RESILIENCY BUILDING

OREGON STATE TREASURY

OWNER
PJs Land Development LLC

DEVELOPER
RPS Development

TENANT
Oregon State Treasury

TECHNICAL REPRESENATIVE
WSP

GENERAL CONTRACTOR
Pence Construction

ARCHITECTS
GBD Architects

STRUCTURAL
KPFF Consulting Engineers

MECHANICAL
Glumac

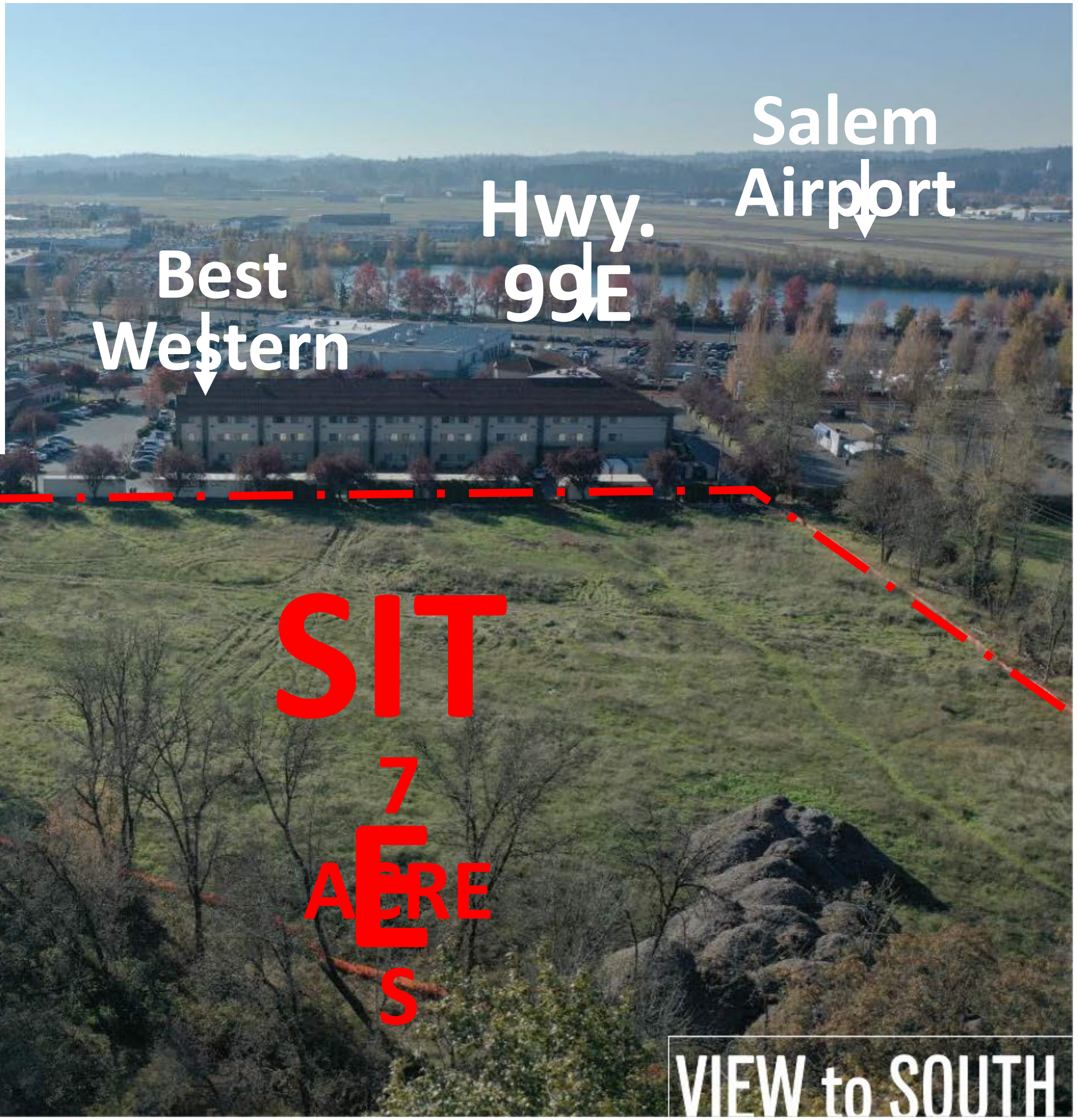
CIVIL
Westech Engineering

LANDSCAPE
Laurus Designs

OWNER

Steve Freeburg


Keizer
Hayesville
99E
221
5
WEST SALEM
SITE
Salem
Fruitland
22
Four Corners
99E


Salem
Airport
Hwy.
99E
Best
Western
SIT
E
7
ACRES
Mill
Creek
VIEW to SOUTH

TENANT

OREGON
STATE
TREASURY

What does the Oregon Treasury Do?

Oregon Treasury is the state's financial services center. The Office of the State Treasurer is established in the Oregon Constitution as a separately elected official within the executive branch, and the Treasurer is responsible for managing Oregon's financial resources. To achieve that, Treasury offers a broad portfolio of services for state agencies, Oregon's sovereign tribes, local governments, and families and individuals across the state.

PROTECTING PUBLIC TRUST FUNDS

HELPING FAMILIES SAVE FOR HIGHER EDUCATION

HELPING GOVERNMENTS SUCCEED

PROTECTING RETIREMENT SECURITY

Financial Empowerment

Vision Statement

Leading the way for Oregonians to achieve long-term financial security.

Mission Statement

Improving Oregon governments' and citizens' financial capabilities.

Protecting Oregon's Finances

$118 B
Assets under management
December 2020

$317 B
Bank transactions supported annually
In 2020

$4.4 B
Oregon College Savings assets
December 2020

Aa1/AA+/AA+
Oregon Credit Rating

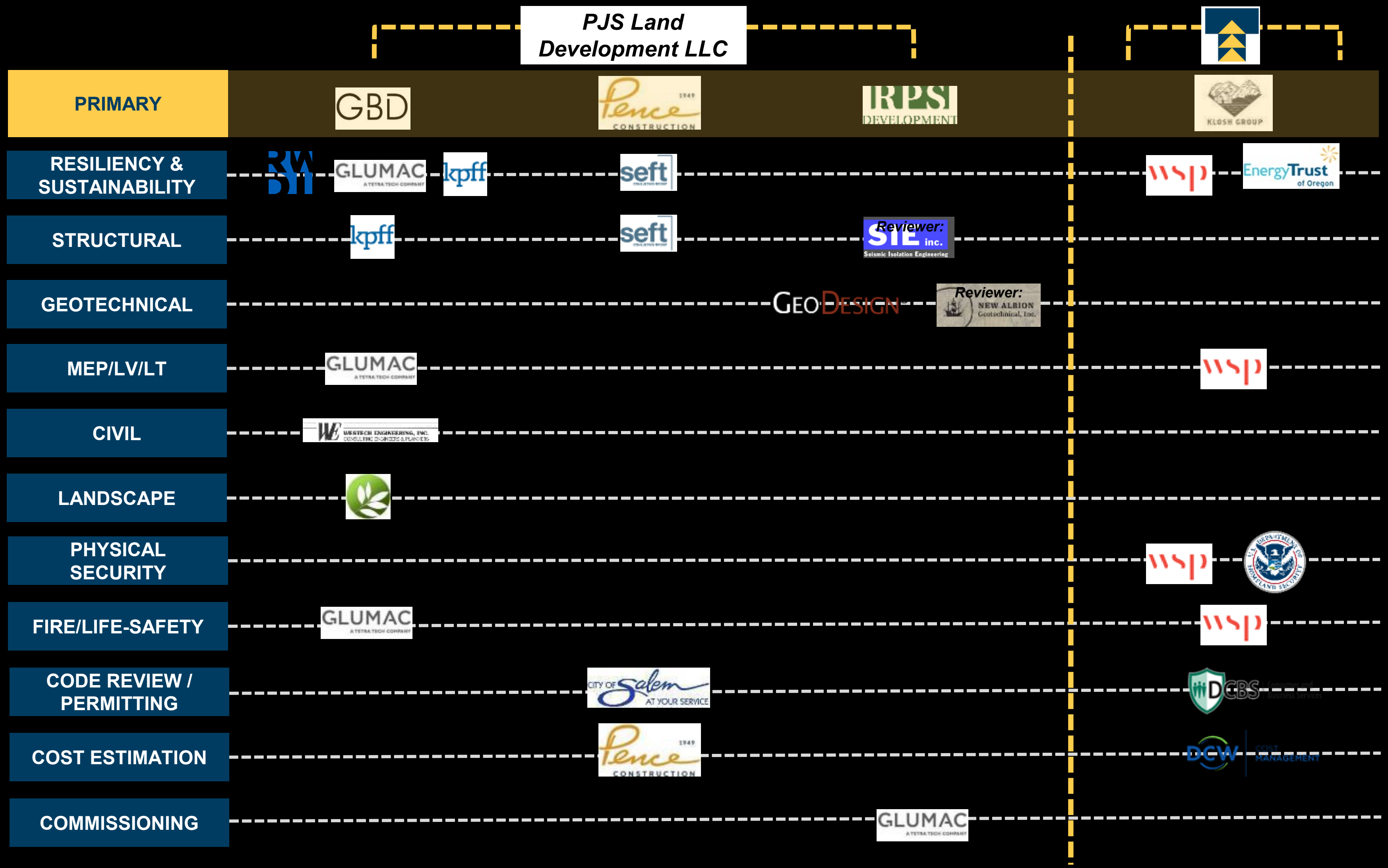
Goal: Ensure Continuity of Treasury Operations

How we'll get there:

New, resilient building able to withstand a variety of disruptions, including a Cascadia Subduction Zone earthquake:

- Project kick-off April 2018
- Construction began summer 2020
- Substantial Completion March 2022

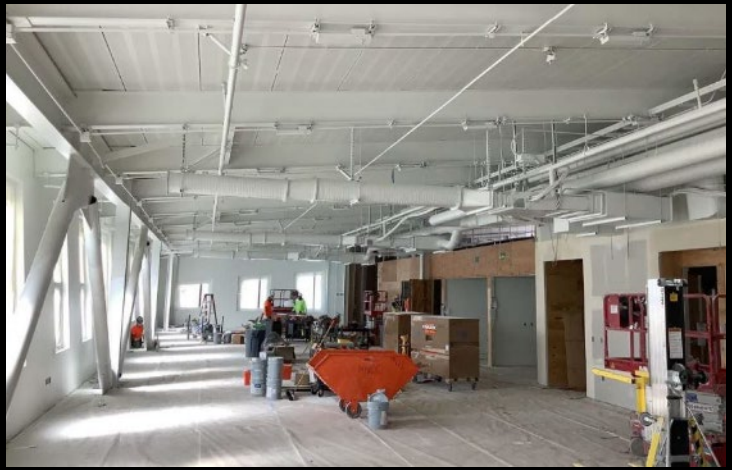
Project Team



State Building Requirements

While not a state-owned building, the team included targets typical of state-owned buildings including:

- EO 17-21 Carbon Reduction
- State Energy Efficient Design
- 1.5% for Green Energy Tech
- One Percent for Art
- Project Labor Agreement
- Minimum 12% apprentice labor, targeting 20% apprentice, 18% minority and 9% female hours.



ARCHITECT

GBD

Craig Stockbridge, AIA

WHAT is UNIQUE

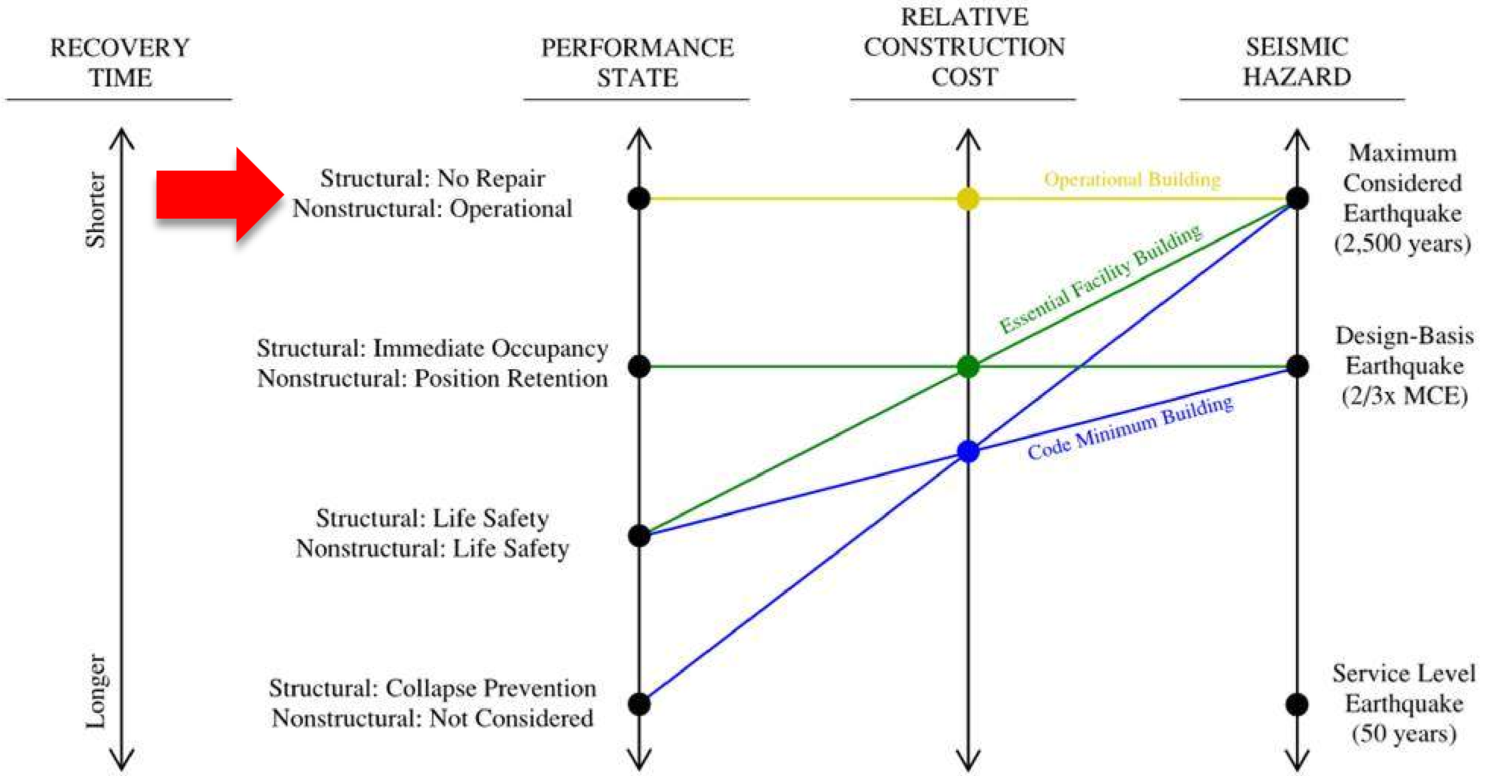
- First USRC base isolated structure in the country
- Only USRC Platinum rated structure in Oregon
- Carbon reduction of 40% (= 100 acres of forest)
- Disaster Resistant (earth, water, fire, pandemic)
- Net Zero

