

Kelly Cha

From: Jyothsna Giridhar [REDACTED]
Sent: Tuesday, August 21, 2018 12:43 PM
To: Kelly Cha
Cc: Tom Gilman
Subject: Inputs of Sunnyvale Green Building Program update
Attachments: DES Inputs Green Building Program.PDF

Hello Kelly,

Nice to get in touch with you through email. I am a sustainability coordinator with DES Architects and Engineers. I just wanted to get in touch with you to provide my inputs on the proposed update to the Green Building Program in Sunnyvale. I wanted to share that the current version of LEED is LEED Version 4, and is applicable to all projects registered with USGBC after October 21st, 2016.

Several of our projects in Moffett Park and other parts of the City are certified or targeting LEED Platinum under LEED v2009 (LEED V3). However, our experience shows that LEED V4 is a major leap over LEED V3 with several new stringent requirements. Consequently, it is a major challenge to target the same number of points that was feasible under LEED V3. Under LEED V4, it may be feasible to achieve a Platinum only if a project is located in a very dense neighborhood, even if it is a net zero building that has also achieved the MRc Life-cycle Impact Reduction.

Given the stringency of the updated version of LEED, we would like to propose mandating LEED Gold after the industry is ready. We would also like to propose deferring the LEED Platinum requirement for availing incentives on FAR, till the industry is prepared to target higher certifications under LEED V4

We have attached a letter that provides more details of the updates in the rating system and issues with some credits. Please feel free to reach us if you have any comments/questions. Again, it was a pleasure to get in touch with you through email. I look forward to meeting you this evening.

Kind Regards,

Jyothsna Giridhar
Sustainability Coordinator | LEED AP BD+C

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Architecture | Interior Design | Landscape Architecture | Structural Engineering | Civil Engineering | Visual Communications | [Green Building Consulting](#)

August 21st, 2018

City of Sunnyvale
Building Safety Division
Department of Community Development



Re: Sunnyvale's Green Building Program Update

This is in reference to the proposed revisions to the requirements of Non-residential projects as part of Sunnyvale's Green Building Program. The program proposes to mandate a minimum of LEED Gold level for all new non-residential buildings. While LEED Gold has a threshold of 60 points, LEED Platinum rating requires a minimum of 80 points. We would like to inform the City that the current LEED Version (LEED V4) is in effect for all projects registered with USGBC after October 21st, 2016.

Several of our projects including campuses in Moffett Park and other parts of the City have achieved or targeting LEED Platinum under LEED V3. Our new campuses typically have a considerable buffer over Platinum threshold of 80 points and target between 87 to 91 points under LEED V3. However, our experience shows that LEED V4 is a major leap over LEED V3 requirements. A Platinum rating with a comfortable buffer of at least 6 points (86 points) is achievable in LEED V4 if the project is in a brownfield site located in an extremely dense neighborhood, and near net zero. The stringency of the requirements has made it difficult to target the same number of points that were possible under LEED V3.

In LEED V4, the baseline for energy credit is 11% more stringent than the baseline for the same credit in LEED V3. Additionally, the site credits have been revamped to an extent that it is not feasible to achieve them unless it is in an extremely dense neighborhood. For example, the requirements for LTC4 Surrounding Density and Diverse Uses has resulted in our projects in Sunnyvale achieving a maximum of 4 points out of 6, even if it is in an extremely urban setup. Some of our projects near Caltrain stations are targeting only 1 of 6 points available for LTC5 Access to Quality Transit, because the credit requires a specific number of trips per day. Moreover, USGBC is revisiting some credits like SSc Rainwater Management, MRc BPDO EPD Option 2, and IEQc Daylight to iron out issues with the requirements. At this point, we are not aware of when USGBC will roll out the revised version. We would also like to point out that some requirements such as number of trips available in public transport systems and development density is not completely within the project teams' control.

Our analysis shows that a typical project in the Bay Area that is not located in a downtown setup may achieve a maximum of 83 points, if it is a net zero building, has onsite PVs, and achieves the whole building life cycle performance credit. The 3-point buffer over 80 points which is the Platinum threshold does not provide a guarantee that the project will achieve the rating.

Subject: Sunnyvale's Green Building Program Update
Date August 21st, 2018
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While we fully support the City's goal of improving the minimum standards of sustainable buildings, we would propose mandating LEED Gold after the industry is prepared for the current version. Since achieving LEED Platinum is very challenging under LEED V4, we would also propose deferring the LEED Platinum requirement to avail incentives on the FAR, till the project teams are ready for the change.

Please feel free to reach out if you have any questions.

Sincerely,

DES Architects + Engineers, Inc.



Jyothsna Giridhar, LEED AP BD+C

Sustainable Building Coordinator

From: [Maria McGuigan](#)
To: [Kelly Cha](#)
Cc: [Janette D'Elia](#)
Subject: JPC Letter to Sunnyvale's Draft Green Building Update as of 8/21/18
Date: Tuesday, August 21, 2018 11:27:04 AM

Dear Ms. Cha,

Please find our attached letter with our comments to the City's Draft Update to the Sunnyvale Green Building Policy issued for public comment. I'll also be attending the community meeting this afternoon and look forward to meeting you today.

Best,

Maria McGuigan | [Jay Paul Company](#)

Senior Director, Real Estate Development
Four Embarcadero Center, Suite 3620
San Francisco, CA 94111
Office: 415 263 7400 | Direct: 415 263 7402



VIA EMAIL AND HARD COPY MAIL

August 21, 2018

Ms. Kelly Cha
Community Development Department
City of Sunnyvale
456 W. Olive Avenue
Sunnyvale, CA 94086

Re: Sunnyvale Green Building Update – Draft Staff Recommendations dated 8/21/18

Dear Ms. Cha,

We are writing to you to outline our initial thoughts and concerns to the Draft Staff Recommendations to Sunnyvale's Green Building Program dated August 21, 2018 currently out for public input. As you may know, Jay Paul Company strives to be a leader in green development with our entire Sunnyvale office portfolio of more than 9 million square feet committed to LEED certification Gold with several projects achieving Platinum level.

We are concerned about a few of the updates suggested in the draft Green Building Policy update as outlined in our points below:

1. Sunnyvale's proposed Green Building Updates and Existing Entitlements
The City needs to confirm that under the proposed policy updates, the City will uphold and preserve the vested entitlements for projects with voluntary incentives under current project Development Agreements and Conditions of Approvals for both New Construction and initial Tenant Improvements. Our projects in the Moffett Park area benefited from voluntary incentives with density bonuses for projects to achieve LEED Gold certification. To change this to a higher standard would be problematic and should remain subject to meeting the LEED Gold certification requirements.
2. Clarifications to the language and thresholds for LEED Gold versus Platinum suggested in the Green Building Updates. The proposed modifications to Voluntary Incentives as currently drafted "LEED Gold with a minimum of 80 points," is confusing as "80 points" is Platinum level. Perhaps the intent was to require LEED "high gold" with a minimum of 70 to 75 points. We are concerned with a prescribed requirement of "LEED Platinum", particularly under the current version of LEED v4, as achievement of credits at this level will be extremely difficult for projects in Sunnyvale specifically in Moffett Park as they will not be able to take advantage of

the many Location and Transportation credits due to the lack of density according to USGBC credit criteria. To obtain these credits, a project must be within a minimum number of transit stops and modes, with high frequency during weekdays in order to meet the potential credits. In our opinion a standard of Platinum is setting the bar much too high under LEED v4, and a standard of LEED “high gold” is a more realistic voluntary incentive for projects.

3. USGBC Design Review Required for LEED Verification. The addition of USGBC Design Review for verification of LEED credits applicable to commercial new construction projects >30,000 Sq. Ft. will require registration with USGBC and payment of applicable fees for registration and USGBC design review and credit verification. Although these project costs are relatively small in scale compared to overall LEED implementation, these are added upfront costs to smaller projects that will impact the bottom line regardless of whether LEED certification is pursued.
4. Applicable Project Size and Minimum Requirements. The suggested changes in the Project Size to meet the minimum LEED standards at present pertains to projects >30,000 Sq. Ft. (from the current >100,000 Sq. Ft.). The reduced Sq. Ft. threshold is especially critical for NZE (Net Zero energy) projects in the 30,000-100,000 Sq. Ft. range as it is more attainable than in large scale projects, 250,000-300,000 Sq. Ft., as there are very few buildings in the world of this size that are NZE. It may make more sense to issue an update with tiers and tailor the NZE or Zero Carbon requirements more specifically to project size.
5. Voluntary Incentives suggestion of Net Zero option for increased density. option. The “FAR Increase to 10% in Moffett Park by achievement of Net Zero on the project site by An ILFI certification or another from a comparable organization” implies a range of definitions and will need to be more fully clarified. The IFLI NZE certification requires 100% energy offset through on-site renewable energy and does not allow any combustion sources (natural gas). Further, certification for NZE under IFLI does not occur after at least 1 year of occupancy by a Tenant. This means that potential verification of NZE achievement may not be possible for 2-5 years (or beyond due to leases) after initial construction. Achieving NZE will be very difficult for larger buildings between 100,000 to 300,000 Sq. Ft. as many of the Mechanical and Plumbing System designs rely on natural gas. However, if the City would allow NZE via the purchase of offsite renewables and carbon offsets (to account for any natural gas usage) that would be more attainable to be NZE and in line with the LEED v4 Green Power credit. Projects could be encouraged to minimize gas usage where possible but for large buildings, eliminating gas will prove to be detrimental particularly in our case with speculative projects where the end user/Tenant is not known during design/construction, therefore the energy demand and required offset is not known. Design and construction modifications to the base building systems after-the-fact once Tenant requirements are known will result in increased cost and potential schedule delays to both Developer and Tenant. The policy update needs to consider how the suggested changes and incentive criteria impact New Construction projects and Tenant Improvements.

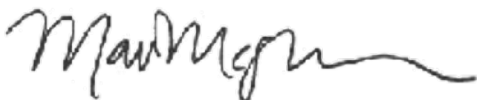
6. LEED Standards Continue to Become More Stringent due to USGBC Updates.

US Green Building Council continues to make certification at every level more difficult each time it updates the LEED requirements with a new version of LEED. The change from LEED v3 to LEED v4 alone is a significant jump in requirements for certification or USGBC design review to demonstrate for LEED Gold/Platinum equivalence. The updates in Optimized Energy credits, use a baseline ASHRAE 90.1-2007 and ASHRAE 90.1-2010, resulting in a 20% increase in overall energy efficiency. Furthermore, we analyzed several of our recent projects applying the 2007 and 2010 ASHREA baselines which resulted in a significant loss in energy points under LEED v4. As an example, Moffett Towers II was awarded 16 points under Optimized Energy credits with LEED v3, with only 4 credits earned for LEED v4. For Moffett Place Building 6, under LEED v3, 8 points would be earned and under LEED v4 only 1 credit would be achieved. The available energy points attainable are significantly reduced with the latest version of LEED making it much more difficult to achieve LEED Gold or Platinum levels. Due to LEED v4 the City's proposed ordinance will be at least 20% more difficult to achieve for energy credits alone.

Further, the City's modifications suggest certain levels of LEED to meet the suggested Policy updates. LEED v4 requires that a Tenant lease be signed to award design and construction credits, whereas in the past USGBC would accept "letters of commitment" from Landlords with verification that requirements would be met and upheld by future Tenants. There are requirements for maintenance of LEED certification credits required in LEED v4 which put more obligation on the Tenant's to uphold LEED credits for the benefit of the Core Shell construction. This prescribed approach will be very difficult to achieve under the current LEED v4 and come with a significant cost to both developers and Tenant's which may negatively impact current and future marketability for New Construction and Tenant Improvement projects in Sunnyvale.

We would like to emphasize that we support the City's efforts to be a leader in sustainability and will continue to do the same with each Jay Paul project. Based on the points raised in this letter, we believe, the suggested updates to the Green Building Policies need to be examined further and voluntary incentive options for green density bonuses need to be more clearly identified and applicable to projects for speculative developments where the Tenant(s) are not known during design and construction.

Sincerely,

A handwritten signature in black ink, appearing to read "Maria McGuigan", with a long, sweeping horizontal line extending to the right.

Maria McGuigan
Senior Director, Development & Construction

From: [REDACTED]
To: [Kelly Cha](#)
Cc: [Amber Blizinski](#)
Subject: Feedback on Draft Green Building Code Update
Date: Tuesday, August 21, 2018 8:47:25 PM

Kelly,

Thank you for taking the notes today on the feedback at the Green Building Code Update Draft Outreach meeting at 2 pm.

There wasn't a lot of time for me to provide my input at the meeting itself and I compose my thoughts better in writing anyway, so please see below for my feedback and suggestions. I also have a number of questions which I'll send in a separate mail since this one is getting quite long already.

Feedback and suggestions on the Green Building Code Update Draft.

- It would be good to incentivize 'all electric' buildings. Buildings with all-electric systems (that use SVCE 100% GHG free electricity) will not generate CO2 emissions at all. There are a wide array of solutions available including Heat Pump Water Heaters, Heat Pump heating/AC (whether air source or geothermal ground source.), induction cooktops, standard electric or heat pump clothes dryers. Some of these are superior to conventional systems in terms of lifecycle energy costs, safety, health performance and convenience. Natural gas is increasingly implicated in human health concerns whether from dangerous chemicals used in fracking (especially in populated areas), large scale leaks from storage facilities (Aleso Canyon), and explosion hazards due to aging infrastructure (San Bruno). Environmentally, fracked natural gas uses vast amounts of fresh water in a state wracked by increasing drought. Collection, transport and storage of natural gas is fraught with leaks of essentially pure methane which is 50 - 80 times more potent a greenhouse gas than CO2. New buildings that install natural gas systems will be committing to a 20 - 30 year (or longer) use of natural gas. This takes us to and beyond the range of 2050 when cities need to have an 80% reduction of greenhouse gas emissions compared to 1990 levels. This kind of reduction cannot happen without a dramatic shift from fossil fuels. The state will eventually require a phaseout of fossil fuels and there is opportunity for Sunnyvale to regain leadership in this area. Certainly this is not part of state standards yet because the governor and legislature have not dared to take on the powerful financial and legal forces of the oil and gas industry, but it is the right thing to do with respect to environment and human health. Perhaps it could be phased in over time. Certainly developers will not like this proposal as it would force them to change for Sunnyvale and not other cities. But in the meeting today it was noted that the the incentives are meant to be difficult to achieve. While the greatest financial, environmental and health savings can be achieved by 'capping' natural gas lines in a new development, perhaps some (smaller) incentives could be given for 'fuel shifting' from gas to electricity instead of going 'all electric'.
- Reconsider whether to adopt incentives for Tier 1 and Tier 2 of CalGreen instead of continuing with LEED points and Built IT Green Point rating systems. Switching to CalGreen tiers puts significant onus on the city to train inspectors and make

interpretations of things that may not be as well understood, but it may be a well spent investment considering the direction of state standards. Or perhaps a hybrid model could work? Developers could choose CalGreen Tier 1 or Tier 2 for progressive incentives vs. choosing LEED or Green Point Certification. This would give developers more flexibility and would force the city to develop its building inspection staff to become more knowledgeable in the CalGreen Tiered options.

There are training courses available through respected channels that city building inspectors and planners could attend.

- Reconsider reference to "Solar heat pumps". My understanding is that a hybrid air source heat pump combined with solar thermal on the roof is significantly more expensive (and takes up considerable roof space) than solar PV to supply electricity to an air source heat pump. And now that SVCE provides GHG free electricity the solar PV on the roof is not even that important (though it can save owners and tenants significantly over the life of the PV system). There is a current study issue relating to heat pumps for water and space heating. The results of that study could inform ways to incentivize their use through the Green building code.

- If rooftop solar is to be incentivized it is likely better for both tenants and owners of a development to actually install solar rather than just make it 'solar ready'. It is nearly always less expensive over the life cycle of the building to install solar when the building is being built than to add it later. That being said, it is also probably better to incentivize fuel switching to electricity (using SVCE) than to incentivize rooftop solar. By the time the Green Building Code update is released and in force, the 2020 state requirement for new residential to be zero net energy will already require builders to utilize solar.

- Considering that the timeline for presenting the Green Building Code Update to City Council (in 2019) is after the Council is expected to review and approve of the CAP 2.0 (December 2018), please work with ESD to identify likely actions that could be incorporated into the Green Building Code update. There is opportunity to incorporate current innovations and best practices with respect to GHG reduction in buildings and not just rely on what is currently in CAP 1.0. The time for incorporating CAP 1.0 actions into the Green Building Code is past due and it would be best to focus on likely future actions.

- Please review my submission to the Open IDEO Innovate Sunnyvale Climate Action Challenge platform called "Updated Green Building Code and Developer's Carbon Impact Fee" at: <https://challenges.openideo.com/challenge/sunnyvale/community-review-of-ideas/updated-green-building-code-and-developer-s-carbon-impact-fee> While this would be a fairly radical departure from current policy, I believe we need to take bold steps and some risks in order to achieve an 80% reduction in GHG emissions from the city by 2050. There are several other submissions on the site relating to "How we power our Buildings (Energy) that could be relevant. Some include: "Policy", "One Stop Trusted Energy Shop", "Free Energy Audit for home and building owners", and "Benchmarking Requirement", etc. It would be worth a browse through all the ideas for items relevant to the Green Building Code Update.

- I saw in the Next Steps slide that there will be a Study Session with the Planning Commission. Please consider inviting the Sustainability Commission to this study session. A joint meeting could be very useful.

- As brought up in the meeting today, ongoing energy performance of buildings may fall far short of the designed (and certified) plans. Consider requiring one or both

of: a) a building energy management system that can self-tune for lowest energy intensity and highest comfort and/or b) an required building energy audit and 'tune-up' every 5 years to check ongoing performance. This would be a kind of 'smog check' if you will for buildings.

- No voluntary incentives were listed for remodels of either residential or commercial. There is opportunity to design voluntary incentives that promote 'all electric' retrofits. For example, the city could incentivize through: publicizing rebates available through SVCE or PG&E, providing discounts on permitting fees, or giving concessions on some other favorite code exceptions commonly requested at the time of remodeling.

- Moffett Park 20% + 10% incentives seem generous, while Peery Park developments are exempt from the incentives because they could get Community Development Benefits. Seems like there could be a common standard for both these and any future large business development areas.

- I encourage the staff to become well-versed in expected changes to the next update of the CA Building Code Title 24 so Sunnyvale does not incentivize actions that will be CalGreen or Energy Code Mandatory in the 2019 release.

Thank you for the opportunity to provide feedback.
Sincerely,

Kristel Wickham
1102 Viscaino Ave
Sunnyvale CA 94086
[REDACTED]

From: [Andrew Miner](#)
To: [Kelly Cha](#); [Amber Blizinski](#)
Cc: [Trudi Ryan](#); [Chuck Clark](#); [Brad Vedula](#)
Subject: FW: green building update—general comment
Date: Friday, August 24, 2018 9:56:45 AM

Andrew R. Miner, AICP
Assistant Director
Community Development Department

Phone: 408 730-7707
Fax: 408 328-0710

From: Barbara Fukumoto [REDACTED]
Sent: Friday, August 24, 2018 8:38 AM
To: Andrew Miner <AMiner@sunnyvale.ca.gov>
Subject: green building update—general comment

Hi, Andy,

I appreciate how much has been accomplished over the years through your green building program—in collaboration, with a rather light touch, and without causing distress to the building community. I appreciate that you have hosted an outreach meeting before staff's ideas have solidified. And thank you for encouraging public input.

Since the last update, Council has strengthened its direction on climate. Early in 2017, Council made climate action an official Council priority. And earlier this year, the Mayor signed on to a letter declaring strong support for the Paris climate goals.

As 407 US Mayors representing 70 million Americans, we will adopt, honor, and uphold the commitments to the goals enshrined in the Paris Agreement. We will intensify efforts to meet each of our cities' current climate goals, push for new action to meet the 1.5 degrees Celsius target, and work together to create a 21st century clean energy economy. More here: <https://medium.com/@ClimateMayors/climate-mayors-commit-to-adopt-honor-and-uphold-paris-climate-agreement-goals-ba566e260097>

Since the last update the Citizen Advisory Committee has voiced strong support for steep GHG reductions, culminating in no net emissions.

