

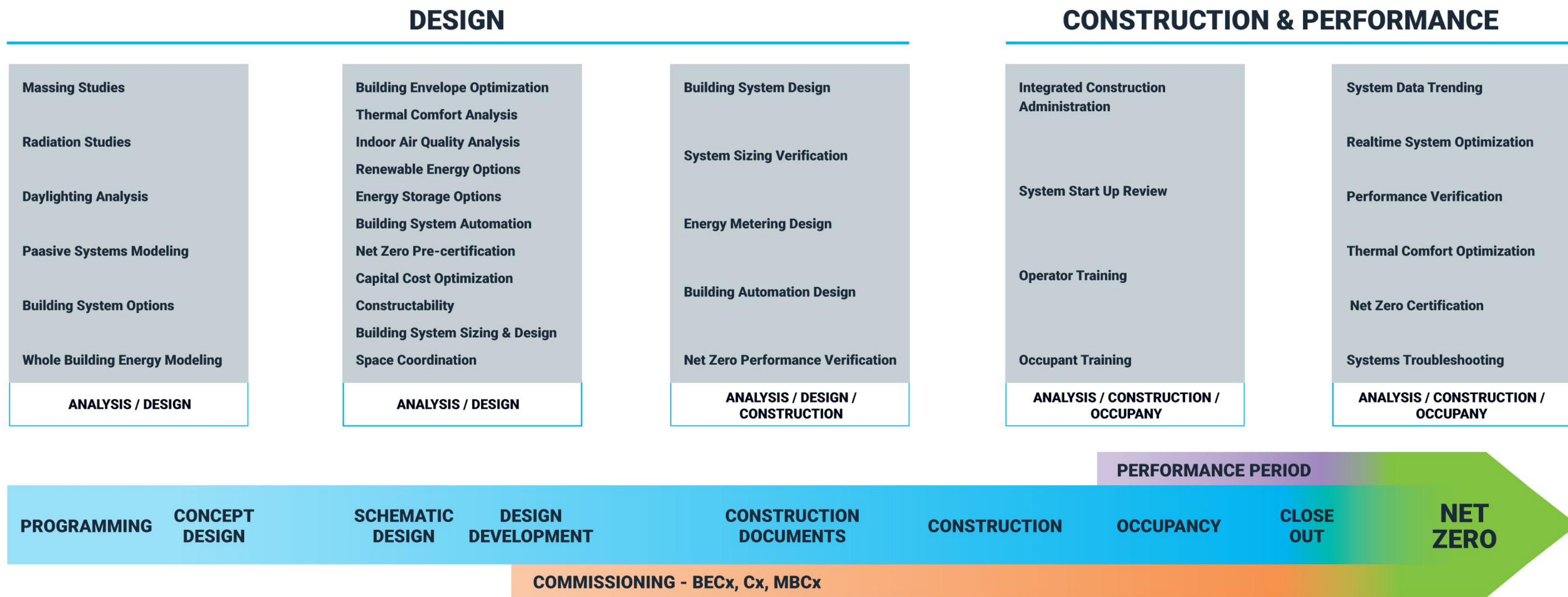
NEXT STEPS

in the Decarbonization Journey

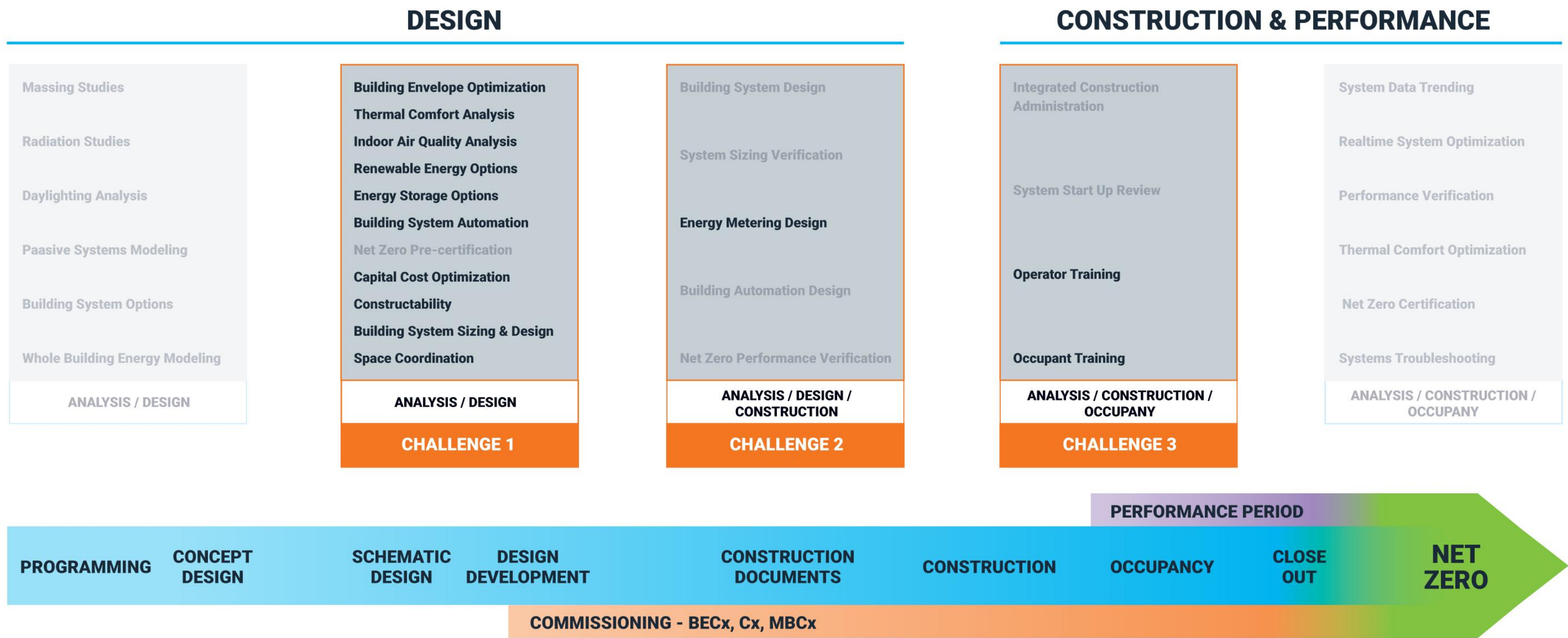
The Built Environment has made strides towards delivering sustainable buildings over the past 25 years. Learn about the Next Steps in this Journey towards