INTERIM REPORT

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Project Leader:	Wen S. Chern
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Oak Ridge, Tennessee 37830
operated by
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for the
Department of Energy

INTERIM REPORT

1. TECHNICAL OBJECTIVES: Develop econometric and simulation models for forecasting electricity demand (energy and peak demand) by states and by utility service areas.

2. MAJOR MILESTONES ANTICIPATED AND ACCOMPLISHED:

		Date Anticipated	Date Attained
a.	Draft report, Version II of the State-Level Model	11/79	11/79
b.	Draft report, Varying Elasticity Demand Model	3/80	4/80
c.	Econometric Analysis of Electricity Demand in 1979	6/80	
d.	Draft report, Integrated Forecasting System	6/80	
e.	Final report, Demand Forecasts for Dairyland Power Cooperative	7/80	
f.	Draft report, Version III of the SLED Model	9/80	

Note: It is generally expected that a final report can be issued within three months after a draft report is completed.

3. MAJOR ACCOMPLISHMENTS AND PROGRESS DURING THIS PERIOD:

a. State-Level Electricity Demand Forecasting

(i) The draft report, "A Varying Elasticity Model of Electricity Demand With Given Appliance Saturation" was completed and is currently under internal review. This model represents Version III of the SLED model. In this model, the saturation variables of appliances are incorporated in the demand equations. Thus, the model specification is more sophisticated than those of Versions I and II. However, there remain some problems with the estimated results for a few states where extreme conditions on the saturation levels of electric appliances exist. We will try to further improve these regression results. Also, the forecasting part of this version is more complicated than Versions I and II. It will be sometime before we are able to produce forecasting results. I believe that we have made another significant milestone in modeling electricity demand for the project.

(ii) In order to examine further the sensitivity of the model to various price assumptions, Version II of the SLED model was used to evaluate electricity conservation impacts of two federal energy pricing policies--decontrol of crude oil prices and deregulation of natural gas prices. The results show that the impacts of the deregulation scenarios vary from region to region, depending upon the pattern of fuel substitution and the mix of power generation. However, the overall impacts of these price deregulations are only moderate. Detailed results were presented in a paper, "An Econometric Analysis of Electricity Conservation Through Various Pricing Policies."

(iii) For validating the Version II SLED model, an ex post forecasting was conducted for 1979. While the analysis has not yet been completed, the preliminary results show that the ex post predicting error was 1.6% for the U.S. as a whole. Even though this error may be considered fairly small, the forecasted growth rate of total electricity sales is 4.67% which is higher than the actual growth rate of 3%. The results also show that economic conditions affect electricity demand in all three sectors in 1979. The climatic conditions affect the residential and commercial demands as one would expect. We will document these results in a paper.

b. Integrated Forecasting System

As we discussed in the April progress report, we have been trying to incorporate the SLED model, the service area energy model, and the peak demand model into an integrated forecasting framework. The integration refers to the framework for implementing these three components of forecasts in a systematic and consistent manner; it does not intend to imply that the three computer models will be integrated because it is not practical to do so. Rich Tepel and John Trimble have completed development of the service area models; the responsibilities of implementing further validation of these models and the forecasting portion of the peak demand model have been switched to Colleen Gallagher and Donald Johnson. Efforts have begun to write the report for the Integrated Forecasting System according to the attached outline. (The portions related to model description were completed.)

c. The Service Area Model for the Dairyland Power Cooperative.

Sidney Feld requested that we develop a service area forecast for the Dairyland Power Cooperative in LaCross, Wisconsin. This study of the need for power will help complete the file on Dairyland's nuclear plant, Genoa No. 2, which went into operation in 1971. With the cooperation and assistance of Richard Larochelle at the Rural Electrification Adminstration, we have compiled all the needed historical data for developing the service area model. The Dairyland's service area covers four states - Wisconsin, Minnesota, Illinois and Iowa. Since Wisconsin and Minnesota accounted for about 90% of Dairyland's total sales, we consider only the demand components for these two states in the service area model. The demand components in Iowa and Illinois will be forecasted using the SLED model. Ruth Maddigan, Colleen Gallagher and Don Johnson have been working on model development. Preliminary regression results were developed. The forecasts of Dairyland's electricity demand will be completed in June. This case study has proved to be a very useful application of the integrated forecasting system. A report will be written for the study.

