



Announcements:

Sunday, September 11

- Don't miss the Opening Reception this evening from 5:00–7:00pm in room Grand 8. The Data Center World Opening Party will provide you with ample opportunity to relax and network with your peers.

Monday, September 12

- The Peer Connection Luncheon will take place from 12:15–1:30pm in room Grand 7.
- The Data Center World Expo and Cocktail Reception will be located in Cypress Hall 1 and will take place from 4:15–6:45pm.

Tuesday, September 13

- The exhibit hall will open today at 11:30am and lunch will be provided in the expo hall. The Data Center World raffle ticket collection will begin today. Deposit your raffle tickets in sponsoring exhibitor's booths during the expo hours of 11:30am–1:45pm. The raffle will take place from 2:15 to 2:30pm in the expo hall in Lounge A. You must be present to win! Only one prize per person will be collected.

Wednesday, September 14

- The closing session will take place today. Be sure to attend "When Disaster Strikes–Will You Be Prepared?" presented by AFCOM's Data Center Institute Panel from 10:30–11:30am in room Grand 1.



PNNL's Evolution in Data Centers and Monitoring

Ralph Wescott
Data Center Manager
August 30, 2011

PNNL-SA-82488



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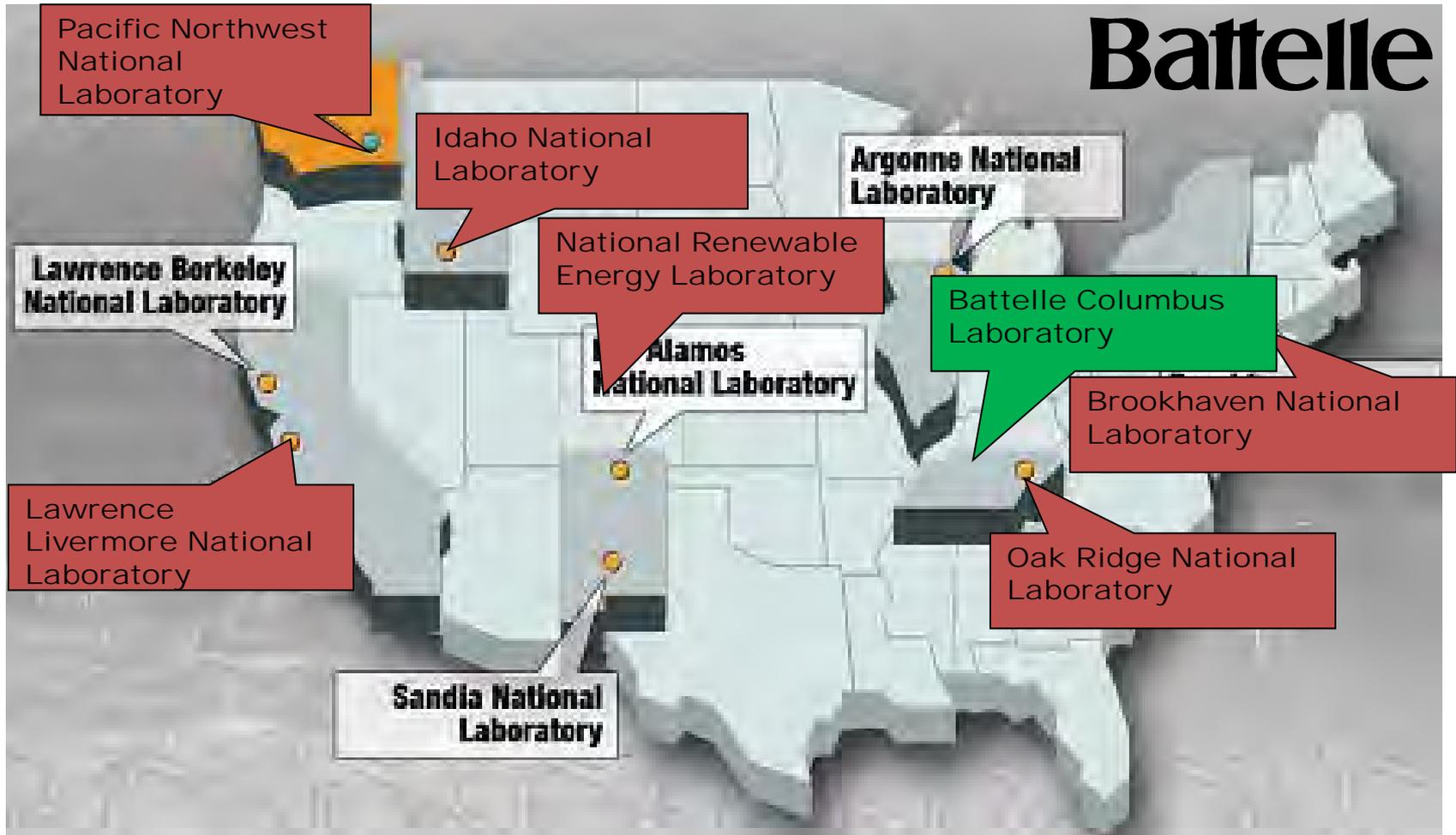


PNNL performs basic and applied research to deliver energy, environmental, and national security solutions for our Nation





Pacific Northwest National Laboratory located in Washington State is one of six national laboratories operated by Battelle



PNNL

- ▶ A multiprogram research laboratory
- ▶ FY 2009 business volume \$1.112B
- ▶ 4,900 staff
- ▶ 10,000 networked devices
- ▶ Unique laboratory equipment
- ▶ Scientific supercomputing



Information Sciences Building

ISB2/1

- ▶ Commissioned 1983 as main general purpose data center
- ▶ 3,000 sq ft
- ▶ 500kW UPS power
- ▶ 1ft raised floor
- ▶ Low ceiling (facility in basement)
- ▶ 4 x 20 ton traditional dry cooler CRACs
- ▶ 2 x 30 ton water side economizer CRACs
- ▶ Synapsense environmental monitoring and automated PUE calculations
- ▶ Upgraded from 2005 to present



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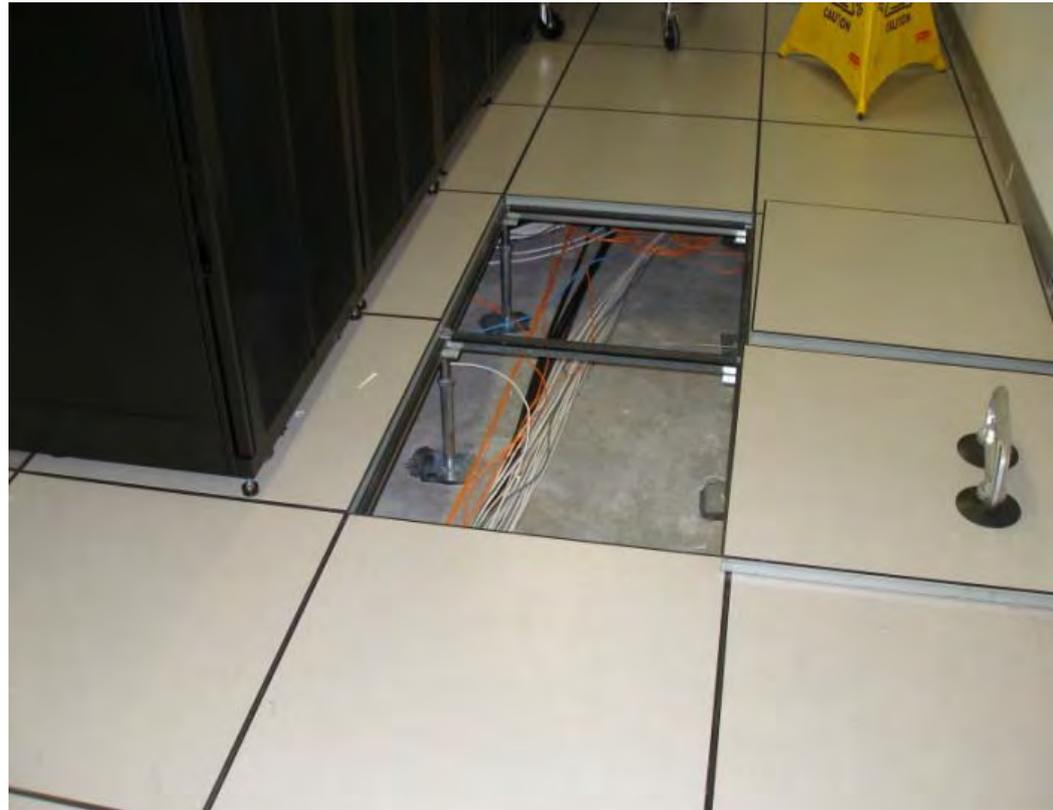
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Improve Airflow