Decarbonization with an emphasis on building systems. Hear about opportunities for improved outcomes during design, construction and operation of buildings.

Speaker:
Sachin Anand

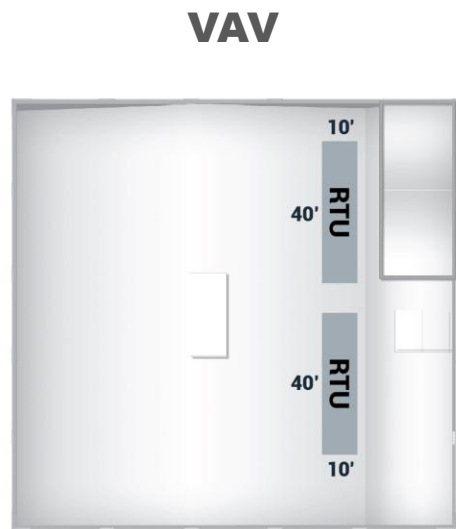
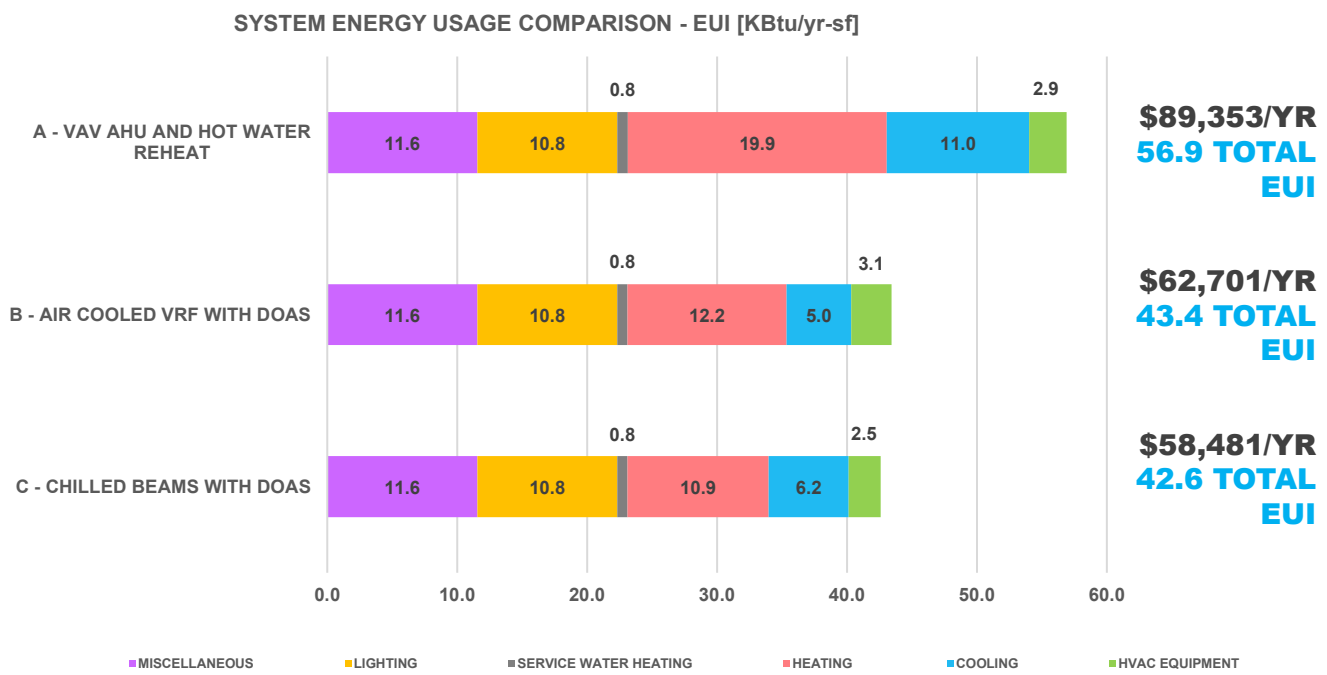
PROJECT PROCESS



