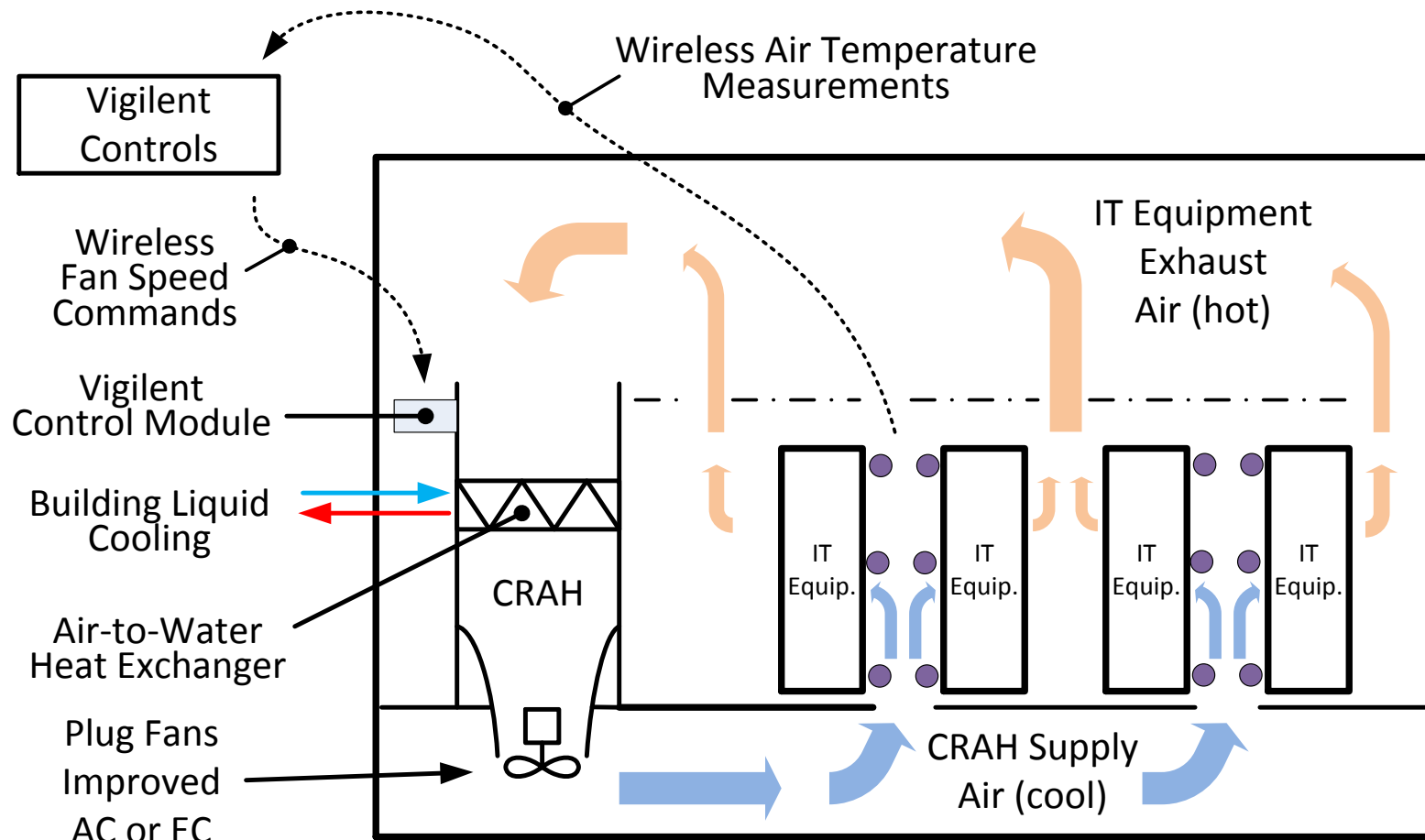


# Project Timeline

	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
<b>Project Funded</b>	■										
<b>VFD Installation</b>		■	■								
<b>EC Plug Fan Installation</b>			■	■							
<b>Vigilent System Install</b>				■	■						
<b>Vigilent System Go Live</b>					■	■	■	■	■	■	■

