

High SO₂ Removal Efficiency Testing

DE-AC22-92PC91338

Technical Progress Report - July - September 1995

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INTRODUCTION

This document provides a discussion of the technical progress on DOE/PETC project number DE-AC22-92PC91338, "High Efficiency SO₂ Removal Testing", for the time period 1 July through 30 September 1995. The project involves testing at six full-scale utility flue gas desulfurization (FGD) systems, to evaluate low capital cost upgrades that may allow these systems to achieve up to 98% SO₂ removal efficiency. The upgrades being evaluated mostly involve using performance additives in the FGD systems.

The "base" project involved testing at the Tampa Electric Company Big Bend station. All five potential options to the base program have been exercised by DOE, involving testing at Hoosier Energy's Merom Station (Option I), Southwestern Electric Power Company's Pirkey Station (Option II), PSI Energy's Gibson Station (Option III), Duquesne Light's Elrama Station (Option IV), and New York State Electric and Gas Corporation's Kintigh Station (Option V). The originally planned testing has been completed for all six sites.

The remainder of this document is divided into four sections. Section 2, Project Summary, provides a brief overview of the status of technical efforts on this project. Section 3, Results, summarizes the outcome from technical efforts during the quarter or results from prior quarters that have not been previously reported. In Section 4, Plans for the Next Reporting Period, an overview is provided of the technical efforts that are anticipated for the fourth quarter of calendar year 1995. Section 5 contains a brief acknowledgement.

DISCLAIMER

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PROJECT SUMMARY

On the base program, testing was completed at the Tampa Electric Big Bend Station in November 1992. The upgrade option tested was DBA additive. Base project efforts during the third quarter of calendar year 1995 consisted only of project management and reporting activities.

For Option I, at the Hoosier Energy Merom Station, results from another program co-funded by the Electric Power Research Institute (EPRI) and the National Rural Electric Cooperative Association have been combined with results from DOE-funded testing. Three upgrade options have been tested: DBA additive, sodium formate additive, and high pH set-point operation. All testing was completed by November 1992. There were only minor reporting activities for this site during the current quarter.

Option II involved testing at the Southwestern Electric Power Company Pirkey Station. Both sodium formate and DBA additives were tested as potential upgrade options. All of the testing at this site was completed by May 1993. There were only minor reporting activities for this site during the current quarter.

On Option III, for testing at the PSI Energy Gibson Station, testing with sodium formate additive was completed in early October 1993, and a DBA additive performance and consumption test was completed in March of 1994. There were only reporting efforts for this site during the current quarter.

Option IV is for testing at the Duquesne Light Elrama Station. The FGD system employs magnesium-enhanced lime reagent and venturi absorber modules. An EPRI-funded model evaluation of potential upgrade options for this FGD system, along with a preliminary economic evaluation, determined that the most attractive upgrade options for this site were to increase thiosulfate ion concentrations in the FGD system liquor to lower oxidation percentages and increase liquid-phase sulfite alkalinity and to increase the venturi absorber pressure drop to

improve gas/liquid contacting. Parametric testing of these upgrade options was conducted in March of 1994. A draft Technical Note summarizing the results from this site was submitted to DOE and to the utility for review in early January 1995. There were no other significant activities for this site during the current quarter.

Option V is for testing at the NYSEG Kintigh Station. Baseline testing was conducted in July 1994. Parametric testing at this site was conducted in late August, and a sodium formate additive consumption test was conducted in September 1994. Results from this parametric and additive consumption testing were included in the Technical Progress Report for the time period of October through December 1994. This report was submitted in January 1995. During the first quarter of calenday year 1995, FGDPRISM modeling of these test results and economic evaluations of upgrade options were conducted, and a draft Technical Report of these results were submitted to DOE and to NYSEG for review. Results of the modeling and economic evaluation for this site were included in the previous quarterly Technical Progress Report.

