

DOCKETED

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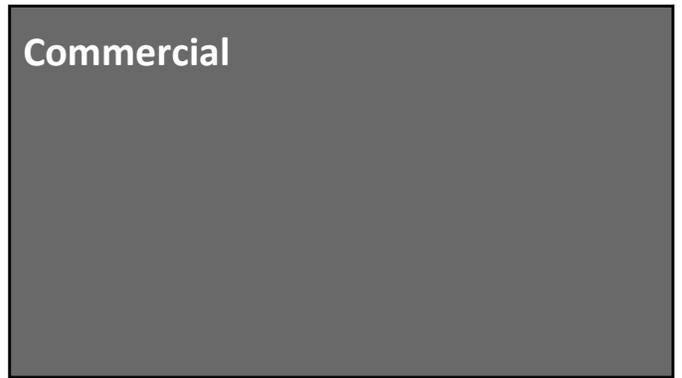
All Electric Building Examples

There is a strong shift toward all electric buildings in California as shown in the attached slide deck. We are seeing this across the state and designed by many different architecture and engineering firms.

Additional submitted attachment is included below.



1



2



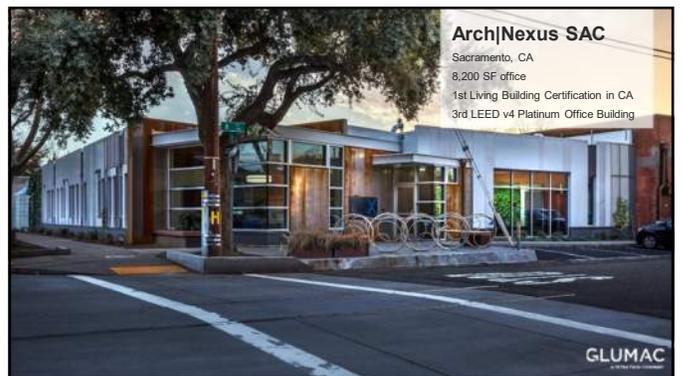
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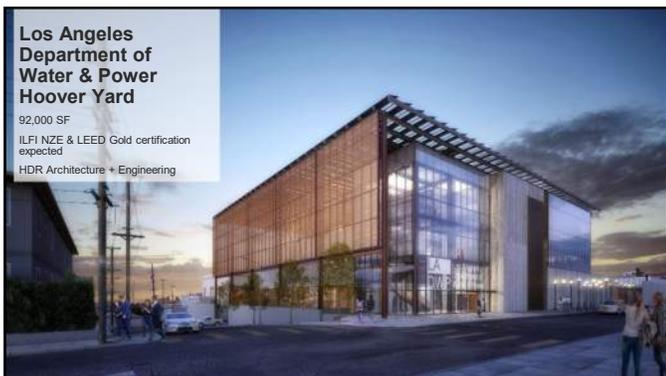
8



9



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11



12



**Downtown Office
UC Merced**
67,400 SF office
Architect: Heller Manus
MEP: Integral Group

13



**California Air
Resources Board**
Riverside, CA
404,000 SF office
ZGF Architecture
Affiliated Engineers

14



Audi Fletcher Jones
Costa Mesa, CA
42,000 SF Show Room and Dealership

GLUMAC

15



**CSUN
Sustainability Center**
Northridge, CA
4,000 SF campus building
LEED Platinum, Net Zero Energy
Gensler

GLUMAC

16



**California Lottery
Santa Fe Springs**
12,000 SF
Architect: LPAS
MEP: Integral Group

17



Boulder Commons
100,000 SF mixed-use office
ILFI NZE certification expected
EHDD, Integral Group

ehdd

18



The David & Lucile Packard Foundation Headquarters
 49,200 SF Office Building
 LEED Platinum
 ILFI NZE certified
 EHDD, Integral Group

ehdd

19



500 Santana Row
 San Jose
 236,000 SF Office
 WRNS Architects
 Interface Engineering

20



UC Berkeley - Berkeley Way
 320,000 SF
 Architect: WRNS
 Mechanical: Interface Engineering

© Lawrence Romano Photography

21



Bay Meadows
 1,000,000+ SF
 Architect: HOK
 Mechanical: Interface Engineering
 Electrical: Interface Engineering

© Bruce Dornoff

22



Santana Row Lot 11



UC Davis Webster Hall Replacement



American Geophysical Union

Hormoz Janssens, Principal
INTERFACE ENGINEERING

Almost all our projects are all-electric, I have only been using gas systems where required by the client.

