Town of Harvard Energy Advisory Committee

BRIAN SMITH – CHAIR	ASSOCIATE MEMBERS:	ELLEN SACHS-LEICHER
ERIC BROADBENT – VICE CHAIR	STUDENT MEMBER:	OPEN
DAVID FAY	LIAISONS:	KARA MINAR, SELECT BOARD
PAUL GREEN		JOHN RUARK, SCHOOL COMMITTEE
FORREST HODGKINS		SUSANMARY REDINGER, CAPITAL PLANNING
CHRIS ROY		CHARLES OLIVER, FINANCE COMMITTEE

Meeting Minutes 1/23/19

Attendees: B. Smith, E. Broadbent, D. Fay, P.Green, F. Hodgkins, E. Sachs-Leicher, J. Ruark, SusanMary Redinger (School Building Committee Chair)
Linda Dwight (Superintendent)
Jon Snyer (Schools Facilities Director) Attendees for the HES Presentation identified below.

Location: Town Hall Volunteer Government Room 8 PM

	Meeting Discussion/Status
Admin	**The minutes of 1/9/19 were voted on and approved 4-0. Paul Green abstained.**
	Volunteer Fair Feb 2 – Brian will attend.
	Annual Town Report **due Jan 25. – Brian to send to group for comment**.
	Bromfield Science Fair – **Mar 8 – HEAC agreed that 2 people will be able to represent HEAC as judges.**
	Harvard Devens Jurisdiction Committee Input – **HEAC discussed input for SusanMary to bring back to the DJC. There are questions to be addressed?** **1. Who would control the utilities and what would happen to the MLP? Can the territory of the MLP be expanded to include the Harvard or non-Devens portions?** **2. What are the energy usages and needs?** **3. In regards to the State utility and incentive programs – how would that affect Harvard's Green Community Designation? And ongoing access to the programs available?** **4. Devens is an MVP community – what are the ongoing sustainability and vulnerability impacts? Will those add to/detract from overall preparedness?** **5. What is the anticipated overall workload for HEAC? What would be the expectations? How would the work of the Devens Sustainability Commission and any other energy related committees/groups be integrated?** 6. **Would there be an energy manager position created?**
Schools	**HES Building Project – 8:00 – 9:00 pm** *NV5 (Engineering and Consulting) – Owner Project Manager – Thomas Murphy* *Arrowstreet (Architects) – Emily Grandstaff-Rice, Katy Lillich* *Garcia, Galuska and DeSousa (Consulting Engineers) – HVAC – Carlos DeSousa, Richard Newell* *See attached presentation. All of the ideas discussed during the meeting as part of the design are intended to be in the Bid Spec. There is an independent commissioning agent for MSBA (BR+A)*
	1. *Describe the design of the physical plant at the new Hildreth School with respect to energy use*. – The system features were discussed. Also discussed that lifecycle costs will be minimized due to lower maintenance costs of the new system.
	2. *What is the predicted energy performance of the HVAC system (including EUI, Energy Use Intensity)? In what ways does the design exceed code? How does the predicted performance compare to code? -* The average school Energy Use Intensity (EUI) is 80-90. The existing HES is ~70. The target for the new HES is ~40. It will be important to monitor the behavior in order to meet the target. The school is more efficient but has a larger square footage and therefore may use more energy.

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	3. *How does the HVAC control system work? Which Building Management System will be used? How will that be integrated with Bromfield's BMS? What provisions have been made for sub-metering electricity?* – The HES includes the upgrade of the TBS BMS interface (Tridium Niagara?) The new system for all of HES is more complicated to operate. It is recommended that a Controls contract be in place similar to the BCM contract so that the system is monitored and maintained.
	4. How will Hildreth avoid the poor HVAC performance of Bromfield? What will prevent classrooms from overheating from solar gain? Is there a danger of HVAC components on the roof not working because of freezing?
	5. What provisions have been made for later add-on of rooftop solar? – There is accessibility for covering 32% of the roof for a total installed estimate of 138kW.
	6. What provisions are there for charging electric vehicles? – There is consideration for (2) spots with a Chargepoint charging system?
	7. Is an electric Domestic Hot Water Heater in the design?- Currently no. The pros and cons of on demand hot water heaters were discussed. Carlos D has had good experience with these (such as EeMax). Jon Snyer's experience is that on demand hot water are a maintenance headache. A decision needs to be made by Feb 1.
Energy Policy	1. Town Energy Policy Subcommittee – Leader: Paul Green. The plan for Town approval of a policy and action plan at a Town Meeting (Spring 2019 or 2020) is to be reviewed. Paul prepared a Consider This article for HEAC review at a future meeting. 2. MVP Resilience Subcommittee (Municipal Vulnerability Preparedness program assessment and planning) - Harvard was awarded $15k year FY19 and $20k FY20. Ag Survey was issued. Ag day workshop planned for Feb 2.
Town Energy Project Updates	1. 2017 Green Community Grant Projects: **–** Contract Deadline May 31, 2019. a. BAS Programming – **Programming completed 1/22.** b. Peregrine Retro-commissioning **– will not be completed.** 2. GC Admin a. Final Report – **Brian to complete – there is no Town Hall employee available.** 3. GC Projects – Propose for 2019 Application a. MRPC Assistance – Brian to contact Karen Chapman for completing application. b. Main and Still River Fire Stations – Northern Energy / BE Retrofit insulation quote rcvd Nov 5. RISE c. Lighting – Old Library, Main Library – EMC Audited. – Old and New Library proposal rcvd 12/27. d. Lighting at Bromfield School - to be audited separately by EMC Dec 12. There is one pole light, several can lights, and misc hallway lighting that need to be done. **Proposal rcvd Jan 18.** e. Building Operator Training for Jon Snyer – Jon is interested in taking this training if approved and considers that he will have the support of Linda Dwight. f. **TBS Boiler – change 2 position to variable gas valve. Buderus display not working. Replace controls?**
Misc Projects	**1.** Community Choice Aggregation (CCA) Plan for BOS – Leader- Chris – Eric. Actions: a. Approved at Town Meeting 10/24/16. Remaining Actions:

Meeting Minutes 1/23/19

	i. Step 5 – DPU review and approve plan (submitted 7/31/18) - 6 months ii. Step 6 – Broker develop customized plan with HEAC. iii. Step 7 – SB approved customized plan. b. Contract between Town and Colonial Power Group broker was signed week of 6/5/18. The public notice hearing occurred Nov 7 in Boston. c. Survey – Eric to review comments on the latest draft survey with Ellen and Brian. Reviewed on 1/9. The survey should be issued asap due to expected program approval in Jan 2019. **2.** CPIC Projects – pending proposals for TBS, Library, HCC, Fire Stations. **3.** HES Solar Panels – The School Committee asked about the plan for the solar array (~6kw). Preference is to transfer them to Town building/property. (e.g., track building, sewer station, Bromfield). Eric obtained quote from Ostrow Electric $4300 to remove them from the roof. **4.** HEAC invited to attend a Feb Select Board meeting – good to invite entire committee.
	Meeting adjourned 10 pm.
Future Meetings	2019 – 2/13, 2/27 HEAC Meeting Location/Time: Volunteer Government Room, Town Hall 8 pm.