And since the last update, we are experiencing intensified manifestations of climate change worldwide—especially widespread wildfires, even in northern climates (including in Sweden and the arctic circle and including British Columbia, Germany, and of course CA), heat waves, and floods. Climate change is progressing faster than predicted. Just yesterday I read that the oldest and thickest Arctic sea ice is breaking up for the first time in recorded history. <http://thehill.com/policy/energy-environment/402816-arctics-oldest-and-thickest-sea-ice-break-for-first-time>

Scientists are attributing of the recent extreme weather to climate change: <https://www.nbcnews.com/news/us-news/climate-experts-now-cite-global-warming-during-extreme-weather-disasters-n895976> I have even noticed a decided shift recently in the news, which now more frequently connects the dots between the recent events and climate. And public perception seems to be shifting as well: [https://www.csmonitor.com/Business/2018/0816/Amid-fires-and-hurricanes-price-of-climate-change-begins-to-hit-home?](https://www.csmonitor.com/Business/2018/0816/Amid-fires-and-hurricanes-price-of-climate-change-begins-to-hit-home?cmpid=FB&utm_campaign=Echobox&utm_medium=Social&utm_source=Facebook#Echobox=1534428163)
https://www.csmonitor.com/Business/2018/0816/Amid-fires-and-hurricanes-price-of-climate-change-begins-to-hit-home?cmpid=FB&utm_campaign=Echobox&utm_medium=Social&utm_source=Facebook#Echobox=1534428163 Indeed, the March Yale poll on voter opinions on climate (before recent fires) shows clear support for action nationwide. <http://www.climatechangecommunication.org/climate-change-opinion-map/>

So, I believe staff has a strong basis for significant advances that focus on reducing the GHG emissions in all building categories—in *this* update. I believe that, with climate change already as bad as it is and with more

temperature increases in the pipeline from the GHG already emitted, we need to seize *this* opportunity to put Sunnyvale on track for the steep reductions called for by scientists, the Paris Agreement and the CAC. It is critical that we use all tools at our disposal to accelerate action, including this green building update. We don't have the luxury of time. I understand that accelerating the pace of change is not easy, but neither is experiencing the effects of climate change. Your green building program is a powerful tool. Let's use it to drive needed change at the pace that is now required.

Barbara

Kelly Cha

From: [REDACTED]
Sent: Friday, August 24, 2018 12:21 PM
To: Kelly Cha; ABlinzki@sunnyvale.ca.gov
Subject: Sunnyvale's Green Building Program Update
Attachments: Letter to City of Sunnyvale re Green Building Program.pdf

Please consider the attached letter providing input on the draft Green Building Program update. Sunnyvale is a leader in combating climate change. It is important that the City review these types of policies in order to stay on the forefront. As an industry professional who has worked with the LEED system for over a decade I have concerns with the current draft. It is in all our best interest to see the City do this right. Thank you for your attention. I am more than happy to answer any questions about my comments or anything else that would help the City craft this update.

Erik Dyrr



415.275.4265 (c) | 530.715.0674 (o)





City of Sunnyvale
Community Development Department
456 W. Olive Avenue
Sunnyvale, CA 94086

August 22, 2018

Subject: Sunnyvale's Green Building Program Update

Sunnyvale is commended on being on the leading edge of green building ordinances and incentives. Most of our clients are more than happy to meet or exceed these requirements. Primarily due to the market demand for LEED certified space in the region.

I would like to point out that the update from LEED v3 to v4 is a significant leap in requirements. For example, the Optimized Energy credit changed to a baseline of ASHRAE 90.1-2007 to ASHRAE 90.1-2010. Analysis shows code update is a 20% increase in energy efficiency. We did some analysis on a couple of our projects in the region and the energy points dropped significantly using the baseline required in LEED v4.

Project	LEED v3	LEED v4
Moffett Towers 2	16	4
Moffett Place	8	1
2747 Park Blvd, Palo Alto	8	3

The reduction in energy points alone is enough to drop a certification a full level. On top of that the ordinance proposes to increase the required LEED certification levels to reach voluntary incentives in the Moffett Park area. In a sense, the City is doubling up on the increase in the Green Building program. This will make it very difficult to achieve levels of Gold and Platinum. In particular, tenant improvements will be extremely difficult to achieve these upper levels due to limited options.

LEED v4's increase in sustainable requirements is not something that can be overcome simply by throwing more money at a project. In many cases, credits simply are not applicable to a given site or building type. The City should consider keeping the same levels in their program and upgrade to v4. Provide incentives for achieving Gold certification. A developer may be able to achieve Platinum with the core and shell but the tenants may not be able to achieve this level. This disincentivizes that developer to push the envelope on the core and shell if the City requires tenants to achieve the same level as the core and shell.

Also, I urge the committee to clarify this part of the ordinance:

Moffett Park

Projects can increase FAR by 15% (MP-I) or 20% (MP-TOD) by achieving:

- LEED Gold Level with USGBC Certification that achieves at least 80 total points or LEED Platinum equivalent, and *(if you achieve 80 points on a certified project, then it will be certified Platinum)*
- Design Phase Credits reviewed and approved by USGBC. *(what is the intent of this statement? All certified projects have Design Phase credits reviewed)*

In addition, projects in Moffett Park can increase FAR by another 10% by achieving:

- LEED Platinum with USGBC certification with Design Phase Credits reviewed and approved by USGBC, or *(this is the same requirement as above)*
- Net Zero Energy on the project site, certified by International Living Future Institute (ILFI) or by other comparable organization, and *(ILFI certification for ZNE does not come for a minimum of 1 year after full occupancy. How do you get the 10% increase in FAR if proof does not come for 2-3 years later? Is the City willing to accept a letter of commitment?)*

And lastly, the Green Building Ordinance should specify which version of LEED is required. Does this update require projects registered under LEED v3 to update to LEED v4? Or are they to meet the same requirements under v3?

Respectfully,



Erik Dyrr

 NRG Engineering

415.275.4265 (c) | 530.715.0674 (o)





August 28, 2018

To: Kelly Cha, Associate Planner, City of Sunnyvale
Amber Blizinski, Principal Planner, City of Sunnyvale

From: Andrea Traber, Sr. Principal, Integral Group
Marilyn Specht, Associate, Integral Group

Subject: Sunnyvale Green Building Program Update Draft

Thank you for the opportunity to review and comment on the current draft of the Sunnyvale Green Building Program Update. As Sustainability Consultants who have been working in Sunnyvale for many years, we are excited to see the City continuing to push with regards to sustainability and appreciate the thoughtful approach in soliciting feedback through public outreach. We've reviewed the draft of proposed changes and have the following comments:

- The Citywide Voluntary Incentive for the Non-Residential projects includes criteria for "LEED Gold level with USGBC Certification that achieves at least 80 total points or LEED Platinum equivalent." This language is confusing as LEED Gold is 60-79 points, whereas LEED Platinum is 80 points or more. Therefore, LEED Gold or 80 points is a contradiction and is unclear as to the meaning of the requirement.
- The next bullet includes a stipulation that "Design Phase Credits [must be] reviewed and approved by USGBC." We assume this is at the time of permit submission, but the exact timing is not clear. As Sustainability Consultants who currently work in Sunnyvale and have worked in the City for many years, our experience is that projects are not able to submit for LEED Design Review until after 100% CD, which is often 3-4 weeks after permit is received at best. This language and expectation around timing of Design Phase credits should be clarified to avoid any confusion with project teams. We suggest that:
 - project applicant be required to demonstrate that the project is registered for LEED,
 - project applicant be required to submit LEED scorecard with building permit application,
 - LEED Project Administrator is designated in LEED Online,
 - Credits to be pursued are assigned to team members on LEED Online and this is verified to be consistent with the LEED scorecard submitted,
 - LEED Project Administrator be required to attest to above,
 - Evidence of LEED Design Phase submittal is provided to the Building Department as soon as it has been submitted.
- The Moffett Park Voluntary Incentives for Non-Residential projects includes requirements for LEED Platinum or Net Zero Energy for the FAR bonus. We work on many different types and size projects in Sunnyvale and a portion of our work is speculative core and shell developments. Under LEED v4, USGBC has tightened the flexibility for speculative projects by only allowing certain energy and water credits to be counted if tenants are officially signed on to a lease and these requirements are incorporated into lease requirements. Therefore, there are less energy and water point opportunities available for speculative projects than was possible under LEED v2009. Furthermore, ILFI's Net Zero Energy certification not only requires the project to perform at a net positive energy rate (produce more energy onsite than is consumed) but also demonstrate this performance over a 12-month period during occupancy. Speculative core and shell projects with no known tenant will be unable to design to a net positive level (without a tenant, actual energy demand cannot be accurately

determined) and unable to meet the performance period without an occupied space. This particular incentive is not suitable for speculative core and shell projects given the challenges outlined above.

- The final incentive option included for the FAR bonus is an additional green/sustainable development feature. It would be helpful for project teams to have a few examples of the type of strategies that would be acceptable for this option, if possible.

Thank you again for the opportunity to provide feedback and we look forward to seeing the finalized program updates. Feel free to reach out if you'd like any further input from us.

Sincerely,



Andrea Traber, AIA, LEED Fellow
US West Sustainability + Resilient Design Leader



Marilyn Specht, LEED AP (ND, O+M), LFA, WELL AP, EcoDistricts AP, Fitwel Ambassador
Associate, Senior Sustainability Consultant

From: [Barbara Fukumoto](#)
To: [Amber Blizinski](#)
Cc: [Andrew Miner](#); [Kelly Cha](#)
Subject: Green Building Update—need for bold and decisive action
Date: Thursday, September 06, 2018 1:13:24 PM

Hi, Amber,

I want to offer some insight into why those of us who closely follow the climate situation are pressing for maximum, envelope-pushing ambition in the current update of the green building code.

Worldwide, greenhouse gas (GHG) emissions are still rising. NASA's current GHG measurement is 408 ppm, this when the safe level is thought to be 350 and pre-industrial levels were in the 280s. Current levels are much higher than any time during the last 650,000 years and the rate of increase is likewise much faster, according to the American Chemical Society for one: <https://www.acs.org/content/acs/en/climatescience/greenhousegases/industrialrevolution.html>

We are immersed in articles like the one below, which is based on a study commissioned by several governments, including Norway, S. Korea and the UK. It will shortly be presented to the UN Secretary-General.

“By 2030, We Will Pass The Point Where We Can Stop Runaway Climate Change.”

The world is on the cusp of a green economic renaissance that it must **embrace** — or else face a nightmare future of runaway global warming, according to a report commissioned by several governments including the U.K., Norway and South Korea.

The next two to three years are a “critical window” for bold climate decisions that can usher in a new era of economic growth by 2030, says the [study](#) by the Global Commission on the Economy and Climate, an international green growth initiative fronted by former political leaders, including former Mexican President [Felipe Calderón](#), former New Zealand Prime Minister [Helen Clark](#) and onetime Nigerian finance minister [Ngozi Okonjo-Iweala](#).

“This is more than just a report,” Calderón said. “It is a manifesto for how we can turn better growth and a better climate into reality. It is time we **decisively** legislate, innovate, govern, and invest our way to a fairer, safer, more sustainable world.”
https://www.huffingtonpost.com/entry/runaway-climate-change-2030-report_us_5b8ecba3e4b0162f4727a09f

[my emphasis] Please note that the next two or three years are considered critical.

The entire article is definitely worth a read, but it concludes as below:

Asked to rate on a scale of 1 to 10 how confident he is that global warming could be contained below 2C — with 10 the most confident — Rockström responded:

“From a scientific perspective, I am on a 7 or an 8. There is a 70-80 percent chance that we could steer ourselves back to a safe operating space on earth, based on the fact that the planet is still resilient [and] we haven’t touched the tipping point buttons yet. But on the ‘will we do it?’ ranking, I become much less optimistic and fall down to a 6.”

In other words, this scientist believes that there is a 20 or 30% chance that we are already out of time to maintain a safe climate, but have a 70-80% chance of staying within what we think are rather safe limits. However, he thinks that we only have a 60% chance of remaining safe because he sees people as less-likely to to what science says is needed. The 20-30% judgement that it is already too late is one of the scariest assessments that I have read, but frightening evaluations are becoming more common. Climate Change is no longer discussed in the future tense, but the present. Scientists are screaming at us, in their probabilistic way.

We understand that the green building code has resulted in significant achievement over a period of time. We realize that government usually needs to work incrementally, to think in terms of years or decades, to avoid rocking the boat, to consider all opinions (regardless of their validity). However, the world has waited so long to act decisively on Climate that we have run out of time for an approach of small increments. I firmly believe that government needs to step out of normal comfort levels and maximize the use of all the tools available to accelerate the rate of change. We need government to opt for a more activist role, in line with Council priorities. (And Climate Action is one.)

We don’t think we have time to delay beginning to electrify—to begin to eliminate the use of fossil fuels in buildings. We need to address electrification in this green building code update. We must find a way to minimize the number of new buildings that depend on natural gas and encourage existing building owners to start converting to electricity. New buildings, if powered by natural gas, will either continue to emit greenhouse gases well into the future or will require expensive retrofits. We don’t have the time or money for either of these options.

The world and the country depend on California to lead in creating the bold solutions needed. And the Bay Area is the most innovative and progressive region of the State. Let’s use this code update to explore effective ways of pushing the electrification ball forward and blaze a trail for others. (Couldn’t avoid the mixed metaphor.)

Thank you for your time in reading this long e-mail.

Barbara Fukumoto

From: Douglas Kunz
To: [Kelly Cha](#)
Cc: [Amber Blizinski](#)
Subject: Green Building Program Update comment - Residential Standards
Date: Thursday, September 06, 2018 4:22:48 PM

Dear Kelly and Amber,

I'm writing to urge you to explicitly align the next Green Building Program Update with Council's Policy Priority to Accelerate Climate Action, and to suggest one potential avenue for better doing so with regards to the Residential Standards within the program.

This comment is intended to align with the following key principles:

- It is easier and more cost-effective for both the City and the Development community if the Green Building Program references existing standards rather than developing standards unique to Sunnyvale - **particularly standards or programs already being used** by the city and industry
- There is stronger potential for policy innovation with voluntary measures rather than mandatory requirements.

In that spirit, for the "Voluntary Incentive" requirements for new residential construction, I'd suggest replacing the menu of measures listed in the draft proposal (cool roof, greywater and/or rainwater catchment system, etc.) with a requirement that explicitly targets eliminating greenhouse gas emissions. In order to do so, I'd highlight one portion of Build It Green's "GreenPoint Rated" certification program, since that certification program is already being used by the City. One measure that is required for **all** houses that achieve GreenPoint Rated certification for new construction is "Measure J5.1: Home Outperforms Title 24 Part 6." There are several "pathways" that can be used to meet this measure, and the following pathway in particular would sharply reduce a new home's GHG emissions:

Option Two: All Electric Compliance. The approach for compliance, for both single family and multifamily is as follows:

- 3% compliance margin
- Prescriptive requirements: water heating that includes either the installation of a HPWH with an energy factor of 3.2 or greater or a solar thermal system with a minimum 30% solar fraction
- All electric homes must have a photovoltaic system
- Photovoltaics may be used to meet compliance

Note that the 3rd point (that new homes would need to have a PV system) simply aligns with CEC's 2019 Building Energy Efficiency Standards requiring solar in new residential construction, so that specific item would not constitute a new requirement for homebuilders (Build It Green also confirmed to me via email that they "don't require a specific photovoltaic system size - this allows for more consideration regarding design").

If requiring Measure J5.1 Option 2 for a new home to qualify for Voluntary Incentives causes cost concerns in the development community, then I'd favor making those incentives (additional allowed FAR, lot coverage, etc.) more robust. Eliminating GHG emissions in new homes built in Sunnyvale would be a big policy win; if stronger incentives were needed in

order to make the economics work for our development community, that'd be a very reasonable adjustment to make to our Green Building Program in order to facilitate shifting our new residential construction onto a zero-carbon trajectory.

Thank you for your consideration.

Sincerely,
Doug Kunz

From: [Peter Kahn](#)
To: [Kelly Cha](#)
Subject: Green Building
Date: Wednesday, October 03, 2018 2:17:29 PM

Why should a developer need to pay USGBC hundred of thousands of dollars to get certified? There should be a self certification option or a certification by other qualified professionals not just USGBC. They over charge for their service and are not necessarily the only competent arbitrator.

[Peter Kahn](#)

[AVP](#)

Real Estate Development
Costco Wholesale Corporation

From: [John Vidovich](#)
To: [Kelly Cha](#)
Subject: Re: Green Building Outreach Meeting on October 15 - REVISED
Date: Monday, October 08, 2018 12:08:05 PM

Here is my input. This is based on our experience and true savings. So much of the "green" code is political and not really effective at making our buildings sustainable. Here are my comments.

1. Underground parking is definitely GREEN. It provides shade, better temperature when getting in the car and the car lasts longer in the shade.
2. Solar. Solar is very important since the electric use is next to the panel locations. But what limits solar is time of day and a big item should be a battery location even if Batteries are not currently installed. Today battery technology is getting better but massive improvements are coming. To utilize we need battery storage likely underground and future technology may mean larger spaces.
3. Storm water retention in the underground. Roof run off is fairly clean and it comes at times when the storm systems are overloaded and if it can be stored in a building it can later be used for landscape watering. A very very green item.
4. NO one pays attention to the underground and sewer pipes should be clay and not plastic for green points. The clay pipes breathe and they actually let some of the sewer seep in a manner that it is purified and taken up by plants.
5. Carpets should be wool for points because wool lasts longer and is definitely more green. I have not heard of cotton carpets but drapes are never counted but they can be cotton which is a sustainable fiber.
6. Stone of any kind is better than man made products. Crushed stone glued is also good.
7. Having open ceilings is more expensive than Tbar. Tbar uses a lot of plastic for the ducts and a better solution is hard metal ducting but the ceiling is more versatile, lasts longer and is good for green points. Currently no one cares. So Longevity is a reason to give it more green points. But it also is humanly better. Humans are the whole reason we build. We are not building prisons but experience buildings and that is why wool and open ceilings deserve green points.
8. Taller buildings are controlled by zoning so it is unfair to let the tall buildings get more points. But think about taller buildings, they are more efficient for transit and housing people. Less footprint.
9. Bike storage is definitely green. Supplying bikes for daytime use of the employees is worth a point. Most people drive but if they could use a company bike in a useful place that is worth a point.
10. Glass on the south side is extremely difficult as to heat. So the best solution is two windows with a good air space in between and outside air traveling through the glass interstitial space. Also thickening the mullions works too. This is ONLY on south side windows. Green does not mean we build dungeons but we can get good effects with thicker mullions and some gapping. Also trees are really good. Best trees though are the ones that grow slow and use less water. No one pays attention to that now.
11. Green should have some experimental points so that it is not a bureaucratic exercise. Leeway needs to be allowed in addition to the solid rules so that developers can be innovative. Say a building supplies extra parking and uses it to have electric cars for the employees so they do not drive their gas cars. Just an idea.
Say paying for solar in the area but off site may also work. The key is to be open.

In a message dated 10/3/2018 2:31:29 PM Pacific Standard Time, KCha@sunnyvale.ca.gov writes:

Good afternoon,

Sorry for multiple email messages. A few attachments were missing from the last email. The missing attachments, along with the updated draft staff recommendations, are attached here for your review prior to the outreach meetings.

The City has revised the previously shared draft recommendations for the Green Building Program based on comments received at the August outreach meetings and via e-mail. We would like to invite you to share additional (or new) comments with us at one of two upcoming community outreach meetings. Both meetings will cover the same agenda and will allow ample time for comments and questions from members of the public on the recommended modifications.

The City first adopted the green building program in 2009, establishing LEED and Build It Green levels for nonresidential and residential projects, respectively. There have been periodic amendments to these standards since 2009, as was contemplated when the program was first adopted. The current effort is the latest update to the program and will increase minimum (and incentive) standards for nonresidential and residential projects.

Staff will present the updated draft staff recommendations and walk the audience through the standards during the outreach meeting(s). The existing Green Building Program standards and the updated draft staff recommendations are included in this e-mail.

Please join City staff to discuss the study:

When: Monday, October 15, 2018

9:00 AM

OR

6:30 PM

Where: Sunnyvale City Hall

West Conference Room

456 W Olive Avenue, Sunnyvale 94086

If you cannot make it to the outreach meeting and would like to provide input on the recommended updates or would like to be added to an interest list to receive future e-mail notifications on the subject, please contact Kelly Cha (Associate Planner, Planning Division) at kcha@sunnyvale.ca.gov or (408) 730-7408.

We are trying to reach as many people as possible with this notice, please feel free to forward the information along to interested parties and post this notice where appropriate.

Thanks,

KELLY CHA

Associate Planner

Community Development Department

Follow us on: Phone: 408-730-7408

One-Stop Permit Center: 408-730-7444

Sunnyvale.ca.gov

From: [Barbara Fukumoto](#)
To: [Andrew Miner](#)
Cc: [Amber Blizinski](#); [Kelly Cha](#)
Subject: Green building update
Date: Thursday, October 11, 2018 11:23:36 AM

Hi, Andy,

Thank you to you and your staff for finding a way to incorporate electrification in the current green building code update.

