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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

PREPARED DIRECT TESTIMONY

OF

GREGORY M. NELSON

Q. Please state your name, address, occupation and employer.

A. My name is Gregory M. Nelson. My business address is 702 North Franklin Street, Tampa, Florida 33602. I am employed by Tampa Electric Company ("Tampa Electric" or "Company") in the position of Manager, Environmental Planning in the Environmental and Fuels Department.

Q. Please provide a brief outline of your educational background and business experience.

A. I received a Bachelor Degree in Mechanical Engineering from the Georgia Institute of Technology in 1982 and a Masters of Business Administration from the University of South Florida in 1987. I am a registered Professional Engineer in the State of Florida. I began my engineering career in 1982 in Tampa Electric's Engineering Development Program. In 1983, I went to work in the Production Department where I was responsible for power plant performance projects. Since 1986, I have held

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1 various environmental permitting and compliance  
2 positions. In 1997, I was promoted to Administrator -  
3 Air Programs in the Environmental Planning Department.  
4 In this position, I was responsible for all air  
5 permitting and compliance programs. In 1998, I was  
6 promoted to Manager, Environmental Planning. My present  
7 responsibilities include the management of all Tampa  
8 Electric environmental permitting and compliance  
9 programs, with the exception of environmental auditing.

10  
11 **Q.** What is the purpose of your testimony in this proceeding?

12  
13 **A.** The purpose of my testimony is to present, for Florida  
14 Public Service Commission ("Commission") review and  
15 approval, estimated project costs associated with the  
16 company's continuing environmental projects previously  
17 approved for cost recovery through the Environmental Cost  
18 Recovery Clause ("ECRC"). The amounts included will be  
19 for the period January 1, 2000 through December 31, 2000.  
20 I will also include estimated project costs for two  
21 projects currently being reviewed by the Commission in  
22 Docket No. 990976-EI. I will identify the environmental  
23 requirements for these two projects along with the  
24 company's Big Bend Unit 1 and 2 Flue Gas Desulfurization  
25 System ("FGD system"). Finally, my testimony will

1 identify the variances between actual and estimated  
2 capital and operating and maintenance ("O&M") project  
3 costs from the January 1999 through December 1999 period  
4 which are calculated in Schedules 42-4E through 42-8E  
5 sponsored by Tampa Electric witness Karen O. Zwolak. I  
6 will provide an explanation for significant project  
7 variances.

8  
9 Q. Have you prepared an exhibit to support your testimony?

10  
11 A. Yes, I have. My Exhibit No. \_\_\_\_ (GMN-1) was prepared  
12 under my direction and supervision and consists of two  
13 documents.

14  
15 Q. Please describe the nature of any new expenditures for  
16 environmental compliance projects projected for recovery  
17 through the ECRC for the periods January 1999 through  
18 December 1999 and January 2000 through December 2000.

19  
20 A. The newest project that Tampa Electric is seeking cost  
21 recovery for, beginning in December 1999 and continuing  
22 in the projected period January through December 2000, is  
23 its FGD system. Estimated project costs associated with  
24 the FGD system are addressed in the testimony of Tampa  
25 Electric's witness Donald E. Pless. The FGD system is

1 under construction in order to comply with Phase II of  
2 the Clean Air Act Amendments ("CAAA") required by January  
3 1, 2000. The CAAA impose sulfur dioxide or SO<sub>2</sub> emissions  
4 limits on existing steam electric units with an output  
5 capacity of greater than 25 megawatts and all new utility  
6 units. Tampa Electric conducted an exhaustive analysis  
7 of options to comply with Phase II of the CAAA that  
8 culminated in the selection of the FGD project to serve  
9 Big Bend Units 1 and 2. The Commission, in Order No.  
10 PSC-99-0075-FOF-EI issued January 11, 1999 in Docket No.  
11 980693-EI, found that the FGD project is the most cost  
12 effective alternative for compliance with the SO<sub>2</sub>  
13 requirements of Phase II of the CAAA.

14  
15 Tampa Electric has also sought approval of two additional  
16 environmental projects that will commence in 1999. On  
17 July 28, 1999 the company, in Docket No. 990976-EI,  
18 petitioned the Commission to approve for cost recovery  
19 through the ECRC two new environmental compliance  
20 programs. The programs consist of the Environmental  
21 Protection Agency ("EPA") Section 114 Mercury Emissions  
22 Information Collection Effort and the Gannon  
23 Electrostatic Precipitator Optimization ("ESP") Study.  
24 On September 23, 1999 in Docket No. 990976-EI Staff  
25 recommended approval of the company's petition. This

1 recommendation is scheduled for consideration at the  
2 Commission's October 5, 1999 Agenda Conference. Tampa  
3 Electric will include 1999 costs associated with the  
4 approved programs in the true up for 1999. Capital and  
5 O&M expenditures for these environmental compliance  
6 projects will be incurred commencing in 1999. The  
7 company has also estimated that costs for the EPA Mercury  
8 Emissions Information Collection Effort will continue  
9 through early 2000. Recoverable O&M costs resulting from  
10 the EPA Mercury Emissions Information Collection Effort  
11 and the Gannon ESP study for the remainder of 1999 are  
12 shown on Form 42-5E and on Form 42-2P for the year 2000.  
13 The capital costs incurred in 1999 from the EPA Mercury  
14 Emissions Information Collection Effort are summarized on  
15 Form 42-7E and on Form 42-3P for costs incurred in 2000.  
16 These forms are presented in Ms. Zwolak's testimony.

