

Verified Zero Net Energy Building Case Study



Photo Credits Eric Laignel



OVERVIEW

- Location:** Alameda, CA
- Project Size:** 160,000 SF
- Construction Type:** New
- Completion Date:** 2012
- Building Type:** Office
- CA Climate Zone:** 3
- Total Campus Cost:** \$40,000,000
- Cost/SF:** \$250

Measured Energy Stats

$$16.8 - 29.5 = -12.7^*$$

BUILDING'S TOTAL EUI	RENEWABLE PRODUCTION RPI	BUILDING'S NET EUI
16.8	29.5	-12.7

Site Energy Use Index (EUI) kBtu/SF/year

The Energy Equation: **the building energy use minus the renewables production equals the net energy of the building.** Buildings may be 'Getting to Zero' and have a net EUI above zero. If renewable production exceeds energy use its net EUI is below zero (negative) and it is creating surplus energy.



For more information:
newbuildings.org/zero-energy

THE NORTH FACE & VF OUTDOORS

The North Face corporate facility is part of the VF Outdoor Campus in Alameda, California. The VF Outdoors Headquarters occupies 14 acres of the Harbor Business Park and includes a 160,000-square-foot, four-building development completed in 2012. A fifth building is currently in design as well which will expand the campus to 205,000 square feet. The campus design features extensive views of the adjacent San Francisco Bay and as many sustainable design features as possible within a realistic budget. FME Architecture was the architect for the project and designed the campus to house VF's office headquarters for its three major outdoor sporting good brands: The North Face, JanSport, and Lucy.

This case study describes both the efforts of the VF Campus to pursue an "emerging net zero energy campus" design approach with a focus on one of the The North Face offices, which has achieved verified zero net energy (ZNE) performance. The North Face comprises two of the four campus buildings, with JanSport and Lucy in a third building—each being 45,000 square feet. The fourth building is a 26,000-square-foot amenities building which includes a complete fitness center, a café, and an outdoor training area. The campus features extensive daylighting, efficient lighting and mechanical systems, and renewables to help demonstrate a strong sustainability ethic in line with the corporate mission.

The entire campus was designed with zero net energy (ZNE) goals, and the company is close to offsetting nearly all of the site's electricity use. The campus also has gas usage in the café and gym facility which, to date, is not able to be completely offset directly onsite. Thus, VF Outdoors opted to use renewable energy credits (RECS) to make up the remaining difference. While this is an

*The North Face Building: Although the gas usage is master-metered for the site, the majority of the usage is for the gym and café in Building A. Analysis indicates the gas for The North Face Building C is nominal for hand washing and two office dish sinks, and is estimated to use only 5% of the site's gas, translating to less than 1-2 EUI points.

Team/Owner Details

Architect: FME Architecture + Design

Structural Engineer: SEI

MEP Engineering: Syserco

Civil Engineering: Kier & Wright

Developer: SRM Associates

Landscape Architect: April Phillips
Design Works Inc.

Interior Design: Rapt Studio

General Contractor: J.M. O'Neill

Commissioning Agent: Rick Unvarsky
Consulting Services

LEED Consultant: Sage Green
Development

Awards

LEED Gold Certification
(Buildings B, C, & D)

approach that demonstrates their corporate commitment to use 100% renewable energy, it contradicts California's desire to offset all energy through "onsite generation resources". Therefore, the campus remains in the emerging ZNE category. However, The North Face Building C does have its own renewable system and has been verified as a ZNE building. Both the The North Face ZNE building and the larger VF campus emerging ZNE efforts provide important examples of how both projects and campuses are moving forward toward zero net energy goals on multiple fronts.

Planning and Design Approach

A new facility was beneficial for VF Outdoor because it combined the headquarters of its three top brands. Not only did this allow for collaboration among the companies as the leaders in outdoor/active apparel brands, but it also helped reduce the company's energy consumption by enabling them to share spaces, such as dining areas and collaborative work spaces. The design was a large scale joint effort between the design team, tenants, and the VF Outdoor Corporation. The first step was to consider potential five-year growth of the company and how the campus will be able to continue to achieve ZNE performance, even as the company expands. As an integrated design effort, occupants weighed in on how they wanted their spaces to be interconnected with the views of the San Francisco Bay. They favored design concepts with low, open workspaces that would contribute to the overall connectivity of work flow, but also maximize efficiency in heating, cooling, and lighting. Committees were formed to address each major design aspect and team members—from the architect, interior designer, engineer, developer, and VF sustainability managers—all weighed in on the value to occupants, efficiency goals, and economic bottom line of each feature. The client had originally targeted LEED Platinum certification, but decided to aim for LEED Gold instead, to target the value of the systems, as opposed to the piece-by-piece costs of installing LEED Platinum standard systems.

