All Electric Buildings: From Design to Reality

BayREN 2019 Energy Code & Beyond

March 3, 2020

Brad Jacobson, AIA, LEED AP
Principal
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Mission Driven: We Design For Climate

We've been a national leader in sustainable design since our founding more than 70 years ago – it's our passion and mission. We pioneered the Net Zero Energy concept over 15 years ago in response to climate change. Today we are leading the industry toward a Climate Positive future.

Our portfolio is outpacing the AIA 2030 Challenge, seeking a fully carbon-neutral built environment by 2030 with Net Zero Energy, Passive House, and LEED® certified projects. With the teamwork of our clients and partners, we firmly believe we will get there, together.

15 LEED® Platinum

17 LEED® Gold

3 LEED® Silver

11 Net-Zero Certified & Emerging Projects

6 Committee on the Environment AIA Awards

5 Livable Buildings UC Berkeley Center for the Built Environment

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The David & Lucile Packard Foundation Headquarters

49,200 SF Office Building

LEED Platinum

ILFI NZE certified

EHDD, Integral Group

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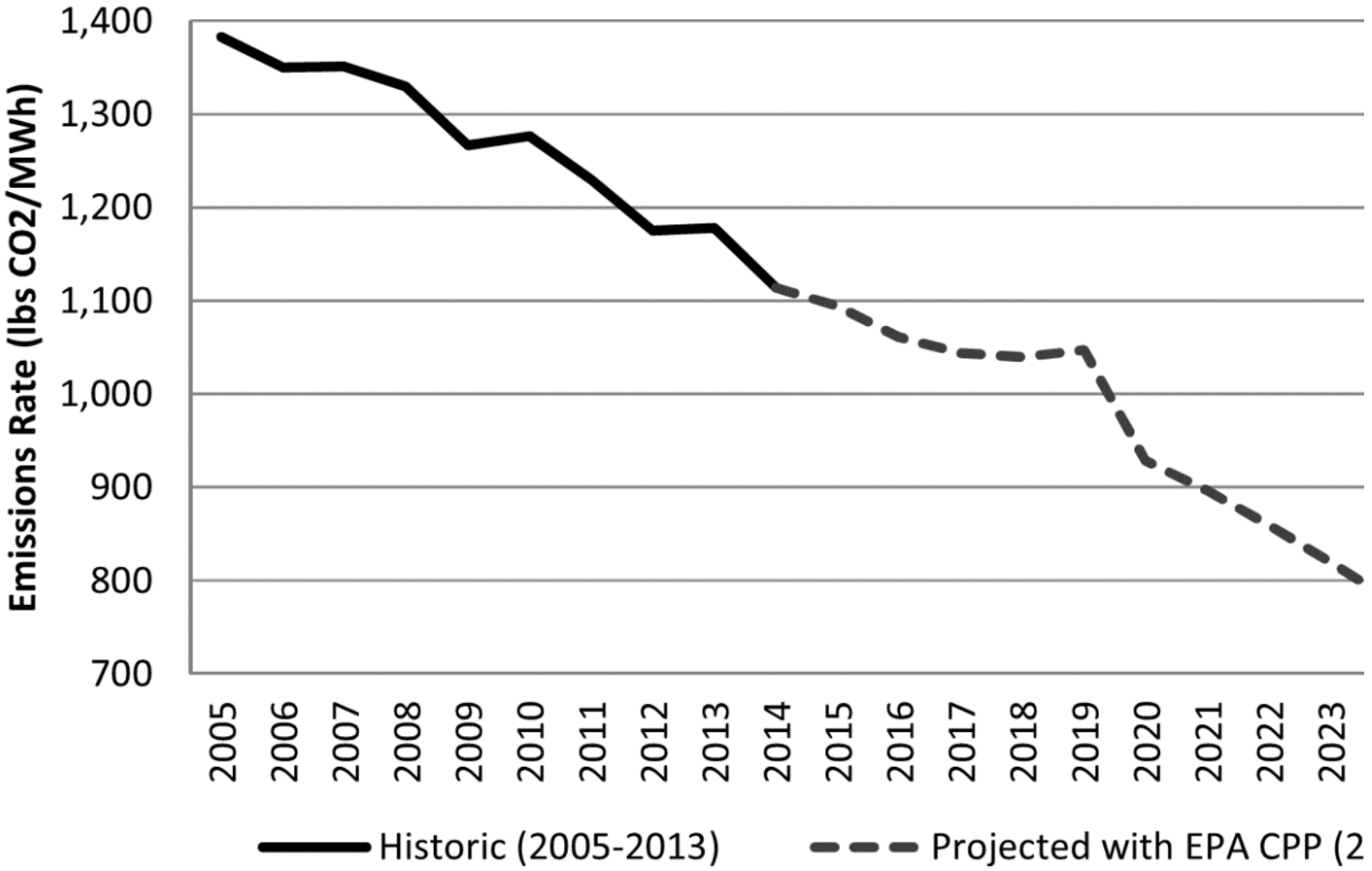
Optimizing Buildings for Electrification

+ $75,000	Premium for triple glazing
- $150,000	Eliminate perimeter heating
	and reduce # of heat pumps
= $75,000	Net first cost savings
- $200,000	PV reduction to reach NZE

The David and Lucile Packard Foundation

All Electric Buildings Reduce Emissions Over Time



Keith Dennis in The Electricity Journal http://dx.doi.org/10.1016/j.tej.2015.09.019

