SIERRA POINT
ENERGY PERFORMANCE PREVIEW
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PREPARED FOR
THE CITY OF BRISBANE

PREPARED BY

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1. EXECUTIVE SUMMARY

1.1 BACKGROUND

The City of Brisbane contracted with Zinner Consultants and Brummitt Energy Associates to determine a baseline level of energy efficiency and on-site renewable energy sources that can reasonably be obtained by the proposed Health Care Properties, Inc., (HCP) Sierra Point development, and to calculate how this baseline translates into LEED points. The City's goal is to mandate a reasonable number of LEED Energy & Atmosphere Credit 1 (EAc1—Optimize Energy Performance) and Credit 2 (EAc2—On-Site Renewable Energy) points.

Sierra Point is planned as a biotech campus with five buildings encompassing 540,000 sf, surface parking, a parking garage, and 15,000 sf of retail space. At the time of this analysis, the site and base buildings have been designed to a schematic level.

1.2 ENERGY PERFORMANCE PREVIEW ASSUMPTIONS

In discussions with the City, the following assumptions for this analysis were determined:

- **LEED-NC 2.2** (NC = New Construction). LEED-NC, which analyzes full project buildout including process loads, was selected because HCP indicated that they intend to proceed with the project only upon signing tenants and in conjunction with constructing tenant spaces. In other words, each building will be designed with lighting and heating, ventilation and air conditioning (HVAC) as a "build to suit."

  Because tenants will have control over their lighting and HVAC systems, it will not be possible to achieve the targeted LEED Energy and Atmosphere credits without their cooperation. To help tenants understand their opportunities, the developer could create tenant guidelines describing energy efficiency issues and opportunities. In addition, because the process loads in the lab portions of the buildings may be large, energy efficiency improvements will be needed in those systems as well as the base buildings and its energy systems. Although Title 24 does not count process loads, they are counted for LEED.

- **Separate LEED Analysis for Each Building**. This approach was selected for the same reason as LEED-NC 2.2, i.e., each building will be designed and constructed separately. Completion of the design and construction of the entire campus is likely to be over several years, and may be as long as ten years.

  The parking lot and structure are not included in this analysis because their energy use is small when compared to the biotech buildings, and any efficiency they may achieve should not be relied upon for calculating future LEED points. The parking garage could be submitted as a separate LEED project. The retail is not included because it is a relatively minor portion of the project.

- **Title 24 2005**. Title 24 2005 (T24-05) is the current version of the California Energy Efficiency Standards. LEED requires that every project meet a minimum energy performance level, which is set at two EAc1 points, or, 14% better than the code-related baseline. In California, this means 14% better than T24-05 code. If a project is currently registered with LEED, then LEED allows the project to continue to use T24-05 as a baseline.

  Please note, however, that Title 24 is made more stringent every 3 years (the next scheduled update will take effect in 2009). Most, if not all, Sierra Point buildings are therefore likely to be built under a future version. As a result, the information in this analysis will need to be periodically reviewed and updated.

- **Solar (Photovoltaic) Potential for the Entire Site.** This includes the rooftops of the office buildings, the top of the parking garage, and over the surface parking.

- **Limited Scope and Conclusions.** The scope of this analysis was limited to a preliminary examination of the technical feasibility for energy efficiency and on-site renewable energy systems. Therefore, this report and its conclusions do not take into account other factors including first costs, life cycle costs and benefits, and the financial resources available to fund improvements.

1.3 CONCLUSIONS

1. The energy analysis indicates that, under the stated assumptions, each Sierra Point HCP building could achieve at least 18% better than required for T24-05 and for LEED calculations. Achieving 18% is likely to require energy efficiency improvements in all parts of the project: the building envelope, its lighting and HVAC systems, and its process loads. This will equate to 3 EAc1 Optimize Energy Performance points, which requires a minimum of a 17.5% improvement in energy performance.
2. Higher energy efficiency, and therefore more LEED EAc1 points, is also possible. However, this would require strategies beyond what can be included in this preliminary analysis because of the concept level of the current design and the unknown tenant process loads. Given these limitations, we recommend that a higher level of energy performance be encouraged, but not be required.
3. Given the large process loads, it is not reasonable to assume that the Sierra Point HCP buildings will be able to incorporate sufficient solar (photovoltaic) power to earn any LEED EAc2 On-Site Renewable Energy points.

2. EA-C1 – OPTIMIZE ENERGY PERFORMANCE

The text below outlines the key elements which make up the Sierra Point project's building performance. This is a preliminary analysis based on an early, concept level of information. It is intended to provide a general picture of appropriate performance targets, and is not based on detailed design.

