7 Key Strategies

- Deliver the Energy as efficiently as possible
- Deliver the Energy just in time
- Deliver just the right amount of Energy
- Take Advantage of Excess Energy
- Right-size the Equipment
- Take advantage of Temperate Climate in Puget Sound
- Educate Users/Operators, Constantly Commission and Monitor

Deliver the Energy As efficiently as possible

- 80 plus VFD's
- Dampers bypass unneeded coils to reduce static pressure
- Modular Chillers
- Energy Efficient UPS
- Pulse Purge heated compressed air dryer
- LED task lighting - 10 W per task light
- But my favorite and the wave of the future is:

Optimization Programs

- We bought Fanwall 2.0

Deliver the Energy Just in Time

- Emergency Lights come on only in Emergency
  - Don't have 25% of lights on all the time
- Occupancy Sensors in all common areas
  - Conference rooms, break rooms, copy rooms
- Two level Vacancy Sensors in all offices
- Two level lighting in Cube area
- Air Exchange Rate tied to when the lights are on
- Zone overrides for after-hour operations

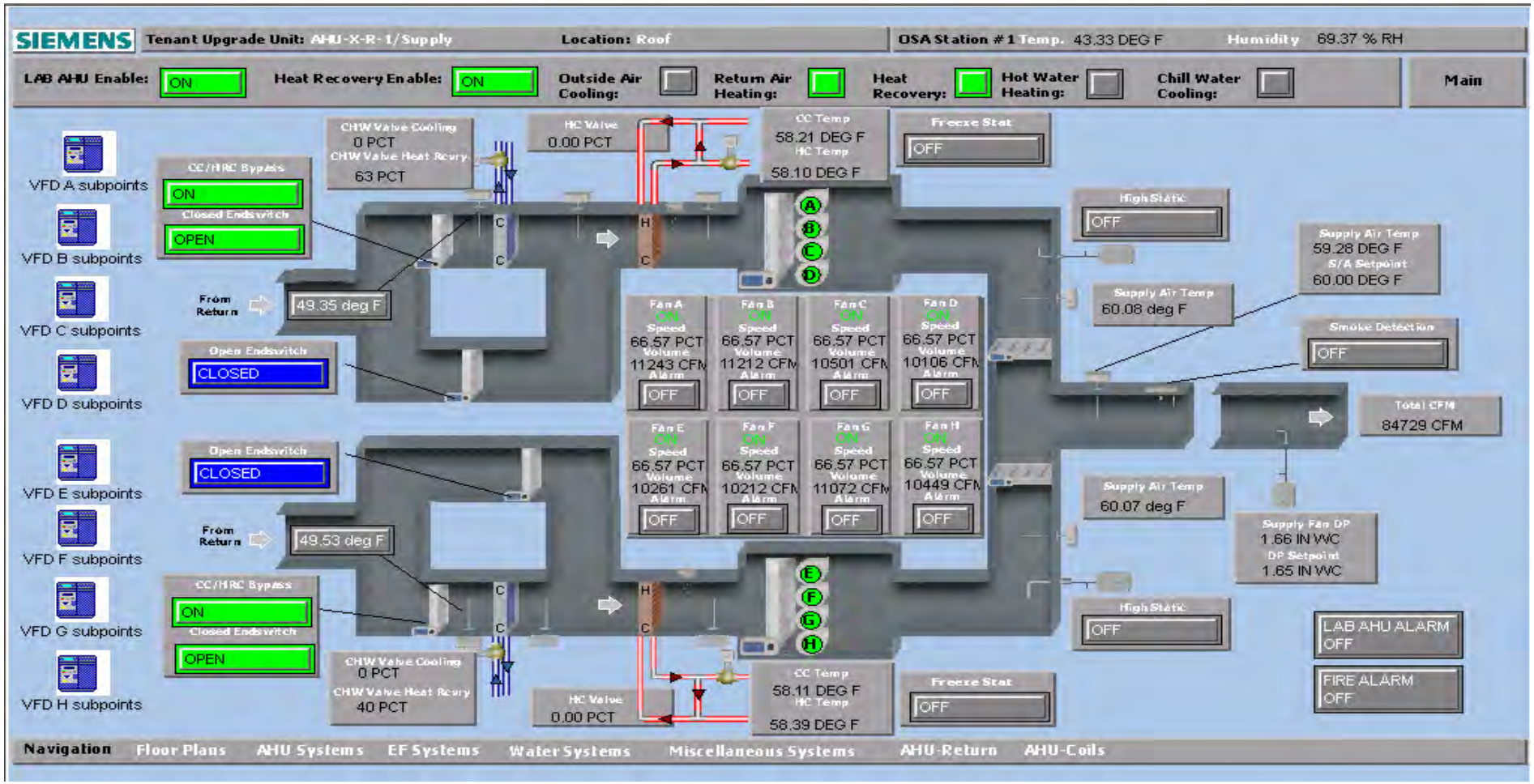
Deliver Just the Right Amount

- 6 Air Changes/hr when lab occupied, 2 when not
- Office/Cubes zoned (5,000 sq... ft.) heating/cooling
  - After-hours, only spaces needing energy get it
- Lighting intensity sensors (daylight harvesting)
- Static Pressure reset
- Emergency Generators minimize block heating
- Electrical Closets fed from Lab Air
  - No need for office air handler to come on at night
- CO2 sensors in conference rooms, CO in garage

Take advantage of Excess Energy

- Excess heat from electrical rooms and office return air to preheat lab air supply (huge)
- Heat recovery from lab and fume exhaust system (this is big - it can be 40 degrees outside and bypass heating valves are closed)
- Heat from Data Center to preheat Data Center Air (huge energy savings, plus no heating coil for less static pressure)

84,000 CFM, 43 degree outside air, Heating valves closed????



Right Size the Equipment

- Combined Fume Exhaust/Lab Exhaust
- Multiple fans for Exhaust system
- Fan Array Walls for Supply and Exhaust
  - In Data Center
- Modular Condensing Boilers
  - With room for future expansion
- Small Hot Water Boilers (lab and domestic)
  - With room for future expansion
- Point of Use hot water system

6 small exhaust fans vs. 2 large fans
No Oversizing!

- No by-pass air, optimization, improved reliability

Take Advantage of the Temperate Climate in the Puget sound

- Data Center uses 90% “free” outside air cooling
  - 8% Evaporative cooling, 2% Mech cooling
- Oversized coils for free cooling of CRAC units in UPS room
- Design Day in Puget Sound is Different
  - Reduced heating/cooling requirement for 100% outside air lab system allows downsizing of everything
  - Chillers to Ducts to Transformers
  - Savings cascade at multiple levels

Education, Commissioning, Monitoring

- Classes for Operators and Occupants
  - 600 hours of Operator training
  - 4 Classes for occupants
- Building User Guide
- Commissioning
  - 13 After-hours walk throughs
    - Making sure systems were truly off at night

Our Commissioning Concept includes the In-house team