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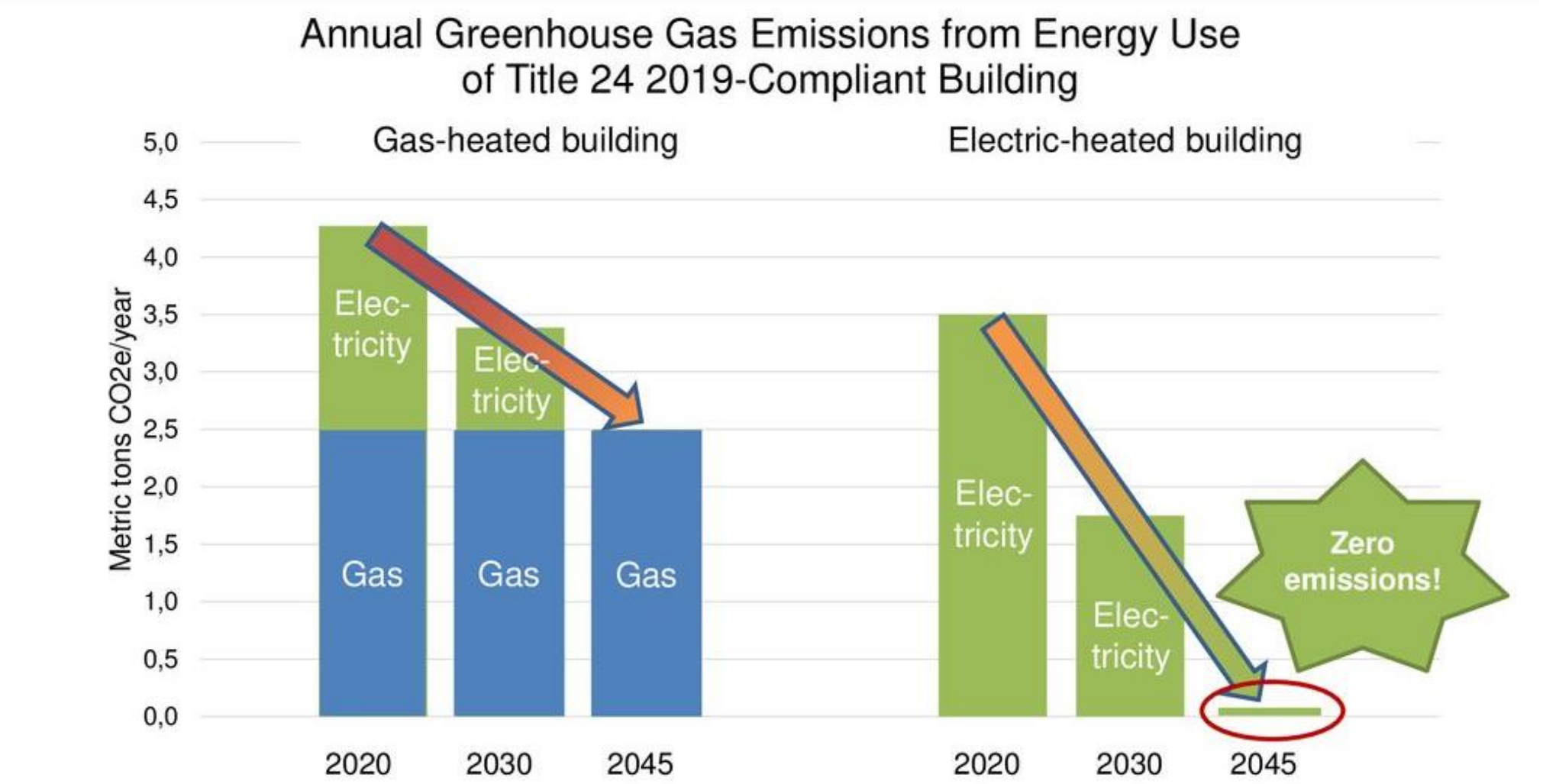
Building Electrification as a Pathway to Zero Emissions



NRDC analysis, climate zone 6 (Los Angeles) with rooftop solar. Including methane leakage

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Are We Ready for All Electric Buildings?

Boulder Commons

100,000 SF mixed-use office

ILFI NZE certification expected

EHDD, Integral Group

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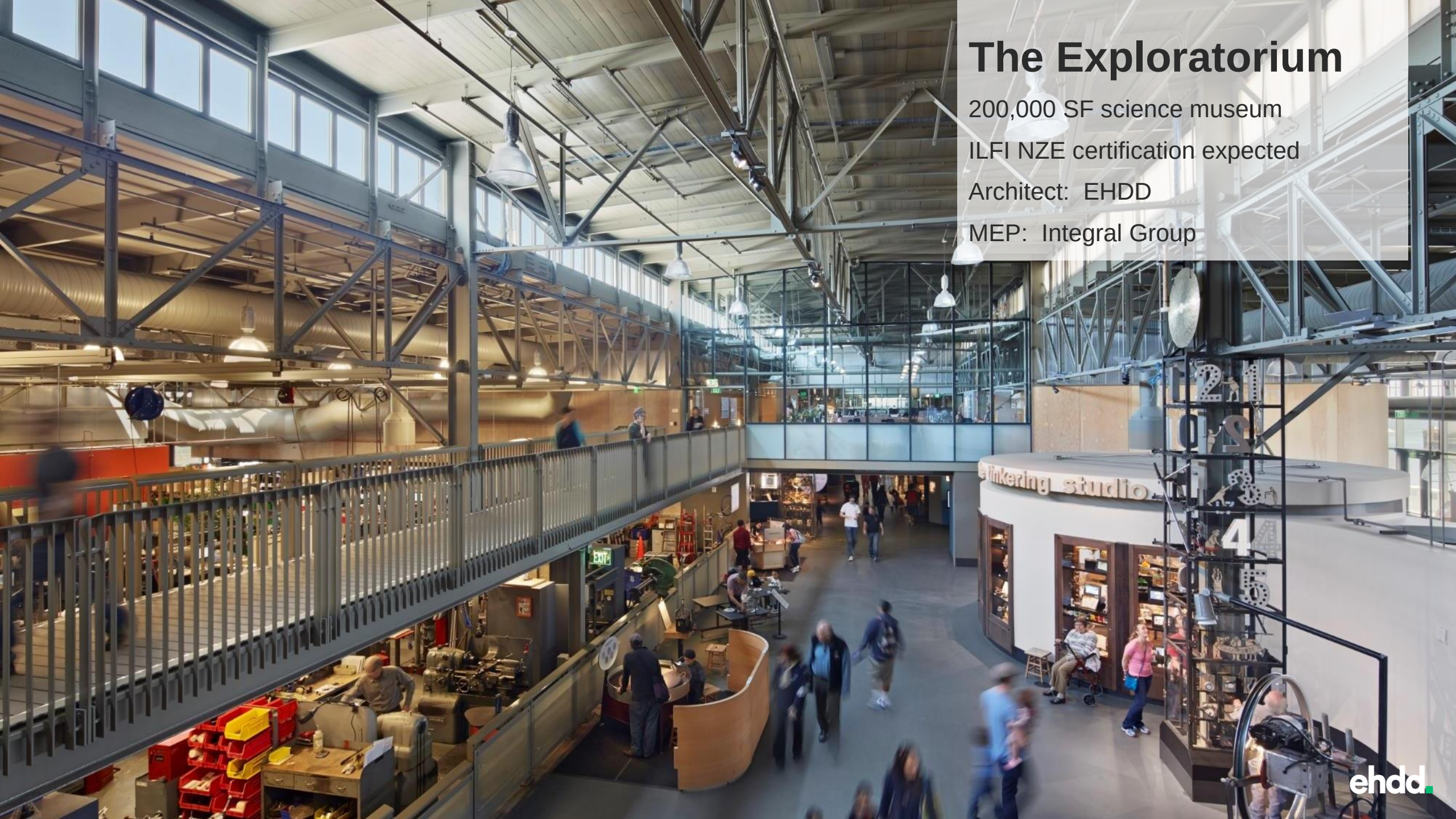

