

DOCKETED	
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Decarbonization, Healthy Electrification, and Sustainable Paths for ZNE

Just.

Organization Name: Guttman & Blaevoet
Organization Type: Service Provider
Headquarters: San Francisco, California
Satellite Facilities: Santa Rosa & Sacramento
Number of Employees: 38

Social Justice and Equity Indicators:

Diversity

- ☒ Non-Discrimination
- ☒ Gender Diversity
- ☒ Ethnic Diversity

Equity

- ☒ Full Time Employment
- ☒ Pay-Scale Equity
- ☒ Union Friendly
- ☒ Living Wage
- ☒ Gender Pay Equity
- ☒ Family Friendly

Safety

- ☒ Occupational Safety
- ☒ Hazardous Chemicals

Worker Benefit

- ☒ Worker Happiness
- ☒ Employee Benefit
- ☒ Continuing Education

Local Benefit

- ☒ Local Control
- ☒ Local Sourcing

Stewardship

- ☒ Responsible Investing
- ☒ Community Volunteering
- ☒ Positive Products
- ☒ Charitable Giving
- ☒ Animal Welfare
- ☒ Transparency

THE SOCIAL JUSTICE LABEL
GUT-001 EXP. 05/10/2018

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grounded
ground-breaking
&
engineering

Ted M. Tiffany, LEED BD+C, CEA
Director of Sustainability

Title-24 Part 6 & Part 11 Involvement



1995

• Sonoma State
EMD

2001

• EnergySoft
LLC

2008

• EnergySoft
LLC

2013

• Guttman &
Blaevoet
Engineers

2019

• Guttman &
Blaevoet
Engineers

1998

• Gabel
Associates

2005

• EnergySoft
LLC

2010

• Guttman &
Blaevoet
Engineers

2016

• Guttman &
Blaevoet
Engineers



**BUILDING
DECARBONIZATION
COALITION**

ZNE & Electrified Building Design

JESS JACKSON SUSTAINABLE WINERY BUILDING

DAVIS, CALIFORNIA



PROJECT HIGHLIGHTS

- » Registered for Living Building Challenge Net-Zero Energy Building Certification
- » Exceeds LEED Platinum requirements
- » Award of Merit, ENR California's Best Projects, 2013

OWNER

University of California,
Davis

SIZE

8,500 square feet

PROJECT COST

\$2.6 million

COMPLETION DATE

2013

PROGRAM

Designed to be a completely passive support building, the new 8,500sf building will house equipment and renewable energy systems to enable the adjacent winery, brewery and food-processing complex to become the first self-sustainable, zero-carbon teaching and research facility in the world.

The Net-Zero Energy goal for the building itself necessitated a super optimized building envelope that goes beyond the requirements for a LEED Platinum building. Other sustainable strategies include displacement ventilation combined with a radiant heating and cooling system, night flush/cooling combined with thermal mass, and photovoltaics. In addition, all water – for use in cleaning tanks, landscaping and other applications – comes from captured rainwater stored in tanks and recycled.

ZNE & Electrified Building Design

SMUD EAST CAMPUS - OPERATIONS CENTER

SACRAMENTO, CALIFORNIA



PROJECT HIGHLIGHTS

- » 2nd Largest Net-Zero Energy Campus in the U.S.
- » LEED Platinum certified
- » Design/Build Project Delivery

OWNER

Sacramento Municipal
Utility District

SIZE

Office/Training Bldg:
175,000 SF
Maintenance Bldg: 38,000 SF
Shop Bldg: 49,000 SF
Warehouse Bldg: 44,000 SF
Electrical Repair Shop:
15,000 SF
Energy Mgmt Center/Data
Center: 50,000 SF
Fuel Island & Wash Station
Parking for 600 Employees

PROGRAM

Mechanical, electrical, telecom and security services for design-criteria, basis-of-design, technical specifications, space planning for equipment, and bridging documents for SMUD's new 350,000sf Net-Zero Energy corporation yard campus.

Built on a 50+ acre parcel of land, this new facility will become the new field operations center replacing SMUD's current yard, which is over 60 years old. Program includes a maintenance building, and a administrative/office/conference/training building with a wellness center.