Pushing ahead with electrification now as far as possible seems even more critical than it was just weeks ago, in view of this week's UN report, covered here by the New York Times: <https://www.nytimes.com/2018/10/07/climate/ipcc-climate-report-2040.html>

A landmark report from the United Nations' scientific panel on climate change paints a far more dire picture of the immediate consequences of climate change than previously thought and says that avoiding the damage requires transforming the world economy at a speed and scale that has "no documented historic precedent."

[The report](#), issued on Monday by the Intergovernmental Panel on Climate Change, a group of scientists convened by the United Nations to guide world leaders, describes a world of worsening food shortages and wildfires, and a mass die-off of coral reefs as soon as 2040 — a period well within the lifetime of much of the global population.

The National Geographic article on the report is well worth a read:

<https://www.nationalgeographic.com/environment/2018/10/ipcc-report-climate-change-impacts-forests-emissions/>

The UN IPCC report itself argued for accelerated electrification as a key measure in meeting the highly preferable 1.5 degree target, as opposed to 2.0 degrees.

These two quotes are from the "Summary for

Policymakers." http://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf

The first quote speaks to the need for quicker electrification. The second argues for immediate action to avoid locking in carbon-emitting infrastructure, stranding assets, reducing flexibility, and cost escalation. (My emphases.)

C2.2. In energy systems, modelled global pathways (considered in the literature) limiting global warming to 1.5°C with no or limited overshoot (for more details see Figure SPM.3b), generally meet energy service demand with ***lower energy use, including through enhanced energy efficiency, and show faster electrification of energy end use*** compared to 2°C (high confidence).

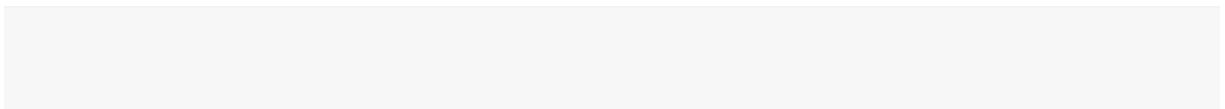
-Chapter Box 8 in Chapter 3, Cross-Chapter Box 11 in Chapter 4}

D1.3. The lower the emissions in 2030, the lower the challenge in limiting global warming to 1.5°C after 2030 with no or limited overshoot (high confidence). ***The challenges from delayed actions to reduce greenhouse gas emissions include the risk of cost escalation, lock-in in carbon-emitting infrastructure, stranded assets, and reduced flexibility in future response options in the medium to long-term*** (high confidence).

So, I have a concern with the current draft update of the green building code. I am not understanding why new single home/duplex construction and remodels/alterations are not included in an electrification effort. I would think that electrifying a single-family home or duplex would be easier than a multi-family residence. These new homes will either be emitting carbon decades in the future or need substantial upgrades, likely more expensive when done after the initial build. Also, I would think that the time of alteration/remodel would be a logical and cost-effective time to also electrify. Thank you for any light you can shed.

I hope we can move uniformly toward minimizing new fossil fuel infrastructure across all building categories with all possible speed.

Barbara



From: [Scott Shell](#)
To: [Kelly Cha](#)
Subject: Green Building Outreach
Date: Sunday, October 14, 2018 9:28:04 PM

Hi Kelly,

I'm responding to The City's requests for comments on the Draft Green Building Program recommendations.

My firm is working on a project on Crossman Avenue for a high tech firm.

The latest IPCC report on climate change is alarming for California.

<https://www.nytimes.com/2018/10/09/opinion/climate-change-ipcc-report.html>

The good news is that California met its 33% renewable energy target years ahead of schedule, will exceed 50% in 10 years, and 100% zero carbon by 2045. With our excellent Title 24 energy code additional energy efficiency is reaching a point of diminishing returns, while the rise of renewable energy is dramatically reducing carbon emissions.

To take advantage of our abundant clean renewable energy, the critical challenge in the building sector is to quickly transition off of natural gas to all-electric buildings. We now know that GHG emissions from gas are as bad as coal due to leaks (fugitive emissions).

Jerry Brown's recent Executive Order requires California to be carbon neutral by 2045. This will require that all existing buildings replace their gas heating and water heating equipment within the next 26 years. We need to immediately stop installing new gas infrastructure and appliances which owners will soon have to replace as an expensive retrofit. Once these systems are installed, shifting from gas to electric will require a larger electrical service, and in commercial buildings larger transformers and switchgear which will be very expensive to retrofit. Our architectural practice is shifting to all-electric as our clients will not be happy if they have to retrofit their buildings in the near future. We've completed dozens of all electric buildings within our client's typical budgets and performance goals. I interviewed our mechanical engineering firms and they all agreed it is feasible and cost effective to go all-electric on the vast majority of buildings (see summary attached).

The University of California recently announced that all new buildings on all ten campuses are required to be all-electric in order to lower carbon emissions and to avoid the expense of retrofitting their new buildings in the near future.

Our firm has long been strong supporters of LEED and Build It Green certifications, but CalGreen has significantly raised the bar on green building standards and climate change is so critical we recommend shifting priorities to decarbonization. We encourage Sunnyvale to shift Green Building standards much more strongly toward electrification.

Sunnyvale is a national leader in electric car sales at 15% of new car sales, and dozens of new models are rolling out in the next year. There will be an exponential increase in electric cars in the next decade and it is MUCH cheaper to building the charging capacity when a building is constructed

rather than as a retrofit. Electric cars need to charge during daytime hours when clean renewable energy is available, so it is important to require charging stations at commercial facilities, not just residential.

<https://www.theicct.org/sites/default/files/publications/CA-cityEV-Briefing-20180507.pdf>

So we have the following recommendations for the Sunnyvale Green Building program:

1. **Single family Minimum Standard:**

- a. ADD option for all-electric instead of Green Point rating.
- b. ADD mandatory wiring/receptacle for a future electric range and heat pump: these are very low cost measures for new construction, and will avoid expensive retrofits later. The California Energy Commission already added this wiring requirement for Heat Pump Water Heaters in all new construction (2019) for these reasons.
- c. Add mandatory heat pump water heaters on all new construction—very cost effective.

2. **Single family Voluntary:**

- a. ADD option of all-electric AND electric car charging instead of Green Point rating (or with a lower Green Point rating).
- b. At a minimum require wiring/receptacle for car charging.

3. **Multi-family residential Minimum Standard:**

- a. ADD requirement to go all-electric (or at minimum an option instead of Green Point rating). Multi-family is already commonly all-electric in California and is one of the easiest and most cost effective project types. Electrification eliminates safety and health issues associated with combustion appliances. There are already several programs underway to retrofit multi-family projects to get them off of gas; we shouldn't be building more.
- b. At minimum ADD mandatory wiring/receptacle for future electric range and heat pump.

4. **Multi-family Residential Voluntary:**

- a. Require electric car charging, or at a minimum remove cool-roof option, which is too easy and will effectively eliminate the electric car charging option.

5. **Residential voluntary remodel/addition:**

- a. ADD option for planning bonus for additions if converting to all-electric

- b.
- 6. **Non-residential Minimum:**
 - a. ADD all-electric requirement in lieu of LEED (or at minimum as an alternative to LEED). All-electric eliminates the need and expense of a LEED rater, USGBC registration and review, etc.
 - b. At minimum ADD mandatory wiring/receptacle for electric car charging
- 7. **Non-residential Voluntary:**
 - a. ADD electric vehicle charging.
 - b. ADD additional electrical capacity and wiring (but not chargers) to allow for future very low cost expansion.
- 8. **Major Alterations:**
 - a. ADD electric car charging OR electric heat pump

Many thanks for all your efforts toward making Sunnyvale a more sustainable city!
Scott

Scott Shell FAIA LEED® AP BD+C
Principal

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Are We Ready for All-Electric Buildings?

Scott Shell FAIA LEED® AP BD+C CERTIFIED PASSIVE HOUSE DESIGNER
Principal, EHDD

At EHDD, we have been pushing the boundary of low energy building design for [more than 15](#) years. When the U.S. withdrew from the Paris [Climate Agreement last year](#), we decided to take a [closer](#) look to see if [our building design strategies](#) could reduce carbon emissions at a scale commensurate with the climate challenge.

[First](#), we calculated the carbon emissions for some of our buildings, and were [pleased](#) to see how much cleaner our electric grid was than just a few years [ago](#). As California advances toward its 50% renewable energy goal by 2030, electricity will keep getting cleaner and cleaner.

We have made great strides in cleaning up our power grid, but what about our buildings? Most buildings in California still use natural gas for space and water heating.

We've completed [more than a dozen](#) all-electric zero energy ([NZE](#)) buildings with rooftop solar. But are we ready to shift all of our buildings to all-electric, and rely on the cleaner grid for low carbon power? We decided to ask a handful of our top mechanical engineering partners if the building industry is ready for this shift. Their response was generally Yes, we can now design all electric buildings that are competitive with natural gas in most of our projects.

Ted Tiffany & Steve Guttman, Guttman & Blaevoet Consulting Engineers
Eric Solrain, Integral Group
Kent Peterson, P2S Engineering
Peter Rumsey, Point Energy Innovations
Sean Armstrong, Redwood Energy
Meg Waltner, Alisdair McGregor, Raphael Sperry, ARUP
Hormoz Janssens, Interface Engineering

Is the industry ready to shift to all electric buildings today?

Integral: Generally, yes. Integral currently has dozens of all electric buildings recently complete, in construction, and in design. A big sea change in recent years. A lot of momentum in Multi-family residential and general commercial projects moving to electric.

Arup: Electrification is something that we are looking at for many projects today – both at the individual building and city master plan scale.

It is also an issue that we are looking at in our internally funded research: Arup just identified electrification as a key trend for our global strategic research planning and we are also starting a detailed research project to create design guidelines for electrification, which will build on earlier research laying out a blueprint for fossil-fuel free designs by 2020.

Interface: Almost all our projects are all electric, even one in Minnesota where we are using air source heat pumps for a large facility. I have only been using gas systems where required by the client.

Point Energy Innovation: Heat pumps and electric heating have already made significant inroads in California. We are seeing a lot of developers use electric heating with high levels of insulation in apartments that don't need cooling. Developers are using VRF systems on small to medium sized commercial buildings. Production home builders have been using central heat pump heating and cooling units for many years.

G&B: For most building types and sizes, there is no technical reason preventing the industry from shifting to all-electric buildings. We are seeing a surge in the use of larger heat pumps for generating hot water systems. A client has to be motivated to make the change from a high carbon source (such as natural gas) to an electric based system, because the cost of gas is relatively cheap right now.

P2S: New buildings are much easier to get to all electric because you can do an integrated design. Residential buildings are easy, and medium size non-res, say up to 100,000 sf are straightforward. Existing buildings can present challenges, and large complex projects have their challenges as well.

Redwood Energy: FEIA shows continued growth in all electric construction since 1994, and today one in four new homes in the United States is built all electric. Developers have been choosing all electric construction because it cost less to build and that trend has been going on for 24 years now. New construction is easy to go electric both technically and financially--the construction cost savings justify going all-electric.

Are there project types or sizes that are more challenging?

Redwood Energy: Yes, low-power homes like trailer homes, small apartments and old houses have a relatively small list of products to choose from that will fit their limited power supply without requiring a new breaker panel and potentially a service upgrade for more power.

G&B: Labs and Hospitals are a challenge due to the high outside air loads, demands for sterilization, high hot water loads, all that need higher content fuels like natural gas. Not impossible, but challenging.

Interface: Most project types work just fine. We are doing 500,000 gsf all electric office for Microsoft, with major savings using heat pumps vs a central plant.

All Electric projects:

Interface:



Santana Row Lot 11



Sacred Heart School



Chatam University Dining



Chatam University Housing



American Geophysical Union



White Hill Campus, Ross Valley USD



Bay Meadows



UC Santa Cruz West Housing

Redwood Energy:



Church Hill Townhouses, Fortuna



Affirmed Housing, Carson



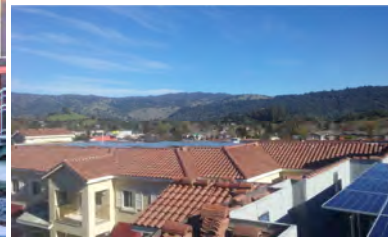
Danco, Eureka



Danco, Arcata



Arcata Bay Crossing



Cloverdale Family Apartments

Integral:



1700 Webster



Integrated Genomics Lab, LBNL



SFO Consolidated Admin Facility

Guttman & Blaevot:



UCSD Nuevo West



UCSC Student Housing West



UCD Jess Jackson



SMUD Corp Yard



PG&E Livermore



UCD Webster Hall

Point Energy Innovation:

EHDD:



Exploratorium
Photo by Bruce Damonte



Packard Foundation
Photo by Jeremy Bittermann



Boulder Commons
Coburn Partners



Marin Country Day School
EHDD



Lick Wilmerding High School
EHDD



Mark Day School
EHDD

ARUP: Example projects that have considered or gone all electric included:

- All-electric micro-unit 16-story residential project in Hawaii on track for LEED Platinum
- Northern CA courthouse -- all electric VRF design
- MarketZero – near zero retrofit of a San Francisco Whole Foods considered electrification (including DC distribution) as a strategy. Final design electrified rotisserie ovens which were major natural gas end-use.
- University central plant replacement with all electric to minimize GHG emissions (study)
- All-electric master plan for international 2-million-person city with carbon neutrality goals
- [Decarbonization strategies](#) for existing municipal buildings in SF
- High rise student housing project in Southern California -- Looked closely at electric vs gas on a high rise student housing project. Ultimately went with heat pump for space heating and grey water heat recovery and solar thermal supplemented by gas boilers for water heating.

How does the construction cost compare?

P2S: Electric is cost competitive on most new work, in that we can design to meet a client's typical budget using good integrated design.

Integral: It depends on what you are comparing it to. If comparing to a high-performance design (LEED gold, better than Title 24) then electric is cheaper. If comparing to moderate performance, electric is cost neutral. If comparing to most basic design, there will be a small cost premium. There are significant code changes in California energy code in 2019 that will make electric even more cost competitive.

Point Energy Innovation: Generally as a hot water system for domestic or heating is in the neighborhood of 10% to 20% more expensive with the prices coming down. Title 24 used to discourage electric heating of all types and is now more neutral on the issue. See this analysis for University of California:

<https://www.ucop.edu/sustainability/files/Carbon%20Neutral%20New%20Building%20Cost%20Study%20FinalReport.pdf>

Redwood Energy: It is between \$2,500 and \$5,000 of savings for the developer per residence not plumb gas.

G&B: A significant issue is whether or not gas service can be eliminated on the site, and the cost savings for eliminating this utility

Interface: Electric is almost always less expensive or cost neutral. Very rarely is it more expensive. Often it is our value engineering option. The exception is geothermal systems where the cost of the excavation and tubing makes is much less economical.

We do lots of detailed cost analysis with developers to find the most cost effective solution. For example, at 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.

Arup: Gas piping is much more labor intensive, so more expensive than running wires, especially in California.

As your electric uses grow, the code lets you assume a higher diversity factor which we've found in some projects actually leads to downsizing of the electric system, reducing its first cost.

If all electric you save on gas service to building, offsetting other costs.

How does the life cycle cost compare?

Arup: The low cost of gas and comparatively high price of electricity can hurt cost-effectiveness. The cost of gas and electricity varies a lot by where you are, and some large users such as SFO or Campuses sometimes have much lower rates. Oregon and Washington have cheap electricity.

G&B: Lower LCC's in most cases are reported if time of use cost management practices are enabled. In the UCOP report almost all cases showed lower LCC's with all-electric buildings.

P2S: It depends on what you are comparing it to, but for most projects it has lower cost lifecycle cost. However, a large gas co-gen plant produces very low cost energy, but has poor carbon performance.

What percentage of your work is currently all electric?

Interface: almost all our work is electric

G&B: +/-25% of our work is all electric, and this is trending upwards.

ARUP: We are looking at it much more often, but it is still not that common in our building types.

Redwood Energy: 90%

Integral: Very common

Can we eliminate gas service to these buildings?

Redwood Energy: Absolutely, and is a huge favor to the Builder to reduce costs and dangers, and it is a huge favor to society which pays disproportionately for upkeep of gas lines compared to electric lines, and of course the whole planet desperately needs us to stop burning fossil fuels.

ARUP: Often in large buildings there is a restaurant or some other small specialty use that requires gas. Service can be downsized.

G&B: In most cases yes.

Integral: Usually yes.

Other thoughts or recommendations?

Integral: All electric takes up significantly less space and that space can be used for other things. At 1700 Webster the gas option filled the roof with equipment, while the electric option freed up enough space for a nice deck and pool!

Getting gas service to the equipment, and a flue out through the building can be challenging problems.

Getting make-up air to gas boilers can be challenging.

There have been good advances in heat pump choices in recent years. Aermec and Climacool make excellent equipment, that can heat and cool simultaneously with robust controls.

Huge climate benefits to shifting from gas to electric. London is completely redoing it's 10 year old decarbonization plan which was drafted when they had a dirty electric grid. Their grid is much cleaner now so they are quickly revising the plan to promote electrification.

Arup: Eliminating a boiler flue is a big deal, routing those up and out a tall building are challenging.

Likewise fresh air requirements for boiler rooms can be challenging to meet. Heat pumps give you more flexibility in where they are located.

Significant safety benefit by eliminating gas. Water heaters pulling loose from gas connection is a major source of fires after earthquakes. A \$500 automatic shut off valve isn't needed if you don't have gas.

Many buildings we are designing now will not be open till 2022 or later, we need to anticipate the future.

The grid will be even cleaner, codes will be tighter

Interface: The space requirements are much smaller, instead of having two to three separate systems for space heating, cooling, and hot water, we can do it with a single heat pump system and it only needs half as much space. That space can be used for other things or the building made smaller for more savings.

Maintenance is less than most conventional systems because you have one system rather than multiple systems to maintain. Maintenance is just like an air-conditioning system, it's the same thing in reverse, and you eliminate the boiler.

A huge benefit for heat pumps is reducing water use. Using an air source heat pump for cooling rather than a cooling tower has large water savings. In addition, electric power plants consume 42% of the water used in the US, by using heat pumps paired with PV on your building, you can self-consume that electricity dramatically reducing water use from the power plant.

PV + heat pump is a very effective combination. Even better add SunDrum solar thermal collector to back of PVs to pre-heat domestic hot water.

The heat pump industry has come a long way in last ten years, and equipment costs have come down.

Many more manufacturers, better trained mechanics, larger market share, and controls greatly improved.

10 years ago, efficiency was poor in cold climates. When it got below 45 degrees, and the heat pumps switched to electric resistance heating. Now they are efficient down to 20 degrees, so they are good solutions in many more climates.

G&B: See UC Report on Strategies for Decarbonization.

https://www.nceas.ucsb.edu/files/research/projects/UC-TomKat-Replacing-Natural-Gas-Report_2018.pdf

End of document

Full and unedited responses from each firm:

Eric Solrain, Integral Group

Is the industry ready to shift to all electric buildings today?

Generally, yes. Integral currently has dozens of all electric buildings recently complete, in construction, and in design. A big sea change in recent years. A lot of momentum in Multi-family residential and general commercial projects moving to electric.

Are there project types or sizes that are more challenging?

For hot water heating using a gas boiler is very economical. With good design, electric heat pumps can get close to that cost, 10-20% higher. If you can eliminate the gas service to the building, this often will cover the premium.

How does the construction cost compare?

It depends on what you are comparing it to.

If comparing to a high-performance design (LEED gold, better than Title 24) all electric is cheaper.

If comparing to moderate performance, all electric is cost neutral.

If comparing to most basic design, there will be a small cost premium.

There are some significant code changes in California energy code in 2019 that will make all electric even more cost competitive.

How does the life cycle cost compare?

5-7 years.

What percentage of your work is currently all electric?

50%

Can we eliminate gas service to these buildings?

Usually yes. Sometimes there are other gas uses such as for a commercial kitchen where they are reluctant to shift to induction cooking.

Other thoughts or recommendations?

All electric has several big advantages:

- All electric equipment takes up significantly less space and that space can be used for other things. At 1700 Webster the gas option filled the roof with equipment, while the heat pump option had much less equipment so they were able to put a nice deck and pool on the roof.
- Getting gas service to the equipment, and a flue out through the building can be challenging problems. Getting make-up air to gas boilers can be challenging.
- For large multi-family projects heat-pump dryers avoid all the problems associate with venting.
- Good advances in heat pump choices in recent years. Aermec and Climacool make excellent equipment, that can heat and cool simultaneously with robust controls.
- Huge climate benefits to shifting from gas to electric. London is completely redoing it's 10 year old decarbonization plan which was drafted when they had a dirty electric grid. Their grid is much cleaner now so they are quickly revising the plan to promote electrification.