The Exploratorium

200,000 SF science museum

ILFI NZE certification expected

Architect: EHDD

MEP: Integral Group

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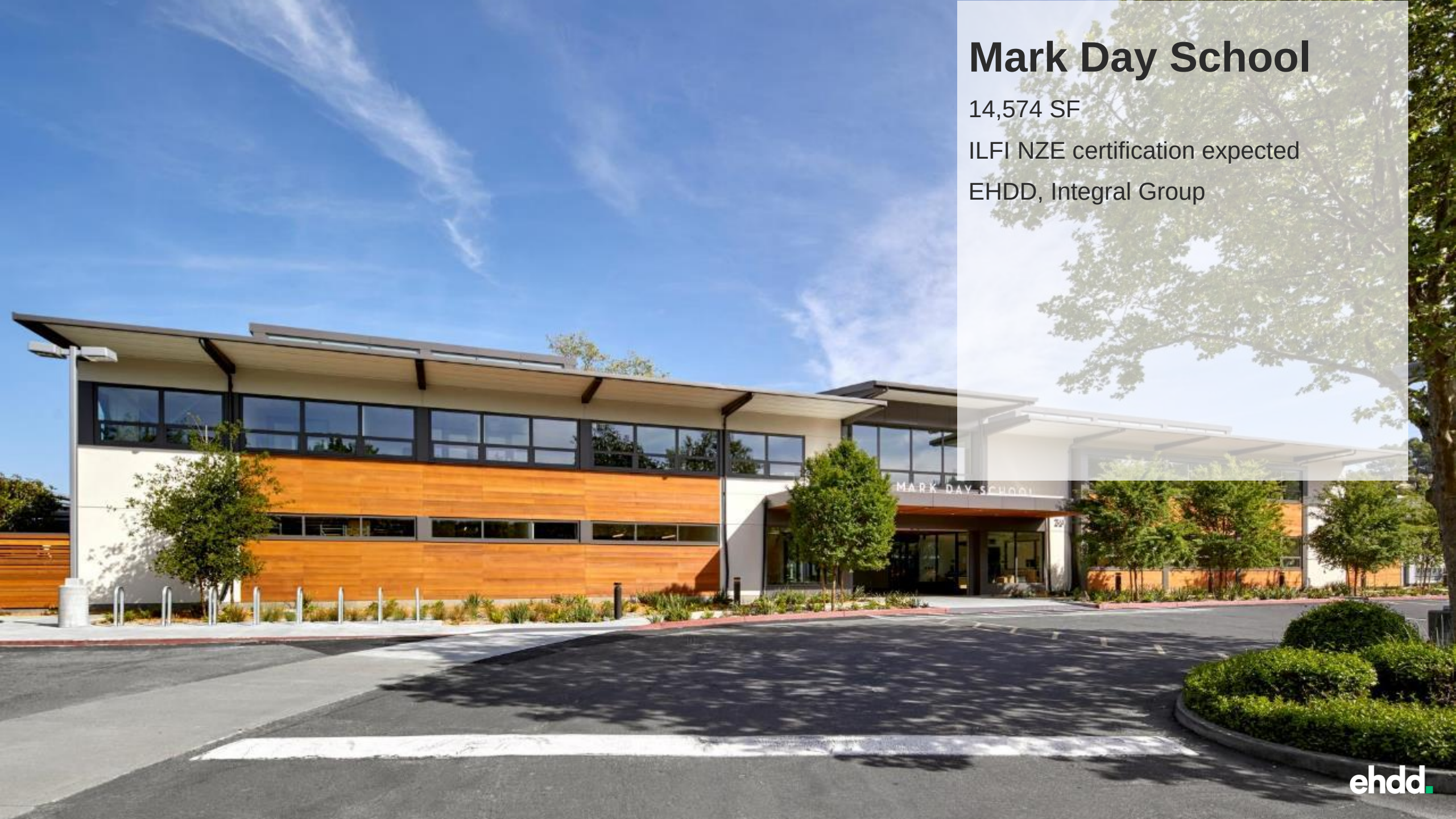