2.1 ANALYSIS PROCEDURE

A concept level energy model was created for this analysis, using the key assumptions listed below. The energy use related to the labs was estimated from other projects simulated by the consultant and also by information provided by Mr. Dan Hipple based on his experience with existing buildings. Mr. Hipple is a biotech facilities manager who has provided input to the city of Brisbane.

Mr. Hipple stated that there are many variations in the biotech industry. Predicting each possibility is outside the scope of this preliminary analysis, except to show that these loads must be considered and cannot be ignored if high performance buildings are to be achieved.

2.2 PROJECT ASSUMPTIONS

Assumptions include:

- A four story building with 14 feet floor to floor
- 40% Window-Wall-Ratio (WWR) on each side, which seems appropriate based on the renderings. The WWR is calculated based on the gross wall area, from slab to roof insulation.
- General building dimensions based on the site plan
- R-19 roof insulation and R-19 insulation in typical frame walls
- Lighting based on 2005 Title 24 code (1.1 watts/sf for complete office buildings, which includes labs)
- A standard water cooled chiller system with floor-by-floor Variable Air Volume (VAV) air handlers
- Standard daytime office occupancy profile

Because Brisbane is in a mild climate zone and because the building geometries are "fat rectangles" with glazing on all sides, the orientation of these buildings is not a big factor. The actual glazing may vary between 30% and 40%, and the tenant may choose a different baseline HVAC system, but those differences will not affect these general findings. An attempt was made to match the annual energy use of existing lab buildings to provide a "sanity check." Because the retail is such a small portion of the campus, it has been not been included in this analysis.

The baseline model then varied the efficiency of the glazing, lighting, HVAC, and process loads.

2.3 ENVELOPE

The possible envelope improvements include insulation, cool roof, glazing specifications (U-value, Solar Heat Gain Coefficient (SHGC), and Visible Light Transmittance (VLT)). Improving the glazing SHGC to <=0.30 will improve the efficiency of the building and is recommended.

However, even taken together, the possible gain in energy efficiency is about 4% - 6%. Even if the office occupancy were 100% with no labs, the envelope alone will not achieve the 14% minimum energy performance level.

2.4 LIGHTING

In high performance buildings, the lighting efficiency is often improved from code minimum to 20% or even 40% better than code. This impact on the overall performance for an office building would range from about 5 to 11%.

High lighting performance is usually very cost effective. It would maintain foot-candles, provide even illumination, and reduce ongoing operating costs. It would be accomplished with a combination of optimizing daylit spaces, fixture choices and layout, high efficiency lamps and ballasts, and appropriate controls.

2.5 HVAC

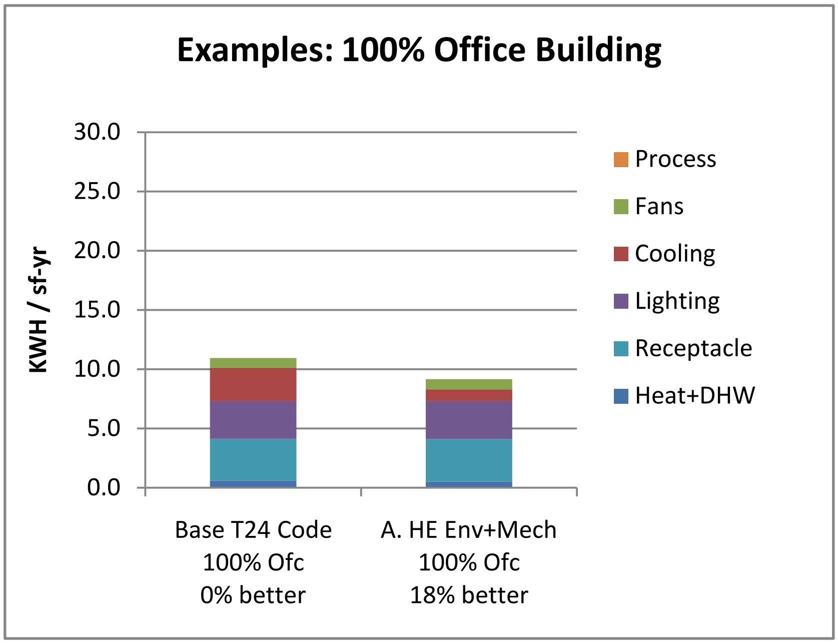
Based on the cooling load and building type, a standard, fixed speed water-cooled chiller with VAV systems was assumed for this analysis. Typical improvements include variable speed primary pumping, and variable speed chiller(s). This impact on the overall performance for an office building, as with lighting improvements, would be in the range of about 5 to 11%. Depending on the base HVAC system chosen by the tenants, different improvement options may be more appropriate, but all systems should have improvement opportunities.