Alisdair McGregor, Raphael Sperry, and Meg Waltner, ARUP

Is the industry ready to shift to all electric buildings today?

Electrification is something that we are looking at for many projects today – both at the individual building and city master plan scale.

It is also an issue that we are looking at in our internally funded research: Arup just identified electrification as a key trend for our global strategic research planning and we are also starting a detailed research project to create design guidelines for electrification, which will build on earlier research laying out a blueprint for fossil-fuel free designs by 2020.

How does the construction cost compare?

Gas piping is much more labor intensive, so more expensive than running wires, especially in California.

As your electric uses grow, the code lets you assume a higher diversity factor which we've found in some projects actually leads to downsizing of the electric system, reducing its first cost.

If all electric you save on gas service to building, offsetting other costs.

On high rise student housing project, electric stoves costs less than gas due to piping costs, but too much inertia and tradition behind gas cooking.

How does the life cycle cost compare?

First costs of electrification can be comparable or lower, due to cost savings from gas infrastructure. The low cost of gas and comparatively high price of electricity can hurt cost-effectiveness. The cost of gas and electricity varies a lot by where you are, and some large users such as SFO or Campuses sometimes have much lower rates. Oregon and Washington have cheap electricity.

What percentage of your work is currently all electric?

They are looking at electrification much more often on projects, but still not that common. Often owners consider all electric but choose to only electrify some end-uses.

Can you share examples of your all electric buildings (name and thumbnail image)?

Example projects that have considered or gone all electric included:

- All-electric micro-unit 16-story residential project in Hawaii on track for LEED Platinum
- Northern CA courthouse -- all electric VRF design
- MarketZero -- near zero retrofit of a San Francisco Whole Foods considered electrification (including DC distribution) as a strategy. Final design electrified rotisserie ovens which were major natural gas end-use.
- University central plant replacement with all electric to minimize GHG emissions (study)
- All-electric master plan for international 2-million-person city with carbon neutrality goals
- [Decarbonization strategies](#) for existing municipal buildings in SF
- High rise student housing project in Southern California -- Looked closely at electric vs gas on a high rise student housing project. Ultimately went with heat pump for space heating and grey water heat recovery and solar thermal supplemented by gas boilers for water heating.

Can we eliminate gas service to these buildings?

Often in large buildings there is a restaurant or some other small specialty use that requires gas. Service can be downsized.

Other thoughts or recommendations?

Eliminating a boiler flue is a big deal, routing those up and out a tall building are challenging. Likewise fresh air requirements for boiler rooms can be challenging to meet. Heat pumps give you more flexibility in where they are located.

Significant safety benefit by eliminating gas. Water heaters pulling loose from gas connection is a major source of fires after earthquakes. A \$500 automatic shut off valve isn't needed if you don't have gas.

Many buildings we are designing now will not be open till 2022 or later, we need to anticipate the future. The grid will be even cleaner, codes will be tighter

Hormoz Janssens, Interface

Is the industry ready to shift to all electric buildings today?

Almost all our projects are all electric, even an LBC project in Minnesota where we figured out how to use air source heat pumps for a large facility. I have only been using gas systems where required by the client.

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

Are there project types or sizes that are more challenging?

Most project types work fine.

We are doing a large student housing project for UC and the big load there is domestic hot water, so we are using heat pumps with SunDrum solar preheating which gets the heat pump COP up around 7, super-efficient. Space heating loads are so low we are using very low cost electric resistance heat. The project mechanical costs are 20-30% less than a conventional design.

How does the construction cost compare?

Electric is almost always less expensive or cost neutral. Very rarely is it more expensive. Often it is our value engineering option. The exception is geothermal systems where the cost of the excavation and tubing makes it much less economical.

We do lots of detailed cost analysis with developers to find the most cost effective solution. For example, at 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.

The heat pump industry has come a long way in last ten years, and equipment costs have come down. Many more manufacturers, better trained mechanics, larger market share, and controls greatly improved. 10 years ago, efficiency was poor in cold climates. When it got below 45 degrees, and the heat pumps switched to electric resistance heating. Now they are efficient down to 20 degrees, so they are good solutions in many more climates.

How does the life cycle cost compare?

Lifecycle cost is almost always less expensive.

What percentage of your work is currently all electric?

Almost all.

Other thoughts or recommendations?

The space requirements are much smaller, instead of having two to three separate systems for space heating, cooling, and hot water, we can do it with a single heat pump system and it only needs half as much space. That space can be used for other things or the building made smaller for more savings.

Maintenance is less than most conventional systems because you have one system rather than multiple systems to maintain. Maintenance is just like an air-conditioning system, it's the same thing in reverse, and you eliminate the boiler.

A huge benefit for heat pumps is reducing water use. Using an air source heat pump for cooling rather than a cooling tower has large water savings. In addition, electric power plants consume 42% of the water used in the US, by using heat pumps paired with PV on your building, you can self-consume that electricity dramatically reducing water use from the power plant.

PV + heat pump is a very effective combination. Even better add SunDrum solar thermal collector to back of PVs to pre-heat domestic hot water.

Another great option is the Sharc system: a pre-manufactured system to extract heat from waste water using a heat pump.

Peter Rumsey, Point Energy Innovation

heat pumps and electric heating have already made significant inroads in California. We are seeing a lot of developers use electric heating with high levels of insulation in apartments that don't need cooling. Developers are using VRF systems on small to medium sized commercial buildings. And production home builders have been using central heat pump heating and cooling units for many years. We are seeing a surge in the use of larger heat pumps for generating hot water systems. The installation labor is the same as boilers but the equipment for this use is typically more expensive. Generally as a hot water system for domestic or heating is in the neighborhood of 10% to 20% more expensive with the prices coming down. Title 24 used to discourage electric heating of all types and is now more neutral on the issue. I understand that future versions of title 24 are going to be more encouraging of some types of electric heating.

Steve Guttman & Ted Tiffany, Guttman & Blaevot Consulting Engineers

Is the industry ready to shift to all electric buildings today

For most building types and sizes, there is no technical reason preventing the industry from shifting to all-electric buildings. Right now, without Code or other regulatory mandates or incentives, it depends on the client and their goals. Some clients are choosing to go with all-electric systems to meet carbon reduction/neutrality goals (primarily public clients and very large emitters), or due to other drivers that make them want to be highly sustainable. If you change to a carbon metric the decision is clear; the electric grid in California is fairly clean and the carbon metric favors electricity. If the owner is focused on operating cost then gas wins but the environment loses. A client has to be motivated to make the change from a high carbon source (such as natural gas) to an electric based system, because the cost of gas is relatively cheap right now.

Are there project types or sizes that are more challenging?

Laboratories and Hospitals are a challenge with all electric sources due to the high outside air loads, demands for sterilization, high hot water loads, all that need higher content fuels like natural gas. Not to say they are impossible, but challenging.

How does the construction cost compare?

See Peter Rumsey's report (link below) for decarbonized buildings that has a pretty robust investigation of costs between biogas, traditional gas electric and electrified buildings. A significant issue is whether or not gas service can be eliminated on the site, and the cost savings for eliminating this utility (remote or greenfield sites obviously save more by avoiding a new service).

<https://www.ucop.edu/sustainability/files/Carbon%20Neutral%20New%20Building%20Cost%20Study%20FinalReport.pdf>

How does the life cycle cost compare?

Lower LCC's in most cases are reported if time of use cost management practices are enabled. In Peter's report almost all cases showed lower LCC's with all-electric buildings.

What percentage of your work is currently all electric?

+/-25% of our work is all electric, and this is trending upwards.

Can you share examples of your all electric buildings (name and thumbnail image)?

1301 Folsom Street, San Francisco (not built)

UC Davis Webster Hall (design competition; design went to another team)

UC Santa Cruz Student Housing West (design competition; design went to another team)

UC San Diego Nuevo West Student Housing (design competition; design went to another team)

Jess Jackson Sustainable Winery Building

PG&E Livermore Substation Training Facility
SMUD east Campus Corporation Yard (bridging documents)

Can we eliminate gas service to these buildings?

In most cases yes.

Other thoughts or recommendations?

Lots of educational resources need to be developed around electrification in the market place. The perception is still that we are going back to electric resistance heat, or even that we can just put a bunch of PV on the building and the source of heat doesn't matter. Lots of misconceptions out there about what an all-electric building is. Also, see UC Report (link below) on Strategies for Decarbonization.

https://www.nceas.ucsb.edu/files/research/projects/UC-TomKat-Replacing-Natural-Gas-Report_2018.pdf

Kent Peterson, P2S Engineering

Is the industry ready to shift to all electric buildings today?

Are there project types or sizes that are more challenging?

- New buildings are easier to get to all electric because you can do an integrated design
- Residential buildings are easy
- Building under 100,000 gsf are straightforward. Air source heat pumps are available up to 2 MBTU, so at 20 btu/sf that is good up to 100,000 sf building
- Existing buildings with a system designed around high temp water can be expensive to retrofit, you'd have to change out coils in VAV units, which is harder to pencil out.
- For large complex campuses with numerous buildings there is a broader range of mechanical strategies and technologies. Heat Recovery Chillers are expensive for example
- A low emission building depends on how clean that specific grid is—it can vary a lot. California's Investor Owned Utilities are all low emission.

How does the construction cost compare?

It is cost competitive. We can design to a client's standard budget using good integrated design. Maintenance is no more than a chiller, except you don't have the water and piping.

How does the life cycle cost compare?

It depends on what you are comparing it too.

For most projects it has lower cost lifecycle cost.

A large co-gen plant produces very low cost energy, but has poor carbon performance

What percentage of your work is currently all electric?

Can you share examples of your all electric buildings (name and thumbnail image)?

Can we eliminate gas service to these buildings?

Other thoughts or recommendations?

For cold climates it depends on the refrigerant used. Under 30 degrees can lower efficiency for some refrigerants

CO2 refrigerant like the Sanden Heat pumps can work efficiently to -10 degrees.

Sean Armstrong, Redwood Energy

Is the industry ready to shift to all electric buildings today?

The Federal Energy Information Agency has documented non-stop growth in all electric construction beginning at least a 1994, and today one in four new homes in the United States is built all electric.

Developers have been choosing all electric construction because it cost less to build and that trend has been going on for 24 years now.

New construction is easy technically and financially and because the construction cost savings justify going all-electric.

Are there project types or sizes that are more challenging?

Yes, low-power homes like trailer homes, small apartments and old houses have a relatively small list of products to choose from that will fit their limited power supply without requiring a new breaker panel and potentially a service upgrade for more power.

Existing homes struggle with power upgrades so the challenge is organizing manufacturers around the product type of low-power equivalent to what they're making for new construction where they are ignoring power limitations and using as much power as they think they want or need.

How does the construction cost compare?

Depending on the residence, it is between \$2,500 and \$5,000 of savings for the developer per residence not Plumb gas.

How does the life cycle cost compare?

Maintenance

Air conditioners and refrigerators last for 15 years or so, and the reversible air conditioners used for space heating and hot water have the same lifespan. Electric resistance stoves last four decades because there's almost nothing that can break, and the same goes for electric dryers. Higher-performance versions might be more temperamental but fundamentally the technology is very stable.

Water heaters have an air filter around their compressor so some maintenance is required.

What percentage of your work is currently all electric?

90%

Can we eliminate gas service to these buildings? (perhaps excluding labs and commercial kitchens)

Absolutely, and is a huge favor to the Builder to reduce costs and dangers, and it is a huge favor to society which pays disproportionately for upkeep of gas lines compared to electric lines, and of course the whole planet desperately needs us to stop burning fossil fuels.

Other thoughts or recommendations?

All electric consistently saves construction costs and ongoing utility bills. Only education is preventing developers from profiting from the technological innovations available in the all-electric domain.

From: [Sue Serrone](#)
To: [Kelly Cha](#)
Cc: [Andrew Miner](#)
Subject: Input on Green Building Code Updates
Date: Monday, October 15, 2018 12:53:32 AM

Dear Kelly and Andy,

I'm writing to express my belief that although many of the green building standards are excellent, they fall short of the standards that the urgency of our environmental situation demands.

In particular, no new pipelines for natural gas, needs to be mandated. Pipelines themselves have been proven to account for methane leaks that are significantly worse than other greenhouse gasses. There is no reason to allow natural gas as a voluntary choice, even if the builder has been told the occupant wants it. Once the process of fracking is explained, and once occupants are told of the newly discovered extent of toxic leaks within the system, they would be happy for their own safety as well as reducing the large environmental cost.

In the case of individuals wanting gas for cooking, it has been suggested that our library can provide an induction unit (\$70) for checkout to demonstrate the superior performance of induction for cooking. The City, non-profits, or other funders might be willing to underwrite some of the cost of induction cookware through rebates.

I also think that food scrap recycling must be a part of all new developments and also spread to existing multifamily complexes and businesses. Points could be earned for on-site composting ability and space to grow various kinds of gardens (as opposed to just open "grass" space). This process can prove to be a highly desirable feature for residents/employees who could participate in the garden process and reap the benefits of well-nourished fruit trees, edible plants and produce. The agrihood in Santa Clara (in the last phase of review) will soon be a working example of some of these principles. They could also apply to green roofs.

One last thought is to encourage the use of new materials and new methods of building. The Turner Center in Berkeley, for example, is testing 3-D printing housing and new types of modular design. These new directions use much more recycled material for building and create less waste. They should be incentivized through our green codes to provide all electric small housing units and ADU's to start.

Thank you for your consideration, I would be happy to provide references and statistics for my suggestions on request,

Sincerely,

Sue Serrone
Chair Livable Sunnyvale
Committee Member, CAP2 Advisory
Board Member Leadership Sunnyvale

Kelly Cha

From: Delforge, Pierre [REDACTED]
Sent: Friday, October 19, 2018 9:14 AM
To: Kelly Cha
Subject: RE: Green Building Outreach Meeting on October 15 - REVISED
Attachments: NRDC Sunnyvale Green Building Update Support Letter 10-19-2018.pdf

Dear Ms. Cha,

After considering the material you sent out to the community, and on behalf of NRDC members in Sunnyvale and in California, please find attached NRDC's comments regarding Sunnyvale's proposed update of its Green Building Standards.

We generally support the standards which are an important environmental leadership strategy for Sunnyvale, and we suggest an addition that we believe would significantly improve its impact.

Thank you for your consideration.

Best,
Pierre

PIERRE DELFORGE
Senior Scientist – Building Decarbonization

NATURAL RESOURCES DEFENSE COUNCIL
111 SUTTER ST., 21ST FLOOR, SAN FRANCISCO, CA 94104
T 415.875.6139 | [REDACTED]
BLOG: [HTTPS://WWW.NRDC.ORG/EXPERTS/PIERRE-DELFORGE](https://www.nrdc.org/experts/pierre-delforge)

Please save paper. Think before printing.

Begin forwarded message:

From: Kelly Cha <KCha@sunnyvale.ca.gov>
Date: October 3, 2018 at 2:31:08 PM PDT
Cc: Amber Blizinski <ABlizinski@sunnyvale.ca.gov>
Subject: Green Building Outreach Meeting on October 15 - REVISED

Good afternoon,

Sorry for multiple email messages. A few attachments were missing from the last email. The missing attachments, along with the updated draft staff recommendations, are attached here for your review prior to the outreach meetings.

The City has revised the previously shared draft recommendations for the Green Building Program based on comments received at the August outreach meetings and via e-mail. We would like to invite you to share additional (or new) comments with us at one of two upcoming community outreach meetings. Both meetings will cover the same agenda and will allow ample time for comments and questions from members of the public on the recommended modifications.



October 19, 2018

Kelly Cha, Associate Planner, Planning Division
City of Sunnyvale
456 W Olive Ave
Sunnyvale, CA 94086

Re: Green Building Program Update – SUPPORT with Amendments

Dear Ms. Cha:

On behalf of Natural Resources Defense Council (NRDC), which has over 3 million members and activists, more than 400,000 of whom are Californians, we write to generally support Sunnyvale's green building program update and to suggest an improvement that would provide important leadership on reducing greenhouse gas emissions from energy use in buildings.

Residential and commercial buildings are responsible for a quarter of greenhouse gas (GHG) emissions in California, and emissions from gas furnaces and water heaters for the majority of those emissions. Heating our homes and offices and producing hot water with high-efficiency electric equipment is critical to reducing emissions from the building sector, especially as the electricity supply is getting increasingly renewable.¹

Green building codes are a key tool to encourage customers and developers to build the low-emissions buildings of the future, rather than continue to build new gas infrastructure that would lock in GHG emissions for decades to come and would likely get stranded before the end of its life as California transitions to clean energy in buildings. Governor Jerry Brown recently signed two laws that send a clear signal that California needs to decarbonize its building sector in order to achieve its climate and clean energy goals.²

Sunnyvale can be at the forefront of the building decarbonization movement by including all-electric buildings as an option in its Green Building program. Specifically, we recommend two additions to Sunnyvale's proposed Green Building program update:

1. Minimum standard: allow all-electric buildings as an alternative option to some or all of Greenpoint or LEED rating points (for all residential and commercial new construction). If the mixed-fuel option is chosen, require electrification readiness including dedicated electrical circuits and 240-volt outlets at the water heater, cooktop, and clothes dryer locations; and
2. Voluntary incentives: require all-electric construction including electrification of commercial kitchens.

¹ Hopkins, A., "Decarbonization of Heating Energy Use in California Buildings", <https://www.synapse-energy.com/California-Building-Decarbonization>

² P. Delforge, "Gov. Brown Signs Low-Carbon Buildings Bill AB 3232 into Law", <https://www.nrdc.org/experts/pierre-delforge/gov-jerry-brown-signs-low-emissions-buildings-bill-law>

This approach would support customer choice, while encouraging the all-electric option by giving customers and developers a strong compliance incentive to choose the low-GHG option.

This is an opportunity for Sunnyvale to lead other cities in the Bay Area and throughout California to adopt similar approaches, ultimately paving the way for the California Energy Commission to adopt statewide standards that would also encourage the lowest-GHG designs.

All-electric construction is feasible and cost-effective. Many leading developments in both market rate and affordable housing, and commercial buildings already choose all-electric construction today due to its financial, comfort, health, safety, and environmental benefits. All-electric construction saves on both first costs due to avoiding the gas connection and plumbing costs, and operational costs when paired with onsite solar generation.

All-electric construction is not yet default practice due to a lack of awareness and understanding among customers and building trades of its feasibility and benefits. This makes policies like green building codes critical to accelerate the transformation of the new construction market to low-carbon buildings.

We appreciate your consideration of our proposal and would be happy to address any questions.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Delforge', with a stylized flourish at the end.

Pierre Delforge
Senior Scientist

From: [Scott Shell](#)
To: [Kelly Cha](#)
Cc: [Aimee Bailey](#) [REDACTED]
Subject: Marin Reach Code
Date: Saturday, October 20, 2018 4:29:20 PM

Kelly,

I noticed that Marin County offers an all-electric option as a reach code (see below). This may be useful in supporting Sunnyvale to go all electric.

Many thanks,
Scott

On Fri, Aug 24, 2018 at 10:47 AM Luke Morton [REDACTED] wrote:

I'll mention the Marin County Reach Code in this context.

While the purest outcome would be to institute an all-electric 'mandate', from my perspective as an energy consultant, incentives can get us most of the way there. When I reviewed the Marin County policy, I noted how there are either exemptions or lower 'reaches' if the home is all-electric. Here is a screenshot of the relevant all-electric options (highlighting mine).