▶ Before

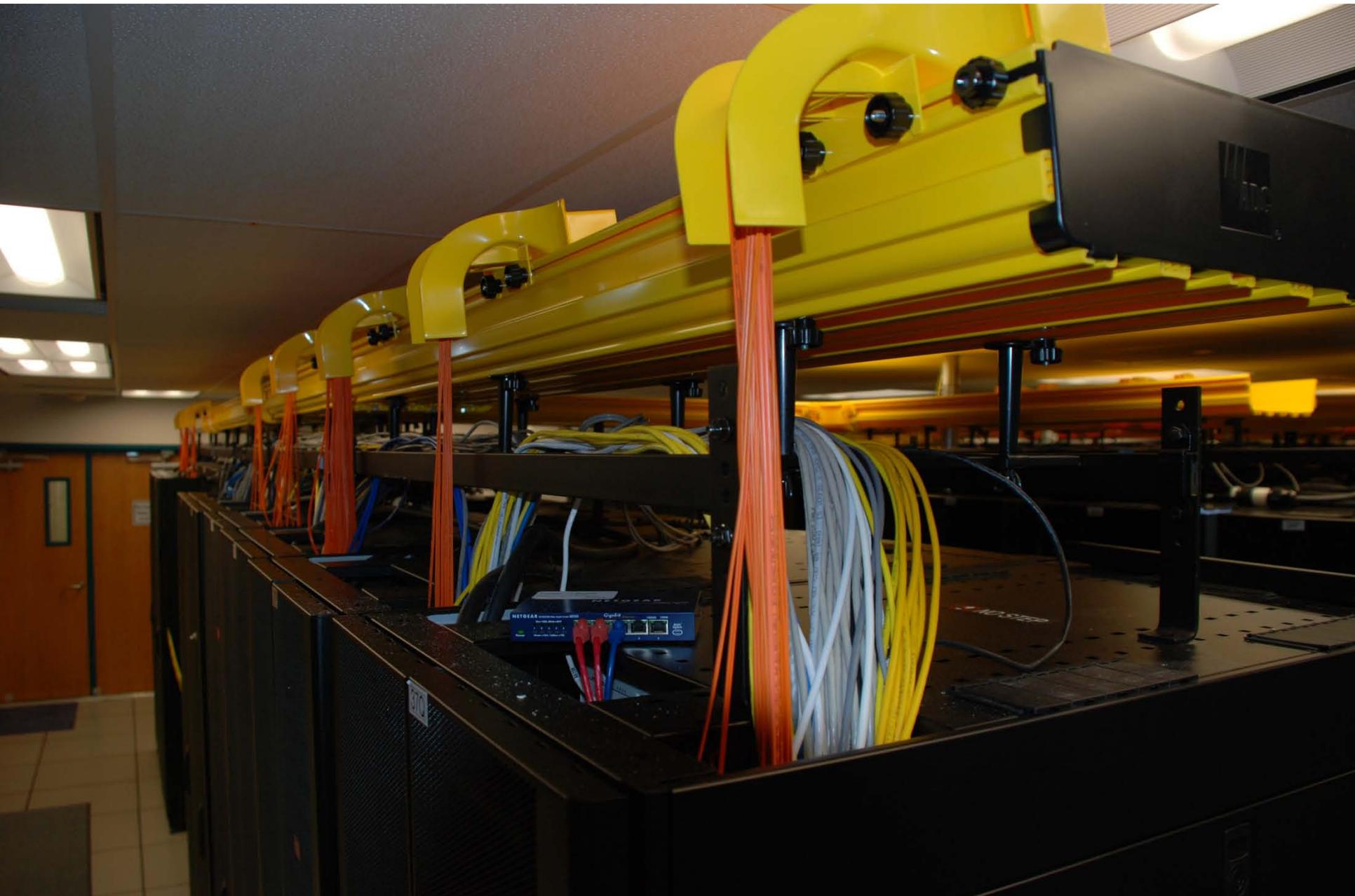


▶ After



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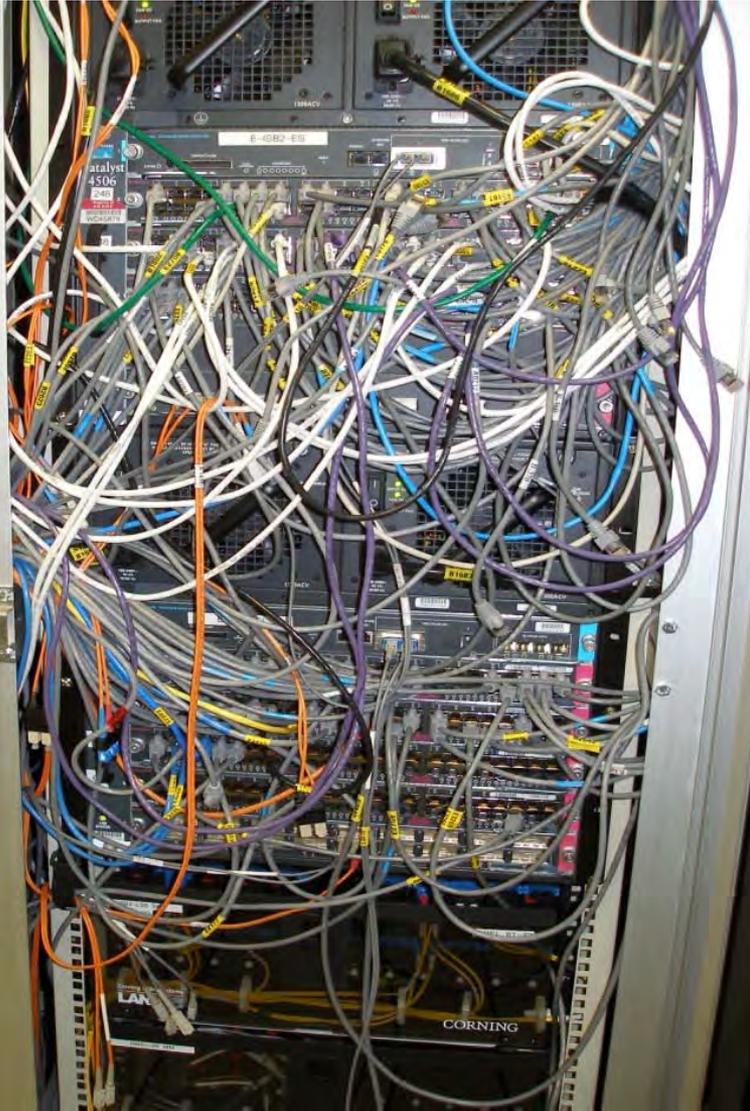
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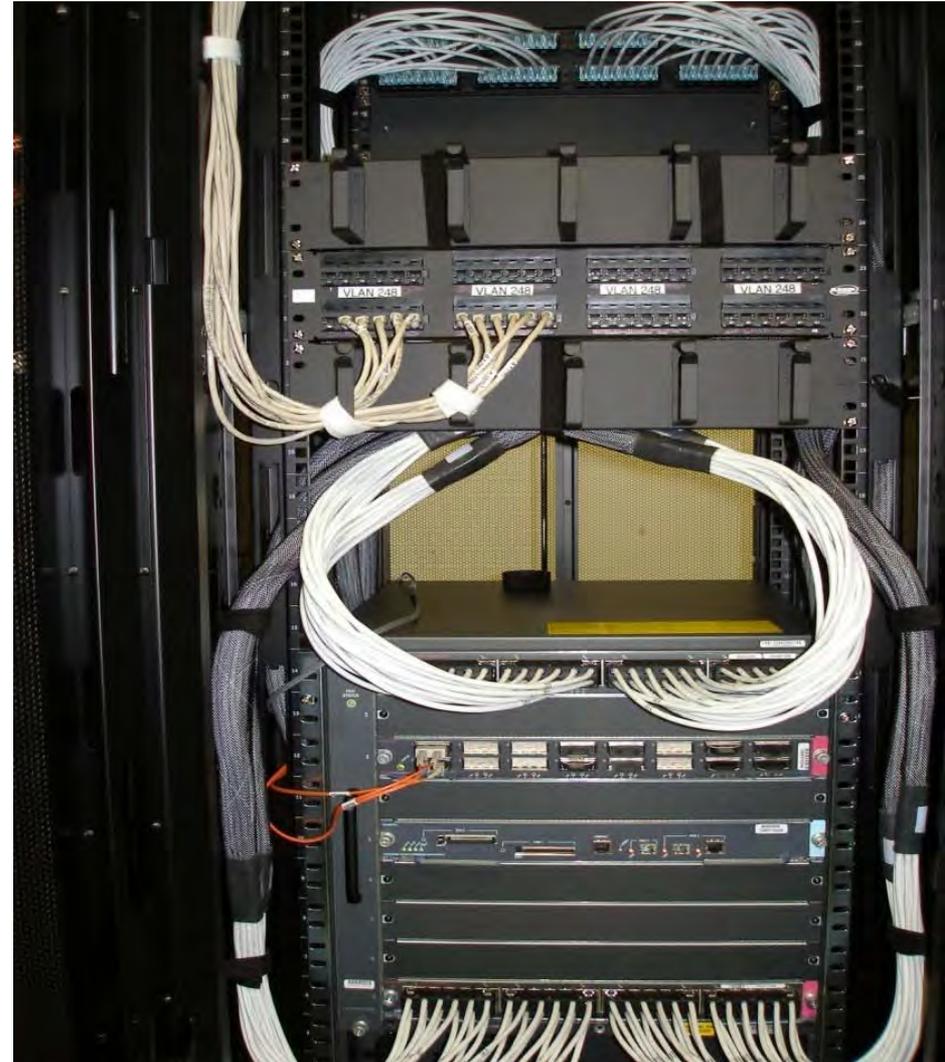
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Row-Centric Networking

Before



After



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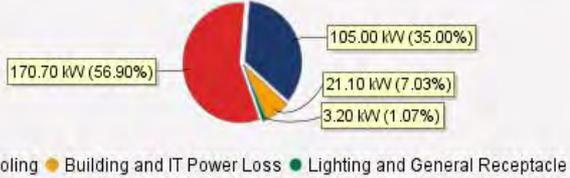
Row
34





