MODIFICATIONS TO THE WIEN AUTOMATIC SYSTEM PLANNING PACKAGE (WASP) FOR IMPROVING POWER POOLING ANALYSIS

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by

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FOREWORD

This report concerns the use of the Wien Automatic System Planning Package (WASP) model, modified to meet the needs of the Florida Public Service Commission for improving power pooling analysis. It is important to note that the Tennessee Valley Authority (TVA) has developed and has the proprietary rights to the WASP model. Any commission, agency or other potential user of this model or any modifications thereof must first secure the permission of the TVA for its use.

This report was prepared by Dr. Shoichiro Nakamura and Mr. Spyridon Tzemos of The National Regulatory Research Institute (NRRI) under Contract No. EC-77-C-01-8683 with the U.S.Department of Energy (DOE), Economic Regulatory Administration, Division of Regulatory Assistance. The opinions expressed herein are solely those of the authors and do not reflect the opinions nor the policies of either the NRRI or DOE.

The NRRI is making this report available to those concerned with state utility regulatory issues since the subject matter presented here is believed to be of timely interest to regulatory agencies and to others concerned with utilities regulation.

The NRRI appreciates the cooperation of the Florida Public Service Commission with the authors in preparing this study and for their permission to make this information available to others interested in regulatory affairs.

Douglas N. Jones
Director

EXECUTIVE SUMMARY

This report summarizes the activities that were undertaken by the National Regulatory Research Institute (NRRI) in fulfillment of the Florida Technical Assistance Project for Power Pooling Studies under Contract No. EC-77-C-01-8683 with the U.S. Department of Energy (DOE). The work consisted of four tasks that were jointly agreed to by the Florida Public Service Commission (FPSC), NRRI and were approved by DOE.

The Wien Automatic System Planning (WASP) computer model was developed at the Oak Ridge National Laboratory for use by the International Atomic Energy Agency. Although WASP was originally intended to be used for optimal electric system expansion planning in underdeveloped or developing countries, the program was also adopted for use by several public utilities and state agencies in the United States. This trend necessitated the modifications made in this project so that WASP could best fit the needs of the Florida Public Service Commission.

The modifications made to WASP have improved the original version in the following ways:

1. A large generating system can now be represented adequately; and as a result, WASP can be used in power pooling studies on a state or regional level.

2. The accuracy of reliability calculations was increased so that the very small loss of load probabilities (high reliabilities) of aggregated generation systems can be estimated more precisely.

3. The cost algorithm was modified to provide the option of simulating investor-owned utilities accounting practices. Therefore, WASP results were compatible to those of private utilities, and the program can be used for comparative checks.

4. The input data algorithms were modified so that outages of generating units could be more precisely represented. Also, system load description data can be retrieved from the public utilities' data in an easier and more accurate way.

The modified WASP code was extensively tested with satisfactory results. During the on-site testing, further modifications were made in order to adapt the program to FPSC's computer facilities in the optimum way. The program algorithms were analyzed in detail so that FPSC's staff could gain adequate insight into the program and learn to use it properly. This modified version of WASP was made operational on the FPSC computer system in May of 1979.

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CHAPTER 1

INTRODUCTION

Background

In April 1978, the Florida Public Service Commission (FPSC) responded to a solicitation by NRRI described in the Regulatory Assistance Program brochure with a request for technical assistance in the general research area of power pooling. At that time, the FPSC had recently acquired the Wien Automatic System Planning (WASP) model and was concerned with its direct applicability to conditions in Florida. The original intent for selecting WASP was to fulfill the FPSC responsibility under the Power Plant Siting Act, the Grid Bill, and general rate case investigations. After examination of the model, staff members of the FPSC concluded that WASP needed modification and identified several elements of the internal program that would have to be redesigned if the model were to satisfy the needs of the Commission.

The Request for Technical Assistance

The FPSC turned to the National Regulatory Research Institute (NRRI) for technical assistance and submitted a statement of needs and requirements in April 1978. Specifically, the FPSC statement requested the following modification to the WASP code:

1. Change the form of load data input from fifth order polynomial to point-wise data.
2. Add an option which produces a levelized annual fixed charge.

3. Increase the limit of total number of units to 200, or 240 if possible.
4. Add an option to allow the user to specify seasonal maintenance by input.
5. Incorporate the forced outage rate as a function of age of the plant.
6. Evaluate the possibility of increasing the accuracy in dealing with spinning reserve.
7. Evaluate the possibility of increasing the accuracy of LOLP (loss-of-load-probability).

The project was selected for support by the NRRI with funds provided by the U.S. Department of Energy (DOE) in October of 1978. Dr. Shoichiro Nakamura, a professor of Nuclear Engineering at The Ohio State University and a recognized authority on WASP, was selected to provide the technical assistance to the FPSC. A meeting was held at the FPSC in November of 1978 with the purpose of producing a work plan that would satisfy the staff and the program objectives of NRRI.

<u>Development of the Work Plan</u>

As a result of that meeting, a work plan was developed that was agreed to by the staff of the FPSC and the NRRI project team. The objective of the technical assistance effort was to modify the WASP model and the codes in accordance with the seven project items listed in the Commission's request for assistance. Among the seven items requested by the FPSC, items (1), (2), (4), and (5) were relatively simple, while items (3), (6), and (7) required careful study before starting any alteration of WASP. Item (3) was considered logical from the programming point of view but could increase the core storage requirement significantly. Therefore, item (3) needed prior evaluation of the increased requirement for core space and compatability with the FPSC computer. Item (7) needed evaluation as to whether it was possible to accomplish this modification with the existing version of WASP. Item (7) was viewed as possible by adopting the piecewise polynomial developed previously at The Ohio State University. However, its compatability with WASP had to be evaluated in terms of memory requirements and increased computational time.

The NRRI project team then proceeded to implement the technical assistance through a program composed of four tasks.

Task One: Evaluation of Feasibility of Modifications

At the end of Task One, it was necessary to assess:

a. what the expanded number of generating units to be included in the program must be;
b. whether it is possible to modify the spinning reserve treatment;
c. whether the piecewise linear approximation should be incorporated into the existing WASP program.

Task Two: WASP Modifications

The purpose of this task was to reprogram WASP on The Ohio State University computer. This effort includes debugging and a series of alterations to the card decks of WASP.

Task Three: On-site Technical Assistance

The modified WASP was tested extensively on The Ohio State University computer to make sure the code worked properly with all different types of user's input. After completing tests of WASP on The Ohio State University computer, the program will then be tested on FPSC's computer to make certain all the programs are operational. If any problems are encountered during the test, WASP will be readjusted for the FPSC computer. Therefore, a representative from NRRI will be made available for on-site consultation and assistance.

Task Four: Documentation of the Program Modifications

The modifications made to the program are to be clearly written and submitted to the staff of the FPSC.

The work plan specified that the NRRI project team produce three reports to be submitted to the FPSC. The first report was to contain research findings on (a) the number of generating units to be included in the program; (b) whether it is possible to modify the spinning reserve treatment; and (c) whether the piecewise linear approximation should be incorporated into the existing WASP program.

This first report was submitted to the FPSC in February of 1979 and required their formal approval before further work was continued on the project. A copy of the first report can be found in Appendix A of this final report. A second brief verbal report was provided to the FPSC by telephone relating the progress of modification and testing underway at The Ohio State University. The work plan also called for a final report to document in detail the results of the technical assistance effort, the modifications made to the code, and the nature of the reprogramming required of the WASP model. This document satisfied the final report requirement of the work plan and is presented as evidence of that effort.

Those readers not familiar with the original documentation and operation of WASP will better understand this report if References 1 and 2 in the bibliography are consulted.

CHAPTER 2

IMPLEMENTATION OF THE WORK PLAN

This chapter summarizes the work performed as described in the implementation of the first three tasks of the work plan. Each task description is presented followed by a description of the activities associated with the implementation of that task. Where the presentation of material such as computer programs or documentation is found to be inappropriate, that material is cited in an attached appendix.

<u>Task One: Evaluation of Feasibility of Modifications</u>

> The contractor will evaluate the feasibility of performing the WASP modifications suggested by FPSC within the time and budget constraints of this project.

The Wien Automatic System Planning (WASP) code was designed to determine the optimal generation expansion plan for an electric utility generating system. FPSC acquired WASP to fulfill their responsibility as described under the Power Plant Siting Act, Grid Bill and general rate case investigations. In order to apply WASP to these legislative requirements more effectively, FPSC requested the following modifications to the code:

1. Change the form of the load data input from fifth order polynomial to point-wise data.
2. Add on option by which the depreciation of generating plants is accounted for by a fixed charge rate rather than by salvage values.

3. Increase the limit of total number of units to 200, or 240 if possible.
4. Add on option to allow the user to specify seasonal maintenance by input.
5. Incorporate the forced outage rate as a function of age of the plant.
6. Evaluate the possibility of increasing the accuracy of LOLP (Loss-of-Load Probability).
7. Evaluate the possibility of increasing the accuracy in dealing with spinning reserve.

The first six modifications were determined to be feasible and were implemented under Task Two. Research on the seventh modification indicated that a more accurate treatment of spinning reserve was possible only if the current two-block representation of each generating unit was changed to three-block representation. Such a change required substantial reprogramming and would cause significant increase in computational time. It was concluded that, although a more elaborate treatment of spinning reserve was possible, it could not be incorporated in WASP within the time and budget constraints of this project.

Task Two: WASP Modifications

1. Modifications to Load Input Data.

The load data were the input for the LOADSY module of WASP. The data handling algorithm of LOADSY was modified to accept point-wise representation of the Load Duration Curve (LDC). Up to 1000 points may be assigned by the user for the LDC representation. Since the computing time of LOADSY was not affected significantly by the number of points of LDC, it was recommended that the maximum number of points, namely 1000, be used for the best accuracy.

A detailed technical description of the LOADSY algorithm is presented in Appendix B, while the input format changes are listed in Appendix C.

2. Fixed Charge Rate Option in Capital Cost Calculations.

The capital cost component of electric generation by an expansion schedule is calculated in the DYNPRO module. The optimization was performed for a finite study period. (Under the original WASP assumption the remaining value of the plants, after the study period, is taken into consideration by assigning a salvage value at the end of the study period to each expansion alternative.)