Policy

VF Corporation is one of the largest clothing companies in the world and has made a public commitment to recognize its responsibility and capability to reduce its global footprint. Several of its brands, such as Timberland and The North Face, have a proven reputation of a commitment to the outdoors. The company met its 2009 goal of a 5% reduction in greenhouse gas emissions across all its facilities by 2015. Understanding its role as a leader in the industry motivated VF Corporation to commit to the RE100 program. Led by The Climate Group, RE100 is an international initiative of influential businesses, committed to 100% renewable electricity, working to increase demand and delivery of renewable energy. Through this program, VF set a goal that all of its owned and operated facilities use 100% renewable energy by 2025. The VF Outdoor Campus in Alameda was one of the company's first facilities to aggressively target this goal.

Financing Costs & Benefits

Construction & Design Costs

Construction cost for the project was \$40 million for the four-building development. The design for all of the office buildings used a standard set of construction specifications which allowed for savings in both design and construction. The the

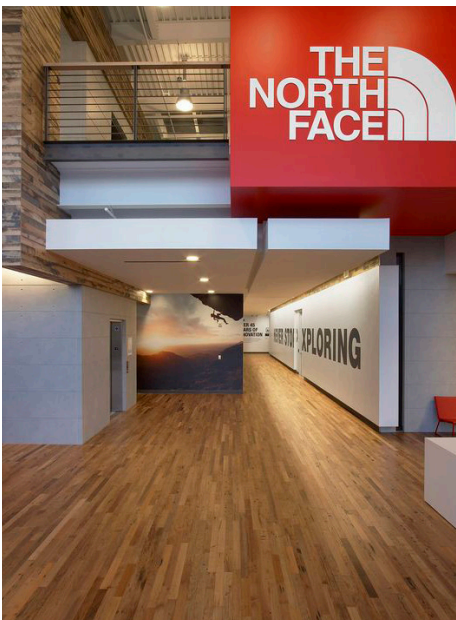


Photo Credits: Eric Lagomel



“These are brands that have a deep passion for the outdoors – not only to play in it, but to preserve it - and we wanted this campus to really speak to that.”

-Steve Rendle, Vice-President,
VF Corporation

individual costs for each of the four campus buildings was fairly close because the three office buildings are the same size. Thus, a rough estimate of the costs are close to \$250/square foot, with an estimated cost for the The North Face building in the range of \$11.2 million.

Financing & Incentives

At the time of the planning and design, the market was in an economic downturn, which caused Lehman Brothers, the majority landowner, to go bankrupt. This threw the project into economic uncertainty and created a two-year delay, until 2010 when VF Outdoor came back with an aggressive plan and strict financial guidelines but the same sustainability objectives in mind. Incentives played a major role in the success of this project. A rebate from Alameda Municipal Power, based on a five-year performance credit, was the main source of incentive financing for the project. This rebate was for commercial customers installing solar photovoltaic (PV) systems and provided a quarterly credit based on the amount of excess kilowatt hours (kWh) put back into the grid.

Operating Costs

The performance target for the project was LEED Platinum, so this was factored into the design analysis to determine what each credit would cost, and confirm that it made sense in operational savings. Because all other VF properties, prior to the Alameda campus, have been leased and this would be their first owned property, the VF team could not make a comparison on operations. However, an analysis of estimated savings generated by the site's onsite renewables shows the avoided annual utility costs are quite significant. Using the Energy Information Administration utility averages for California for cost per kWh, it estimated that in 2015 renewables associated with The North Face building C provided savings of more than \$65,000, with annual savings for the entire VF Campus at approximately \$200,000 in avoided energy costs from onsite renewable energy generation alone. In total, between January 2013 and November 2016, the campus generated 4,615,072 kWh from onsite photovoltaics, which translates into an estimated savings of more than \$760,000.



Photo Credit: Eric Laignel

“The commitment to sustainability is a feature we’re really proud of. It’s not just a few stick-ons—it’s really a comprehensive scope done with a real budget in mind.”

- Joe Ernst, SRM Associates

Energy Efficiency Strategies & Features

Lighting & Daylighting

Daylighting is a prime feature for all the VF campus office buildings, allowing for reduced reliance on electric lighting, a strong connection to nature, and an unobstructed view of the San Francisco Bay. Executive offices claim the interior of the space, allowing the majority of employees to work along the exterior, where 90% of the offices have daylit spaces, views, and access to operable windows.

