[redacted] Inspiring better buildings. [redacted]

[redacted] **1099 Osage**

USGBC Review Response

December 19, 2011

EAp2:Minimum Energy Performance

1000006088[redacted] – 1099 Osage

Review Comments

The LEED Prerequisite Form and supporting documentation have been provided stating that the project has achieved an energy cost savings of 48.38% using the ASHRAE 90.1-2007 Appendix G methodology. Energy efficiency measures include ground source heat pumps, daylight harvesting in common areas, lighting power reductions, fan power reductions, and process load reductions. However, the following twelve review comments requiring a project team response must be addressed for the final review.

Please upload a summary document that includes a narrative response to each preliminary review comment that has been addressed by the project team, and a narrative describing any additional changes made to the energy models between the preliminary and final review phase.

For eQUEST submissions, the following reports for both the Baseline and Proposed Cases should be provided: all BEPU, ES-D, PS-E, LV-H, LV-I, SV-A, PS-C, and PV-A reports.

Please see narrative responses in blue below. Savings increased slightly to 50.95% because of changes made: mainly due to using System Type 2: PTHP as the baseline system in all spaces other than corridor & lounge areas instead of the System Type 4: PSZ HP that was initially used. This increased heat pump supplemental use, and economizers were removed from these spaces.

TECHNICAL ADVICE:

1. Process energy accounts for less than 25% of the Baseline energy cost for the building, and the supporting narrative indicates that all process loads have been accounted for with consumption estimates determined from a combination of Energy Star published data and the California Statewide Residential Appliance Saturation Study. However, the table in the process load narrative is not clear. For example, the difference between the two columns labeled “Standard” and the two columns labeled “Energy Star” is not clear, nor are the three columns labeled “Y”, “N”, and “M” and how they relate to the rest of the table. Please revise the process load narrative to fully explain each column in the provided table, the corresponding units of measure (where applicable), and how the value in one column is used to determine the value in other columns. Add a row to the table to indicate the sum of the reported values. Where saturation Energy Star data are listed, provide a link or footnote referencing the exact page, table, figure, etc. in the California Saturation Study or Energy Star website from which the value was determined.

The write-up was confusing. Please see the revised ‘Process Load Narrative.pdf.’ Values were increased to reflect the more recent California study results, but process loads are still under 25% of the whole building energy cost.

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2. A savings of 39.92% has been claimed for the project's elevators, but the uploaded Exceptional Calculation Method documentation does not include any reference to elevators. Additionally, the Baseline Case elevator equivalent full-load hours (found by dividing total consumption by the peak demand) are 7,778 hours, which means the Baseline elevators were modeled as operating at full capacity 89% of the year. Please review the Baseline and Proposed Case elevator inputs and schedules for consistency. If savings are claimed for elevator operation, follow the Exceptional Calculation Method (ECM) to document savings. Note that as the authority having jurisdiction, LEED requires that the ECM demonstrate that the proposed measures are not standard practice for the project's location. Savings claims should be supported by monitored or published data for the specific measure employed.

According to the "NYSERDA Multifamily Simulation Guidelines", the Baseline model should use hydraulic elevators when the building is less than 8 stories high. This building is 8 stories, so the models were revised to not claim savings for traction elevators. Savings claimed initially was very minor; this does not significantly impact results.

3. The energy values reported in Tables EAp2-4 EAp2-5 for the Baseline and Proposed Cases are inconsistent with the uploaded simulation summaries. Many values appear to have been rounded, and other values differ significantly from the BEPU reports. For example, Table EAp2-4 reports the Baseline electric space heating consumption as 336,800 kWh, but the corresponding Baseline BEPU report reflects 97,360 kWh. Table EAp2-5 reports the Proposed Case electric space heating consumption as 80,200 kWh (with zero demand), but the Proposed BEPU report reflects 86,356 kWh. Similar discrepancies can be found for other end-uses in both cases. Please revise Table EAp2-4 and ensure the reported information matches the final BEPU reports exactly.