MEP Systems and Energy Conservation Measures Overview

Hildreth Elementary School
Harvard, MA

MECHANICAL SYSTEM PAYBACK SUMMARY BASED UPON CODE-INITIAL SELECTION

Baseline	System	Gross Capital Investment*	Annual Elec. Cons. (kWh)	Annual Gas Cons. (MBTU)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual Maint. Cost	Combined Annual Expense	Combined Expense Savings**	Total Life-Cycle Savings***	Discounted Payback (Years)****
-	1. Hot water coil heating/dx cooling VAV AHU system with energy recovery and terminal VAV boxes with hot water reheat coils serving the administration, cafeteria, classroom, and media center areas 2. Code efficient gas-fired non-condensing boiler plant	$3,794,924	642,890	3,705.0	$115,720	$45,201	$160,921	$1.89	**69.4**	$20,825	$181,746	-	-	-

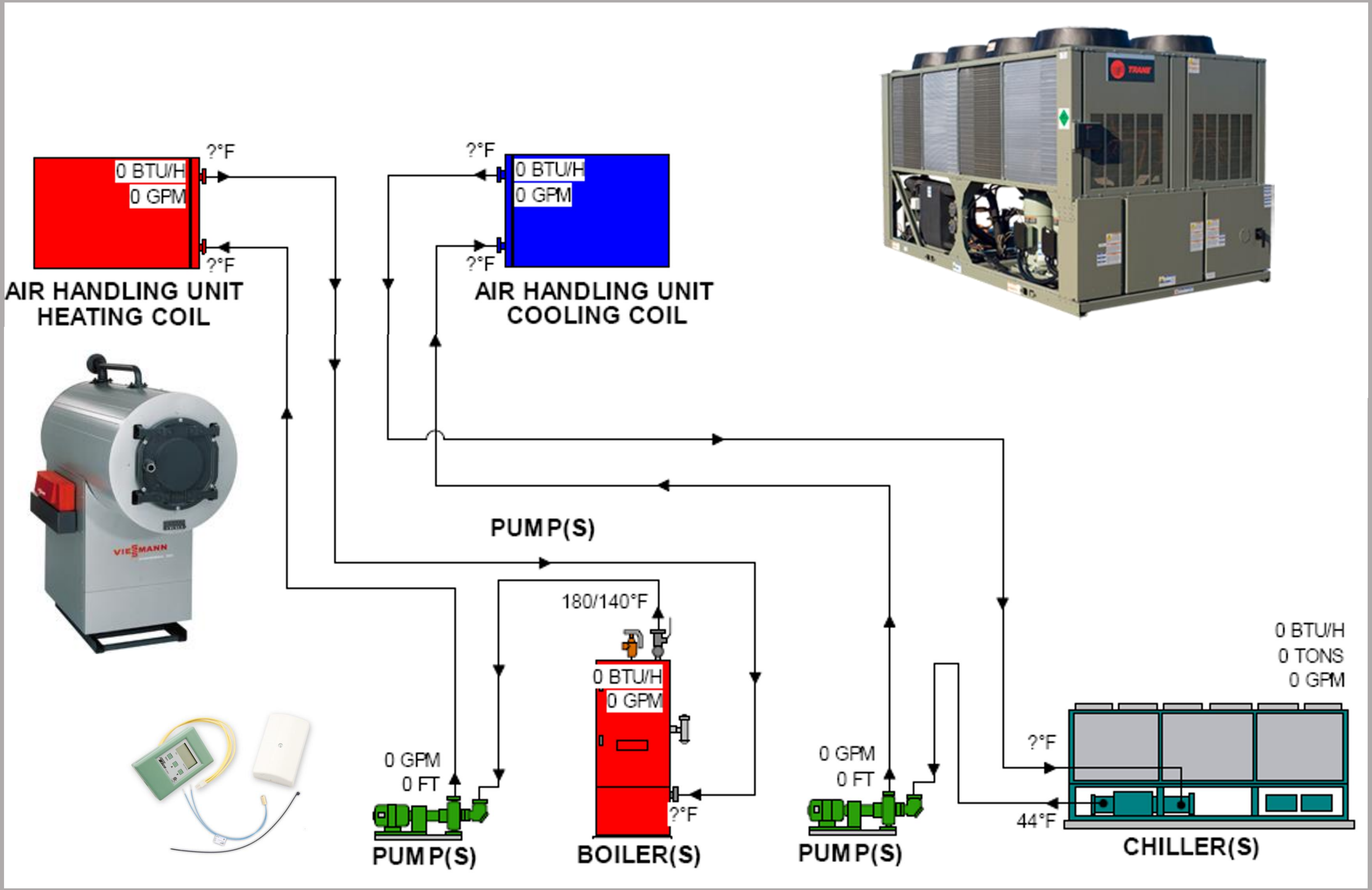
Option	System	Gross Capital Investment*	Annual Elec. Cons. (kWh)	Annual Gas Cons. (MBTU)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual Maint. Cost	Combined Annual Expense	Combined Expense Savings**	Total Life-Cycle Savings***	Discounted Payback (Years)****
1	1. Hot/chilled water coil induction units serving the classroom and administration areas 2. Hot water coil heating/dx cooling 100% O.A. VAV ventilating units with energy recovery and demand ventilation serving induction units of the administration, cafeteria, classroom, and media center areas 3. Hot water coil heating/dx cooling overhead VAV unit with energy recovery and demand ventilation serving the cafeteria area 4. High-efficiency gas-fired condensing central boiler plant 5. High-efficiency air-cooled chiller plant	$3,786,789	553,710	2,928.7	$99,667	$35,730	$135,397	$1.59	**56.7**	$23,825	$159,222	$22,524	$586,194	Instant******
* 2	1. VAV dehumidification displacement ventilation diffusers with terminal VAV boxes and perimeter hot water radiant heating panels 2. Hot water coil heating/dx dehumidification VAV displacement ventilation units with energy recovery and demand ventilation serving the classroom, cafeteria, and gymnasium areas 3. Hot water coil heating/dx cooling VAV displacement ventilation unit with energy recovery and demand ventilation serving the media center areas 4. Variable refrigerant flow (VRF) terminal evaporator units with air-cooled condensing units serving the administration areas 5. Hot water coil heating/dx dehumidification 100% O.A. ventilation units with energy recovery providing ventilation to the administration areas 6. High-efficiency gas-fired condensing central boiler plant	$3,273,389	461,200	2,469.7	$83,015	$30,131	$113,146	$1.33	**47.5**	$21,300	$134,446	$47,300	$1,712,409	Instant******
3	1. VAV fully air-conditioned displacement ventilation diffusers with terminal VAV boxes and perimeter hot water radiant heating panels 2. Hot water coil heating/dx cooling VAV displacement ventilation units with energy recovery and demand ventilation serving the classroom, cafeteria, gymnasium, and media center areas 3. Variable refrigerant flow (VRF) terminal evaporator units with air-cooled condensing units serving the administration areas 4. Hot water coil heating/dx dehumidification 100% O.A. ventilation units with energy recovery providing ventilation to the administration areas 5. High-efficiency gas-fired condensing central boiler plant	$3,659,488	485,410	2,511.9	$87,375	$30,645	$118,020	$1.39	**49.0**	$21,300	$139,320	$42,426	$1,204,705	Instant******
4	1. VAV dehumidification displacement ventilation diffusers with terminal VAV boxes and perimeter hot water radiant heating panels 2. Hot water coil heating/chilled water coil dehumidification VAV displacement ventilation units with energy recovery and demand ventilation serving the classroom, cafeteria, and gymnasium areas 3. Hot water coil heating/chilled water coil cooling VAV displacement ventilation unit with energy recovery and demand ventilation serving the media center areas 4. Variable refrigerant flow (VRF) terminal evaporator units with water-cooled condensing units serving the administration areas 5. Hot water coil heating/chilled water coil dehumidification 100% O.A. ventilation units with energy recovery providing ventilation to the administration areas 6. High-efficiency gas-fired condensing central boiler plant 7. Geothermal wells with water-to-water source heat pump chillers	$5,738,542	498,130	2,288.7	$89,663	$27,923	$117,586	$1.38	**46.9**	$23,800	$141,386	$40,360	#VALUE!	N/A*****

**Indoor AHU's are part of design with chilled cooling and hot water heating.*

ENERGY CONSERVATION MEASURES (ECM) SAVINGS SUMMARY BASED ON DESIGN BUILDING (ABOVE CODE)

Baseline	Description	Annual Elec. Cons. (kWh)	Annual Gas Cons. (MBTU)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Combined Expense Savings*	Energy Cost Savings Percentage
Design Building	1. Design Envelope (Wall Insulation R-16.3 – 20.16 c.i., Roof Insulation R-32.5 c.i., Windows 0.36 U-Value w/ 0.39 SHGC, Curtainwall 0.38 U-Value w/ 0.39 SHGC) 2. Design Mechanical Systems (VAV Dehumidification Displacement Ventilation Systems and 93% High-Efficiency Condensing Boilers) 3. Design High-Efficiency Lighting System (0.5 w/s.f.) 4. Design High-Efficiency Domestic Hot Water Systems (94% Eff. Hot Water Heaters)	391,850	2,036.0	$70,533	$24,839	$95,372	$1.12	39.67	-	-