One Tough Building

1.GUIDING DESIGN PRINCIPLES

1. STRUCTURALLY SAFE + READILY REOCCUPIED
   - USRC platinum
2. RESILIENT / EMBRACE HAZARDS
   - natural or human born
3. MINDFUL OF BUDGET + SCHEDULE
4. SUSTAINABLE & HIGH PERFORMING
5. QUALITY, DURABLE, SMART
   - 20 year building / strive to 100 year
6. INVITING + COMFORTABLE
7. PRACTICAL + MODEST
8. INTEGRATE NATURE

WHAT IS USRC PLATINUM?



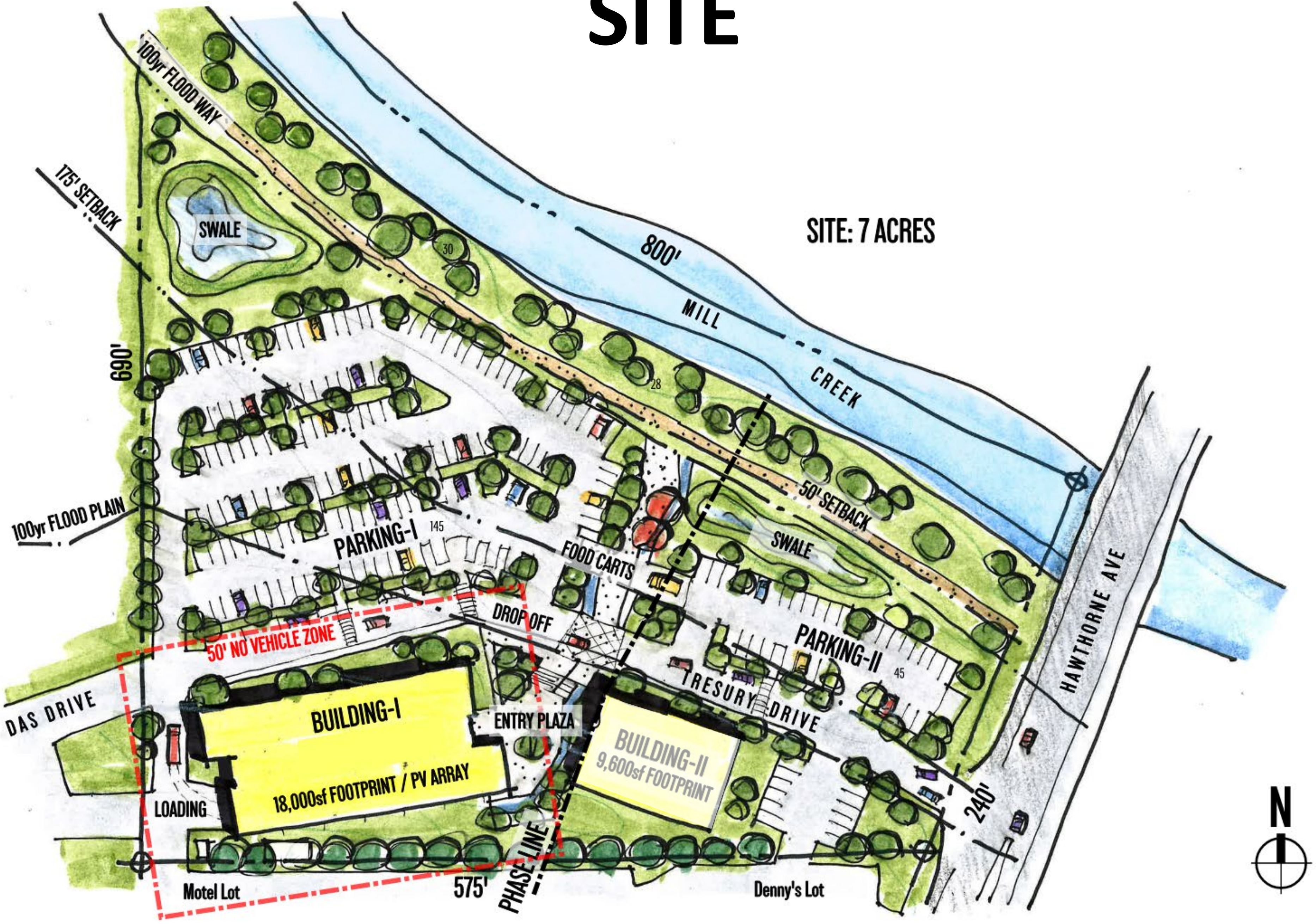
resilience

[ri-zil-yens] noun - *English*

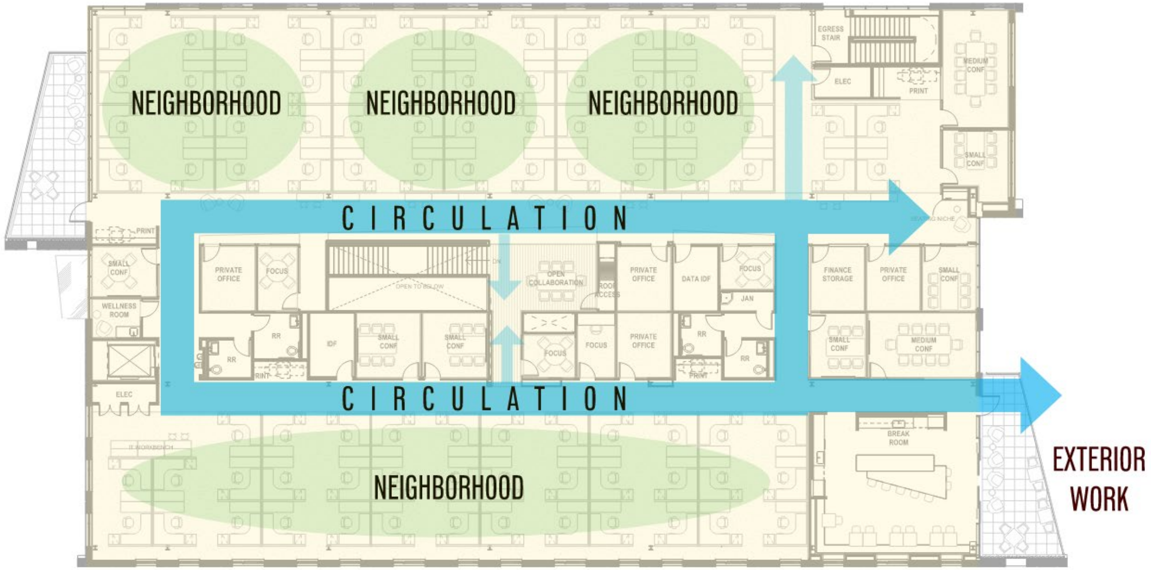
the capacity to recover quickly from difficulties; toughness.

(resist threats / hazards)

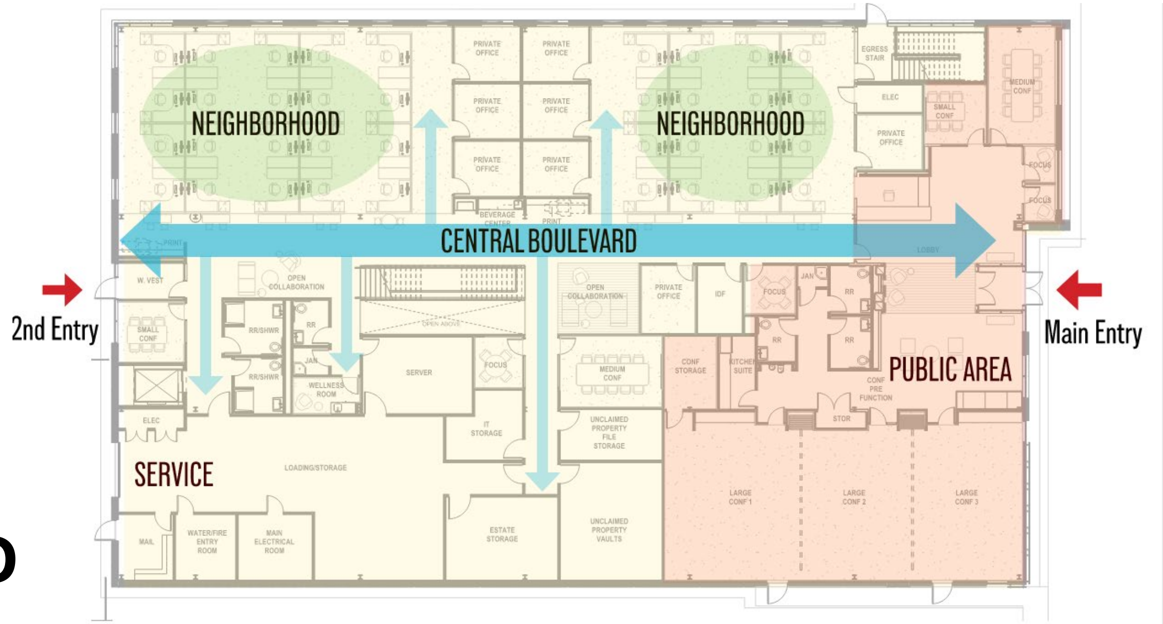
SITE


SITE: 7 ACRES
100yr FLOOD WAY
175' SETBACK
SWALE
30
800'
MILL
CREEK
690'
28
50' SETBACK
100yr FLOOD PLAIN
PARKING-I
145
FOOD CARTS
SWALE
DROP OFF
50' NO VEHICLE ZONE
PARKING-II
45
TRESURY DRIVE
HAWTHORNE AVE
DAS DRIVE
BUILDING-I
18,000sf FOOTPRINT / PV ARRAY
ENTRY PLAZA
BUILDING-II
9,600sf FOOTPRINT
LOADING
240'
PHASE LINE
Motel Lot
575'
Denny's Lot
N