4. COMMUNICATIONS:

a. Colleen Gallagher presented a paper, "An Econometrics Analysis of Electricity Conservation Through Various Pricing Policies," in the Annual Convention of the Eastern Economic Association, Montreal, May 7-10, 1980.

b. Maynard Bowman of the New York State Energy Office and Keith Brown of EPRI requested information regarding the SLED model capabilities. Brown expressed that EPRI would like to use the SLED model for their planning purposes.

5. PUBLICATIONS:

a. H. S. Chang and W. S. Chern, An Econometric Study of Electricity Demand by Manufacturing Industries, ORNL/NUREG/TM-358, May 1980.

INTERNAL DISTRIBUTION

1. R. S. Carlsmith
2. H. S. Chang
3-4. W. S. Chern
5. G. A. Dailey
6. W. Fulkerson
7. C. A. Gallagher
8. M. T. Huie
9. B. D. Holcomb
10. F. R. Mynatt
11. T. H. Row
12. R. C. Tepel
13. J. L. Trimble
14. T. J. Wilbanks
15. Laboratory Records
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EXTERNAL DISTRIBUTION

17. Donald Cleary, Division of Engineering, Nuclear Regulatory Commission, Washington, D.C. 20555

18. Sidney Feld, Division of Engineering, Nuclear Regulatory Commission, Washington, D.C. 20555

19. Harry Landon, Division of Safeguards, Fuel Cycle, and Environmental Research, Nuclear Regulatory Commission, Washington, D.C. 20555

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26-27. Technical Information Center (DOE-TIC), Oak Ridge, Tennessee 37830

28. Office of Assistant Manager for Energy Research and Development, DOE-ORO, Oak Ridge, TN 37830

Attachment: "May Progress Report"

INTEGRATED SYSTEM FOR FORECASTING ELECTRIC ENERGY AND LOAD FOR STATES AND UTILITY SERVICE AREAS

Outline

I. INTRODUCTION - Chern
- Needs for both energy and load forecasts
- Need for regional details

II. INTEGRATED SYSTEM

II.1 Structure of the System - Chern
- This section describes the general structure of the system and summarizes the various components of the system and major outputs.

II.2 The SLED Model - Chern

II.2.1 General structure of the model

II.2.2 Inputs and outputs

II.3 The Disaggregation Model for Service Areas - Tepel

II.3.1 Model description
- Describes the rationals for the particular formulation used.
- Presents the general structural equations.
- Discusses the criterion for selecting variables.

II.3.2 Data requirement
- Lists all the potentially important variables.
- Data sources — what are available from public sources and what are required from the utilities.
- Sample period

II.3.3 Model development
- Estimation
- Forecasting

II.4 The Load Distribution Model for Service Areas - Trimble

II.4.1 Model description
- Discusses alternative models tested but only presents the final model selected.

II.4.2 Data requirement
- Lists all important variables.
- Data sources (including information about what are generally available from utlities).
- Sample period (indicates the minimum requirement)

II.4.3 Procedures for Estimation and Forecasting
- Describes each step of modeling
- Inputs and outputs of forecasting

III. APPLICATIONS

III.1 Description of the Selected Utility Service Areas - Tepel
- Comparison between service areas and the corresponding states.
- Comparison between service areas.
- Summarizes the importance for doing service area forecasts.

III.2 Development of Scenarios - Gallagher
- Summarizes the assumptions needed at both the state and service area levels.
- Summarizes the specific assumptions used for the sensitivity analyses.

III.3 Model Results

III.3.1 Forecasts of electricity demand by states - Gallagher

III.3.2 Forecasts of electricity demand by service areas - Tepel

A. Model estimation

B. Forecasting results

III.3.3 Forecasts of peak load and load distribution - Trimble

A. Model estimation

B. Forecasting results

III.4 Comparative Analysis of the Results - Tepel and Trimble

IV. CONCLUSIONS - Chern