Source: Vigilent

# Closed Loop Wireless Control Diagram





# Plug Fan with EC Motor

## Plug Fan Installed

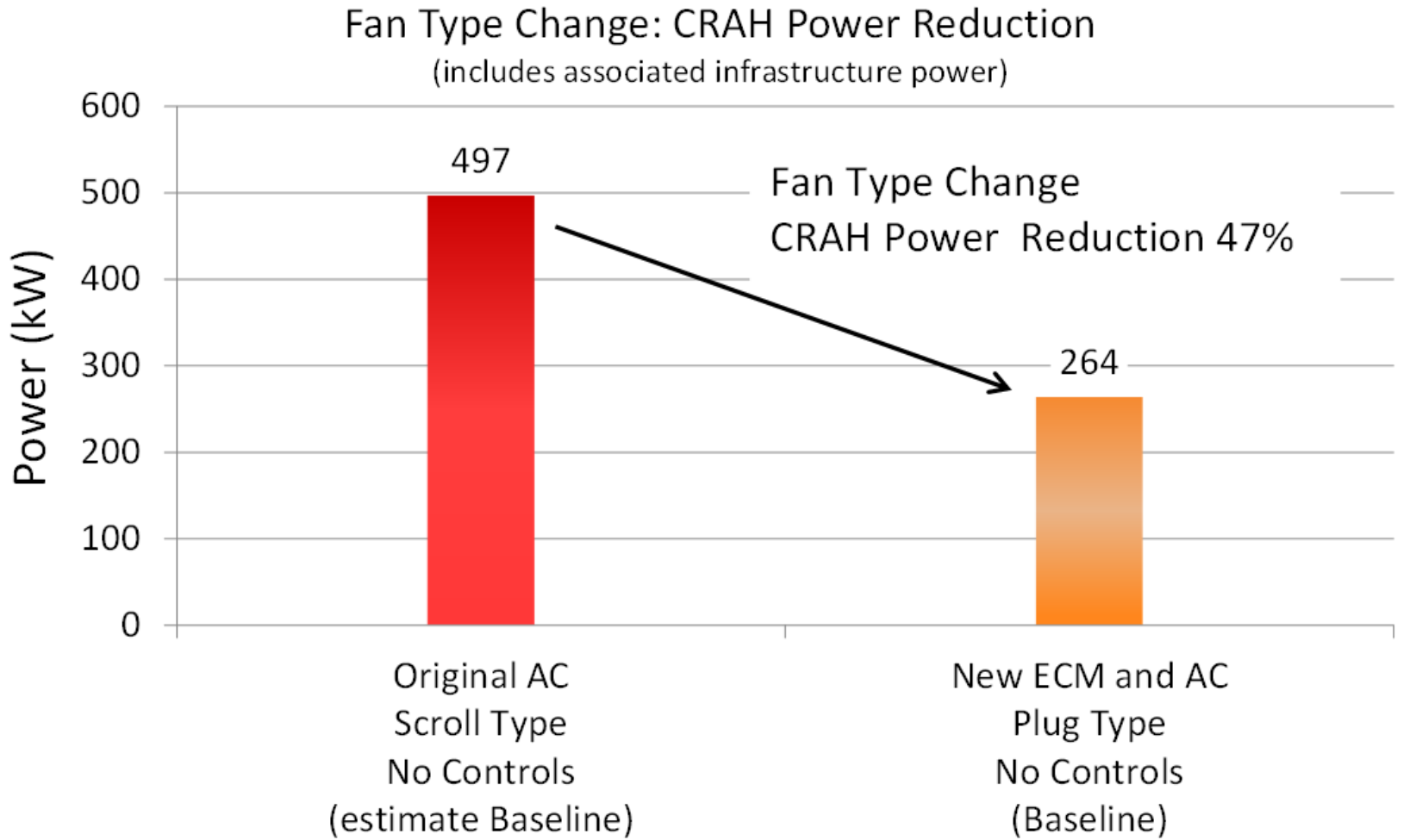


*Note: Impeller under the floor for better air flow*