THE RECTANGLE

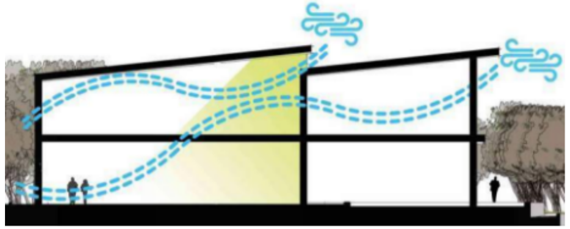


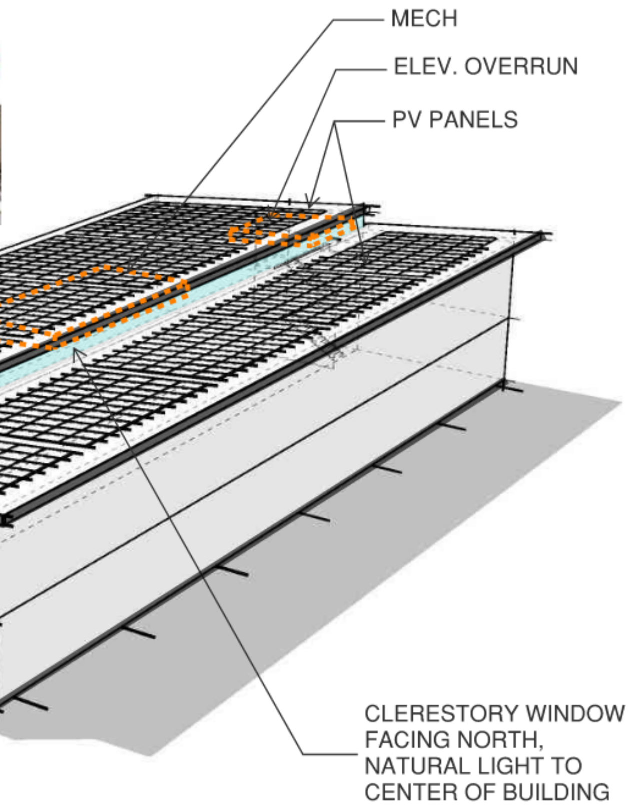
UPPER LEVEL

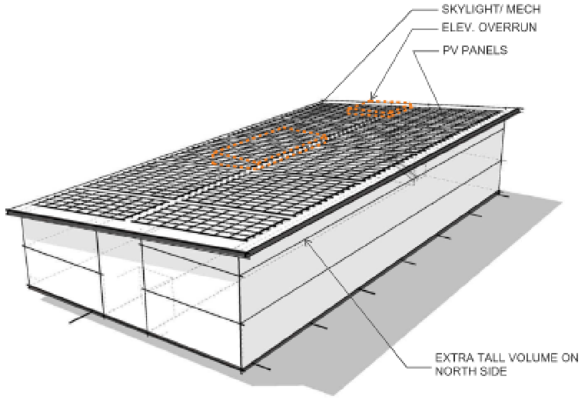


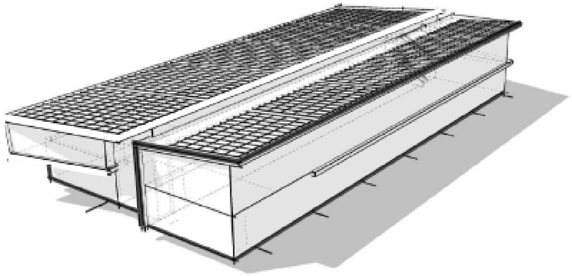
GROUND LEVEL

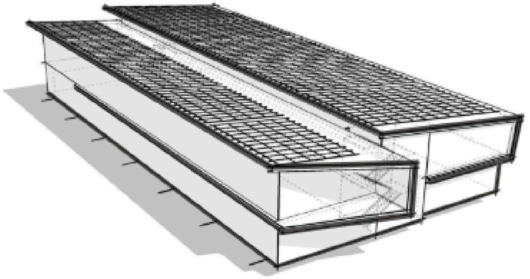
MASSING

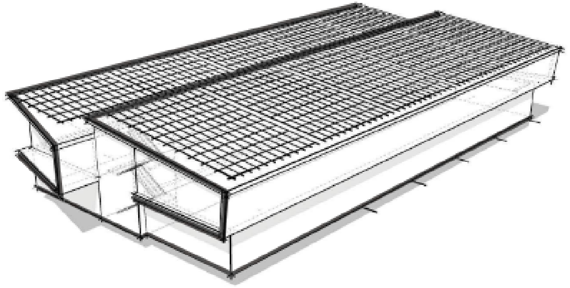



MECH
ELEV. OVERRUN
PV PANELS
CLERESTORY WINDOW FACING NORTH, NATURAL LIGHT TO CENTER OF BUILDING


SKYLIGHT/ MECH
ELEV. OVERRUN
PV PANELS
EXTRA TALL VOLUME ON NORTH SIDE








SLIDING
ISOLATOR
BASE

RESILIENCY THROUGH SUSTAINABILITY

The Oregon State Treasury Resiliency building is a 2-story, 36,000sf state of the art resilient building designed to withstand a 9.0 earthquake without damage.
The building is designed to meet sustainability benchmarks including:
Net Zero Energy (produces more energy than consumes)
International Living Future Institute (ILFI Certified)
Leadership in Energy & Environmental Design, (LEED) Gold (equivalent)
Carbon reduction of 40% (485,600 tons) equal to 100 acres of forest.
United States Resiliency Council Platinum Rating

The USRC Platinum Rating represents a the highest level of building performance. Platinum rated buildings are expected to suffer negligible damage – less than 5% of replacement cost, and allow functional recovery within a few days of a major seismic event. The USRC Platinum Rating is sought by owners who demand the highest level of asset protection and virtually uninterrupted functionality of their operations.

GBD

ARCHITECTURE

A1 Clerestory for daylighting & natural ventilation
A2 Roof overhangs to protect and shade below
* A3 Exterior work areas
A4 Super insulated roof R-30
A5 Super insulated wall R-50
A6 High performance glass & window system
A7 Durable cleanable finishes
A8 Central light shaft / stair for daylighting
A9 Biophilic elements for employee health
A10 Interior window blinds to control glare

STRUCTURAL / SEISMIC

S1 Lightweight structure & skin
S2 Seismic base isolation with concrete moat allowing up to 18” of horizontal movement in any direction
S3 Moment frame & braced frame superstructure
S4 Exposed structure for visual inspection
S5 Acoustic metal deck (sound absorption)
S6 Minimized nonstructural elements such as ceilings to improve reoccupancy

MEP DESIGN

GLUMAC

A TETRA TECH COMPANY

Chris Lowen, P.E.

MECHANICAL

* M1 100% outside air and fully exhausted
* M2 Filtered air intake through MERV filters
M3 Automated clerestory windows
* M4 High performance HVAC system (30% above code)
M5 Radiant Floor & VRF Systems
M6 Ceiling fans (air mixing)
M7 Automated controls of HVAC based on manual operable window positions

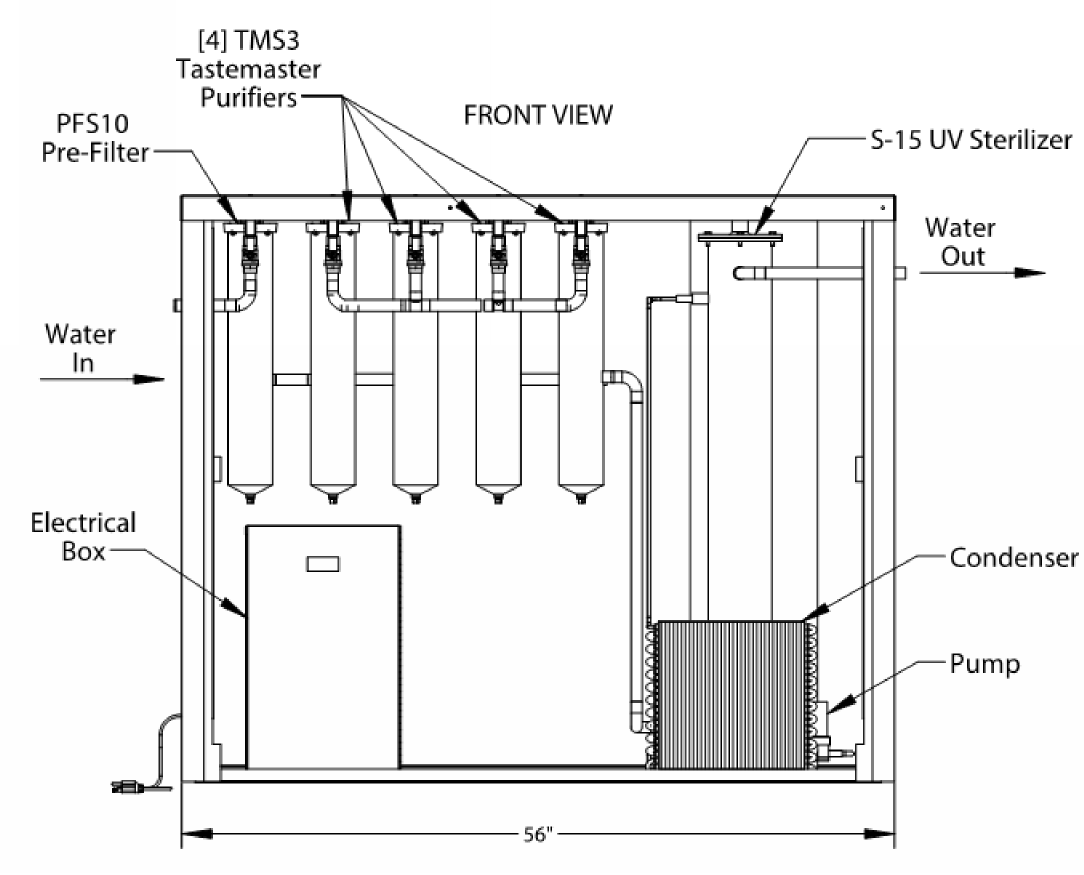
ELECTRICAL

E1 On site energy / PV array
* E2 96-hour emergency power system
* E3 Solar site lighting
E4 Auto dimming controls
E5 Wall and desk mounted lighting to resist seismic movement
* E6 (7) EV Vehicle Charging Stations

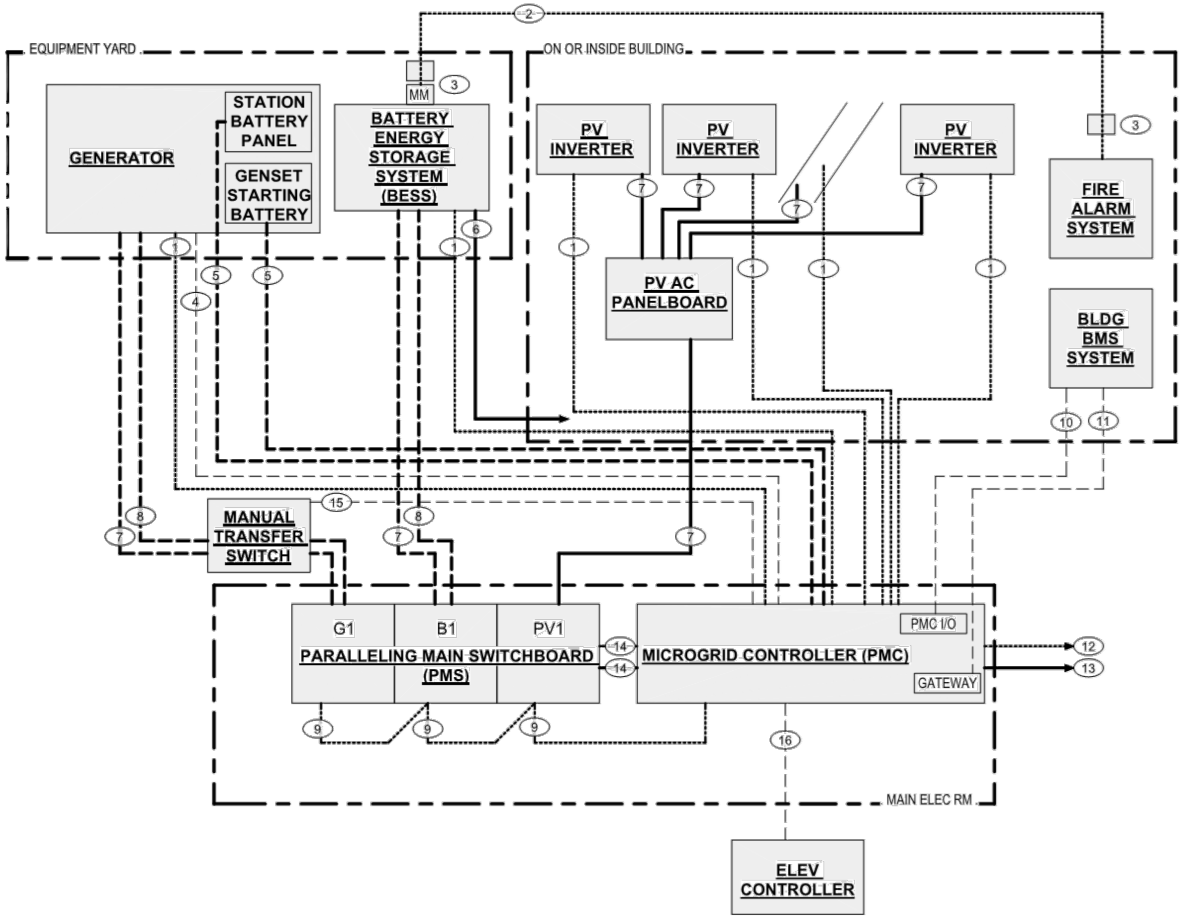
PLUMBING

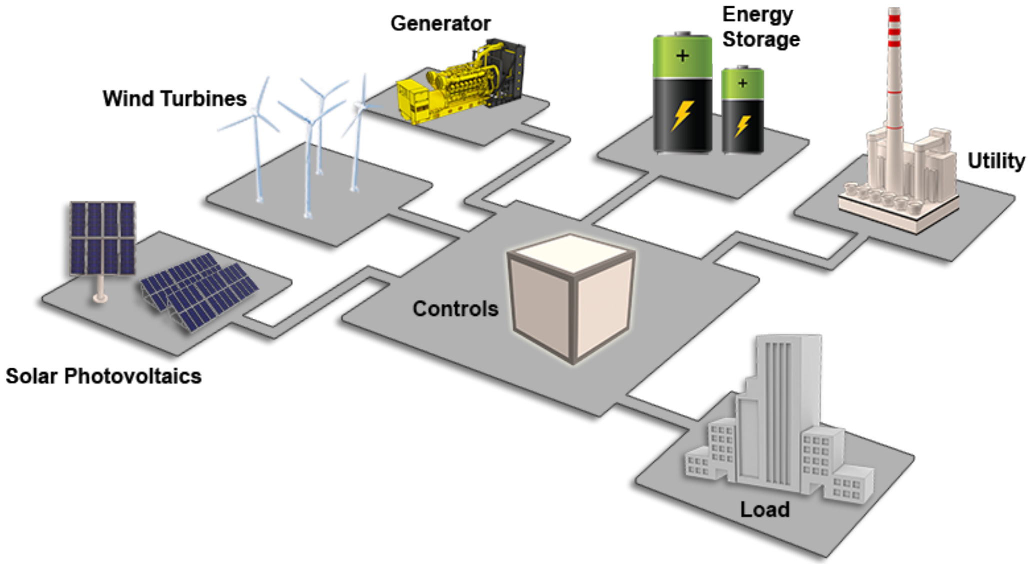
* P1 Auxiliary septic tank
P2 Low flow plumbing fixtures
P3 Touchless plumbing fixtures
* P4 Well water for backup drinking supply