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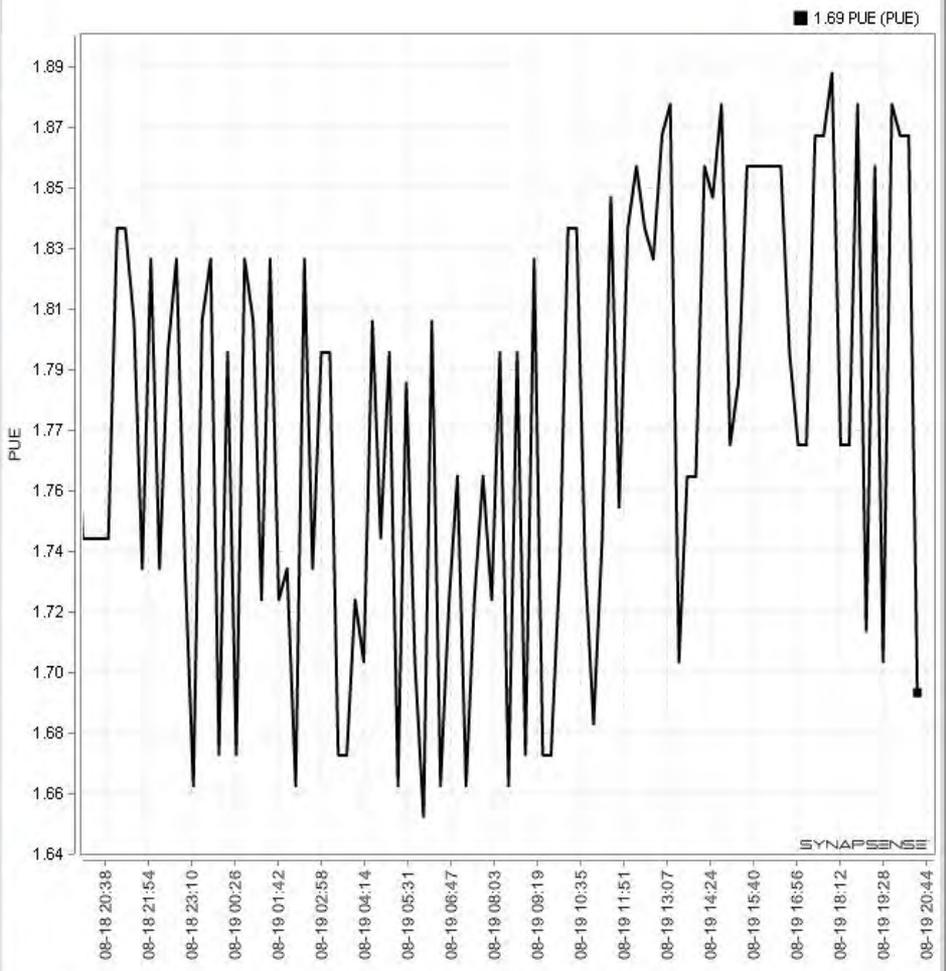
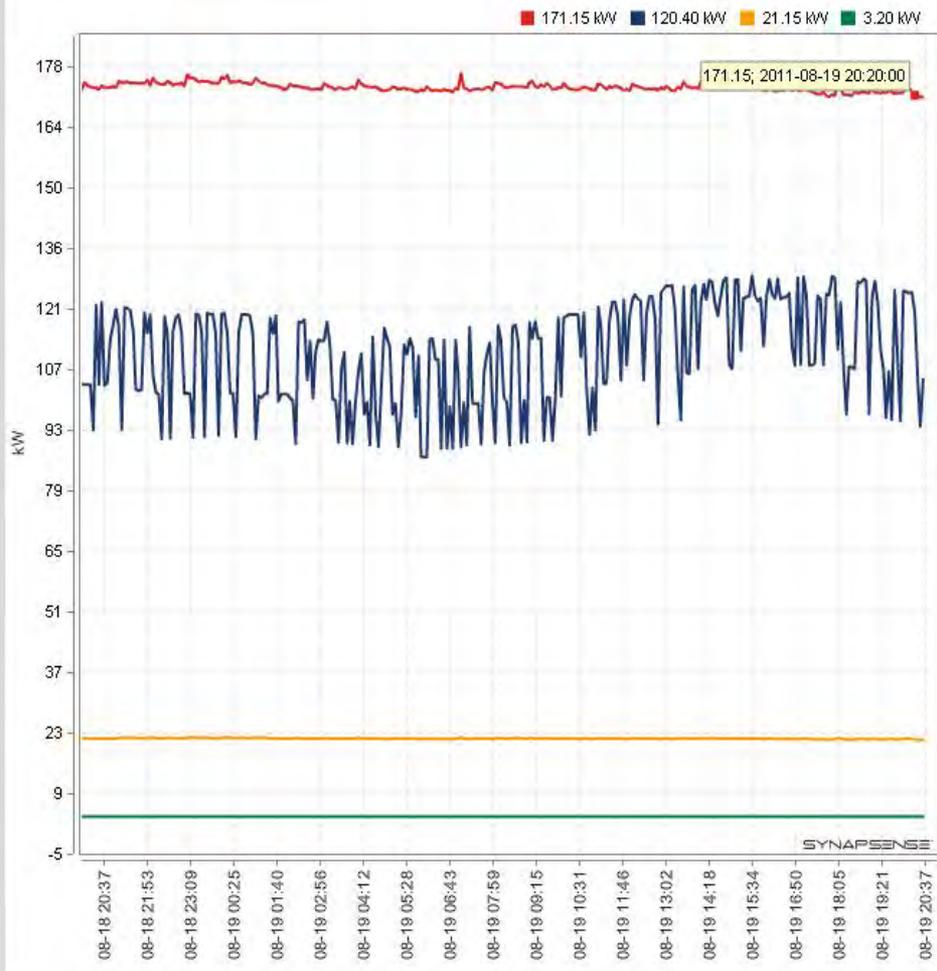


PUE: 1.69
DCiE: 0.59
DCE: 1.82

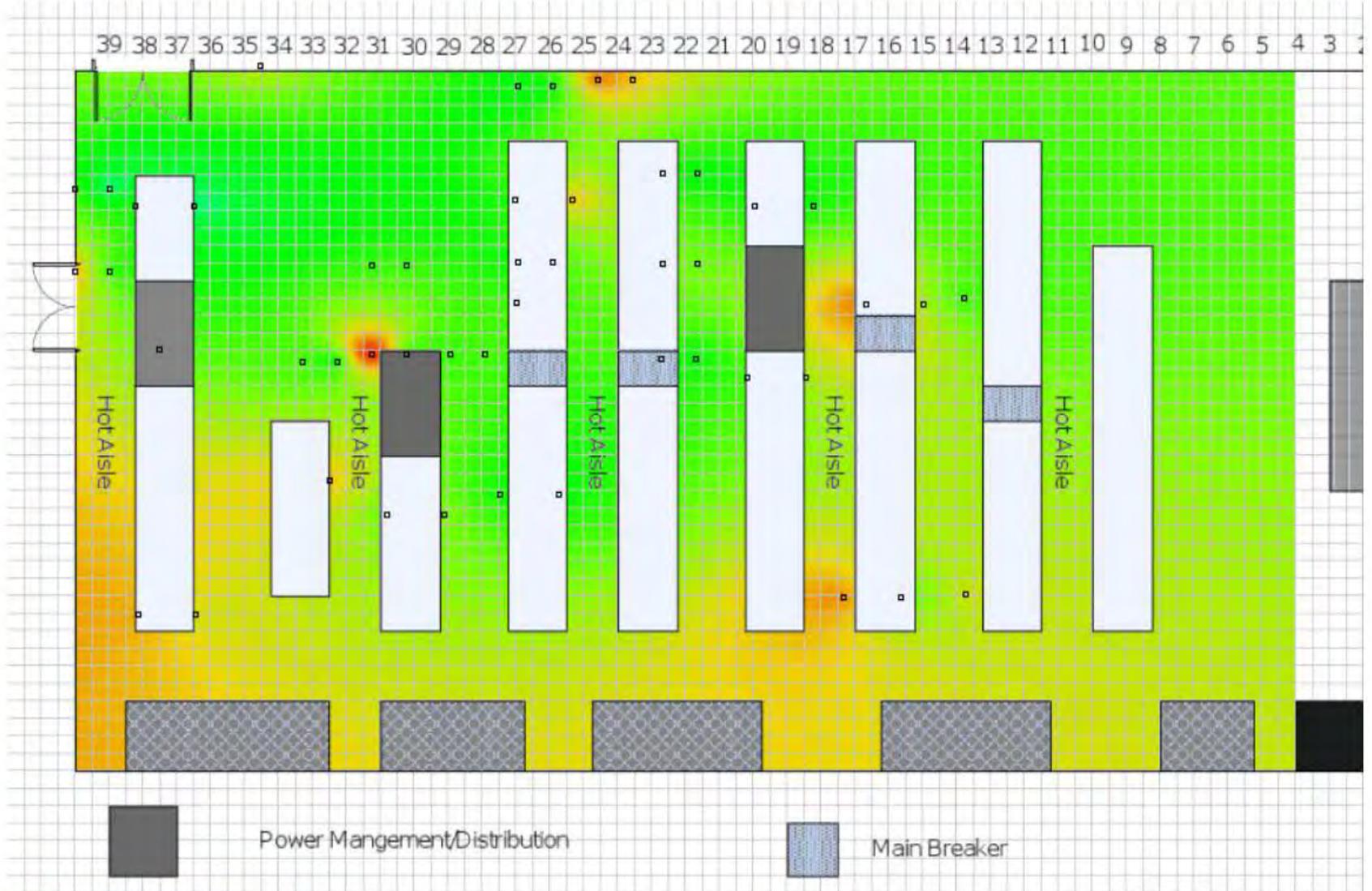
	Actual	Design	Utilization
	kW	kW	%
IT	170.70	300.00	56.90
Cooling	105.00	160.00	65.63

Start Time: 2011-08-18 20:00 End Time: 2011-08-19 21:00 [Show Data](#)

PUE DCiE DCE



Temp-Top(°F)



Environmental Molecular Sciences Laboratory EMSL/1119

- ▶ Commissioned 1997
- ▶ 8,000 sq ft
- ▶ Perimeter CRAC chilled water cooling
- ▶ 150kVA PMM's using underfloor power distribution
- ▶ 2' raised floor
- ▶ Unused ceiling plenum