The DYNPRO algorithm was modified to make the salvage value calculation optional and provide a Fixed Charge Rate (FCR) option that accounted for generating unit depreciation in accordance with private utility accounting procedures. The FCR was the factor which, "when multiplied by the capital cost of a facility, produced a levelized annual fixed charge reflecting return on investment, depreciation, taxes, insurance, retirement dispersion, and investment." [1]

In the modified DYNPRO version, the total cost of an expansion configuration is based on the sum of:

a) the present worth of the total operating cost for all generating units during the study period;

b) the present worth of the fixed charges of all generating units that were added to the system during the study period.

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[1] Page 7 in Reference 3 in the bibliography.

The fixed charges for each added generating unit were calculated for the life of the unit. The fixed charge rate is a user specified parameter.

A more technical description of the DYNPRO modifications is included in Reference 3 in the bibliography. The necessary input data changes are described in Appendix C. Table 1 shows the results of sample WASP runs with and without the FCR option. The input data used were identical to those for the predetermined run of Case 26 [2] except for the FCR option.

Table 1

Objective Function for Case 26 With and Without the FCR Option

YEAR	OBJECTIVE FUNCTION (Thousands of Dollars)			
	No FCR	12% FCR	15% FCR	18% FCR
1982	926,130	1,044,330	1,140,266	1,236,201
1986	2,406,457	2,781,345	3,052,569	3,323,793
1990	3,831,580	4,387,459	4,803,992	5,218,662
1994	5,296,328	6,067,640	6,664,992	7,262,343

3. Increase of the Maximum Number of Generating Units

The total number of units that can be handled by WASP was increased from 100 to 270. The sum of the total number of units specified in the fixed and variable systems (FIXSYS and VARSYS modules respectively) was limited by programming considerations to 270. Since no more than 20 expansion alternatives could be specified in the variable system, at least 250 units would always be described by the fixed system.

[2] WASP sample runs in Reference 2 in the bibliography.

The increase in core memory requirement for each module is listed in Table 2.

Table 2

Core Memory Increase Due to Change in the Maximum Number of Units in WASP

WASP MODULE	Additional Memory Requirements	
	STORAGE LOCATIONS	IBB BYTES
LOADSY	-	-
FIXSYS	170	680
VARSYS	-	-
CONGEN	680	2,720
MERSIM	9,350	37,400
DYNPRO	3,060	12,240

4. & 5. User Specification of Seasonal Maintenance Schedule and Incorporation of Forced Outage Rates as a Function of Plant Age.

Although modifications 4 and 5 are mentioned separately in Task One, they are described here simultaneously because they both are accomplished by the same auxiliary program.

Availability probability of a generating unit is defined as the probability a unit will be available when it is called to generate power. Thus, both scheduled maintenance and changes of the unit's forced outage rate affect the unit's availability probability. Since the system's LOLP calculation is based on the availability probability of each unit, the LOLP changes when the availability probability is modified.

The availability probability was originally defined in CONGEN as

$$P = 1 - FOR/100 \qquad (1)$$

where P: generating unit availability probability

FOR: generating unit forced outage rate.

Hence, the maintenance outage effect was not taken into consideration.

Auxiliary program MATURE was written to create an adjusting factor for each generating unit availability probability so that it incorporated both scheduled maintenance effects and forced outage rate maturity with unit age.

The maintenance schedule for each unit is specified by the number of days required for maintenance in each period (usually four periods per year with a maximum of 12) of every year studied. An adjusting factor to the availability probability P, defined by eq. (1), is calculated as:

$$PAD = \left(1 - \frac{DAYS}{365/NPER}\right) \cdot PMATUR \qquad (2)$$

where PAD: availability probability adjusting factor for each unit, each period of the year, for every year studied.

DAYS: number of days of scheduled maintenance for each unit, each period of the year, for every year studied.

PMATUR: forced outage rate adjusting factor for each unit, each year.

NPER: number of periods per year.

The default value for the adjusting factor PAD is 1.0. MATURE stores PAD in the MATURE.MAINT binary file through logical unit 35.

The modified CONGEN module of WASP (PWCONGEN, described in the next section) reads the PAD adjusting factors from the MATURE.MAINT binary file and applies them to each unit's availability probability. The adjusted availability probability is:

$$p' = p \cdot PAD \tag{3}$$

where p': the adjusted availability probability for each unit, in each period, for every year studied.

p: as defined in eq. (1).

PAD: as defined in eq. (2).

Use of p' for LOLP calculation is a user option. Forced outage rate maturity adjustments for expansion candidates cannot be used in optimization runs but only in predetermined runs. This is because the *a priori* knowledge of the year when an expansion candidate comes in service is required for the compilation of the MATURE input data. Only then, is it possible to know the unit's age at each year of the study and make the necessary forced outage rate maturity adjustments. The same is true for scheduled maintenance since maintenance scheduling is possible only when the system generation mix is known. Forced outage rate maturity adjustments for the existing units are always meaningful because their age is always known.

Description of MATURE input data is provided in Appendix C.

6. Accuracy Increase in LOLP calculation

The accuracy of LOLP calculated by WASP was improved by switching the Fourier expansion of load curves originially used in the probabilistic simulation in CONGEN, to the piecewise polynomial expansion. The new version of CONGEN is henceforth called PWCONGEN (Piece-Wise CONfiguration GENerator). The effect of the maintenance outage was also incorporated into the LOLP calculation of PWCONGEN. The probabilistic simulation in

MERSIM was not changed but still used Fourier expansions for the following reasons: (1) the major objective of MERSIM was to calculate electric energy generated by each generating unit; (2) since MERSIM uses two-capacity block representations of generating units, the use of piece-wise polynomial would substantially increase the total computing time; (3) having taken into consideration the maintenance outage effect in PWCONGEN, the LOLP calculated by PWCONGEN was theoretically equivalent to that by MERSIM; (4) the Fourier expansion provided sufficient accuracy to the energy calculations in MERSIM. The piecewise polynomial used in PWCONGEN did not increase the computing time considerably because energy generation was not calculated.

The accuracy of PWCONGEN was checked against a special case (a system consisting of identical units) where LOLP could be calculated analytically. The results of this comparison are shown in Table 3. The running time of PWCONGEN was compared with the original CONGEN. The results are listed in Table 4.

PWCONGEN also includes the option of adjusting the availability probability of the generating units; thus LOLP can be calculated with consideration for the effects of scheduled maintenance and forced outage rate maturity.

A detailed technical description of PWCONGEN is provided in Appendix B, while the input data description is given in Appendix C.

Task Three: On-Site Technical Assistance

> The contractor will test the modified WASP on FPSC's computer in order to make certain all programs tested at The Ohio State University work at FPSC.

Table 3

PWCONGEN Reliability Check

Number of Identical Plants	Number of Points for LDC Inversion	LOLP for Period 1					LOLP for Period 2				
		Exact	CONGEN		PWCONGEN		Exact	CONGEN		PWCONGEN	
		%	%	% Error	%	% Error	%	%	% Error	%	% Error
9	1,000	0.61514	0.6014	2.233	0.6151	$<10^{-4}$	1.95412	2.0895	6.928	1.9541	0.0005
9	500				0.6138	0.218				1.9510	1.159
13	1,000	0.11349	0.1203	6.000	0.1135	1.026	0.68860	0.6982	1.394	0.6883	0.042
13	500				0.1131	0.343				0.6856	0.435

Table 4

Running Time Comparison Between CONGEN and PWCONGEN*

Number of FIXSYS Units	CONGEN CPU Seconds	PWCONGEN Run 1 CPU Seconds	PWCONGEN Run>1 CPU Seconds
7	1.68	15.50	12.00
110	2.68	68.93	14.78
220	4.04	131.60	14.98

* VARSYS and LOADSY are identical in all cases.

The modified WASP package was transferred and tested by NRRI staff on FPSC's computer during the week of May 14-19, 1979. Several changes were necessary due to differences between the FORTRAN compilers of the OSU's AMDAHL and the FPSC's CDC computers.

The CDC's single precision representation of real numbers is equivalent to the double precision of AMDAHL. Therefore, all double precision variables were changed to single precision to avoid unnecessary core memory utilization. Accuracy tests on the CDC computer at the FPSC gave the results listed in Table 5.

Table 5

Results of PWCONGEN Accuracy Tests on FPSC's CDC Computer

LOLP %	% ERROR
0.02	1.0
0.002	3.0
0.000008	6.0

Running procedures were demonstrated during the test at FPSC. All WASP modifications were carefully checked, and detailed instructions with regard to the modifications were given to the FPSC's staff. Additional details for the on-site testing of WASP are provided in Appendix E.

Task Four: Documentation of the Program Modifications

> The contractor will prepare documentation of all modifications made to the code, alterations to input and output format, if any, and results of tests.

A detailed documentation of the WASP modifications is presented in Appendix B. The input data changes are described in the procedure manual contained in Appendix C, while the results of the test runs are listed in Appendix D. Appendix E contains the report for the on-site testing of modified WASP.

CHAPTER 3

SUMMARY AND CONCLUSIONS

In power pooling studies, several public utilities are combined to form an aggregate electricity generating system. Such a system contains a large number (often greater than 100) of generating units. The original WASP model could accurately represent only up to 100 units. This constraint was relaxed and the modified WASP can handle up to 270 units, rendering it capable of representing large generating systems.

The loss-of-load-probability (LOLP) calculation by the original WASP was of questionable accuracy and abnormalities were experienced at small LOLP values. These defects were corrected in the modified WASP through the use of a piecewise linear approximation in the algorithm for LOLP calculation. Thus WASP can now be used to analyze power pools that exhibit high reliabilities where such an analysis with the original version would have been of questionable validity because of inaccuracies in the calculation of small LOLP values. Consideration of pollution control in dispatching and individual commitments of the public utilities may make the WASP generated maintenance schedule inapplicable in actual operating conditions. For this reason, the modified WASP provides an option for user specified maintenance schedules. Furthermore, the availability of the generating units can be more accurately represented by providing an option to make adjustments to unit availability because of maturity.

The user options for scheduled maintenance specification, unit availability adjustments for maturity, and fixed charge rate cost calculations in accordance with standard utility practices make the modified WASP compatible with expansion planning models that are currently in use. Therefore, public utility regulatory commissions can utilize WASP to verify the accuracy of the expansion planning models used by investor-owned utilities.