2.6 COMBINED

This graph shows an example of using envelope and HVAC efficiencies to achieve a performance of 18% better than T24-05 code.

Combining envelope and lighting efficiencies would also achieve this combined result.

Of course, including all three sets the stage for more flexibility and opportunity.



HE = High Efficiency

2.7 PROCESS LOADS

Process loads are energy uses that are *not* for the purpose of human comfort. Examples for lab spaces include the need for 100% outside air (vs. about 15% for human comfort in a typical office environment), fume hoods, machines used for scientific analyses, sterile environments, and data processing.

Typically, process loads increase the cooling loads. Improving the HVAC systems efficiency will therefore help improve the efficiency of both the process cooling and the comfort cooling. Other process loads, such as fume hoods, are largely independent of the central HVAC system, and would benefit from efficiency measures targeted to those uses. Some labs may have extended hours of operation; while these are not process loads, per se, they do increase the overall energy use intensity.

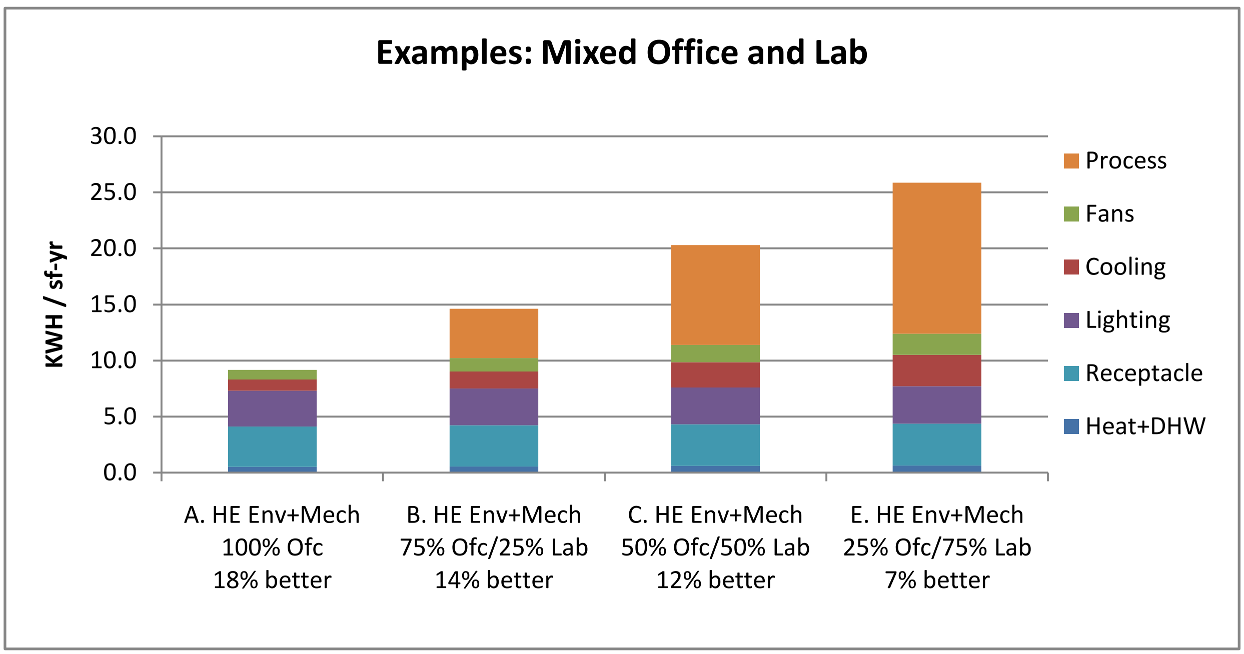
The concept model shows that a new office building in Brisbane which complies with T24-05 would use about 10 to 12 kWh/sf per year of electrical energy. However, lab buildings are known to use quite a bit more. Mr. Hipple provided examples of biotech buildings in the Brisbane area that use between 30 and 60 kWh/sf-yr. The concept energy model scenarios were modified to include various amounts of once-through air, and internal heat sources to estimate some possible impacts of the biotech occupancies.

Since under the current energy code, the base office building will only use approximately 12 kWh/sf-yr: everything above that is related to processes and loads which are specific to the biotech occupancies.