Exterior sun shades work to block hot, high-angle sun in the summer. Reflectors were installed to help increase interior penetration of daylighting, and light sensors were installed 15 feet from the windows to adjust and lessen the need for electric lighting. Occupancy sensors were also installed to mitigate any issues of occupant lighting control during unoccupied times. Although daylighting allows for minimal use, the lighting that is installed in the building is highly efficient T5 fluorescent lights or LEDs.

Envelope

Thick, 18” walls and double glazed windows enclose the offices, while a rigid insulation with a higher reflectivity than is required by code was installed on the roof for excellent heat shedding and enhanced solar absorption. The wall insulation has an R-value of 13, while the roof insulation has an R-value of 30. The central amenities building embodies VF’s interests in both apparel and sustainability, substituting 5,500 pairs of recycled blue jeans for traditional insulation. All other buildings on the campus, including The North Face buildings have standard fiberglass insulation material. Materials are all LEED standard or above with CRI Green Label Plus Certified carpeting, reclaimed wood, FSC Certified wood, or are Greenguard Certified.

HVAC

Understanding that HVAC systems account for a large percent of energy use in an office, the design team first implemented passive heating and ventilation strategies. All exterior windows are operable to give occupants greater control over their environment. These windows also feature energy efficient glass which limits overheating of the facility.

The buildings also use an indirect-direct evaporative cooling (IDEC) system which conditions air without the use of compressors or refrigerants. The system draws fresh air from outside for each cycle. It integrates variable frequency drives which control the fan speed of the four air handling units, using minimal energy to

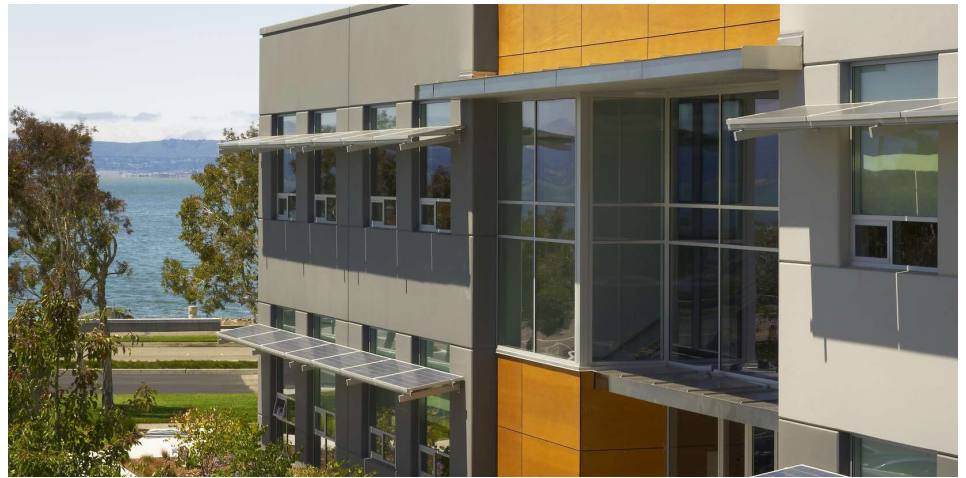


Photo Credit: Eric Laignel

operate. These units feed a total of 120 variable air volume zones. Demand-control ventilation allows the system to operate only when necessary.

Plug Loads

Occupancy sensors control much of the lighting in the building to avoid unnecessary electricity use, and automatic controls were put in place by VF Outdoors' IT company to ensure that inactive workstations were put into sleep mode after even just a few minutes of non-use. The building systems and controls are run by an Energy Management System, called Energy 2.0, by Alerton Building Automation Resources. VF Outdoor developed a contract with Alerton to maintain and troubleshoot any controls issues on a quarterly basis, reducing much of the lag time in discovering any inefficiencies in the buildings.

Monitoring & Controls

Facilities managers at the site use BACnet to allow building systems to communicate and work efficiently with one another. An Alerton building monitoring system uses carbon dioxide sensors to operate HVAC systems based on occupancy. The IDEC HVAC is centrally controlled by the operations and maintenance team where the sensors on the insides of the buildings are set to a cooler setting for meeting rooms and other higher volume spaces. The HVAC system uses a sophisticated control method to evaluate building and exterior climate conditions to optimize the evaporative cooling approach. However, with Alameda's mild climate, there is generally very little heating or cooling needed, so the systems are engaged infrequently.

