

May 29, 2007

Mr. Thomas J. Christofk Air Pollution Control Officer Placer County Air Pollution Control District 11464 B Avenue Aubum, CA 95603

re: Union Pacific Comments Regarding Advanced Locomotive Emission Control System (ALECS) Proof of Concept Project Final Report

Dear Mr. Christofk:

Union Pacific Railroad (UPRR) is pleased to have been a major sponsor in a collaborative project to evaluate stationary air pollution control equipment to capture and treat emissions from locomotives in the J.R. Davis Yard. The ongoing strong working relationship between the Placer County Air Pollution Control District (District) and UPRR was a key factor in the completion of the project, and continues to drive the evaluation of the real potential of the scrubber application.

As you know, we have three key concerns:

First, ALECS was not tested under actual yard operating conditions. Although ALECS was effective in treating emissions, the system for actually collecting the emissions still presents a major hurdle to any actual scale up of ALECS for use in a rail yard. Second, the calculations of cost effectiveness assumed that ALECS would be running close to capacity 96% of the time. This assumption is extremely optimistic, especially in the absence of any testing of the system in actual rail yard operating conditions. And third, these same cost-effectiveness calculations don't conform to the Moyer Program or EPA's Air Pollution Control Cost Manual principles and guidance. In order to compare cost-effectiveness of various alternatives, a consistent approach should be used.

We have provided additional, more detailed comments on these and other issues in the enclosed attachment. We appreciate your offer to post these comments on your website along side the District's April 2, 2007 report. We sincerely do look forward to continuing to work with you and your staff in the future.

Sincerely,

Lanny A. Schmid

Director of Environmental Field Operations

## Detailed Comments of the Union Pacific Rail Road On the

## Evaluation of the Advanced Locomotive Emission Control System (ALECS) Final Report Dated April 2, 2007

The Advanced Locomotive Emission Control System (ALECS) proof-of-concept project was a short-term effort involving the development of locomotive-specific interfaces to capture emissions from stationary or slow moving locomotives, and testing to demonstrate the effectiveness of air pollution control equipment.

As noted in our April 10, 2007 letter, we agree with the general conclusions of the District's report on the performance of the emissions treatment system (ETS). We also agree that significant work remains to develop and prove the emissions collection system (ECS). In addition, we concur with the District's conclusion that the wide ranging estimates of cost effectiveness are based upon (1) an optimized, yet to be developed installation, (2) numerous assumptions for several aspects of the yard's operations, and (3) site and location specific characteristics. This test was appropriately the first step to determine applicability and adaptability of the technology.

Building on those issues, we do have some key substantive concerns that are summarized below.

- The proof of concept project did not attain one of its key objectives of collecting emissions from locomotives in the rail yard moving and operating under a range of typical conditions. The emissions collection system (ECS) must perform consistently and efficiently to prevent delays in rail operations, and is essential to the success of any future potential application of ALECS.
- The calculation of potential emission reduction benefits associated with the deployment of the ALECS at a rail yard is critically dependent upon the quantity of emissions captured for subsequent treatment. Two scenarios were assumed for evaluation purposes and to serve as the basis for approximation of system efficiency: (1) the system availability is assumed to be 96% (ready to operate), and equally important, (2) the utilization rate is assumed to be 96%. Thus, the system was optimistically assumed to be available to operate and utilized to capacity 8400 of the 8760 hours in a year. Actual total annual, daily and instantaneous mass emissions loading will be required to fully, adequately appropriately evaluate any future applications.
- The range of cost effectiveness (the dollars per weighted ton of pollutant removed) of the ALECS for the two assumed scenarios is roughly 25% lower than would be derived by consistent use of a discounted cash

financial analysis based upon the Moyer Program and EPA's Air Pollution Control Cost Manual principles and guidance. A thorough evaluation of cost effectiveness based upon pollutant loading from localized, yard specific operations is absolutely critical for any proposed application of ALECS.