STEP 2A (FOR HOMES <4,000 SQUARE FEET): SELECT ONE ENERGY EFFICIENCY METHOD²

COMPLIANCE METHOD:	REQUIREMENT:	FIELD VERIFIER:
<input type="checkbox"/> PROJECT WITHOUT SOLAR	If a photovoltaic system is <u>not</u> installed, demonstrate ³ that the energy use of the proposed home is 15% more efficient than the 2016 State Energy Code.	HERS Rater, where verification is required ⁴
<input type="checkbox"/> PROJECT WITH SOLAR	If a photovoltaic system is installed, demonstrate ³ that the energy use of the proposed home is 20% more efficient than the 2016 State Energy Code.	
<input type="checkbox"/> ALL-ELECTRIC	Demonstrate that the proposed home will be all electric ⁵	

STEP 2B (FOR HOMES ≥4,000 SQUARE FEET): SELECT ONE ENERGY EFFICIENCY METHOD²

COMPLIANCE METHOD:	REQUIREMENT:	FIELD VERIFIER:
<input type="checkbox"/> ZERO NET ELECTRICITY	Demonstrate ³ that the proposed mixed-fuel ⁶ home: <ul style="list-style-type: none">• is 35% more efficient than the 2016 State Energy Code• will generate as much electricity on-site as it is expected to use in a year, equivalent to an energy design rating (EDR) of 20 or less.	HERS Rater, where verification is required ⁴
<input type="checkbox"/> ALL-ELECTRIC ALTERNATIVE	Demonstrate ³ that the proposed all-electric ⁵ home: <ul style="list-style-type: none">• is 20% more efficient than the 2016 State Energy Code• includes at least 2.5 kW of solar.	
<input type="checkbox"/> PASSIVE HOUSE	Develop the proposed home to Passive House Institute US (PHIUS) Standards.	PHIUS Rater

There is a similar policy in Palo Alto that is very useful in arguing for all-electric homes. It's not 100% effective, as some of my clients don't seem to mind spending an extra \$20k-\$50k in natural gas hookups and extra efficiency measures just for a gas cooktop. But, if they're looking for value engineering, it's #1 on my list of recommendations.

From: [Sue Serrone](#)
To: [Nupur Hiremath](#); [Kelly Cha](#)
Subject: Sustainability Speaker Series | City of Cupertino, CA
Date: Saturday, October 20, 2018 1:13:25 AM

Hi,

I went to the Oct.18 speaker series and I am so excited by Dr. Jacobson's research that I am hoping others will want to find out more about the bigger picture of electrification.

He also included how much money can be saved in building with no fossil fuels, really amazing! (The notice and his bio is below.)

He and many others working in this field conclude that all we lack is the political will to be able to stop and REVERSE global warming! I am truly optimistic and energized by all this new information.

I hope others will want to dive in and see what's going on in the world of electrification!

No video is posted yet that I know of, but I will send you the links to his two journal articles from which he derived most of his presentation.

Best regards,
Sue Serrone

<https://www.cupertino.org/our-city/departments/environment-sustainability/green-events-activities/speaker-series>

Sent from my iPad

From: [Sue Serrone](#)
To: [Nupur Hiremath](#); [Kelly Cha](#)
Subject: Links to Jacobson's articles
Date: Saturday, October 20, 2018 2:40:20 AM

Climate : 100% clean and renewable Wind, Water, and Sunlight (WWS) all-sector energy roadmaps for 53 towns and cities in North America - ScienceDirect

<https://www.sciencedirect.com/science/article/pii/S2210670718300568>

<https://www.sciencedirect.com/science/article/pii/S0960148118301526>

From: [Ken Powelson](#)
To: [Kelly Cha](#)
Subject: Please encourage all-electric buildings!
Date: Monday, October 22, 2018 11:32:55 AM

Dear Kelly,

Sunnyvale has a unique opportunity to support early adopters of all-electric buildings, so California has your experience to point to so that they can roll out these policies at the state level in the next code cycle. As an architect working on projects in Sunnyvale and Silicon Valley, I encourage the city to require:

All electric buildings (no gas connection) as an OPTION to Greenpoint/LEED rating for their Minimum Standard.

And Mandatory electrification for the Voluntary Standard including commercial kitchens and car charging.

And if not all electric, then mandatory Pre-wiring for future electrification which is a very low cost option.

Thank you for your consideration!

Ken

Ken Powelson LEED® AP BD+C
Associate

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500 TREAT AVE. #201 SAN FRANCISCO CA 94110 USA
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From: [Aimee Bailey](#)
To: [Kelly Cha](#)
Cc: [Melody Tovar](#); [Nupur Hiremath](#); [Don Bray](#)
Subject: Sunnyvale's Green Building Program update - SVCE feedback
Date: Monday, October 22, 2018 8:18:25 AM

Kelly,

Greetings, thanks to you and the other Sunnyvale staff for all your leadership with the Sunnyvale Green Building Program! As I mentioned briefly at the Oct 15 evening outreach meeting, given how successful it is, SVCE would love to document it in some way to help other cities replicate it. Maybe early next year would be an appropriate time, after you all are finished with the update process.

Since SVCE has had meetings/e-mails with Sunnyvale staff on it, we wanted to provide some feedback on the revised update for your consideration. We suggest:

- Requiring all-electric for commercial development. Developers who have built all-electric say it's technically and economically feasible – including for kitchen/cafeteria applications. The economics in particular do not appear to be a barrier because the additional square footage incentive you're offering through the program is so extremely valuable. And since it's a voluntary incentive program, they can always simply build to the minimum standard if they have a preference for gas.
- Requiring pre-wiring of 220V circuits to the dryer, stove, and water heater locations for any dual-fuel residential building. The 2019 baseline code is already including prewiring requirements effective Jan 1, 2020. The cost to prewire is small during construction but will save each Sunnyvale resident thousands of dollars down the line.
- Adding an all-electric option for residential single family and duplex (new construction and existing).

Please let us know if you have any questions. Happy to discuss any of the above. Thanks for considering our feedback, and we look forward to helping highlight this program to other cities.

Best regards,
Aimee

Aimee Gotway Bailey, PhD
Director of Decarbonization & Grid Innovation
(408) 721-5301 x1023



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VIA EMAIL

October 30, 2018

Ms. Kelly Cha
Community Development Department
City of Sunnyvale
456 W. Olive Avenue
Sunnyvale, CA 94086

Re: Sunnyvale Green Building Update – Draft Staff Recommendations Revised dated 10/15/18

Dear Ms. Cha,

This letter is to provide our comments to the Revised Draft Staff Recommendations Sunnyvale Green Building Program dated October 15, 2018. Jay Paul Company provided its comments to the initial Draft Staff Recommendations Sunnyvale Green Building Update Program dated 8/21/18.

Jay Paul Company has demonstrated our commitment to building the highest level of green building design in Sunnyvale and will continue to implement the latest sustainability methods to attract and retain high-value tenants. As stated in our previous communications, we support the City's Green Building Program and Sunnyvale's desire to be the sustainability leader in Silicon Valley. However, we have a few comments and concerns with some of the proposed measures for the updated program as discussed below:

1. Project all-electric (no gas line connection) for Voluntary Incentives for Additional FAR 10-30% Citywide and Moffett Parks:

The addition of the all-electric requirement seems to be consistent with the shift away from natural gas/combustion to reduce carbon emissions produced by buildings. We are in support of carbon reduction and are in favor of all-electric for smaller building products with less demand on hot water heating and other factors like onsite food service/kitchens. Going to all-electric utility for a typical commercial/R&D office 100-300k sq. ft. is less feasible in that the demand load for hot water for large building uses include fitness (showers), café/kitchens, and place a higher demand for hot water and gas reliant equipment. The MEP systems can be designed around this but will require much more flexibility and creativity to design systems without combustion. Sunnyvale has attracted many high-tech Tenants to Sunnyvale that offer expansive food service and outdoor amenities programs for their employees. The onsite dining services have also contributed to project's TDM requirements and the reduction of daily single occupant vehicle trips and overall traffic. An across the board all- electric requirement for large building

tenants could prove to be difficult and more expensive especially for gas-reliant kitchen equipment and hot water heating. Since current Title-24 energy code leans on natural gas, it may be best for the City to wait for the new T-24 in 2020 to eliminate potential conflicts between credits and penalties for natural gas vs. electric utilities. We anticipate that Tenant's will request exemptions for kitchen use, or specific equipment to be served by gas until the codes are updated.

2. Net Zero Energy (NZE) with IFLI Certification option for increased FAR 10%:

The IFLI NZE certification requires 100% energy offset through on-site renewable energy modes and does not allow for combustion sources (natural gas). The certification under IFLI requires a 12-month performance period after tenant occupancy to measure the energy consumption against the building's renewable energy production. For speculative development projects where the Tenant is not known during the design/construction of the core shell, designing the MEP to a specific energy demand (or an offset) for a specific Tenant is not possible. To take advantage of the voluntary incentive, we would have to design the tenant improvements and have insight to a specific Tenant's operations and actual energy consumption. For Jay Paul Company the NZE incentive option as currently written is simply not an option. We would ask that the City reconsider and further examine more flexible options for targeting Net Zero.

One way to do this, to consider a blend of onsite and offsite renewables and/or carbon offsets (RECs to account for natural gas usage) to reach NZE status, this may provide for a more reasonable target, and this would be consistent with LEED v4 and current Title-24 energy code. Projects could be encouraged to minimize gas usage where possible but for large buildings, particularly in the case for tenant food services with commercial kitchens, allow for carve-outs to exempt certain equipment.

The City should consider allowing for a combination of strategies, a menu or tiered framework, rather than a blanket requirement – all electric or NZE IFLI certified - that will preclude many developers and tenants from being eligible to target density incentives. This coupled with LEED v4 Gold Platinum level will be very difficult and even impossible in many cases to achieve. As we stated in our previous letter 8/21/18, LEED v4 Platinum *sets the bar high* and due to certain site credit requirements and tenant performance credits, there will be a lot of challenges given the location for developments in the Moffett Park area.

More research may be needed particularly for larger commercial office buildings, mid to high rise (3-stories or higher) as the available roof space for PV (Photo Voltaic) is quite limited, and the sites are not large enough for expansive PV arrays onsite. How are other Cities meeting or exceeding the standard for sustainability and fostering all-electric and NZE? The City of Palo Alto's energy code (Reach program) provides a few pathways for developers to the City's green building requirements. They allow for options such as performance basis (building performs

___% better than code), the use of photo voltaic (PV) to offset a certain % percentage of the anticipated energy consumption/demand load, and an all-electric option, or some combination of the above.

There are very few large buildings in the 150-300k sq. ft. range in the world that are net zero certified. The amount of land or building roof area required for any given project to provide for and offset its energy consumption with on-site renewables would require many sq. ft of area either on land or on a building's roof space (which is not an option for a multi-story building). A building would need to have enough PV to offset its consumption by >105% for IFLI NZE certification or in other cases 3-times the amount *on a site to source basis* as defined in Sunnyvale's current draft of the Green Building Program as a definition for *Net Zero Energy*. If a building is greater than <100k sq. ft. the number of onsite renewables to offset a building's consumption would be unattainable in most cases and eliminate most projects in the City or Moffett Park from being eligible to achieve this level of certification.

To attest to the above, in almost all cases when you look for a registry of NZE certified buildings, the projects are either residential or institutional and less than >50k sq. ft. in size. It is not widely done because it is very difficult to achieve for large buildings.

NZE certified building case studies (IFLI):

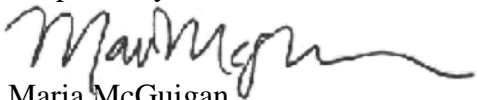
<https://living-future.org/lbc/case-studies/?certs=zero&sqft=50k-150k>

NZE certified registry list (New Buildings Institute):

https://newbuildings.org/wp-content/uploads/2018/01/GTZ_2018_List.pdf

In conclusion, we would ask that the City reconsider and conduct further research on the requirements for NZE certification and the impacts for requiring all-electric for the Green Building voluntary incentives coupled with LEED Platinum (v4 and above). It seems based on the types of building developments likely to benefit from these incentives, the options prescribed may not be feasible and preclude commercial office for R&D/Tech Tenant companies with larger food service and kitchen operations. We would be happy to continue the discussion with the City and support a more flexible menu of sustainable options for the voluntary incentive portion of the Green Building Program.

Respectfully,



Maria McGuigan
Senior Director, Real Estate Development

Encl:

Getting to Zero – Net Zero Energy Projects, by New Building Institute 2018

2018 Getting to Zero List of Zero Energy Projects

We know there are more projects than we have captured here. We encourage you to submit ZE and ULE projects through our registry so we can recognize these leaders in the growing field of zero energy buildings.

Be Counted at
newbuildings.org/share.

The 482 trailblazing projects listed here are proof positive that zero energy design and operation is feasible in every climate, market sector, size, and building type across U.S. and Canada. In the six years since NBI produced the first *Getting to Zero List* in 2012, the number of ZE projects has increased more than 700%. More and more designers, owners, and occupants are gaining valuable ZE experience and expertise, and new projects are appearing regularly. Projects are listed alphabetically and grouped by year completed or projected for completion.

New information is included in the *2018 Getting to Zero List* about project certification. Projects that have achieved Zero Energy Certification from ILFI are listed in the ZE Certified buildings category. For the first time, this List also shows information about the LEED status of ZE projects.

Definitions

Zero Energy (ZE) projects are buildings, or groups of buildings, with greatly reduced energy loads such that, totaled over a year, 100% or more of the energy use can be met with renewable energy generation. In this List, projects are categorized as ZE Certified, ZE Verified, or ZE Emerging.

Zero Energy Certified projects have been awarded Zero Energy, Net Zero Energy, Living Building, or Energy Petal certification by ILFI. ILFI has thoroughly reviewed one continuous year of energy consumption and generation data to certify zero energy performance. NBI and ILFI are collaborating to launch a new ZE platform in 2018, including a combined data portal, certification program, and interactive ZE project database.

Zero Energy Verified projects have achieved ZE for at least one full year and NBI has Verified the performance data.

Zero Energy Emerging buildings have publicly stated a goal of reaching ZE but have not yet demonstrated achievement of that goal. These buildings may be in the planning or design phase, under construction, or have been in operation for less than twelve months. Others may have been operating for at least a year, but their measured energy use data either has yet to achieve ZE, or the data to document ZE performance was not available.

(L) after the project name indicates a project has achieved USGBC LEED certification (at any level).

(M) after the project name indicates a project that has provided measured energy use data.

Site EUI stands for the total gross site-level Energy Use Intensity, a metric used to measure annual energy use per square foot of building space. Energy use includes consumption from all fuels (grid-delivered and onsite-generated electricity, natural gas, district energy, and delivered fuels) in thousands of British Thermal Units (kBtu) per year. That sum is divided by the building size in gross square feet, thus the units are kBtu/sf/year.

Source EUI accounts for upstream generation, transmission, and distribution losses associated with delivering usable energy to the site.

RPI stands for Renewable Production Intensity, a metric used to define annual renewable energy generation per square foot. This is the onsite renewable analogue to EUI. This is shown in both site and source, just like EUI.

Net EUI is simply EUI minus RPI. A building with a measured net EUI (site or source) less than zero has achieved ZE. Some buildings in the ZE Emerging category show a negative net EUI based on modeled or estimated data.

zEPI is metric on a 0-100 scale that sets a constant goal of ZE and is normalized by climate and building type. For more information about zEPI, see page 18.

ZERO ENERGY CERTIFIED

YEAR	PROJECT NAME	CITY	STATE	BUILDING TYPE	SIZE (SF)	TOTAL EUI	SOURCE EUI	SITE RPI	SOURCE RPI	NET EUI	NET SOURCE EUI	ZEPI SCORE
2007	IDEAs Z2 Design Facility (M)	San Jose	CA	Office	6,557	22.6	71.2	23.2	73.0	-0.6	-1.8	-1
	Chrisney Library (M)	Chrisney	IN	Public Assembly	2,413	16.7	52.6	17.4	55.0	-0.8	-2.4	-1
2009	Living Learning Center at Tyson Research Center (M)	Eureka	MO	Education	2,968	24.5	77.1	26.4	83.2	-1.9	-6.1	-2
	Omega Center for Sustainable Living ^L (M)	Rhinebeck	NY	Other	6,200	13.2	41.6	21.5	67.6	-8.3	-26.0	-7
	Pringle Creek Painter's Hall ^L (M)	Salem	OR	Public Assembly	3,595	11.1	35.0	15.4	48.4	-4.3	-13.4	-5
	Putney Field House ^L (M)	Putney	VT	Education	16,800	9.7	30.6	10.4	32.9	-0.7	-2.3	-1
	Bertschi School Science Wing ^L (M)	Seattle	WA	Education	1,425	48.0	151.2	48.4	152.5	-0.4	-1.3	0
	DPR Construction San Diego Net Zero Office ^L (M)	San Diego	CA	Office	24,000	14.8	46.1	17.1	53.9	-2.4	-7.8	-3
2010	Energy Lab at Hawaii Preparatory Academy ^L (M)	Kamuela	HI	Education	5,902	11.0	34.8	28.0	88.2	-17.0	-53.4	-15
	Hood River Middle School Net-Zero Addition ^L (M)	Hood River	OR	Education	5,331	26.8	84.3	27.1	85.4	-0.4	-1.1	0
	Richardsville Elementary School ^L (M)	Bowling Green	KY	Education	72,285	19.0	59.9	21.6	68.0	-2.6	-8.1	-3
	Coastal Maine Botanical Gardens Bosarge Family Education Center ^L (M)	Boothbay	ME	Education	8,200	19.2	60.3	23.5	73.9	-4.3	-13.6	-4
2011	Locust Trace AgriScience Campus (High School) (M)	Lexington	KY	Education	70,000	9.9	31.0	10.6	33.3	-0.7	-2.3	-1
	TD Bank Branch - Ft. Lauderdale ^L (M)	Fort Lauderdale	FL	Office	3,970	91.8	289.3	95.6	301.1	-3.8	-11.8	-4
	zHome - Issaquah (M)	Issaquah	WA	Multifamily	5,813	21.0	66.2	22.0	69.3	-1.0	-3.1	-2
	Bullitt Foundation Cascadia Center for Sustainable Design and Construction (M)	Seattle	WA	Office	51,800	9.7	30.6	16.6	52.4	-6.9	-21.8	-10
	David and Lucile Packard Foundation ^L (M)	Los Altos	CA	Office	49,161	24.4	76.8	29.0	91.4	-4.6	-14.6	-7
	DPR Construction Phoenix Net Zero Office ^L (M)	Phoenix	AZ	Office	16,533	26.8	84.3	29.5	92.9	-2.7	-8.6	-3
2012	Phipps Center for Sustainable Landscapes ^L (M)	Pittsburgh	PA	Public Assembly	24,350	18.2	57.3	18.7	58.8	-0.5	-1.5	0
	Sacred Heart Schools Stevens Family Library ^L (M)	Atherton	CA	Education	6,800	13.2	41.6	30.8	97.0	-17.6	-55.4	-22
	Smith College Bechtel Environmental Classroom (M)	Northampton	MA	Education	2,500	11.5	36.1	17.6	55.6	-6.2	-19.5	-6
	435 Indio Ave (M)	Sunnyvale	CA	Office	31,800	13.5	42.5	28.7	90.2	-15.2	-47.7	-23
2013	PNC Net-Zero Branch ^L (M)	Ft Lauderdale	FL	Mercantile (Enclosed and Strip Malls)	4,766	59.1	186.0	64.4	203.0	-5.4	-17.0	-5
	Sandy Grove Middle School ^L (M)	Lumber Bridge	NC	Education	74,000	20.6	64.9	35.7	112.6	-15.1	-47.7	-15
	West Berkeley Public Library ^L (M)	Berkeley	CA	Public Assembly	9,399	21.7	68.3	25.5	80.4	-3.8	-12.1	-5
	Brock Environmental Center ^L (M)	Virginia Beach	VA	Education	10,500	14.6	45.9	28.6	90.1	-14.0	-44.2	-14
2014	DPR San Francisco Office ^L (M)	San Francisco	CA	Office	24,010	21.6	68.0	22.1	69.6	-0.5	-1.6	-1
	Willow School ^L (M)	Gladstone	NJ	Education	20,000	21.8	68.8	35.0	110.2	-13.1	-41.4	-12
	Phipps Conservatory SEED Classroom ^L (M)	Pittsburgh	PA	Education	950	14.5	45.8	20.8	65.6	-6.3	-19.8	-6
2015	Rocky Mountain Institute Innovation Center ^L (M)	Basalt	CO	Office	15,610	16.8	52.9	26.2	82.7	-9.4	-29.8	-12
	Suncoast Credit Union - Bushnell Service Center (M)	Bushnell	FL	Office	3,743	6.8	21.4	8.4	26.5	-1.6	-5.1	-12
2016	Maclay Architects' Office (M)	Waitsfield	VT	Office	2,568	22.1	69.5	25.0	78.6	-2.9	-9.1	-2

Building names in **Bold** are new to the List
Buildings with (M) indicate measured data
(L) indicates LEED Certification