In other words, as the process loads increase, the human comfort, envelope, and lighting loads become proportionally smaller. Therefore, to achieve a higher performance building, all of the energy uses must be improved.

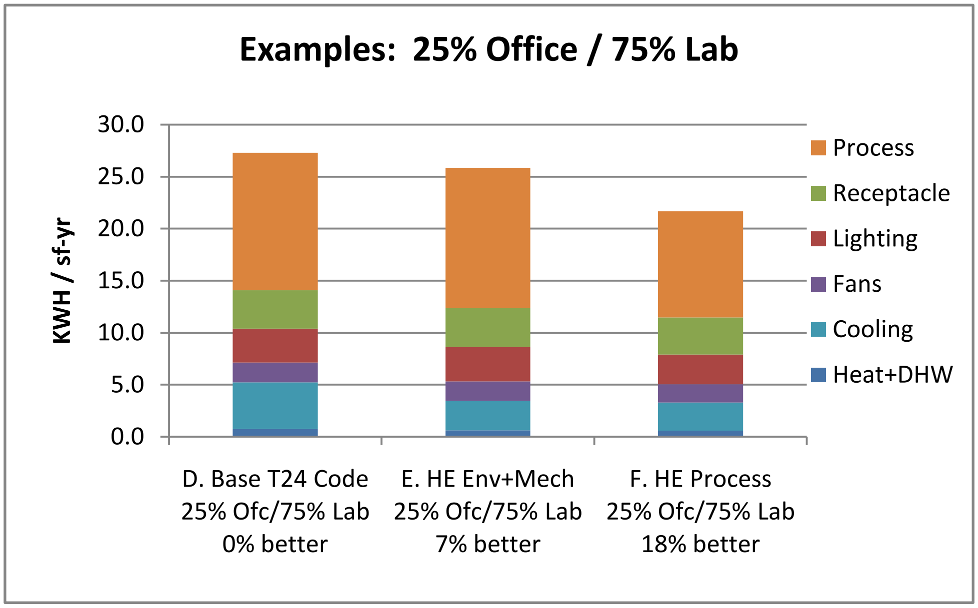
Scenario E below has 1 floor of office and 3 floors of labs with 100% outside air and process heat sources. These are all High Efficiency (HE) scenarios. Even so, the energy use has more than doubled from 10 kWh/sf for the base office building to over 25 kWh/sf for the lab dominated building.

The graph shows that the process loads completely overwhelm the envelope and lighting efficiencies. Therefore, because LEED considers all of the energy uses, not just the code regulated energy uses, the process loads must be included in the efficiency strategies.



Scenario D is a code complying building.

Scenario E includes envelope and HVAC efficiencies as described in Sections 3.1 and 3.3 above. For an office building, this resulted in 18% overall performance.



However, with the impact of so much process load, if the process load is not improved, the overall performance for Scenario E drops to about a 7% improvement.

Scenario F shows that if, in addition to other improvements, the process loads are also improved by about 20%, then the overall building can achieve the target of 18%.

- Strategies for improving the process loads themselves must be included in order to get a LEED rating. In other words, the tenants must participate in improving the energy performance.

Some of the Improvements to process loads may need to be calculated outside of a typical building energy model, with the adjustment being made in the LEED analysis.

2.8 PARKING GARAGE AND SITE LIGHTING

Although under the current code, projects often benefit from improvements in parking-related lighting, no benefit has been assumed in the analysis for several reasons:

- Depending on the leasing, the projects may be submitted a building at a time rather than as a campus.
- With the high process loads, the energy use of parking lighting is not significant.
- Future codes will not give as much credit to parking lighting improvements.

3. ENCOURAGING HIGHER PERFORMANCE

Many projects, although maybe not all, will be able to perform at higher levels than 18%. The City could require and participate in a sustainable design charrette at the beginning of design.

3.1 POTENTIAL SOURCES OF INCENTIVES

There are several sources of potential incentives which can help to incentivize projects to achieve higher levels of energy performance. These are subject to change every few years, so they cannot be fully quantified at this time. However, it would be valuable to consider them when a specific building is under design.

- PG&E Savings By Design. This program provides energy efficiency incentives and technical assistance to help projects achieve higher efficiency. For the 2009-2011 program cycle, the current plan is to provide Owner's incentives of up to $500,000 for projects which achieve high energy savings. These incentives increase with the level of efficiency, so that a project which achieves 20% better than code would gain four times the incentives as a project that only achieved 10%. These incentives will be adjusted on a three year cycle.