RESILIENT DESIGN FEATURES



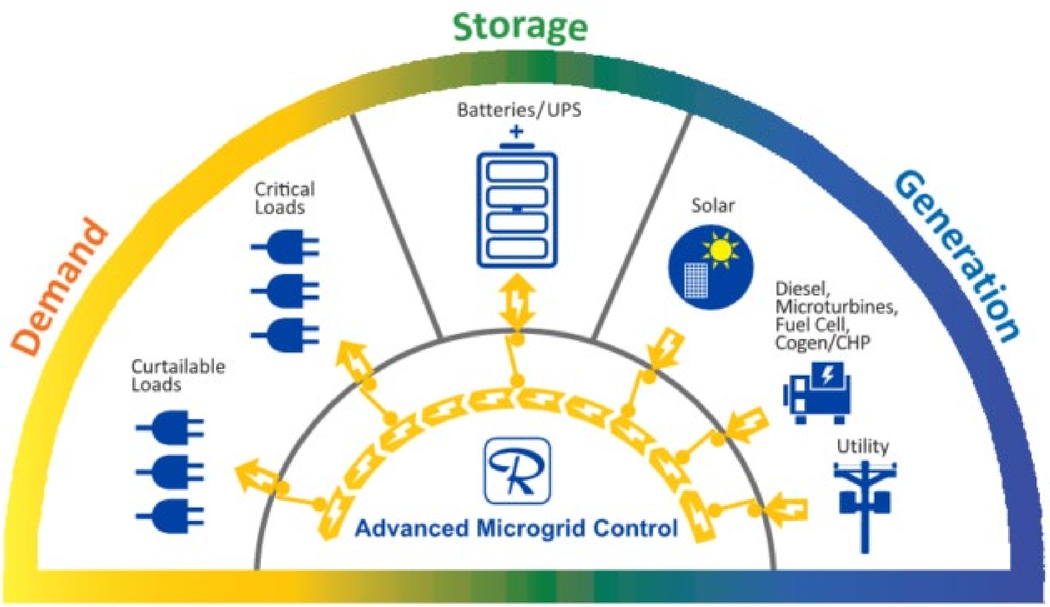
Power Independence & MicroGrids



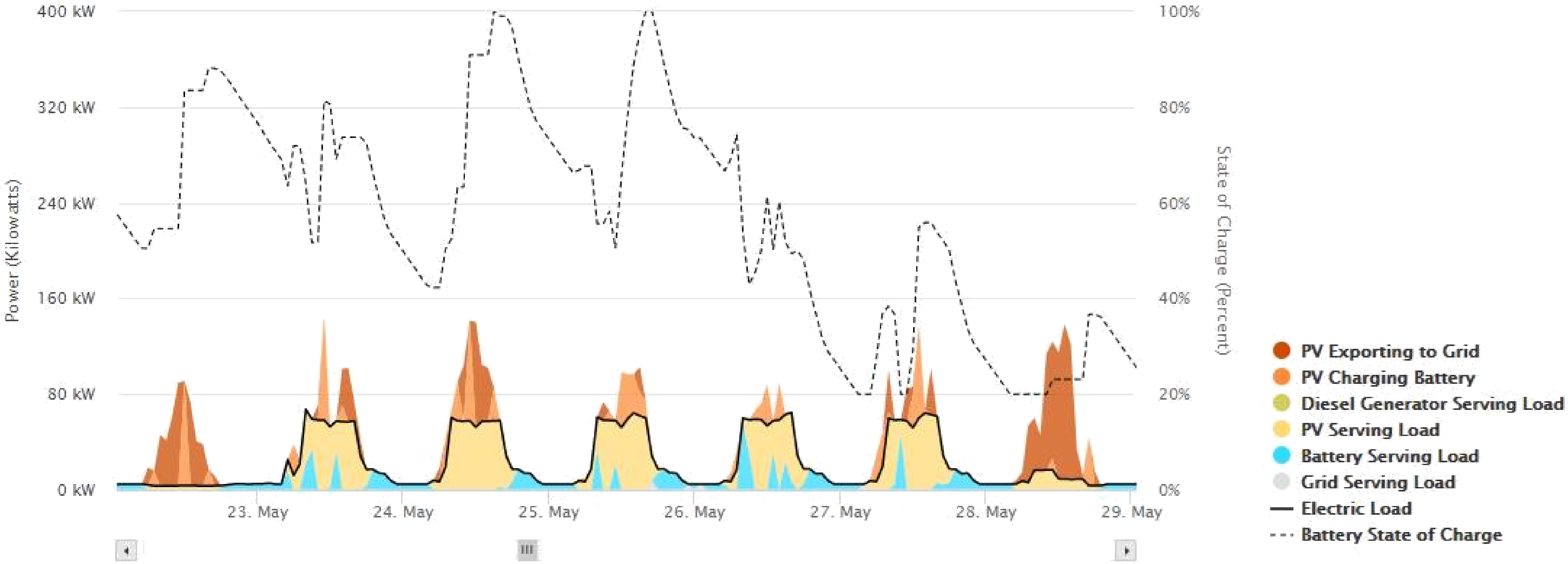


Distributed Energy Resource Integration

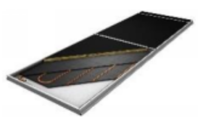
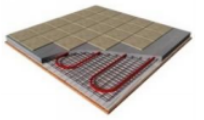
- Solar PV:
  - 238kW rooftop PV Array sized for net zero
  - Offsets annual building consumption
  - Can operate in grid tied or island mode
- Energy Storage:
  - 250kW Battery System
  - Reduces peak energy demand
  - Shifts building demand
  - Can operate in grid tied or island mode
- Generator:
  - 300kW Diesel Generator
  - 96 hour belly tank



Simulating Power Management



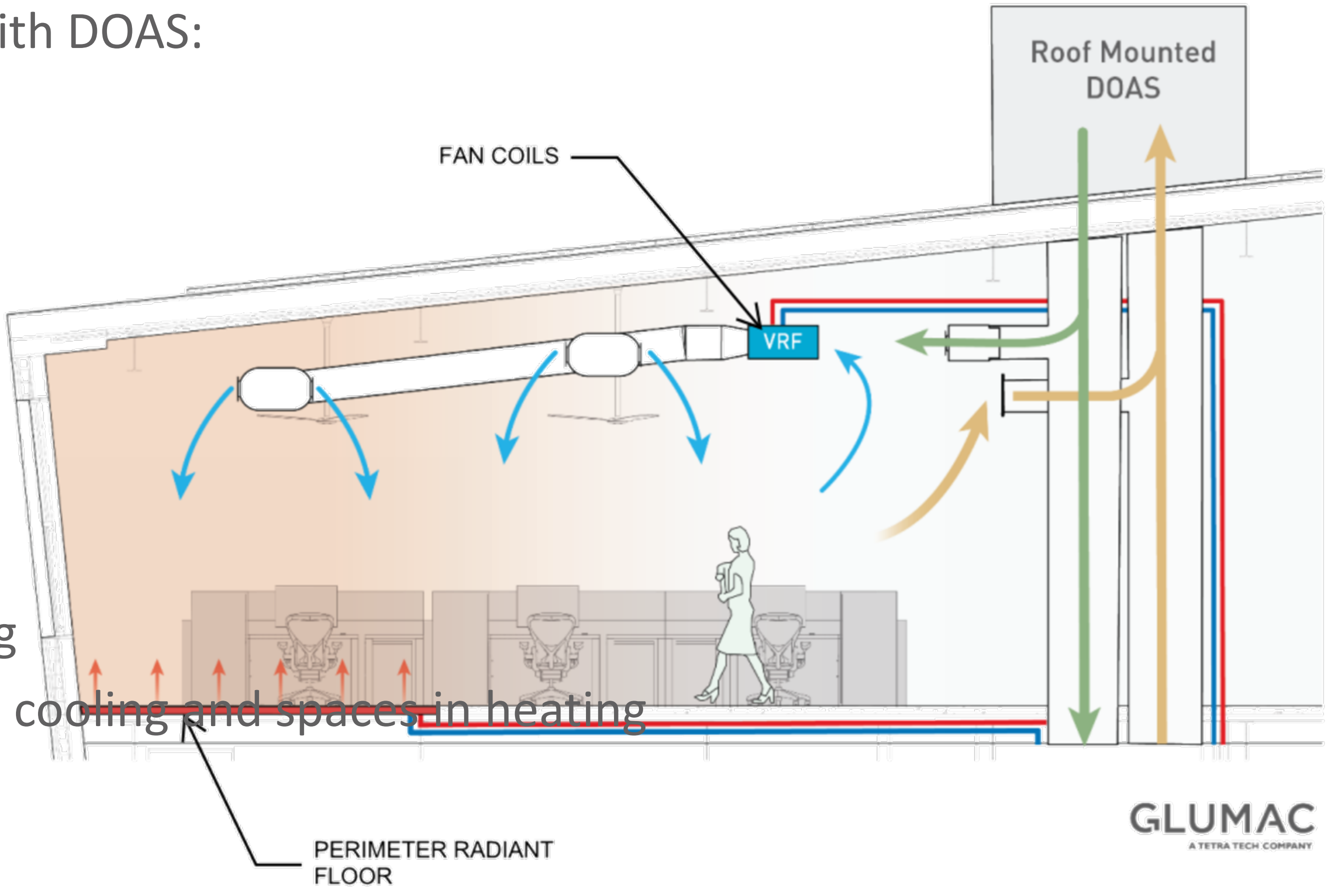
Mechanical System Selection

OPTION	SYSTEM TYPE	IMAGE	DESCRIPTION	SPECIAL NOTES	CENTRAL PLANT OPTIONS	RESILIENCY	ENERGY USE	FIRST COST	CONSTRUCTABILITY	LIFE CYCLE COST	THERMAL COMFORT	FLEXIBILITY	ARCHITECTURAL	ACOUSTICS	OPERATIONS & MAINTENANCE	TOTALS
					WEIGHTING (1-5)	5	5	4	3	3	3	2	1	2	3	62
HVAC System Options																
1	Air Cooled VRF		DOAS unit with energy recovery and heating/cooling providing minimum outside air plus additional ventilation. Air-cooled VRF condensing units on the roof, VRF fan coils, branch selectors, and refrigerant piping, DOAS ventilation ductwork and VAV boxes.	Minimum 50% of fan coils must be connected to a condensing unit for the fan coils to operate. Life span of equipment is typically less than central plants.	No central plant. All fan coils are served by air-cooled condensing units located on the roof with refrigerant piping down to each floor.	3	3	5	5	4	3	2	2	3	4	44
2	Four-Pipe Fan Coil		DOAS units with energy recovery and heating/cooling providing minimum outside air plus additional ventilation. Fan coils and chilled and heating water piping loops, DOAS ventilation ductwork and VAV boxes.	Fan coil units are deeper than other systems which may limit ceiling/head heights in some areas.	a.) Traditional air-cooled chillers and natural gas boilers. b.) Heat pump chillers to produce chilled and heating water.	4	3	3	5	3	3	3	1	3	3	41
3	Radiant Panels		DOAS units with energy recovery and heating/cooling providing minimum ventilation and to meet the latent load. Medium temp CHW and HW loops. a.) Passive radiant panels. b.) VAV boxes with HW reheat. (c.) VRF fan coils if hydro-kits used.	Radiant heating and cooling panels are very energy efficient and provide optimum thermal comfort.	a.) Traditional air-cooled chillers and natural gas boilers. b.) Heat pump chillers to produce chilled and heating water. **c.) VRF hydro-kits.**	5	4	2	3	5	5	4	4	5	4	50
4	Underfloor Air Distribution		All air system with roof mounted AHU's with economizer, heating and cooling. Underfloor fan terminals with reheat at the perimeter and conference rooms and round floor diffusers in office space.	Raised access floor system required.	No central plant. AHU's are either Dx + gas or electric heat pumps with auxillary heating.	2	1	4	2	2	4	5	5	4	4	36
5	Water Source Heat Pump		DOAS units with energy recovery and heating/cooling providing minimum outside air plus additional ventilation. Ground source heat exchange. Water-source heat pumps and condenser water piping loop, DOAS ventilation ductwork and VAV boxes.	Water source heat pumps are deeper than other systems which may limit ceiling/head heights in some areas. Resiliency of the underground piping is the main concern.	Closed loop geo-exchange system with a supplemental fluid cooler and auxillary heat source such as a boiler.	1	5	1	1	1	3	3	3	1	2	26
6	Radiant Floor		DOAS units with energy recovery and heating/cooling providing minimum outside air. PEX tubing imbedded in a topping slab at the perimeter to meet the envelope heating and cooling loads, DOAS ventilation ductwork and VAV boxes..	Radiant floors are considered a very comfortable system at a relatively lower cost than some other hydronic options.	VRF hydro-kits heat and cool water via the condensing unit for the radiant floor and can be coupled with VRF fan coil units to meet interior and latent loads.	5	4	5	4	5	5	1	4	5	4	54