17  
18 **Q.** Are there any other projects with capital expenditures  
19 projected for the period January 2000 through December  
20 2000?

21  
22 **A.** Of the seven capital projects that were approved in  
23 Docket No. 980007, Order No. PSC-98-1764-FOF-EI, issued  
24 December 31, 1998, only two, the Gannon Unit 5 Stack  
25 Extension and the Gannon Unit 6 Stack Extension, will

1 continue to incur construction costs. Tampa Electric is  
2 seeking continued cost recovery for the remaining five  
3 projects approved in December 1998 as well as the eight  
4 projects approved in previous cost recovery proceedings.  
5 These projected expenses are summarized in Ms. Zwolak's  
6 testimony on Forms 42-3P and 42-4P.  
7

8 **Q.** Are there other projects with O&M expenses projected for  
9 the period January 2000 through December 2000?  
10

11 **A.** Yes. Tampa Electric has estimated costs for continued  
12 recovery of O&M expenses previously approved by the  
13 Commission in prior ECRC orders associated with four  
14 projects; the Big Bend Unit 3 Flue Gas Desulfurization  
15 Integration, the Big Bend Units 1 and 2 Flue Gas  
16 Conditioning, the National Pollutants Discharge  
17 Elimination System (NPDES) Permit Fees, and recovery of  
18 SO<sub>2</sub> Emission Allowance costs. In addition to the  
19 continuation of these projects, Tampa Electric has  
20 projected O&M expenses associated with the FGD system,  
21 which will commence in 2000, and O&M expenses associated  
22 with the EPA Mercury Emissions Information Collection  
23 Effort, commencing in 1999 and ending in early 2000. The  
24 O&M expenses are summarized on Form 42-2P in Ms. Zwolak's  
25 testimony and projected O&M costs for the FGD system are

1 discussed in the testimony of Tampa Electric witness  
2 Donald E. Pless.

3  
4 Q. Are the projected costs associated with these  
5 environmental compliance activities appropriate?

6  
7 A. Yes. The identified activities and related project costs  
8 are legally required by environmental regulations that  
9 are either new or whose scope has changed to become more  
10 stringent. The projected environmental compliance costs  
11 were developed by Tampa Electric's engineering and  
12 environmental staff and were provided to Ms. Zwolak for  
13 calculation of the environmental factors. As indicated  
14 in Ms. Zwolak's testimony in this proceeding, the  
15 expenditures are appropriate for recovery through the  
16 ECRC.

17  
18 Q. How do the variances of actual capital project  
19 expenditures for January 1999 through December 1999  
20 compare with the original projections?

21  
22 A. As shown on Form 42-6E, overall actual/estimated  
23 recoverable costs were \$28,948 more than originally  
24 projected.

25

1 Q. Please explain any variances in excess of five percent of  
2 recoverable costs to those originally projected as shown  
3 on Form 42-6E.

4  
5 A. There are eight projects with variances of recoverable  
6 costs to those originally projected that exceed five  
7 percent:

8  
9 1. The Gannon Ignition Oil Tank recoverable costs are  
10 estimated to be \$48,862 or 14.1% lower than  
11 originally projected. This variance is due to a  
12 correction in depreciation expense resulting from  
13 the Commission's ECRC Audit Report, Control No. 99-  
14 042-2-1.

15 2. The Big Bend Fuel Oil Tank #2 Upgrade recoverable  
16 costs are estimated to be \$110,092 or 5.7% lower  
17 than originally projected. This variance is due to  
18 deferred payment of 1998 project expenses and an  
19 extended project completion date into 1999.

20 3. The Phillips Upgrade Tank #1 recoverable costs are  
21 estimated to be \$7,679 or 38.2% greater than  
22 originally projected. This variance is due to  
23 delays by the supplier of cathodic protection  
24 equipment that resulted in additional costs to  
25 secure the equipment and effect the installation.



- 1           4.    The Gannon Unit 5 Classifier Replacement recoverable  
2           costs are estimated to be \$206,916 or 24.1% greater  
3           than projected due to the inclusion of payroll costs  
4           and full recovery of the replaced asset.    These  
5           issues are scheduled to be addressed in the upcoming  
6           hearing.
- 7           5.    The Gannon Unit 6 Classifier Replacement recoverable  
8           costs are estimated to be \$96,680 or 29.1% lower  
9           than projected due to a correction in the  
10          calculation for return on investment for projects  
11          with construction work-in-progress related expenses.
- 12          6.    The Big Bend Unit 2 Classifier Replacement  
13          recoverable costs are estimated to be \$144,903 or  
14          22.5% higher as a result of Tampa Electric's  
15          inclusion of payroll costs and full recovery of the  
16          replaced asset.    These issues are scheduled to be  
17          addressed in the upcoming hearing.
- 18          7.    The Gannon Unit 5 Stack Extension recoverable costs  
19          are estimated to be \$0 or 100% lower than originally  
20          projected.    The variances for this project is due to  
21          revised in-service dates resulting from additional  
22          pre-construction requirements from the United States  
23          Environmental Protection Agency (USEPA).    In a  
24          letter date-stamped April 13, 1999, the USEPA, under  
25          its permitting authority, requested that a fluid