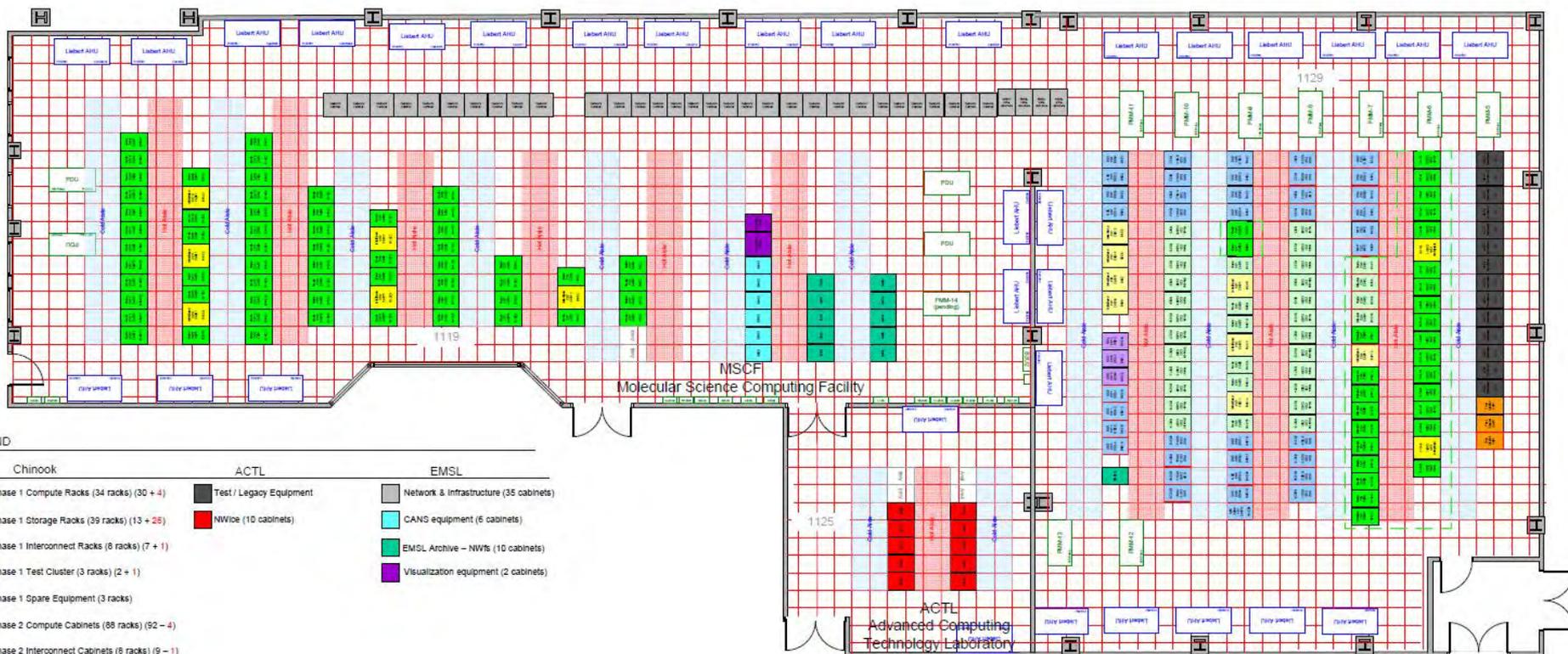
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High Performance Computing Center



LEGEND

Chinook

- Phase 1 Compute Racks (34 racks) (30 + 4)
- Phase 1 Storage Racks (39 racks) (13 + 26)
- Phase 1 Interconnect Racks (8 racks) (7 + 1)
- Phase 1 Test Cluster (3 racks) (2 + 1)
- Phase 1 Spare Equipment (3 racks)
- Phase 2 Compute Cabinets (88 racks) (52 + 4)
- Phase 2 Interconnect Cabinets (6 racks) (9 + 1)

ACTL

- Test / Legacy Equipment
- NWay (10 cabinets)

EMSL

- Network & Infrastructure (35 cabinets)
- CANS equipment (6 cabinets)
- EMSL Archive - NWfs (10 cabinets)
- Visualization equipment (2 cabinets)

Total: 164 (153 + 27)

Project Title
High Performance Computing Center
Pacific Northwest National Laboratory
Richland, Washington

Drawing Title

NO.	DESCRIPTION	DATE	BY

Project No.
Date
Scale

Sheet

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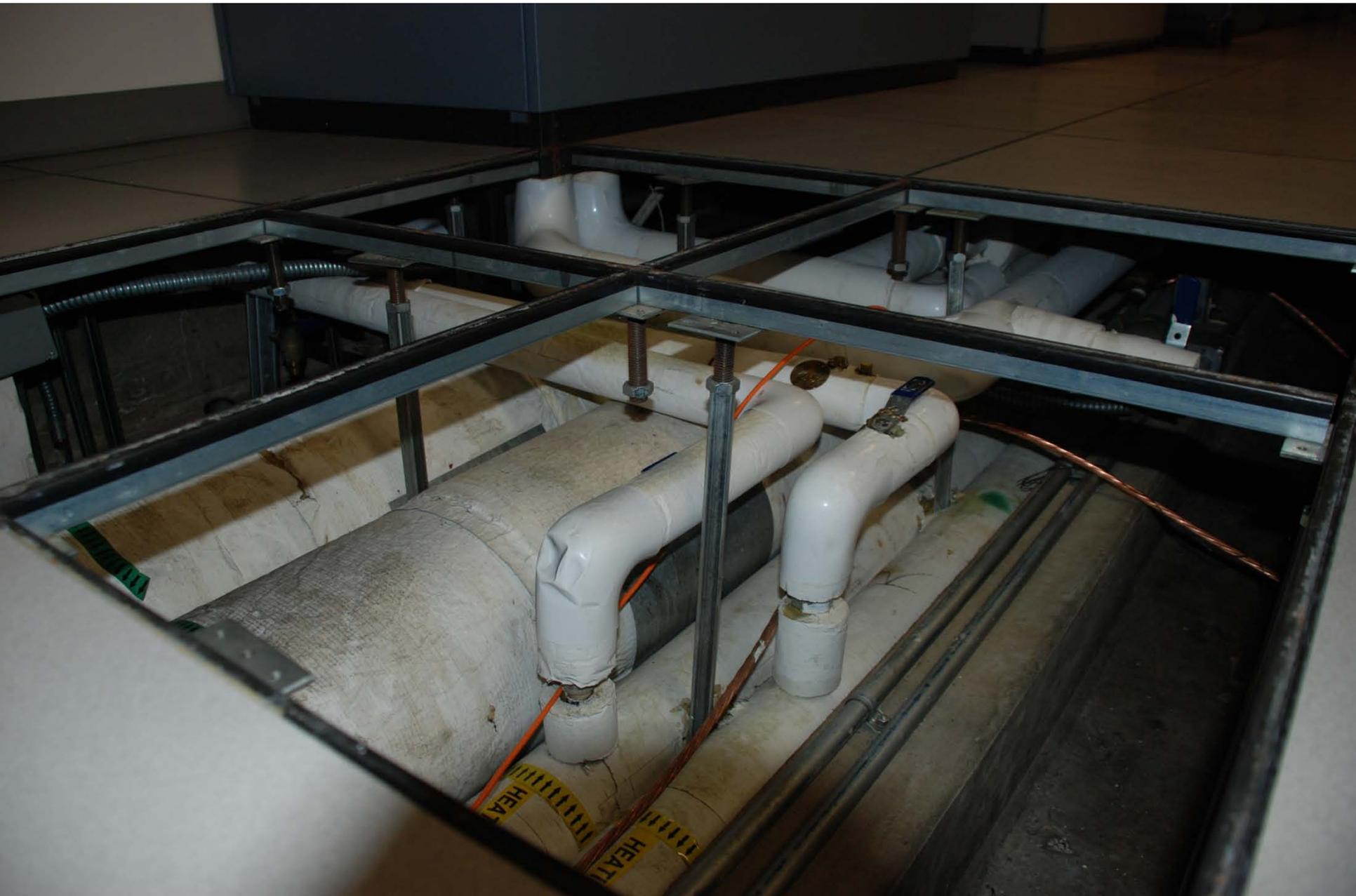