The extensive on-site testing of WASP provided FPSC staff with the necessary insight into the program so that the results can be correctly interpreted and utilized with confidence. A thorough understanding of the program algorithms is one of the major advantages of WASP when compared with other commercially available expansion models (such as the General Electric or the Westinghouse models) where the algorithms are proprietory. The FPSC is now in position to verify the validity of the results of expansion planning models submitted by public utility companies in support of their need for additional power plant construction.

Public utility regulatory commissions can use WASP to estimate the cash requirements for expansion of the electricity generating system. This information is necessary for power pooling financial analysis and in rate case investigations when corporate finance models (such as RAM-finance) are utilized to determine the cost of electricity.

Although the modifications made to WASP during this project have greatly increased its usefulness to public utility regulatory commissions, time and budget considerations limited the making of additional modifications. Several improvements were identified and endorsed by the FPSC staff and the NRRI project team. Four major modifications were identified that could further enhance WASP.

1) The existing WASP literature is fragmented and outdated. The input data descriptions, although precise, provide no details on data compilation procedures and no information for their proper use or correct interpretation of the final results. Therefore, a substantial effort is required to update and combine the existing literature into a user oriented manual that would contain:

a) Detailed algorithm description;

b) Precise input data requirements;

c) Data sources and proper usage of input data;

d) Sample parametric sensitivity analysis so that the dependence of the output results on the various input parameters can be realized.

2) Research and further modifications are needed in the generating unit's depreciation algorithm in order to increase its accuracy and computational efficiency.

3) A financing feasibility constraint should be incorporated in WASP to assure that the projected optimum expansion plan is within the utility's financing capabilities. Such considerations would also increase computational efficiency by avoiding detailed simulation of expansion configurations that are not feasible.

4) Transmission limitations of utility interconnections should be incorporated in WASP so that power pools can be analyzed more realistically.

Confidence in the use of WASP by state utility regulatory commissions would be greatly enhanced by arranging for on-site technical assistance from experienced WASP users. The new capabilities of the modified WASP and the experience gained by the FPSC staff during the on-site testing gave them the necessary confidence in the operation of the program so that it could be used in an upcoming rate case. NRRI and FPSC staff agreed that similar on-site technical assistance or WASP workshops would be extremely valuable to other state utility regulatory commissions interested in the use of WASP as a regulatory analysis tool.

BIBLIOGRAPHY

(1) Jenkins, R.T., and Joy, D.S., Wien Automatic System Planning Package (WASP) - An Electric Utility Optimal Generation Expansion Planning Computer Code, ORNL - 4945, July 1974.

(2) WASP - 2B (version 76-1) User's Manual. International Atomic Energy Agency, September 1976.

(3) Anderson, B.A. Modifications to Augment Private Utility Use of the Wien Automatic System Planning Package. Proceedings of the WASP Users Conference. Columbus, Ohio: The Ohio State University, August 18-19, 1977.

APPENDIX A

First Report

of

Technical Assistance in Power Pooling

for

The Florida Public Service Commission

submitted by

S. Nakamura

1.0 Introduction

This report describes the research findings on the following three subjects as specified in the Approved Work Plan for The Florida Public Service Commission:

a) the number of generating units to be included in the program;

b) whether it is possible to modify the spinning reserve treatment; and,

c) whether the piecewise linear approximation should be incorporated into the existing WASP program.

2.0 Findings and Conclusions

2.1 The Number of Generating Units to be Included in the Program

Examination of the WASP program has shown that the limit of total number of units can be easily increased to 240. Therefore, we will increase the limit to 240 as originally requested by FPSC.

2.2 The Spinning Reserve Treatment

A more elaborate treatment of spinning reserve requires a three-block representation of each generating unit as opposed to the current two-block representation. In order to change the current two-block representation to three-block representation, a substantial reprogramming is necessary. The computational efficiency from such a change will be significantly sacrificed. We conclude that, while a more elaborate treatment of spinning reserve in WASP is not impossible, it cannot be incorporated within the time and budget constraint of the present project.

However, we suggest that the FPSC can incorporate the effect of spinning reserve approximately through the loading order of base and peaking block of units.

2.3 Use of Piecewise Linear Approximation

Piecewise linear approximation provides much better accuracy for the probabilistic simulation that calculates loss-of-load probability and energy generation by each generating unit than the Fourier expansion that is currently used. FLSC has requested us to investigate the feasibility of replacing the Fourier expansion in WASP by the piecewise approximation.

Our computational study during December indicates that the piecewise linear approximation is several times more time consuming than the Fourier expansion if Fourier expansion in WASP is entirely replaced by the piecewise linear approximation. However, the accuracy of WASP can be increased significantly with little increase in computing time if piecewise polynomial approximation is adopted only in part of WASP. This is the case if only LOLPs for a large number of alternative configurations in one period are to be calculated. The former is the case in the subroutine MERSIM (Merge-Simulation subprogram) and the latter in the subroutine CONGEN (Configuration Generating subprogram). Based on this finding, we propose that the piecewise polymonial approximation be used in CONGEN while the Fourier expansion be retained in MERSIM. We also propose to incorporate the maintenance outage effect in the probabilistic simulation calculation in CONGEN.

Since no energy is calculated in CONGEN, the last equivalent load curves, all the alternative configuration in a period may be obtained only by convolution and deconvolution of a few units except the first alternative configuration. The computing time required for convolution or deconvolution is small compared with that of an entire calculation. Therefore, the increase of computing time by adopting piecewise polynomial is minimal. CONGEN filters out those configurations that do not satisfy the LOLP test. If LOLP is calculated accurately in CONGEN, all the configurations passed to MERSIM have satisfied the LOLP test. Therefore, the user can rely on LOLP calculated in CONGEN rather than that calculated in MERSIM. In increasing the accuracy of LOLP calculation in CONGEN, incorporation of maintenance outage effect is essential.

3.0 Conclusion

The limit to the total number of units incorporated into WASP will be increased to 240.

No modification of WASP with regard to spinning reserve will be attempted in this study.

Piecewise polymonial approximation will be adopted in CONGEN in conjunction with maintenance schedule to increase the accuracy of the LOLP calculation.

APPENDIX B

B.1 LOADSY Technical Description of Program Modifications

Originally, the load data were supplied to the LOADSY module as a normalized Load Duration Curve (LDC) expressed by a fifth order polynomial. This representation of LDC was transformed into a point-wise linear representation by subroutine LOADS and stored in the TLD array which is defined as

$$TLD_j = \sum_{i=0}^{5} C_i X_j^i \qquad j = 1, NTH \qquad (1)$$

where $$X_j = (j-1) \cdot \left(\frac{1}{NTH}\right) + \tfrac{1}{2} \qquad (2)$$

TLD_j: fraction of peak load at the jth point

X_j: fraction of a period at jth point

C_i: ith coefficient of fifth order polynomial $(i = 0 - 5)$

NTH: number of points used for discretization

The original LOADSY algorithm used a fixed value of 720 for NTH.

In the modified LOADSY module, the input of LDC may be given directly in point-wise data ($NTH \leq 1000$) for each period of the year. The input data for all periods are stored in the POL array. The load data of each period is transferred into the TLD array in subroutine LOADS.

The fifth order polynomial representation of LDC still remains an option in the modified LOADSY. Two additional modifications were made in LOADSY in order to facilitate the probabilistic simulation in PWCONGEN.

a) The number of points used for the inversion of the LDC, called INVERT, can be specified by the user. INVERT must be less than or equal to 1,200.

b) The inverted load duration curve (calculated in COEFF subroutine and stored into the TLOD array) is transferred into binary disk file LOADDATA through logical unit 22.

B.2 FIXSYS

The required increase of the number of units that can be handled by WASP led to the following changes in FISXYS:

1) Executable line 5:

DIMENSION MWC (101)

was changed to

DIMENSION MWC (271)

2) Executable line 70:

IF(NFP-100) 18,18,15

was changed to

IF(NFP-270) 18,18,15.

B.3 VARSYS

No modifications were necessary in VARSYS.

B.4 MATURE

A flow chart of the MATURE program is shown in Figure B.1.

B.5 CONGEN

The following changes in dimensions were made:

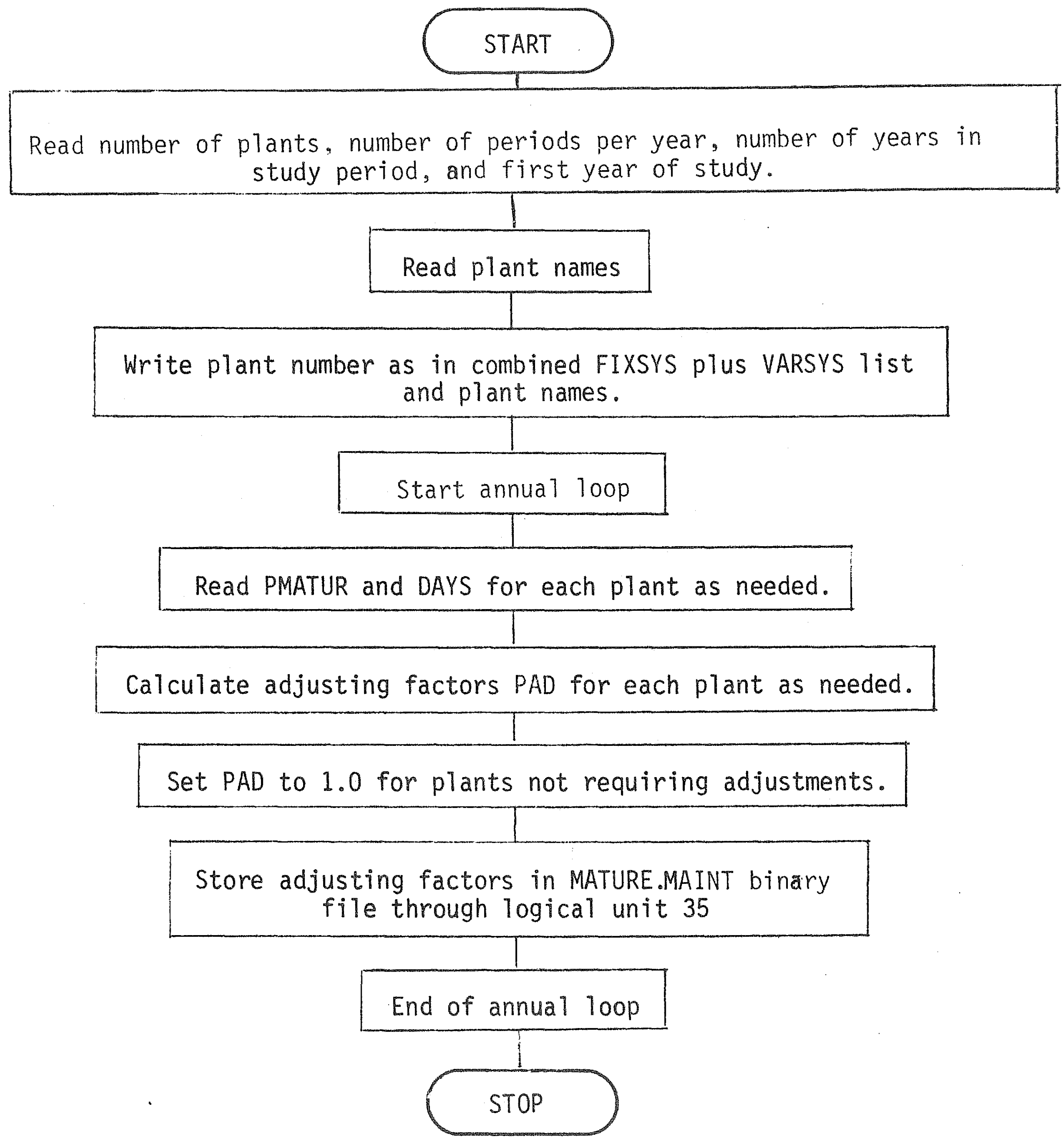
FOR (101) was changed to FOR (271)