Sustainable features include photovoltaics, chilled beams, radiant heating, evaporative cooling, geothermal system, natural ventilation, solar domestic hot water, grey water system, and thermal energy storage. Additional services include building energy performance modeling, Title-24 documentation, façade engineering, commissioning, LEED consulting, and peer review services.

ZNE & Electrified Building Consulting



EL CERRITO RECYCLING AND ENVIRONMENTAL RESOURCE CENTER

City of El Cerrito, California

Zero Net Energy, Zero Net Water, and LEED Platinum Certified. Design assist services to help the \$3M facility achieve Zero Net Energy and LEED Platinum certification. The facility serves as a recycling drop-off location and consists of a two-acre site, with 2,000sf of building space. The Center includes a 10kW photovoltaic array and an 11,000-gallon rainwater cistern. Materials salvaged from the old recycling center were incorporated into the new Center. Hybrid of Design-Build and Integrated Project Delivery delivery method.



FACULTY/STAFF HOUSING

University of California, Davis

Mechanical and electrical design for the new \$18M, 44-unit single-family faculty/staff housing complex consisting of 2-, 3-, and 4-bedroom homes. The project will be designed for Zero Net Energy with a comprehensive approach to sustainability. Design started in 2016.



FREMONT HIGH SCHOOL, OAKLAND UNIFIED SCHOOL DISTRICT

Oakland, California

Mechanical design for the \$82M project including a new academic building, a gym and wellness center, a cafeteria/student union building, a new football and soccer field, and renovation of the existing academic building. Targeting Zero Net Energy. Estimated construction completion 2020.



GUANGZHOU INTERNATIONAL INNOVATION CITY

Guangzhou, China

Mechanical, electrical, and plumbing design, sustainability consulting, and energy & environment modeling services for a detailed master plan for the 10-square-kilometer district. The goal is to target net-zero energy with integrated cogeneration systems and renewable energy strategies while reducing the building potable water use by 80% and eliminating carbon emissions by 70%. Completed in 2016.

ZNE & Electrified Building Commissioning



DAVID AND LUCILE PACKARD FOUNDATION HEADQUARTERS*

Los Altos, California

LEED Platinum certified and Living Building Challenge Zero Net Energy certified. Commissioning authority for new Zero Net Energy & Carbon 2-story, 45,000sf office space with basement. Key features include thermal storage tanks, rainwater system, solar hot water system, photovoltaics, water-sourced heat pumps, and chilled beams. Includes monitoring based commissioning. Completed in 2014.



COMMERCIAL BUILDING PARTNERSHIP

Lawrence Berkeley National Laboratory, Pacific Northwest National Laboratory, & the National Renewable Energy Laboratory

Contract for technical expertise and consulting services to aid building owners, developers, and operators in the design of new buildings and retrofit of existing buildings to achieve low to zero energy performance with their projects. Services contracted include mechanical, electrical, and low-voltage systems, commissioning, and building performance modeling including energy analysis, life cycle cost analysis, daylighting, and computational fluid dynamics.



THE EXPLORATORIUM*

San Francisco, California

Designed for LEED Platinum and Net-Zero Energy. Commissioning services for the new, 190,000 square foot museum space. Spaces include museum exhibits, restaurant and classroom facilities. Key features include in-slab-radiant, one-of-a-kind bay water cooling system, photovoltaics, rainwater system, and programmable circuits for museum exhibits. Includes monitoring based commissioning.

ZNE & Electrified Building IN DESIGN



Albany High School ZNE Design

1. Goal of ZNE with an all-electric building.
2. 80 KW of PV planned.
3. R-27 walls, R-31 roof, glazing is 0.35 SHGC and U-value 0.38. No skylights.
4. Orientation, daylighting and shading optimized.
5. Extensively modeled daylighting analysis and control.
6. LED lighting at 0.584 w/sf.
7. Highest available EER/SEER or IEER packaged units 12.0-13.31/12.8-15.8 – Carrier HCQA Series.
8. Low pressure supply and return/economizer relief – no exhaust fans to reduce fan energy.
9. Heat recovery of the restroom exhaust as make-up for the maker space/restrooms.
10. CO2 DVC for the classrooms.
11. Units are SZVAV where available (2 of the larger units)
12. Mixed mode with natural ventilation and red light - green light user indication.
13. Operable windows and high, stack-effect, motorized louvers with “HVAC off” window switches.
14. Heat pump DHW heater ducted to the server room as a heat source.
15. EUI predicted at 30 kbtu/sf/yr.