EMERSON

1
Liebert
UNINTERRUPTIBLE POWER SUPPLY

hp

hp

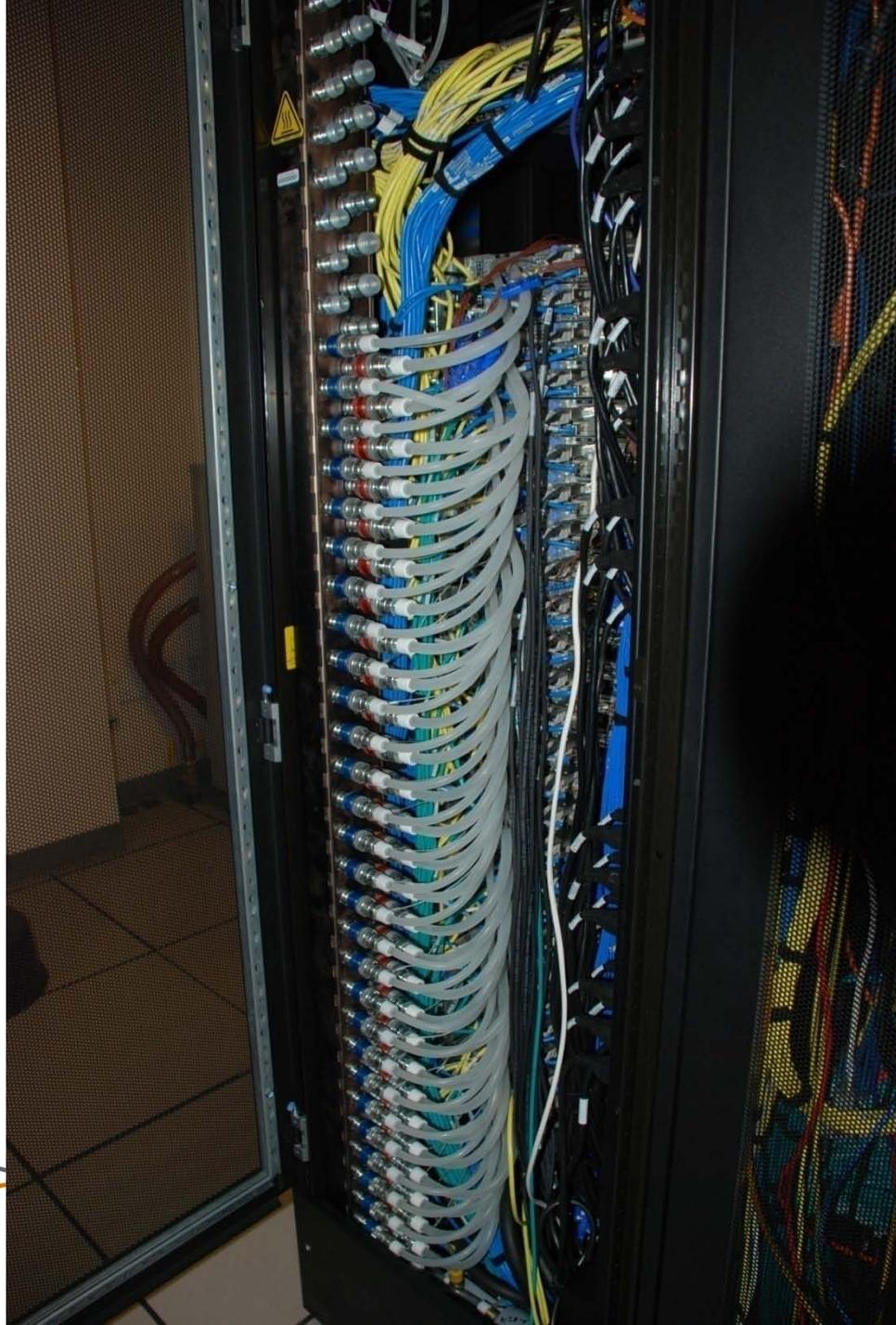


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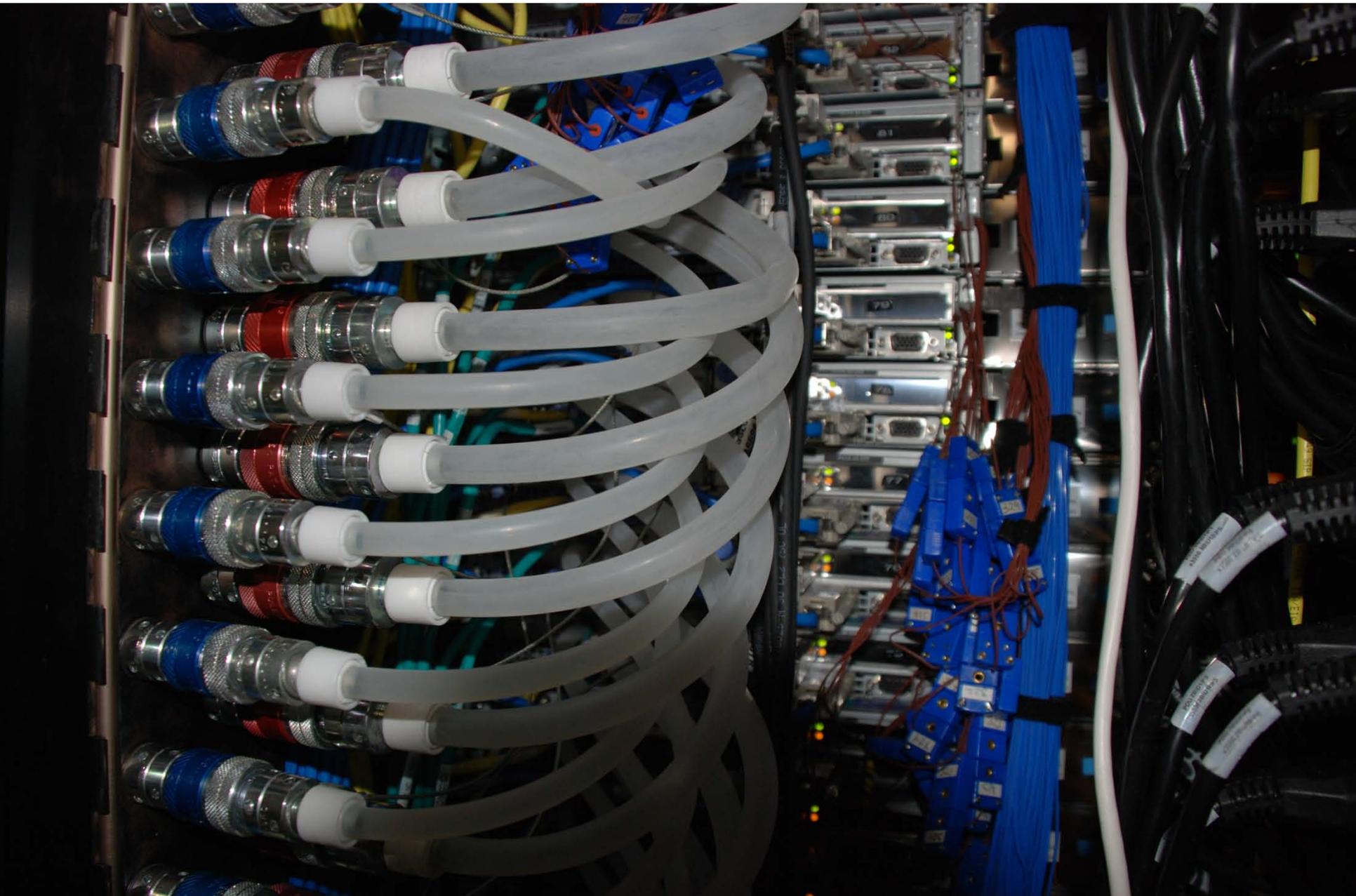


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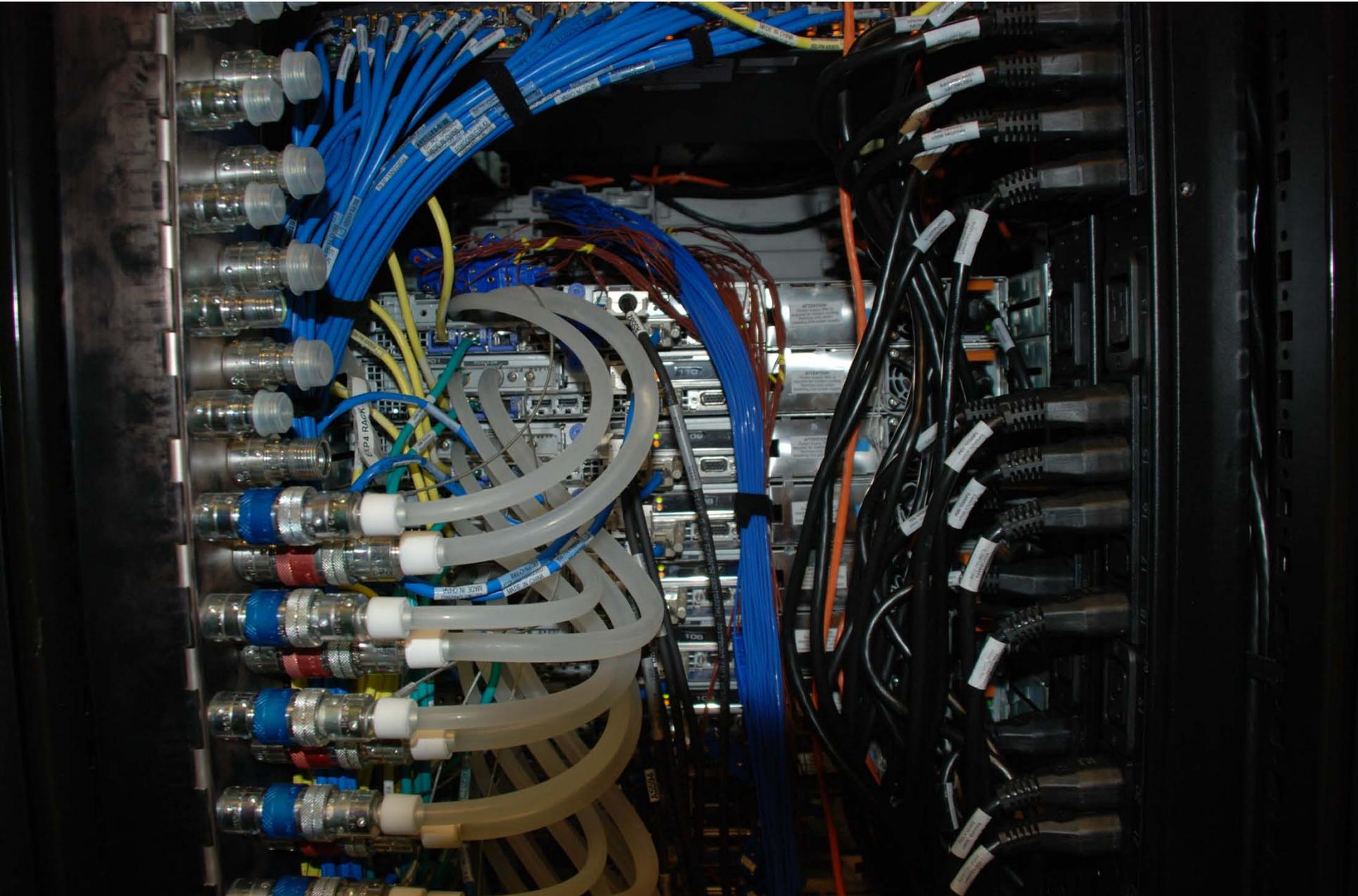


