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STAFF EVALUATION OF A DRAFT RESEARCH FINAL REPORT

TITLE:	Air Quality Impacts Associated with Economic Market Potential for Distributed Generation in California
PRINCIPAL CONTRACTOR:	Distributed Utility Associates
INVESTIGATOR:	Joseph Iannucci
BUDGET:	$98,960
DURATION:	9 Months

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I. SUMMARY

Widespread use of distributed generation (DG), induced by the deregulation of the electricity industry, may increase the amount of air pollutants from power generation, setting back California's efforts to improve air quality. This final report evaluates the net projected emission impacts from the potential use of cost-effective DG in California, for the years 2002 and 2010. This study estimated the economic market potential of cost-effective DG in California. The DG sources investigated were small electricity generators that use hydrocarbon-based fuels to produce electricity and range from 50 kW (kilowatts) to 5 MW (megawatts) in generation capacity. Air emissions from each cost-effective distributed generator were then calculated, based on cost-effective hours of operation and the size of the generator. These results were compared to the air emissions that would have resulted from central power generation only, to determine the net and relative emission impacts for each distributed generator. Air emissions calculated included NO_x, SO_x, CO, CO_2, VOCs, and PM10.

Overall, the study found that the increased use of combustion-based distributed generators would increase all emissions except SO_x, when compared to the existing mix of in-state generation. However, some distributed generators are nearly as clean as, or even cleaner than, new central generation. The study also found that the economic market potential for DG, even for cost-effective applications, is likely to be modest for the next few years. This is due to a wide range of factors, such as unfamiliarity with the technologies, the reluctance of regulators to allow "wires" utilities to own and operate distributed generators, and local air quality regulations. The use of DG, however, will increase slowly as the obstacles are overcome and distributed generator technologies' cost and performance improves.

II. TECHNICAL SUMMARY

Objective

The objective of the study was to quantify the net air emission impacts that could result from the use of to produce electricity in California, for the years 2002 and 2010.

Background

Deregulation of the electricity industry is expected to encourage increased use of DG. DG units are small power generation sources that can increase flexibility and reliability of power sources, reduce the cost of providing power to customers, reduce infrastructure investment, and optimize asset utilization. But DG sources, given the existing technology, have the potential to emit a greater amount of pollutants than large central power plants. In 1998, this study was approved to provide an estimate of additional air emissions that could result from the expanded use of DG sources in California. The investigator was required to work with an advisory committee of experts from industry, air districts, and the California Energy Commission throughout the study. The goal was to provide the ARB, air districts and other agencies with the best available estimates of DG

source emissions that could then be used to develop appropriate air quality control strategies for DG sources within the state.

Summary

The study utilized a three-step process to estimate the potential amount of air emissions from DG in California. First, the study estimated the economic market potential for DG for both utilities and large energy users, given the available technologies and their costs. These estimates were fed into economic models that compared the costs of DG technologies to the range of costs for providing central utility service. The market potential was then estimated as the percentage of new load growth for which DG is more cost-effective than the central power generation.

Next, air emission impacts were calculated for the years 2002 and 2010 and compared to the in-state central-generation-only scenario to estimate the net emissions from DG. Finally, the results were integrated into an overall assessment of the DG economic market potential and total emission impacts on a statewide basis, compared to the existing central generation mix. In addition, emission impacts are estimated for eight air districts, including the Bay Area, Sacramento Metro Area, San Joaquin Valley, and South Coast air districts.

Overall, the study found that DG is currently cost-effective for some applications. It can, for example, provide peaking capacity at a lower overall cost than traditional central generation and wires solution to utilities. For electric utility customers, DG has a limited economic market potential during on-peak price periods when electric energy prices are highest, unless it is very fuel-efficient or operates in combined heat and power or cogeneration mode. These cost-effective applications, however, contribute a very small part of the energy needed to serve new load growth. Thus, although emissions from these cost-effective distributed generators are significantly higher than the existing mix

of in-state generation on a per unit of energy basis, these generators do not emit a significant total amount of air pollutants when considered on a yearly basis.

DG technologies are likely to improve in cost and performance between 2002 and 2010. Noticeable improvement is expected for some DG technologies, such as the microturbine, advanced turbine system, and conventional combustion turbines. However, in spite of the projected improvement in these technologies, the study found that emissions from distributed generators in 2010 will still be significantly higher than the mix of in-state generation, on a per unit of energy basis.

III. STAFF COMMENTS

The first draft of this report was reviewed and commented on extensively by members of the project advisory committee and staff from the ARB's Stationary Source and Research Divisions. The project advisory committee consisted of experts from the electric utility industry, DG manufacturers, California Council for Environmental and Economic Balance, California Energy Commission, and the Bay Area air district. This is the second draft of the report that incorporates many of the comments received from those reviewers. The contractor was unable to incorporate comments that require redoing of the analysis. Those comments will be acknowledged in an appendix of the report. This report, in staff's opinion, provides a comprehensive analysis of the air quality impacts of DG in California. This is the first report of its kind and its results will be helpful to the ARB, air districts, and other agencies in developing appropriate strategies for improving air quality. Additional works are needed to fully explore the air quality impacts of an expanded use of DG, especially in the light of California's evolving competitive market for electricity.

The report still contains some typographical and other editorial errors that need to be corrected. Also, there are some statements in the report that need to be qualified. These errors will be communicated to the principal investigator.

IV. STAFF RECOMMENDATIONS

Staff recommends the Research Screening Committee accept this draft final report, subject to inclusion of appropriate revisions and additions in response to the staff comments, and any changes and additions specified by the Committee