Measure	Description	Annual Elec. Cons. (kWh)	Annual Gas Cons. (MBTU)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Combined Expense Savings*	Energy Savings Percentage
Alternate Glazing Performance	Windows 0.26 U-Value w/ 0.35 SHGC Curtainwall 0.26 U-Value w/ 0.29 SHGC	389,460	1,992.4	$70,103	$24,307	$94,410	$1.11	39.06	$962	**1.0%**
Alternate Glazing Percentage	25% in lieu of 30%	388,770	2,009.4	$69,979	$24,514	$94,493	$1.11	39.23	$879	**0.9%**
Alternate Roof Insulation	R-40 Continuous Roof Insulation	391,900	2,018.4	$70,542	$24,624	$95,166	$1.12	39.46	$206	**0.2%**
Solar Domestic Hot Water	Solar System providing all Domestic Hot Water Heating	391,850	1,277.6	$70,533	$15,587	$86,120	$1.01	30.75	$9,252	**9.7%**
Combined ECM's	Combined Energy Conservation Measures	387,890	1,194.8	$69,820	$14,576	$84,396	$0.99	29.62	$10,976	**11.5%**


0 BTU/H
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AIR HANDLING UNIT
HEATING COIL
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COOLING COIL
PUMP(S)
180/140°F
0 BTU/H
0 GPM
?°F
0 GPM
0 FT
PUMP(S)
BOILER(S)
0 GPM
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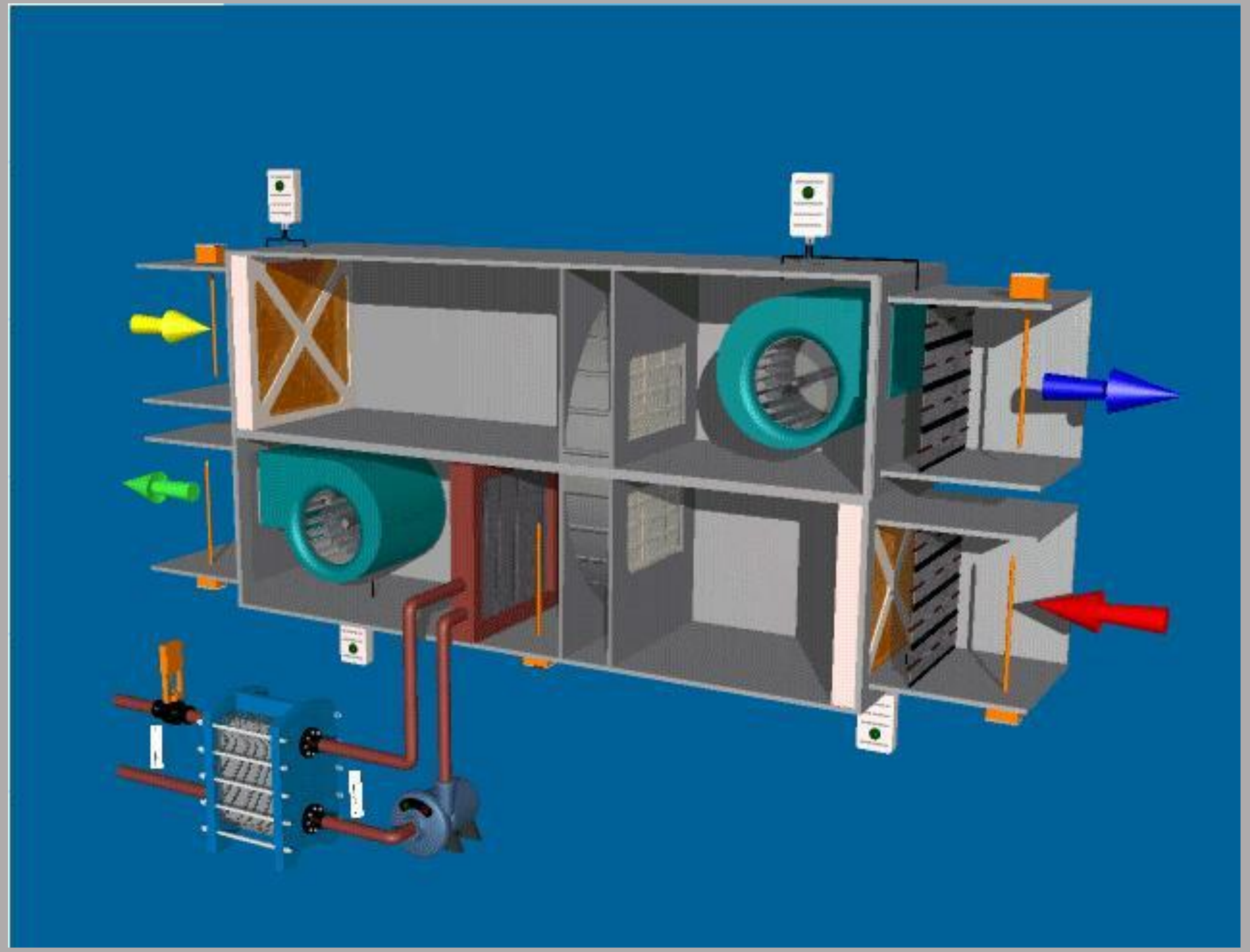
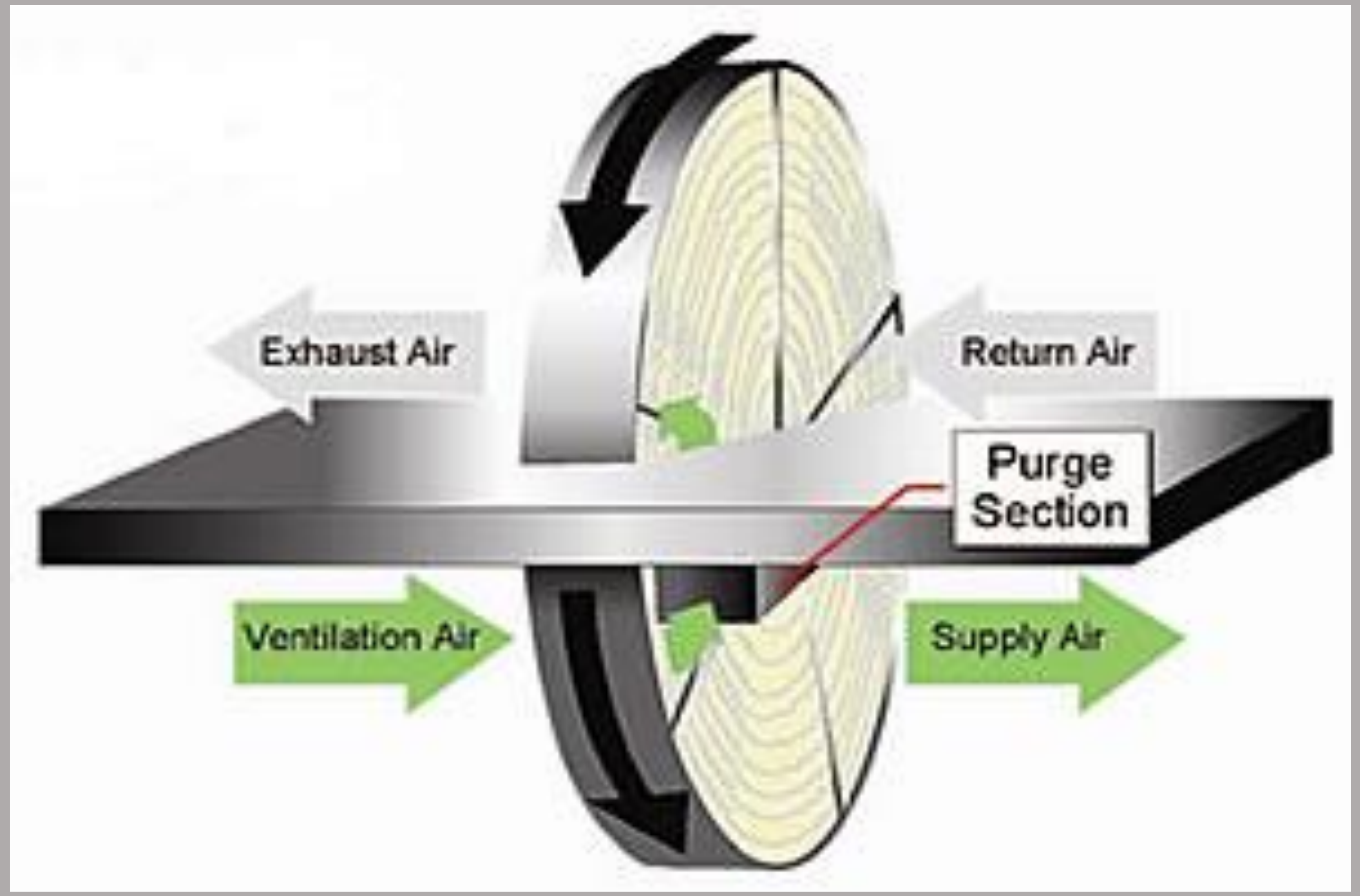
PUMP(S)
0 BTU/H
0 TONS
0 GPM
?°F
44°F
CHILLER(S)

