



NEW TECHNOLOGY & STRATEGY IDENTIFICATION REPORT

March 3, 2017

SUMMARY

ProspectSV and its partners on two, CEC-funded Zero Net Energy building demonstrations conducted an open Call for Innovations in the Fall of 2016. Under this call we were seeking new technologies that were demonstration-ready and site appropriate to incorporate into our two project sites: (1) a four-story, mixed-use, low-income housing site and (2) a 24,000 square foot grocery store.

We conducted a global search for new technologies, reaching out to 67 organizations representing start-up incubators, research institutions, academia, and investment funds. We also utilized the networks of our project partners in architecture and design in the building industry.

We reviewed over 40 responses with submissions from twelve different states and six different countries. In all, our search yielded high-level recommendations of seven new technologies for the Innovate Net Zero Project and five new technologies for the MarketZero Project. In both of these projects, the design teams next look at ways to incorporate these new technologies and strategies into different design options.

PURPOSE

Our tech discovery phase of the project has had multiple benefits for the project teams. The main intention of this process was to find new building technologies that would be beneficial to the specific challenges at our two CEC-funded project sites. However, in many cases, professionals in our design team could take findings from the tech discovery process and apply them to current and future projects that they were working on. In addition to this, we also wanted to foster new ecosystem connections between product development teams and the building owners, designers, and engineers who serve as gate-keepers to new technology adoption. Our goal is to develop a mutually beneficial dialogue to move the entire innovation ecosystem forward.

CRITERIA

To execute this vision, we developed a Call for Innovators which provided preliminary questions as well as background about both project sites. These questions were used to assess different technologies across a five main Criteria to best answer the following:

- a. **Technology Readiness** –what stage of development is the product at? has the product had previous pilots before? If not, do they have a working prototype?
- b. **Energy Performance** – how does this product differ from current competitors in the market? what are the energy savings benefits to installing this product? what is the cost of the installation?
- c. **Site Applicability** – does this product answer specific challenges for the particular building use / energy system / building vintage?
- d. **Ease of Installation & Interoperability** – What does the installation process entail? Describe the disruption this will cause to occupants? How easy is this technology to integrate into existing systems?
- e. **Ease of Maintenance & Operation** – What is the maintenance effort and what level of expertise is needed to complete it?

NOTE: A copy of our Call for Innovators is attached to end of this document followed by the initial scoring matrix"

OUTREACH

We leveraged our network of over 67 organizations and over 100 individuals to find new solutions for our ZNE demonstrations by sharing our Call for Innovators. In addition, we also had several media channels pick up media on this call. Below is a short list of institutions, organizations, and other groups:

- i. **Incubators:** Tumml, LACI, Cyclotron Road, Greentown Labs, Incubate Energy Network, CleanTech Open, Austin Technology Incubator, Energy Exceclerator, Innosphere, NextEnergy, NY Acre, Oregon Best, Powerhouse, Urban.US, TomKat, InnoEnergy
- ii. **Research Institutions and Academia:** National Renewable Energy Lab (NREL), Lawrence Berkeley National Lab (LBNL), ARPA-E and Academic programs such as Caltech's FLoW, UC Berkeley, San Jose State University
- iii. **Funds:** Prelude Ventures, Evok Innovations, Westly Group
- iv. **Social Media:** Twitter, LinkedIn (including groups: Green Building Products, Building Green, Sustainable Silicon Valley, Cleantech, Cleantech Open, Cleantech.org, OnStartups, Lean Startup, GreenBiz, Green & Sustainability Innovators, Sustainable Silicon Valley, US Green Building Council)
- v. **Media (with links to published articles):** [City Minded](#), [Fast Company's Co.Exist](#), [Solar Thermal Magazine](#), [Meeting of the Minds](#), [CleanTechnica](#), [Money News](#), [PR Newswire](#), and [Govtech](#).

REVIEW PROCESS

Open submissions were reviewed by ProspectSV with feedback from our project teams consisting of designers, architects, engineers, and researchers based on the five-point criteria described above. All qualified applicants were given follow-up questions and eventually a phone-interview with the team to discuss additional details of their product submission to determine whether they should be recommended to the design team for inclusion. The most promising solutions were included in the modeled assessment of energy efficiency measures for detailed evaluation.

In addition, members of each project team and our newly formed Technical Advisory Committees also provided additional recommendations of new technologies and products to consider which we put into our review process.