NSETS (101) was changed to NSETS (271)

MWC (101) was changed to MWC (271)

NTYPE (101) was changed to NTYPE (271)

Figure B.1
MATURE Flow Chart



B.6 PWCONGEN

Probabilistic simulation successively generates Equivalent Load Duration Curves (ELDC) through convolutions. The jth ELDC is defined by the recurrence relation

$$ELDC_j(x) = p_j \cdot ELDC_{j-1}(x) + (1-p_j) \cdot ELDC_{j-1}(x-C_j) \qquad (3)$$

where $ELDC_j(x)$: the jth equivalent load duration curve

P_j: the jth unit availability probability

C_j: the jth unit capacity

The ELDC for j=0 is the original inverted load duration curve (also called load probability curve). After all N units in the system are convolved, LOLP is found as

$$LOLP = ELDC_N(X_c) \qquad (4)$$

where LOLP: generating system's loss-of-load probability

$ELDC_N(X)$: the Nth equivalent load duration curve

X_c: the system capacity

PWCONGEN uses eq.(3) to calculate each successive ELDC numerically using the piecewise linear representation of ELDC. This calculation is performed in subroutine PWADD.

Function PWFUN of PWCONGEN utilizes eq.(4) to find the system LOLP for each prospective expansion configuration.

A PWCONGEN run consists of two steps. In the first step the ELDC, convolving all the units of the fixed system, is generated and stored in the binary disk file FIXELDC through logical unit 32. In the second step, the fixed system ELDC is read from FIXELDC and the expansion candidate units are convolved. The LOLP for each expansion configuration is then calculated.

The two-step approach of PWCONGEN saves computing time because ELDC for the fixed system is calculated only once during the WASP optimization process. This is especially important when the fixed system involves a large number of units. The size of the array to store the ELDCs is limited to 3,000. If the normalized original inverted load duration curve is represented by the number of points "INVERT," then the maximum number of points for the final ELDC curve is

$$\text{MAXIMU} = \text{INVERT} \cdot \left(1 + \frac{X_c}{\text{Peak}}\right) \qquad (5)$$

where MAXIMU: maximum number of points in ELDC representation

INVERT: number of points for the representation of the inverted load duration curve

X_c: system capacity in MW

PEAK: system period peak in MW

If the maximum reserve margin specified in PWCONGEN is RES percent, the maximum system capacity allowed by the PWCONGEN reserve margin constraints is

$$X_{max} = \text{PEAK} \cdot \left(1 + \frac{\text{RES}}{100}\right) \qquad (6)$$

Replacing X_c in eq.(5) with X_{max} from eq.(6) yields

$$\text{MAXIMU} = \text{INVERT} \cdot \left(2 + \frac{\text{RES}}{100}\right) \qquad (7)$$

Both INVERT and RES are specified by the user and must be chosen so that the following constraints are satisfied:

$$\text{INVERT} \leq 1{,}200 \qquad (8)$$

$$\text{MAXIMU} \leq 3{,}000$$

As INVERT is increased, the accuracy of the probabilistic simulation becomes higher but consumes more time. The effect of INVERT on LOLP accuracy and running time is shown in Table B.1.

The flow chart of subroutine PWLOLP is shown in Figure B.2.

B.7 MERSIM

Two kinds of modifications were made in MERSIM.

a) The dimensions of the following arrays were changed:

Main Program

The dimensions of the arrays, MWB, MWC, ENERGY, NAME, NTYPE, MAINT, MAINCL, FOR, OMA, OMB, BHRT, FCST, FCSTF, CRMHRT, NSETS, LOCATN were changed from 101 to 271. The dimensions of arrays, AVLBTY, NOSETS, USBSF, UCBSL, UINCF, UINCL were changed from 100 to 270. Arrays, LORDER(200), NCONS(500), NORDER (500), PMAINT (100,12), INAME (202), ICLAS (202) were changed to LORDER (540), NCONS (1350), NORDER (1350), PMAINT (270,12), INAME (542), ICLAS (542).

Subroutine MAINTN

Arrays, MWC(101), NOSETS(100) were changed to MWC(271), NOSETS(270).

Subroutine ANSIM

Arrays, MWCS(100), MWBS(100) were changed to MWCS(270), MWBS(270).

Subroutine SIMUL

Arrays, ENGB(101), ENGP(101), EGEN(101), EPPK(101), NSETS(100), MWCS(100) were changed to ENGB(271), EPPK(271), NSETS(270), and MWCS(270).

Table B.1

Effect of INVERT on LOLP Accuracy and Computing Time

YEAR	INVERT	LOLP (%) CONGEN	PWCONGEN	
1980	200		0.00035	
	500		0.00035	
	1,000	0.00789	0.00035	
1985	200		0.01619	
	500		0.01620	
	1,000	0.02133	0.01621	
1990	200		0.05153	
	500		0.05160	
	1,000	0.07559	0.05163	
1994	200		0.07512	
	500		0.07493	
	1,000	0.09894	0.07498	
Total CPU Time (Seconds)				
			Run 1	Run 2
	200		3.64	3.84
	500		8.05	7.01
	1,000	1.68	15.50	12.00

Figure B.2.
Flow Chart for Subroutine PWLOLP

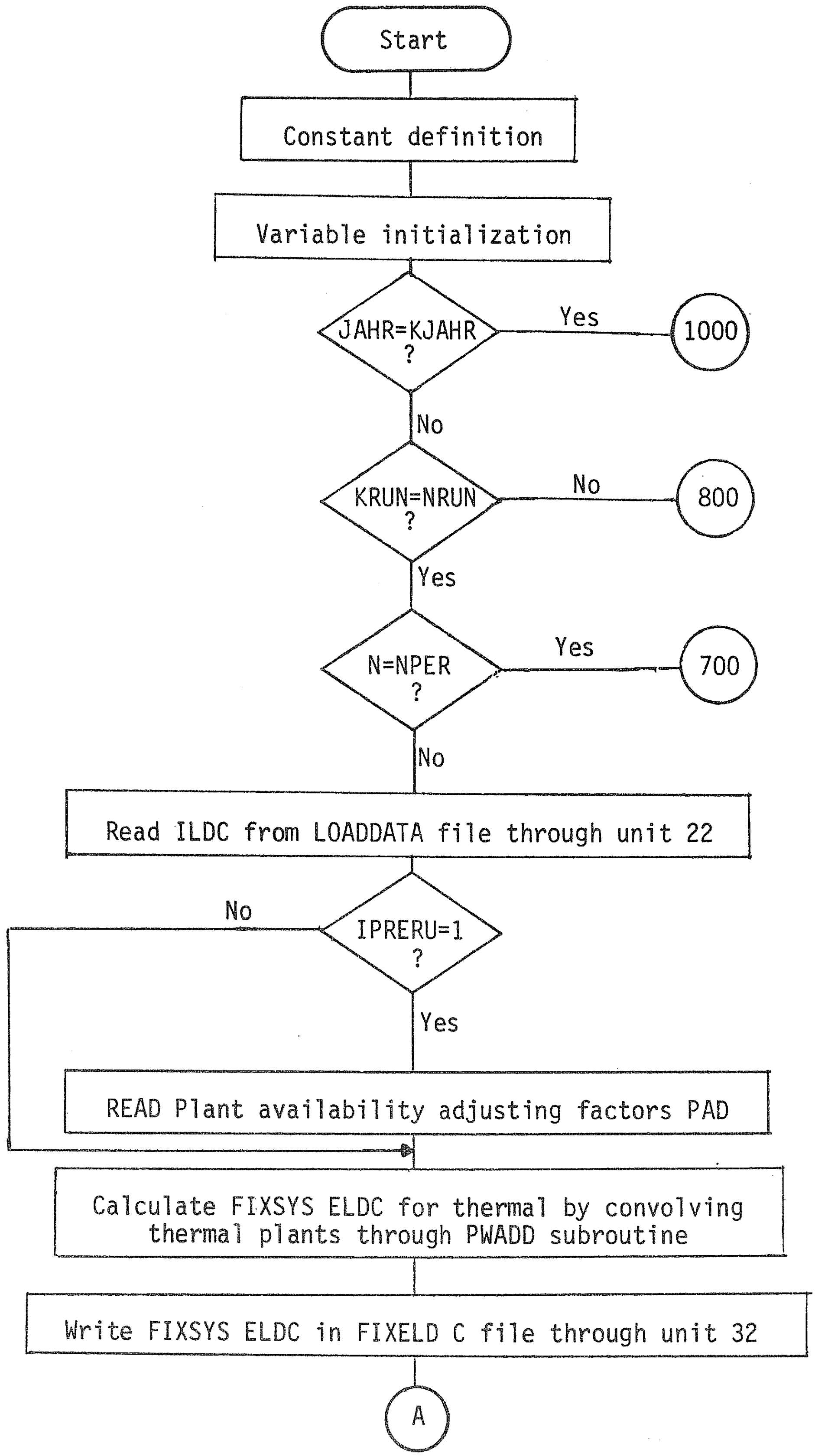


Figure B.2 (Cont'd)