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model study be completed in order to justify increasing the Gannon stacks to the proposed stack height of 110 meters. A copy of this letter is set forth as Document 1 of my exhibit. Only one contractor, Colorado State University, was qualified to conduct the specific fluid modeling required by USEPA. A copy of the proposal provided by Colorado State University is provided as Document 2 of my exhibit. At this time, the modeling is being conducted and the results will be subject to the USEPA's review. The timing for the USEPA's review is not known at this time.

8. The Gannon Unit 6 Stack Extension recoverable costs are estimated to be \$0 or 100% lower than originally projected for the reasons included for the Gannon 5 Stack Extension.

**Q.** How do the variances of actual O&M expenses for January 1999 through December 1999 compare with the original projections?

**A.** As shown on Form 42-4E, overall actual/estimated project expenses were \$1,345,938 more than originally projected.

1 Q. Please explain any variances in excess of five percent of  
2 actual expenses to those originally projected and shown  
3 on Form 42-4E.

4  
5 A. There are three projects with variances of actual  
6 expenses to those originally projected which exceed five  
7 percent:

8  
9 1. The Big Bend Units 1 and 2 Flue Gas Conditioning  
10 expenses are estimated to be \$35,070 or 15.2% less  
11 than originally projected. This variance is due to  
12 a projected decrease in the use of the flue gas  
13 conditioning process as a result of start-up and  
14 check-out of the new Big Bend Units 1 and 2 FGD  
15 System.

16 2. The SO<sub>2</sub> Emission Allowance expenses are estimated to  
17 be \$3,120,826 or 77.2% greater than originally  
18 projected. This variance is due to a significant  
19 decrease in the amount of economy sales transactions  
20 which correspondingly decreased the emission  
21 allowance credits to ratepayers.

22 3. The NPDES Annual Surveillance Fee expenses are  
23 estimated to be \$39,100 or 29.2% lower than  
24 originally projected. The variance is due to the  
25 delay in delegation to the Florida Department of

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Environmental Protection of the NPDES program from the USEPA for the Gannon facility.

**Q.** Please summarize your testimony.

**A.** In total, Tampa Electric has estimated costs associated with 20 environmental projects, including its Big Bend 1 and 2 FGD system, for the year 2000. All but four of the projects are required by the company to comply with either CAAA or Clean Water Act requirements. The remaining four projects are requirements under the Florida Department of Environmental Protection's Above-Ground Storage Tank System Rule, Florida Administrative Code, Rule 62-762. Projected costs associated with these environmental compliance activities are appropriate and have been included in ECRC schedules sponsored by Ms. Zwolak.

**Q.** Does this conclude your testimony?

**A.** Yes, it does.



## UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4  
ATLANTA FEDERAL CENTER  
51 FORSYTH STREET  
ATLANTA, GEORGIA 30303-8960

**RECEIVED**

APR 15 1999

4APT-APB

APR 13 1999

BUREAU OF  
AIR REGULATION

Mr. Cleve Holladay  
Meteorologist - Bureau of Air Regulation  
Florida Department of Environmental Protection  
Twin Towers Office Building  
2600 Blair Stone Road  
Tallahassee, Florida 32399-2400

Dear Mr. Holladay:

The March 4, 1999, Tampa Electric Company (TECO) responses to the Region 4 comments of December 8, 1998, have been reviewed. These responses were submitted to the Environmental Protection Agency (EPA) via a fax to Stan Krivo of the Air and Radiation Technology Branch. Region 4's December 1998 comments centered on increasing the existing stack height (i.e., 96 meters ( m)) of F. J. Gannon Station Units 5 and 6 to 110 m without a fluid modeling demonstration. The 100 m stack height is apparently needed to avoid pollutant concentrations related to downwash that may adversely impact air quality. The modeling concerning this issue was originally submitted to address title V permit compliance with the sulfur dioxide (SO<sub>2</sub>) National Ambient Air Quality Standards (NAAQS) for the Tampa Electric Company's F. J. Gannon Station. Region 4 comments pursuant to the review of the March 4, 1999 response follow.