100% OUTSIDE AIR CENTRAL VENTILATION ROOFTOP UNIT ENCLOSURES WITH ENERGY RECOVERY FOR DISPLACEMENT AND INDUCTION UNIT SYSTEMS





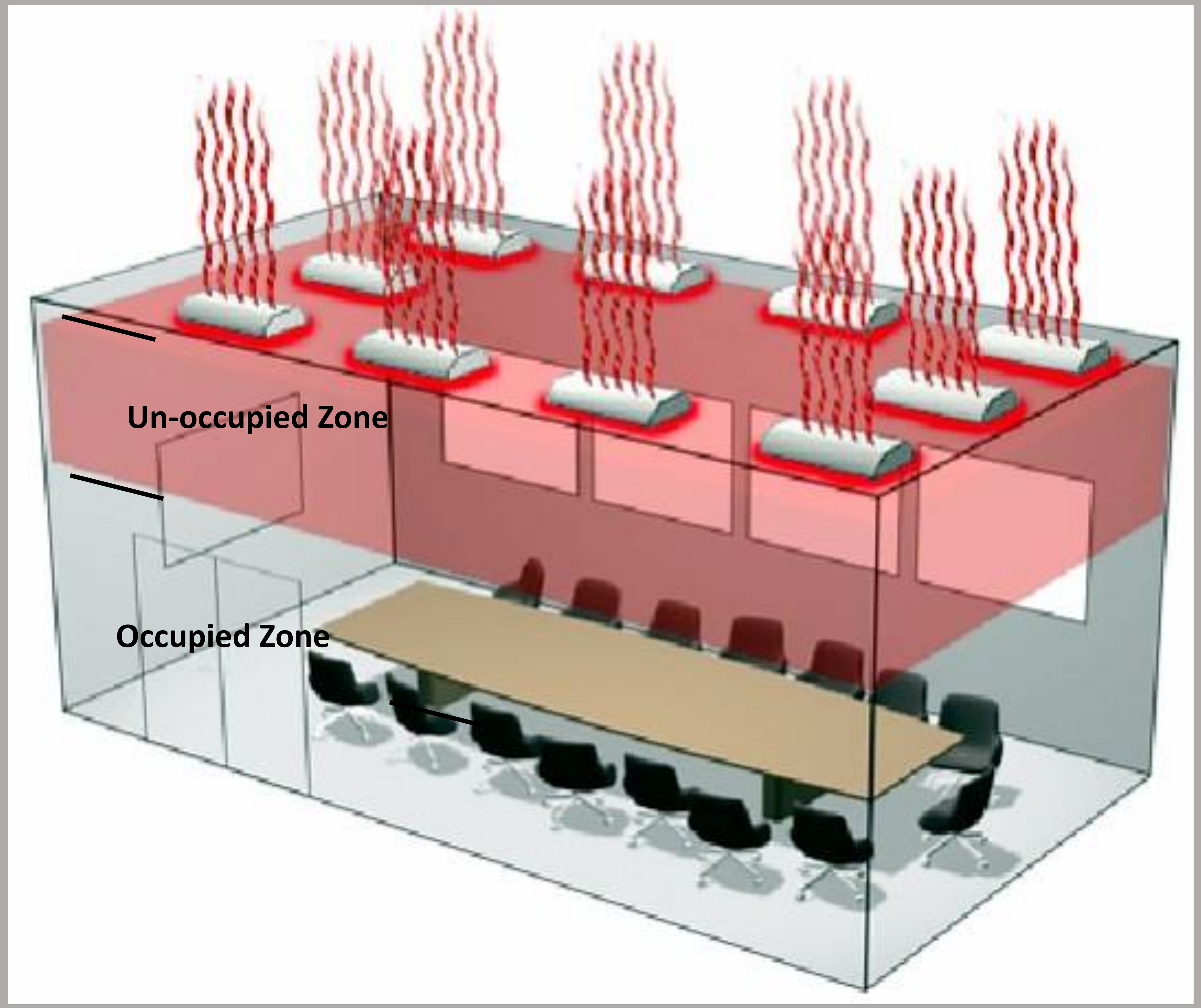
- Ventilation air is provided from Rooftop or Indoor Air Handling Units
- Hot water Heating and Chilled water Cooling