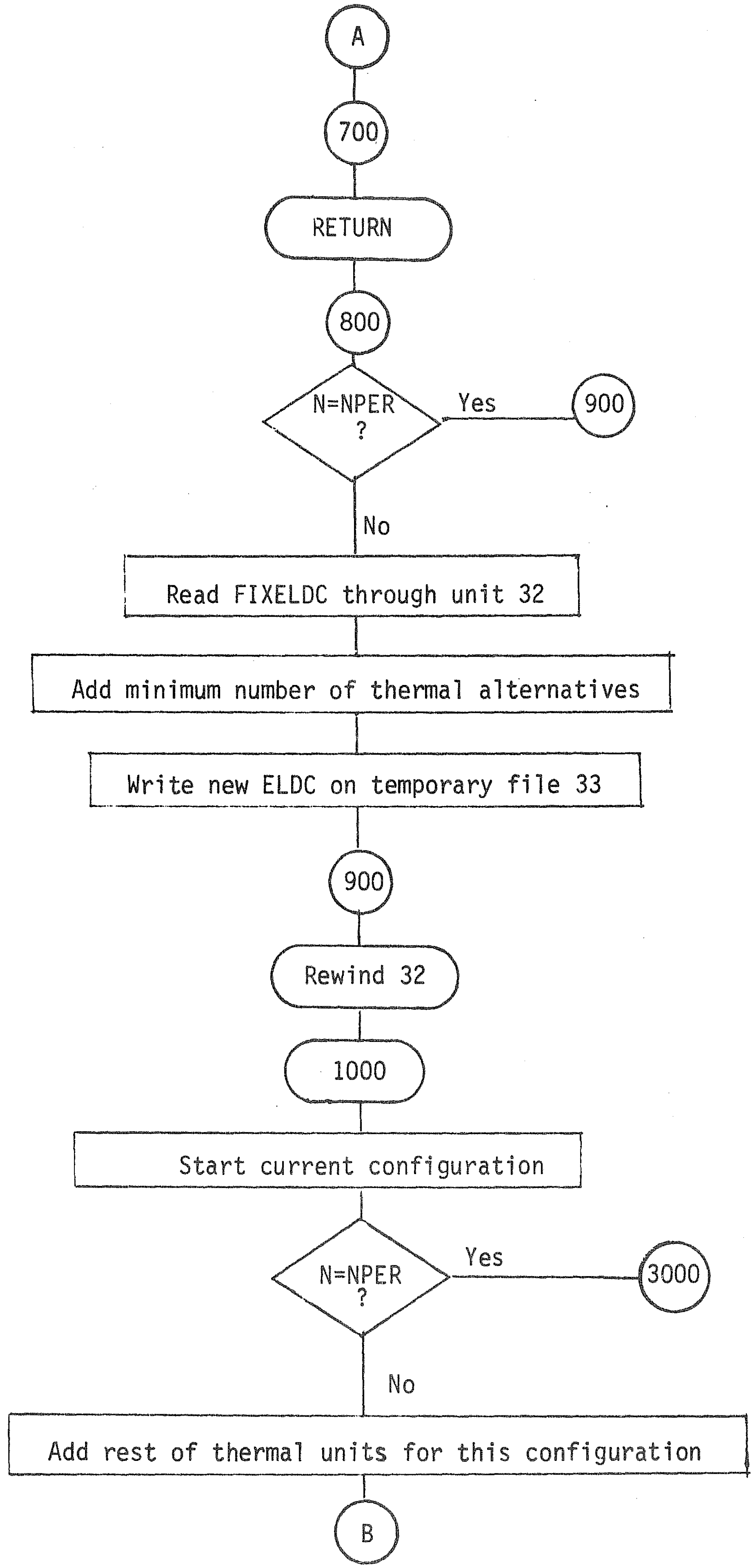
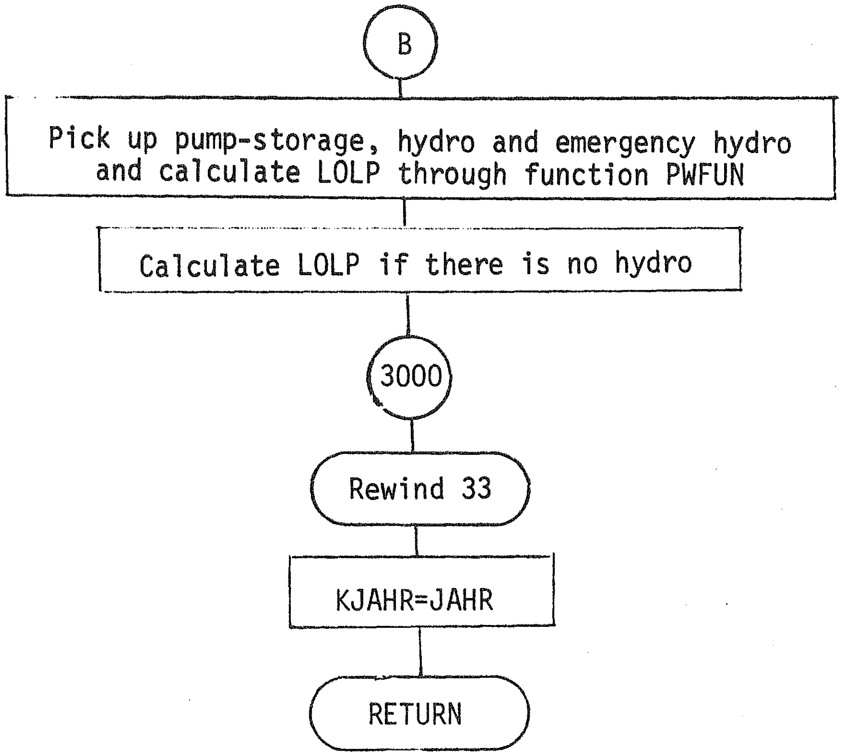


Figure B.2 (Cont'd)



Subroutine HYDALL

Array, NLIST(500), was changed to NLIST(1350).

Subroutine MILORD

The dimensions of arrays, MWCS, MWBS, DMWC, DMWB, and DSMW were changed from 100 to 270.

b) The control variable NUMRUN was inserted after executable statement 32 in the MAIN program. At the first MERSIM run for a specific set of FIXSYS, VARSYS, and LOADSY, NUMRUN must be 1. At any subsequent run, NUMRUN ≠ 1. This control variable eliminates the need for an initial creation of a "null" binary disk file 16.

B.8 DYNPRO

Two kinds of modifications were made in DYNPRO.

a) Array dimension changes.

Main program

The dimensions of the arrays, PLIFE, NAME, NTYPE, MWC, COSTL, COSTF, COST2L, and COST2F were changed from 101 to 271. In relation to this, the 12th executable statement was changed from

```
DO 1ØØ I = 1, 1Ø1
```

to

```
DO 1ØØ I = 1, 271
```

Subroutine CAPITL

Array, NTYPE(101), was changed to NTYPE(271).

b) The fixed charge rate option was incorporated in DYNPRO as described in Ref. (3) in the bibliography of the main report.

Appendix C

Modifications to WASP-2B User's Manual

CONTENTS

The modifications described in this appendix refer to the "User's Manual for WASP-2B" (also known as WASP-2, version 76-1). See Reference 2 in the Bibliography of the main report.

C.1. Job Control Language (JCL) Modifications

1) The first part of Figure 2.1, creating a "null" SIMULNEW file, is not necessary.

2) Figure 2.3 should be replaced with Figure C.1. There are two substantial differences between the two tables other than those necessary because of differences between IAEA's and OSU's computers:

   a) LOADSY JCL of modified WASP-2B require binary file 22 (LOADDATA)

   b) PWCONGEN JCL of modified WASP-2B require binary files 22 (LOADDATA) and 32 (FIXELDC).

C.2. Input Data Modifications.

C.2.1 LOADSY input data

Replace Table 2.1 with Table C.1. Card types 2 and 4 represent the load duration curve. Either of them can be used each year but not both together. If the load duration curve for a specific year is the same as for the previous year, type 2 or 4 cards are not required.

C.2.2. FIXSYS input data

There were no modifications in FIXSYS input data.

C.2.3. VARSYS input data

There were no modifications in VARSYS input data.

C.2.4. CONGEN input data

There were no modifications in CONGEN input data.

C.2.5. MERSIM input data

Add card type A∅ to Table 2.5.

Type No.	Cols.	Format	Name	Type of Information
A∅	1-4	I	NUMRUN	The first time MERSIM is run with a specific set of FIXSYS, VARSYS, CONGEN or PWCONGEN, and MATURE runs, it must be NUMRUN = 1. NUMRUN ≠ 1 for all subsequent runs.

Figure C.1
JCL for Modified WASP-2B

LOADSY JCL

```
// REGION=300K
/*JOBPARM LINES=10000
//LOADSY  EXEC  FTG1G,PARM='LET,NORES,NOMAP'
//SYSLIN  DD  DSN='TS0904.TS0904.LOADSY.OBJ',DISP=SHR
//GO.FT12F001 DD DSN=TS0904.LOADDUCU,
//    DISP=(OLD,KEEP),UNIT=USERDA,SPACE=(TRK,(1,1)),
//    DCB=(RECFM=VBS,LRECL=2292,BLKSIZE=2296)
//FT22F001 DD DSN=TS0904.LOADDATA,
// DISP=(NEW,CATLG),UNIT=USERDA,SPACE=(TRK,(60,1),RLSE),
//  DCB=(RECFM=VBST,LRECL=24048,BLKSIZE=24052)
//GO.SYSIN  DD  *
********************      LOADSY DATA      ********************
/*
//
```

FIXSYS JCL

```
// REGION=190K
/*JOBPARM LINES=10000
//FIXSYS  EXEC  FTG1G,PARM='LET,NORES,NOMAP'
//SYSLIN  DD  DSN='TS0904.TS0904.FIXSYS.OBJ',DISP=SHR
//GO.FT10F001  DD  DSN=TS0904.FIXPLANT,
//      SPACE=(TRK,(1,1)),UNIT=USERDA,
//      DCB=(RECFM=VSB,BLKSIZE=176,LRECL=172),DISP=(OLD,KEEP)
//GO.SYSIN  DD  *
********************      FIXSYS DATA      ********************
/*
//
```

VARSYS JCL

```
// REGION=190K
/*JOBPARM LINES=10000
//VARSYS  EXEC  FTG1G,PARM='LET,NORES,NOMAP'
//SYSLIN  DD  DSN='TS0904.TS0904.VARSYS.OBJ',DISP=SHR
//GO.FT11F001  DD  DSN=TS0904.VARPLANT,
//      SPACE=(TRK,(1,1)),UNIT=USERDA,
//      DCB=(RECFM=VSB,BLKSIZE=176,LRECL=172),DISP=(OLD,KEEP)
//GO.SYSIN  DD  *
********************      VARSYS DATA      ********************
/*
//
```

Figure C.1 (Con't.)