## Plug Fan Upside Down on Pallet



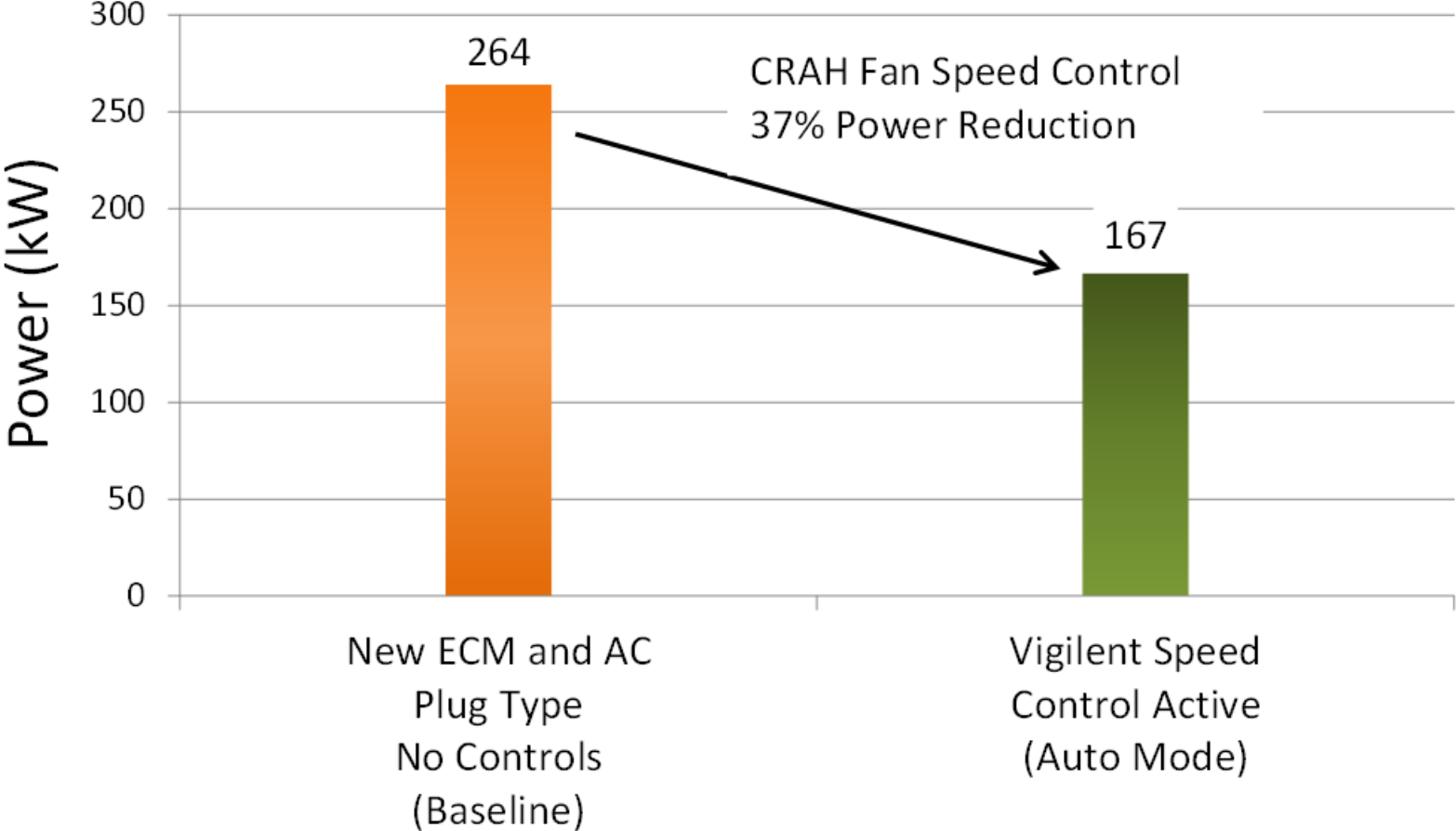
# CRAH Power Reduction Due to Fan Type Change





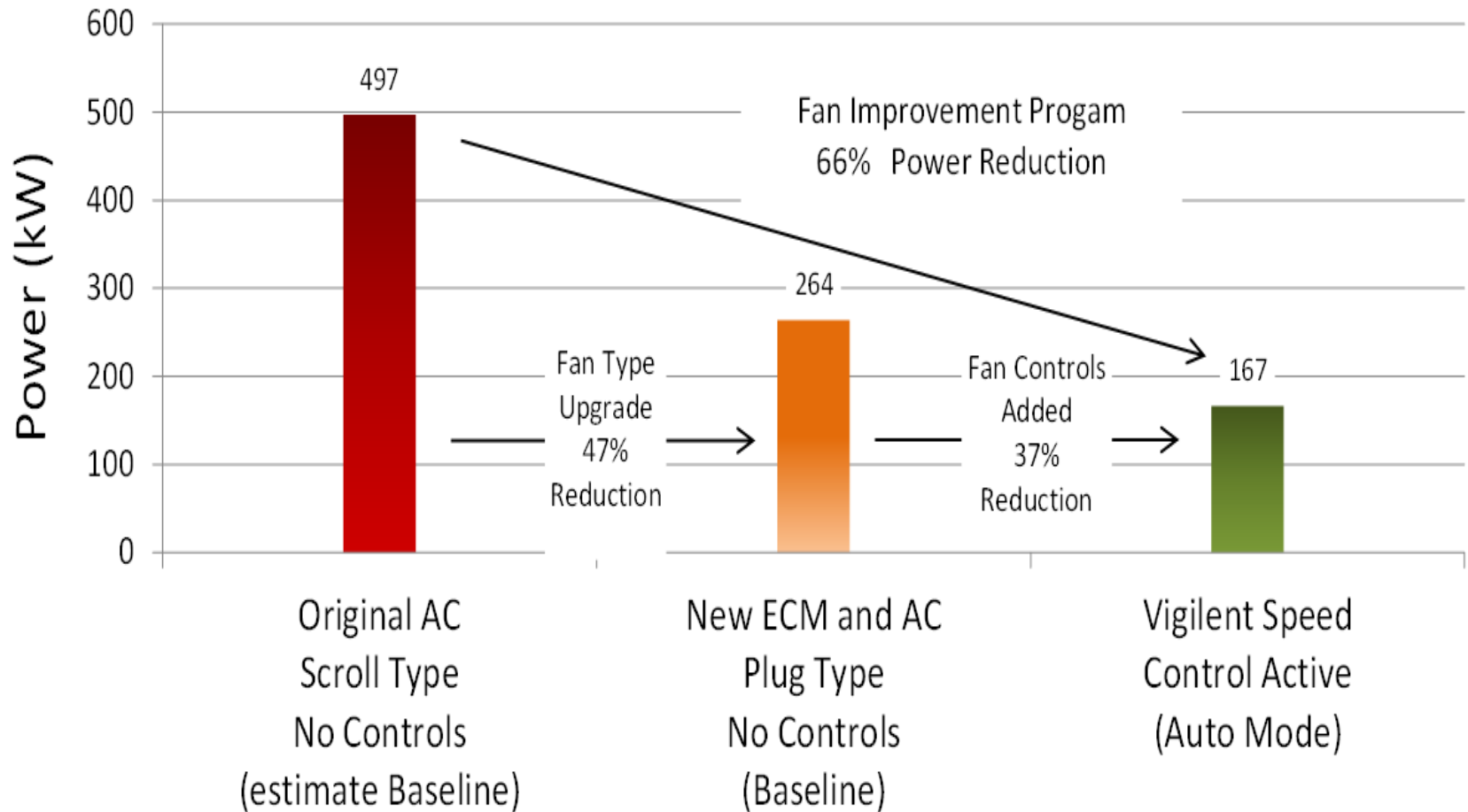
# Vigilant Control Addition CRAH Power Reduction