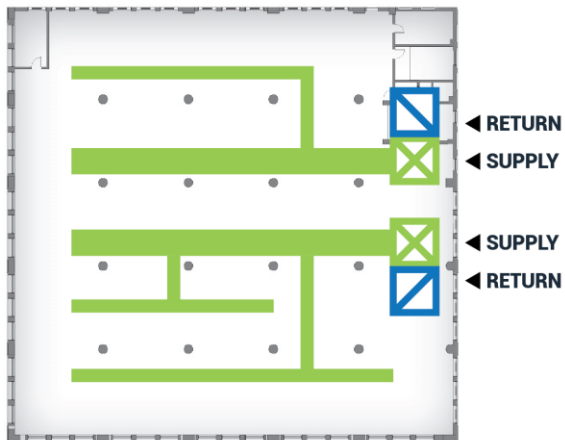
CHALLENGES TO THE PROJECT PROCESS



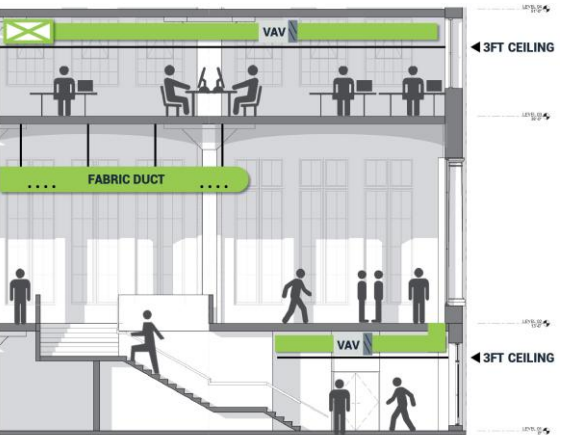
CHALLENGE 1: INTEGRATED DESIGN & ANALYSIS



ROOF

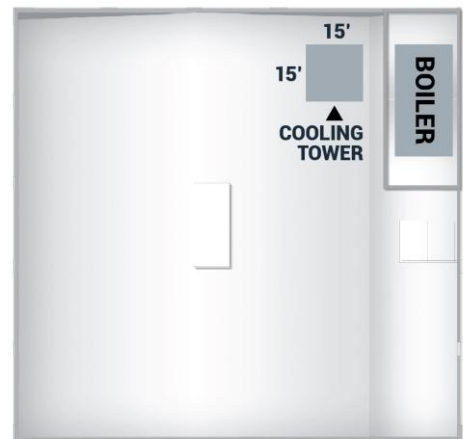


TYPICAL UPPER FLOOR

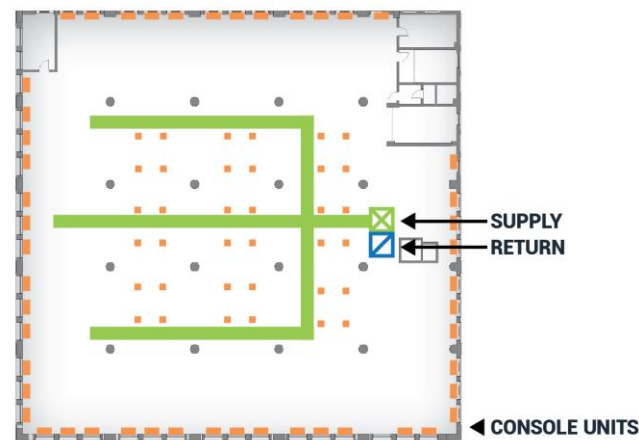


DIAGRAMMATIC SECTION

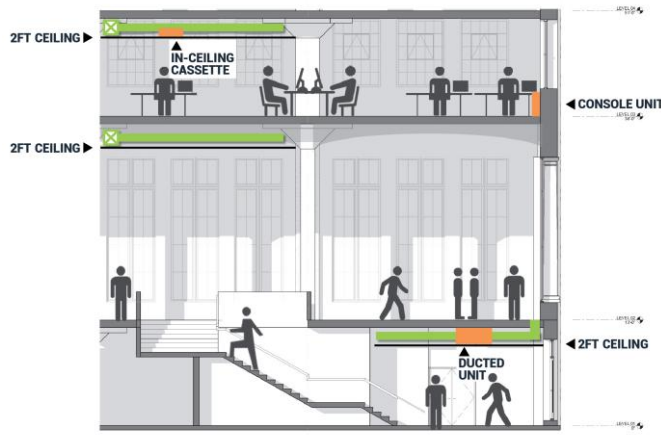
WATER COOLED VRF



ROOF

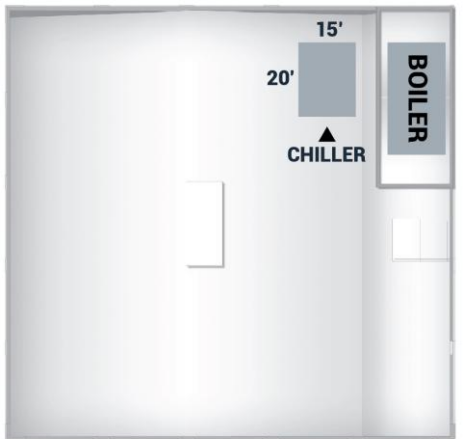


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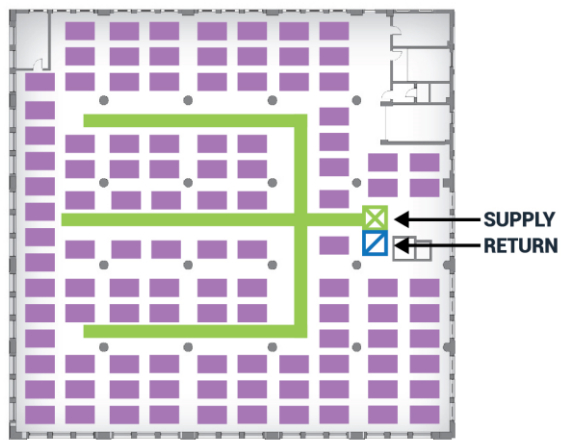