MATURE JCL

```
// REGION=190K
/*JOBPARM LINES=10000
//MATURE  EXEC  PROC=FORTRUN
//CMP.SYSIN  DD  *
********************     MATURE PROGRAM    ********************
/*
//GO.FT35F001 DD DSN=TS0904.MATURE.MAINT,
//    SPACE=(TRK,(16,1),RLSE),DCB=(RECFM=VBS,LRECL=12960,BLKSIZE=12964),
//   DISP=(OLD,KEEP)
//GO.SYSIN DD *
********************     MATURE DATA       ********************
/*
//
```

CONGEN JCL

```
// REGION=350K,TIME=2
/*JOBPARM   LINES=10000,CARDS=10000
//CONGEN  EXEC  FTG1G,PARM='LET,NORES,NOMAP'
//SYSLIN  DD  DSN='TS0904.TS0904.CONGEN.OBJ',DISP=SHR
//GO.FT10F001 DD DSN=TS0904.FIXPLANT,DISP=(OLD,KEEP)
//GO.FT11F001 DD DSN=TS0904.VARPLANT,DISP=(OLD,KEEP)
//GO.FT12F001 DD DSN=TS0904.LOADDUCU,DISP=(OLD,KEEP)
//GO.FT13F001 DD DSN=TS0904.EXPANALT,DISP=(OLD,KEEP)
//FT23F001 DD DSN=&&A,DISP=(,DELETE),SPACE=(TRK,(4,1)),
//       UNIT=SYSDA,DCB=(RECFM=VBS,LRECL=2404,BLKSIZE=7216)
//GO.SYSIN  DD  *
********************     CONGEN DATA      ********************
/*
//
```

PWCONGEN RUN 1 JCL

```
// REGION=350K,TIME=2
/*JOBPARM   LINES=10000,CARDS=10000
//PWCON1  EXEC  FTG1G,PARM='LET,NORES,NOMAP',TIME=3
//SYSLIN  DD  DSN='TS0904.TS0904.PWCONGEN.OBJ',DISP=SHR
//GO.FT10F001 DD DSN=TS0904.FIXPLANT,DISP=(OLD,KEEP)
//GO.FT11F001 DD DSN=TS0904.VARPLANT,DISP=(OLD,KEEP)
//GO.FT12F001 DD DSN=TS0904.LOADDUCU,DISP=(OLD,KEEP)
//GO.FT13F001 DD DSN=TS0904.EXPANALT,DISP=(OLD,KEEP)
//GO.FT22F001  DD DSN=TS0904.LOADDATA,DISP=(OLD,KEEP)
//GO.FT32F001 DD DSN=TS0904.FIXELDC,
// DISP=(NEW,CATLG),UNIT=USERDA,SPACE=(TRK,(60,1),RLSE),
//   DCB=(RECFM=VBST,LRECL=24048,BLKSIZE=24052)
//FT23F001 DD DSN=&&A,DISP=(,DELETE),SPACE=(TRK,(4,1)),
//       UNIT=SYSDA,DCB=(RECFM=VBS,LRECL=2404,BLKSIZE=7216)
//FT33F001 DD DSN=&&B,DISP=(,DELETE),SPACE=(TRK,(24,1)),UNIT=SYSDA,
//   DCB=(RECFM=VBST,LRECL=24048,BLKSIZE=24052)
//GO.FT35F001 DD DSN=TS0904.MATURE.MAINT,DISP=(OLD,KEEP)
//GO.SYSIN  DD  *
********************  PWCONGEN RUN 1 DATA ********************
/*
```

Figure C.1 (Con't.)

PWCONGEN RUN 2 JCL

```
//PWCON2  EXEC  FTG1G,PARM='LET,NORES,NOMAP'
//SYSLIN  DD  DSN='TS0904.TS0904.PWCONGEN.OBJ',DISP=SHR
//GO.FT10F001 DD DSN=TS0904.FIXPLANT,DISP=(OLD,KEEP)
//GO.FT11F001 DD DSN=TS0904.VARPLANT,DISP=(OLD,KEEP)
//GO.FT12F001 DD DSN=TS0904.LOADDUCU,DISP=(OLD,KEEP)
//GO.FT13F001 DD DSN=TS0904.EXPANALT,DISP=(OLD,KEEP)
//GO.FT32F001 DD DSN=TS0904.FIXELDC,DISP=(OLD,KEEP)
//GO.FT35F001 DD DSN=TS0904.MATURE.MAINT,DISP=(OLD,KEEP)
//FT23F001 DD DSN=&&A,DISP=(,DELETE),SPACE=(TRK,(4,1)),
//       UNIT=SYSDA,DCB=(RECFM=VBS,LRECL=2404,BLKSIZE=7216)
//FT33F001 DD DSN=&&B,DISP=(,DELETE),SPACE=(TRK,(24,1)),UNIT=SYSDA,
//  DCB=(RECFM=VBST,LRECL=24048,BLKSIZE=24052)
//GO.SYSIN  DD  *
********************  PWCONGEN RUN 2 DATA  ******************
/*
```

MERSIM JCL

```
//MERSIM  EXEC  FTG1G,PARM='LET,NORES,NOMAP'
//SYSLIN  DD  DSN='TS0904.TS0904.MERSIM.OBJ',DISP=SHR
//GO.FT08F001 DD SYSOUT=A
//GO.FT09F001  DD  DUMMY
//GO.FT10F001 DD DSN=TS0904.FIXPLANT,DISP=(OLD,KEEP)
//GO.FT11F001 DD DSN=TS0904.VARPLANT,DISP=(OLD,KEEP)
//GO.FT12F001 DD DSN=TS0904.LOADDUCU,DISP=(OLD,KEEP)
//GO.FT13F001 DD DSN=TS0904.EXPANALT,DISP=(OLD,KEEP)
//GO.FT15F001 DD DSN=TS0904.SIMULNEW,DISP=(OLD,KEEP)
//GO.FT16F001 DD DSN=TS0904.SIMULOLD,DISP=(OLD,KEEP)
//GO.SYSIN  DD  *
********************     MERSIM DATA     ********************
/*
```

DYNPRO JCL

```
//DYNPRO  EXEC  FTG1G,PARM='LET,NORES,NOMAP'
//SYSLIN  DD  DSN='TS0904.TS0904.DYNPRO.OBJ',DISP=SHR
//GO.FT08F001 DD SYSOUT=A
//GO.FT09F001  DD  DUMMY
//GO.FT07F001 DD DSN=TS0904.OSDYNDAT,DISP=(OLD,KEEP)
//GO.FT10F001 DD DSN=TS0904.FIXPLANT,DISP=(OLD,KEEP)
//GO.FT11F001 DD DSN=TS0904.VARPLANT,DISP=(OLD,KEEP)
//GO.FT12F001 DD DSN=TS0904.LOADDUCU,DISP=(OLD,KEEP)
//GO.FT13F001 DD DSN=TS0904.EXPANALT,DISP=(OLD,KEEP)
//GO.FT15F001 DD DSN=TS0904.SIMULNEW,DISP=(OLD,KEEP)
//GO.FT18F001 DD DSN=TS0904.EXPANREP,DISP=(OLD,KEEP)
//GO.SYSIN  DD  *
/*
********************     DYNPRO DATA     ********************
//
```

Table C.1
Types of Data Cards Used in LOADSY

Type No.	Columns	Format	Name	Type of Information
A	1-4	I	NPER	Number of periods (seasons) per year (2 to 12). Cols 1 & 2 must be blank.
	5-8	I	NOCOF	Number of cosine terms in Fourier approximation of load duration curve (100 maximum, 50 recommended). Col.5 must be blank.
	9-12			Must remain blank
	13-16	I	NNTH	Number of points for load duration curve representation
	17-20	I	INVERT	Numbers of points used for inverted load duration curve representation.
B	1-8	F	PKMW	Annual peak load (MW)
	9-14	I	JAHR	Year number
1	1-4	I	INDEX	Index number (1 indicates end of data for this year; 2 indicates that one type-2 card follows for each season; 3 indicates that one or two type-3 cards follow; 4 indicates that (NNTH/5) + 1 cards follow). Cols. 1-3 must be blank.
2	1-12	F		a_0 (normally 1.0)
	13-24	F		a_1
	25-36	F		a_2
	37-48	F		a_3
	49-60	F		a_4
	61-72	F		a_5
3	1-8, 9-16,etc. for each period	F	PUPPK	Ratio of peak load in period 1 to annual peak, up to 10 numbers per card. For 11 or 12 periods per year, use the first one or two fields of a second type-3 card. For 4 periods for example, only the first 4 fields would be used. One of the ratios should be 1.0.

Table C.1
Types of Data Cards Used in LOADSY (Con't.)

Type No.	Columns	Format	Name	Type of Information
4	1-16, 17-32, etc.	F		Point-wise representation of load duration curve. Use NNTH/5 cards for NNTH points for each period. Add NPER/5 cards at the end for the minimum load in each period. For example, if NNTH=720 and NPER=2, 289 cards will be needed.

C.2.6. DYNPRO input data

Add card type 19 to Table 2.6.

Type No.	Columns	Format	Name	Type of Information
19	1-4, 5-8, etc.	F	LFCR	Levelized Fixed Charge Rate (LCFR) for each expansion candidate. LCFR = 0 or blank cause default to original method using total cost and salvage calculation.

C.2.7. PWCONGEN input data

Add card type A to Table 2.4 that describes the CONGEN input data.