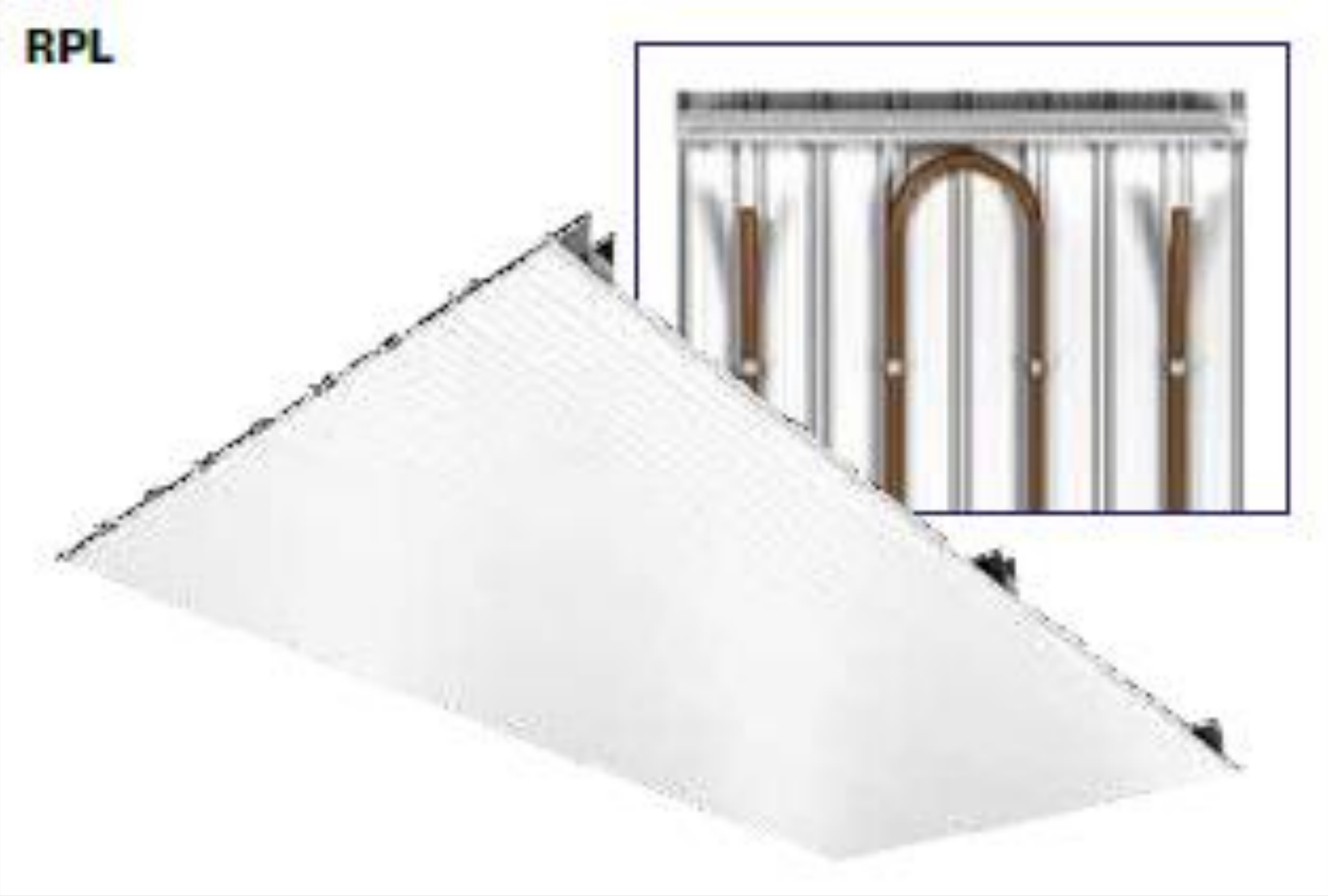
Load Calculation Reductions

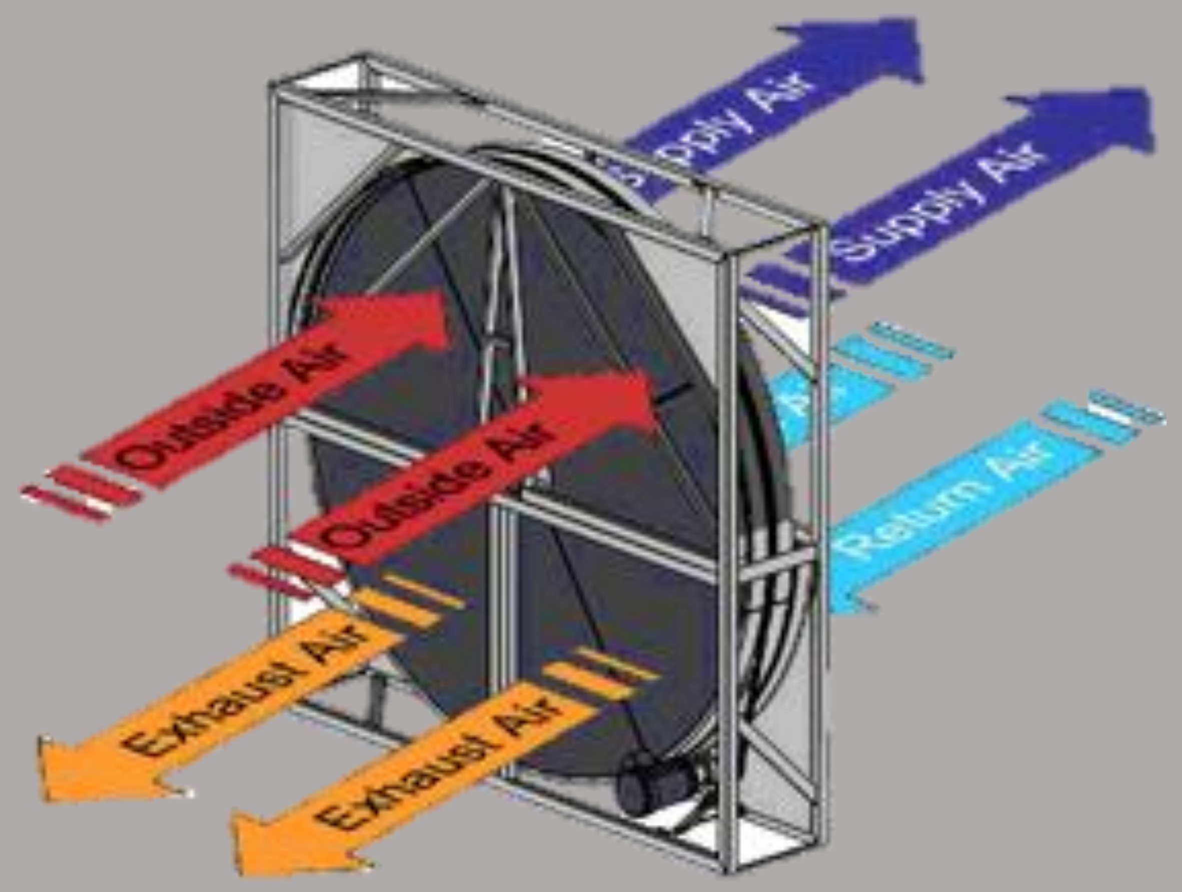
- Conventional System: All heat generated in room is included in air flow calculation since all airflow is mixed.
- Displacement System: Only loads which occur in the Occupied Zone are factored
- Results in: Smaller equipment & systems and lower installed and operating costs for Displacement Systems

Additional Energy Efficiency Measures

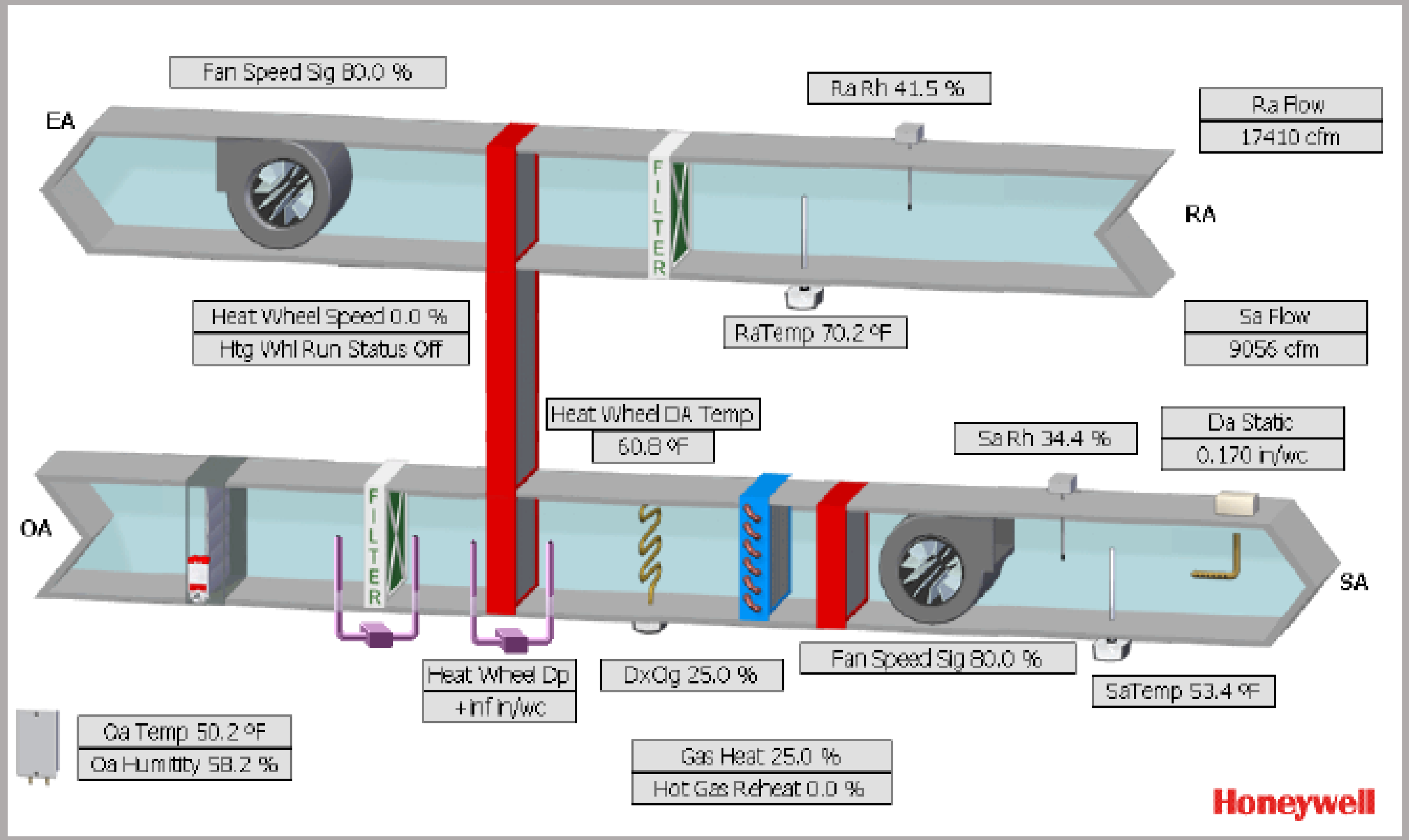
- Energy Recovery: Transfers energy from the return air stream to the supply air stream to pre-heat or pre-cool the outside air.
- Variable Air Volume w/ Aircuity CO_2 Demand Control Ventilation: Modulates the airflow to large single zone areas in accordance to space mounted thermostat and CO_2 sensors reducing energy consumption due to reduced air changes.