(includes associated infrastructure power)

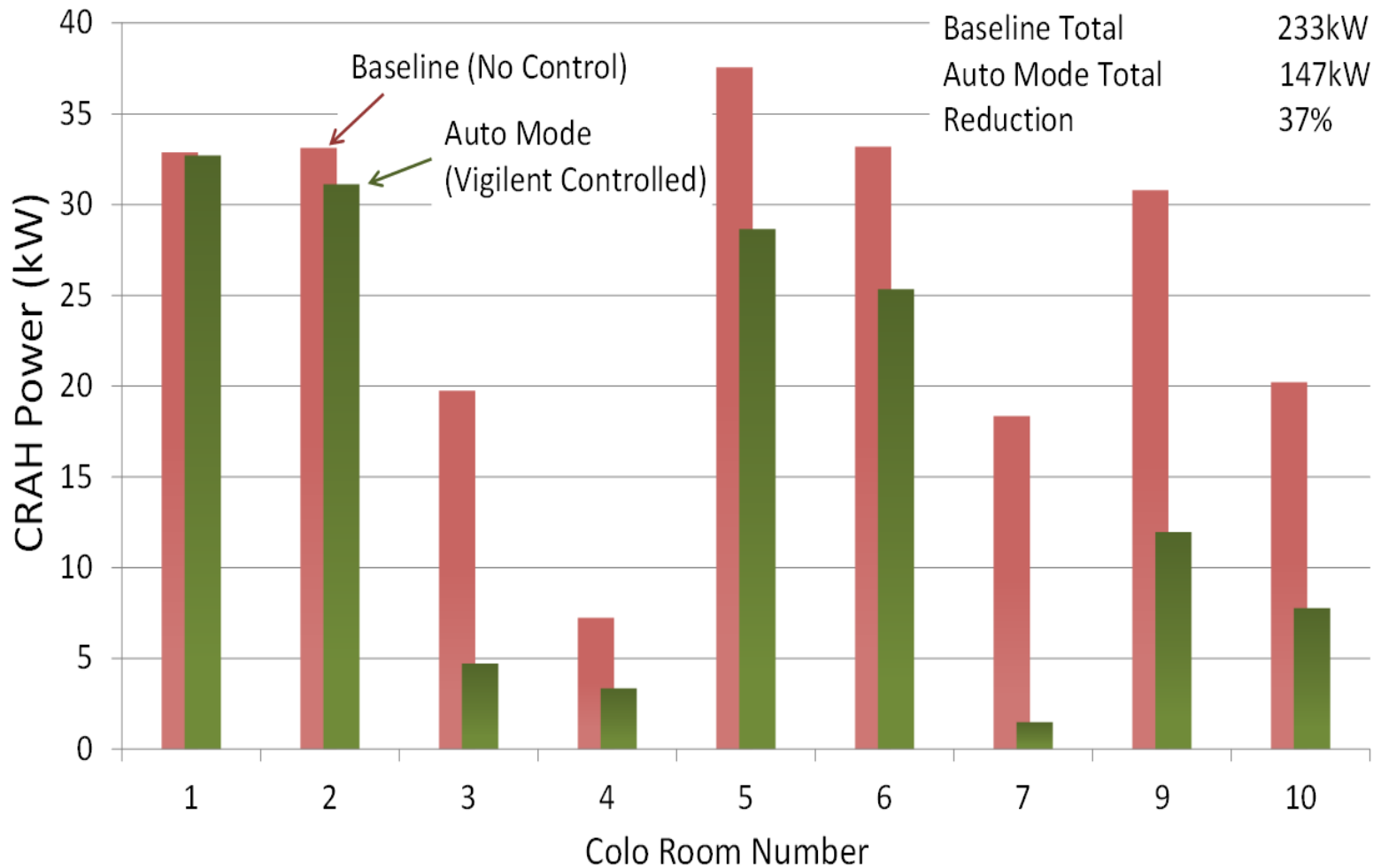


Source: Lawrence Berkeley National Laboratory High-Tech