Type No.	Cols.	Format	Name	Type of Information
A	1-4	I	NRUN	NRUN = 1, PWCONGEN creates the FIXed system Equivalent Load Duration Curve (FIXELDC) NRUN≠1, the LOLP for expansion alternatives is calculated. For each set of FIXSYS, VARSYS, LOADSY and MATURE, NRUN = 1 only once. All other runs must have NRUN ≠ 1.
	5-8	I	INVERT	Number of points used for the representation of the inverted load duration curve. (Maximum = 1200)
	9-12	I	IPRERU	IPRERU = 1, the plant availability changes option is in effect. IPRERU≠1 no changes of plant availability are possible.

C.2.8. MATURE input data

Table D.2 shows the input data card types used by MATURE. One type 3 card must be used for each power plant for which maintenance or forced outage will be modified. The combined FIXSYS and VARSYS plant order must be preserved. No adjustments are possible for hydro or pump storage plants. Add one blank card after all changes each year. The

Table C.2 MATURE Input Data

Type No.	Columns	Format	Name	Type of Information
1	1-4	I	NFP	Number of plants in the combined FIXSYS plus VARSYS list. (Maximum = 270)
	5-6	I	NPER	Number of periods per year. (Maximum = 12)
	7-8	I	NYEARS	Number of years in study period. (Maximum = 30)
	9-12	I	NYEAR	The first year of the study period.
2	1-4,9-12, etc.	A4,4X	PLANT	Plant names as described in FIXSYS and VARSYS. Ten names per card separated by ten 4-column blank fields. NFP/10 cards are required. (For example, if NFP = 28, there will be 3 cards out of which the third will contain only 8 plant names.)
3	1-3	I	I	Plant number as found in the combined FIXSYS plus VARSYS list.
	7-12	F	PMATUR	Maturity adjusting factor.
	13-16, 17-20,etc.	F	DAYS	Days of scheduled maintenance each period.

blank card will indicate the end of input for current year. This process must be repeated for each year. If no adjustments are required for a specific year, a blank card would indicate so.

C.3. Sample input data

Table C.3 lists the input data used to obtain the output listed in Appendix D. These input data are similar to IAEA's case-26 predetermined run (listed in the reference procedures manual). Use of MATURE for plant availability adjustments changed the results.

DYNPRO input data using LFCR ≠ 0.0 are not presented here though a DYNPRO output with LFCR = 15.0% for all plants is provided in Appendix D.

Table C.3
Input Data for Sample Runs of Modified WASP-2B

```
LOADSY DATA
   2  50       7201000
   1647.  1980
   3
   .8782    1.0
   4
0.997978969566060.993975551893300.990023272646210.986121670969050.98227028845300
0.978468669130210.974716359467910.971012908362560.967357867133880.96375078951900
0.960191231666570.956678752130810.953212911865670.949793274218870.94641940492608
0.943090872104950.939807246249260.936568100222970.933373009254390.93022155093022
0.927113305189700.924047854318680.921024782943730.918043678026230.91510412885651
0.912205727047920.909348066530920.906530743547230.903753356643890.90101550666735
0.898316796757650.895656832342410.893035221131020.890451573108720.88790550053068
0.885396617916110.882924542042370.880488891939080.878089288882200.87572535638814
0.873396720207890.871103008321050.868843850930030.866618880454050.86442773152334
0.862270040973150.860145447837930.858053593345370.855994120910550.85396667613000
0.851970906775860.850006462789890.848072996277670.846170161502650.84429761488024
0.842455014971950.840642022479470.838858300238780.837103513214230.83537732849269
0.833679415277580.832009444883050.830367090728020.828752028330320.82716393530078
0.825602491337310.824067378219050.822558279800420.821074882005250.81961687282090
0.818183942292310.816775782516150.815392087634890.814032553830920.81269687932065
0.811384764348600.810095911181520.808830024102470.807586809404960.8063659753[illegible]498
0.805167232345200.803990292568970.802834870334520.801700681898960.80058744549448
0.799494881322390.798422711547230.797370660290880.796338453626690.79532581957352
0.794332488089890.793358191068070.792402662328180.791465637612280.79054685457849
0.789646052795090.788762973734610.787897360767950.787048959158440.78621751605601
0.785402780491230.784604503369450.783822437464870.783056337414670.78230595971312
0.781571062705620.780851406582880.780146753374980.779456866945480.77878151298549
0.778120459007860.777473474341160.776840330123900.776220799298550.77561465660567
0.775021678578020.774441643534640.773874331574990.773319524573000.77277700617122
0.772246561774880.771727978546020.771221045397600.770725552987560.77024129371298
0.769768061704110.769305652818540.768853864635260.768412496448790.76798134926326
0.767560225786500.767148930424190.766747269273910.766355050119280.76597208242404
0.765598177326150.765233147631910.764876807810060.764528973985850.76418946393518
0.763858097076690.763534694475840.763219078819060.762911074427790.76261050724264
0.762317204819470.762030996323450.761751712523240.761479185785030.76121325006668
0.760953740911790.760700495443820.760453352360190.760212151926390.75997673597005
0.759746947875100.759522632575800.759303636550900.759089807817720.75888099592623
0.758677051953200.758477828496260.758283179668030.758092961090180.75790702988761
0.757725244682450.757547465588260.757373554204040.757203373608430.75703678835371
0.756873664460000.756713869409260.756557272139500.756403743038790.75625315393940
0.756105378111940.755960290259370.755817766511190.755677684417500.75553992294309
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0.634522576350610.634006444720280.633493314936550.632983224428930.63247621027216
0.631972309180360.631471557501100.630973991209510.630479645902380.62998855679228
0.629500758701640.629016286056860.628535172882390.628057452794890.62758315899727
0.627112324272830.626644980979320.626181161043110.625720895953210.62526421675546
0.624811154046550.624361737968170.623915998201090.623473963959280.62303566398401
0.622601126537930.622170379399190.621743449855540.621320364698430.62090115021712
0.620485832192750.620074435892500.619666986063630.619263506927610.61886402217424
0.618468554955720.618077127880760.617689763008700.617306481843590.61692730532829
0.616552253838610.616181347177360.615814604568480.615452044651140.61509368547385
0.614739544488530.614389638544640.614043983883280.613702596131300.61336549029535
0.613032680756060.612704181262090.612380004924220.612060164209500.61174467093534
0.611433536263560.611126770694560.610824384061400.610526385523860.61023278356261
0.609943585973270.609658799860500.609378431632150.609102486993330.60883097094049
0.608563887755580.608301241000110.608043033509240.607789267385920.60753994399499
0.607295063957250.607054627143570.606818632669020.606587078886930.60635996338304
0.606137282969560.605919033679280.605705210759710.605495808667110.60529082106067
0.605090240796560.604894059922030.604702269669570.604514860450920.60433182185126
0.604153142623270.603978810681220.603808813095090.603643136084690.60348176501371
0.603324684383890.603171877829050.603023328109250.602879017104860.60273892581067
0.602603034329990.602471321868770.602343766729670.602220346306180.60210103707672
0.601985814598750.601874653502860.601767527486860.601664409309910.60156527078662
0.601470082781130.601378815201210.601291436992390.601207916132040.60112821962348
0.601052313490090.600980162769390.600911731507140.600846982751480.60078587854700
0.600728379928840.600674446916810.600624038509480.600577112678280.60053362636162
0.600493535458960.600456794824950.600423358263480.600393178521850.60036620728481
0.600342395168710.600321691715550.600304045387130.600289403559130.60027771251522
0.600268917441140.600262962418840.600259790420530.600259343302850.60026156180089
0.600266385522380.600273752941720.600283601394120.600295867069670.60031048500749
0.600327389089800.600346512036010.600367785396850.600391139548460.60041650368650
0.600443805820210.600472972766600.600503930144450.600536602368470.60057091264341
0.600606782958130.600644134079710.600682885547560.600722955667520.60076426150597
0.600806718883900.600850242371060.600894745280010.600940139660260.60098633629236
0.601033244682000.601080773054110.601128828346970.601177316206310.60122614097939
0.601275205709140.601324412128240.601373660653210.601422850378540.60147187907076
0.601520643162590.601569037746980.601616956571260.601664292031220.60171093516522
0.601756775648280.601801701786190.601845600509640.601888357368260.60192985652477
0.601969980749060.602008611412310.602045628481080.602080910511400.60211433464291
0.602145776592920.602175110650510.602202209670690.602226945068440.60224918681284
0.602268803421150.602285661952960.602299628004220.602310565701420.60231833769562
0.602322805156610.602323827766980.602321263716220.602314969694830.60230480088845
0.602290610971880.602272252103300.602249574918270.602222428523860.60219066049280
0.602154116857500.602112642104230.602066079167180.602014269422550.60195705268268
0.601894267190160.601825749611890.601751335033220.601670856952030.60158414727284
0.601491036300920.601391352736390.601284923668280.601171574568710.60105112928693
0.600923410043430.600788237424060.600645430374140.600494806192530.60033618052575
0.600169367362090.599994179025680.599810426170630.599617917775110.59941646113548
0.599205861860320.598985923864620.598756449363840.598517238868000.59826809117580
0.598008803368720.597739170805120.597458987114360.597168044190840.59686613218819
0.596553039513300.596228552820470.595892457005460.595544535199650.59518456876411
  .595              .595
   1
   1936.   1981
   1
   2274.   1982
   1
   2669.   1983
   1
   3129.   1984
   1
   3666.   1985
   3
```

Table C.3 (Continued)

```
 .9237   1.0
 2
        1.0     -3.27689     15.08061    -32.55363     30.9992     -10.70771
        1.0     -3.27689     15.08061    -32.55363     30.9992     -10.70771
 1
 4290.  1986
 1
 5017.  1987
 1
 5863.  1988
 1
 6845.  1989
 1
 7985.  1990
 3
 .9545   1.0
 2
        1.0     -3.51974     16.19426    -34.83805     33.05702    -11.37309
        1.0     -3.51974     16.19426    -34.83805     33.05702    -11.37309
 1
 9307.  1991
 1
10837.  1992
 1
12609.  1993
 1
14658.  1994
 1
END OF LOADSY DATA
```