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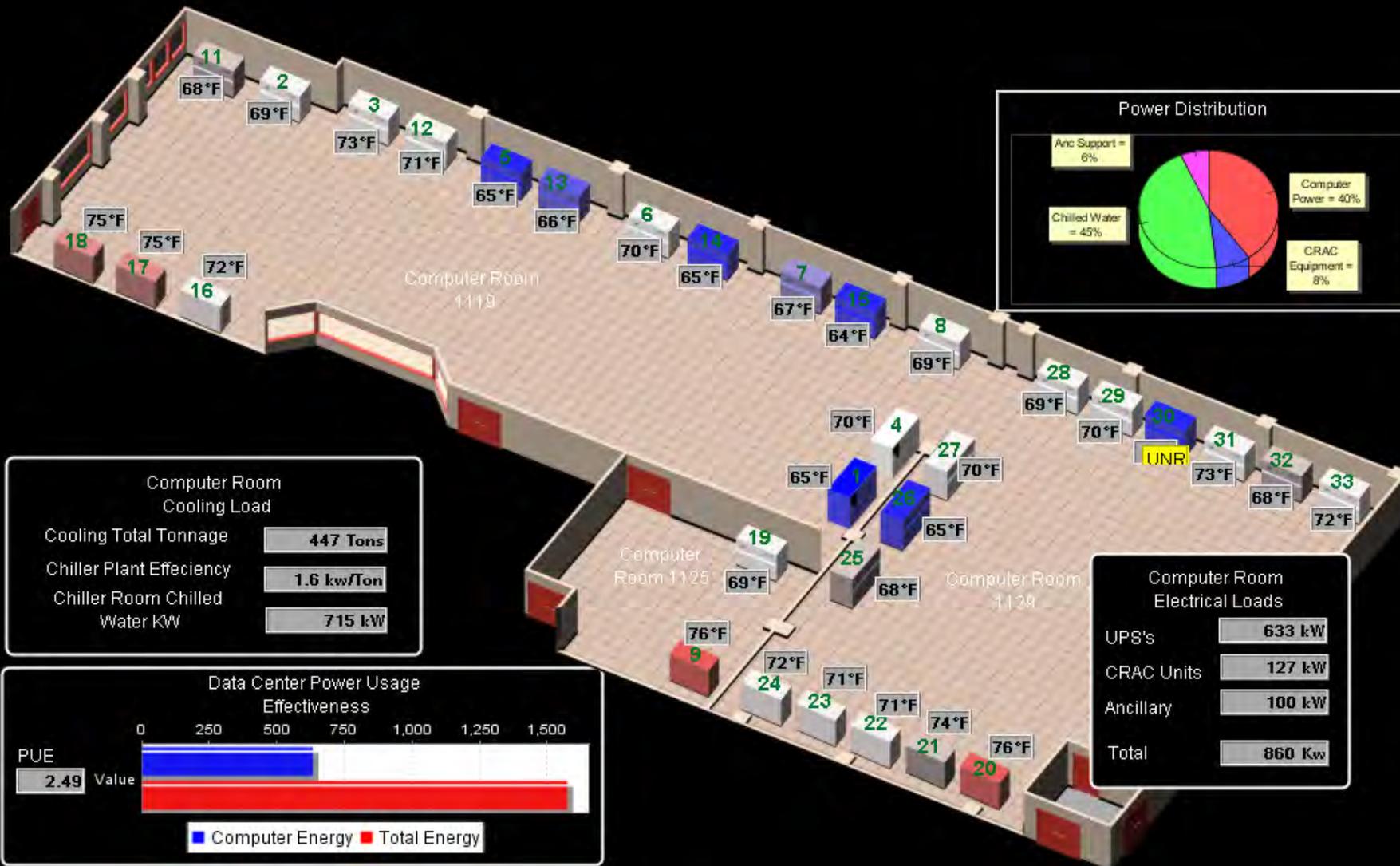
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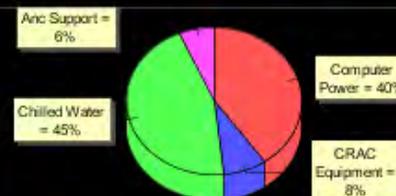
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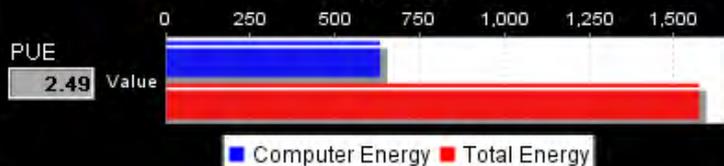
Power Distribution



Computer Room Cooling Load

Cooling Total Tonnage	447 Tons
Chiller Plant Efficiency	1.6 kw/Ton
Chiller Room Chilled Water KW	715 kW

Data Center Power Usage Effectiveness

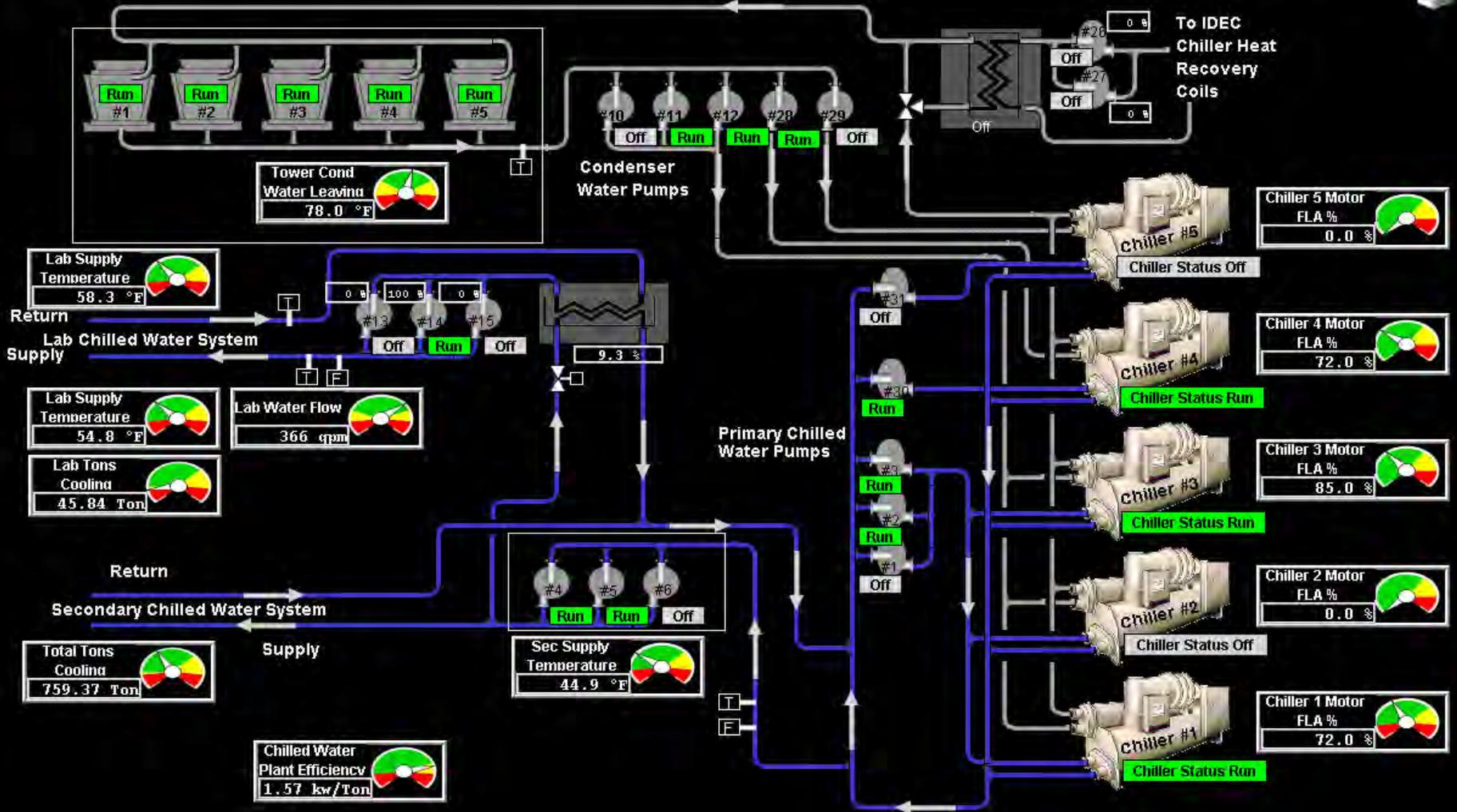


Computer Room Electrical Loads

UPS's	633 kW
CRAC Units	127 kW
Ancillary	100 kW
Total	860 Kw

Building EMSL Chiller Plant

Alarm Log



Computational Sciences Facility CSF/1811

- ▶ 10,000 sq ft
- ▶ 3MW power, 500kW UPS
- ▶ Commissioned December 2009
- ▶ 3ft raised floor
- ▶ 5ft ceiling plenum
- ▶ Building chilled water (heat to aquifer and to “wet labs” for air refresh)
- ▶ 65F aquifer closed loop for rear door heat exchangers and heat dump if special circumstances require compressors



