



MEMORANDUM

Date: August 19, 2010

Project No.: 103-99727

To: Jennifer Millman/Shabnam Barati

Company: Impact Sciences

From: Brian Patterson, Ph.D.

RE: Review of Potential Human Health Risks – Solar Energy Research Center Project: Lawrence Berkeley National Laboratory, Berkeley, California

OVERVIEW

At your request, Golder Associates Inc. has reviewed the proposed Solar Energy Research Center (SERC) project at the Lawrence Berkeley National Laboratory (LBNL) from the perspective of potential impacts to human health risk in the surrounding area resulting from project-related toxic air contaminant (TAC) emissions. Golder has proposed a semi-quantitative approach to this assessment which does not involve performing explicit human health risk assessment calculations. Instead, this approach relies on the overall human health risk assessment calculations performed previously as part of the Environmental Impact Report (EIR) certified for the 2006 long range development plan (2006 LRDP) for the entire LBNL facility.

As part of the LRDP EIR, TAC emissions from project construction and operation activities were estimated and quantitatively assessed to predict potential human health impacts to onsite and offsite persons. Although the exact details of the LBNL projects that would be constructed under the 2006 LRDP were not known at the time that the 2006 LRDP EIR was prepared, conservative best estimates of the parameters of these future projects were evaluated as part of the human health risk assessment (HHRA) in the EIR. In fact, the HHRA calculations were performed based on two different sets of parameters: 1) a set of hypothetical “projects” at various sites around the facility, and 2) a set of “bounding case” parameters which grouped projects into unrealistic, but conservative, groupings around the perimeter of the LBNL facility.

Although the bounding case assessment was generally considered to be more conservative than the hypothetical LRDP case, comparisons of the SERC project are more easily made to the hypothetical case assessment. Therefore, this memorandum compares the parameters affecting TAC emissions for the SERC project to the LRDP project assumptions to determine whether it can be shown that the HHRA in the 2006 LRDP EIR adequately assesses the potential human health impacts resulting from the SERC project, and no project-specific quantitative HHRA is required.

PROJECT PARAMETER COMPARISON

The SERC project will consist primarily of a proposed 38,000 gross square foot building which will house research laboratories, offices, and interaction space. TAC emissions associated with the



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project will result from both project construction activities (primarily diesel particulate matter [DPM] from mobile sources powered by diesel-fueled internal combustion engines) and project operations. Project operation emissions will occur from the use of chemicals in research laboratories, natural gas combustion in water heaters, and DPM emissions from an associated emergency backup generator. Evaporative cooling towers are also proposed as part of the project, but these are likely to be chemical-free units, so it is assumed that insignificant quantities of TACs would be emitted by the cooling towers.

For purposes of this evaluation, it is assumed that the SERC building would be located at the location of existing Building 25A at the LBNL facility, which is scheduled for demolition.

In the 2006 LRDP EIR HHRA assessment, a hypothetical building covering the area occupied by existing buildings 25 and 25A was included in the analysis (designated as hypothetical Building S7). Building S7 covered the areas where the SERC building and the currently proposed General Purpose Lab would be located. Recently, an HHRA was specifically conducted for the General Purpose Lab and these impacts were shown to be less than significant.¹

The overall approach for assessing the HHRA impacts from the SERC project is to determine if the 2006 LRDP HHRA assessment based on the hypothetical Building S7 project conservatively represents the TAC emissions anticipated for the SERC and GPL projects combined. One way this can be assessed is to compare the likely level of TAC emissions from the primary sources of TAC emissions associated with these projects for project construction/demolition activities and operations.

Construction/Demolition

Assessments of air quality emissions related to construction/demolition activities for buildings at the LBNL facility are primarily dependent on the square footage of the buildings being constructed or demolished. In the case of the SERC project, there are no building demolitions associated with the project, and the air quality impacts due to demolition of Building 25A have been addressed as a component of the Old Town demolition project and demolition of Building 25 is addressed as a component of the Seismic Phase 2 project (which includes the GPL building). Additionally, the demolition of Buildings 25 and 25A were considered in the 2006 LRDP HHRA.

In the 2006 LRDP HHRA, impacts from building construction activities were assessed based on the total square footage of the hypothetical buildings being constructed. The following table (Table 1)

¹ *Air Quality Technical Analysis Performed for the Seismic Phase 2 Project at the Lawrence Berkeley National Laboratory*, Golder Associates Inc., January 26, 2010.



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compares the gross square footage of the SERC and GPL buildings compared to the hypothetical Building S7 in the 2006 LRDP HHRA assessment.

Table 1. Comparison of Estimated Building Gross Square Footage

<i>SERC Building</i>	<i>GPL Building</i>	Combined SERC + GPL Buildings	Hypothetical LRDP Building S7
38,000 ft ²	43,000 ft ²	81,000 ft ²	142,000 ft ²

As shown in Table 1, the combined square footage of the two buildings actually proposed for the Building 25/25A site is less than the square footage of the hypothetical building assumed for the site in the 2006 LRDP HHRA. Because TAC emissions associated with building construction are expected to be roughly proportional to the square footage of the building being constructed (and were assumed to be exactly proportional in the 2006 LRDP HHRA), this implies that the human health impacts from TAC emissions during the construction of the SERC building were adequately accounted for in the 2006 LRDP HHRA. No project-specific HHRA is therefore warranted.²

Operations

TAC emissions from operations at office/laboratory buildings at LBNL occur primarily from the use of chemicals in research laboratories, natural gas combustion in water heaters, and DPM emissions from any associated emergency backup generators.

Similar to the comparison of construction activity levels provided in Table 1 above, Table 2 presents a comparison of TAC emission sources for the SERC and GPL buildings to the sources assumed for the hypothetical Building S7 in the 2006 LRDP HHRA.