and Industrial Systems Group

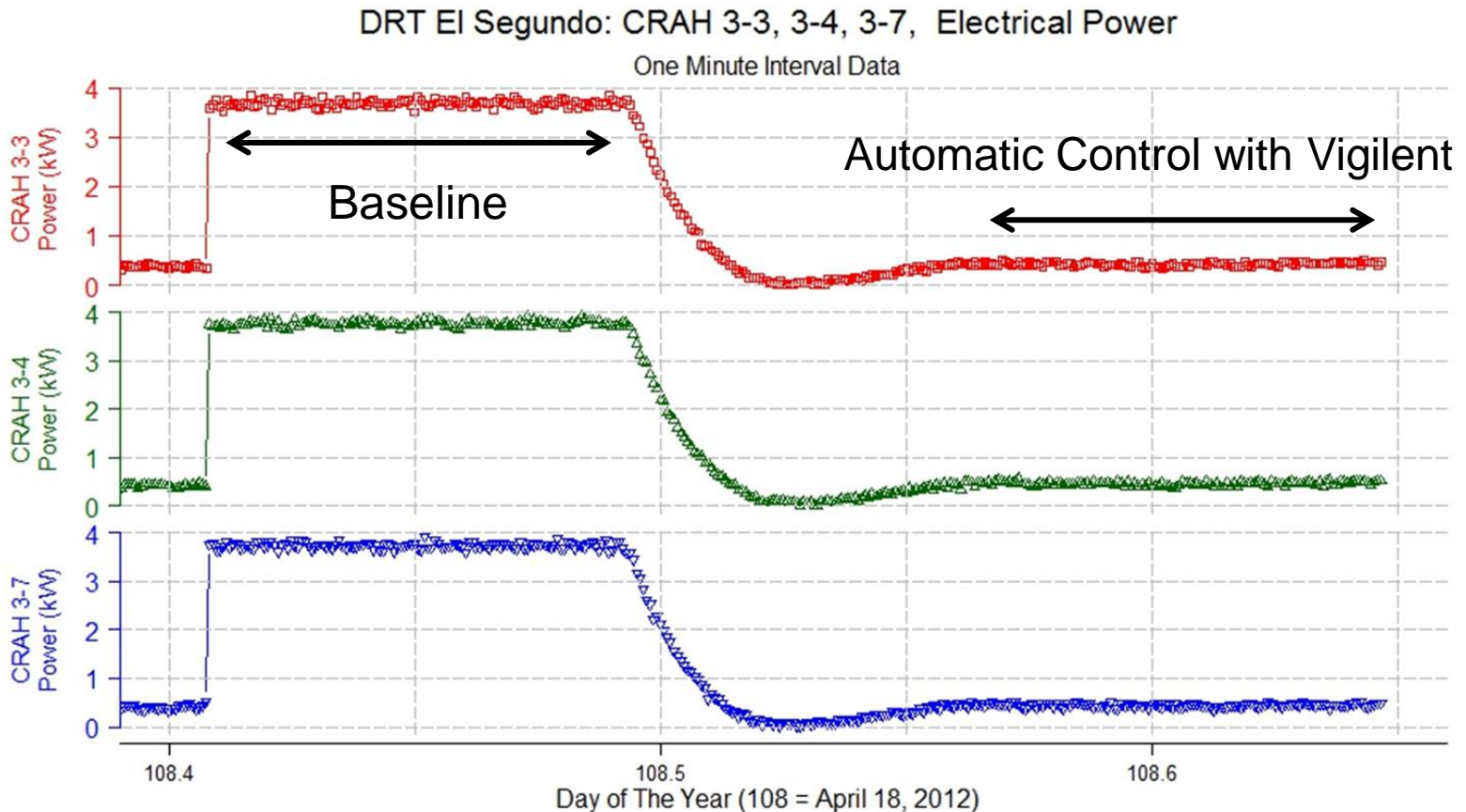
## CRAH Fan Improvement Program Total Infrastructure Power Reduction