Mark Day School

14,574 SF

ILFI NZE certification expected

EHDD, Integral Group

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Lick Wilmerding High School

55,000 SF

ILFI NZE certification expected

EHDD, Integral Group

Marin Country Day School Sciences

11,500 SF

ILFI NZE certification expected

EHDD, Integral Group

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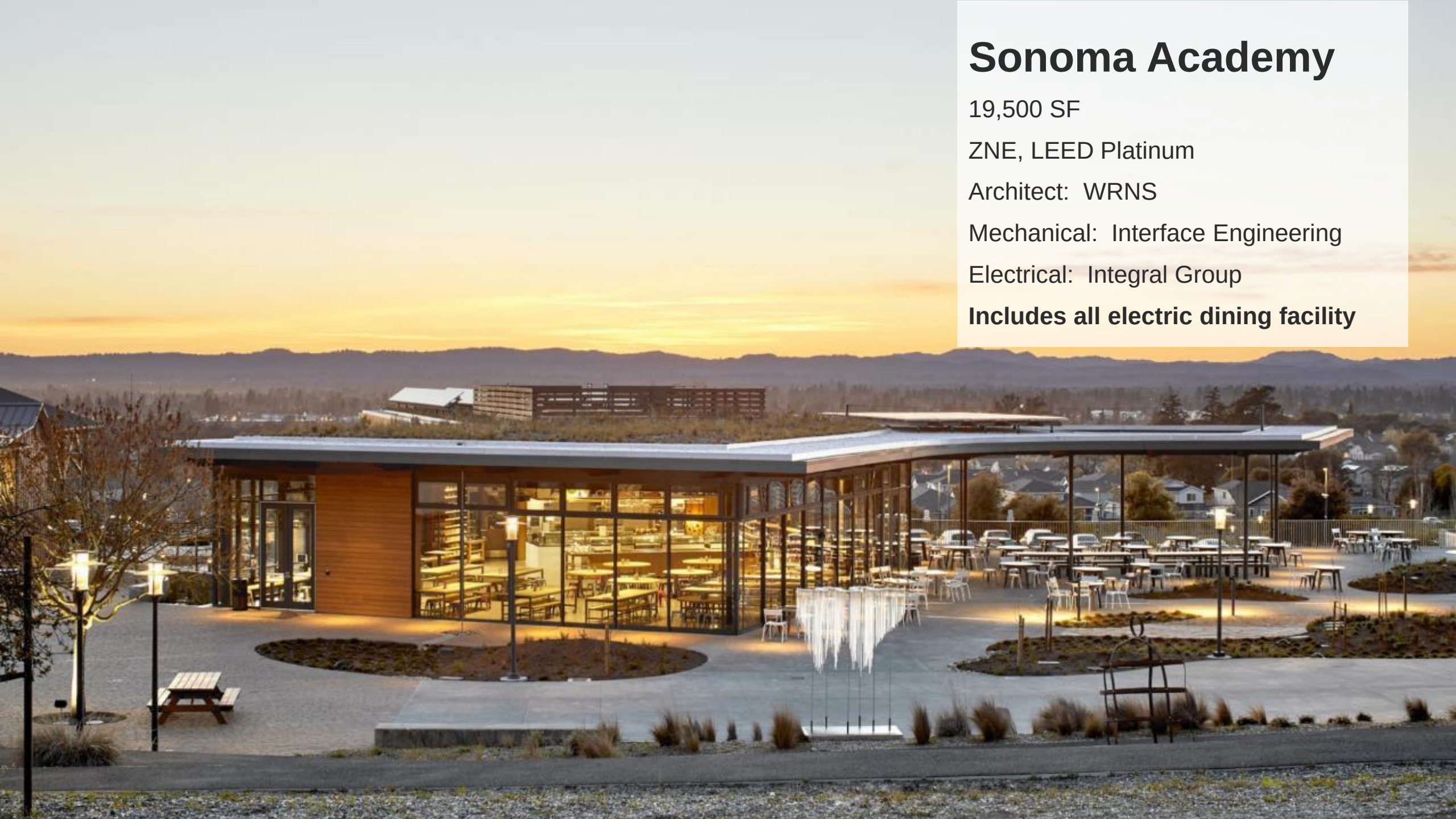

Sonoma Academy

19,500 SF

ZNE, LEED Platinum

Architect: WRNS

Mechanical: Interface Engineering

Electrical: Integral Group

Includes all electric dining facility

Claire Lilienthal Middle School

22,000 SF

SF Unified School District

Architect: Lionakis

SMUD Operations

Sacramento

361,000 SF

Office & Operations

Architect: Stantec

MEP: Guttmann & Blaevoet

270 Brannan

San Francisco

SF, Office

Perkins & Will

Interface Engineering

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500 Santana Row

San Jose

236,000 SF, Office

WRNS Architects

Interface Engineering

700 Santana Row

San Jose

829,000 SF, Office

WRNS Architects

Interface Engineering

Adobe HQ

650,000 sf

San Jose

Architect: Gensler

SFO Admin

San Francisco

SF, Office

Cavagnero

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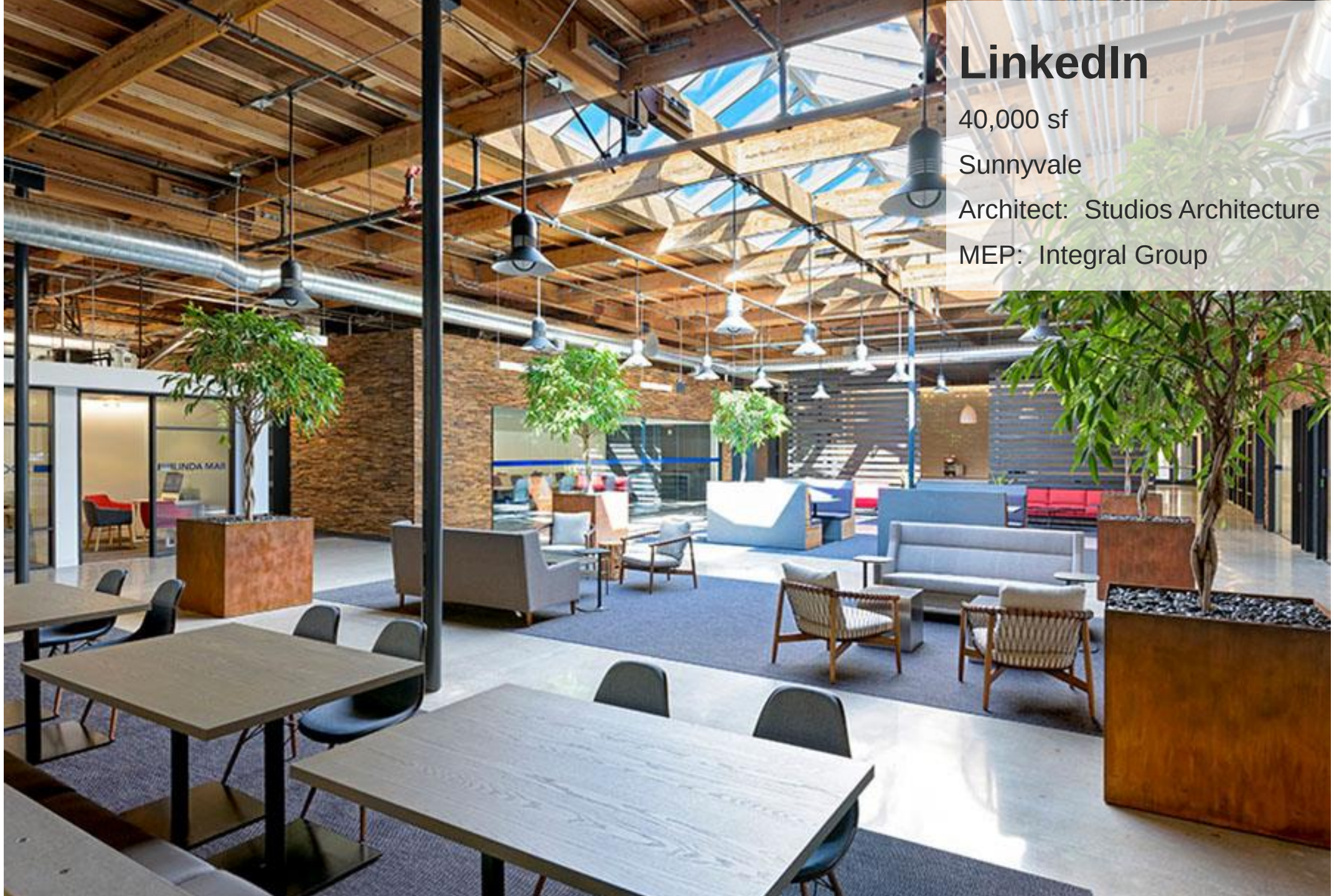