1. TECO states that the Good Engineering Practice (GEP) formula stack height is 133 m; however, TECO is only proposing to raise the stack height for Units 5 and 6 to 82 percent (%) of the GEP formula height, or 110 m. The use of 110 m would require fluid modeling to justify this height as the GEP stack height for setting an emission limit. As previously stated in Region 4's December 8 1998 comments, according to the GEP stack height regulations, there is no restriction or prohibition against, or demonstration required for raising an existing (or replacing) a stack up to 65 m, provided prohibited dispersion techniques are not employed. Raising a stack above the 65 m *de minimis* height requires evidence that the additional height is necessary to avoid downwash-related pollutant concentrations that raise health and welfare concerns. This evidence can be achieved through either of two methods: (1) demonstrate by fluid modeling, using the existing stack and emission rate (before the stack is raised) and adding in the background air quality, that excessive pollutant concentrations will occur, or (2) show by site-specific information that the existing short stack(s) has in fact caused a local nuisance. EPA does not regulate the actual height of a stack and a company is free to build a stack to any height; however, section 123 of the Clean Air Act provides that the EPA Administrator shall regulate that portion of the stack height that is used in calculating emission limitations. Therefore, to use the stack height in regulatory modeling, the new Units 5 and 6 stack height that TECO proposes must be validated in the manner presented above.

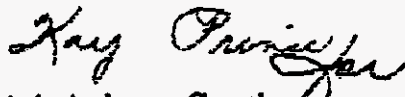
2.

2. The TECO letter cites Rule 62-210.550(3) of the Florida State Implementation Plan (SIP) which provides that EPA or the local air program may require the use of fluid modeling or a field study to verify the GEP stack height for the setting an emission limit. It has been the policy of Region 4 and other EPA Regional Offices to adhere to the requirement of developing, by fluid modeling, the GEP stack height that should be used in modeling if a stack is being raised above the *de minimis* stack height of 65 m. Region 4 continues to use this policy and requires the appropriate fluid modeling to be developed to justify the 110 m stack height for TECO Units 5 and 6. Without this policy, the use of a 110 m stack in regulatory modeling to avoid excessive pollutant concentrations would be considered a prohibitive dispersion technique.

3. Additional air dispersion modeling was performed for Units 5 and 6 based on the current sulfur dioxide (SO<sub>2</sub>) allowable emission limits using the 96 m stack height with and without building downwash to address the 40% excessive concentration criteria. Modeling results for the high-second-high concentration for the 24-hour averaging periods was used. Upon further review of the stack height guidance, the 40% excessive concentration criterion can only be demonstrated through fluid modeling. The submitted Industrial Source Complex (ISC3) model modeling does not meet this requirement.

Region 4 looks forward to working with you to resolve the stack height issue and is willing to provide assistance in developing a fluid modeling protocol for the Gannon Unit 5 and 6 stacks. If this assistance is required, please submit future a response to my attention. If questions arise regarding these comments, please contact Brenda Johnson of my staff at (404) 562-9037.

Sincerely,



Linda Anderson-Carnahan  
Chief  
Air Planning Branch

cc: Stan Krivo, Air and Radiation Technology Branch

cc: File

5 Sheplak, TV

**FLUID MECHANICS and  
WIND ENGINEERING  
PROGRAM**

**Colo**

EXHIBIT NO. \_\_\_\_\_  
DOCKET NO. 990007-EI  
TAMPA ELECTRIC COMPANY  
(GMN-1)  
FILED: OCTOBER 1, 1999  
DOCUMENT NO. 2  
PAGE 1 OF 14

Dr. David E. Neff  
Voice: (970) 491-8576  
FAX: (970) 491-8330  
Email: neff@engr.colostate.edu

Engineering Research Center, Rm# B223  
Department of Civil Engineering  
Fort Collins, Colorado 80523  
U.S.A.

July 14, 1999

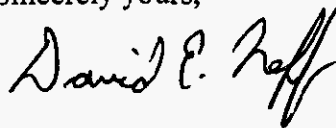
Mr. Lawrence N. Curtin  
HOLLAND & KNIGHT LLP  
315 South Calhoun Street, Suite 600  
P.O. Drawer 810 (ZIP 32302-0810)  
Tallahassee, Florida  
Voice: (850) 224-7000  
FAX: (850) 224-8832

Your Ref: Study Proposal rev.1  
Our Ref: LT07-14-99a.WPD

Dear Lawrence,

Enclosed are two copies of the Wind Tunnel Study Proposal rev.1. Please forward one copy to Ms. Theresa Watley. I need to get your email address as well as Theresa's email and mailing address. Also, if you decide to do the study, I will need a good street map of the site area (~6 to 10 kilometer radius around the generating plant.

Sincerely yours,



David E. Neff  
Research Professor, Associate Director  
Fluid Dynamics and Diffusion Laboratory

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COLLEGE OF ENGINEERING  
COLORADO STATE UNIVERSITY  
FORT COLLINS, COLORADO 80523

EXHIBIT NO. \_\_\_\_\_  
DOCKET NO. 990007-EI  
TAMPA ELECTRIC COMPANY  
(GMN-1)  
FILED: OCTOBER 1, 1999  
DOCUMENT NO. 2  
PAGE 2 OF 14

July 13, 1999

**TO:** Mr. Lawrence N. Curtin  
HOLLAND & KNIGHT LLP  
315 South Calhoun Street, Suite 600  
P.O. Drawer 810 (ZIP 32302-0810)  
Tallahassee, Florida  
Voice: (850) 224-7000  
FAX: (850) 224-8832

**TYPE OF SUPPORT REQUESTED:** Service Contract

**TITLE OF RESEARCH PROJECT:** Wind Tunnel Good Engineering Stack Height Study  
of the Francis J. Gannon Generating Station