ZNE & Electrified Building IN DESIGN

2.2 Site Simulation –Solar Exposure 2nd Floor Walkway

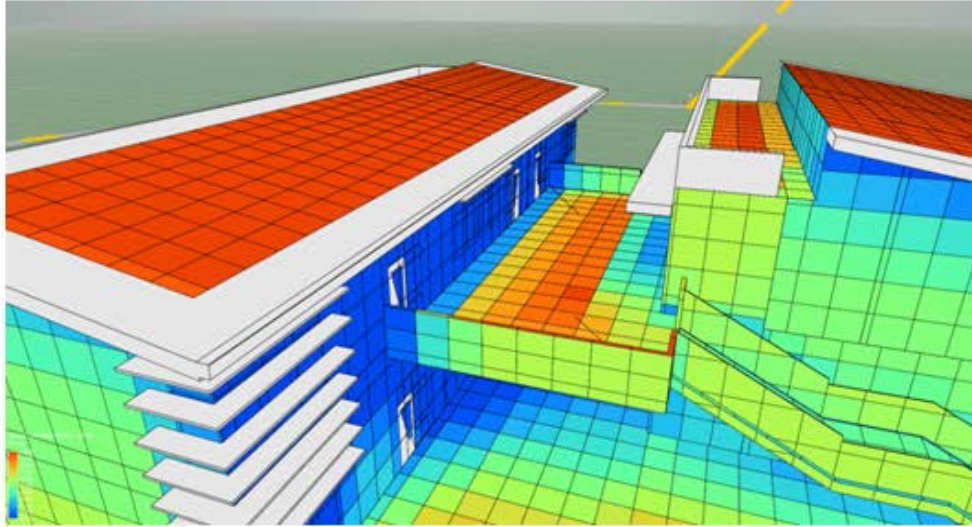
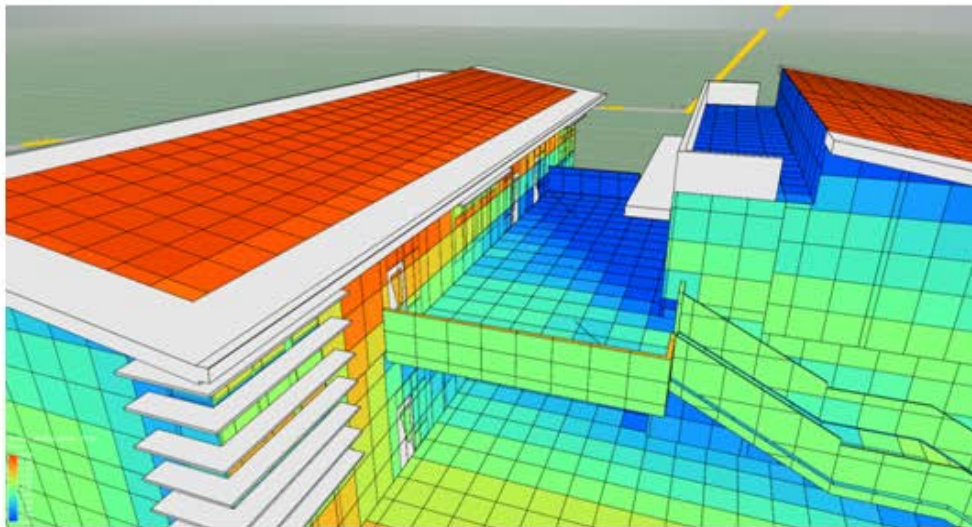


Figure 5 (Above), Figure 6 (Below)



Annual Solar Exposure

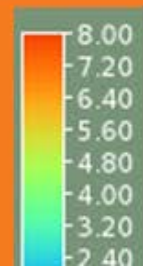
Figure 5 illustrates the Sunlight Exposure Hours results on June 20th from 8:00am to 5:00pm from the SunCast simulation.