ZERO ENERGY VERIFIED

YEAR	PROJECT NAME	CITY	STATE	BUILDING TYPE	SIZE (SF)	TOTAL EUI	SOURCE EUI	SITE RPI	SOURCE RPI	NET EUI	NET SOURCE EUI	ZEPI SCORE
2000	Oberlin College Lewis Center (M)	Oberlin	OH	Education	13,600	31.4	98.8	36.9	116.2	-5.5	-17.4	-5
2001	Environmental Tech. Center Sonoma State (M)	Rohnert Park	CA	Education	2,200	2.3	7.3	3.8	11.9	-1.5	-4.6	-2
2003	Audubon Center at Debs Park ^L (off grid) (M)	Los Angeles	CA	Other	5,020	17.1	53.9	17.1	53.9	0.0	0.0	0
	Science House (M)	St. Paul	MN	Other	1,532	18.0	56.7	18.0	56.7	0.0	0.0	0
2004	Challengers Tennis Club (M)	Los Angeles	CA	Other	3,500	9.0	28.1	9.0	28.4	0.0	-0.3	0
2005	Hawaii Gateway Energy Center ^L (M)	Kailua-Kona	HI	Other	5,600	28.0	88.2	31.0	97.7	-3.0	-9.5	-4
2007	Aldo Leopold Legacy Center ^L (M)	Baraboo	WI	Office	11,900	16.0	50.4	18.0	56.7	-2.0	-6.3	-2
2008	Bagatelos Architectural Glass Solutions (M)	Sacramento	CA	Other	63,000	17.1	53.9	17.5	55.1	-0.4	-1.2	0
	Camden Friends Meeting Social Hall ^L (M)	Camden	DE	Public Assembly	3,121	17.9	56.3	19.7	62.0	-1.8	-5.7	-2
	Environmental Nature Center ^L (M)	Newport Beach	CA	Education	8,535	17.6	55.4	27.7	87.3	-10.1	-31.9	-12
	Hudson Valley Clean Energy HQ (M)	Rhinebeck	NY	Other	5,470	9.8	30.7	10.4	32.6	-0.6	-1.9	-1
2009	Bacon St. Offices ^L (M)	San Diego	CA	Office	4,500	12.7	40.0	22.2	69.9	-9.5	-29.9	-13
	Watsonville Water Resources Center Admin Building ^L (M)	Watsonville	CA	Office	16,000	51.4	160.4	117.8	371.1	-66.4	-210.7	-101
2010	Dovetail Construction HQ Barn ^L (M)	Richmond	VA	Office	6,800					0.0		0
	NREL Research Support Facility ^L (M)	Golden	CO	Office	222,000	46.1	145.2	46.1	145.2	0.0	0.0	0
	Anna Maria Historic Green Village ^L (M)	Anna Maria	FL	Other	9,797	28.2	88.8	34.8	109.6	-6.6	-20.8	-7
2011	Diamond X Ranch Student Intern Center-Malibu (M)	Calabasas	CA	Public Assembly	3,500	31.5	99.3	35.1	110.5	-3.6	-11.2	-4
	EcoCenter at Heron's Head Park (off grid) ^L (M)	San Francisco	CA	Education	2,400							
2012	Leon County Cooperative Extension (M)	Tallahassee	FL	Office	13,000	19.4	61.1	19.6	61.7	-0.2	-0.6	0
	Plaza Point ^L (M)	Arcata	CA	Multifamily	20,283	15.3	48.2	16.3	51.4	-1.0	-3.2	-2
2013	IBEW Local 595 Zero Net Energy Center (M)	San Leandro	CA	Education	45,001	15.0	47.3	21.0	66.2	-6.0	-18.9	-7
	Lenawee Intermediate School District Center for a Sustainable Future (M)	Adrian Township	MI	Education	8,750	7.7	24.3	10.1	31.8	-2.4	-7.5	-2
	231 Main Street (Alfandre Architecture, EcoBuilders, and Others) ^L (M)	New Paltz	NY	Office	5,400	45.2	142.1	52.6	165.8	-7.5	-23.7	-9
2014	DMV Fresno Field Office ^L (M)	Fresno	CA	Office	19,808	23.1	72.7	43.4	136.8	-20.4	-64.1	-28
	Jess Jackson Sustainable Winery Building (M)	Davis	CA	Warehouse and Storage	8,500	1.4	4.4	2.7	8.5	-1.3	-4.1	-5
	Pahrangat National Wildlife Refuge Administrative Office and Visitor Contact Station (M)	Alamo	NV	Public Assembly	5,000	27.8	87.7	39.9	125.5	-120	-37.8	-12
	AP+I Design (M)	Mountain View	CA	Office	14,300	17.9	56.3	18.4	57.8	-0.5	-1.5	-1
2015	Bishop O'Dowd High School, Environmental Science Center ^L (M)	Oakland	CA	Education	3,275	18.0	56.5	18.6	58.7	-0.7	-2.2	-1
	Discovery Elementary School (M)	Arlington	VA	Education	98,000	15.5	48.8	19.1	60.2	-3.6	-11.4	-4
	Frick Environmental Center (M)	Pittsburgh	PA	Public Assembly	15,500					-2.1		-2
	P.S. 62 (Kathleen Grimm School of Leadership and Sustainability) (M)	Staten Island	NY	Education	68,680	32.9	103.7	33.9	106.7	-0.9	-3.0	-1
	Potomac Watershed Center ^L (M)	Accokeek	MD	Education	3,971	44.2	139.4	46.0	144.8	-1.7	-5.4	-2
	Sarasota Audubon Nature Center ^L (M)	Sarasota	FL	Education	2,500	10.3	32.4	15.6	49.1	-5.3	-16.7	-5
2016	Sbrega Technology and Learning Center - Bristol Community College (M)	Fall River	MA	Education	50,679	45.0	116.2	60.9	191.8	-15.9	-75.6	-15
	Twenty Mile Farm Administration and Maintenance Building ^L (M)	Boise	ID	Office	15,222	11.3	35.6	18.6	58.6	-7.3	-23.0	-10

Building names in Bold are new to the List
Buildings with (M) indicate measured data
(L) indicates LEED Certification

ZERO ENERGY EMERGING

YEAR	PROJECT NAME	CITY	STATE	BUILDING TYPE	SIZE (SF)	TOTAL EUI	SOURCE EUI	SITE RPI	SOURCE RPI	NET EUI	NET SOURCE EUI	ZEPI SCORE
2002	NREL Wind Site Entrance Building (SEB)	Golden	CO	Other	160	70.3	221.3	24.0	75.7	46.2	145.6	45
2003	Woods Hole Research Center ^L (M)	Falmouth	MA	Office	19,200	16.0	50.4	5.0	15.8	11.0	34.6	13
2004	Westmont High School Science Education Facility (M)	Campbell	CA	Education	12,362	44.4	140.0	0.0	0.0	44.4	140.0	55
	CDPH Richmond Labs, Building P ^L	Richmond	CA	Office	205,153							
2005	Delmar High School Science Education Facility	San Jose	CA	Education								
	Melink Corporation Headquarters ^L (M)	Milford	OH	Office	30,000	12.2	38.3	5.4	16.9	6.8	21.4	9
2006	Prospect Sierra Founders Art Center	El Cerrito	CA	Education	5,000							
	Montenay Office Building	Burnaby	BC	Office								
2007	Prairie Hill Learning Center	Roca	NE	Education	2,940							
	Regent College Library	Vancouver	BC	Public Assembly								
	Akron Zoo ^L	Akron	OH	Public Assembly								
2008	Aquarium of the Pacific Watershed Addition ^L	Long Beach	CA	Education	2,500							
	City of Hayward Water Pollution Control Facility	Hayward	CA	Other								
	Mills River Elementary School ^L (M)	Mills River	NC	Education	80,820	30.4	95.8	0.0	0.0	30.4	95.8	30
	da Vinci School High Performance Classroom ^L (M)	Portland	OR	Education	1,485	27.1	85.4	25.0	78.8	2.1	6.6	2
2009	Design Engineer Headquarters ^L	Cedar Rapids	IA	Office	15,747							
	Millennium Water (Southeast False Creek Olympic Village) ^L	Vancouver	BC	Multifamily								
	Oak Ridge National Lab Office Building 3156	Oak Ridge	TN	Office	6,900							
	Bagley Classroom University of Minnesota Duluth ^L	Duluth	MN	Education	2,000							
	Center for Energy Efficient Design ^L	Rocky Mount	VA	Education	3,600							
	Charlotte-Douglas Airport - Fire Rescue and Fire Facility	Charlotte	NC	Public Order and Safety								
	Clif Bar Headquarters ^L	Emeryville	CA	Office				23.0	72.4			
	Evie Garrett Dennis E12 Campus (Denver Schools) ^L (M)	Denver	CO	Education	184,769	99.0	311.9	71.0	223.7	28.0	88.2	29
	Green Phoenix Learning Center	Phoenix	AZ	Education								
	Greensburg Kansas Net Zero Community ^L	Greensburg	KS	Multifamily								
2010	Harmony House for Cats ^L (M)	Chicago	IL	Other	7,095	50.0	157.5			50.0		43
	Lowell Trial Court	Lowell	MA	Other	245,000							
	Magnify Credit Union ^L (M)	Lakeland	FL	Mercantile (Enclosed and Strip Malls)	4,151	75.0	236.3	68.0	214.2	7.0	22.1	7
	MEC Aviation Campus (M)	Glendale	AZ	Education	85,000	99.0	311.9	69.0	217.4	30.0	94.5	31
	New Bristow Elementary School ^L (M)	Bowling Green	KY	Education	79,817	23.8	75.0	0.0	0.0	23.8	75.0	23
	New Century Elementary School	Fayetteville	NC	Education	109,758							
	Palmetto Bay Municipal Center ^L	Palmetto Bay	FL	Office	25,000							
	The Andrew	New York City	NY	Multifamily								
	Turkey Foot Middle School (M)	Edgewood	KY	Education	133,000	22.0	69.2	11.0	34.7	11.0	34.5	11

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ZERO ENERGY EMERGING

YEAR	PROJECT NAME	CITY	STATE	BUILDING TYPE	SIZE (SF)	TOTAL EUI	SOURCE EUI	SITE RPI	SOURCE RPI	NET EUI	NET SOURCE EUI	ZEPI SCORE
2011	Broadway High School ^L	San Jose	CA	Education								
	Butte Glenn Community College	Oroville	CA	Education	800,000	38.9	122.6	27.2	85.7	11.7	36.9	13
	Centre for Interactive Research on Sustainability (CIRS) ^L	Vancouver	BC	Education	76,223							
	Desert Research Institute Renewable Energy Experimental Facility ^L	Reno	NV	Other	1,400							
	Eastside Fire & Rescue Station 72 ^L	Issaquah	WA	Public Order and Safety	11,400							
	EcoFlats Building	Portland	OR	Multifamily	19,860							
	Frito-Lay Casa Grande Snack Factory ^L	Casa Grande	AZ	Other	188,000							
	George V Leyva Middle School Admin Bldg	San Jose	CA	Office	9,200	34.0	107.1	25.0	78.8	9.0	28.3	14
	Glenn York Elementary School	Pearland	TX	Education	96,297							
	Highland Chevron ExtraMile Gas Station	Beaverton	OR	Mercantile (Retail Other than Mall)	6,000							
	June Key Delta Community Center	Portland	OR	Public Assembly	1,631							
	Lady Bird Johnson Middle School	Irving	TX	Education	152,000							
	McCormick Spice Net Zero Warehouse (M)	Belcamp	MD	Warehouse and Storage	369,000	38.3	120.6	20.0	63.0	18.3	57.6	50
	Mokelumne Watershed Headquarters (M)	Campo Seco	CA	Office	5,675	10.4	32.8	9.8	30.9	0.6	1.9	1
	Mutual Housing at the Highlands	Sacramento	CA	Multifamily								
	NASA Propellants Facility at Kennedy Space Center ^L (M)	Titusville	FL	Office	9,540	43.6	137.3	34.0	107.1	9.6	30.2	12
	Nazlini Community School Fire Station	Nazlini	AZ	Public Order and Safety	1,900							
	Parris Island Child Development Center	Parris Island	SC	Other	25,775	58.0	182.6	58.0	182.6	0.0	0.0	0
	Pierce College Maintenance & Operations Facility and Net-Zero Central Plant ^L (M)	Los Angeles	CA	Education	42,000	16.0	50.4	8.0	25.2	8.0	25.2	9
	Portland Community College Newberg Center ^L	Newberg	OR	Education	13,000							
	Redding School for the Arts ^L (M)	Redding	CA	Education	77,091	16.0	50.4	8.0	25.2	8.0	25.2	9
	Rice Fergus Miller Office & Studio ^L (M)	Bremerton	WA	Office	39,000	21.0	66.2	3.0	9.5	18.0	56.7	25
	San Ysidro Land Port of Entry ^L	San Diego	CA	Other	200,000							
	Sangre de Cristo PK-12 School ^L (M)	Mosca	CO	Education	8,000	26.0	81.9	0.0	0.0	26.0	81.9	25
	VanDusen Botanical Garden Visitor Centre ^L	Vancouver	BC	Public Assembly	19,000	35.2	110.9	10.2	32.1	25.0	78.8	27
	West Irving Library ^L	Irving	TX	Public Assembly	25,876							
	Wilson Air Center - Chattanooga Airport - West Side Aviation Development ^L	Chattanooga	TN	Other	9,015							
2012	Abondance - Montreal Multi-Family Net Zero	Montreal	QC	Multifamily	3,048							
	Aster Place	Eureka	CA	Multifamily								
	Blanchet House of Hospitality ^L	Portland	OR	Multifamily	35,000	22.0	69.3					
	Clos du Bois Winery	Sonoma	CA	Office								
	Colonel Smith Middle School	Fort Huachuca	AZ	Education	88,693							
	Conrad N. Hilton Foundation ^L	Agoura Hills	CA	Office	22,240	22.0	69.3	24.0	75.6	-2.0	-6.3	-3
	Fireside Elementary (M)	Phoenix	AZ	Education	88,664	51.0	160.7	41.1	129.5	9.9	31.2	10

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2012	Franklin Regional Transit Center	Greenfield	MA	Other	24,000							
	High Tech Middle North County ^L	San Diego	CA	Education	27,058							
	Jody Richards Elementary School (M)	Bowling Green	KY	Education	80,904	20.0	63.0	0.0	0.0	20.0	63.0	20
	Kaupuni Village	Aiea	HI	Multifamily								
	Kohler Environmental Center ^L	Wallingford	CT	Education	31,325							
	La Valentina North (M)	Sacramento	CA	Multifamily	19,875	31.0	97.7	6.0	18.9	25.0	78.8	39
	Maharishi University of Management Sustainable Living Center	Fairfield	IA	Education	6,900	9.9	31.2	10.4	32.8	-0.5	-1.6	0
	McGrory Glass Facility	Paulsboro	NJ	Warehouse and Storage	108,000							
	Morphosis Architecture Studio (M)	Culver City	CA	Office	11,600	24.0	75.6	20.0	63.0	4.0	12.6	6
	North Shore Community College Health and Student Services Building ^L	Danvers	MA	Education	58,000							
	Orangewood Middle School and Studio Project	Phoenix	AZ	Education								
	Paisano Green Community ^L	El Paso	TX	Multifamily	55,202							
	Playa Vista Elementary (M)	Los Angeles	CA	Education		28.3	89.1	20.9	65.8	7.4	23.3	9
	Sail Lofts	Thomaston	ME	Multifamily	7,500							
	San Luis National Wildlife Refuge Complex HQ and Visitor Ctr. ^L	Los Banos	CA	Education	16,500							
	Skaneateles Village Hall ^L	Skaneateles	NY	Office	3,723	47.0	148.1	0.0	0.0	47.0	148.1	57
	St Petersburg Net Zero Office (Sierra Club) ^L	St Petersburg	FL	Office	5,000							
	Student Services Center at Mesa College ^L	San Diego	CA	Education	85,000							
	Sweetwater Spectrum Community (M)	Sonoma	CA	Multifamily	15,990	9.4	29.6	4.4	13.7	5.1	15.9	9
	UC Davis West Village (eco district)	Davis	CA	Education		50.0	157.5	0.0	0.0	50.0	157.5	58
	UniverCity Childcare Centre	Burnaby	BC	Service	5,690							
	Valatie Free Library	Hudson River Valley	NY	Public Assembly	750							
	Vernonia School	Vernonia	OR	Education	135,000	35.4	111.6					
	William S Hart High School District	Santa Clarita	CA	Education								
	Zero Energy Research Lab at University of North Texas	Denton	TX	Education	1,200							
2013	64 Catherine Street ^L	Boston	MA	Multifamily	1,416							
	Austin Gardens Environmental Education Center ^L	Oak Park	IL	Public Assembly	2,100							
	Beckstoffers Mill Senior Housing Complex	Richmond	VA	Multifamily	8,000							
	Bennington Superior Court & State Office Building (M)	Bennington	VT	Office	65,000					26.1		31
	Blackford School Multi-Use Building	San Jose	CA	Education								
	Boy Scouts of America The Summit Bechtel Reserve Treehouse	Glen Jean	WV	Public Assembly	5,000							
	Bright 'n Green 'Sandy Resistant' Mixed Use Project ^L	Brooklyn	NY	Multifamily								
	Burr and Burton Academy Mountain Campus ^L	Peru	VT	Education								

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2013	Castlemont Elementary School Multipurpose Building	Campbell	CA	Education								
	Centre of Excellence at Okanagan College	Kelowna	BC	Education	61,100							
	Church Hill Townhomes ^L	Fortuna	CA	Multifamily								
	College of the Desert West Valley Campus - Phase 1	Palm Springs	CA	Education	50,000	22.0	69.3	24.0	75.6	-2.0	-6.3	-2
	Delta Building - NYC	Brooklyn	NY	Other	2,700							
	Exploratorium Pier 15 ^L (M)	San Francisco	CA	Other	330,000	42.0	132.3	36.0	113.4	6.0	18.9	7
	Forest Service's Technology and Development Center	San Dimas	CA	Office	32,800							
	Foundry Court by Nexus Homes	Philadelphia	PA	Multifamily								
	General Aviation Terminal ^L	Appleton	WI	Other	8,000			13.0	41.0			
	Green Leaf Inn	Delavan	WI	Lodging								
	Hollis Montessori School (M)	Hollis	NH	Education	19,100	11.3	35.6					
	Keene State College Technology, Design and Safety Building	Keene	NH	Education	53,000							
	Lane Community College, Downtown Academic Center ^L (M)	Eugene	OR	Education	90,000	25.0	78.8	0.0	0.0	25.0	78.8	27
	Los Guilicos Correctional Facility (M)	Santa Rosa	CA	Public Order and Safety	149,000	23.9	75.3	1.1	3.5	22.8	71.8	28
	MetroWest High School		CA	Education								
	OSD Downtown Educational Complex	Oakland	CA	Education								
	Park Place	Missoula	MT	Other	4,295							
	Park Slope Brooklyn ZNE Brownstone	Brooklyn	NY	Multifamily	7,000							
	Rohner Village	Fortuna	CA	Multifamily								
	Salt Lake City Public Safety Building ^L (M)	Salt Lake City	UT	Public Order and Safety	175,480	70.1	220.9	34.8	109.7	35.3	111.2	34
	Sherman Oaks Elementary School Multiuse Facility	Campbell	CA	Education								
	SMUD Net Zero Campus - East Campus-Operations Center ^L	Sacramento	CA	Office	350,000							
	Sokol Blosser Winery Tasting Room ^L	Dundee	OR	Mercantile (Retail Other than Mall)	5,700	24.0	75.6	0.0	0.0	24.0	75.6	27
	Solterra EcoLuxury Apartments ^L	San Diego	CA	Multifamily								
	Taliesin West Net Zero Retrofit - Frank Lloyd Wright	Scottsdale	AZ	Public Assembly								
	TD Bank ZNE Branch Prototype	Mississauga	ON	Service	1,590							
	UC San Diego J Craig Venter Institute ^L	La Jolla	CA	Education	40,079	53.2	167.6	63.8	201.1	-10.6	-33.5	-12
	University of South Carolina Darla Moore School of Business ^L	Columbia	SC	Education	250,000							
	VF Outdoor HQ ^L	Alameda	CA	Office	160,000							
	Walgreens Evanston Store ^L	Evanston	IL	Mercantile (Enclosed and Strip Malls)	14,000	48.7	153.4	54.0	170.1	-5.3	-16.7	-4
	Wayne Aspinall Federal Building and Courthouse ^L (M)	Grand Junction	CO	Public Order and Safety	41,562	21.0	66.2	15.0	47.3	6.0	18.9	6