**PRINCIPAL INVESTIGATOR:** Dr. David E. Neff, Research Professor  
Fluid Mechanics and Wind Engineering Program  
Associate Director, Fluid Dynamics and Diffusion Laboratory

Civil Engineering Department  
Colorado State University  
Fort Collins, CO 80523  
Telephone: (970) 491-8576  
FAX: (970) 491-8330  
Neff@engr.colostate.edu

**CONTRACT PERIOD:** 12 weeks

**AMOUNT REQUESTED:** \$49,017

**STARTING DATE:** July 19, 1999

**Material may not be extracted from this proposal  
and distributed to third parties without permission**



## INTRODUCTION

A wind-tunnel measurement program is proposed to assess the effects of site influences on plumes from units 5 and 6 of the Francis J. Gannon Generating Station. This proposed fluid model of air pollutant dispersion will accomplish the following objectives:

- 1) Determine whether structures near the Generating Station cause "excessive concentrations" downwind of the existing 96 meter plant stack. An excessive concentration is defined as a "maximum ground-level concentration monitored or modeled in the presence of nearby structures or terrain obstacles that is 40% or more, in excess of maximum ground-level concentration, monitored or modeled for the same orientation and stack parameters in the absence of downwash, wake or eddy effects produced by nearby structures or terrain."
- 2) If the 96 meter plant stack configuration produces "excessive concentrations" then determine the minimum stack height which does not produce "excessive concentrations."
- 3) Insure that all modeling is consistent with EPA requirements for wind tunnel testing including those provided in Guideline for Use of Fluid Modeling to Determine Good Engineering Practice Height (EPA-450/4-81-003, July, 1981).

This proposal and budget are based on the information provided by Mr. Lawrence N. Curtin of HOLLAND & KNIGHT LLP (dated July 2, 1999) and conversations with Ms. Theresa Watley of Tampa Electric Company. Project costs assume all architectural drawings, topographic maps, aerial photographs, relevant meteorology and source information are available from HOLLAND & KNIGHT LLP prior to a contract starting date in the year 1999. Technical data will be forwarded to HOLLAND & KNIGHT LLP shortly after acquisition, and a draft final report delivered within 11 weeks (assuming the study protocol is accepted by the EPA with a one week turn around). Changes in the scope of work or project delays imposed by the sponsor will require adjustment of the proposed time schedule and may require a change in the price of this project.

## STATEMENT OF WORK

The major tasks of this study are :

1. Study Protocol.
2. Model Construction.
3. Atmospheric Dispersion Comparability Testing (ADCT).
4. Wind Direction and Stack Height Determination Testing.
5. GEP Stack Height Documentation Testing.
6. Final Report.

Table 1 -- GANNT Chart, details the proposed time schedule for the accomplishment of these tasks. Included in this chart are noteworthy sub-categories. The total time required for the completion of this study is projected to be 12 weeks.

Table 2 -- Wind Tunnel Test Matrix, provides an overview of the proposed wind tunnel tests, the type of measurements required for each test and the wind tunnel testing time for each group of tests. All model tests will be performed in the Environmental Wind Tunnel (EWT) test facility at Colorado State University (CSU). This tunnel has a 12' by 7' cross-section, a 60' length, a wind speed range of 0 to 15 m/s. A description of this facility is provided in Appendix B.

The work on each of the major project tasks is summarized below:

### **TASK (1) Protocol Preparation**

A detailed study protocol will be developed and submitted to the HOLLAND & KNIGHT LLP for review and forwarding to the appropriate State and EPA representatives for their approval. This protocol will include details of the boundary layer wind tunnel, instrumentation used, model scale and area coverage, compliance with similarity criteria, concentration determination methodology, tunnel data logs, and report data presentation.

### **TASK (2) Scaled Model Site and Topography Preparation**

The necessary site documentation of topological maps, aerial photographs and architectural drawings of significant structures will be acquired from HOLLAND & KNIGHT LLP prior to the start of the project. This information will be used to fabricate a sufficiently accurate (by GEP standards) scale model, ~12 feet in diameter, of all structures and significant terrain features. The model length scale ratio is projected to be between 1:500 and 1:1000, thus the model turntable areas will represent a 1.8 to 3.6 kilometer circular area centered around plant site. Modeled upwind and downwind structural and terrain features will also be fabricated as necessary. The necessary model roughness, as

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specified in the GEP standards, will be added to significant rounded structures. At present model construction is set to start at contract initiation, if desired model construction can start after protocol finalization with the appropriate time extension at no additional project costs.

**TASK (3a) Approach Flow Verification - ADCT Testing**

All necessary GEP atmospheric dispersion comparability tests will be performed prior to the completion of scaled model construction (see GANNT chart, Table 1). Table 2, Wind Tunnel Testing Matrix, shows that GEP requires that nine wind, one temperature, one visualization and seven concentration profiles be performed in this test series. These test data will be analyzed and presented to HOLLAND & KNIGHT LLP for review.