Mechanical System

- Variable Refrigerant Flow (VRF) System with DOAS:
  - VRF Fan Coils
  - VRF Hydro-Kits
    - Perimeter Radiant Floor
    - Chilled water
    - Heating water

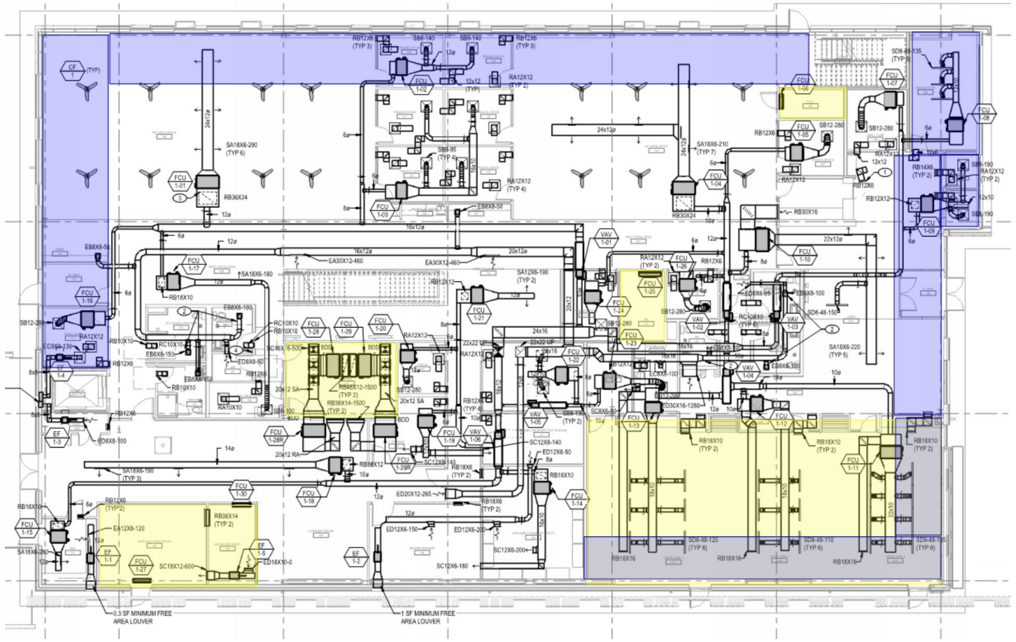
  - Heat Recovery VRF Condensing Units
    - Simultaneous heating and cooling
    - Heat recovery between spaces in cooling and spaces in heating

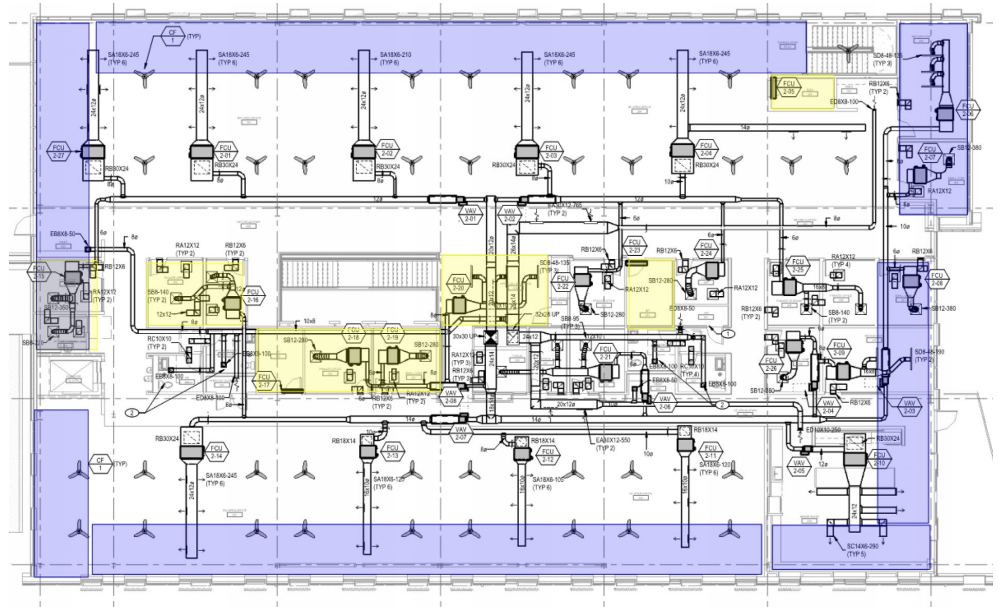


Mechanical Resiliency

- Emergency Power Operation:
  - Radiant floor System
  - Operable windows (DOAS will not operate)
  - Some FCUs

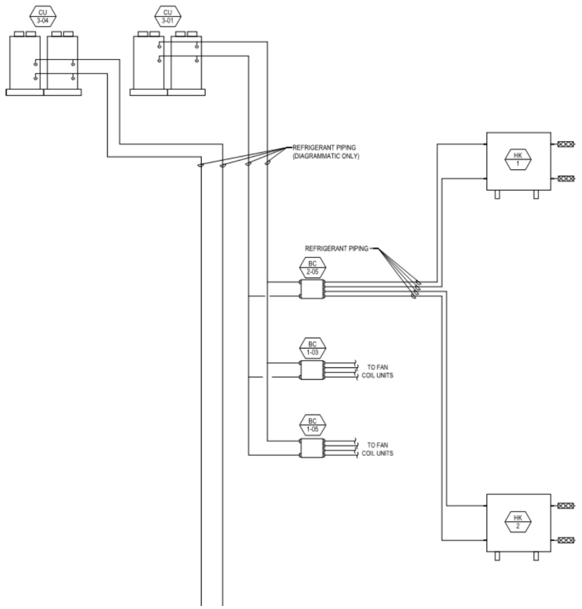
- Special Seismic Certification for DOAS
- KPFF Seismic/Resiliency Modeling

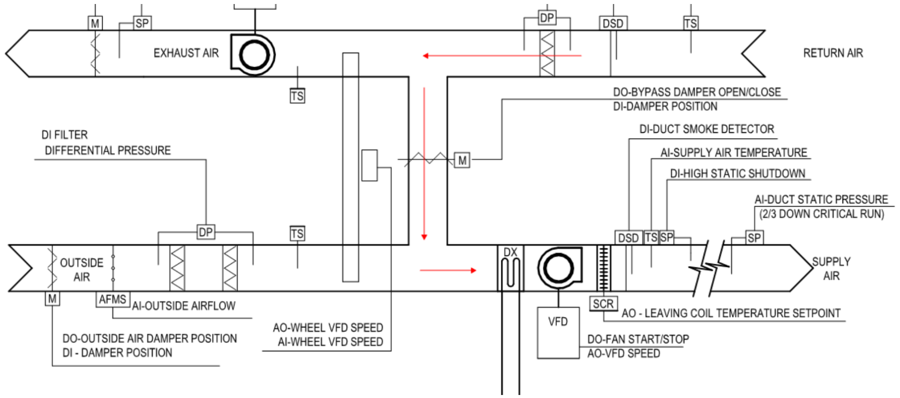


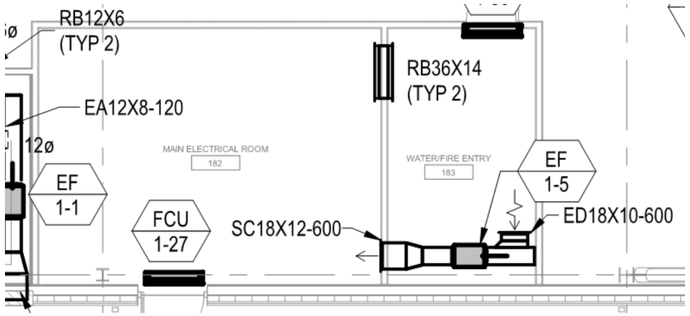


Unique Aspects of Mechanical Design

- Sick room, mail room
- DOAS recirc option for contaminated outside air
- Server room cooling: Heat recovery + Redundant System
- Heat Pump Hot Water Heaters







SUSTAINABILITY CONSULTANT

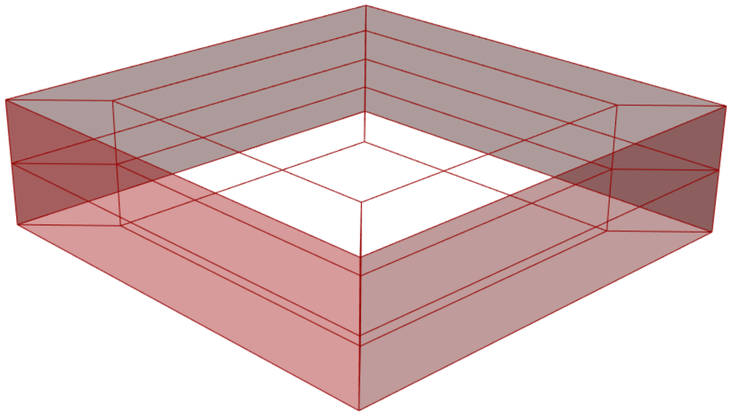
Zach Stevens

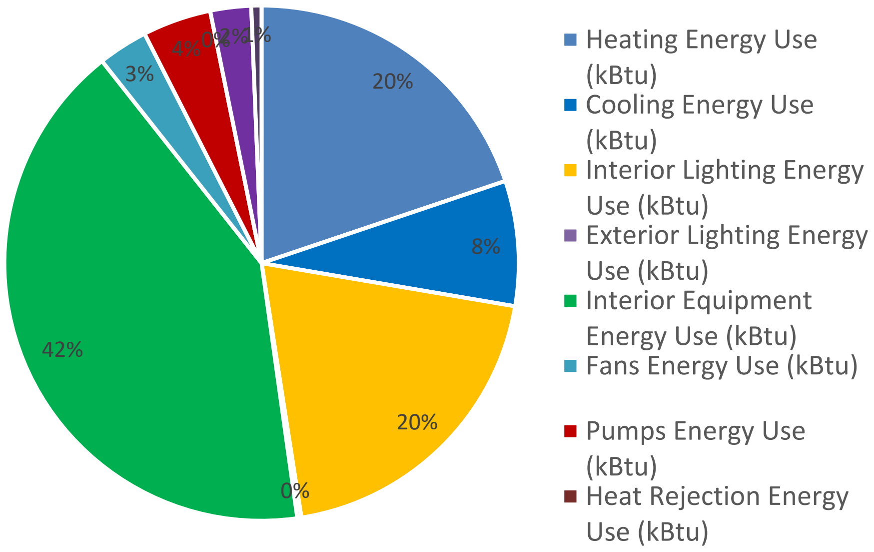
Prioritization & Parametrics

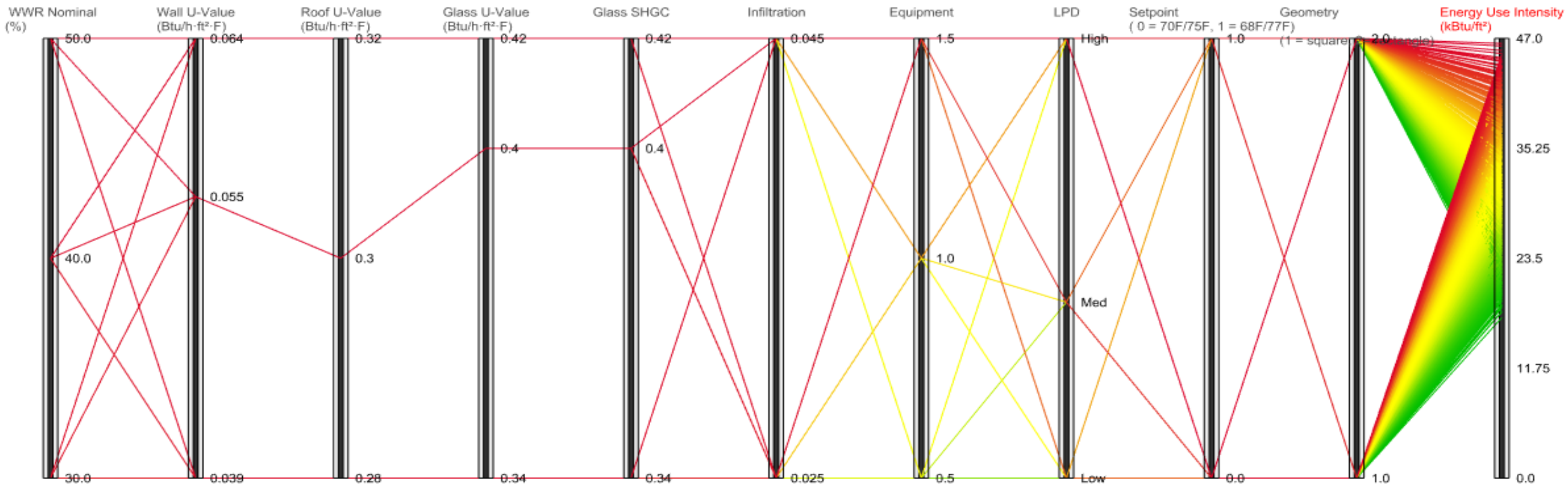
Priorities:

1. Resiliency
2. Energy Efficiency
3. Sustainability
4. Health & Wellness

Prioritization & Parametrics



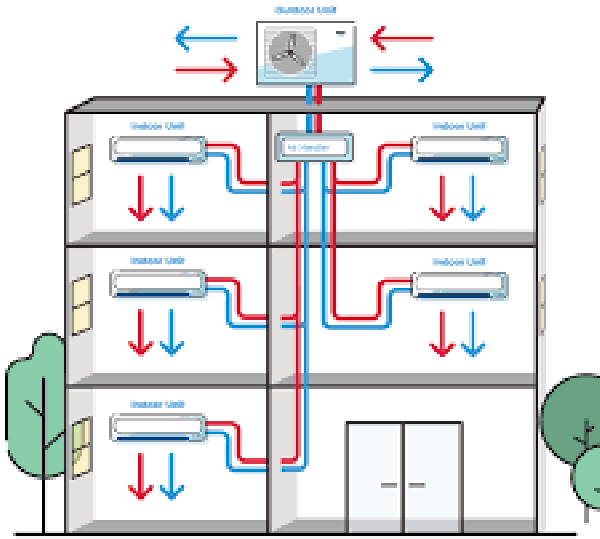


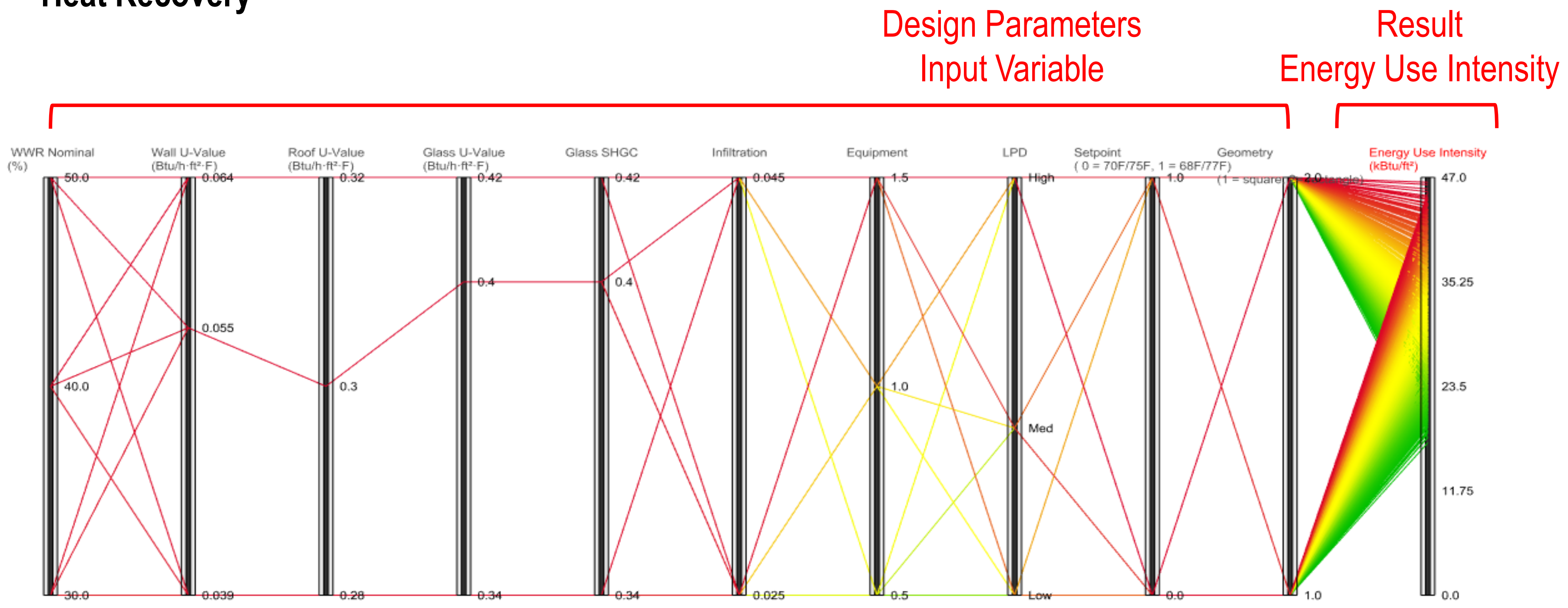


Prioritization & Parametrics

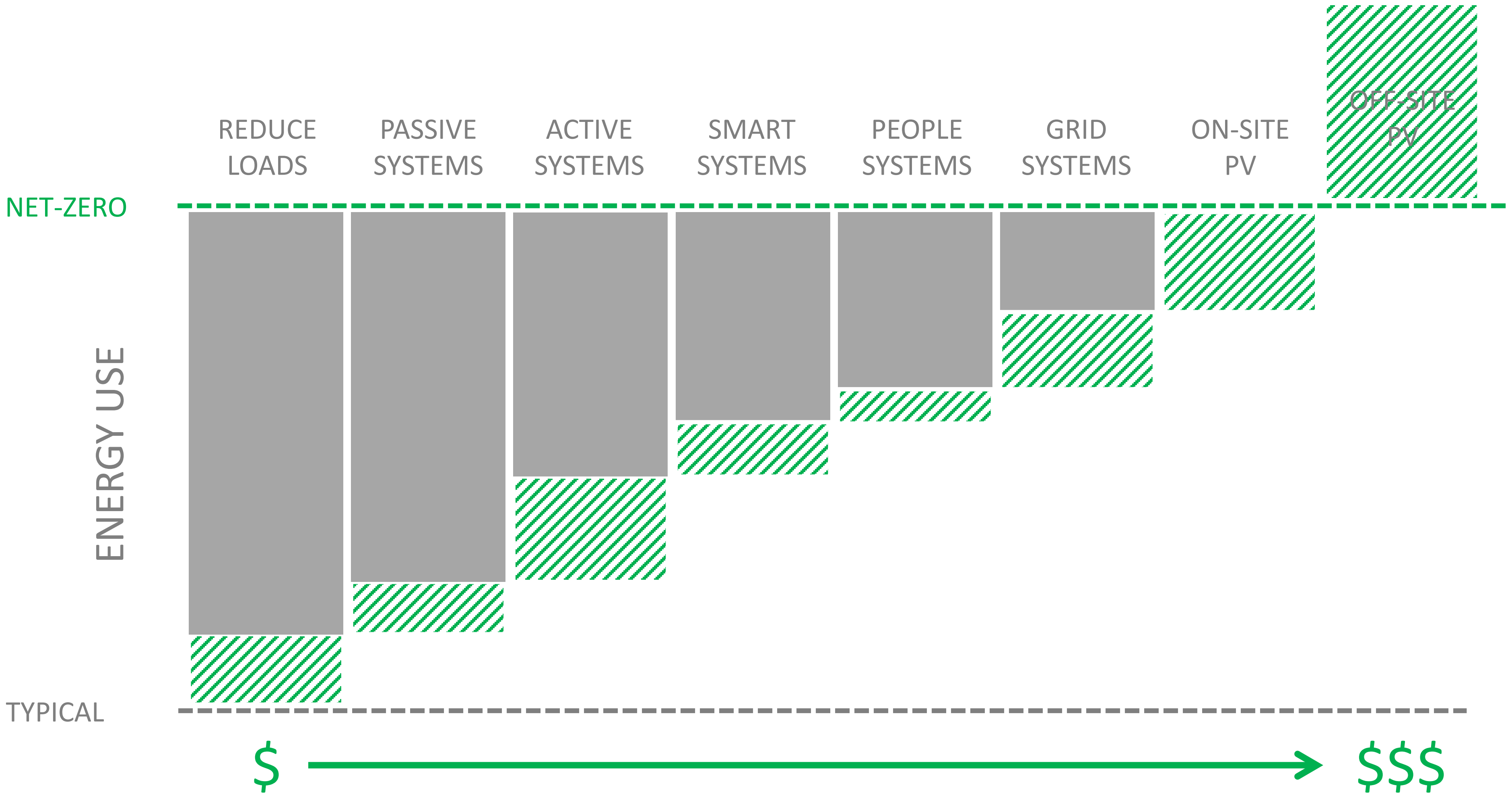
Key Factors:
- Equipment and receptacles
- Lighting energy
- HVAC Energy