- System (Zone) Scheduling
- Occupied-Unoccupied Control
- Night Setback Operation
- Lighting Control System Integration
- Increased Energy Savings
- Integrate with Preventative Maintenance Scheduling

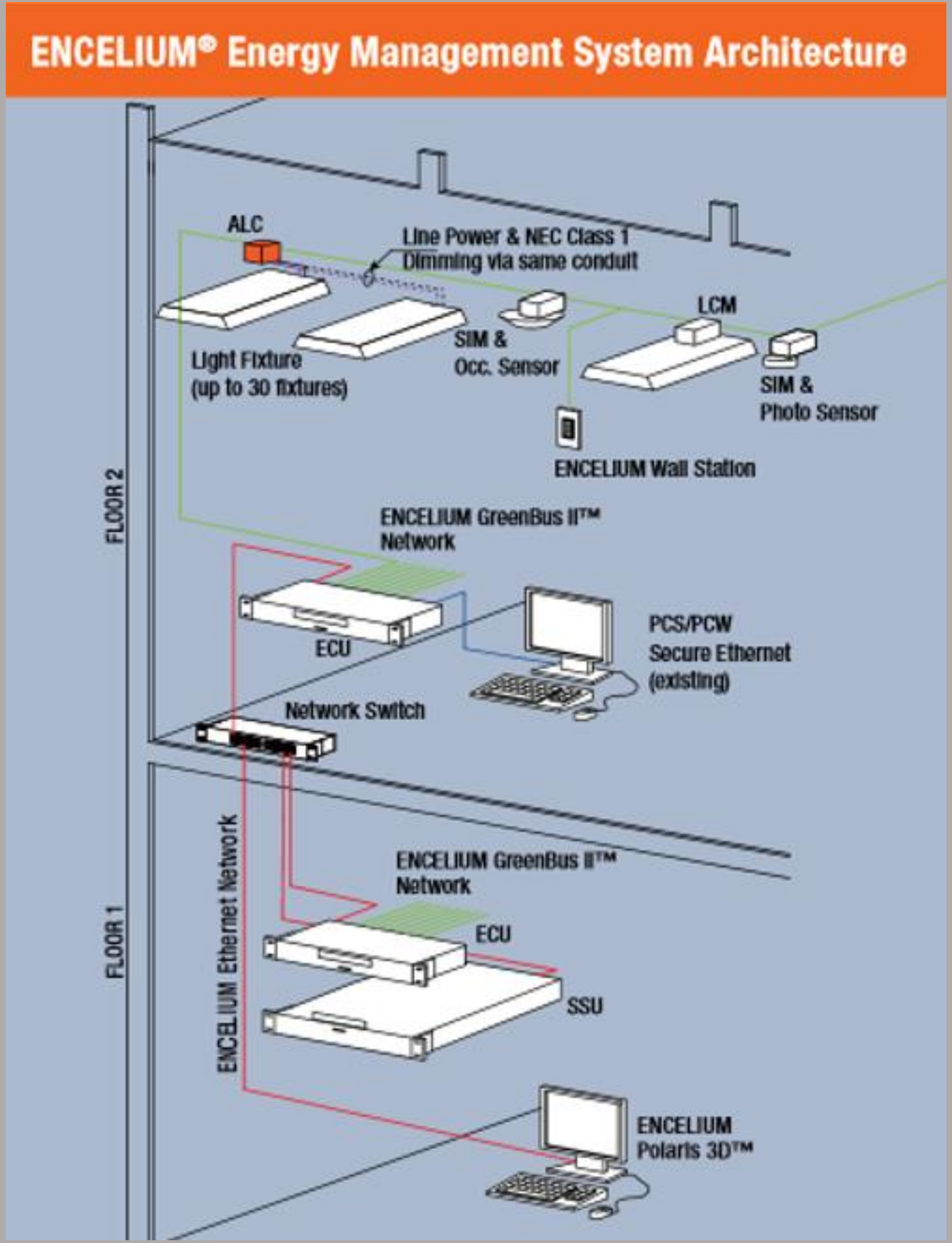


LIGHTING CONTROL SYSTEM

- Occupancy Sensor
- Daylight Sensor
- BMS Integration
- Addressable groups
- Integration to future demand response program