LinkedIn

40,000 sf

Sunnyvale

Architect: Studios Architecture

MEP: Integral Group

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435 Indio

Sunnyvale Office Renovation

31,000 SF Office Renovation

NZE, Zero Carbon

Architect: RMW

MEP: Integral Group

380 N. Pastoria

Mountain View Office Renovation

42,000 SF Office Renovation

NZE, Zero Carbon

Architect: WRNS Studio

MEP: Integral Group

Edwina Benner Plaza, Sunnyvale

Affordable – 66 Units, Occupied

MidPen Housing, David Baker Architects, Emerald City Engineers, Association for Energy Affordability
Central Heat Pump Water Heating

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2437 Eagle Ave, Alameda

Affordable – 20 Units, Occupied

Housing Authority of the City of Alameda, Anne Philips Architecture, Fard Engineers, Association for Energy Affordability

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Casa Adelante, 2060 Folsom, San Francisco

127 Units, under construction

Mithun: "We have found first costs to be neutral going all electric"

Developers: TNDC/CCDC, Architect: Mithun & YA Studio, Association for Energy Affordability
Central Heat Pump Water Heating

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Balboa Upper Yard Family Apts, San Francisco

120 units, in design development

Developer Mission Housing Development & Related California, Architect: Mithun
Central Heat Pump Water Heating

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Maceo May Veterans Apartments, Treasure Island

105 units, in permitting

Chinatown Community Development Center, Swords to Plowshares, Mithun, Association for Energy Affordability
Central Heat Pump Water Heating

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681 Florida, San Francisco

136 units total, In Design Development

Developers: TNDC & MEDA, Architect: Mithun
Central Heat Pump Water Heating

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Linda Vista, Mountain View

101 units, In bidding phase

Palo Alto Housing is Developer, architect is Van Meter Williams Pollack, Integral Group
Central Heat Pump Water Heating

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Coliseum Place, 905 72nd Ave, Oakland

59 units, In Construction Documents

DBA:
"Construction cost is not an issue IF you can help subcontractors understand what you are asking them to price"

Developer Resources for Community Development, David Baker Architects, Energy Modeling by Redwood Energy, MEP by EDesignC

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Quetzal Gardens, San Jose

71 Units

RCD Housing is Developer, SGPA Architects, Redwood Energy

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St. Paul's Commons, Walnut Creek

Affordable – 45 Units, Under construction

Pyatok:

"It is critical to share information about best practices and lessons learned"

RCD, Pyatok Architects, Fard Engineers, Association for Energy Affordability
Central Heat Pump Water Heating

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2437 Eagle Ave, Alameda

Affordable – 20 Units, Occupied

Housing Authority of the City of Alameda, Anne Philips Architecture, Fard Engineers, Association for Energy Affordability

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Altamira Family Apartments, Sonoma

Affordable, 48 units

Developer is SAHA, Pyatok Architects, Fard Engineers, Association for Energy Affordability

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Stoddard Housing, Napa

Affordable – 50 Units, Under construction

Burbank Housing, Dahlin Group Architects, Emerald City Engineers, Association for Energy Affordability
Central Heat Pump Water Heating

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California Universities Are Transitioning to All-Electric Buildings

The University of California system and Stanford University are making all-electric buildings the default in new construction.

JUSTIN GERDES | SEPTEMBER 24, 2018

"No new UC buildings or major renovations after June 2019, except in special circumstances, will use on-site fossil fuel combustion, such as natural gas, for space and water heating"

https://www.greentechmedia.com/articles/read/california-universities-are-transitioning-to-all-electric-buildings#gs.QUr5W_E

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UC Davis Student Housing, Webster Hall Replacement

371 beds,

Design/Build, DPR GC, HKS Architects, Interface Engineering
Central Heat Pump Water Heating

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UC San Francisco Minnesota Street Housing

595 Units

Skanska is GC, Kieran Timberlake Architects, Point Energy Innovations
Nyle Central Heat Pump Water Heating

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UC Santa Cruz Student Housing West

750,000 sf, 3,000 beds, under construction

P3, Capstone is Developer, Sundt is GC, HED Architects, Interface Engineering
Central Heat Pump Water Heating

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- **LBNL Integrative Genomics Lab**
  - 81,000 SF Research Lab
  - Architect: Smith Group
  - MEP: Integral Group

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- **LBNL BioEpic Lab**
- 70,000 SF Research Lab
- Architect: Smithgroup

J. Craig Venter Institute Laboratory

44,600 SF Research Lab

ZGF, Integral Group

Kaiser Santa Rosa Medical Office

87,300 SF Medical Office

LEED Platinum, ZNE

Architect: HPS

MEP: Integral Group

Bradley Terminal, LAX

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All Electric Restaurants at LAX

Bradley Terminal

Andre Salvadar, So Cal Edison food service expert helped these tenants adapt to all electric, he's a great resource!

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Sonoma Clean Power Headquarters