Electric is almost always less expensive or cost neutral. Very rarely is it more expensive. Often it is our value engineering option.

We are doing a 500,000 sf all electric office with major cost savings using heat pumps vs a central plant.

Bay Meadows our all electric design for 1 million sf of development was significantly less expensive than a traditional rooftop package unit + boiler + reheat system.

A huge benefit for heat pumps is reducing water use.

We've done several all electric commercial food service projects that have been very successful. The Chef's quite skeptical at the beginning, but now say they will never go back to cooking on gas.

23



270 Brannan
 San Francisco
 SF Office
 Perkins & Will
 Interface Engineering

ehdd

24



SFO Admin

San Francisco
SF: Office
Cavagnero

25



30 Van Ness Avenue

800,000 SF
Developer: Lend Lease
Architect: SCB
MEP: Meyers+
Sustainability: Thornton Tomasetti

26



700 Santana Row

San Jose
829,000 SF, Office
WRNS Architects
Interface Engineering

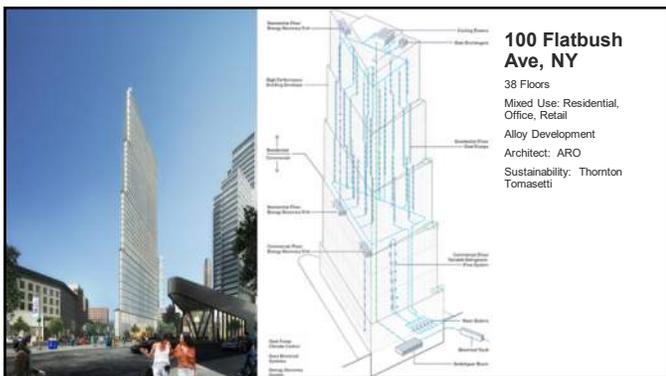
27



Adobe HQ

650,000 sf
San Jose
Architect: Gensler
MEP: Taylor Engineering

28



100 Flatbush Ave, NY

38 Floors
Mixed Use: Residential, Office, Retail
Alloy Development
Architect: ARO
Sustainability: Thornton Tomasetti

29



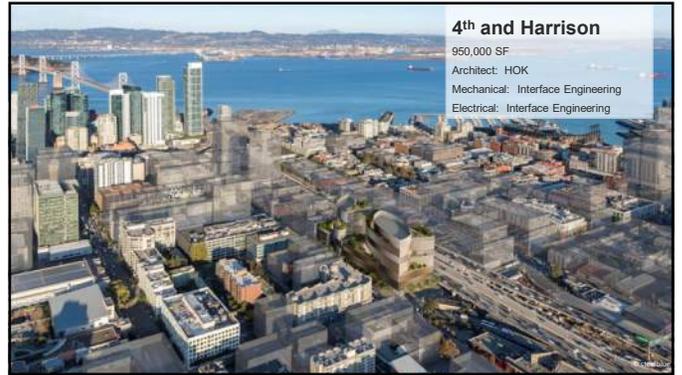
Microsoft Puget Sound

2,500,000 SF
Zero Carbon, LEED Platinum
Architect: LMN, NBBJ, WRNS, ZGF

30



31



32



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34



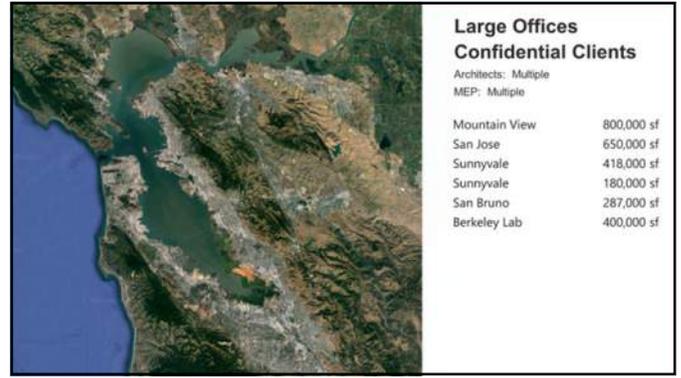
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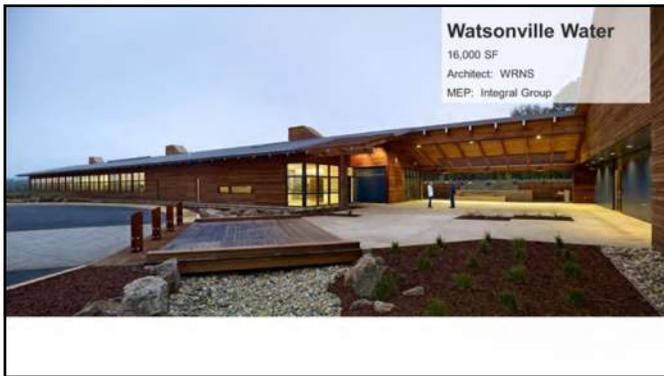
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41