DIAGRAMMATIC SECTION

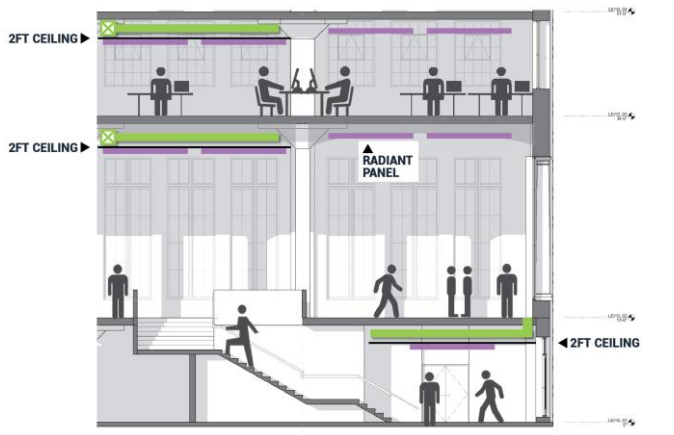
RADIANT



ROOF

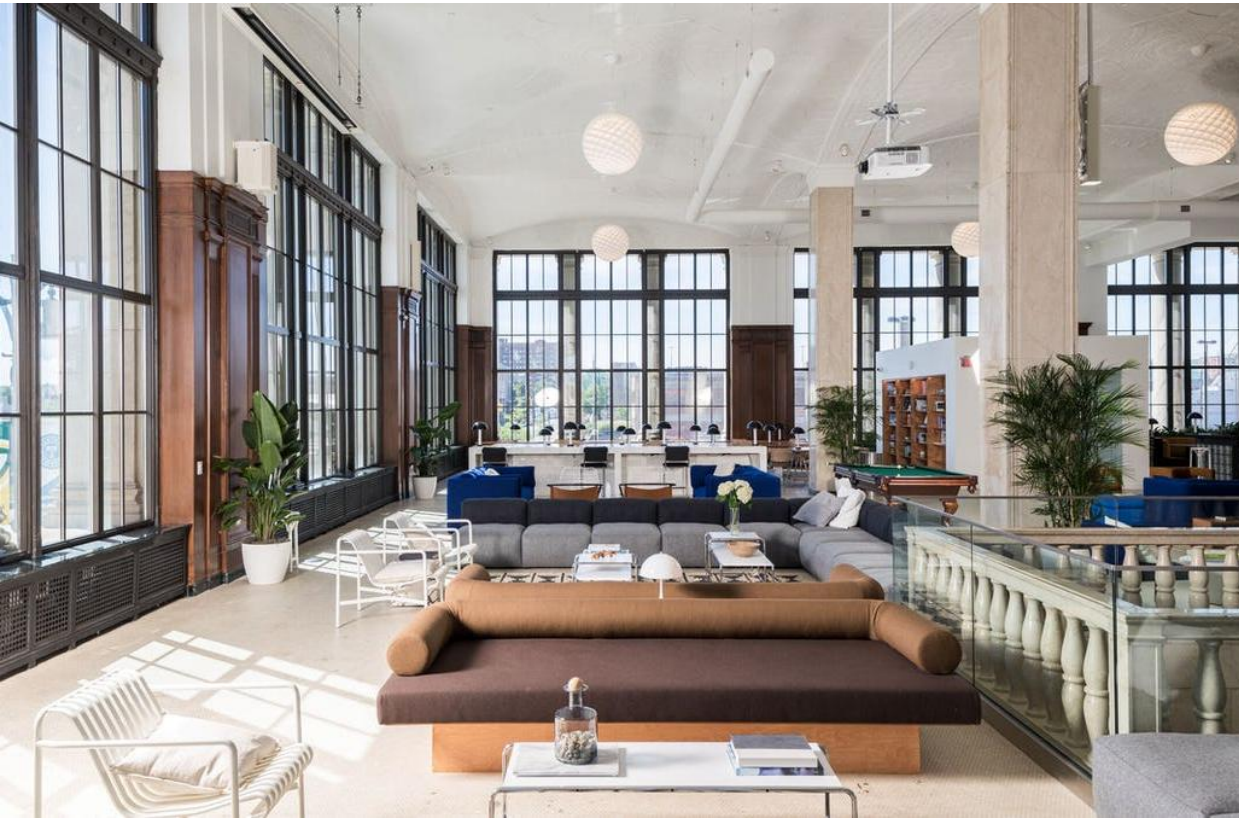


TYPICAL UPPER FLOOR



DIAGRAMMATIC SECTION

CHALLENGE 1: INTEGRATED DESIGN & ANALYSIS



What's Working?

- Tools and Computing Power
- Data Visualization

What's Not Working?

- Siloing between Analysis/Modeling and Design

Opportunities

- Designer led Analysis
- Cross Training



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CHALLENGE 2: METERING AND CONTROLS