**TASK (3b) Stack Gas Dispersion Verification - Reynold Number Testing**

The GEP standards require that Reynolds number invariance of the concentration field be demonstrated whenever the model stack Reynolds number scales to less than 300, whenever smooth shaped obstacles are present and whenever the flow has significant terrain influences. Reynolds number independence testing will be performed on the scaled model if deemed necessary in the Protocol.

**TASK (4) Wind Direction and Stack Height Determination**

- Appropriate boundary layer development techniques will be utilized to accurately represent wind conditions approaching the plant stack for each of the tested wind directions. The downwind topography and structural influences will be adjusted for each of the tested wind directions.
- Flow visualization tests will be performed for eight wind directions (both with and without structural influences) selected to be sensitive to the influences of local structures and/or topography. Concentration testing will be performed on four wind directions (both with and without structural influences), selected from the flow visualizations, deemed to be sensitive to the influences of local structures and/or topography. From this data the worst case wind direction will be selected for further study.
- Concentration measurements, in the vicinity of excessive concentrations, will be performed on four stack heights both with and without adjacent building influences. From this data the approximate stack height at which the transition from excessive to non-excessive concentrations occurs will be determined.

**TASK (5) GEP Documentation Testing**

- Appropriate boundary layer development techniques will be utilized to accurately represent wind conditions approaching the plant stack for the worst case wind direction. The downwind topography and structural influences will be adjusted for the worst case wind direction.
- One stack height will be selected, with consultation from HOLLAND & KNIGHT LLP, for full GEP documentation.

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- Table 2 - Wind Tunnel Testing Matrix shows that to meet GEP requirements a total of nine wind, two visualization and twenty-four concentration profiles will be performed in this test series.
- All data will be analyzed and presented in a format consistent with GEP requirements.

**TASK (6) Final Report Generation**

A draft report will fully document all project similarity techniques, instrumentation employed, test programs, test data and result summaries in sufficient detail to satisfy GEP requirements. Video of visual tests along with still photographs will be included with this report. All comments and changes on this draft report will be incorporated into the final report.

## **BUDGET and DELIVERABLES**

The total projected costs for the completion of GEP stack height documentation for both units 5 and 6 of the Francis J. Gannon Generating Station is \$49,017. \$25,000 will be invoiced six weeks into the study, the remainder will be invoiced upon study completion.

The cost for full GEP documentation and reporting of any additional unit stacks at the Francis J. Gannon Generating Station is \$6,000 each. If the model must be reinserted into the wind tunnel a flat fee of an additional \$1,500 will be charged.

Three copies of the final report with photo/movie documentation on CDROM will be mailed to HOLLAND & KNIGHT LLP upon project completion. Additional copies of the report will be available at the cost of reproduction.

A model service agreement acceptable to the university is provided in Appendix A.

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EXHIBIT NO. \_\_\_\_\_  
DOCKET NO. 990007-EI  
TAMPA ELECTRIC COMPANY  
(GMN-1)  
FILED: OCTOBER 1, 1999  
DOCUMENT NO. 2  
PAGE 8 OF 14