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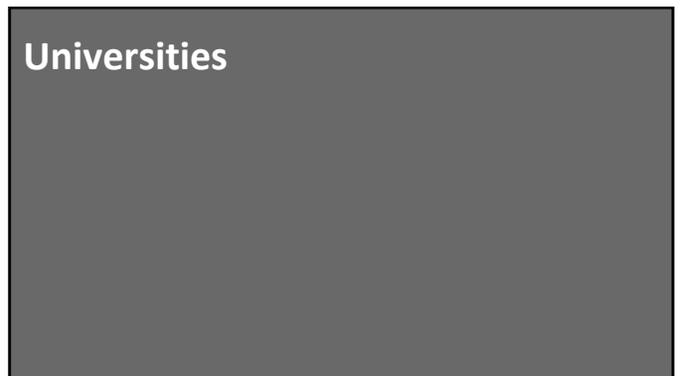
45



46



47



48



**David Phillips, Associate Vice President for Energy & Sustainability
UC Office of the President**

UNIVERSITY OF CALIFORNIA

The University of California has committed to carbon neutrality by 2025. We are prioritizing all-electric new buildings (required starting June 2019), and then electrifying existing buildings & systems over time.

Our studies show that all electric mechanical equipment capital costs are comparable for academic & lab buildings, and the costs are lower for residential buildings. Twenty year life cycle costs are comparable for Academic and labs buildings, and lower for residential buildings.

UC has many all-electric housing projects, office buildings, and laboratories now in place and many more in design.

UC's carbon neutrality strategies are pragmatic: don't allow growth to increase carbon emissions; and then transition *existing* buildings and systems off fossil fuels over time.

Decarbonizing Your Campus thru Electrification, SCUP 2019

49



CSU East Bay Core Library
100,000 SF
Architect: Carrier Johnson
MEP: Integral Group

50



City College of San Francisco Multi-Use Building
102,000 SF
Architect: Pfau Long Architecture
Mechanical: Interface Engineering

51



City College of San Francisco Diego Rivera Theatre
113,000 SF
Architect: TEF Design / LMW Architects
Mechanical: Interface Engineering

52

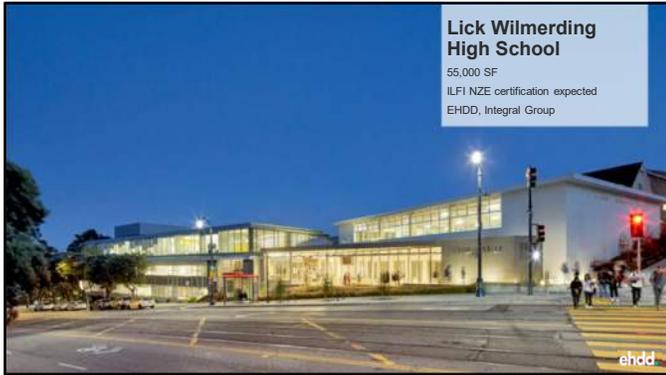


Boston University Computing & Data Sciences
345,000 SF
Architect: KPMB
MEP: BR+A

53

Schools

54



Lick Wilmerding High School

55,000 SF
ILFI NZE certification expected
EHDD, Integral Group

ehdd

55



Mark Day School

14,574 SF
ILFI NZE certification expected
EHDD, Integral Group

ehdd

56



Marin Country Day School Sciences

11,500 SF
ILFI NZE certification expected
EHDD, Integral Group

ehdd

57



Sonoma Academy

19,500 SF
ZNE, LEED Platinum
Architect: WRNS
Mechanical: Interface Engineering
Electrical: Integral Group