METER TAG	METER TYPE	LOCATION OF METER	METER CONNECTION POINT	METERED EQUIPMENT	EQUIPMENT DESCRIPTION	LOCATION OF EQUIPMENT
M-1	MULTIPOINT METER	MAIN ELECTRICAL ROOM	LP-1	LP-AD-1	PANEL BOARD - LIGHTING	HEALTH CLINIC
M-2	MULTIPOINT METER	MAIN ELECTRICAL ROOM	MP-1	DOAS-1	DEDICATED OUTDOOR AIR SYSTEM	ROOF
M-3	MULTIPOINT METER	MAIN ELECTRICAL ROOM	MP-1	DOAS-2	DEDICATED OUTDOOR AIR SYSTEM	ROOF
M-4	MULTIPOINT METER	MAIN ELECTRICAL ROOM	MP-1	DOAS-3	DEDICATED OUTDOOR AIR SYSTEM	ROOF
M-5	MULTIPOINT METER	MAIN ELECTRICAL ROOM	MP-1	MAU-1	MAKE-UP AIR UNIT	ROOF
M-6	MULTIPOINT METER	MAIN ELECTRICAL ROOM	MP-1	MP-2	PANEL BOARD - HVAC EQUIPMENT	MAIN ELECTRICAL ROOM
M-7	MULTIPOINT METER	MAIN ELECTRICAL ROOM	MP-2	KEF-1	KITCHEN EXHAUST FAN	ROOF
M-8	MULTIPOINT METER	MAIN ELECTRICAL ROOM	MP-L-1	KEF-2	KITCHEN EXHAUST FAN	ROOF
M-9	MULTIPOINT METER	MAIN ELECTRICAL ROOM	MP-L-1	DWH-1	DOMESTIC WATER HEATER	KITCHEN
M-10	MULTIPOINT METER	MAIN ELECTRICAL ROOM	MP-L-1	DWH-2	DOMESTIC WATER HEATER	KITCHEN
M-11	MULTIPOINT METER	MAIN ELECTRICAL ROOM	MP-L-1	DWH-3	DOMESTIC WATER HEATER	WATER HEATERS 227
M-12	MULTIPOINT METER	CLOSET 167B	MP-L-2	KEF-3	KITCHEN EXHAUST FAN	ROOF
M-13	MULTIPOINT METER	CLOSET 167B	MP-L-2	KEF-4	KITCHEN EXHAUST FAN	ROOF
M-14	MULTIPOINT METER	CLOSET 167B	MP-L-2	DWH-4	DOMESTIC WATER HEATER	K1 LEARNING ZONE 215
M-15	MULTIPOINT METER	CLOSET 167B	MP-L-2	DWH-5	DOMESTIC WATER HEATER	WATER HEATERS 224
M-16	MULTIPOINT METER	MAIN ELECTRICAL ROOM	RP-1A	RP-1A CCT NO 31	EV CHARGING STATION	MAIN ELECTRICAL ROOM
M-17	MULTIPOINT METER	MAIN ELECTRICAL ROOM	RP-1A	RP-1A CCT NO 33	EV CHARGING FUTURE	MAIN ELECTRICAL ROOM
M-18	MULTIPOINT METER	MAIN ELECTRICAL ROOM	RP-1A	RP-1A CCT NO 35	EV CHARGING FUTURE	MAIN ELECTRICAL ROOM
M-19	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD MSB	C-1	CHILLER	ROOF
M-20	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD MSB	LP-1	PANEL BOARD - LIGHTING	MAIN ELECTRICAL ROOM
M-21	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD MSB	FUTURE SOLAR PV SYSTEM	SOLAR SYSTEM	ROOF