FINALISTS – InnovateNetZero

Through this Call for Innovators process, our team recommended a number of new technologies to be investigated during the design phase of this project. Below is a list and short description of the products with more detailed descriptions in the appendix:

- **Aeroseal: Automated Aerosol Sealing of Building Envelopes** (aeroseal.com)
 - New building envelope sealing technology designed to seal the outer shell of homes and small buildings using volatile latex aerosol. The aerosol is applied under positive room air pressure to automatically find and seal imperfections in the existing building envelope.
- **International Wastewater Systems: Piranha** (www.sewageheatrecovery.com)
 - Heat recovery system which transfers thermal energy from wastewater to heating, cooling & hot water for commercial, residential and industrial buildings.
- **Lunos e²** (www.lunos.de/en)
 - Ductless and decentralized ventilation unit that provides 90.6% heat recovery, air filtration, and ventilation.
- **Ventacity 1000 RT** (www.ventacity.com)
 - Similar functionality to the Lunos units but designed as a small-ducted unit providing up to 1,000 cubic feet per minute with 82% to 93% heat recovery, air filtration, and ventilation
- **N2 Global Solutions: Plug Load Management** (n2-gs.com)
 - Plug load management system that can eliminate stand-by energy use with IoT capability to monitor and learn user behavior.
- **Keewi Inc: Plug Load Management** (keewisolutions.com)
 - Plug load management system that can eliminate stand-by energy use with IoT capability to monitor and learn user behavior.
- **HIVE Lighting: Wasp 100-C** (hivelighting.com)
 - New high efficiency LED and Plasma lighting designed specifically for theatrical applications.

- **EndeF: ECOMESH** (ecomesh.es/en/)
 - Combined Solar PVT (Photo-volatic and Solar-Thermal) panels to boost on-site production and address high domestic hot water use.

FINALISTS – MarketZero

Through this Call for Innovators process, our team recommended a number of new technologies to be investigated during the design phase of this project. Below is a list and short description of the products with more detailed descriptions in the appendix:

- **Viking Cold Solutions: Phase Change Material cells** (vikingcold.com)
 - Thermal Energy Storage (TES) solution that combines intelligence with Phase Change Material (PCM) to maximize the energy efficiency of a refrigeration system. Viking Cold PCM cells add thermal mass to a room, giving it the ability to hold designated temperatures for much longer periods of time, which helps reduce the runtime of refrigeration equipment. Controls and an energy management system help maintain a constant temperature as well as alerting in case of mechanical malfunction or power outage.
- **Nelumbo: Ice-Nein** (nelumbo.io)
 - Nelumbo deploys advanced materials for energy solutions to improve energy efficiency, minimize fouling, and reduce downtime for any size or model of commercial Refrigeration and Air Conditioning equipment. Coatings exhibit the first commercial application of Droplet(R)ejection™ performance, improving cooling efficiency by up to 30% and reducing defrost cycle frequency and duration by more than 20%.
- **Software Motor Corp: Vulcan Motor** (softwaremotorcorp.com)
 - A new electric motor that delivers improvements in electrical energy consumption of 75% to dramatically more, depending on application. When securely connected to central data repositories, these IoT ready motors generate data that can be visualized and analyzed, providing real time insights into operating performance and efficiencies of motor-drive systems.
- **Bosch: DC MicroGrid Platform** (bosch.us)
 - DC-power server module to integrate AC grid power, DC on-site renewables, and DC battery storage to enable DC-powered lighting and HVAC systems. Resulting electrical system will have significantly lower conversion losses.

- **Nextek Power Systems: Power Hub Driver** (nextekpower.com)
 - DC-Power Hub Driver to integrate AC grid power, DC on-site renewables, and DC battery storage to enable DC-powered lighting and HVAC systems. Resulting electrical system will have significantly lower conversion losses.

APPENDIX

Call for Innovators (August 10, 2016)



CALL FOR ENERGY INNOVATORS

August 10, 2016

PURPOSE OF THIS REQUEST FOR INFORMATION

ProspectSV and its partners are seeking pre-commercial products and solutions from global clean technology innovators for energy efficiency, energy recovery and renewable energy solutions for potential inclusion in two, state-funded demonstrations in San Francisco, CA. This is a unique opportunity for your emerging technologies to be included into a project demonstration and will offer valuable feedback from our professional team of designers and engineers. We are searching globally for partners to meet significant challenges in two very different projects:

The MarketZero project is a four-year \$3.6M effort funded by the California Energy Commission to target one of the “final frontiers” in California’s goal towards a Zero Net Energy (ZNE) future: grocery stores. The project will design and retrofit an existing Whole Foods Market in San Francisco, CA into the world’s first zero net energy (ZNE) grocery store. As part of the project we will be targeting new products and technologies to bring into our design with the goal to “design for scale.” Project partners include Whole Foods Market, Arup, Lawrence Berkeley National Labs, and the City of San Francisco.