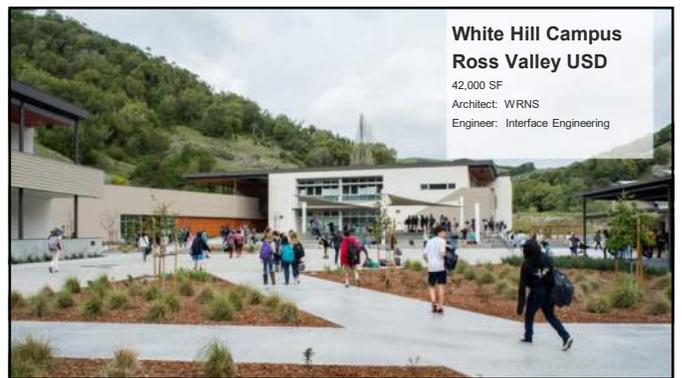
58



Sacred Heart School Library

6,800 SF
LEED Platinum
NZE certified
Architect: WRNS
MEP: Interface Engineering

59



White Hill Campus Ross Valley USD

42,000 SF
Architect: WRNS
Engineer: Interface Engineering

60



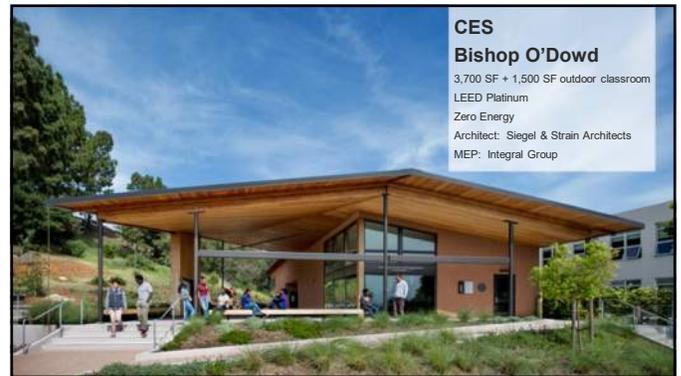
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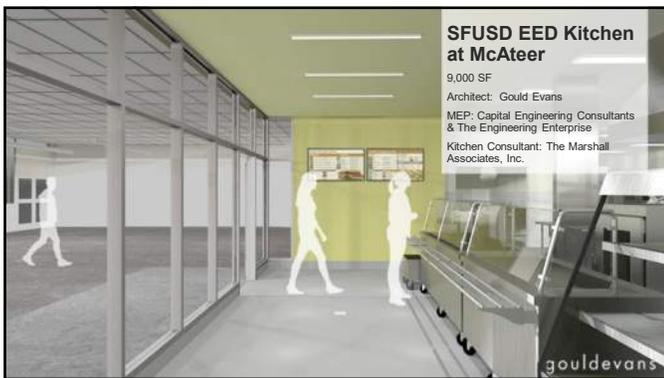
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67



68



69



70



71



72



Blue Oak Middle School
 16,000 SF
 All-Electric Campus
 Ratcliff, McCracken & Woodman

73



74



The Exploratorium
 200,000 SF science museum
 ILFI NZE certification expected
 Architect: EHDD
 MEP: Integral Group

75

Peter Rumsey, Principal
 PONTENERGY

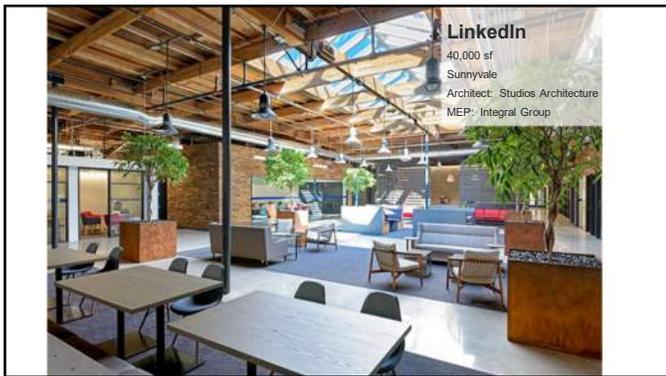
There are great examples of all electric buildings for virtually every building type that are cost effective. It is very easy for our firm to design these systems.

For Multifamily projects we are seeing a lot of developers use electric heating with high levels of insulation in apartments that don't need cooling.

All electric air-cooled VRF heat pumps are very common on multifamily projects up to ten stories where cooling is needed; this is very cost effective.

The market for all electric buildings and heat pumps has been making significant inroads in California, and this had gotten the attention of manufacturers. General Contractors and mechanical subcontractors are getting more familiar with this approach as well.