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2014	California Department of Motor Vehicles	Sacramento	CA	Office	520,000							
	Camp Parks	Dublin	CA	Other								
	Catherine Houghton Arts Center	Bethehem	NH	Education								
	Chatham University Eden Hall Campus	Richlandtown	PA	Education								
	Chemeketa Community College Health Science Complex	Salem	OR	Education	70,000							
	Clarum Homes Headquarters	Palo Alto	CA	Office								
	Cottages at Cypress ^L	Fort Bragg	CA	Multifamily								
	Craftsbury Outdoor Center Lodge	Craftsbury Common	VT	Lodging								
	Dixon Valley Glen ^L	Dixon	CA	Multifamily								
	East Bay MET School	Newport	RI	Education	16,800							
	Electrical and Computer Engineering Building and University of Illinois	Champaign	IL	Education	250,000							
	Environmental Innovation Center ^L	San Jose	CA	Education	46,000	23.8	75.0					
	Ewa Elementary School Portable Classroom - Oahu	Aiea	HI	Education	13,000							
	Family Pet Hospital	Clovis	CA	Health Care (Outpatient)	8,700							
	First Housing Development Corp	Tampa	FL	Office	17,000							
	Glumac Office Aon Center Floor 23	Los Angeles	CA	Office	17,500							
	Gundersen Health System ^L	La Crosse	WI	Health Care (Inpatient)								
	Kaiser Permanente Antelope Valley Medical Office Building ^L (M)	Lancaster	CA	Office	136,800	31.0	97.7	6.0	18.9	25.0	78.8	35
	Kalaheo NZE Community	Honolulu	HI	Multifamily								
	La Escuelita Education Center	Oakland	CA	Education	123,000							
	LPL Financial Center at La Jolla Commons ^L	San Diego	CA	Office	415,000							
	Market One ^L	Des Moines	IA	Office	50,000							
	Massachusetts Division of Fisheries & Wildlife - Field Headquarters Building ^L	Westborough	MA	Office	45,000	22.6	71.2	0.0	0.0	22.6	71.2	27
	MEC Northeast Campus (M)	Phoenix	AZ	Education	101,081	71.5	225.2	48.1	151.5	23.4	73.7	24
	Monarch School Classroom ^L	Houston	TX	Education	1,120							
	Oak Park High School	Oak Park	CA	Education	960							
	Odyssey Elementary School	Woods Cross	UT	Education	84,000							
	Perkins + Will Office ^L	San Francisco	CA	Office	21,170							
	Pflugerville Elementary School	Pflugerville	TX	Education	93,000							
	Richard J. Lee Elementary School ^L (M)	Coppell	TX	Education	95,633	21.2	61.8	18.8	59.3	2.3	2.5	2
	San Bernardino Community College District	Garden Grove	CA	Education								
	SFO Airfield Operations Terminal - VIP Center ^L	San Mateo	CA	Other	8,300							
	Solana Ranch Elementary School	San Diego	CA	Education	68,000							
	Student Success and Retention Center at East Los Angeles College ^L	Los Angeles	CA	Education	136,000							
	The Village at Beechwood	Lancaster	CA	Multifamily	22,960							

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2014	UC Santa Barbara Recreation Center ^L	Santa Barbara	CA	Education	140,000							
	University of Minnesota Itasca Biological Station and Laboratories	Lake Itasca	MN	Education	10,900							
	Varennes Library ^L (M)	Varennes	QC	Public Assembly	24,000	14.5	45.7					
	Zenger Farms Community Building	Portland	OR	Public Assembly	8,500							
2015	415 Mathilda (M)	Sunnyvale	CA	Office	33,750	7.1	22.4	6.6	20.9	0.5	1.5	1
	Ankeny Row Townhomes	Portland	OR	Multifamily	8,500							
	Archimania Office	Memphis	TN	Office	5,000							
	Brinkmann True Value	Miller Place	NY	Mercantile (Retail Other than Mall)								
	CA Lottery District Office ^L	Santa Fe Springs	CA	Office	12,840	22.1	69.8	22.2	70.1	-0.1	-0.3	0
	CA Lottery Southern Distribution Center ^L	Rancho Cucamonga	CA	Office	60,600	12.0	37.8	0.0	0.0	12.0	37.8	17
	Carlos Ortega Villas	Palm Desert	CA	Multifamily								
	Cincinnati Police Department - District 3 ^L (M)	Cincinnati	OH	Public Order and Safety	39,000	26.6	83.8	34.0	107.1	-7.4	-23.3	-7
	Dearing Elementary School	Pflugerville	TX	Education	93,000							
	Delta Americas Headquarters ^L (M)	Fremont	CA	Office	200,000	50.1	157.7	36.7	115.6	13.4	42.1	19
	Dr. Martin Luther King, Jr. School	Cambridge	MA	Education	140,000							
	Friends School of Portland	Cumberland Foreside	ME	Education	15,000							
	Grantham Middle School	Goldsboro	NC	Education	86,400							
	Grass Education Center	Washington DC	MD	Education	3,800							
	Greenway Building	Arcata	CA	Office	40,000							
	Gresham Wastewater Plant	Gresham	OR	Other								
	Hanover Page Mill Building ^L	Palo Alto	CA	Office	86,253	30.1	85.8	25.8	81.3	4.3	4.5	7
	Indigo Hammond & Playle Architects Office (M)	Davis	CA	Office	4,000	4.4	13.9					
	Langston Terrace Dwellings	Washington DC	DC	Multifamily								
	Los Angeles Harbor College Sciences Complex ^L	Los Angeles	CA	Education	71,800	5.2	16.3	5.8	18.3	-0.6	-2.0	-1
	Marine Corps Logistics Base (MCLB) ^L	Albany	GA	Other								
	Monterey Bay CSU - Academic Building 2	Seaside	CA	Education	57,331							
	Mosaic Centre for Conscious Community and Commerce ^L	Edmonton	AB	Public Assembly	30,000							
	Muse School	Calabasas	CA	Education								
	Mutual Housing at Spring Lake ^L	Woodland	CA	Multifamily	64,600							
	MZ Condo-Townhomes	Scottsdale	AZ	Multifamily								
	Net Zero Plus Electrical Training Institute ^L	Los Angeles	CA	Education	142,000							
	Parkview Place	Davis	CA	Multifamily	9,300							
	Picuris Pueblo Fire Station	Penasco	NM	Public Order and Safety	2,640							
	R W Kern Center at Hampshire College	Amherst	MA	Education	16,950	23.2	73.1	26.6	83.8	-3.4	-10.7	-3
	Resort at Playa Vista ^L	Santa Monica	CA	Public Assembly	25,000							
	SAAS Stream ^L	Seattle	WA	Education	32,156	32.3	101.7	1.4	4.4	30.9	97.3	33
	Seasons At Ontario Senior Community	Ontario	CA	Multifamily								

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2015	Sierra Nevada Aquatic Research Lab & Multiuse Classroom ^L	Mammoth Lakes	CA	Education	2,696							
	Spring Creek Middle School	Seven Springs	NC	Education	96,000							
	Stanford Central Energy Facility Admin Building	Stanford	CA	Office								
	Sun Baths	Ann Arbor	MI	Other	10,000							
	University of Hawaii at Manoa Net Zero Classrooms	Honolulu	HI	Education	1,500							
	Village in the Bosque Apartments ^L	Bernalillo	NM	Multifamily								
	West Hollywood City Hall Automated Parking Garage	West Hollywood	CA	Other								
	Yarrow Village	Fortuna	CA	Multifamily								
	Zero Energy Nanotechnology Building at SUNY Poly	Utica	NY	Education	356,000							
2016	Arch Nexus SAC Office ^L	Sacramento	CA	Office	8,200	36.3	114.4	39.7	125.1	-3.4	-10.7	-5
	Beneficial State Bank	Oakland	CA	Mercantile (Retail Other than Mall)								
	BEST Center at Laney College	Oakland	CA	Education								
	Bluebonnet Studios Mixed-Use Commons	Austin	TX	Multifamily	86,000							
	Building Positive: Four in One Prototype	Kansas City	MO	Other	43,000							
	California DOT SFOBB Phase 2 Warehouse	Oakland	CA	Warehouse and Storage	28,000							
	City Place Development	Santa Clara	CA	Other								
	Cowhorn Vineyard	Jacksonville	OR	Other	2,200							
	Creamery Row	Arcata	CA	Multifamily								
	Culver City Library	Los Angeles	CA	Public Assembly								
	DPR Office Washington DC	Reston	VA	Office	20,000							
	Egan Junior High School	Los Altos	CA	Education	17,000							
	Equinox Apartments	Scottsdale	AZ	Multifamily								
	Fair Oaks Zero Net Energy Office	Pasadena	CA	Office	12,000							
	Foothill College Sunnyvale Center ^L	Los Altos	CA	Education	50,000							
	Fort Hunter Liggett ^L	Jolon	CA	Other		23.9	75.3			23.9		30
	Grow Community	Bainbridge Island	WA	Multifamily								
	Hitchcock Center for the Environment	Amherst	MA	Education	9,000							
	Imperial Beach Branch Library ^L	Imperial Beach	CA	Public Assembly	14,000							
	Indian Creek Nature Center	Cedar Rapids	IA	Other	12,000							
	Ironhorse Lodge	Prineville	OR	Multifamily	27,000							
	Irvine High School Campus Center	Irvine	CA	Education								
	Kaiser Permanente San Jose Medical Office Building	San Jose	CA	Office								
	King County Housing Authority Administration Building	Tukwila	WA	Office	36,000	28.0	88.2	0.0	0.0	28.0	88.2	40
	King Street L (M)	Seattle	WA	Office	3,680							
	LinkedIn Offices ^L	Sunnyvale	CA	Office	40,000	30.0	94.5	35.0	110.3	-5.0	-15.8	-8
	Lowry Redevelopment Multi-Family ZNE	Denver	CO	Multifamily								
	Lumbee River EMC	Raeford	NC	Office	15,000	18.0	56.7					

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2016	McClellan Ranch (M)	Cupertino	CA	Other	3,265	20.9	65.7	11.6	36.6	9.3	29.1	12
	MEC SW Campus Phase I & II (M)	Buckeye	AZ	Education	77,565	39.0	122.9	25.2	79.4	13.8	43.5	14
	Montpelier Multi Modal Transit Center	Montpelier	VT	Other	35,000							
	Mt. San Antonio College ^L	Walnut	CA	Education	20,610							
	Newcastle Elementary	Newcastle	CA	Education								
	Olympic & Olive Apartments	Los Angeles	CA	Multifamily								
	Ontario Association of Architects HQ	Toronto	ON	Office								
	Passive House Apartments	Steamboat Springs	CO	Multifamily								
	Porter Drive Office Building	Palo Alto	CA	Office	96,626	24.5	77.2	21.0	66.2	3.5	11.0	5
	REI Distribution Center	Goodyear	AZ	Warehouse and Storage	400,000							
	SFO Firehouse #3	San Mateo	CA	Other	20,000							
	Socastee Elementary School	Myrtle Beach	SC	Education								
	Socastee Middle School	Myrtle Beach	SC	Education								
	Sol-Lux Alpha (685 Florida Street)	San Francisco	CA	Multifamily	7,000							
	SunCommon Headquarters	Waterbury	VT	Office	8,800	17.5	55.1	17.5	55.1	0.0	0.0	0
	Sustainable Energy Fund	Allentown	PA	Office	15,000							
	Tesla Gigafactory	Reno	NV	Other	10000000							
	Toyota Dealership Corvallis	Corvallis	OR	Other	34,800							
	Vista Grande Elementary School	Rancho Palos Verdes	CA	Education								
	Waitsfield Town Offices	Waitsfield	VT	Office	4,700	13.2	41.5	13.2	41.5	0.0	0.0	0
2017	Walden Pond Visitor Center ^L	Boston	MA	Public Assembly	5,680							
	William Penn Hotel	San Francisco	CA	Lodging	41,836							
	Woodside Priory School	Portola Valley	CA	Education	13,000							
	Wyandot Lodge	Columbus	OH	Public Assembly	5,800							
	Xilinx HQ Renovation	San Jose	CA	Office	100,000	37.0	116.5	30.7	96.7	6.3	19.8	10
	380 Pastoria Office	Sunnyvale	CA	Office	45,383	25.7	80.8	31.0	97.8	-5.4	-17.0	-8
	47951 Westinghouse	Fremont	CA	Other	82,408							
	Amenities Building, Towers at Great America	Santa Clara	CA	Food Service	23,930	174.2	548.8	342.3	1,078.4	-168.1	-529.6	-26
	Arizona State University Student Pavilion	Tempe	AZ	Education	74,653	40.2	126.6	16.3	51.5	23.8	75.1	25
	Borrego Springs Library and Park	San Diego	CA	Public Assembly	13,500							
	Boulder Commons	Boulder	CO	Other	101,000	24.1	75.9	25.3	79.7	-1.2	-3.8	-1
	Clatsop Community College - Patriot Hall	Astoria	OR	Education	36,000							
	College of Continuing & Professional Education (CCPE)	Long Beach	CA	Education	35,000							
	Cornell Tech NYC Academic Building - Roosevelt Island	New York City	NY	Education	158,000	31.9	100.5	0.0	0.0	31.9	100.5	31
	Crotty Hall - Umass	Amherst	MA	Education	16,800							
	Housing and Community Development Office	San Diego	CA	Office	29,408	26.1	82.1	30.2	95.0	-4.1	-12.9	-6
	IBEW Local 58	Detroit	MI	Office	33,000							
	Kaiser Permanente Baldwin Hills Medical Office Building	Los Angeles	CA	Office	100,000							

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ZERO ENERGY EMERGING

YEAR	PROJECT NAME	CITY	STATE	BUILDING TYPE	SIZE (SF)	TOTAL EUI	SOURCE EUI	SITE RPI	SOURCE RPI	NET EUI	NET SOURCE EUI	ZEPI SCORE
2017	Kaiser Permanente Santa Rosa Medical Office Building	Santa Rosa	CA	Office	87,300	30.0	94.6	30.1	94.8	-0.1	-0.2	0
	Makers Quarter Block D	San Diego	CA	Office	52,974	46.8	147.4	28.2	88.8	18.6	58.6	26
	Marin Academy Science & Innovation Center	San Raphael	CA	Education	20,040	38.4	121.1	61.8	194.6	-23.3	-73.5	-29
	Mark Day School	San Raphael	CA	Education	11,917	27.6	86.9	55.6	175.1	-28.0	-88.2	-35
	Memphis Welcome Center	Memphis	TN	Public Assembly								
	Myrtle Beach Middle School	Myrtle Beach	SC	Education								
	Ocean Discovery Institute	San Diego	CA	Education								
	Ohlone Campus Core Replacement Project	Fremont	CA	Education								
	Oregon Zoo Ed Center ^L	Portland	OR	Public Assembly	20,000							
	OUSD Madison Middle School	Oakland	CA	Education	35,000	14.9	46.9	17.6	55.5	-2.7	-8.6	-3
	Oxford County Waste Management Administration Building	Salford	ON	Office	4,000							
	Palomar Community College	San Marcos	CA	Education								
	Pitzer College Redford Conservancy	Claremont	CA	Education								
	Planet Fitness - St. Petersburg	St. Petersburg	FL	Public Assembly	20,000							
	Ralston Intermediate Multipurpose Building	Garden Grove	CA	Education								
	Salt Lake County District Attorney Office	Salt Lake City	UT	Office								
	Santiago High School Science Building	Garden Grove	CA	Education	8,000	26.0	81.9	0.0	0.0	26.0	81.9	30
	SFO Ground Transportation Unit Facility	San Mateo	CA	Other	14,000							
	Sonoma Academy Grange Building	Santa Rosa	CA	Education	130,000							
	St. James Intermediate School	Myrtle Beach	SC	Education								
	The Roosevelt	Tempe	AZ	Multifamily								
	TreeHouse Flagship Store	Dallas	TX	Mercantile (Retail Other than Mall)	25,000							
	UC Davis California Avenue Lecture Hall	Davis	CA	Education								
	UC Santa Barbara Student Services Buildings	Santa Barbara	CA	Education								
	United Therapeutics Jax Net Zero Center	Jacksonville	FL	Office	75,000							
	West Dorm, Wolf Ridge Environmental Learning Center	Finland	MN	Multifamily	16,500	31.0	97.7					
	Wilde Lake Middle School	Ellicott City	MD	Education	106,221							
	Yellowhawk Tribal Health Center	Pendleton	OR	Health Care (Outpatient)	63,000							
	Yosemite Community College District	Modesto	CA	Education								
	Z-Stay	Denver	CO	Office	1,870	37.0	116.6	32.8	103.3	4.2	13.3	6
2018	American Geophysical Union HQ	Washington DC	DC	Office	62,000							
	Atherton City Hall	Atherton	CA	Office								
	CA State Poly Tech University	Pomona	CA	Education	138,000	17.0	53.4	23.6	74.2	-6.6	-20.8	-8
	Carolina Forest Middle School	Myrtle Beach	SC	Education								
	City of Dublin Public Safety Complex	Dublin	CA	Public Order and Safety								
	City of Hayward 21st Century Library	Hayward	CA	Public Assembly	57,000	35.6	112.1	43.2	136.1	-7.6	-24.0	-7
	City of Santa Clara Swim Center	Santa Clara	CA	Public Assembly								

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(L) indicates LEED Certification

ZERO ENERGY EMERGING

YEAR	PROJECT NAME	CITY	STATE	BUILDING TYPE	SIZE (SF)	TOTAL EUI	SOURCE EUI	SITE RPI	SOURCE RPI	NET EUI	NET SOURCE EUI	ZEPI SCORE
2018	Durham Education Center	Tigard	OR	Education	17,000	19.0	59.9	28.7	90.4	-9.7	-30.5	-10
	Elk Grove Civic Center - Aquatic Center	Elk Grove	CA	Public Assembly								
	Elk Grove Civic Center - Community/Senior Center	Elk Grove	CA	Public Assembly								
	Environmental Learning Center at Mass Audubon Drumlin Farm	Worcester	MA	Other	3,700							
	Gulf State Park Interpretive Center	Baldwin County	AL	Public Assembly								
	Half Moon Bay Library	Half Moon Bay	CA	Public Assembly	22,000							
	Kaiser Permanente Ventura Medical Office Building	Ventura	CA	Office	57,000							
	Lick Wilmerding New Classroom Building	San Francisco	CA	Education	55,140	21.1	66.4	24.9	78.4	-3.8	-12.0	-5
	Lombardo Welcome Center	Millersville	PA	Education	14,627							
	Mohawk College Centre for Partnership and Innovation	Hamilton	ON	Education	90,000							
	North Coastal Health and Human Services Agency Facility	San Diego	CA	Office	40,000							
	OUSD Glenview Elementary School Replacement	Oakland	CA	Education	53,700							
	Pikes Peak Summit Complex	Colorado Springs	CO	Public Assembly	26,000							
	Re Farm Café	State College	PA	Food Service								
	Rio Hondo Community College District	Whittier	CA	Education	78,201							
	Schmidt Ocean Institute and Schmidt Family Foundation	Palo Alto	CA	Office	25,000	28.0	88.2	32.0	100.8	-4.0	-12.6	-6
	SFO Long-Term Parking Garage #2	San Francisco	CA	Other	1,300,000							
	Sonoma County Junior College District	Sonoma	CA	Education	26,954							
	United Therapeutics Unisphere	Silver Spring	MD	Office	122,000							
	Whisper Valley net zero community	Austin	TX	Other								
2019	Woodburn Success High School ^L	Woodburn	OR	Education	11,000							
	Yosemite Institute	Yosemite National Park	CA	Education								
	Bethlehem Steel Site	Lackawanna	NY	Other	76,280							
	Botanica Educational Center	Louisville	KY	Education	10,500							
	Coliseum Place	Oakland	CA	Multifamily								
	Denver Water Headquarters Office	Denver	CO	Office	190,000							
	Erie County Z7+ Light Industrial Facility (ECIDA)	Buffalo	NY	Other								
	Garfield Elementary School	San Francisco	CA	Education	33,800							
	Georgia Tech - Living Building Challenge	Atlanta	GA	Education	34,258	35.0	110.3					
	Graceland Elementary School	Baltimore	MD	Education	94,330							
	Healdsburg City Hall	Healdsburg	CA	Office	13,282							
	Holabird Elementary School	Baltimore	MD	Education	94,330							
	King Open / Cambridge St Upper School & Community Complex	Cambridge	MA	Education	270,000							
	Lilienthal Elementary School	San Francisco	CA	Education	21,995							
	Lubber Run Community Center	Arlington	VA	Public Assembly	42,000							