The InnovateNetZero project is a four-year \$3.8M effort funded by the California Energy Commission that will convert the [William Penn Hotel](#) (a historic, mixed-use building with low-income housing) into a showcase of innovative Zero Net Energy (ZNE) building design. The site includes a theater, offices, and housing for ninety-one low-income residents -- including many formerly homeless and at-risk adults. The project is seeking innovative solutions and products to address a high-density urban housing environment in a high performance building. Project partners include Chinatown Community Development District, RMW Architects, Integral Group, National Renewable Energy Laboratory, and the San Francisco 2030 District.

OPPORTUNITIES

These unique projects are specifically seeking new products and technologies to include into our design and eventual project deployment. Promising product teams will be granted the following:

- A professional design review with project feedback from our design team
- An opportunity for a paid deployment within one or both projects
- Recommended teams may be selected for access to the ProspectSV network and ProspectSV commercialization support program

REVIEW PROCESS

Submissions will be reviewed by a team of professional experts in the field (designers, architects, engineers, and contractors) and feedback will be provided to all applicants. Promising project teams will be recommended to the design team for inclusion in the building. During our review process, you may be required to conduct an interview (in-person or phone) to discuss additional details of your submittal. Deployment of these products is not expected until Q3 2017 (subject to construction timelines for each project) and final decisions will be based on final approval from the owners, expected in early 2017. More details on the timeline can be found below.

Attached with this call are three items:

1. A summary of application materials to be included with the proposal
2. Details on the MarketZero Project (see prospectsv.org/marketzero for latest information)

3. Details on the InnovateNetZero Project (see prospectsv.org/innovate-net-zero for latest information)

EXPECTED TIMELINE:

Aug. 10, 2016	Release and distribution of RFI
Sept. 1, 2016	Deadline to submit questions
Sept. 30, 2016	Deadline for submissions
Early-Oct. 2016	Finalist Notification & Interviews (as necessary)
Late-Oct. 2016	Announcement of Recommended Product Teams
Nov. 2016	Design Review for MarketZero
Q4 2016	Design Review for InnovateNetZero
Q1 2017	Design Completion (both projects)
Q3 2017 – Q2 2018	Construction phase (both projects)

CONTACT AND SUBMISSION INFORMATION

Please submit all questions and submissions to the following:

Email: info@prospectsv.org

Title: [ZNE-Tech] "Company Name"

PROPOSAL REQUIREMENTS

1. COMPANY INFORMATION

A) Company Name

B) Company Details

Provide date business was established, number of full-time employees (or equivalent), location of headquarters.

C) Nature of Business

(limit to 250 words)

D) Summary of Company Finances

2. PRODUCT DESCRIPTION

A) Product Team Profile

Identify your key team members, contact information and relevant experience.

B) Description of Product

Provide a written description of your product (please limit to 250 words). Use of graphics, photographs, a slide deck, video, or other media to further explain your technology are highly encouraged.

C) Product Development Stage

At what stage in Technology Development is your product currently? (Lab-scale, pilot-scale, full-scale) What kind of testing has the product undergone? What benchmarks will you need to meet for your product to be ready to deploy in 2017?

D) Performance Metrics

How does your performance compare to other products in the field? What types of efficiency/generation/reduction have you obtained?

E) Financial Metrics

Please estimate product cost and savings metrics for deployment. (Keep this simple.)

F) Installation & Maintenance Details

Please explain the installation & maintenance procedures for your product (will you need access to, or integration with other building systems?)

G) Previous Projects

Has the product been demonstrated or tested elsewhere? If so, at what scale and at what location(s)?