76



LinkedIn
 40,000 sf
 Sunnyvale
 Architect: Studios Architecture
 MEP: Integral Group

77



435 Indio Sunnyvale Office Renovation
 31,000 SF Office Renovation
 NZE, Zero Carbon
 Architect: RMW
 MEP: Integral Group

78



**415 N. Mathilda
Sunnyvale Office
Renovation**
33,750 SF Office Renovation
NZE, Zero Carbon
Architect: Studio G
MEP: Integral Group

79



**AP+I Office
Mountain View
Office Renovation**
14,300 SF Office Renovation
NZE, Zero Carbon
Architect: AP+I
MEP: Integral Group

80



**380 N. Pastoria
Mountain View
Office Renovation**
42,000 SF Office Renovation
NZE, Zero Carbon
Architect: WRNS Studio
MEP: Integral Group

81



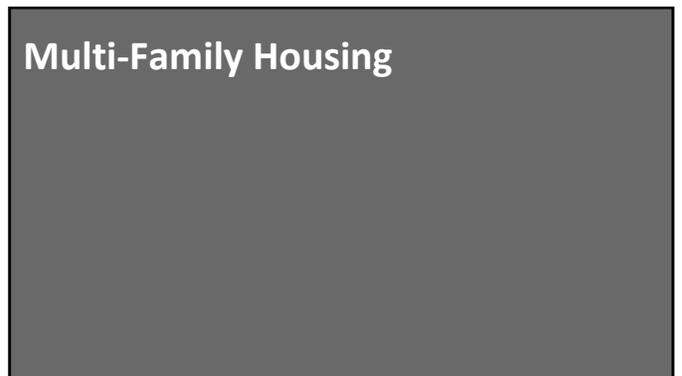
**IBEW Local 595
ZNE Center
San Leandro, CA
Renovation**
46,000 SF Office Renovation
NZE
Architect: FCGA
MEP: ACCO

82



• Pier 70
• San Francisco
• MEP BOD: Point Energy
Innovations

83



84

Walnut Park Apartments, Los Angeles County
Affordable - 64 Units

Hollywood Community Housing Corp, Koning Eizenberg Architecture, Breen Engineering, VCA Green Energy
Central Heat Pump Water Heating

85

UC Irvine Verano 8
1,050 beds

Architect: Mithun, MEP: Glumac. Central Heat Pump Hot Water

86

UC Irvine Student Housing West
1,441 beds

P3, Developer is American Campus Communities, KTCY Architects

87

University of California Riverside - North District
534,000 SF
Architect: Solomon Cordwell Buenz
Mechanical: Interface Engineering
Electrical: Interface Engineering

© American Campus Communities and SCS

88

UC San Diego Nuevo Housing West
1,300 beds

Mithun Architects

89

San Pedro Lofts, San Pedro
Affordable - 91 Units, completion in 2022

Developer: National Core, Architects: RRM Design Group, MEP: Metrics Mechanical, Energy modeling: National Core
Central Heat Pump Hot Water (Sanden)

90



91



92



93



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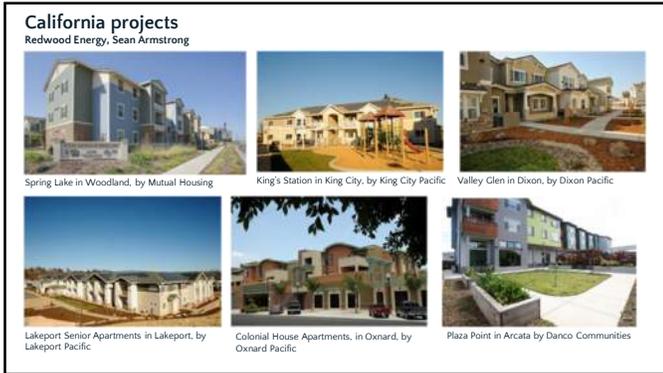
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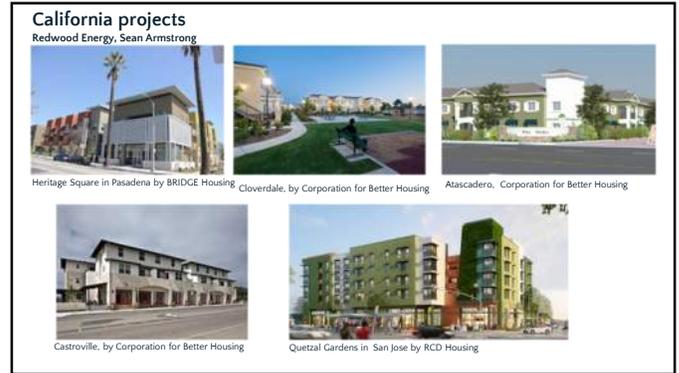
101



102



103



104

Sean Armstrong, Redwood Energy
Redwood Energy
Specialized All-Electric, Greenbuild & Affordable Housing

All-electric construction consistently reduces construction costs and ongoing utility bills.