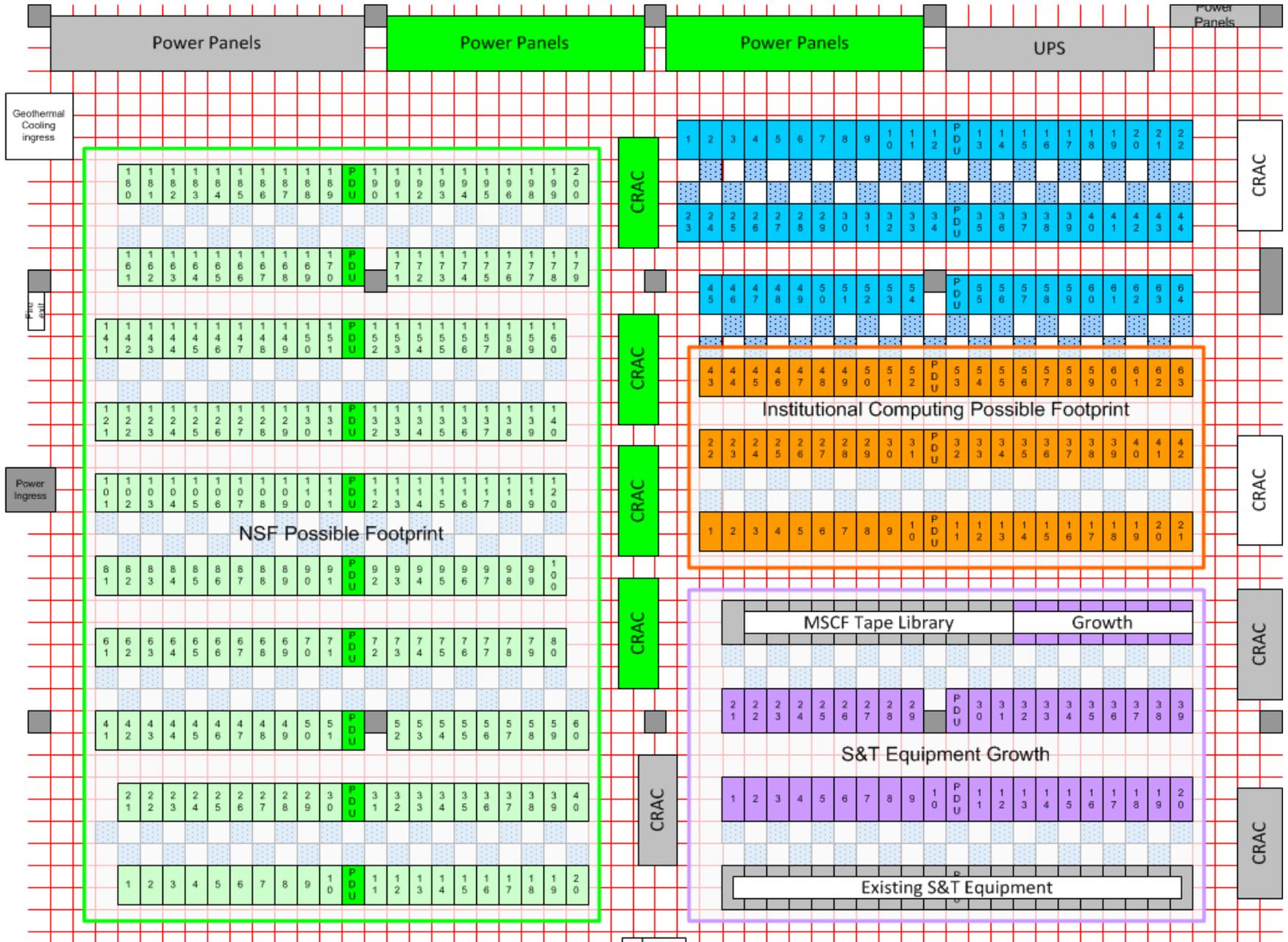
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CSF

CSF 10,000 sq. ft. proposed layout of 400 computer cabinets

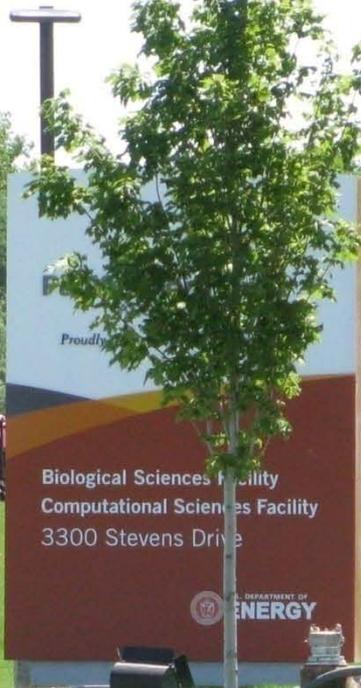












Proudly
Biological Sciences Facility
Computational Sciences Facility
3300 Stevens Drive

DEPARTMENT OF
ENERGY

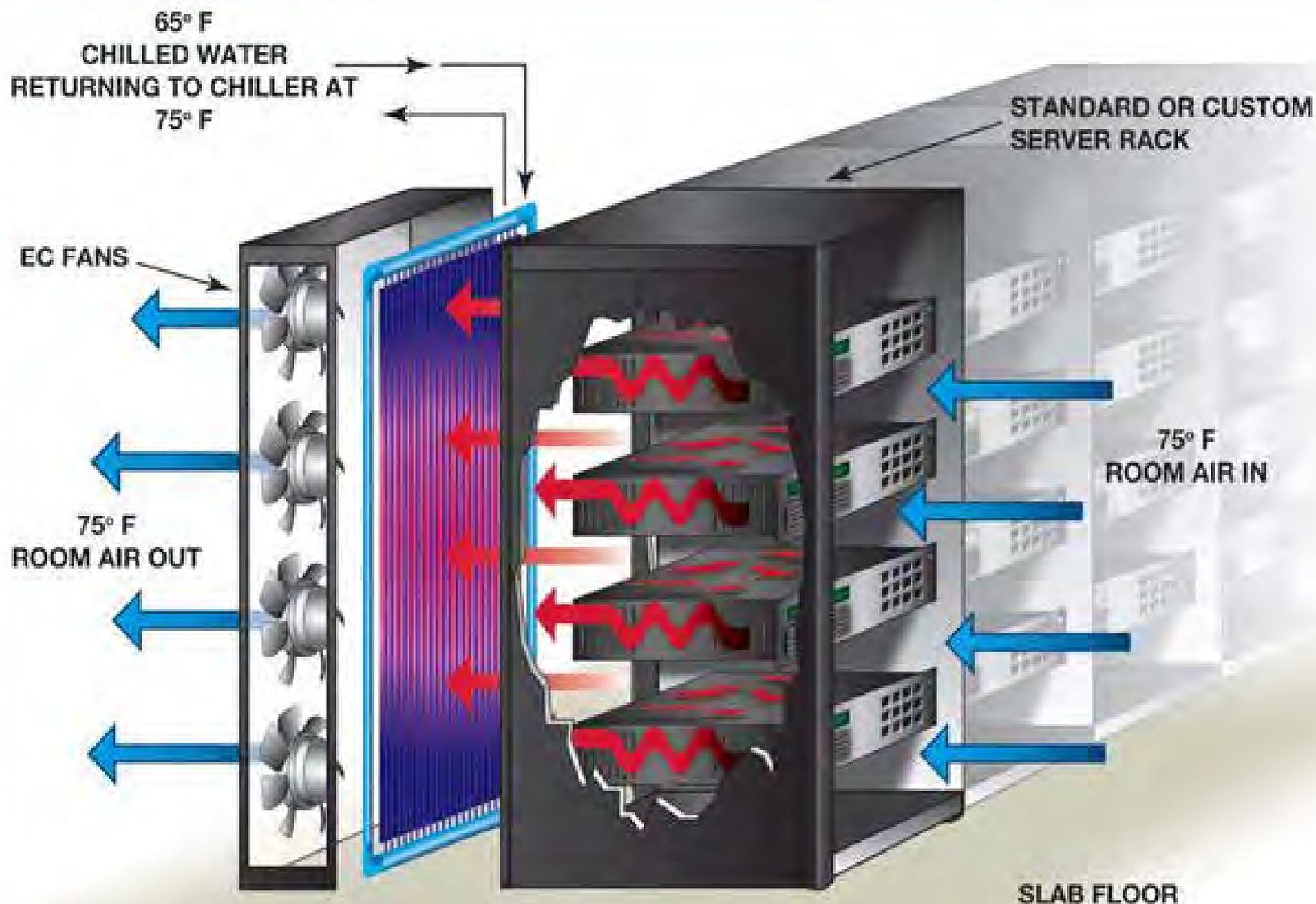






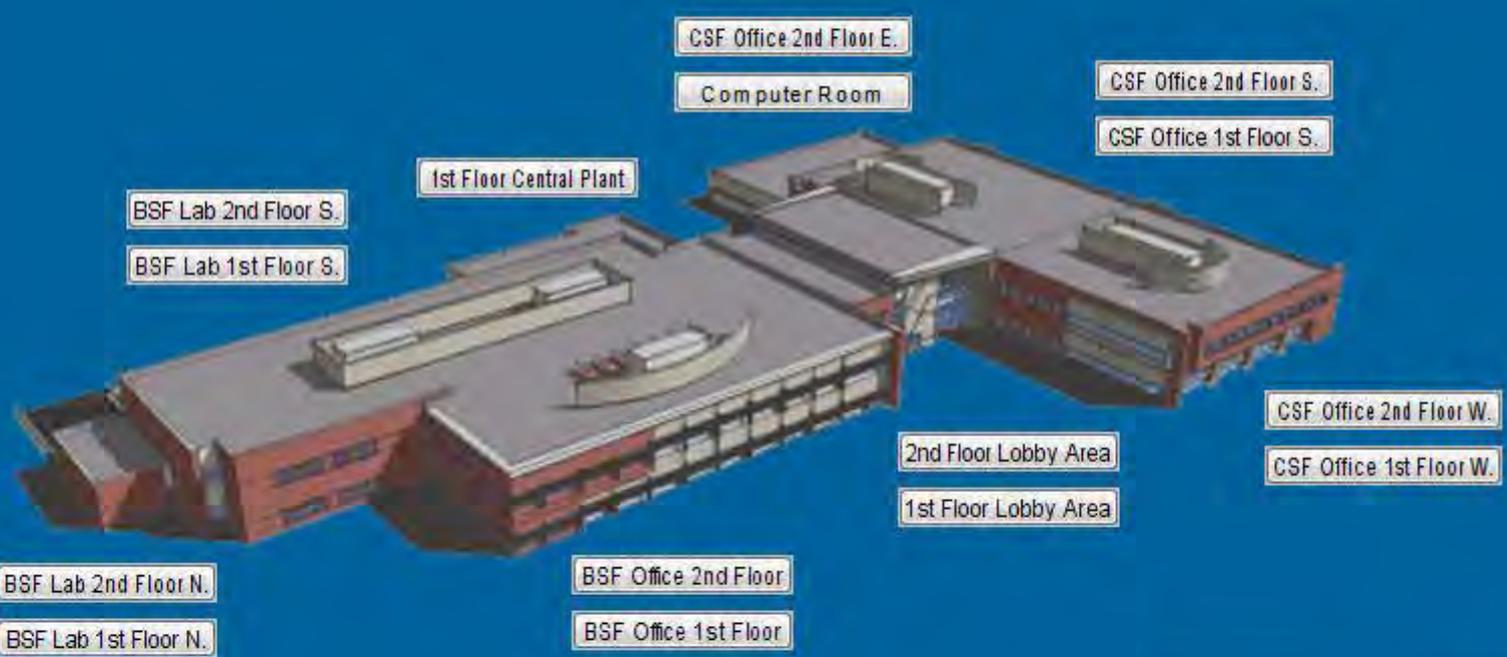






**EXPLODED VIEW OF ACTIVE REAR DOOR
RACK COOLING SYSTEM**

Pacific Northwest National Laboratory Biological and Computational Sciences Facility