14,400 SF Renovated Office Building

All Electric

First “Grid Optimal” Pilot Project

EHDD with Guttman & Blaevoet

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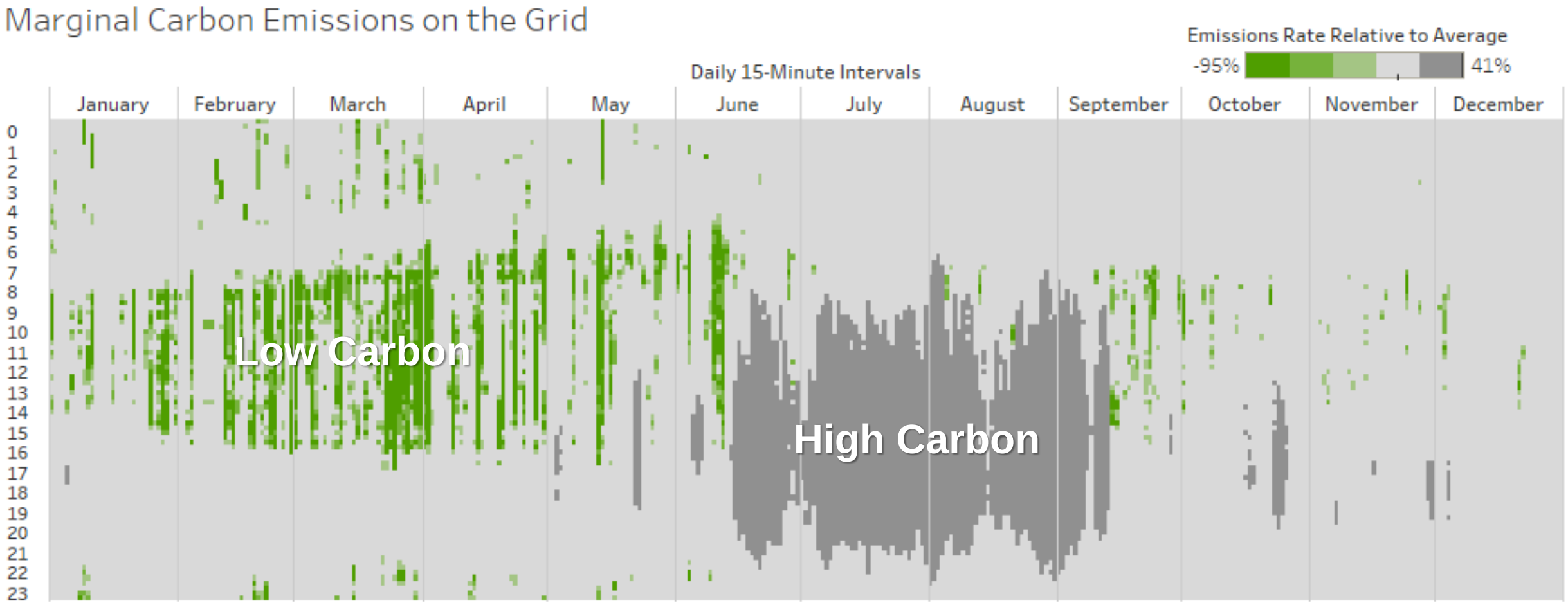
Carbon Intensity of the Grid Varies Over Time



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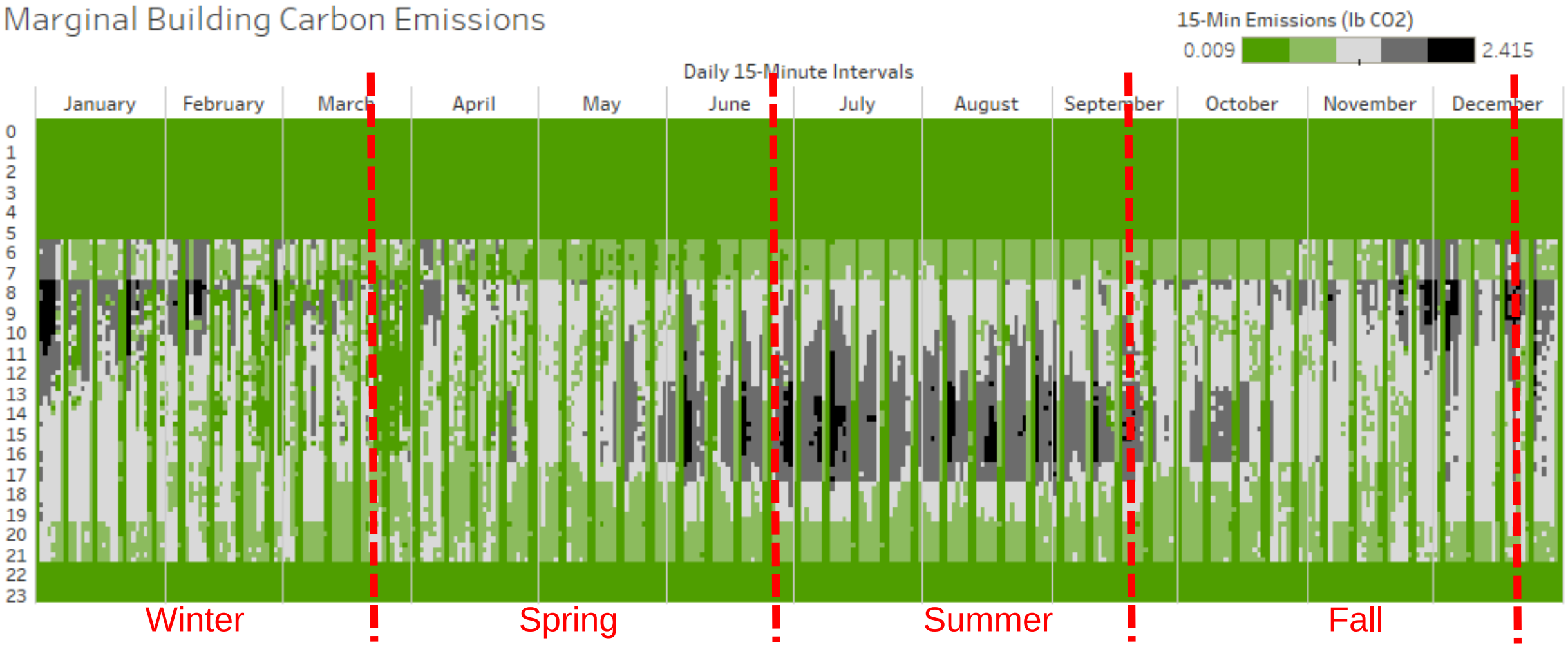
Project Building Emissions Based on Time of Use