It saves between \$2,500 and \$5,000 per residence for the developer to not plumb gas. When infrastructure and appliance costs are added up, a recent study done by Rocky Mountain Institute found a median increased cost of \$8,800 more per house for gas infrastructure, piping, purchasing appliances and venting.

Developers have been choosing all electric construction because it cost less to build and that trend has been going on for a long time now.

FREE DOWNLOAD

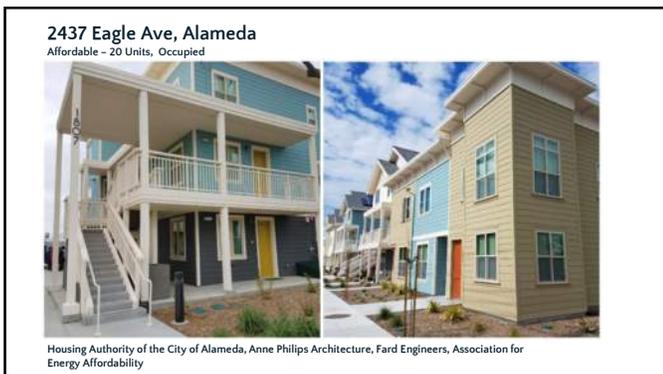
All Electric Construction Guides:
<https://www.redwoodenergy.tech/research/>

Quetzal Gardens, San Jose
Valley Glen, Dixon
Plaza Point, Arcata

105



106



107



108



Malcolm Harris, Principal
MITHÜN

We have a number of all-electric multifamily projects and I'm a huge, huge fan of this change to all-electric multifamily housing.

It is better in every way, a great simplification of the system. Less expensive, higher performance, less maintenance, more sustainable.

At Maceo May we saw big savings from eliminating gas fired hydronic heating, the gas connection, and the solar thermal which paid for continuous exterior insulation, energy recovery ventilators (eliminating Z-ducts), electric resistance heat, and PVs. With these upgrades we are beating Title 24 by 20%, getting more Green Points, and lower GHGs on a grid that's getting cleaner.

The occupants get better indoor air quality benefits from the energy recovery ventilators.

Casa Adelante, 2050 Folson, San Francisco
Maceo May Veterans Apartments, Treasure Island
Balboa Upper Yard Family Apts, San Francisco

109

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

110

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

111

Hunters Point Shipyard Block 52, San Francisco
136 units total, in Design Development



Developer McCormack, Baron, Salazar, Architect: Mithun
Central Heat Pump Water Heating

112

Hunters Point Shipyard Block 54, San Francisco
136 units total, in Design Development



Developer McCormack, Baron, Salazar, Architect: Mithun
Central Heat Pump Water Heating

113

681 Florida, San Francisco
136 units total, In Design Development



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

114

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

115

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

116

Quetzal Gardens, San Jose
71 Units



RCD Housing is Developer, SGPA Architects, Redwood Energy

117

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

118

Altamira Family Apartments, Sonoma
Affordable, 48 units



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

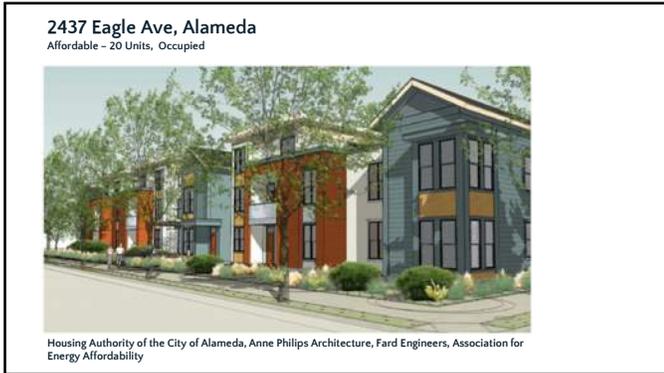
119

Stoddard Housing, Napa
Affordable - 50 Units, Under construction

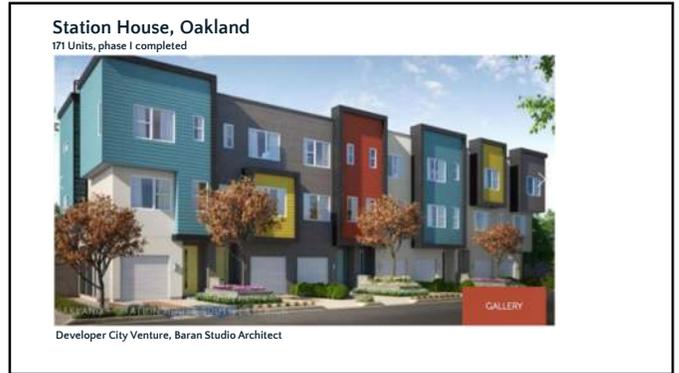


Burbank Housing, Dahlin Group Architects, Emerald City Engineers, Association for Energy Affordability
Central Heat Pump Water Heating