The correct model output files were included in DOE2 OUTPUTS.txt

4. Credit has been taken for a photovoltaic system, but no supporting documentation has been provided to demonstrate how the annual output was determined. Section 1.8 indicates the Manual Cost Input Method was used. However, the simulation software has the ability to model photovoltaic systems directly. Please provide input and output summaries from the software used to determine the system's output to verify the photovoltaic system parameters. If this measure is modeled directly in the energy model simulation software, provide the Proposed Case PS-C report.

The PV system output was calculated by the solar contractor, who factored in shading at the site, and specifics of the system to be installed. This is a more accurate number than we would achieve by simulating the system in eQuest. Specific text from the solar contractor:

"A 48.96kW photovoltaic solar array will be installed on the roof of the facility. The photovoltaic system will consist of 204-240W monocrystalline solar panels manufactured by Solon, two (2) DC combiner boxes, and one (1) 50kW solar inverter manufactured by PVPowered. All equipment will be installed on the roof with a single interconnection point at the main service. Annually the system will produce 70,747kWh to help offset the energy consumption of the facility and help reduce the overall peak demand that the building will required from the serving utility company."

5. Table 1.4.2 indicates that both System Types #3 and #4 were specified under "Other HVAC" systems for the building's common areas. While the use of secondary Baseline systems is acceptable for non-residential space types, please note that multiple secondary HVAC systems should not be specified in the Baseline building unless multiple exception(s) from ASHRAE 90.1-2004, Section G3.1.1 are applicable. The areas reported in Table EAp2-1 indicate the community center and common areas both constitute less than 20,000 square feet, so all such areas should be conditioned with the same Baseline

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system type. The Proposed Case's predominant heating fuel for the community center and corridor/common areas should be used to determine the appropriate secondary Baseline system type. Please revise Table 1.4.2 and the energy model, and provide a narrative with supporting figures to explain which exception(s) from Section G3.1.1 were used to specify the "Other" HVAC system type in the Baseline Case.

The Baseline model was changed to only use one exception for system type: the corridor and lounge spaces, totaling about 27,000 SF, are served by a gas-fired MUA unit. Exception G3.1.1(a) was used for the non-predominant heating source, and System type 3 was used to serve these spaces in the Baseline model. All of the other spaces in the Baseline model are now served by System Type 2: PTHP. This change increased Baseline energy use with more supplemental heating and no ecnomizers.

6. Table 1.4.2 and the uploaded mechanical plans indicate that certain spaces are only served by electric unit heaters. However, cooling equipment should be modeled in both cases if the spaces are considered conditioned per the definition in Section 3 (page 13) of ASHRAE 90.1?2007. Refer to the definition of conditioned space, semi?heated space, and unconditioned space in Section 3. If the heating output capacity is greater than or equal to 15 Btu/h?square foot then the space is considered conditioned and cooling should be included in the Baseline and Proposed Cases. The cooling should be modeled using the Baseline cooling system type in both the Baseline and Proposed Cases, using identical cooling capacity ratios and efficiencies. If the heating output capacity is less than 15 Btu/h-square foot, then the space is considered semi?heated or unconditioned, so only heating equipment should be included in the Proposed and Baseline models; the heating type, capacity ratios, fan volume, and fan power for these spaces should be modeled identically between the Baseline and Proposed Case. Please revise the Baseline and Proposed Cases, as needed, so the correct system type is modeled in all spaces. Additionally, indicate the total heating capacity and building area for semi-conditioned spaces to verify that they qualify as semi-conditioned spaces. Update Table EAp2-1 and Table 1.4.2, as needed, reflecting the changes.

The vestibules should not have been listed under semi-conditioned spaces in Table 1.4.2. These spaces have no cooling, but were modeled with cooling and a relaxed cooling setpoint temperature of 85 F in both the Baseline and Proposed models. The tables were updated; the model correctly follows this requirement.