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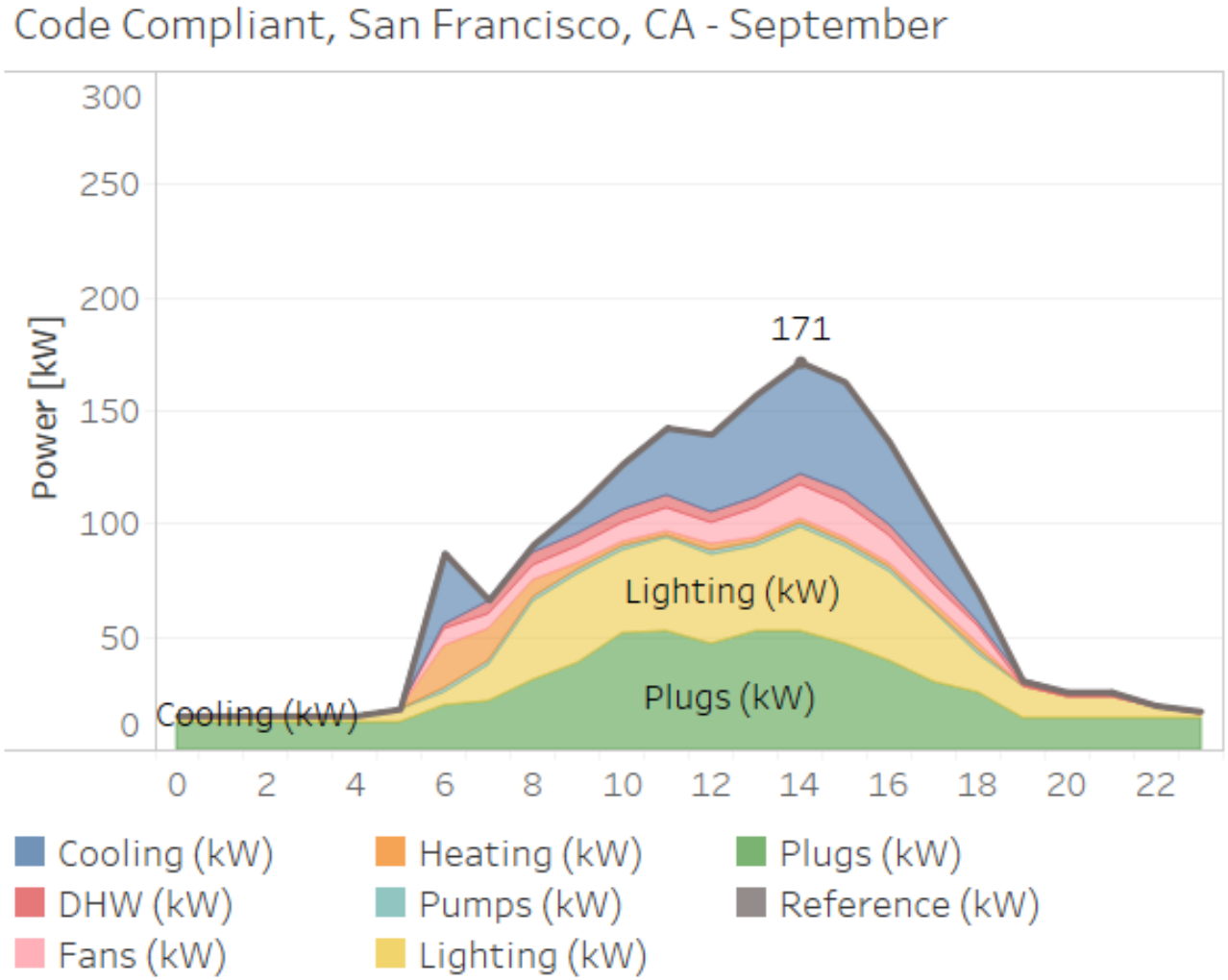
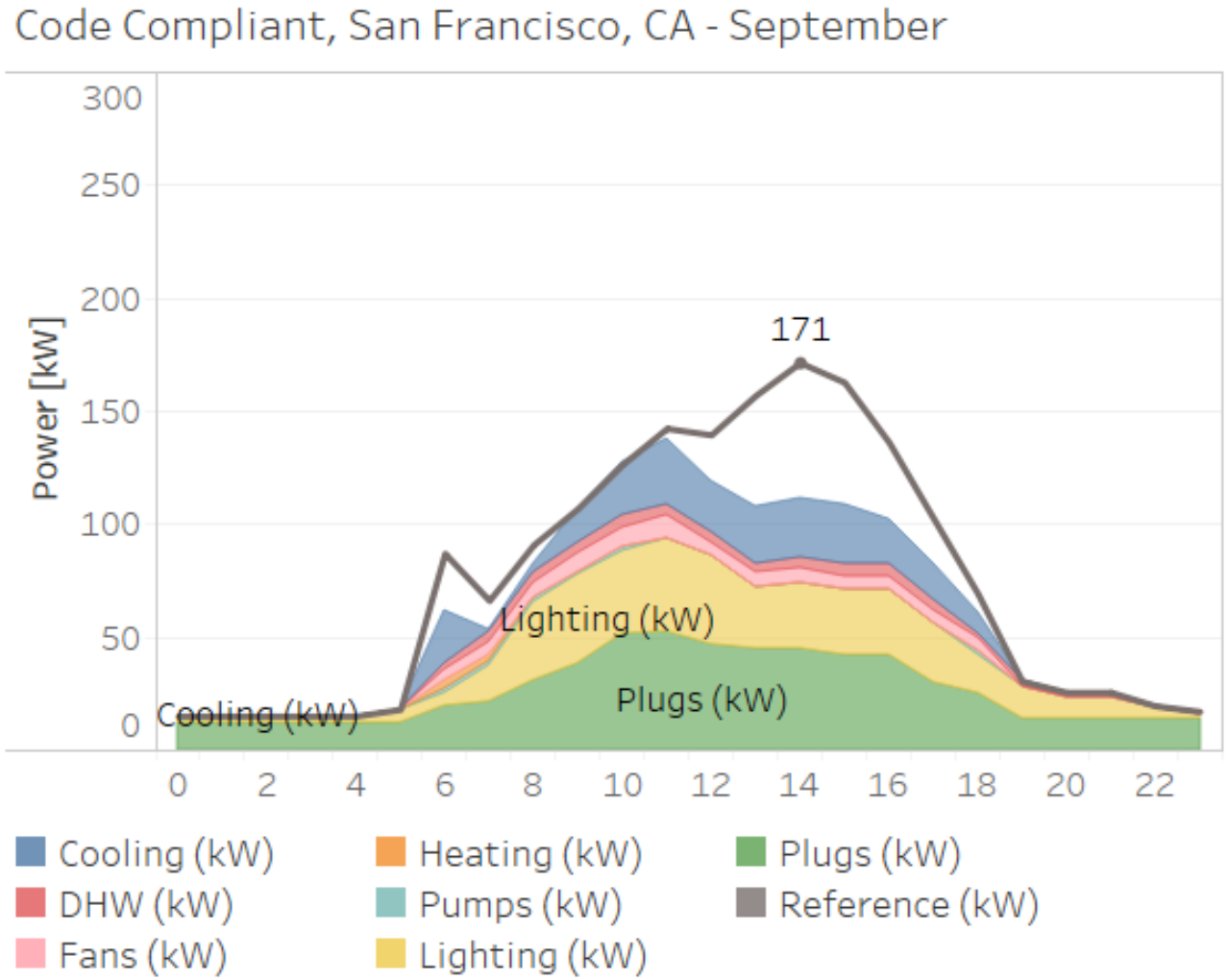
Design Measures Can Change Load Shape



Courtesy of NBI

Design Measures Can Change Load Shape



Courtesy of NBI

Building Measures Applied

Individual Measures

- Thermostat: Expanded Comfort Control
- Thermostat: Morning Preheating
- Thermostat: Afternoon Precooling
- Additional Thermal Mass (floors)
- Interior Automated Blinds
- Lighting Afternoon Demand Response (25% reduction)
- Grid Integrated Appliances Afternoon Response (25% reduction)