Additional Detail on MarketZero

- **Building:** Whole Foods Market
- **Link:** <http://prospectsv.org/marketzero> for latest information
- **Location:** [San Francisco, CA](#)
- **Building Area:** 25,187 ft² (11,820 ft² of retail space)
- **Hours of Operation:** 8 a.m. to 10 p.m., seven days a week
- **Preliminary Systems Description** (additional details to be provided in September):
 - Heating, Ventilation, Air Conditioning, and Cooling (HVAC) is provided to the building via two R410A direct-expansion (DX) cooled package units with natural gas heating.
 - Ambient store lighting is provided by a combination of T8 and T5 linear fluorescent lighting. Specialty display lighting consists of ceramic metal halide downlight and track lighting.
 - Refrigeration needs to the store are served by two R404A compressor racks. A 13.5-ton low-temperature circuit feeds the ice-making and walk-in storage and retail cases need in the retail and walk-in areas. A second 55-ton medium- & high- temperature circuit serves additional cooling needs for walk-in storage and retail cases.
- **Special constraints:** Store must remain open during renovations.

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About Whole Foods Market®

Founded in 1978 in Austin, Texas, Whole Foods Market (wholefoodsmarket.com, NASDAQ: WFM), is the leading natural and organic food retailer. As America's first national certified organic grocer, Whole Foods Market was named "America's Healthiest Grocery Store" by *Health* magazine. The company's motto, "Whole Foods, Whole People, Whole Planet"™ captures its mission to ensure customer satisfaction and health, team member excellence and happiness, enhanced shareholder value, community support and environmental improvement. Thanks to the company's more than 91,000 team members, Whole Foods Market has been ranked as one of the "100 Best Companies to Work For" in America by *FORTUNE* magazine for 18 consecutive years. In fiscal year 2015, the company had sales of more than \$15.4 billion and currently has more than 435 stores in the United States, Canada and the United Kingdom. For more company news and information, please visit media.wfm.com.

About ProspectSV

ProspectSV is a nonprofit urbantech innovation hub focused on solutions for sustainable, smart cities. We bring government, corporations and academia together with start-ups, product teams and expert staff to accelerate innovations in transportation, energy and the built environment. ProspectSV provides a full spectrum of commercialization support including market and technical insight, connections to partners and investors, pilot opportunities as well as access to a \$12 million, 23,000 sq. ft. Technology Demonstration Center with working and industrial space, lab facilities and specialized equipment. In partnership with state and local governments, ProspectSV demonstrates and scales leading edge solutions, resulting in the avoidance of nearly 150 million lbs. of CO₂ in the

coming decade. With projects in over 50 cities, leveraging over \$50 million in funding and financing, and with more than 25 corporate sponsors, ProspectSV is the only organization with the ability to both prove and apply solutions for next generation cities. For more information visit prospectsv.org.

About The San Francisco Department of the Environment

The Department creates visionary policies and innovative programs to improve, enhance, and preserve San Francisco's urban and natural environment, leading the way toward a sustainable future by developing wide-ranging environmental programs, fostering groundbreaking legislation, working collaboratively with key partners, and educating the public on comprehensive sustainability practices. For more information, visit www.sfenvironment.org.

About Arup

Arup is the creative force at the heart of many of the world's most prominent projects in the built environment and across industry. Its engineers and consultants deliver innovative projects across the world. Arup opened its first US office over 25 years ago, and now employs 1,300 in the Americas. The firm was founded in 1946 with an enduring set of values that fosters a distinctive culture, intellectual independence and collaborative approach. The people at Arup are driven to find a better way to deliver better solutions for their clients. For additional information, visit Arup's website at www.arup.com and the online magazine of Arup in the Americas at doggerel.arup.com.

About Lawrence Berkeley National Lab

Lawrence Berkeley National Laboratory addresses the world's most urgent scientific challenges by advancing sustainable energy, protecting human health, creating new materials, and revealing the origin and fate of the universe. Founded in 1931, Berkeley Lab's scientific expertise has been recognized with 13 Nobel prizes. The University of California manages Berkeley Lab for the U.S. Department of Energy's Office of Science. For more, visit www.lbl.gov.