Potential Solutions:
- Computer Specifications
- LEDs + Daylight
- Heat Recovery

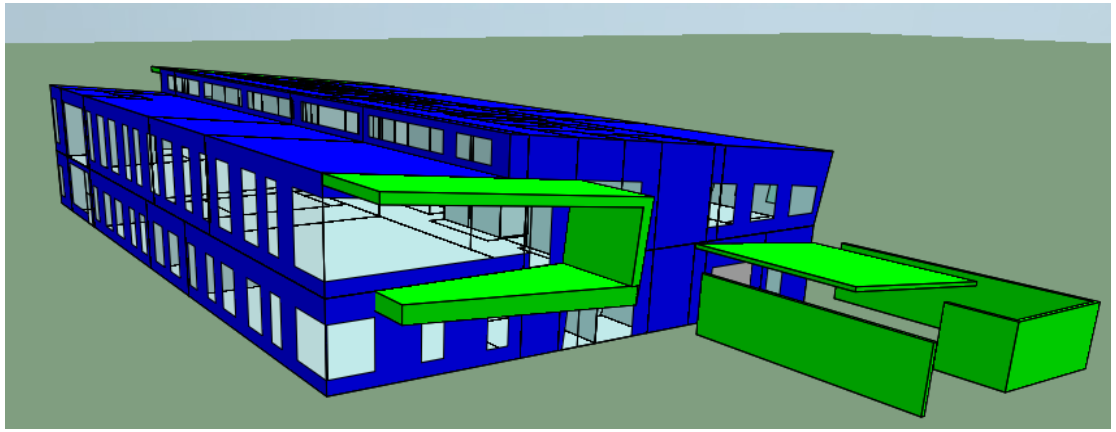




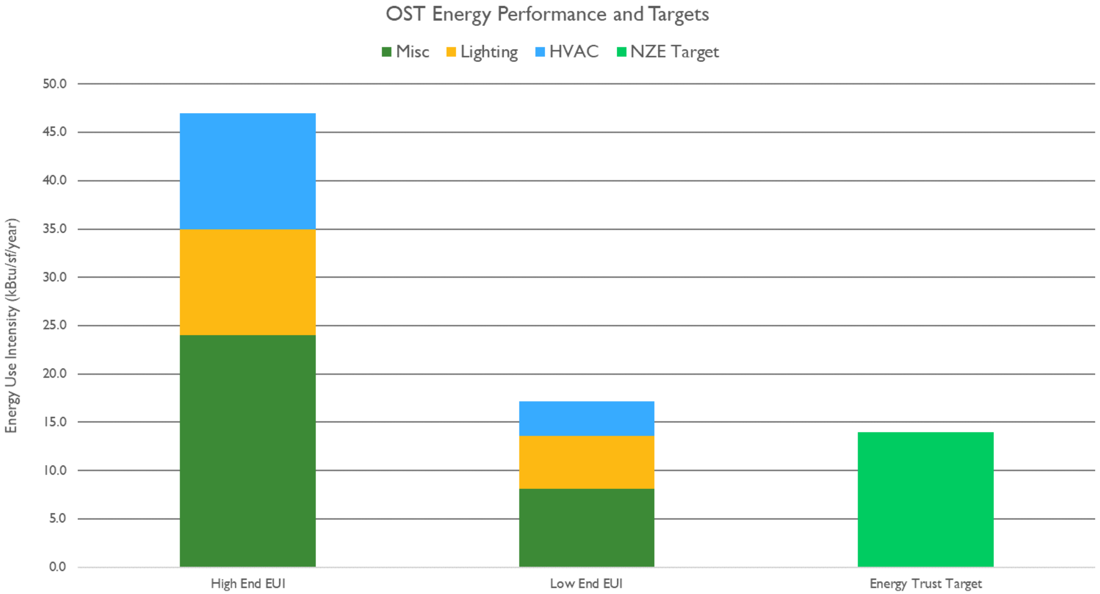
Prioritization & Parametrics



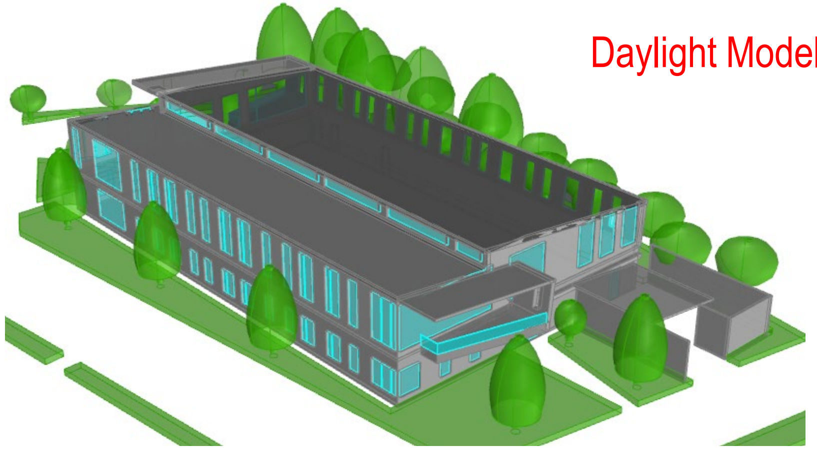
Modeling For ETO

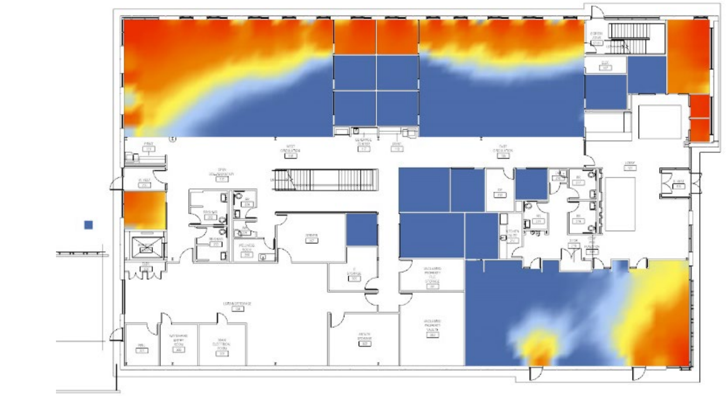


ETO Path to Net Zero

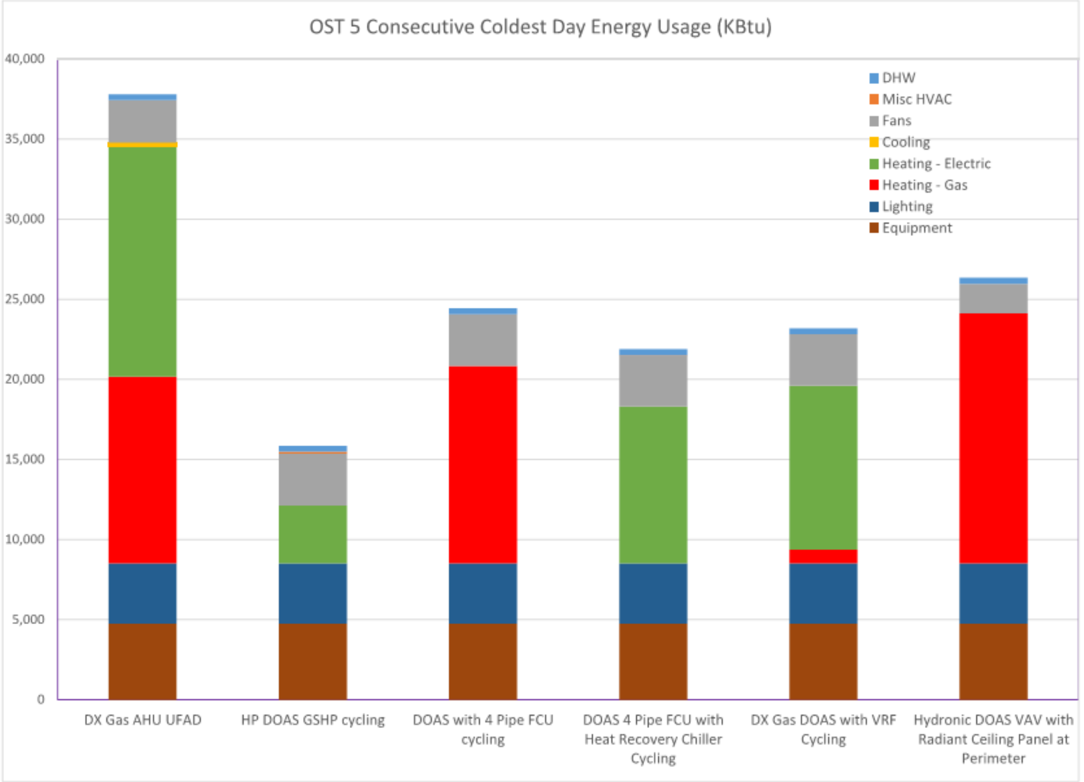


Daylight Modeling



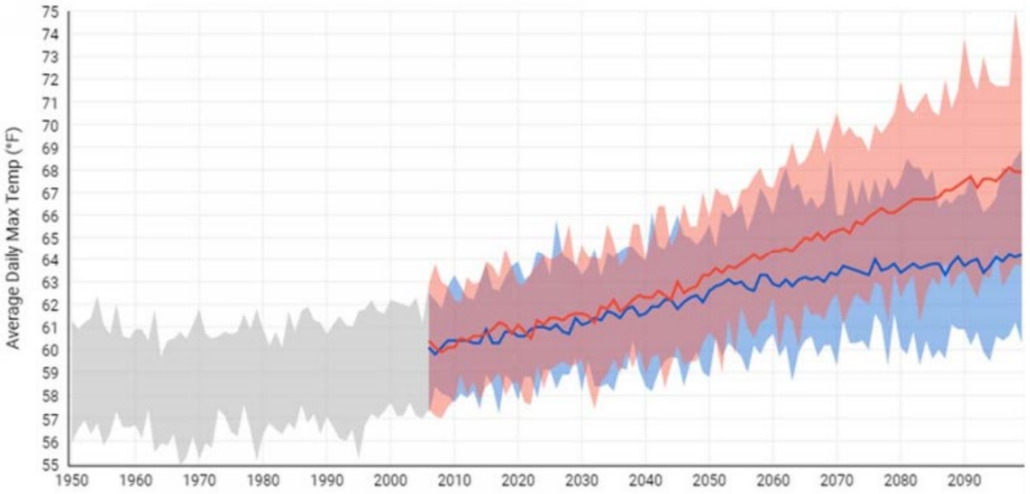


Modeling For Resilience



CLIMATE CHANGE IMPACTS

It is anticipated that climate change will increase the cooling demand for the project. Current models for Salem, OR estimate a mean temperature increase of 4-5% over the life of the building, a little over 3 degrees, shown in the graph below.



Additionally, the cooling degree days (CDD) will increase between 84% and 98%, about 200 to 300 additional CDD.