## **Substantive Comments**

- p. ix and elsewhere: the analytical case for idling Tier 2 locomotives was an assumed scenario for evaluation purposes in the report. It is not realistic since all Tier 2 locomotives are equipped with auto start/stop technology.
- pp. x and xi: The cost/effectiveness values are understated, and the assumed scenarios evaluated are not realistic for actual deployment of the ALECS at a working rail yard. These issues are discussed further below in comments on the technical areas of the report.
- p. 5-2: The assumption that development costs will be allocated between a total of 20 marine and locomotive installations significantly drives the assessment of cost-effectiveness account of economies of scale. A major difference between marine and rail yard applications of this technology relates to a yet-to-be-developed system for collecting the emissions from up to six mobile locomotives simultaneously. The development costs for the ECS would not be allocated to any degree to marine applications.
- p. 5-5: The allocation of costs based on an assumed 96% capacity is critical in the calculation of the cost per ton of removal for the ALECS. While we have no reason to doubt ACTI's assumption that the ALECS would have a 96% availability factor, there is a clear distinction between the engineering concepts of equipment availability and equipment usage. Site and location specific data is required to develop an accurate usage rate.
- p. 5-6: The calculation of cost/effectiveness is based on a discounted present value cash flow analysis which is not consistent with the techniques used in EPA's control cost manual or the Air Resources Board's guidelines for determining cost/effectiveness under the Moyer program. Using the same assumptions as those contained in the District's report for Initial Capital Investment, discount rate, equipment life, and O&M costs, but using the methodology contained in EPA's control cost manual and ARB guidelines, the annualized cost of the ALECS is approximately \$1,550,000 per year. Leaving all other assumptions unchanged, the cost/effectiveness of the ALECS would be \$9000 per ton for the pre-Tier 0 scenario, and \$22,700 per ton for the Tier 2 scenario. With more realistic (but still optimistic) usage rates (as distinguished from availability rates) of 60% to 80%, the cost effectiveness would range

between \$10,800 to \$14,400 for the pre-Tier 0 scenario, and \$27,200 to \$36,300 for the Tier 2 scenario.

- p. 6-2: The District's report envisions an ALECS installation that captures emissions from locomotives where diagnostic and load testing is performed, and also captures emissions from "idling [locomotives] to keep the ALECS fully employed." This is an ideal scenario since the maintenance facility where the diagnostics and some load tests occur is not likely to be a location where there are large numbers of idling locomotives. The cost/effectiveness of the ALECS system in a rail yard application must be evaluated based on realistic deployment scenarios.
- p. 6-3: The use of higher emissions rates than would normally be associated with well-tuned locomotives is a reasonable deployment scenario, especially since locomotives at a shop for maintenance are likely to have a greater incidence of defects that would lead to higher emissions levels. The Districts report assumed deterioration factors that appear to be well in excess of what would be reasonably expected. As cited previously, the site specific evaluation must account for these emissions so that an accurate evaluation of potential benefit and cost effectiveness can be developed.

## **Technical/Editorial Comments**

- p. ix: The GP-38 locomotive tested has a 2000 hp, two-stroke, <u>non-turbocharged</u> diesel engine. The Dash-8 locomotive has a <u>4000</u> hp, four-stroke, <u>turbocharged</u> diesel engine.
- p. x: The presentation of control efficiencies and emission reductions to three significant figures misrepresents the accuracy and precision of the results.
- p. 3-2: The test procedures did <u>not</u> conform to ISO standard 8178. Exceptions to the procedure were discussed during development of the protocol, and these exceptions should be noted in the report. We recognize that these exceptions did not appear to have any significant impact on the reported test results, but believe the exceptions should be noted.
- pp. 3-3 and 3-5: The line-haul locomotive tested was a GE C40-8 (not C39-8) locomotive with a rated output of 4000 (not 3900) horsepower. The switch locomotive tested was a General Motors (not General Electric) locomotive. The C40-8 locomotive is turbocharged; the GP38 is not.