M-22	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD MSB	KP-1	PANEL BOARD - KITCHEN	KITCHEN OFFICE
M-23	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD MSB	MSB	MAIN SWITCHBOARD METER	MAIN ELECTRICAL ROOM
M-24	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD MSB	MP-1	PANEL BOARD	MAIN ELECTRICAL ROOM
M-25	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD MSB	T-MP-1	PANEL BOARD - EQUIPMENT	MAIN ELECTRICAL ROOM
M-26	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD MSB	LIGHTING INVERTER	LIGHTING INVERTER	MAIN ELECTRICAL ROOM
M-27	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD MSB	ELEVATOR	ELEVATOR	MAIN ELECTRICAL ROOM
M-28	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-1A	PANEL BOARD - RECEPTALS	MAIN ELECTRICAL ROOM
M-29	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-1B	PANEL BOARD - RECEPTALS	MAIN ELECTRICAL ROOM
M-30	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-1C	PANEL BOARD - RECEPTALS	MAIN ELECTRICAL ROOM
M-31	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-1D	PANEL BOARD - RECEPTALS	EARLY CHILDHOOD 104
M-32	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-1E	PANEL BOARD - RECEPTALS	EARLY CHILDHOOD 104
M-33	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-2A	PANEL BOARD - RECEPTALS	CIRCULATION 290A
M-34	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-2B	PANEL BOARD - RECEPTALS	CIRCULATION 290A
M-35	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-2C	PANEL BOARD - RECEPTALS	CIRCULATION 290B
M-36	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-2D	PANEL BOARD - RECEPTALS	CIRCULATION 290B
M-37	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-2E	PANEL BOARD - RECEPTALS	CIRCULATION 290C
M-38	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-2F	PANEL BOARD - RECEPTALS	CIRCULATION 290C
M-39	MULTIPOINT METER	MAIN ELECTRICAL ROOM	SWITCHBOARD RDP	RP-AD-1	PANEL BOARD - RECEPTALS	HEALTH CLINIC



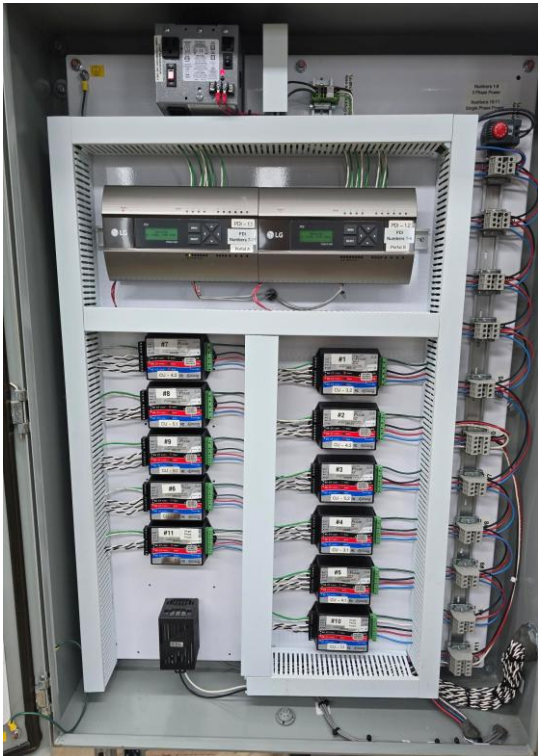
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What's Working?