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Grid Optimal Strategy: Sunshading a Southwest Facade

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Designing for Load Shape at Sonoma Clean Power

Base Load Reduction Measures

Upgraded envelope: All new windows, insulation, air sealing

Exceptional daylighting: add skylighting and increase north windows

Destratification fans for thermal comfort

Peak Shifting and Shaving Measures

Interoperable “smart” Thermafusers

Temperature Setback

Lighting Demand Response

Early winter warm-up

30 kW Photovoltaic Array paired with 150 kWh battery

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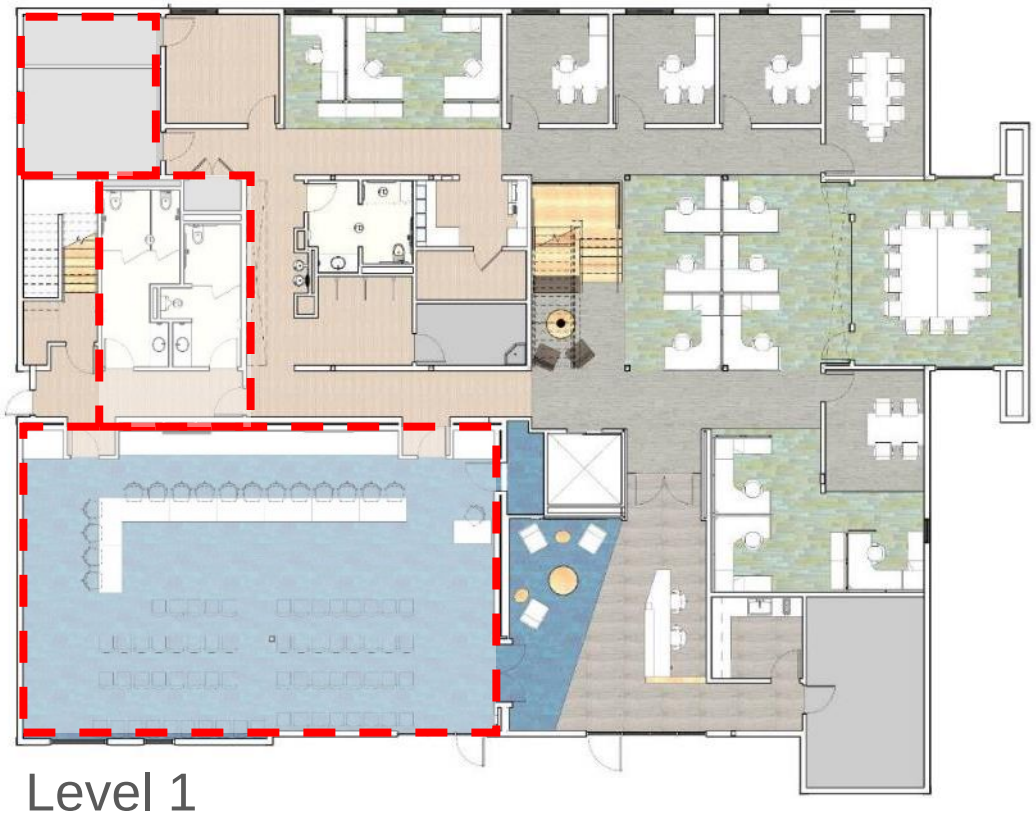
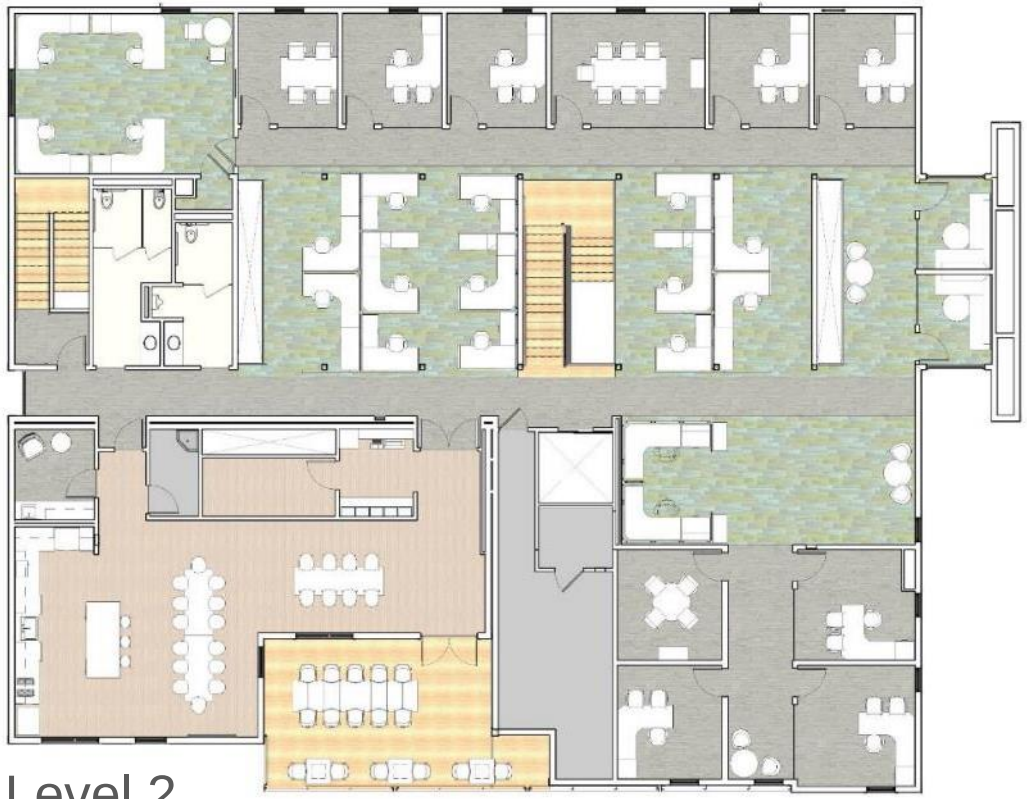
Emergency Operations Mode with Battery Back-Up Power



Level 1



Level 2

150 kWh battery, no PV system: Almost 3 hours.

150 kWh battery, 30 kW PV system on a sunny day: Just over 6 hours.

1MWh battery, no PV system: Over 18 hours.

1MWh battery, 30kW PV system on a sunny day: About 40 hours.

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Q: Is a single energy source smart with power shutoffs?

A: All new gas appliances require electricity

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