## Total CRAH Power per Colo Room During Baseline and Auto Mode Test Periods

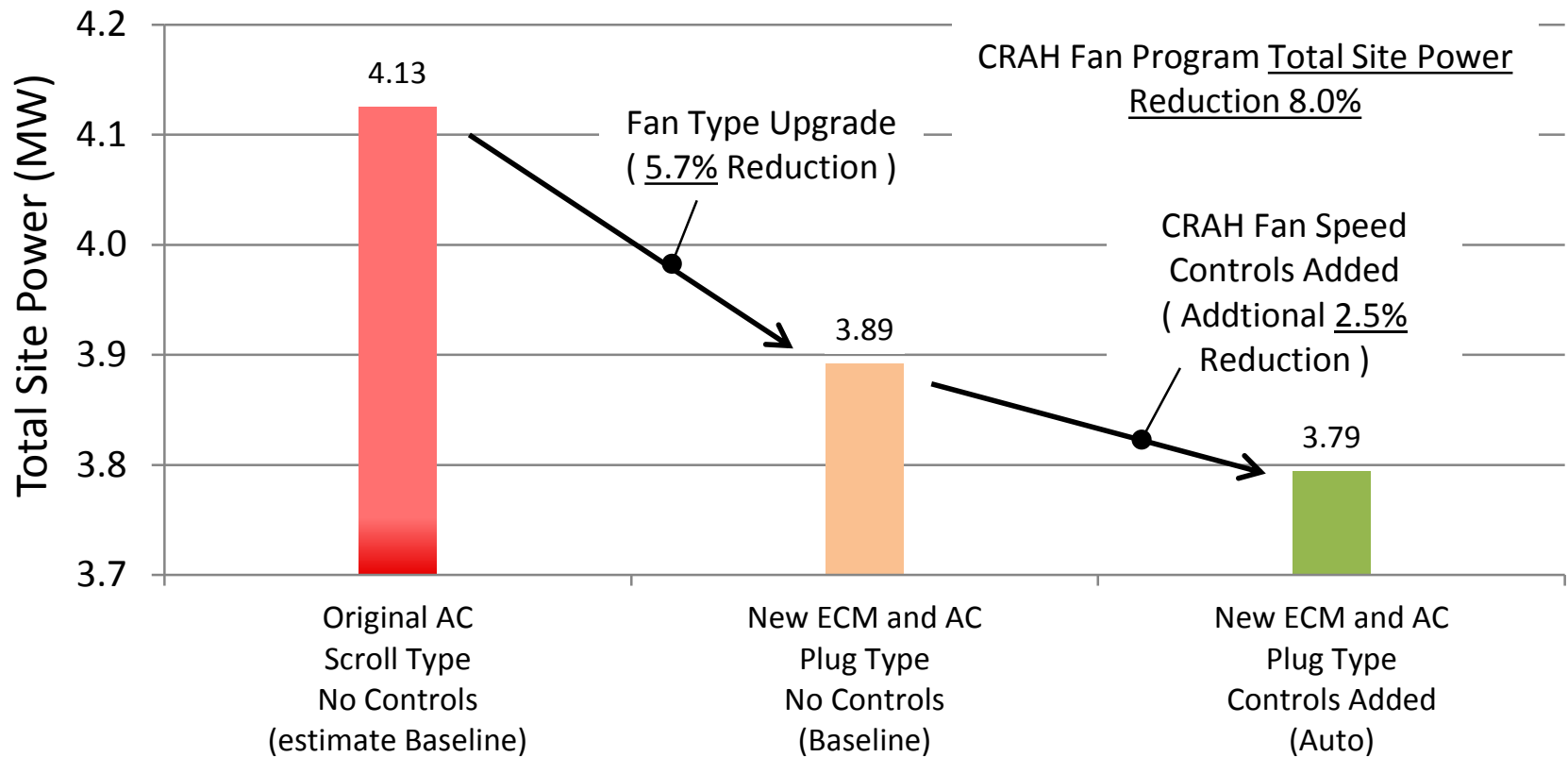


# Colo 3 Controls Response (Baseline vs. Auto)



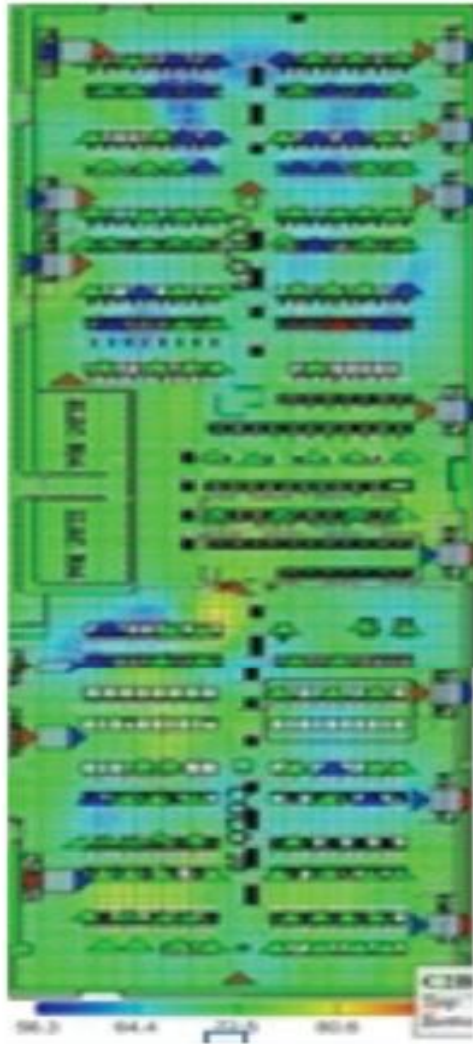
Colo Control Group	CRAH Type	# of CRAHs On/Total	Average Fan Speed	% Energy Savings	Setpoints to meet Customer SLAs (ASHRAE 64.4 – 80.6)
1	Data Aire DACD-3034 30 Ton	7/7	100%	0	ASHRAE
2	Data Aire DACD-3034 30 Ton	8/8	100%	0	ASHRAE
3 & 4	Data Aire DACD-3034 30 Ton	5/18	40%	88%	64.4-77
5 & 6	Data Aire DACD-3034 30 Ton	15/16	89%	25%	ASHRAE
7	Data Aire DACD-3034 30 Ton	3/9	49%	88%	ASHRAE
9 & 10	Liebert FH740C-AA005291 50 Ton	10/14	72%	61%	ASHRAE
<b>Total</b>		<b>48/72</b>		<b>38%</b>	