**TABLES**

Table 1 -- GANNT Chart

Start Date July 19, 1999

Tampa Bay revision 1.0

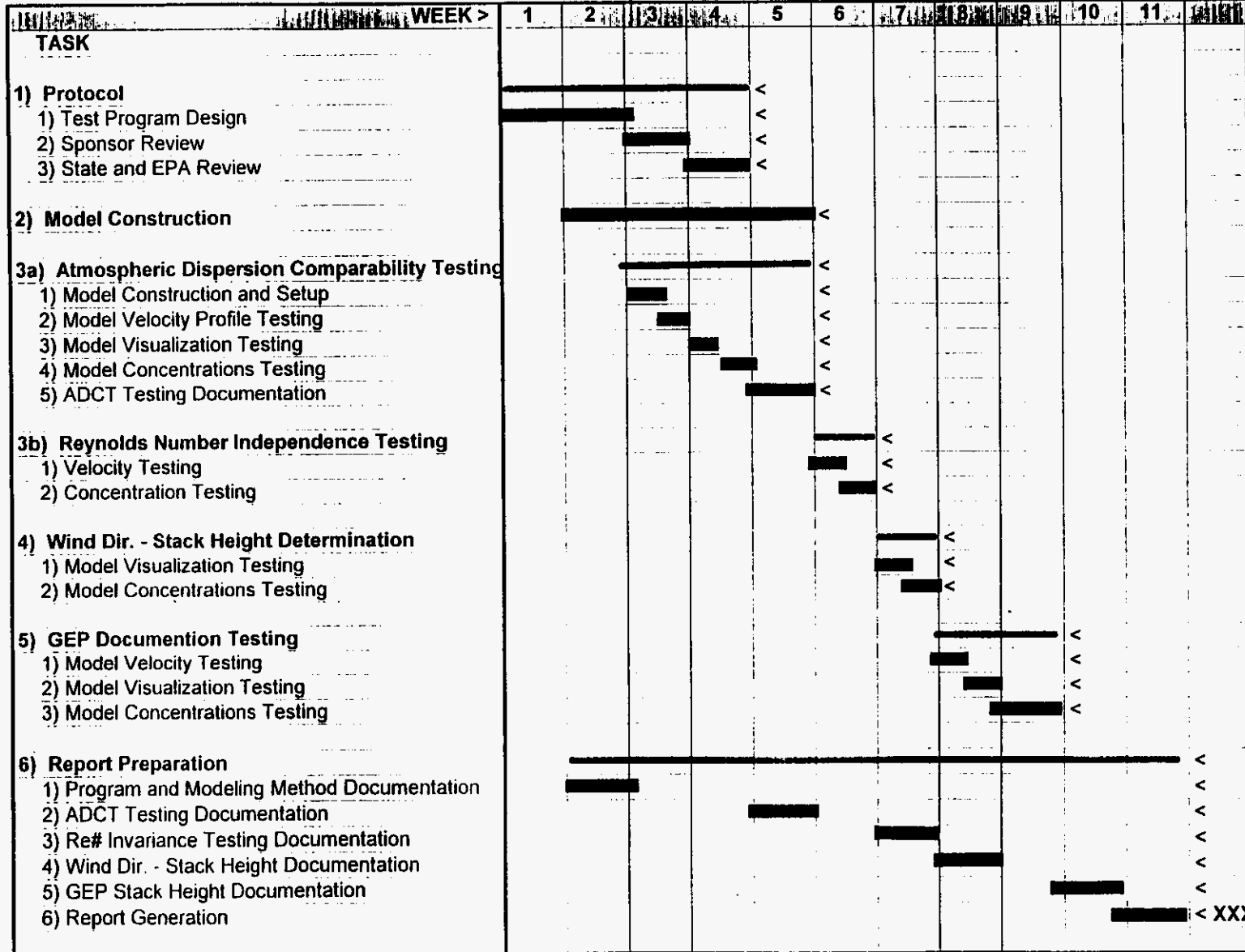


Table 2 -- Wind Tunnel Testing Matrix

Tampa Bay revision 1.0

TEST GROUP	TEST TYPE & NUMBER				TEST PARAMETERS						# Tunnel Days
	Wind Profile	Temp. Profile	Visual Profile	Conc. Profile	Building Config.	Stack Heights	Wind Speed	Wind Dir.	Flow Rate	Test Pos.	
TUNNEL SETUP & REMOVAL	-	-	-	-	-	-	-	-	-	-	2.0
DISPERSION COMPARABILITY	9	-	-	-	1	1	1	1	1	9	1.6
"	-	1	-	-	1	1	1	1	1	1	0.4
"	-	-	1	-	1	1	1	1	1	1	0.6
"	-	-	-	7	1	1	1	1	1	7	1.9
WIND SPEED DETERMINATION	-	-	8	-	2	1	1	8	1	1	1.0
"	-	-	-	8	2	1	1	4	1	1	2.1
RE # INDEPENDENCE	2	-	-	-	1	1	2	1	1	1	0.8
"	-	-	-	2	1	1	2	1	1	1	0.9
STACK HEIGHT DETERMINATION	-	-	-	8	2	4	1	1	1	1	2.1
GEP STACK DOCUMENTATION	9	-	-	-	1	1	1	1	1	9	1.6
"	-	-	2	-	2	1	1	1	1	1	0.6
"	-	-	-	24	2	1	1	1	1	12	5.3
<b>TOTAL</b>	<b>20</b>	<b>1</b>	<b>11</b>	<b>49</b>							<b>21</b>

**Notes:**

- Wind Profile > Cross Wire yields U, u', w', u'w' at 15 elevations
- Temperature Profile > Small Thermocouple yields T, t' at 15 elevations
- Visual Profile > Digital movies and pictures
- Concentration Profile > Source Conc. at up to 45 test locations

EXHIBIT NO. \_\_\_\_\_  
 DOCKET NO. 990007-EI  
 TAMPA ELECTRIC COMPANY  
 (GMN-1)  
 FILED: OCTOBER 1, 1999  
 DOCUMENT NO. 2  
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**APPENDIX A:**  
Service Agreement

**SERVICE AGREEMENT  
CSU AND INDUSTRY SPONSOR**

Sponsored Programs  
491-6355

This Agreement is entered into between \_\_\_\_\_ hereinafter referred to as the Sponsor, and the Colorado State Board of Agriculture, by and through Colorado State University, an Institution of Higher Education of the State of Colorado, located at Fort Collins, Colorado 80523, hereinafter referred to as the University.

WHEREAS the Sponsor desires services in accordance with the scope of work outlined within this Agreement, and

WHEREAS the performance of such services are consistent, compatible and beneficial to the academic role and mission of the University as an Institution of Higher Education and, in consideration of the mutual premises and covenants contained herein, the parties hereto agree as follows:

**ARTICLE I - SCOPE OF WORK**

The University agrees to perform for the Sponsor the services described in Attachment A hereto, under the direction and supervision of \_\_\_\_\_

**ARTICLE II - CONTRACT PERIOD**

This Contract shall become effective on \_\_\_\_\_ and shall be completed on \_\_\_\_\_ unless subsequent time extension, supplement, addition, continuation or renewal is mutually agreed upon in writing between the parties.