- Alarms
- Trendlogs
- 1st Floor
- 2nd Floor
- Quick Views
- Central Plant
- Lab Air System
- CSF Air System
- RTU-3
- Envir. Chambers
- Gas Manifolds
- Steam Boilers
- CH-3
- Lab Alarms
- Lab WH
- Safety Wash
- General Exh
- Dom. WH
- Square D



Previous

Computing Space 1811

CRAC-1-8

Return Temp.
71.6 °F

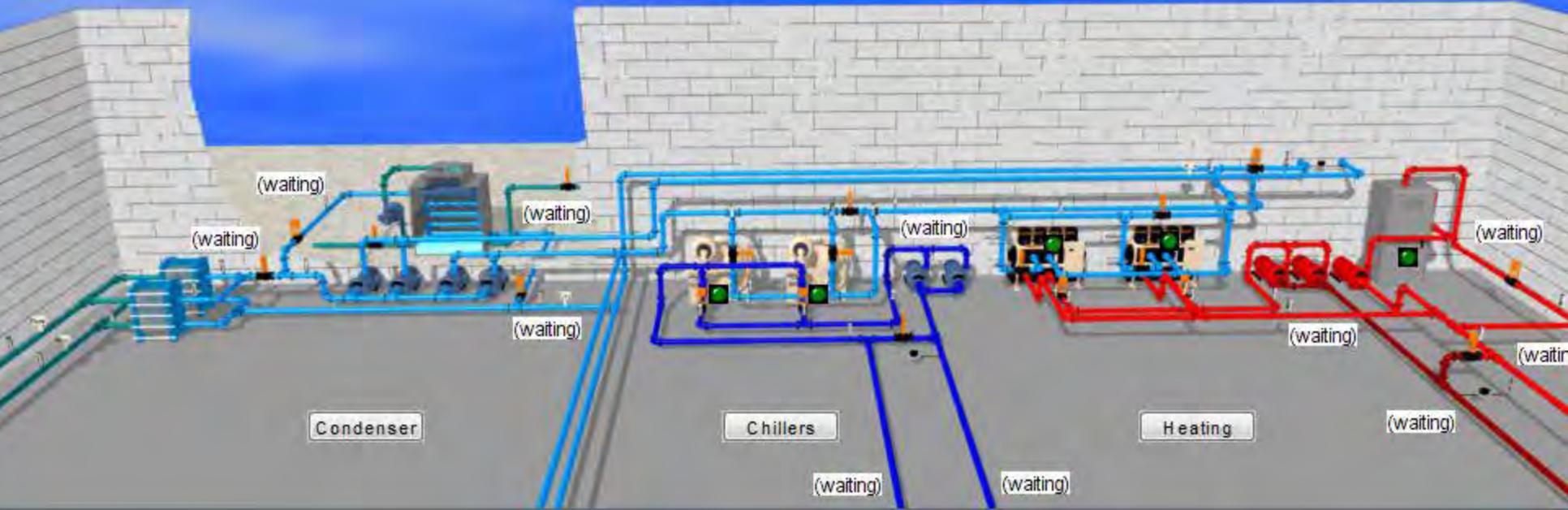


Cooling Valve
33 % Open

CRAC-1-8	
71.6 °F	Space Temp
71 °F	Current Setpoint
71 °F	Temperature Setpoint
Local ON/OFF Switch	On
Supply Fan Status	Running
Alarm Status	Normal
<input type="checkbox"/> Alarm Reset	

- Previous
- Condenser
- Chillers
- Templifiers
- Well Field

(waiting)



Condenser	
Condenser Water Supply Temp	(waiting)
Condenser Water Return Temp	(waiting)
Prod. Well Water Supply Temp	(waiting)
Inj. Well Water Return Temp	(waiting)
Cooling Tower Entering Temp	(waiting)
Cooling Tower Leaving Temp	(waiting)
Well Field Operation	(waiting)
Cooling Tower Operation	(waiting)

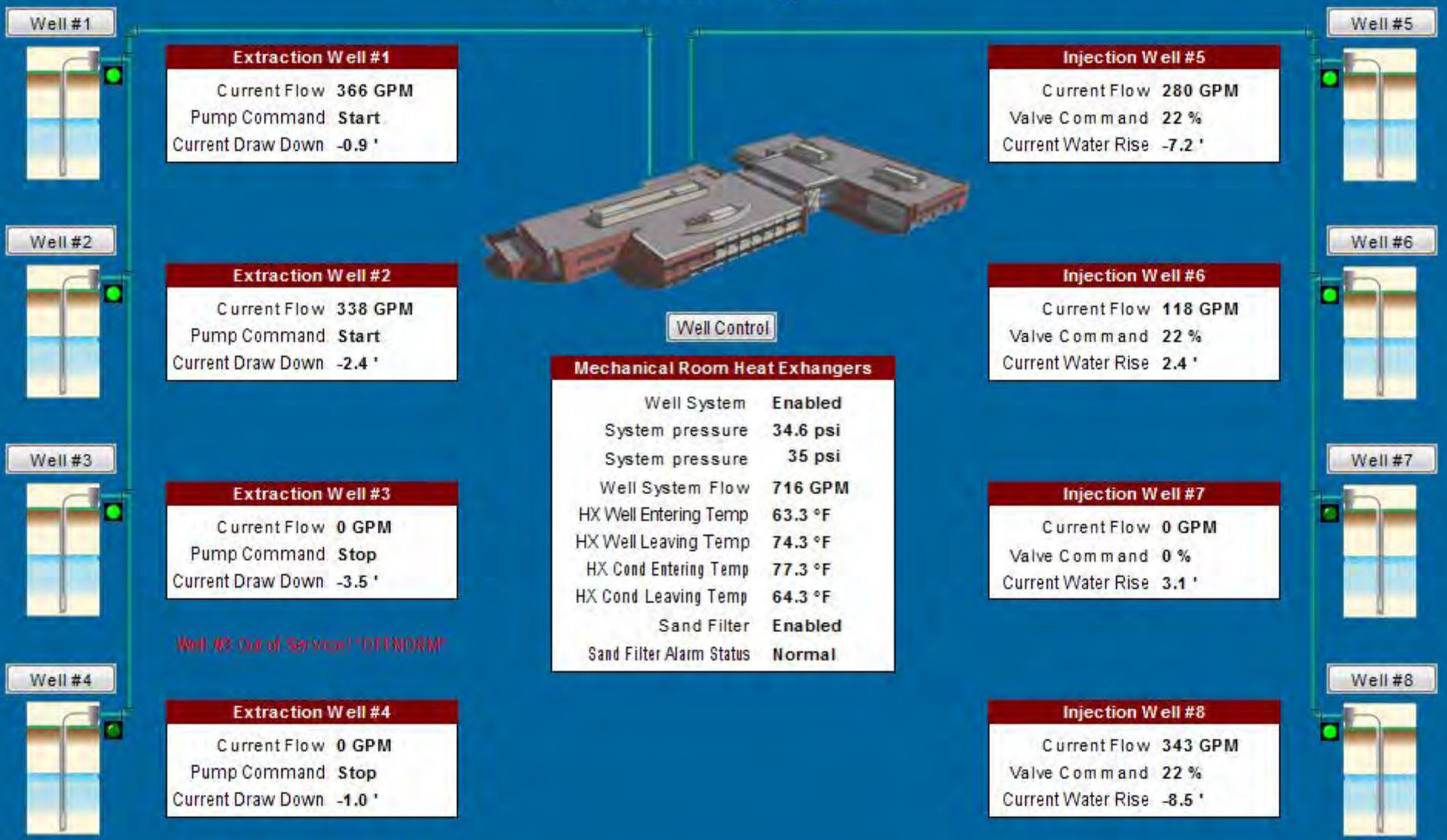
Chillers	
Cooled Water Supply Temp	(waiting)
Cooled Water Return Temp	(waiting)
Chiller 1	(waiting)
Chiller 1 Status	(waiting)
Chiller 1 Capacity	(waiting)
Chiller 2	(waiting)
Chiller 2 Status	(waiting)
Chiller 2 Capacity	(waiting)

Templifiers	
Heating Water Supply Temp	(waiting)
Heating Water Return Temp	(waiting)
Templifier 1	(waiting)
Templifier 1 Status	(waiting)
Templifier 1 Capacity	(waiting)
Templifier 2	(waiting)
Templifier 2 Status	(waiting)
Templifier 2 Capacity	(waiting)

Previous

Biological and Computational Sciences Facility

Well Water System



Extraction Well #1

Current Flow 366 GPM
 Pump Command **Start**
 Current Draw Down -0.9'

Injection Well #5

Current Flow 280 GPM
 Valve Command 22 %
 Current Water Rise -7.2'

Extraction Well #2

Current Flow 338 GPM
 Pump Command **Start**
 Current Draw Down -2.4'

Injection Well #6

Current Flow 118 GPM
 Valve Command 22 %
 Current Water Rise 2.4'

Extraction Well #3

Current Flow 0 GPM
 Pump Command **Stop**
 Current Draw Down -3.5'

Injection Well #7

Current Flow 0 GPM
 Valve Command 0 %
 Current Water Rise 3.1'

Extraction Well #4

Current Flow 0 GPM
 Pump Command **Stop**
 Current Draw Down -1.0'

Injection Well #8

Current Flow 343 GPM
 Valve Command 22 %
 Current Water Rise -8.5'

Mechanical Room Heat Exchangers

Well System	Enabled
System pressure	34.6 psi
System pressure	35 psi
Well System Flow	716 GPM
HX Well Entering Temp	63.3 °F
HX Well Leaving Temp	74.3 °F
HX Cond Entering Temp	77.3 °F
HX Cond Leaving Temp	64.3 °F
Sand Filter	Enabled
Sand Filter Alarm Status	Normal

Well #3 Out of Service! *OFFNORM*

Well #4 Out of Service! *OFFNORM*



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