## CRAH Fan Improvement Program Total Site Savings Estimate

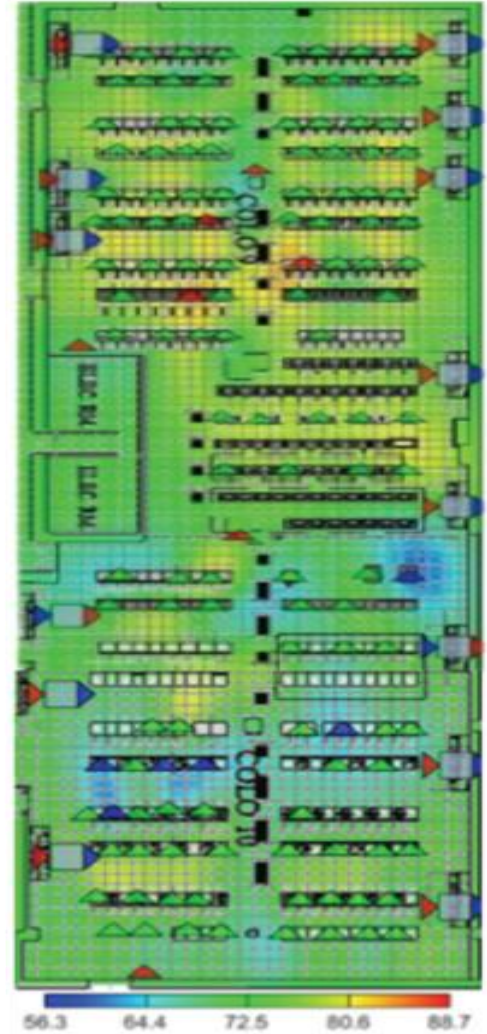




# Over-Cooled

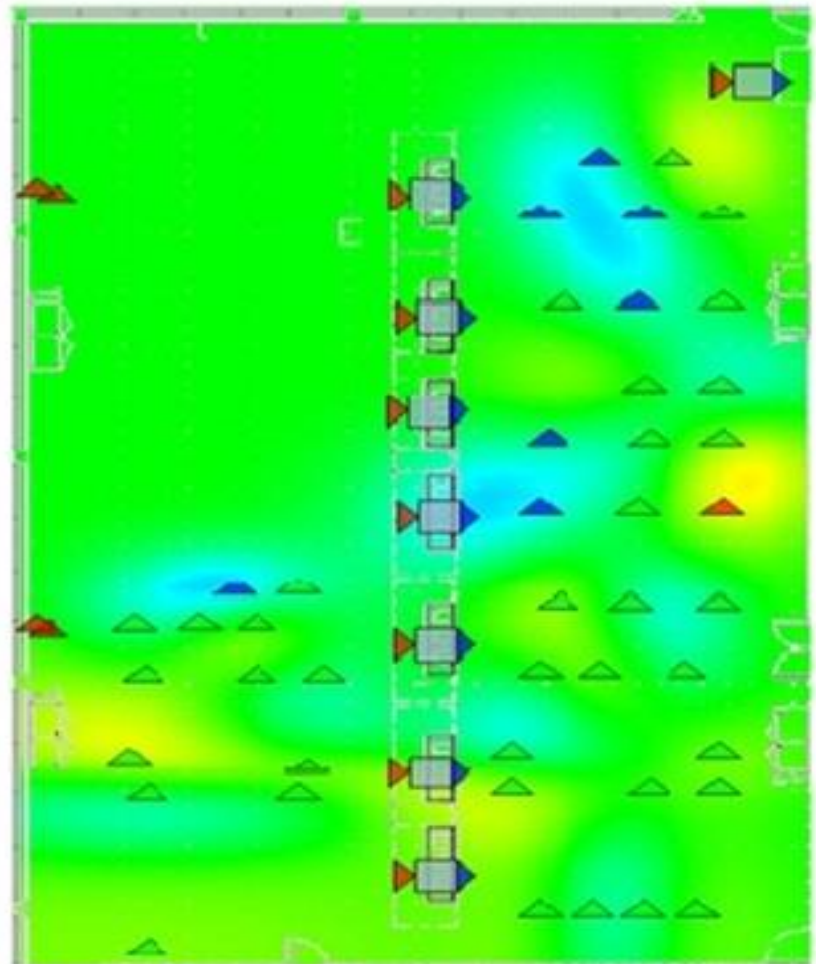
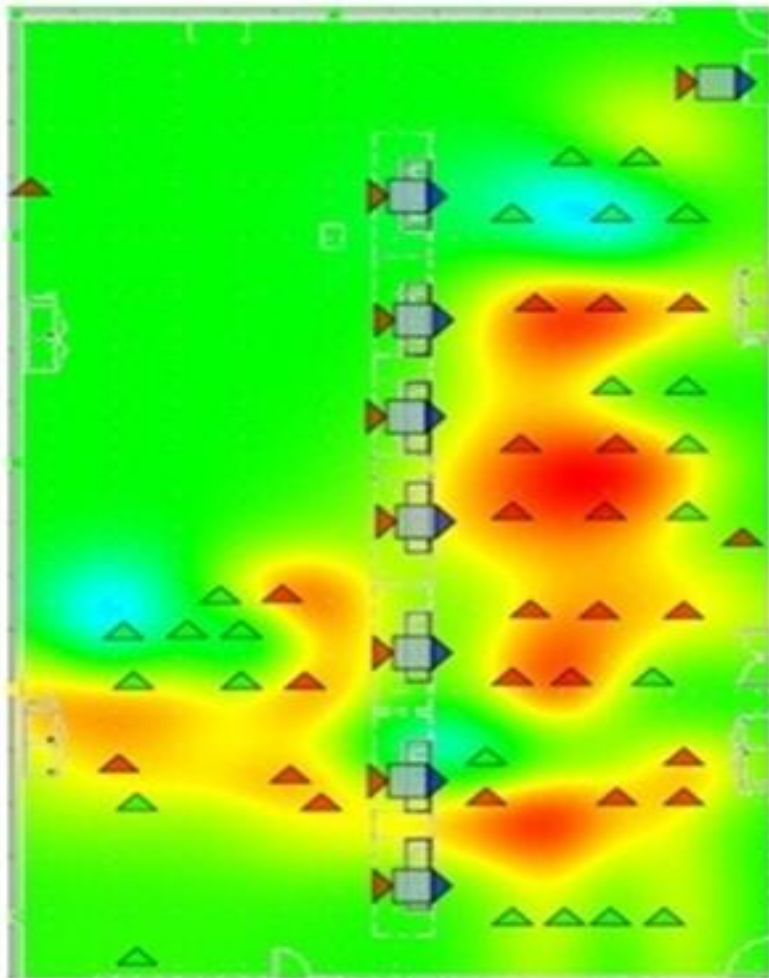


# Optimized Cooling



# Before Blanking Plates

# After Blanking Plates



# Conclusion

- Plug Fans with VFD's and the Plug Fans with Electrically Commentated motors actually saved approximately 230 kW of demand
- Vigilent Controls running in Automatic control saved 85+ kW of demand for a total of to 290 kW of demand reduction on the mechanical load with no reduction of the IT load
- Pier Grant and Utility rebate resulted in a return on the investment period of less than 12 months
- Colo 1 & 2 customers now adding blanking plates to racks – which when complete will provide additional energy savings. electric loads gained and cooling capacity buffer gained
- Ability to see heat profiles room to room and in different areas of the room in real time exceeded expectations
- Digital Realty saving 2.9 M kWh per year since the completion of this project, providing an annual greenhouse gas emission reduction of 1.9 million pounds of carbon dioxide (CO<sub>2</sub>).





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