Additional Detail on InnovateNetZero Project

- **Building:** William Penn Hotel
- **Link:** <http://prospectsv.org/innovate-net-zero> for latest information
- **Location:** [San Francisco, CA](#)
- **Building Area:** 41,836 ft²
- **Number of Units:** 94 Single-Room Occupancy units (SROs)
- **Background Information:** The William Penn Hotel houses a Direct Access to Housing (DAH) program for chronic inebriates, providing permanent housing for many formerly homeless and at-risk adults. In addition, the building features a five-theater, 300-seat community theater and office for a non-profit that serves the Southeast Asian community in San Francisco.
- **Preliminary Systems Description** (additional details to be provided in September):
 - Space heating to each unit is provided by a natural-gas fired boiler and distributed through in-room radiators.
 - Ventilation and natural lighting are provided by operable windows which face internal light shafts
 - The common space areas are illuminated by T8 linear fluorescent lighting.
- **Special Constraints:**
 - The William Penn Hotel is part of the Upper Tenderloin Historic District, a registered national historic place since 2009. Renovations must limit modifications to the building's façade.
 - Renovations must limit length of resident displacement and disruption to the building.

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Chinatown Community Development Center

The Mission of the Chinatown Community Development Center is to build community and enhance the quality of life for San Francisco residents. We are a place-based community development organization serving primarily the Chinatown neighborhood, and also serve other areas including North Beach, Tenderloin, the Northern Waterfront, the Western Addition, Japantown, Polk Gulch, the Richmond, Civic Center and the South of Market area. We play the roles of neighborhood advocates, community organizers, planners, developers, and managers of affordable housing.

Prospect Silicon Valley

ProspectSV is a nonprofit urbantech innovation hub focused on solutions for sustainable, smart cities. We bring government, corporations and academia together with startups, product teams and expert staff to accelerate innovations in transportation, energy and the built environment. ProspectSV provides a full spectrum of commercialization support including market and technical insight, connections to partners and investors, pilot opportunities as well as access to a

\$12 million, 23,000 sq. ft. Technology Demonstration Center with working and industrial space, lab facilities and specialized equipment. In partnership with state and local governments, ProspectSV demonstrates and scales leading edge solutions, resulting in the avoidance of nearly 150 million lbs. of CO2 in the coming decade. With projects in over 50 cities, leveraging over \$50 million in funding and financing, and with more than 25 corporate sponsors, ProspectSV is the only organization with the ability to both prove and apply solutions for next generation cities. For more information visit prospectsv.org.

Integral Group

Integral Group is an interactive global network of design professionals collaborating under a single deep green engineering umbrella. We provide a full range of building system design and energy analysis services, with a staff widely regarded as innovative leaders in their fields. Located in sixteen offices across North America and the UK, along with an international network of affiliates, our passion for sustainable design runs deep. ZNE projects include the Packard Foundation HQ (new construction), 435 Indio Way (30k commercial retrofit), and IDeAs Z Squared Building (commercial retrofit).

RMW Architecture and Interiors

RMW's mission is to "create inspired human environments through the power of responsible design." Named one of the U.S.' Top 50 Firms by Architect Magazine, RMW architecture & interiors is driven to create work environments that encourage productivity, vitality and harmony within a client's culture and business objectives. Environmental responsibility is a key element of RMW's design philosophy. To us, "responsible design" means recognizing that the built environment has the power to change the world and affect lives in meaningful and specific ways. Our goal for every project, regardless of size or scope, is to shape a healthy, engaging environment that delights our clients. To that end, we incorporate research and applications from Architecture 2030, the U.S. Green Building Council, the Living Building Challenge, and, increasingly, the WELL Building Standard, to find sensible and effective solutions.

San Francisco 2030 District

The San Francisco 2030 District is a privately led nonprofit focused on achieving the goals of the 2030 Challenge for Planning issued by Architecture 2030. With over 10 million square feet of San Francisco real estate committed to the goals, the San Francisco 2030 District aims to outperform energy, water and transportation baselines by 50% at the district scale. Together the San Francisco 2030 District and Architecture 2030's mission is to rapidly transform the built environment from being a major contributor of greenhouse gas (GHG) emissions to a central part of the solution to the climate crisis.

National Renewable Energy Laboratory

NREL focuses on creative answers to today's energy challenges. From breakthroughs in fundamental science to new clean technologies to integrated energy systems that power our lives, NREL researchers are transforming the way

the nation and the world use energy. The Buildings Research Program supports improvements in residential buildings, in commercial buildings, in building equipment and components, building energy analysis tools, manufacturing, and in lighting and appliance standards. NREL is a nationally recognized leader in buildings research combining renewable energy with innovative technologies to significantly reduce energy consumption in buildings. The Energy Systems Integration Facility (ESIF) at the U.S. Department of Energy's National Renewable Energy Laboratory provides transformative capabilities to advance our nation's energy system into a cleaner, more intelligent infrastructure.