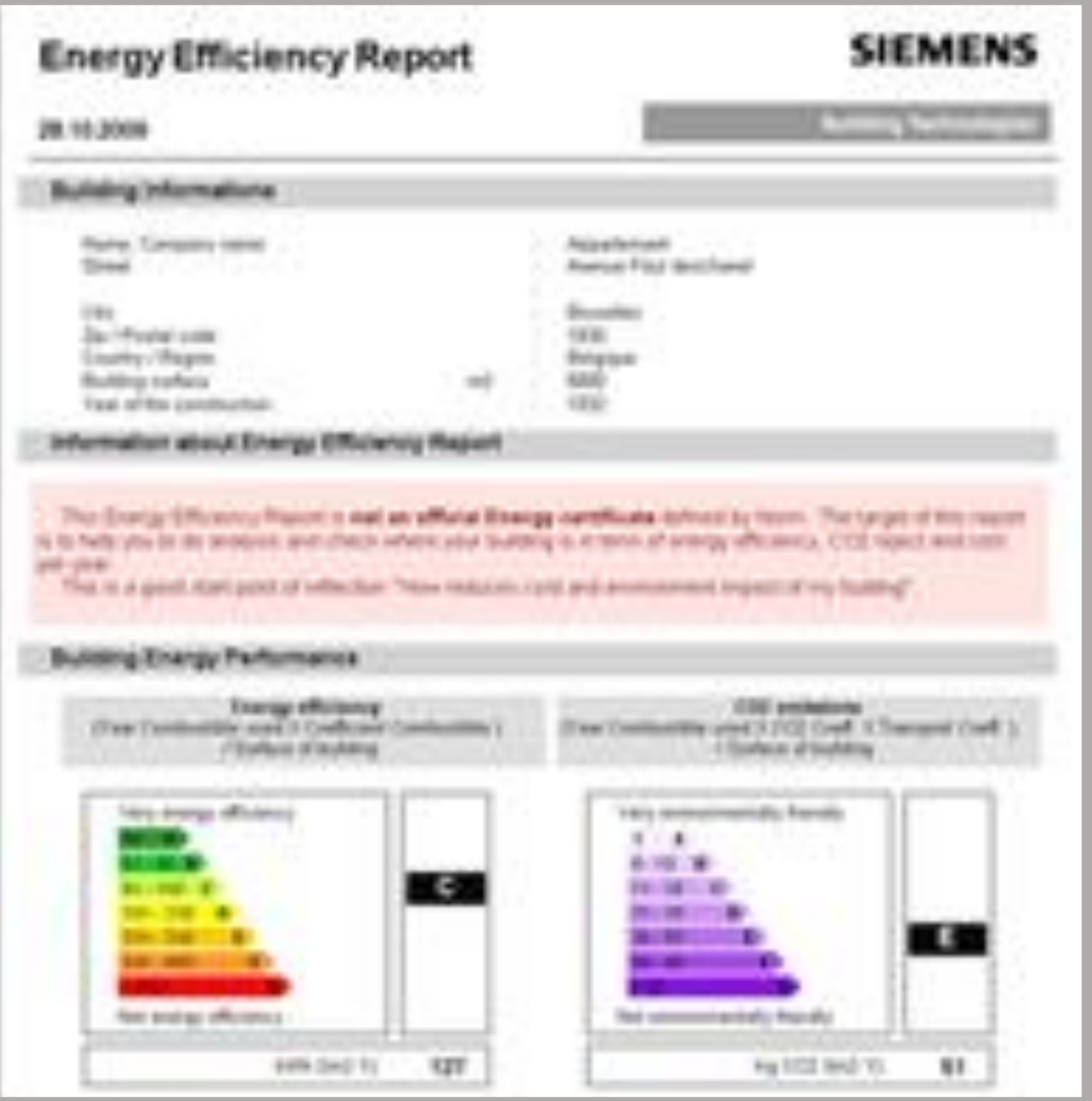
Daylight Sensor

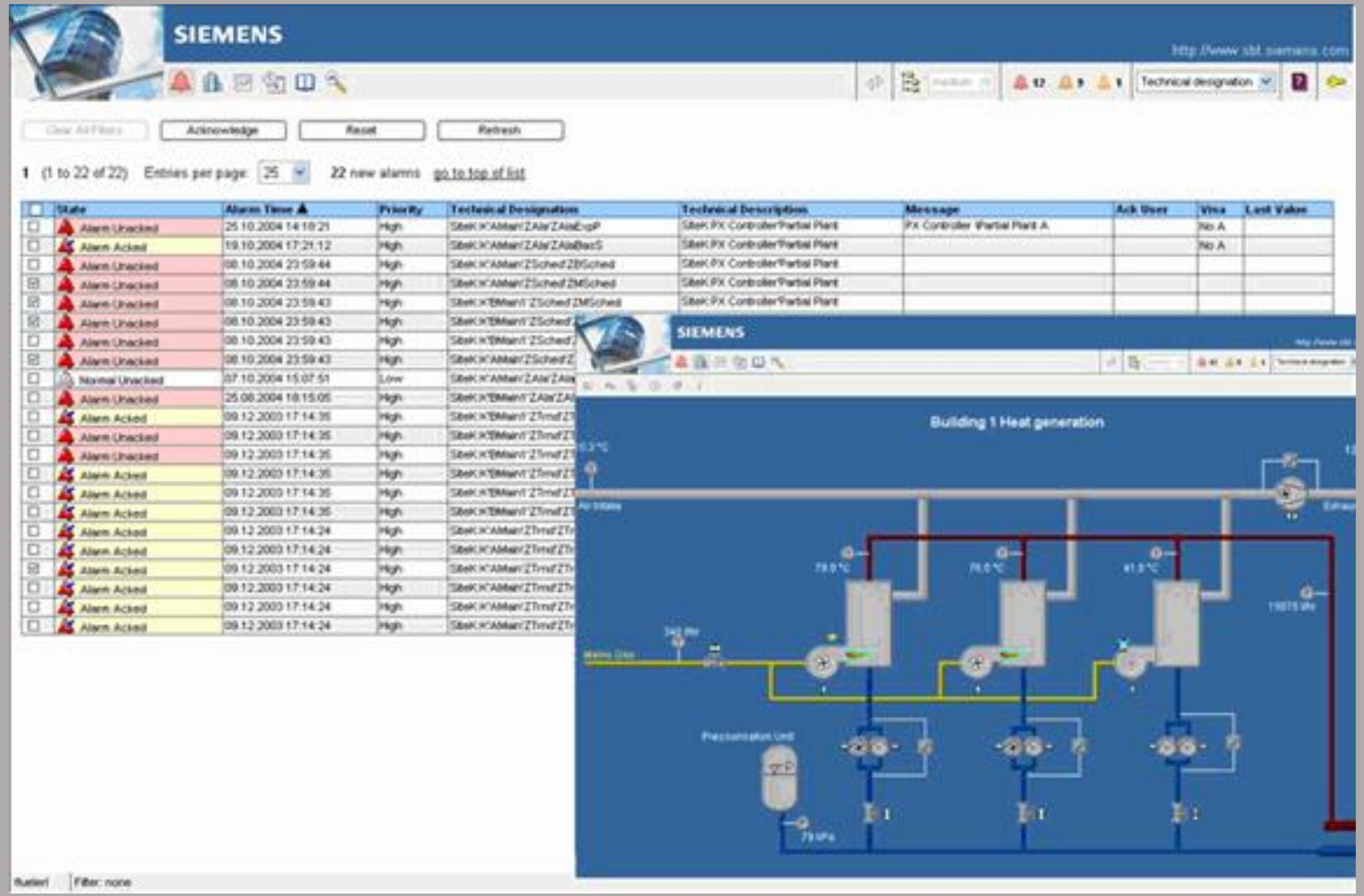
Occupancy Sensor

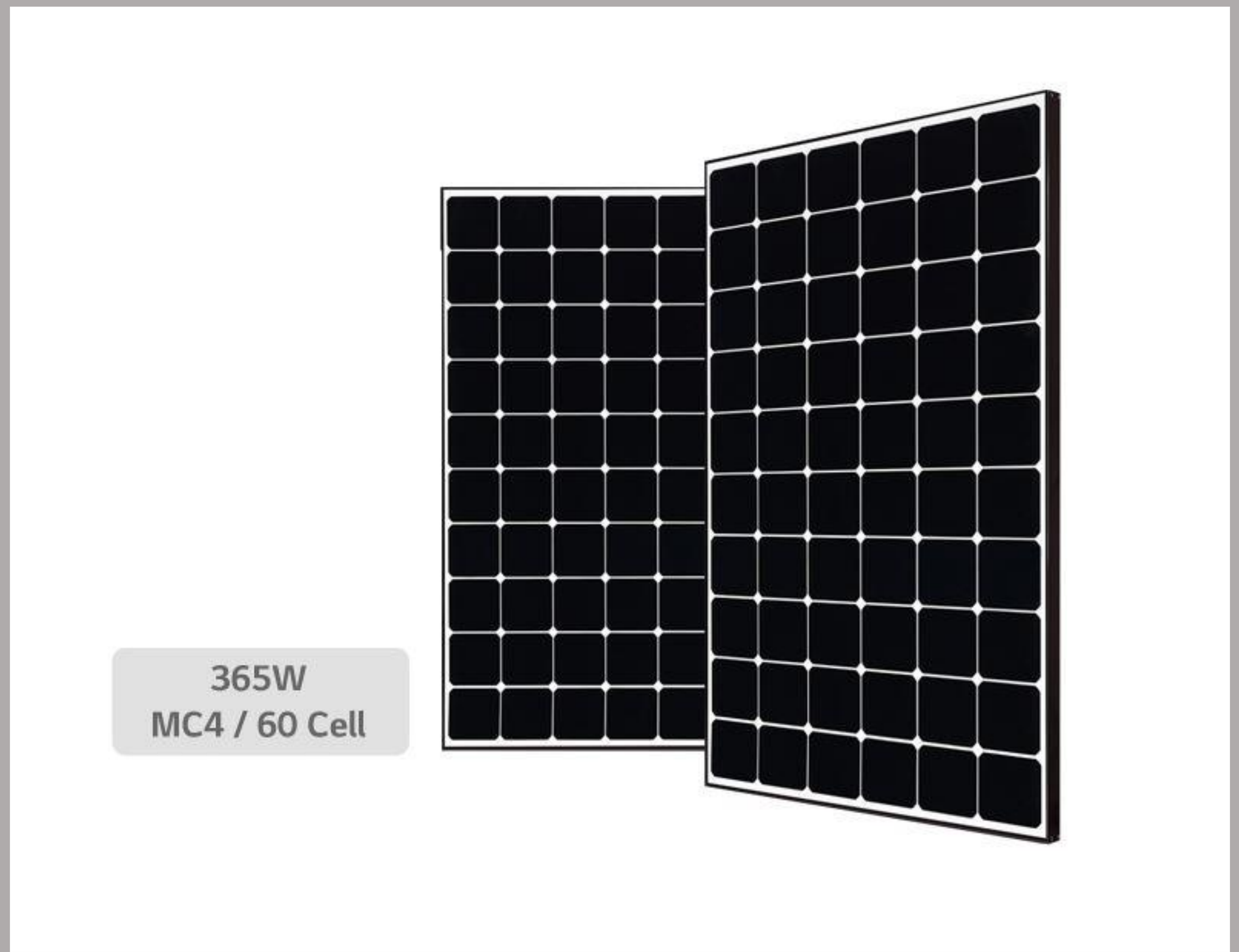


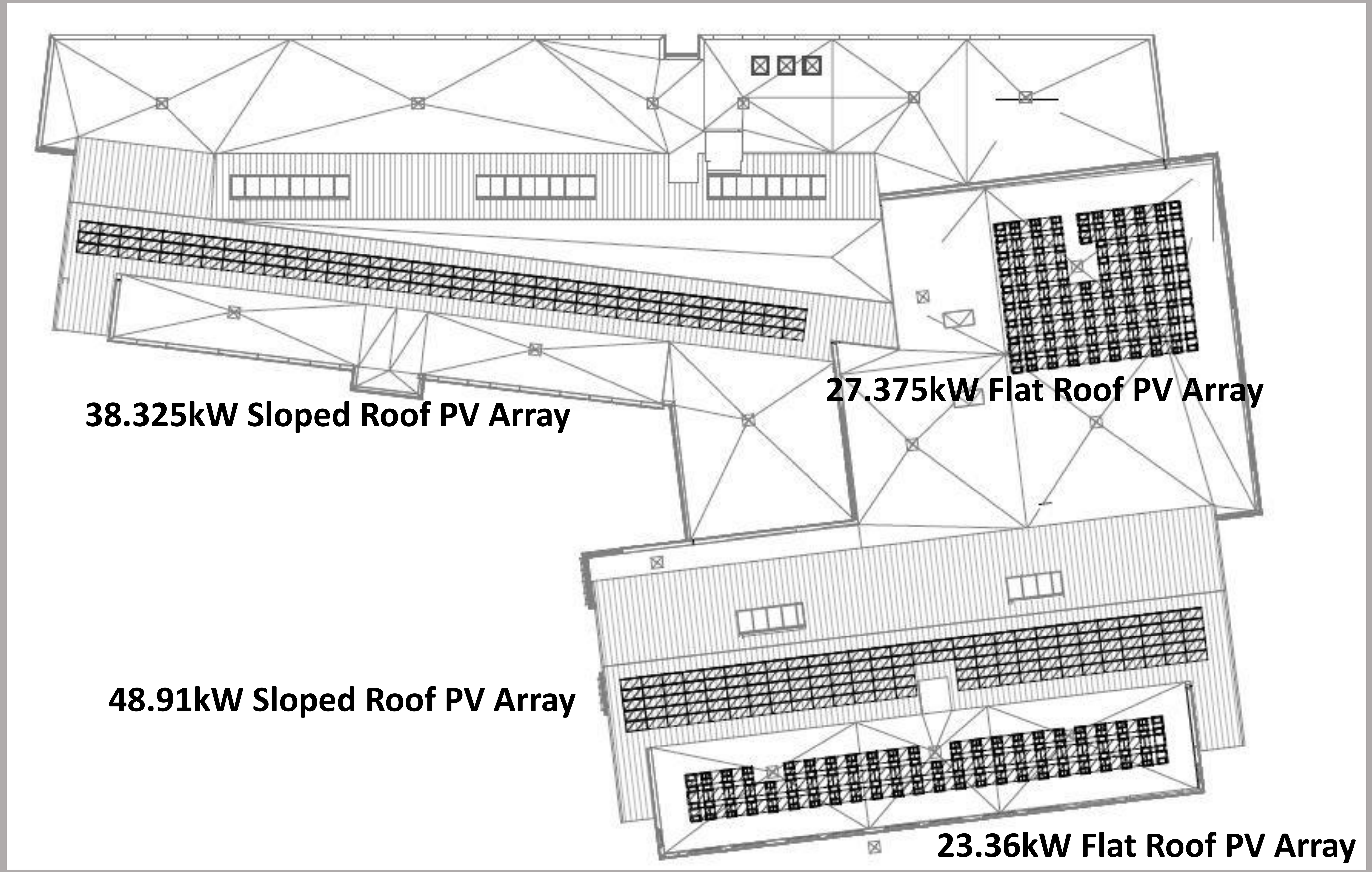
BUILDING DASHBOARD SYSTEM

- Utility Data
- On-Site Generation System
- Submetering
- BACnet IP Integration:
    - Lighting Controls
    - Water & Gas Meters
    - Emergency Generator
    - Fire Alarm System



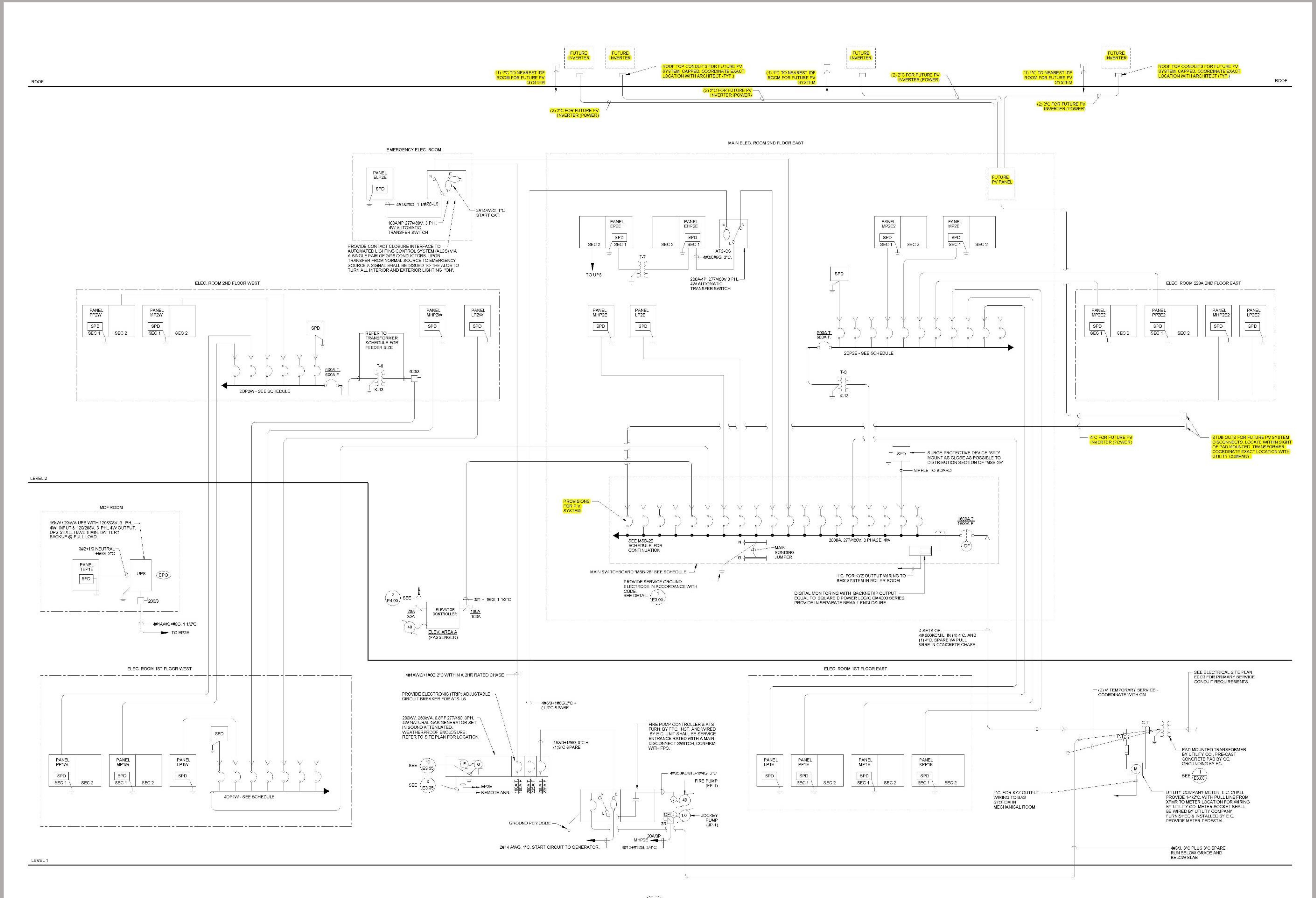






- % Renewable Energy = equivalent cost of energy produced by the system/Total building annual energy cost.
- Estimated 137.97kW total size of the PV arrays producing 173.958kWh/year and a $31,311 energy value.
- Based on $95,372 total building energy cost the system would produce an estimated 32.1% percentage renewable energy.

RENEWABLE ENERGY-PHOTOVOLTAIC ARRAY SYSTEM (PV)-PROVISIONS



1 E3.01 ONE LINE RISER DIAGRAM
SCALE: N.T.S.

ELECTRIC CAR CHARGER