120



121



122



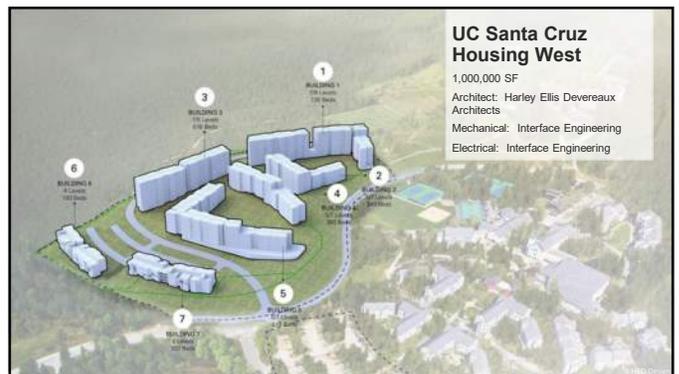
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124



125



126

Cascade Apartments, Seattle
230 Units, 44 floors. At 95% Construction Docs.



Developer is Vulcan, Ankrom Mosian Architects, Engineering by Ecotope

127

4700 Brooklyn, Seattle
227 Units, 24 floors. Under Construction



Developer is FH Brooklyn, NBBJ Architects, Engineering by Ecotope

128

1200 NE 45th Seattle
230 Units, 44 floors. At 50% Design Development



Developer is barrientos RYAN Runberg Architecture Group Engineering by Ecotope

129

Shawn Oram, Principal

Ecotope has completed 26 central heat pump water heating projects since 2008, mostly 100-500 unit projects. Partial list:

- 1944 Blvd. | 300-400 dwelling units**
 - Weston - 134 units - 100% CCHW, Air Source HP in building-grade parking
 - Harbor Towers - 80 units - CCHW in building-grade parking
 - Westshore - 130 units - CCHW in underground parking deck
 - Magnum Apartments - 214 units - CCHW in building-grade parking
 - Bank Apartments - 198 units - CCHW in underground parking deck
 - West 1st - 107 units - CCHW in underground parking deck
 - Indigo Apartments - 128 units - CCHW in underground parking deck
 - Golden Apartments - 120 units, Seattle, Westside
 - The Hill Apartments - 134 units - Vertical 2, Multi-Phase
 - Westshore Plaza - 107/120 units - Vertical 2, Multi-Phase
 - Harborview - 67 units, Harborview Medical Center
- 1944 Blvd. | 200-300 dwelling units**
 - 1944 Skytower - 264 units - CCHW with VRF Energy Maintenance
 - Lincoln - 140 units - CCHW with VRF Energy Maintenance
 - 1944 HP - 140 units - Air-Source



4700 Brooklyn Ave NE, Seattle | Cascade Apartments, Seattle

Bank Apartments, Seattle

1200 NE 45th, Seattle

130

1075 Nelson, Vancouver
435 Units, 60 Stories, Design Development



Henson Development, Architect WKK and IBI Group, MEP Integral Group?? RDH
All electric with possible exception of gas for cooking in penthouse units.

131

Hawaii projects



Maile Tower | Scenic Tower | Waikiki Skytower | Academy Towers

From Redwood Energy, Sean Armstrong's powerpoint "All Electric Tall and Big Buildings"