Modeling For Resilience

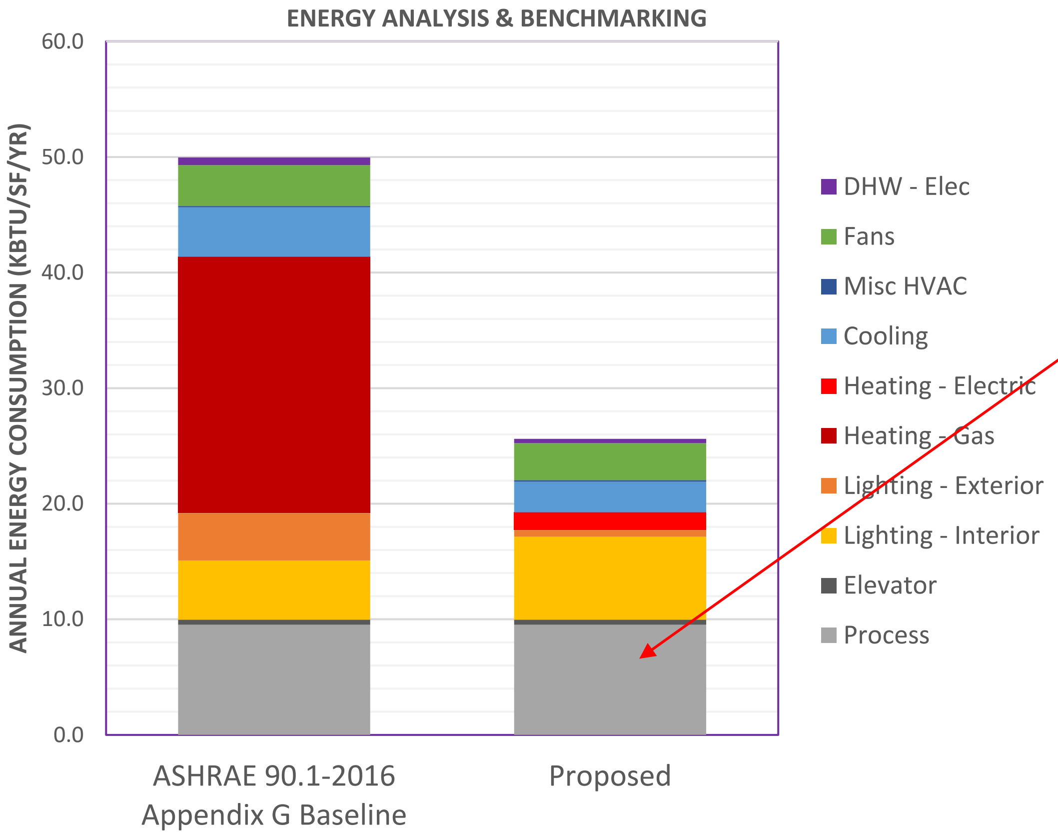
The New York Times

Modeling For Net Zero

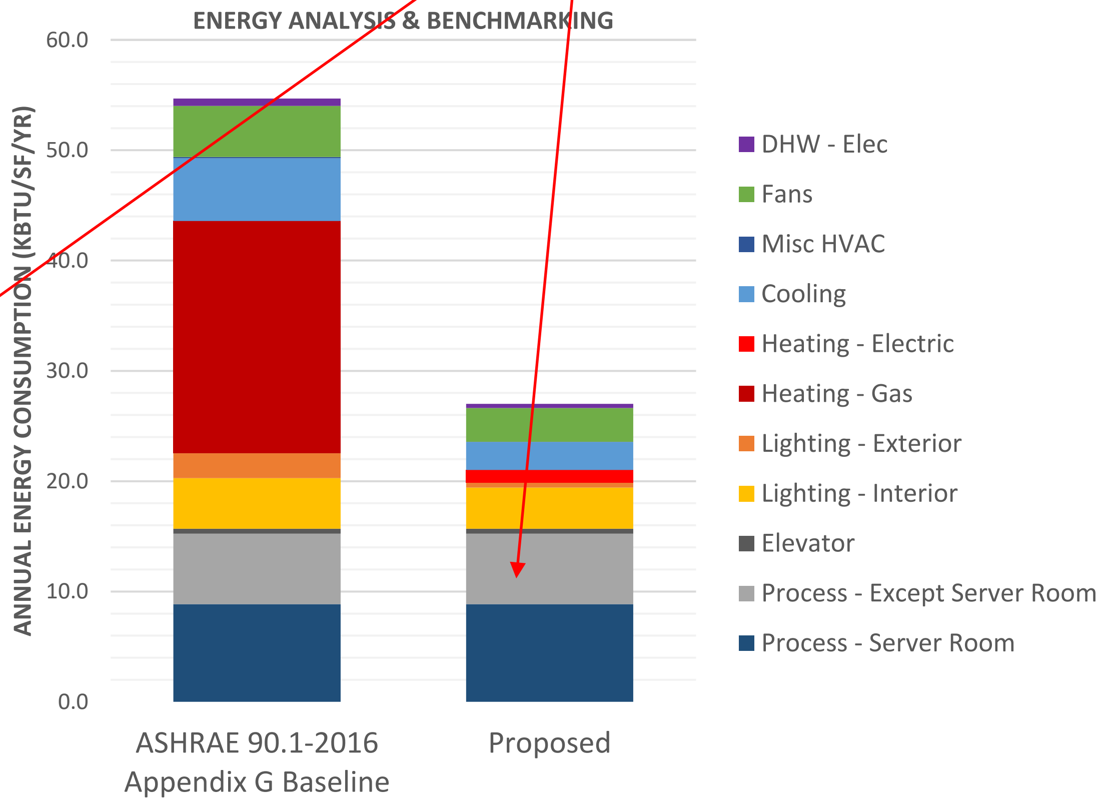
Challenges

Server Energy

Preliminary Model

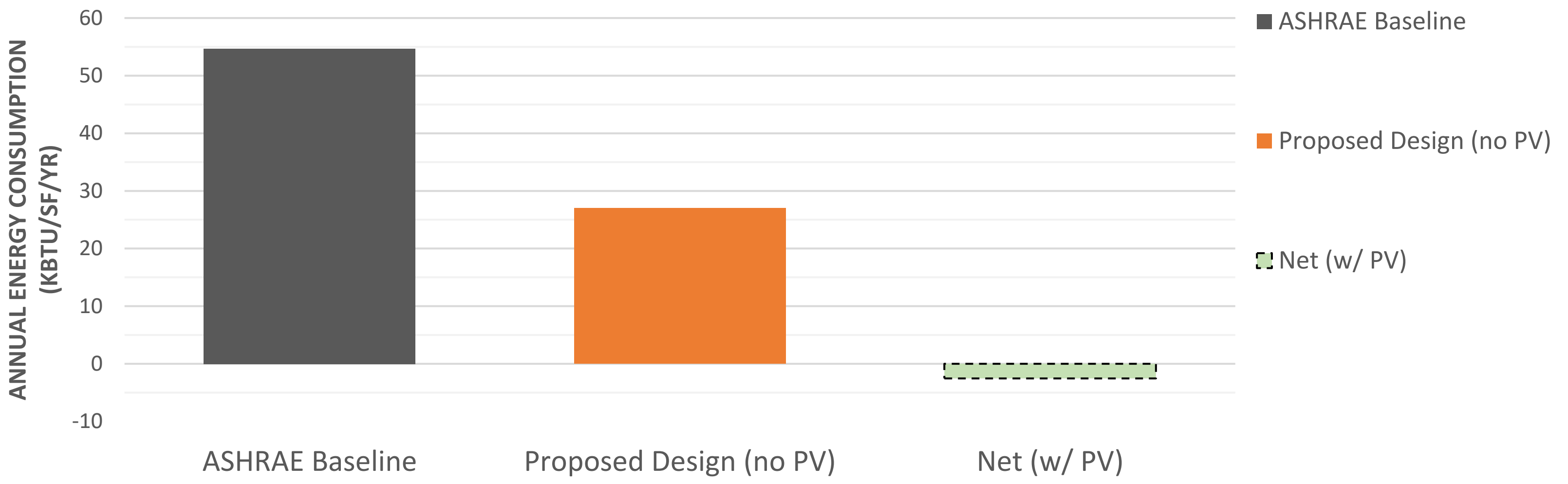


Final Model



Modeling For Net Zero

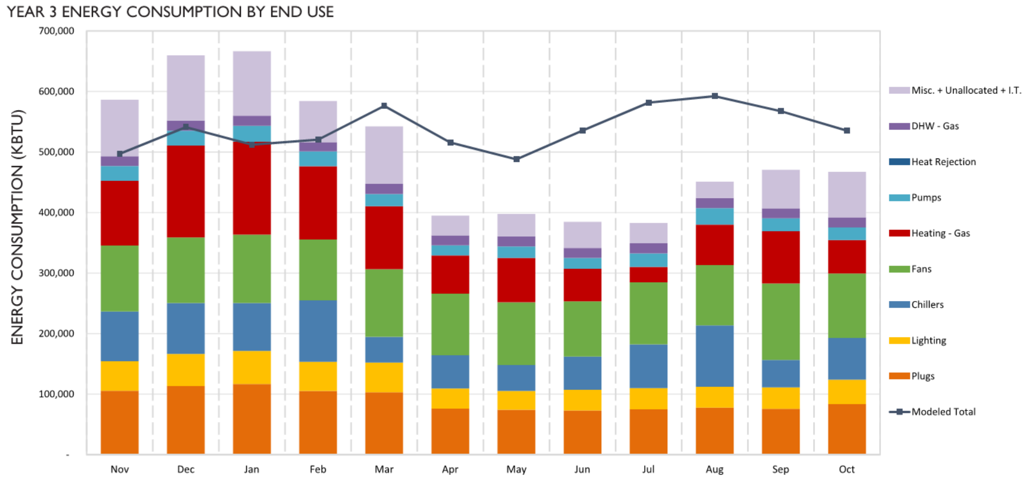
Final Results



Real Performance & Net Zero

Measurement & Verification

CopperTree Analytics



ENERGY METERING SCHEDULE

END USE CATEGORY	CT LOCATION	METERED LOAD	VOLTAGE	POLES	CT RATING	DEMAND LOAD (A)
HVAC	MPS-1	{CM} DP-H1	480 V	3	600 A	364 A
HVAC	MPS-1	{CM} DP-HC1	480 V	3	600 A	399 A
HVAC	LC1B-2	{DMU} EF-1-3	120 V	1	20 A	4 A
HVAC	LC1C-1	{DMU} EF-1-4	120 V	1	20 A	4 A
INTERIOR LIGHTING	DP-HC1	{DMU} EGRESS LIGHTING INVERTER	277 V	1	60 A	26 A
HVAC	LC1C-1	{DMU} ELEVATOR SUMP PUMP - ESP-1	120 V	1	25 A	14 A
EXTERIOR LIGHTING	INVERTER	{DMU} EXTERIOR - EGRESS LIGHTING	277 V	1	20 A	4 A
EXTERIOR LIGHTING	HC1	{DMU} EXTERIOR - LIGHTING	277 V	1	20 A	7 A
HVAC	LC1B-2	{DMU} FCU-01-06	208 V	2	20 A	1 A
HVAC	LC1B-2	{DMU} FCU-01-11,12,13, BC 1-03	208 V	2	20 A	5 A
HVAC	LC1B-2	{DMU} FCU-01-24,25,26	208 V	2	20 A	1 A
HVAC	LC1C-1	{DMU} FCU-01-27,30, BC 1-05	208 V	2	20 A	2 A
HVAC	LC1A-A	{DMU} FCU-01-28,29	208 V	2	20 A	4 A
HVAC	LC1A-B	{DMU} FCU-01-28R,29R	208 V	2	20 A	4 A
HVAC	LC2B-2	{DMU} FCU-02-05	208 V	2	20 A	1 A
HVAC	LC1C-1	{DMU} FCU-02-15,16	208 V	2	20 A	2 A
HVAC	LC1C-1	{DMU} FCU-02-17, BC 2-01,05,06	208 V	2	20 A	2 A
HVAC	LC1C-1	{DMU} FCU-02-18,19,20	208 V	2	20 A	3 A
HVAC	LC2B-2	{DMU} FCU-02-23	208 V	2	20 A	1 A
IDF	LC1B-2	{DMU} IDF 133 - 5-20R - RACK	120 V	1	20 A	3 A
IDF	LC1B-2	{DMU} IDF 133 - 5-20R - RACK	120 V	1	20 A	3 A
IDF	LC1B-2	{DMU} IDF 133 - 5-20R - RACK	120 V	1	20 A	3 A
IDF	LC1B-2	{DMU} IDF 133 - L6-30R - RACK	208 V	2	30 A	24 A
IDF	LC1B-2	{DMU} IDF 133 - L6-30R - RACK	208 V	2	30 A	24 A
IDF	LC1B-2	{DMU} IDF 133 - L6-30R - RACK	208 V	2	30 A	24 A
IDF	LC2B-1	{DMU} IDF 223 - 5-20R - RACK	120 V	1	20 A	2 A
	LC2B-1	{DMU} IDF 223 - L6-30R RACK	208 V	2	30 A	24 A
IDF	LC2B-1	{DMU} IDF 223 - L6-30R RACK	208 V	2	30 A	24 A
	LC2B-1	{DMU} IDF 223 - RACK RECEPT	120 V	1	20 A	2 A
IDF	LC2B-2	{DMU} IDF 243 - 5-20R - RACK	120 V	1	20 A	3 A
IDF	LC2B-2	{DMU} IDF 243 - 5-20R - RACK	120 V	1	20 A	3 A
IDF	LC2B-2	{DMU} IDF 243 - L6-30R - RACK	208 V	2	30 A	24 A
IDF	LC2B-2	{DMU} IDF 243 - L6-30R - RACK	208 V	2	30 A	24 A
INTERIOR LIGHTING	HC1	{DMU} LEVEL 1 - LIGHTING	277 V	1	20 A	8 A
INTERIOR LIGHTING	HC1	{DMU} LEVEL 1 - LIGHTING	277 V	1	20 A	7 A
INTERIOR LIGHTING	HC1	{DMU} LEVEL 1 - LIGHTING	277 V	1	20 A	8 A
INTERIOR LIGHTING	LC1B-1	{DMU} LEVEL 1 EAST - LIGHTING	120 V	1	20 A	4 A
INTERIOR LIGHTING	LC1C-2	{DMU} LEVEL 1 WEST - LIGHTING	120 V	1	20 A	6 A
INTERIOR LIGHTING	HC1	{DMU} LEVEL 2 - LIGHTING	277 V	1	20 A	10 A
INTERIOR LIGHTING	HC1	{DMU} LEVEL 2 - LIGHTING	277 V	1	20 A	9 A
INTERIOR LIGHTING	HC1	{DMU} LEVEL 2 - LIGHTING	277 V	1	20 A	11 A
HVAC	LC1C-2	{DMU} P-1	120 V	1	20 A	6 A
HVAC	LC1C-2	{DMU} P-2	120 V	1	20 A	6 A
HVAC	LC1C-2	{DMU} P-3	120 V	1	20 A	6 A
HVAC	LC1C-2	{DMU} P-4	120 V	1	20 A	6 A
SERVER ROOM	DP-HC1	{DMU} XFR-LC1A-A	480 V	3	125 A	35 A
SERVER ROOM	DP-HC1	{DMU} XFR-LC1A-B	480 V	3	75 A	3 A
PLUG LOAD	DP-HC1	{DMU} XFR-LC1B	480 V	3	175 A	164 A
PLUG LOAD	DP-HC1	{DMU} XFR-LC1C	480 V	3	125 A	71 A
PLUG LOAD	DP-H1	{DMU} XFR-LS	480 V	3	125 A	76 A

ENERGY METERING NOTES:

1. METERING SOFTWARE SHALL BE UTILIZED TO ADD AND/ OR SUBTRACT OTHER METERED DATA TO DERIVE ENERGY CONSUMPTION OF THE SPECIFED END USE CATEGORY.
   A. ALL METERS OF THE SAME END USE CATEGORY SHALL BE ADDED TOGETHER TO DERIVE A TOTAL BUILDING LOAD FOR EACH END USE CATEGORY LISTED.
   B. ALL BRANCH CIRCUIT METERS OF A DIFFERENT END USE CATEGORY THAN THE UPSTREAM PANEL AND/ OR TRANSFORMER SERVING THEM SHALL BE SUBTRACTED FROM THE METERED VALUE MEASURED BY THE UPSTREAM METER.
   C. METERED LOADS SHALL NOT BE DOUBLE COUNTED.
2. ALL METERING SYSTEMS SHALL INTEGRATE WITH BMS SYSTEM FOR REMOTE MONITORING OF ALL SOURCES AND END USE CATEGORIES.
3. PARALLELING MICROGRID CONTROLLER GATEWAY SHALL MONITOR ENERGY PRODUCTION FOR EACH SOURCE:
   A. PV
   B. BESS
   C. GENERATOR
   D. UTILITY

All Sub Meters included in CopperTree

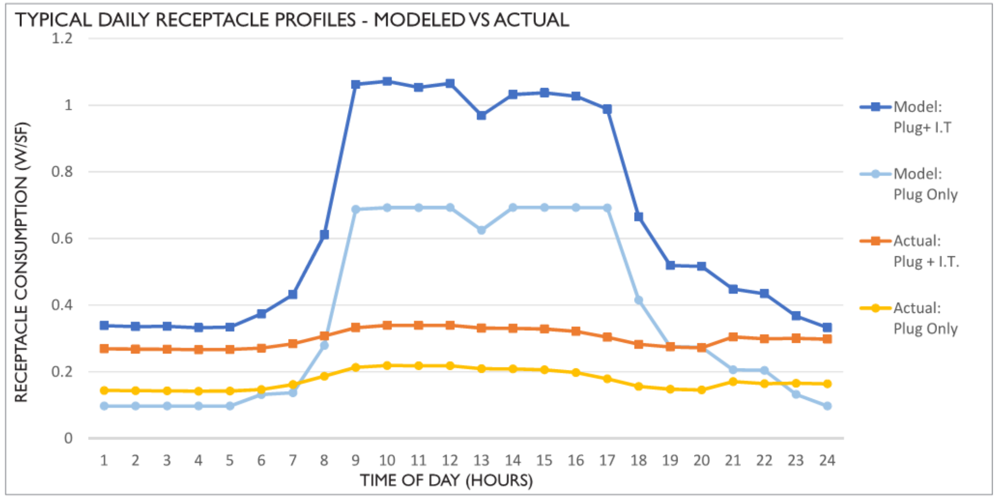
Microgrid components for energy production points / meters

CopperTree to sum sub-meters and BMS calculation by end use. Totals for: Int Lighting, Ext Lighting, Plug, IDF/Server Room, HVAC Fans (zone HVAC), Heating/Cooling VRF, & DHW.

Additional items for CopperTree to map from BMS:

-Weather data (db, wb at minimum)
- DOAS data (CFM, power, SAT, RAT, HR efficiency if possible)
- VRF data (all data available from VRF system. if possible to isolate heating and cooling mode)
- PV Net Meter (production, site use, grid sell-back)
- DHW (power, EWT/LWT, GPM)
- HVAC (setpoints, thermostats, floor level fan power)
- Operable window (open/closed if available)

BMS Points Mapping:
A points mapping exercise will help coordinate this individual BMS points for CopperTree to incorporate from the controls contractor. Will need to determine what points are available from VRF system.



GENERAL CONTRACTOR

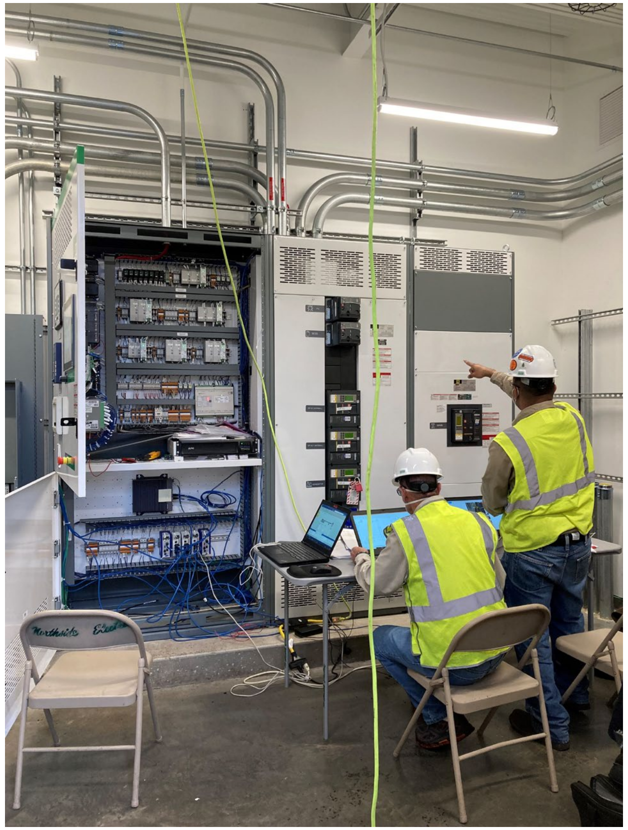
Pence

Philip Johnson

Constructing in Unique Times

BESS

Microgrid



QUESTIONS?

VIRTUAL BUILDING TOUR

THANK YOU


OREGON STATE TREASURY

GBD

GBD


APPROACH

KNOW YOUR SITE

TEST DESIGN SOLUTIONS

CHARRETTES / LISTEN / ID GOALS

PROJECT TEAM COLABORATION OWNERSHIP, DESIGN, CONTRACTORS