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ZERO ENERGY EMERGING

YEAR	PROJECT NAME	CITY	STATE	BUILDING TYPE	SIZE (SF)	TOTAL EUI	SOURCE EUI	SITE RPI	SOURCE RPI	NET EUI	NET SOURCE EUI	ZEPI SCORE
2019	Marin County Day School	Corte Madera	CA	Education								
	Nueva Middle School Expansion	Hillsborough	CA	Education	24,000							
	Santa Monica City Hall	Santa Monica	CA	Office	92,000							
	Telesis Dairy House Complex	Lincoln	NE	Other	174,000							
	Whole Foods	San Francisco	CA	Food Sales	25,187							
	Yosemite Slough Ed Center	San Francisco	CA	Education								
2020	AvalonBay Middlefield	Mountain View	CA	Multifamily								
	CA Air Resources Board ZNE Building	Sacramento	CA	Other	300,000	102.9	324.1	102.9	324.1	0.0	0.0	0
	Cal State Northridge ^L	Los Angeles	CA	Education	6,000,000	32.6	102.6	5.9	18.5	26.7	84.1	31
	Fort Bliss	Fort Bliss	TX	Other								
	Fort Carson	Fort Carson	CO	Other								
	Fort Detrick	Frederick	MD	Other								
	Fremont High School	Oakland	CA	Education	140,000							
	IKEA	Multiple		Mercantile (Retail Other than Mall)								
	LA Convention Center	Los Angeles	CA	Public Assembly	1,000,000							
	Oregon National Guard	Roseburg	OR	Other	20,000							
	SFO Airport Campus	San Mateo	CA	Other								
	Sierra Army Depot	Herlong	CA	Other								
	UC Merced Campus	Merced	CA	Education	6,250,000							
	West Point USMA	West Point	NY	Other								
2023	CCCCD Diablo Valley College Kinesiology Complex	Pleasant Hill	CA	Education								
2029	The Village at RiverBend	London	ON	Multifamily								
2030	Vail Resorts	Multiple		Other								
Year Unknown	Arbor Green ^L	Carson	CA	Multifamily	34,880	15.6	49.2	18.9	59.6	-3.3	-10.4	-5
	Arcade Row	Hyattsville	MD	Multifamily	64,560							
	Arroyo De Paz I	Desert Hot Springs	CA	Multifamily	65,752	27.4	86.2	31.9	100.4	-4.5	-14.2	-7
	Atascadero	Atascadero	CA	Multifamily	60,588	18.0	56.8	19.5	61.5	-1.5	-4.7	-3
	Bandar Salaam	San Diego	CA	Multifamily	54,732	11.7	36.7	12.0	37.8	-0.3	-1.1	-1
	Buena Vista	Hollister	CA	Multifamily								
	CaListoga Apartments ^L	CaListoga	CA	Multifamily	37,669	23.4	73.7	26.9	84.8	-3.5	-11.1	-6
	Camp Southern Ground, Peterson Dining Hall & Lodge #1	Peachtree City	GA	Food Service	19,500							
	Castroville	Castroville	CA	Multifamily	50,254	28.2	88.7	28.2	88.7	0.0	0.0	0
	CCAC Boyce Campus Student Housing	Pittsburgh	PA	Multifamily								
	Cloverdale	Cloverdale	CA	Multifamily	29,618	13.0	40.9	13.0	40.9	0.0	0.0	0
	Colonial House Apartments ^L	Oxnard	CA	Multifamily	46,552	17.2	54.0	17.0	53.6	0.2	0.4	0
	Colorado University Indoor Practice Facility ^L	Boulder	CO	Public Assembly	108,000							
	Corn Creek Visitor Center ^L	Las Vegas	NV	Public Assembly	15,000							
	Heritage Square	Pasadena	CA	Multifamily	46,306	14.6	45.9	13.6	42.8	1.0	3.1	2
	La Costa Paloma	Carlsbad	CA	Multifamily	192,043	8.9	28.2	11.6	36.5	-2.6	-8.3	-4

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ZERO ENERGY EMERGING

YEAR	PROJECT NAME	CITY	STATE	BUILDING TYPE	SIZE (SF)	TOTAL EUI	SOURCE EUI	SITE RPI	SOURCE RPI	NET EUI	NET SOURCE EUI	ZEPI SCORE
Year Unknown	Lancaster Urban Forest Center	Lancaster	PA	Education	21,000							
	Live Oak	Live Oak	CA	Multifamily	86,366	20.0	63.0	20.0	63.1	0.0	-0.1	0
	Los Adobes de Maria I	Santa Maria	CA	Multifamily	64,630	5.5	17.4	5.5	17.4	0.0	0.0	0
	Los Osos Middle School	Los Osos	CA	Education								
	Lynhaven Elementary School Multipurpose	Campbell	CA	Education								
	NetZero Village	Rotterdam	NY	Multifamily								
	Oak Park 1	Paso Robles	CA	Multifamily	94,923	10.6	33.5	11.4	35.8	-0.7	-2.3	-1
	Phase Change Energy Solutions Manufacturing Facility	Asheboro	NC	Other	75,000							
	Placer Village	Placerville	CA	Multifamily	72,400	31.7	99.8	31.7	99.8	0.0	0.0	0
	River View Townhomes	Guadalupe	CA	Multifamily	96,504	11.0	34.6	13.9	43.9	-3.0	-9.3	-5
	Riverview Terrace	Fortuna	CA	Multifamily	43,740	19.5	61.5	20.0	63.0	-0.5	-1.5	-1
	Ruffin Organic Food and Learning Center	Las Vegas	NV	Education								
	S Office Buildings	Seattle	WA	Office	1200,000							
	San Andreas	Watsonville	CA	Multifamily	49,420	9.6	30.3	18.8	59.2	-9.2	-28.9	-16
	San Remo I	Hesperia	CA	Multifamily	66,223	16.2	51.0	14.9	47.0	1.3	4.0	2
	San Remo II	Hesperia	CA	Multifamily	63,232	15.8	49.7	15.6	49.2	0.1	0.5	0
	Tesoro Grove	San Diego	CA	Multifamily	85,113	8.9	28.2	10.3	32.4	-1.3	-4.2	-2
	Thaden School	Bentonville	AR	Education	125,000							
	Thomas Jefferson Elementary School	Baltimore	MD	Education	105,000							
	University of Wisconsin Arlington Agricultural Research Station	Arlington	WI	Education								
	Valley View Phase II	Selma	CA	Multifamily	51,698	21.5	67.7	21.5	67.8	0.0	-0.1	0
	Wasco	Wasco	CA	Multifamily	76,325	19.6	61.8	19.9	62.5	-0.2	-0.7	0
	Williams Green Valley	Williams	CA	Multifamily	44,869	22.6	71.2	22.6	71.2	0.0	0.0	0
	Winnetka	Winnetka	CA	Multifamily	53,642	15.6	49.3	21.9	68.9	-6.2	-19.6	-10
	Yellowstone National Park Youth Campus	Mammoth	WY	Education	52,000							

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(L) indicates LEED Certification



435 Indio Way in Sunnyvale., CA is new to the ZE
Certified List. *Photo Credits: Bruce Damonte*

nbi new buildings
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newbuildings.org

New Buildings Institute (NBI) is a nonprofit organization driving better energy performance in buildings. We work collaboratively with industry market players—governments, utilities, energy efficiency advocates, and building professionals—to promote advanced design practices, innovative technologies, public policies, and programs that improve energy efficiency. We also develop and offer guidance and tools to support the design and construction of energy efficient buildings.

Throughout its 20-year history, NBI has become a trusted and independent resource helping to drive buildings that are better for people and the environment.

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VIA EMAIL

October 30, 2018

Ms. Kelly Cha
Community Development Department
City of Sunnyvale
456 W. Olive Avenue
Sunnyvale, CA 94086

Re: Sunnyvale Green Building Update – Draft Staff Recommendations Revised dated 10/15/18

Dear Ms. Cha,

This letter is to provide our comments to the Revised Draft Staff Recommendations Sunnyvale Green Building Program dated October 15, 2018. Jay Paul Company provided its comments to the initial Draft Staff Recommendations Sunnyvale Green Building Update Program dated 8/21/18.

Jay Paul Company has demonstrated our commitment to building the highest level of green building design in Sunnyvale and will continue to implement the latest sustainability methods to attract and retain high-value tenants. As stated in our previous communications, we support the City's Green Building Program and Sunnyvale's desire to be the sustainability leader in Silicon Valley. However, we have a few comments and concerns with some of the proposed measures for the updated program as discussed below:

1. Project all-electric (no gas line connection) for Voluntary Incentives for Additional FAR 10-30% Citywide and Moffett Parks:

The addition of the all-electric requirement seems to be consistent with the shift away from natural gas/combustion to reduce carbon emissions produced by buildings. We are in support of carbon reduction and are in favor of all-electric for smaller building products with less demand on hot water heating and other factors like onsite food service/kitchens. Going to all-electric utility for a typical commercial/R&D office 100-300k sq. ft. is less feasible in that the demand load for hot water for large building uses include fitness (showers), café/kitchens, and place a higher demand for hot water and gas reliant equipment. The MEP systems can be designed around this but will require much more flexibility and creativity to design systems without combustion. Sunnyvale has attracted many high-tech Tenants to Sunnyvale that offer expansive food service and outdoor amenities programs for their employees. The onsite dining services have also contributed to project's TDM requirements and the reduction of daily single occupant vehicle trips and overall traffic. An across the board all- electric requirement for large building

tenants could prove to be difficult and more expensive especially for gas-reliant kitchen equipment and hot water heating. Since current Title-24 energy code leans on natural gas, it may be best for the City to wait for the new T-24 in 2020 to eliminate potential conflicts between credits and penalties for natural gas vs. electric utilities. We anticipate that Tenant's will request exemptions for kitchen use, or specific equipment to be served by gas until the codes are updated.

2. Net Zero Energy (NZE) with IFLI Certification option for increased FAR 10%:

The IFLI NZE certification requires 100% energy offset through on-site renewable energy modes and does not allow for combustion sources (natural gas). The certification under IFLI requires a 12-month performance period after tenant occupancy to measure the energy consumption against the building's renewable energy production. For speculative development projects where the Tenant is not known during the design/construction of the core shell, designing the MEP to a specific energy demand (or an offset) for a specific Tenant is not possible. To take advantage of the voluntary incentive, we would have to design the tenant improvements and have insight to a specific Tenant's operations and actual energy consumption. For Jay Paul Company the NZE incentive option as currently written is simply not an option. We would ask that the City reconsider and further examine more flexible options for targeting Net Zero.

One way to do this, to consider a blend of onsite and offsite renewables and/or carbon offsets (RECs to account for natural gas usage) to reach NZE status, this may provide for a more reasonable target, and this would be consistent with LEED v4 and current Title-24 energy code. Projects could be encouraged to minimize gas usage where possible but for large buildings, particularly in the case for tenant food services with commercial kitchens, allow for carve-outs to exempt certain equipment.

The City should consider allowing for a combination of strategies, a menu or tiered framework, rather than a blanket requirement – all electric or NZE IFLI certified - that will preclude many developers and tenants from being eligible to target density incentives. This coupled with LEED v4 Gold Platinum level will be very difficult and even impossible in many cases to achieve. As we stated in our previous letter 8/21/18, LEED v4 Platinum *sets the bar high* and due to certain site credit requirements and tenant performance credits, there will be a lot of challenges given the location for developments in the Moffett Park area.

More research may be needed particularly for larger commercial office buildings, mid to high rise (3-stories or higher) as the available roof space for PV (Photo Voltaic) is quite limited, and the sites are not large enough for expansive PV arrays onsite. How are other Cities meeting or exceeding the standard for sustainability and fostering all-electric and NZE? The City of Palo Alto's energy code (Reach program) provides a few pathways for developers to the City's green building requirements. They allow for options such as performance basis (building performs

___% better than code), the use of photo voltaic (PV) to offset a certain % percentage of the anticipated energy consumption/demand load, and an all-electric option, or some combination of the above.

There are very few large buildings in the 150-300k sq. ft. range in the world that are net zero certified. The amount of land or building roof area required for any given project to provide for and offset its energy consumption with on-site renewables would require many sq. ft of area either on land or on a building's roof space (which is not an option for a multi-story building). A building would need to have enough PV to offset its consumption by >105% for IFLI NZE certification or in other cases 3-times the amount *on a site to source basis* as defined in Sunnyvale's current draft of the Green Building Program as a definition for *Net Zero Energy*. If a building is greater than <100k sq. ft. the number of onsite renewables to offset a building's consumption would be unattainable in most cases and eliminate most projects in the City or Moffett Park from being eligible to achieve this level of certification.

To attest to the above, in almost all cases when you look for a registry of NZE certified buildings, the projects are either residential or institutional and less than >50k sq. ft. in size. It is not widely done because it is very difficult to achieve for large buildings.

NZE certified building case studies (IFLI):

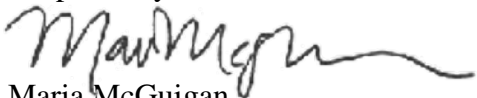
<https://living-future.org/lbc/case-studies/?certs=zero&sqft=50k-150k>

NZE certified registry list (New Buildings Institute):

https://newbuildings.org/wp-content/uploads/2018/01/GTZ_2018_List.pdf

In conclusion, we would ask that the City reconsider and conduct further research on the requirements for NZE certification and the impacts for requiring all-electric for the Green Building voluntary incentives coupled with LEED Platinum (v4 and above). It seems based on the types of building developments likely to benefit from these incentives, the options prescribed may not be feasible and preclude commercial office for R&D/Tech Tenant companies with larger food service and kitchen operations. We would be happy to continue the discussion with the City and support a more flexible menu of sustainable options for the voluntary incentive portion of the Green Building Program.

Respectfully,



Maria McGuigan
Senior Director, Real Estate Development

Encl:

Getting to Zero – Net Zero Energy Projects, by New Building Institute 2018

City of Sunnyvale
Community Development Department
456 W. Olive Avenue
Sunnyvale, CA 94086

October 25, 2018

Subject: Sunnyvale's Green Building Program Update

Please consider the following points related to the draft staff recommendations for updating the City's Green Building program. This draft clarifies some of the concerns with the first draft such as LEED points and levels. However, it appears to still have ambiguity related to requirements for the voluntary incentives. Two requirements in particular are 1) the all electric building and 2) NZE certification.

1. Electrifying our buildings is necessary for a renewable energy powered electric grid to be most effective. It is possible with today's technology to design all electric building systems. Heat pump water heaters, VRF systems, and other technologies have come down in cost and are scalable. However, a blank policy/requirement that doesn't make allowances for processes and appliances that are not up to speed with the market will hinder programs such as what is in the draft update. In Sunnyvale, high tech companies own and occupy a substantial footprint of your building stock. As we know, these companies have a significant emphasis on food programs. Commercial kitchens are commonplace in every large building occupied by one of the high tech giants. The inability to cook with natural gas will be a major disadvantage to leasing space or building new space in Sunnyvale. I recommend the City acquire more research into what effect this requirement will have on the leasing and building desires of major tenants in the area such as Google, Facebook, Amazon, etc. Consider requiring building systems to be all electric with exceptions for non-regulated loads such as cooking.

Also consider that Title 24-2016 penalizes all electric buildings. Heating domestic water with electric vs. gas has a significant penalty under the current code. Please make sure local City codes are not in conflict with State or Federal energy and building codes.

2. Net Zero Energy certification is an excellent incentive option. However, for the larger high-rise building stock, offsetting energy use with on-site generation is not possible. The language in the draft is vague regarding the parameters of the NZE requirement. It should be clarified if off-site renewable generation can be used to offset the consumption on-site or if renewable energy certificates (RECS) or other means of off-site clean energy can make this requirement possible for large projects.

IFLI certification is not possible within the timeframe of a project's interaction with the City planning and building department. I have consulted on multiple IFLI NZE certifications and it is a multi-year process to reach certification. Logistically this is difficult to incorporate and enforce in a building code this type of requirement.

In summary, I encourage the City to expand the code to provide more flexibility with sustainable measures. The City of Palo Alto has a flexible ordinance that allows developers to select a sustainable path that is possible with the elements of the project (i.e., building type, parcel limitations, etc.). A flexible Green Building Program will ultimately achieve a greater level of emissions savings without pushing developers and tenants out of Sunnyvale.

Respectfully,



Erik Dyrr



415.275.4265 (c) | 530.715.0674 (o)



October 22, 2018

City of Sunnyvale
Kelly Cha, Associate Planner
456 W. Olive Avenue
Sunnyvale, CA 94086

Google Inc.
1600 Amphitheatre Parkway
Mountain View CA 94043
650 253-0000 main
google.com

RE: Green Building Program Update

Thank you for the opportunity to comment on the proposed updates to the City's Green Building Program. The proposed changes provide a framework that will encourage the design and construction of more sustainable buildings as part of the City's ambitious and commendable decarbonization goals. Google strongly supports the leadership role that the City is taking to catalyze sustainable design and construction, and is generally in support of the proposed updates.

The one area that Google would like to explore further with the City is the electrification goal identified in the updated Green Building Program. Google is in strong support of this goal and intends to comprehensively explore the electrification potential of our building development projects. We are excited about the move toward all-electric buildings and we have discovered two challenges related to Title 24 energy compliance for both commercial buildings and multi-family residential buildings that we wanted to bring to your attention.¹

Electrification and Title 24 compliance

Below are two challenges that we identified where the proposed Green Building Program updates potentially conflict with current Title 24 requirements.

- **Title 24 compliance is based on energy cost savings** - The City's ambitious electrification and decarbonization goals may conflict with the Title 24 energy standard because compliance is assessed based on energy cost savings, rather than energy use savings or carbon emissions savings. Per the current Title 24, energy cost savings would be calculated by comparing the annual utility cost of the proposed all-electric building to the annual utility cost of a standard baseline building that uses natural gas for heating. Since natural gas is cheaper than electricity, the annual utility cost of an all-electric building may be higher than the natural gas-burning baseline, resulting in non-compliance or reduced compliance margin with Title 24. This may occur even though the all-electric building is a more energy efficient building.
- **Title 24 compliance software has modeling limitations** - Current state modeling software is unable to represent hot water heating by electric systems such as heat recovery chillers and heat pumps--system types which are actually highly efficient because of their ability to leverage heating energy from cooling loads and vice versa. Furthermore, current state modeling software is also unable to represent many of the features that are integral to a high-performance building, such as exterior operable window shades.

¹ Note that the 2016 Title 24 defines multi-family buildings with four floors or more as high-rise residential buildings. (Page 63)
<https://www.energy.ca.gov/2015publications/CEC-400-2015-032/CEC-400-2015-032-CMF.pdf>

Paths to Implementation

Two of the four principal energy efficiency strategies in California's Long Term Energy Efficiency Strategic Plan, 2008² require all new construction to be zero net energy within a target time frame. Specifically, low-rise residential buildings (less than 4 floors) are required to be net zero by 2020, and commercial buildings and high-rise residential buildings (4 floors and more) are required to be net zero by 2030, establishing the commitment to decarbonization of buildings at a state level.

In support of these goals, the California Energy Commission (CEC) has already announced adoption of the 2019 state standards requiring solar systems on all new low-rise residential buildings starting January 1, 2020.³ Although the CEC has not yet released updates to state standards for commercial and high-rise residential buildings, it is likely that the next updates to Title 24 will smooth the path for the movement toward electrification.

As the state standards for both commercial and multi-family residential buildings gradually progress toward achieving net zero energy building goals, some interim alignment with Sunnyvale's trailblazing update to its Green Building Program may be needed in order to ensure compliance with Title 24. We would like to discuss the following potential steps forward with the City of Sunnyvale.

- In its role as the Authority Having Jurisdiction (AHJ), The City has the ability to allow deviations from the standard modeling methodology to meet Title 24. Instead of using energy cost as the compliance metric for Title 24, the City could consider using total energy or carbon emissions as a better indication of the actual performance of the building as it relates to the City's broader goals for electrification and decarbonization. In fact, current LEED energy modeling methodology includes an alternative path of calculating savings based upon carbon emissions or energy⁴, which could inform an alternative framework for demonstrating compliance with Title 24.
- In order to allow for the modelling of diverse innovations in building design features of high performance buildings, the City may choose to implement a review process whereby design teams may propose their modeling methodology and their selected software which is capable of representing energy efficiency measures in an all-electric building, for approval by the City as the AHJ.

Google truly believes the City's goal of electrification is within reach and we look forward to partnering with the City to identify a path to help achieve this goal.

Sincerely,



Jeff Holzman

Sunnyvale District Development Director

² <https://www.energy.ca.gov/ab758/documents/EEStrategicPlan.pdf>

³ https://www.energy.ca.gov/releases/2018_releases/2018-05-09_building_standards_adopted_nr.html?platform=hootsuite

⁴ <https://www.usgbc.org/credits/eapc95v4>

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