**ARTICLE III - FINANCIAL**

The Sponsor agrees to reimburse the University for services performed under this Agreement in a fixed price amount of \$ \_\_\_\_\_ in accordance with the budget itemized in Attachment B and to provide payment in accordance with the following schedule:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The University reserves the right to reallocate funds between approved budget categories.

**ARTICLE IV - REPORTING REQUIREMENTS**

The University will provide reports on the progress of the services as outlined or required in the Scope of Work or as designated as follows:

A progress report, if required, will be furnished at a time agreed to by the participants of this Agreement.

A final report, if required, will be furnished at the completion of the contract period.

#### **ARTICLE V - CONFIDENTIALITY**

It may be necessary for the Sponsor to disclose proprietary information to the University's representatives so they can perform the work described in Article I of this Agreement. At the time of disclosure, the Sponsor must declare which information is proprietary. Proprietary information will not include information which: 1) at the time of disclosure or subsequent to that time is generally available to the public; 2) is known by the University at the time of disclosure and substantiated in written documents; or 3) is made known to the University by a third party not connected with the Sponsor. The University agrees: 1) to receive the information in confidence; 2) not to use it for any purposes other than contained in the scope of work defined in this Agreement; 3) not to disclose it to anyone not a part of this Agreement; and, 4) to use its best efforts to maintain the confidentiality of the information.

#### **ARTICLE VI - EQUIPMENT**

All equipment purchased for use in connection with this Agreement shall be the property of the University, provided that it shall be dedicated to this project while this Agreement is in effect.

#### **ARTICLE VII - INDEMNIFICATION**

Each party hereto agrees to be responsible and assume liability for its own wrongful or negligent acts or omissions, or those of its officers, agents or employees to the full extent required by law, and agrees to hold the other party harmless from any such liability. The University is an Institution of Higher Education of the State of Colorado and is bound by the provisions of the Colorado Governmental Immunity Act and the Constitution of the State of Colorado.

#### **ARTICLE VIII - INSURANCE**

The University agrees to insurance coverage as limited by the statutes of the State of Colorado. All agencies of the State of Colorado, including the University, are provided protection from liability either by the Governmental Immunity Act (24-10-101) or the Risk Management Act (24-30-1501).

#### **ARTICLE IX - COMPLIANCE WITH LAWS**

The University agrees that it will comply with all applicable Federal, State and Local laws, codes, regulations, rules and orders.

#### **ARTICLE X - ASSIGNMENT**

Neither party shall assign or transfer any interest in this Agreement, nor assign any claims for money due or to become due under this Agreement without the prior written approval of the other party.

#### **ARTICLE XI - PATENTS AND INVENTIONS**

The University agrees to take appropriate steps to cause all personnel assigned to the research project to disclose any and all inventions and improvements conceived or reduced to practice by any such personnel in the performance of the research and relating to the subject matter thereof in the form of patent memoranda descriptive of such inventions and discoveries and containing adequate information necessary for the filing of patent applications. The University shall retain all right, title and interest in and to such inventions and improvements and all patent applications therefore which it may file at its election. The University agrees to grant the Sponsor an option to an exclusive world-wide license to inventions made or conceived in the course of this Agreement. Notice of the exercise of the option must be given by the Sponsor to the University in writing within six (6) months of the disclosure of the invention to the University. If the Sponsor exercises its option within the prescribed time period, the parties agree to negotiate in good faith an agreement satisfactory to both parties. All such negotiations, including the execution of an agreement shall be completed within six (6) months of written notice to the University of Sponsor's exercise of said option. Provisions of the license agreement will be dictated by the nature of the inventions, improvements, applications and patents.

If said agreement between the University and the Sponsor is not signed in final form before expiration of the six month period above, the University shall be free to negotiate with other companies not a party to this Agreement without further obligation to the Sponsor provided that it shall not enter into any agreement having more favorable terms than those offered the Sponsor. If

the University shall abandon its rights to such inventions, improvements, applications or patents, the University shall assign to the Sponsor all of its right, title and interest in and to such invention, improvements, applications and patents.

**ARTICLE XII - PUBLICATION BY SPONSOR**

The Sponsor will not include the name of Colorado State University in any advertising, sales promotion or other publicity matter without the prior written approval of the Vice President for Research of the University and the Principal Investigator.

**ARTICLE XIII - TERMINATION**

This contract may be terminated by either of the parties hereto upon written notice delivered to the other party at least ninety (90) days prior to the intended date of termination. By such termination, neither party may nullify obligations already incurred for performance or failure to perform prior to the date of termination.

**ARTICLE XIV - CHANGES AND AMENDMENTS**

This contract constitutes the entire agreement between the parties. All amendments and/or changes shall be by written instrument executed by the parties hereto.

IN WITNESS WHEREOF, the parties hereto have caused this contract to be executed as of the date set forth herein by their duly authorized representatives.

**COLORADO STATE BOARD OF AGRICULTURE  
BY AND THROUGH  
COLORADO STATE UNIVERSITY**

**SPONSOR**

\_\_\_\_\_  
\_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_