7. The Baseline Case economizer required by ASHRAE 90.1-2007, Table G3.1.2.6A, for climate zone 5B does not appear to have been included in the Baseline community center and corridor/common area systems. Table 1.4.2 indicates an economizer is not required for the Baseline Case, but this only applies to the residential systems. Please revise the Baseline Case to include an economizer cycle with the appropriate high-limit shut off for the community center and corridor/common area systems.

Economizers were modeled for System 3: PSZ AC serving the corridor and lounge spaces in the Baseline model. The rest of the building is now served by System 2: PTHP, for which economizers are not required in the Baseline. Table 1.4.2 was updated to reflect this.

8. It is unclear if supplemental electric resistance heating has been modeled in the Baseline Case as described in ASHRAE 90.1-2007, Section G3.1.3.1. Please review the model and update accordingly. Provide further information in Table 1.4.2 confirming that this has been included, and verifying that the supplemental heating is only allowed to operate when outside air temperatures are below 40 deg. F.

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Supplemental electric resistance heating has been modeled in the Baseline Case as described in ASHRAE 90.1-2007, Section G3.1.3.1. Table 1.4.2 was updated to reflect this. This end use was originally included under 'space heating' in Table EAp2-5; this end use was broken out as a separate end use.

9. Pumps are reflected in the Baseline Case energy outputs, even though the Baseline Case HVAC System Types do not include HVAC circulation loops. Please provide further information to justify the pumping energy reported for the Baseline Case, or revise the model as necessary to remove pumping energy.

The building has a central domestic water heating system with a circulating pump. This accounts for the minor pumping energy use. The pump was modeled the same in the Baseline and Proposed models because the pump motor efficiency just meets the requirements of 90.1-2007 Table 10.8.

10. In Table 1.4.5, overall weighted average lighting power density has been reported for the Space-by-Space Method and a supplemental table indicating the lighting power density per space has been provided. However, information has not been provided regarding the area per space, and there are more space types in the supplemental lighting table than were reported in Table EAp2-1. Please specifically indicate in Table 1.4.5 the total area per space function as well as the overall weighted average lighting power density for both the Baseline and Proposed Case. Revise Table EAp2-1 to include all areas for which a unique lighting power density was used.

Space areas were added to the lighting power density summary table along with building average LPD calculations. The Baseline building average LPD for non-residential spaces was entered incorrectly in Table 1.4.5– it was corrected to 0.79 instead of 0.70. The model has correct values for each space; this change does not impact the model. Space types were added to Table EAp2-1.

11. Project Information Form 4 indicates the project uses natural ventilation, but it is unclear how this measure was modeled in the Baseline and Proposed Cases. Please provide a narrative describing the ventilation modeling approach for all space types within the project. Verify that minimum outside airflow (in CFM) was modeled identically in the Baseline and Proposed Cases using the Proposed Case rates.