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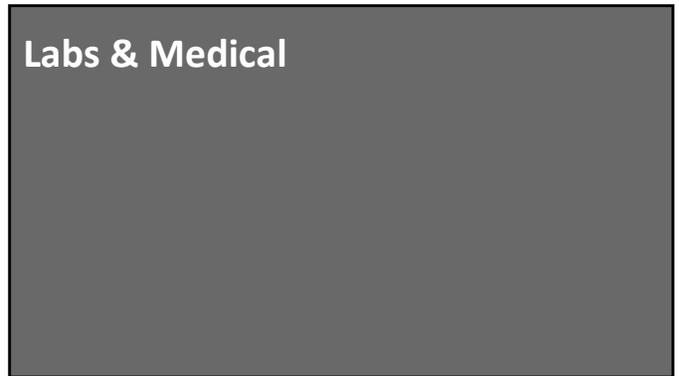
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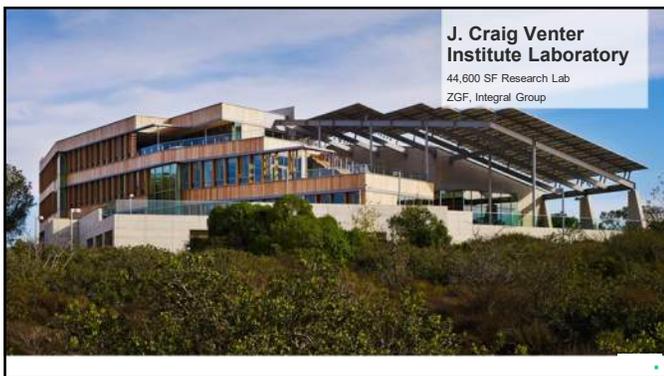
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135



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137



138



- UC Merced 2020 Lab
- Research Lab
- Architect: SOM
- MEP: Interface

139



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

140



- Kaiser Santa Rosa Medical Office
- 87,300 SF Medical Office
- LEED Platinum, ZNE
- Architect: HPS
- MEP: Integral Group

141

DAN DOZER, RA

"I have been in the lab design market for a long time and have worked on a large number of laboratory projects. My goals and expectations are that every project presents a new learning experience for

- We are seeing very little requirement for gas
- We hardly ever install central gas systems anymore
- They use heat guns, they don't use burners anymore
- Electric options are available for almost all equipment
- Only question is steam for cage wash
- I don't think eliminating gas will have much impact at all
- Currently working on Bioscience research stem cell lab in British Columbia and it has no gas

142

DESIGN for SCIENCE

Glen Berry

- I've long advocated for eliminating central gas systems
- Instead of expensive central systems, use portable or local distribution from cylinders
- There is no technical issue, it is only a people issue because some are used to doing it a certain way
- Gas is used for heating or disinfecting. Other equipment is readily available. It doesn't affect the science.
- Currently renovating the USC Hoffman vivarium, replacing large gas & steam autoclave with an electric model
- A large tunnel washer may not be as cost effective w/o gas
- Industry is changing, a lot more electric equipment

143

Restaurants & Commercial Food Service

144

All Electric Kitchen
Troisgros Grande Maison
Roane, France
Michelin 3 stars
https://troisgros.fr/page_3_maisons

145

All Electric Restaurants at LAX
Bradley Terminal

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

146

SUSTAINABILITY OFFICE SFUSD
NIK KAESTNER
DIRECTOR OF SUSTAINABILITY

- Has one electric kitchen under construction, Claire Lilienthal Elementary
- Currently designing all electric kitchens at Clarendon, Hillcrest, and West Portal schools as all electric
- Worked with chef and staff to understand induction cooking
- Visiting Food Service Technology Center in San Ramon to give staff a hands-on look at the equipment
- Doing some training with staff to get them accustomed to induction
- Bids for electric equipment are coming in cheaper than gas
- Biggest energy hogs are the fryers and also make the least healthy food, so promoting other equipment is healthy!

147

Chatam University Dining Commons
All electric kitchen, 250 meals 3 times a day

- The chef was initially reluctant, and had never cooked on induction before
- It took some time to adjust to new kitchen
- But now he loves it and says he will never go back to gas

Interface Engineering

148

Sonoma Academy
19,500 SF
ZNE, LEED Platinum
Architect: WRNS
Mechanical: Interface Engineering
Electrical: Integral Group

149

David Shell - 2nd
Energy Sales Supervisor at Gulf Power Company

- 60% of full service restaurants in our territory are all electric
- We've had success selling Wendy's and McDonald's on electric cooking
- The new combi ovens, steam cabinets, holding cabinets and induction cooktops work great!
- All Fast Food Chains have both gas and electric kitchen options

150



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Resources

All Electric Construction Guides: <https://www.redwoodenergy.tech/research/>

California Cities Lead the Way: <https://www.sierraclub.org/articles/2020/03/californias-cities-lead-way-gas-free-future>

The economics of electrifying buildings: <https://rmi.org/insight/the-economics-of-electrifying-buildings/>

Are we ready for all electric buildings?: <https://tinyurl.com/y3unn3r4>

The smog in your kitchen: <https://www.fresnobee.com/opinion/readers-opinion/article222726175.html>

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