Occupant Engagement and Training

VF has an on-site sustainability manager who provides occupants with instructions on how to operate the building systems, as well as tips on how to reduce energy and water consumption and stay informed of constantly updating practices and policies. When new employees start, they are given an orientation of the green features of the building and site and how they may best operate them. For example, employees are encouraged to close the shades themselves in the summer to avoid direct sunlight and heat load issues. Across the campus, signage for each of the sustainable features that received LEED credits is prominently on display for both new employees during their orientation and for other daily visitors.

“The essential goal is to design an efficient building and then see if you can meet the demand with onsite solar generation.”

– Terry Murphy, Deputy Director of Operations, CA State Lottery

Renewable Energy Generation & Storage

Five cylindrical wind turbines located near the entrance of the main building generate minimal electricity, but visibly demonstrate the VF’s commitment to renewable energy. A 856 kW photovoltaic system offsets the remainder of the electricity use onsite. A 256 kW building array distributed across the four buildings includes, solar panels attached to exterior window shades that account for 7% of total site generation and a rooftop array that accounts for 23% of total site generation. In addition, twelve carport arrays account for the remaining 70% of the total site generation. Engineers worked to ensure the carport arrays would not reduce available parking for the 600 workers, but instead shields them from rain and hot sun.

Post Occupancy

No post occupancy surveys have been performed to date, but the VF Outdoor community response to the sustainable features and collaborative, open work spaces has been incredibly positive. When occupants first moved in, the parking lot offered four electric vehicle charging stations. Within three years, VF Outdoor added eight more to accommodate its employees’ interest in sustainable living. There was a tuning period of about six months for occupants to learn how to coexist with the new features and dial in the controls to fit tenant needs.

Commissioning

After installation of the energy management and control system, Syserco worked with VF’s facilities manager to monitor the campus’ environmental conditions and progress toward ZNE. Monthly meetings with facilities staff and Western Allied Mechanical, ensured occupants were properly controlling the installed equipment.

Continuous commissioning of systems by Rick Unvarsky Consulting Services, in addition to constant monitoring with an energy management and control system, allowed the facilities managers to fix any issues that caused a deviation from optimal building performance.

Monitoring

The BACnet server unites data from the four buildings in one common location for easy monitoring. The system reports gas and water usage, electrical submetering, and system energy generation. Annual energy efficiency audits offer an additional verification of proper energy performance.

Successes

After the initial occupancy, having a commissioning agent tune the systems to create a balance of comfort and energy efficiency was one of the biggest successes. The HVAC system is running at optimal levels and cycling 100% outside air, which occupants have reported makes them feel significantly more contented as compared to a regular office building where air flow and quality complaints are frequent. The copious amount of natural light and the view of the bay also have led to high reports of employee satisfaction. With access to such features as the café, onsite gym, and outside communal areas, employees rarely need to leave the site. This has created high employee satisfaction with their workplace and also a significant reduction in the carbon footprint when paired with





Photo Credit: Eric Laignel

the public transportation options offered. The energy efficient features create a sense of community, have a positive effect on employees' daily lives, and boosts the company's bottom line.

Lessons Learned

- During extreme weather events, the IDEC HVAC system has had some issues with maintaining comfort levels. During these weather events, the HVAC system needs to be manually operated very early in the morning to provide enough cooling or heating to satisfy all the building zones. Going forward, a different set of controls, that allow the system to operate differently or for longer periods during extreme weather events, while also being able to go back to original set points with ease, would be ideal. A slightly larger boiler system that is more comparable for the space should also be considered.
- Although the location on the bay is ideal for views and occupant satisfaction, particulates in the air have caused more maintenance issues than anticipated. These particulates cause sensors to malfunction and have needed to be replaced more frequently than planned.
- Employee education on operable windows and other systems should be at the forefront of occupancy. Windows can create zones where the temperature is less comfortable, especially when the HVAC is running. This can also affect sensor reads and may cause the HVAC system to run longer than necessary.
- The green design of the site and buildings has been well received by the employees on the VF Campus, and the energy efficiency features of the first four buildings will be included into the fifth office building being designed for the campus.

Resources for More Information

- VF Dashboard: http://live.deckmonitoring.com/?id=vf_outdoor_inc
- FME Project Overview: <http://www.fme-arch.com/vf-outdoor>
- Energy Information Administration 2015-2016 rates for California commercial buildings: https://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a