- Technology - Hardware and Software
- Visibility into Data

What Not Working?

- Install and Start Up
- Maintenance



Apartment	Indoor Unit	Hourly Usage	Daily Usage	Weekly Usage	Annual Usage
201	210 Living	0.00 kW-hr	0.00 kW-hr	0.00 kW-hr	0.00 kW-hr
	211 Bed	0.00 kW-hr	0.00 kW-hr	3.77 kW-hr	11.02 kW-hr
203	216 Living	0.00 kW-hr	0.02 kW-hr	1.80 kW-hr	19.50 kW-hr
	217 Bed	0.00 kW-hr	0.00 kW-hr	0.02 kW-hr	0.94 kW-hr
204	252 Living	0.03 kW-hr	0.03 kW-hr	3.71 kW-hr	25.12 kW-hr
	253 Bed	0.00 kW-hr	0.00 kW-hr	0.00 kW-hr	0.01 kW-hr
205	223 Bed	0.00 kW-hr	0.00 kW-hr	0.00 kW-hr	0.03 kW-hr
	222 Living	0.03 kW-hr	0.03 kW-hr	3.71 kW-hr	25.12 kW-hr
206	248 Living	0.01 kW-hr	0.11 kW-hr	7.30 kW-hr	45.20 kW-hr
	247 Bed	0.00 kW-hr	0.00 kW-hr	0.03 kW-hr	0.07 kW-hr
207	228 Living	0.02 kW-hr	0.04 kW-hr	1.04 kW-hr	6.60 kW-hr
	239 Living	0.00 kW-hr	0.00 kW-hr	0.00 kW-hr	4.12 kW-hr
208	240 Bed	0.00 kW-hr	0.00 kW-hr	1.71 kW-hr	9.40 kW-hr
	233 Bed	0.01 kW-hr	0.04 kW-hr	1.28 kW-hr	4.77 kW-hr
209	234 Living	0.06 kW-hr	0.24 kW-hr	13.65 kW-hr	58.94 kW-hr
	Total FCU Usage	2.94 kW-hr	12.75 kW-hr	736.26 kW-hr	4229.56 kW-hr



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Opportunities

- Policy
- Resources
- Training

CHALLENGE 3: BUILDING TURNOVER



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What's Working?