Figure 6 illustrates the Sunlight Exposure Hours results on December 20th from 8:00am to 5:00pm from SunCast simulation.

The graphic scale gives insight into the effectiveness of the shading on the vertical surfaces.

Note: the spectrum of exposure runs from Blue (Least amount of exposure) to Red (Greatest amount of exposure).

Scale: Hours of Exposure per Day



ZNE & Electrified Building IN CODE

Title-24 Part 6-2016

Table 7 – System Descriptions

System Type	Description	Detail
System 1 – PTAC	Packaged Terminal Air Conditioner	Ductless single-zone DX unit with hot water natural gas boiler
System 2 – FPFC	Four-Pipe Fan Coil	Central plant with terminal units with hot water and chilled water coils, with separate ventilation source
System 3 – PSZ	Packaged Single Zone	Single-zone constant volume DX unit with gas heating
System 4 – RESERVED		
System 5 – PVAV	Packaged VAV Unit	VAV reheat system; packaged variable volume DX unit with gas heating and with hot water reheat terminal units
System 6 – VAVS	Built-up VAV Unit	Variable volume system with chilled water and hot water coils, water-cooled chiller, tower and central boiler
System 7 – SZVAV	Packaged Single-Zone VAV Unit	Single-zone variable volume DX unit with variable-speed drive and gas heating
System 8 – RESERVED		
System 9 – HEATVENT	Heating and Ventilation Only	Gas heating and ventilation
System 10 – CRAH	Computer Room Air Handler	Built-up variable volume unit with chilled water, no heating
System 11 – CRAC	Computer Room Air Conditioner	Packaged variable volume DX unit with no heating
System 12 – LAB	Laboratory HVAC System	For floor area < 50,000 ft ² : packaged variable volume system with 100% OA and minimum ventilation rate of 6 ACH For Floor Area ≥ 50,000 ft ² , built-up VAV (VAVS) with water-cooled chiller and central boiler
System 13 – KITCH	Kitchen HVAC System	Dedicated makeup air unit (MAU) – CHW if building is VAVS, DX otherwise. Dedicated exhaust fan.

ZNE & Electrified Building IN CODE

ASHRAE 90.1-2010

TABLE G3.1.1A Baseline HVAC System Types

Building Type	Fossil Fuel, Fossil/Electric Hybrid, and Purchased Heat	Electric and Other
Residential	System 1—PTAC	System 2—PTHP
Nonresidential and 3 Floors or Less and <25,000 ft ²	System 3—PSZ-AC	System 4—PSZ-HP
Nonresidential and 4 or 5 Floors and <25,000 ft ² or 5 Floors or Less and 25,000 ft ² to 150,000 ft ²	System 5—Packaged VAV with Reheat	System 6—Packaged VAV with PFP Boxes
Nonresidential and More than 5 Floors or >150,000 ft ²	System 7—VAV with Reheat	System 8—VAV with PFP Boxes
Heated Only Storage	System 9—Heating and Ventilation	System 10—Heating and Ventilation

Notes:

Residential building types include dormitory, hotel, motel, and multifamily. *Residential space* types include guest rooms, living quarters, private living space, and sleeping quarters. Other building and space types are considered *nonresidential*.

Where no heating system is to be provided or no heating energy source is specified, use the "Electric and Other" heating source classification.

Where attributes make a building eligible for more than one baseline system type, use the predominant condition to determine the system type for the entire building except as noted in Exception a to Section G3.1.1.

For laboratory spaces in a building having a total laboratory exhaust rate greater than 5000 cfm, use a single system of type 5 or 7 serving only those spaces. For all-electric buildings, the heating shall be electric resistance.