Table 2. Comparison of TAC Emission Sources for Building Operations

TAC Source	<i>SERC Building</i>	<i>GPL Building</i>	Combined SERC + GPL Buildings	Hypothetical LRDP Building S7
Laboratory Space	15,000 ft ²	17,200 ft ²	32,200 ft ²	51,500 ft ²
Natural Gas Combustion	3.2 MMBtu/hr	3.3 MMBtu/hr	6.5 MMBtu/hr	41.2 MMBtu/hr
Backup Generator	535 hp	535 hp	1,070 hp	670 hp

² In addition, the project-specific analysis recently performed for the Seismic Phase 2 project (including the GPL) demonstrated less-than-significant human health impacts from building construction/demolition activities on both a project and cumulative basis (*Air Quality Technical Analysis Performed for the Seismic Phase 2 Project at the Lawrence Berkeley National Laboratory*, Golder Associates Inc., January 26, 2010).



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As shown in Table 2, the laboratory square footage and natural gas combustion assessed for hypothetical Building S7 in the 2006 LRDP HHRA was greater than the combined quantities for the SERC and GPL buildings. Since TAC emissions from these sources would be expected to be roughly proportional to these parameters, it is reasonable to conclude that the HHRA in the LRDP EIR adequately assessed TAC emissions from these sources.

The combined engine horsepower of the backup generators for the SERC and GPL buildings (1,070 hp) is somewhat greater than the assumed engine horsepower for the backup generator associated with the hypothetical Building S7 in the LRDP HHRA (670 hp). This might imply that estimated TAC emissions (DPM in the case of diesel generators) would be somewhat higher in the case of the proposed SERC and GPL buildings relative to those assessed in the 2006 LRDP HHRA. However, in the LRDP HHRA assessment, an assumed DPM emission factor of 0.08 grams per horsepower-hour (g/hp-hr) was used. For the recent GPL HHRA assessment, it was determined that available 535 hp generators would have a maximum DPM emission rate of 0.046 g/hp-hr.³ So the maximum hourly DPM emission rate for the two 535 hp generators associated with the SERC and GPL building projects would be 49.2 grams per hour, whereas the assessed DPM emission rate for the single 670 hp generator associated with the hypothetical Building S7 in the LRDP HHRA was 53.6 grams per hour, or slightly higher than the emission rate for the two projects together.

The general conclusion from this comparison of parameters for TAC emission sources is that the TAC emissions associated with project operations at the current Building 25/25A site represented in the 2006 LRDP HHRA were higher than would likely be estimated for the actual projects proposed for this site (SERC and GPL buildings).

The only other aspect of this comparison that needs to be examined is to determine if any substantial differences are expected between the laboratory chemicals likely to be used in the proposed SERC labs and those estimated to be used in new laboratories in general for the 2006 LRDP HHRA. The approach used to make this comparison was to review the chemicals that might be used in the SERC building in any significant quantities and determine if these were considered for use in new laboratories for the 2006 LRDP HHRA.

Golder was provided with a list of chemicals likely to be used in the SERC laboratories, and potential annual usage quantities. This list was reviewed to identify those chemicals that might be used in a SERC laboratory in quantities exceeding 250 milliliters or 250 grams per year. Consistent with the

³ Allowable emissions from diesel internal combustion engines have been further restricted by state and federal regulations since the date that the 2006 LRDP HHRA assessment was performed.



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approach used in the 2006 LRDP HHRA, chemicals that are in the solid phase at room temperature were assumed unlikely to be emitted to the atmosphere, and therefore not included in the evaluation.

After screening for annual usage and physical state, a list of 34 chemicals was generated. Of these 34 chemicals, 15 had toxicity factors published by the California Air Resources Board (CARB) that could potentially be used to quantitatively assess human health effects. All 15 of these chemicals were considered in the 2006 LRDP HHRA. In addition, the projected annual usages of these chemicals were less than 15% of the total usage levels assumed in the 2006 LRDP HHRA.

Given that the 2006 LRDP HHRA quantitatively addressed all of the liquid and gaseous chemicals projected to be used in any significant quantity in the SERC building laboratories (with toxicity factors published by CARB), and the usages of these chemicals are generally consistent with the usage levels assumed in the 2006 LRDP HHRA, it's reasonable to conclude that the use of these chemicals was adequately addressed in that HHRA.

SUMMARY

The purpose of this memorandum is to determine if the HHRA provided in the LBNL 2006 LRDP EIR conservatively assessed the potential human health risks likely to result from the actual proposed SERC building project at the current site of Building 25A (to be demolished). In the LRDP HHRA, a hypothetical laboratory building (with associated TAC emission sources resulting from construction and operation of the building) was assumed for this location. Due to the complex topography of the LBNL facility site, and the importance of distance to the site boundary on the dispersion modeling results that go into the HHRA, the fact that the hypothetical laboratory building in the 2006 LRDP HHRA was sited at the same location as the SERC building supports making this assessment based on a comparison of estimated project emissions. If the emission sources were assumed to be present at different locations, the consideration of more than just TAC emissions would be necessary to make this evaluation.

The analysis provided in this memorandum indicates that the expected TAC emissions from the proposed projects at the Buildings 25/25A site (i.e. the SERC and GPL building projects) will be less than the TAC emissions assumed for the hypothetical Building S7 in the LRDP HHRA. Given that the locations of the actual and hypothetical buildings are comparable, this leads to the conclusion that the 2006 LRDP HHRA conservatively assessed the potential human health risk impacts from the SERC building project in conjunction with risk from all other existing and reasonably foreseeable future sources at LBNL, and a project-specific HHRA is not warranted.