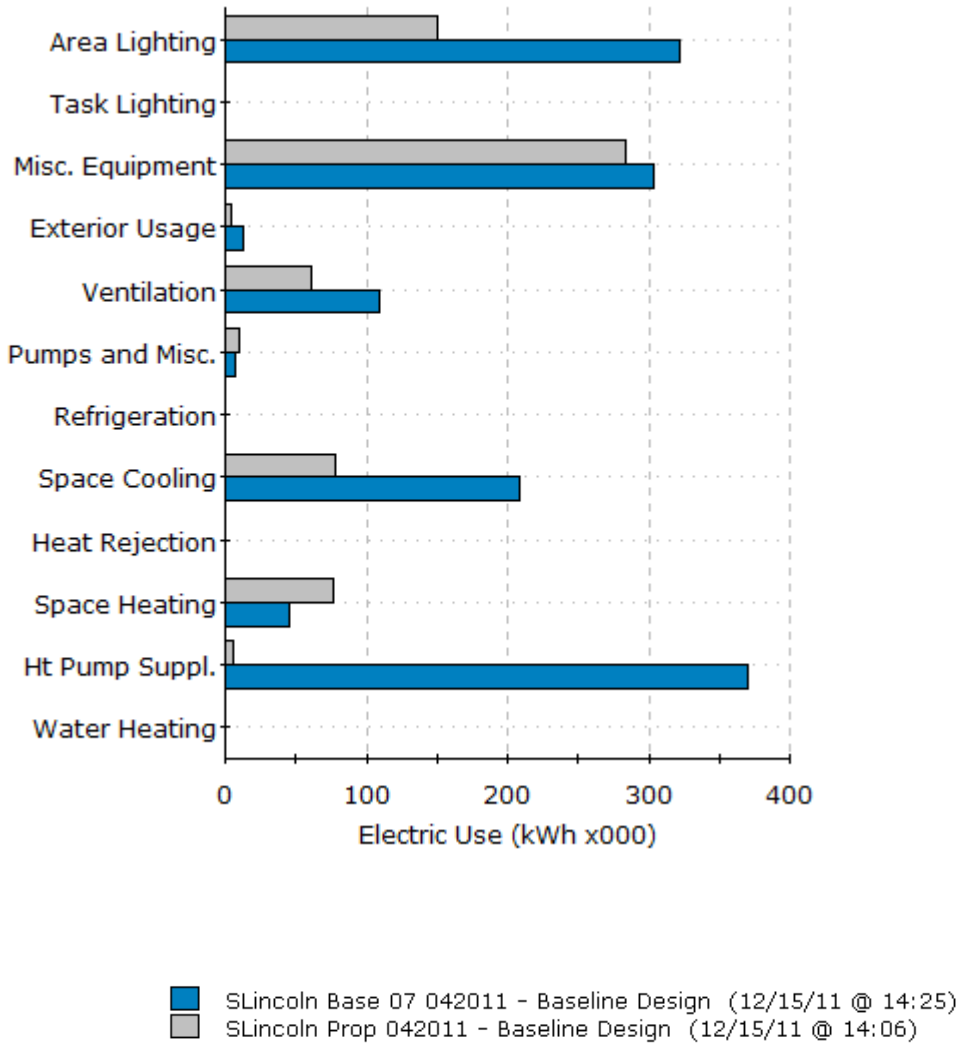
Minimum outside airflow (in CFM) was modeled identically in the Baseline and Proposed Cases using the Proposed Case rates. Natural ventilation was not modeled because there are not HVAC controls to shut down the system when windows are open; it is not clear that the natural ventilation will result in energy savings.

12. The reported heating savings (76.16%) does not appear justified based on the information provided. The similarities between the Baseline and Proposed Case envelope parameters and unitary heating efficiencies make the source of the large savings unclear. While the Proposed Case heating efficiency is expected to be more stable due to water-cooled condensers, the reported information and exceptional calculation indicate the Baseline Case should have a greater fenestration SHGC and a greater internal thermal load profile, both of which tend to reduce winter heating loads. Please review all model inputs and control sequences to verify consistency with design documents and ASHRAE 90.1-2007 Appendix G. If the heating savings remain high, provide a narrative justifying the results. Include references to specific input and output reports to illustrate how the savings were determined.

The significant heating energy savings are mainly due to the elimination of electric resistance supplemental heating in the Proposed design. In [redacted] most of our heating loads exist when the OAT is below 40 F. So, the Baseline PTHP system results in a high supplemental heating energy use. The Proposed ground source heat pump system eliminates this load entirely (aside from minor spaces not on the GSHP loop). This is illustrated in the following graph showing Baseline and Proposed electricity use.

Aside from the ground source heat pumps system with high efficiency heat pumps, further heating energy savings are achieved by:

- High performance windows: the low U-factor actually results in significant heating energy savings from the proposed windows relative to the Baseline
- Single zone heat pumps in the common areas compared to PTHP system in the baseline model.
- Energy recovery on the community resource center system.



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