- Federal Energy Efficiency Tax Deductions. The building energy efficiency deductions in Energy Policy Act of 2005 are set to expire 12/31/08. However, extensions and increases are being debated in Congress, and there is a general expectation that some level of tax incentives will be renewed.

- Some cities provide expedited plan check for higher performance projects. These and other direct incentives might be considered by Brisbane.

4. EA-C2 PHOTOVOLTAIC (PV) SYSTEM

This project is in the very early stages of design. Therefore, the following photovoltaic (PV) power estimates are very general, because many project features have not yet been defined. Variables include, but are not limited to:

- Actual Energy Use Intensity of various biotech tenants when they become defined
- What percentage of roofs would be available for PV arrays
- Different types of PV technology (which is evolving)
- Different locations for PV, such as Building Integrated or structures over surface parking
- Other potential renewable sources or onsite generation
- The incorporation of the full energy costs are required by LEED. This simplified analysis only counts electrical use. Gas use and rates will impact the final analysis.

4.1 POTENTIAL SITE CAPACITY

If high performance PV modules such as Kyocera KC200GT modules are used, and the arrays are mounted substantially flat rather than racked, then the arrays are likely to produce at least 1,400 kWh per year (in Brisbane) for each KW-AC installed. A general estimate of the area needed would be about 100 sf per KW. With these assumptions, and those outlined below, the site capacity of the PV is likely to be about 790 KW, and produce approximately 1,100,000 kWh per year.

Before incentives and rebates, costs have often been observed to be within 10-15% of $8,000/KW. Based on these assumptions, 800 KW of PV could cost $6,400,000 before rebates and incentives, although large systems are likely to be less expensive. Specific contractor bids should be obtained to confirm system design, output, and cost information.

Potential Site Capacity

Potential Area for PV	Gross Area	Usable	Net Area	KW ac	PV Annual kWh
Parking Garage - top	58,000	50%	29,000	290	406,000
Bldgs (5 * 30,000 sf roof)	150,000	33%	50,000	500	700,000
			79,000	790	1,106,000

4.2 PV SYSTEM FOR THE COMMONS

A reasonable range for the electric energy use of the parking garage and site lighting is estimated below. It is likely that a PV array on the top level of the parking garage (producing 406,000 kWh/yr) could more than offset the energy use of the parking garage and site lighting (170,000 to 390,000 kWh/yr.)

A 125 KWac array would provide an output in the range of 175,000 annual kWh. The likely cost, before rebates and incentives, would be in the range of: 125 KW x $8,000/KW = $1,000,000.

Scenarios for Parking and Site Lighting Energy Use

Scenario	Location	Gross Area	Watts/sf	Watts	Hrs/day	Annual Kwh
Lower Energy Use	Parking Garage top	58,000	0.08	4,640	12	20,323
	Parking Garage levels	191,400	0.08	15,312	18	100,600
	Other site lighting	placeholder estimate				50,000
						170,923
Higher Energy Use	Parking Garage top	58,000	0.15	8,700	12	38,106
	Parking Garage levels	191,400	0.15	28,710	24	251,500
	Other site lighting	placeholder estimate				100,000
						389,606

4.3 PV SYSTEM FOR THE CAMPUS

To get LEED points for renewable energy systems such as PV, at least 2.5% of the overall energy use for the project must be provided. However, our preliminary analysis shows that unless large systems are installed, the PV systems are likely to represent less than 2.5% of the load. In general, this would be true for each bio-tech building as well as for the overall campus. Therefore, it is not likely that EA-c2 points will be achieved for the campus as a whole.

Summary of Scenarios for Site Energy Use

Scenario	Description	Gross Area	Energy Use Intensity kWh/sf-yr	kWh/yr	Estimated % PV contribution (with 500 KW system)
Lower Energy Use	Site & Garage Lighting	above		171,000	
	Retail	15,000	15	225,000	
	Bldgs A - E	540,000	20	10,800,000	
	SITE TOTAL (Buildings and exterior lighting)			11,196,000	10%
Higher Energy Use	Site & Garage Lighting	above		390,000	
	Retail	15,000	30	450,000	
	Bldgs A - E	540,000	50	27,000,000	
	SITE TOTAL (Buildings and exterior lighting)			27,840,000	4%

In summary, it seems to be reasonable for the Site and Parking Garage lighting to be offset with PV. For the rest of the campus, the loads are too unpredictable to make a reasonable estimate for sizing a potential PV system or other renewable contribution at this time.