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RESULTS

Results from the base program (at the Tampa Electric Big Bend Station) and the first optional site (Hoosier Energy Merom Station) were presented in detail in the April 1993 quarterly Technical Progress Report, and updates were included in the July 1993 and October 1993 reports. For the second optional site (the Southwestern Electric Power Company Pirkey Station), results were presented in the July 1993 quarterly Technical Progress Report and updated in the October 1993 report.

For the third optional site (the PSI Energy Gibson Station), baseline testing was conducted in May 1993, and those results were presented in the July 1993 quarterly report. Parametric testing at this site was completed in early October of 1993, and these results were discussed in the January 1994 Technical Progress Report. A DBA performance and consumption test was conducted in February and March of 1994. Preliminary results from this test were discussed in the April 1994 Technical Progress Report. An update of the results from this site was presented in the April 1995 quarterly report.

Baseline testing at the fourth optional site (Duquesne Light's Elrama Station) was completed in July 1993. Those results were discussed in the October 1993 quarterly report. The results of EPRI-funded FGDPRIISM modeling and preliminary economic evaluations of potential upgrades for this FGD system were discussed in the January 1994 Technical Progress Report. In March of 1994 parametric testing of the most promising upgrade options was conducted. The preliminary results of these tests were discussed in the April 1994 Technical Progress Report. A draft of the Technical Note for this site was submitted to DOE on January 4, 1995. An overview of the new results presented in this draft technical note was included in the Technical Progress Report for the time period October through December 1994, dated 3 February 1995.

For the fifth optional site, at the New York State Electric and Gas Corporation's (NYSEG's) Kintigh Station, baseline, parametric, and additive consumption tests were completed during the third quarter of 1994. Results from the baseline testing at this site were discussed in

the Technical Progress Report for the third quarter of calendar year 1994 dated December 1994. The parametric and additive consumption tests at this site were also completed late in the third quarter. These results were discussed in the April 1995 quarterly Technical Progress Report. Late in the fourth quarter of calendar year 1994, FGDPRISM modeling of the Kintigh FGD system was completed, as were the economic evaluations of potential upgrade options for this site. A draft report discussing these results was submitted to DOE and to NYSEG in the first quarter of calendar year 1995. These results were discussed in the previous quarterly technical progress report dated July 1995.

There are no new project results to present this quarter.

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PLANS FOR THE NEXT REPORTING PERIOD

All of the testing currently planned for this project has been completed. Scheduled efforts during the fourth quarter of calendar year 1995 will likely only consist of project management and reporting. For the the base program (Big Bend site), a revised Topical Report has been submitted to DOE and is approved for publication. Options I and II (Hoosier Energy's Merom Station, SWEPCo's Pirkey, respectively) are in final reporting phases. Draft Topical Reports for these two sites have previously been submitted to DOE, and review comments have been received. These drafts will be revised to respond to review comments during the next quarter.

For the PSI Energy Gibson Station (Option III), a revised Technical Note summarizing results from both the sodium formate and DBA performance and additive consumption tests was submitted to DOE in May 1995, and review comments were received in September 1995. This Technical Note will be revised, and a draft Topical Report for this site will be submitted during the next reporting period.

A draft Technical Note which summarizes all test results, results of FGDPRIISM modeling, and results of economic evaluations of upgrade options for the Duquesne Light Elrama site (Option IV) was submitted to DOE and to Duquesne Light in January 1995. A revised Technical Note and a draft Topical Report for this site will be prepared during the fourth quarter of calendar year 1995 after review comments on the draft Technical Note are received from Duquesne Light.

For Option V, testing at the NYSEG Kintigh Station, a draft Technical Note summarizing these results was submitted in March 1995. Review comments on this draft were received in September 1995. A revised Technical Note and a draft Topical Report for this site will likely be prepared during the fourth quarter of calendar year 1995.

There is also interest in demonstrating high-efficiency SO₂ removal operation for a longer period of time (three to six months) at one of the six sites participating in this project. At this time, the Tampa Electric Company Big Bend site appears to be the most favorable option for conducting such testing. During the next quarter, we will finalize arrangements with Tampa Electric Company to conduct such longer-term testing. If such arrangements can be made, a Test Plan Addendum for this site will be prepared and submitted to DOE.

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