TABLE G3.1.1B Baseline System Descriptions

System No.	System Type	Fan Control	Cooling Type	Heating Type
1. PTAC	Packaged terminal air conditioner	Constant volume	Direct expansion	Hot-water fossil fuel boiler
2. PTHP	Packaged terminal heat pump	Constant volume	Direct expansion	Electric heat pump
3. PSZ-AC	Packaged rooftop air conditioner	Constant volume	Direct expansion	Fossil fuel furnace
4. PSZ-HP	Packaged rooftop heat pump	Constant volume	Direct expansion	Electric heat pump
5. Packaged VAV with Reheat	Packaged rooftop VAV with reheat	VAV	Direct expansion	Hot-water fossil fuel boiler
6. Packaged VAV with PFP Boxes	Packaged rooftop VAV with parallel fan power boxes and reheat	VAV	Direct expansion	Electric resistance
7. VAV with Reheat	VAV with reheat	VAV	Chilled water	Hot-water fossil fuel boiler
8. VAV with PFP Boxes	VAV with parallel fan-powered boxes and reheat	VAV	Chilled water	Electric resistance
9. Heating and Ventilation	Warm air furnace, gas fired	Constant volume	None	Fossil fuel furnace
10. Heating and Ventilation	Warm air furnace, electric	Constant volume	None	Electric resistance

Note:

For purchased chilled water and purchased heat, see G3.1.1.3.

ZNE & Electrified Building IN DESIGN

ASHRAE 90.1-2013 & 2016 Evolution


Table G3.1.1-2 Baseline Service Water-Heating System

Building Area Type	Baseline Heating Method	Building Area Type	Baseline Heating Method
Automotive facility	Gas storage water heater	Performing arts theater	Gas storage water heater
Convenience store	Electric resistance water heater	Police station	Electric resistance storage water heater
Convention center	Electric resistance storage water heater	Post office	Electric resistance storage water heater
Courthouse	Electric resistance storage water heater	Religious facility	Electric resistance storage water heater
Dining: Bar lounge/leisure	Gas storage water heater	Retail	Electric resistance storage water heater
Dining: Cafeteria/fast food	Gas storage water heater	School/university	Gas storage water heater
Dining: Family	Gas storage water heater	Sports arena	Gas storage water heater
Dormitory	Gas storage water heater	Town hall	Electric resistance storage water heater
Exercise center	Gas storage water heater	Transportation	Electric resistance storage water heater
Fire station	Gas storage water heater	Warehouse	Electric resistance storage water heater
Grocery store	Gas storage water heater	Workshop	Electric resistance storage water heater
Gymnasium	Gas storage water heater	All others	Gas storage water heater
Health-care clinic	Electric resistance storage water heater		
Hospital and outpatient surgery center	Gas storage water heater		
Hotel	Gas storage water heater		
Library	Electric resistance storage water heater		
Manufacturing facility	Gas storage water heater		
Motel	Gas storage water heater		
Motion picture theater	Electric resistance storage water heater		
Multifamily	Gas storage water heater		
Museum	Electric resistance storage water heater		
Office	Electric resistance storage water heater		
Parking garage	Electric resistance storage water heater		
Penitentiary	Gas storage water heater		

Shifting Design Thinking Through Codes, Standards, Education





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Shifting Design Thinking Through Codes, Standards, Education

BUILDING DECARBONIZATION COALITION



**BUILDING
DECARBONIZATION
COALITION**

TRANSFORMING OUR BUILDINGS INTO
SAFER, HEALTHIER, AND MORE AFFORDABLE SPACES
THROUGH CLEAN ENERGY AND HIGH PERFORMANCE,
WITH THE GOAL OF 100% DECARBONIZATION--
FOR ALL OF US.

HOW WE DO IT

PUBLIC POLICY



Develop and support policy that advances building decarbonization at the Legislature, in agency proceedings and at local governments.

RESEARCH



Identify and address critical market gaps preventing building decarbonization through both original and partnered research.

INDUSTRY BEST PRACTICES



Provide best practices and guidance for delivery to businesses and workers through established training and education channels.

CONSUMER EDUCATION



Increase consumer awareness, understanding, and acceptance of the benefits of decarbonized buildings.

<http://www.buildingdecarb.org/>

Shifting Design Thinking Through Codes, Standards, Education

The GridOptimal™ Initiative A New Rating System and Metric For Building-Grid Interactions

*New Buildings Institute
U.S. Green Building Council*

<https://newbuildings.org/gridoptimal-initiative/>

Questions?



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