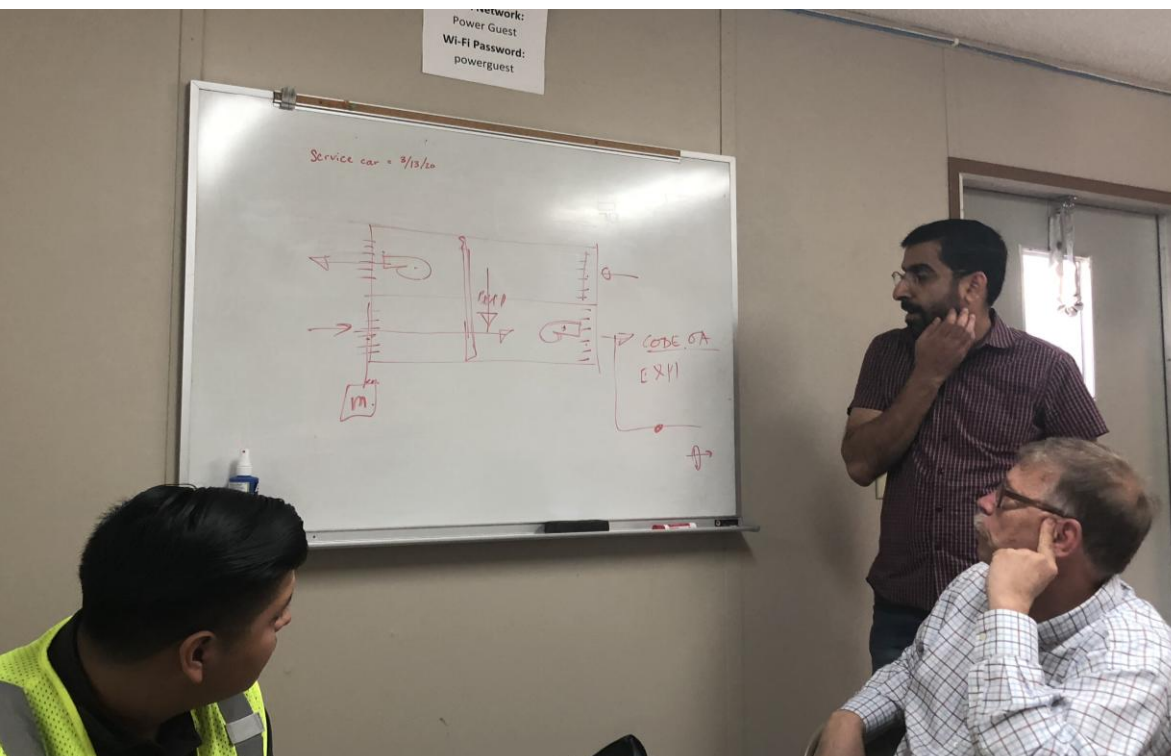
- Awareness
- Improved Technology

What's Not Working?

- Building Turnover
- Lack of Resources
- Prioritize comfort complaints over efficiency

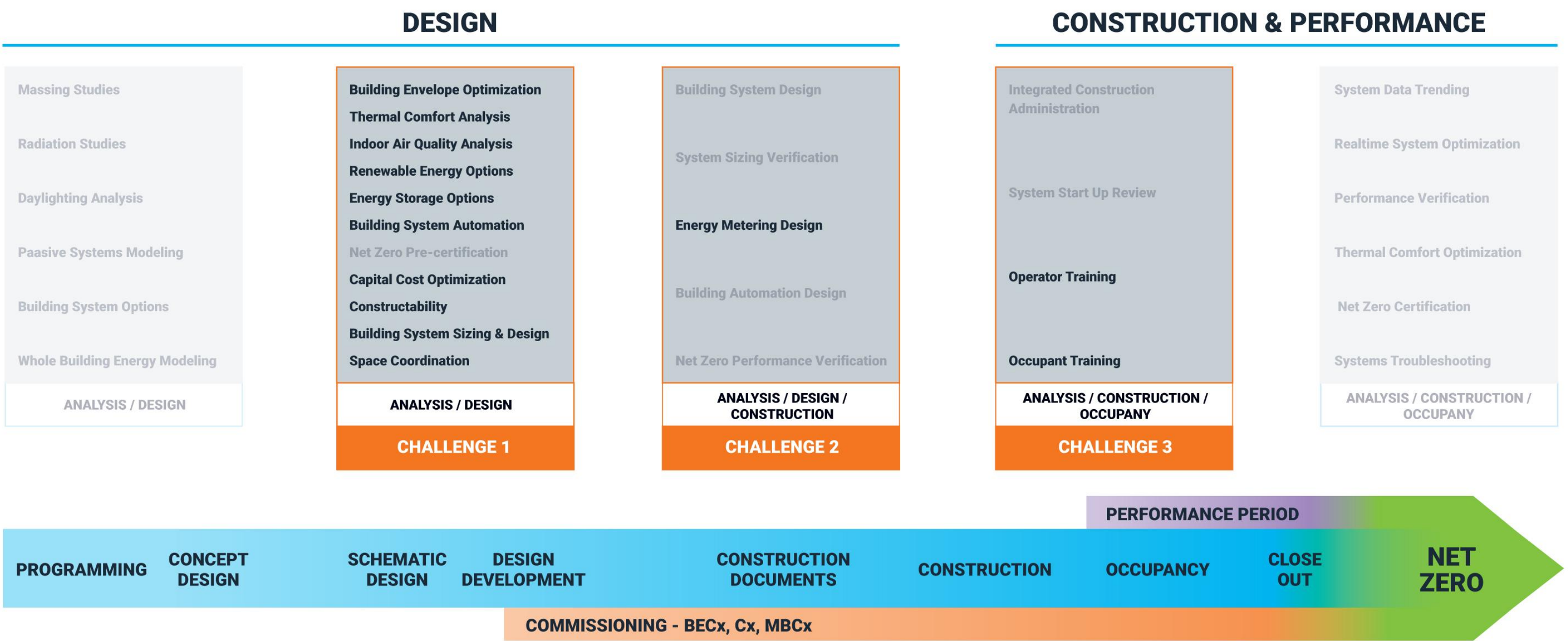
Opportunities

- Resources – grants and rebates for operations
- Policy



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NEXT STEPS FOR DECARBONIZATION



Designer led Analysis

Policy – “Energy Inspector”

Measurement and Reporting by End Use

Training Wheels for Building Turnover