Table C.3 (Continued)

```
FIXSYS DATA
  1980      2
FHYD  1  159  324     0.      0.    0.    0.   5 0  0.0  0      0 2051.   .30  0.0
FEMH  1   44   44  2262.   2262.   10.  980. -199  0.0  0      0    0.   .30
FO1H  5   34  100  2490.   2190.   10.  700.  210  3.0 28    100    0. 2.30  0.0
FO50  8   25   50  2618.   2326.   10.  700.  210  3.0 28     50    0. 3.00  0.0
FD25  3   20   25  2175.   1800.   10.  980.  420  1.0 14     25    0.  .85  0.0
FGTH  5   29   97  6322.   2262.   10.  980.  172  2.5 14     50    0.  .52  0.0
FPST  0                                        6 0                    .325

  1.0000  0.8750
  1.0000  0.7707
  0.5427  0.4573
  0.8841  1.0000
    3                                               HYDRO CONDITIONS
  1.0000  1.0000  1.0000  1.0000  0.6000            NORMAL YEAR
  0.5000  0.9500  0.8200  0.9000  0.2500               DRY YEAR
  1.5000  1.1500  1.2600  1.1000  0.1500               WET YEAR
   .85     .88
   2
     3      2
   1   1980
   1   1981
   3
     5      3
   1   1982
   1   1983
   1   1984
   1   1985
   1   1986
   1   1987
   1   1988
   1   1989
   1   1990
   1   1991
   1   1992
   1   1993
   1   1994
END OF FIXSYS DATA
```

Table C.3 (Continued)

```
VARSYS DATA
           2         9
N600       400   600  2568.   2363.    0.  142.   0 5  12.0 42   600     0.  0.99    0.
N10H       667  1000  2566.   2361.    0.  134.   0 5  16.0 42  1000     0.  0.73    0.
C300       100   300  2480.   2180.  450.   0.0   310   7.0 35   300     0.  1.20
C600       200   600  2460.   2160.  450.   0.0   310  12.0 42   600     0.  0.71    0.
C10H       334  1000  2440.   2140.  450.   0.0   310  16.0 42  1000     0.  0.56
O600       200   600  2440.   2140.   10.  700.   210  10.0 42   600     0.  0.67    0.
GT2H        58   192  6322.   2262.   10.  980.   173  1.25 14    50         0.52
VHYD  4                                           5 0
   233  233 1500.     0                     1982 1
      1.00      0.67
      1.00      0.67
      0.59      0.41
      0.00      0.00
      0   349   780.    92                  1984 1
   1.0000   0.9748
   0.        0.
   0.3987   0.6013
   0.8816   1.0000
   106   616 2611.   138                    1986 1
   1.0000   0.8300
   1.0000   0.3206
  0.6702   0.3298
   0.8837   1.0000
   150   600 2800.     0                    1990 1
   1.0000   0.8000
   1.0000   0.6761
   0.5961   0.4039
   0.0       0.0
VPST  5                                           6 0                     .325
   240   240   218.          0.85      0.88 1984
   240   240   218.          0.85      0.88 1985
   240   240   218.          0.85      0.88 1985
   240   240   218.          0.85      0.88 1986
   240   240   218.          0.85      0.88 1986
END OF VARSYS DATA
```

Table C.3 (Continued)

```
CONGEN DATA
   7                 READ PERIOD AND ANNUAL CRITICAL LOLP
     1.0        1.0
   6                 READ OPTION MODE
   1                 CALCULATION OF LOLP AND CHECKING AGAINST CLOLP'S
   5
   0
   4                 READ MINIMUM AND MAXIMUM RESERVE MARGINS (%)
        0.        50.
   3                 MAXIMUM ADDITIONAL NUMBER OF CANDIDATE UNITS
   0    0    0    0    0    0    0    0    0
   2                 MINIMUM NUMBER OF CANDIDATE UNITS
   0    0    0    0    0    0    0    0    0
   1980
   2
   0    0    1    0    0    0    0    0    0
   1981
   2
   0    0    2    0    0    0    0    1    0
   1982
   2
   0    0    4    0    0    0    0    1    0
   1983
   2
   0    0    4    0    0    0    0    2    0
   1984
   2
   0    0    4    1    0    0    0    2    1
   1985
   2
   1    0    4    1    0    0    0    2    2
   1986
   2
   1    0    4    2    0    0    0    2    2
   1987
   2
   1    0    4    5    0    0    0    2    2
   1988
   2
   1    0    4    7    0    0    0    2    2
   1989
   2
   2    0    4    7    0    0    0    2    3
   1990
   2
   2    2    4    7    0    0    0    2    3
   1991
   2
   2    4    4    7    0    0    0    2    3
   1992
   2
   2    7    4    7    0    0    0    2    3
   1993
   2
   2    9    4    7    0    0    0    2    3
   1994
END OF CONGEN DATA
```

Table C.3 (Continued)

```
PWCONGEN RUN 1 DATA
   11000    1
   7                   READ PERIOD AND ANNUAL CRITICAL LOLP
     1.0        1.0
   6                   READ OPTION MODE
   1                   CALCULATION OF LOLP AND CHECKING AGAINST CLOLP'S
   5
   0
   4                   READ MINIMUM AND MAXIMUM RESERVE MARGINS (%)
        0.        50.
   3                   MAXIMUM ADDITIONAL NUMBER OF CANDIDATE UNITS
   0   0   0   0   0   0   0   0   0
   2                   MINIMUM NUMBER OF CANDIDATE UNITS
   0   0   0   0   0   0   0   0   0
   1980
   2
   0   0   1   0   0   0   0   0   0
   1981
   2
   0   0   2   0   0   0   0   1   0
   1982
   2
   0   0   4   0   0   0   0   1   0
   1983
   2
   0   0   4   0   0   0   0   2   0
   1984
   2
   0   0   4   1   0   0   0   2   1
   1985
   2
   1   0   4   1   0   0   0   2   2
   1986
   2
   1   0   4   2   0   0   0   2   2
   1987
   2
   1   0   4   5   0   0   0   2   2
   1988
   2
   1   0   4   7   0   0   0   2   2
   1989
   2
   2   0   4   7   0   0   0   2   3
   1990
   2
   2   2   4   7   0   0   0   2   3
   1991
   2
   2   4   4   7   0   0   0   2   3
   1992
   2
   2   7   4   7   0   0   0   2   3
   1993
   2
   2   9   4   7   0   0   0   2   3
   1994
END OF PWCONGEN RUN 1 DATA
```

Table C.3 (Continued)

```
PWCONGEN RUN2 DATA
   21000    1
   7                  READ PERIOD AND ANNUAL CRITICAL LOLP
     1.0        1.0
   6                  READ OPTION MODE
   1                  CALCULATION OF LOLP AND CHECKING AGAINST CLOLP'S
   5
   0
   4                  READ MINIMUM AND MAXIMUM RESERVE MARGINS (%)
        0.        50.
   3                  MAXIMUM ADDITIONAL NUMBER OF CANDIDATE UNITS
   0   0   0   0   0   0   0   0   0
   2                  MINIMUM NUMBER OF CANDIDATE UNITS
   0   0   0   0   0   0   0   0   0
   1980
   2
   0   0   1   0   0   0   0   0   0
   1981
   2
   0   0   2   0   0   0   0   1   0
   1982
   2
   0   0   4   0   0   0   0   1   0
   1983
   2
   0   0   4   0   0   0   0   2   0
   1984
   2
   0   0   4   1   0   0   0   2   1
   1985
   2
   1   0   4   1   0   0   0   2   2
   1986
   2
   1   0   4   2   0   0   0   2   2
   1987
   2
   1   0   4   5   0   0   0   2   2
   1988
   2
   1   0   4   7   0   0   0   2   2
   1989
   2
   2   0   4   7   0   0   0   2   3
   1990
   2
   2   2   4   7   0   0   0   2   3
   1991
   2
   2   4   4   7   0   0   0   2   3
   1992
   2
   2   7   4   7   0   0   0   2   3
   1993
   2
   2   9   4   7   0   0   0   2   3
   1994
END OF PWCONGEN RUN 2 DATA
```

Table C.3 (Continued)

```
MATURE DATA
  16 2151980
FHYD    FEMH    FO1H    F050    FD25    FGTH    FPST    N600    N1OH    C300
C600    C1OH    0600    GT2H    VHYD    VPST
  1   0.9
  3   0.9
  4   0.9
 11   0.9
                                                                        END 1980
  2   1.1
  4   1.1
  5   0.9
  6   1.1
 10   1.1
                                                                        END 1981
  1          20.
  5          20.
                                                                        END 1982
                                                                        END 1983
                                                                        END 1984
  1              20.
  5              20.
                                                                        END 1985
                                                                        END 1986
                                                                        END 1987
                                                                        END 1988
  1   0.9    20. 20.
  6   0.9    20. 20.
                                                                        END 1989
                                                                        END 1990
                                                                        END 1991
                                                                        END 1992
                                                                        END 1993
                                                                        END 1994
END OF MATURE DATA
```

Table C.3 (Continued)

```
MERSIM DATA
   1
 1980 1980
   2                  READ LOADING ORDER OPTION
 -1.0
    9     8    12    11    10 1009 1008    13     3     4 1012 1011
 1010 1013 1003 1004     5    14     6 1005 1014 1006     7
   3                  READ MULTIPLIER ON FOREIGN COSTS
  1.2
   4                  OUTPUT OPTION
   0                   MINIMUM PRINTOUT
   5                  DECREASE NUMBER OF FOURIER COEFFICIENTS
  20
   6                  READ DISCOUNT RATE (%) FOR ALL LOCAL OPERATING COSTS
  0.0
   7                  READ DISCOUNT RATE (%) FOR ALL FOREIGN OPERATING COSTS
  0.0
  10                  DECREASE NUMBER OF HYDRO CONDITIONS TO ONE
   3                  (3 IS USED FOR DEMONSTRATING ERROR MESSAGE)
   1980
   2                  READ LOADING ORDER OPTION
  1.0-0.03     1      0     AUTOMATIC LOADING ORDER TO FULFILL SPIN.RESER. REQUIREM.
    9     8    12    11    10    13     3     4     5    14     6     7
  10
   1
   8                  READ DISCOUNT RATES (%) ON PLANT TYPES; LOCAL AND FOREIGN
  0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
  0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
   9                  READ ESCALATION FACTORS ON PLANT TYPES; LOCAL AND FOREIGN
  1.0      1.0      1.0      1.0      1.0      1.0      1.0      1.0
  1.0      1.0      1.0      1.0      1.0      1.0      1.0      1.0
   1981
   1982
   1983
   1984
   2
  1.0-0.05     0     1
   1985
   1986
   1987
   1988
   1989
   2
  1.0-0.03     0     1
   1990
   1991
   1992
   1993
   1994
END OF MERSIM DATA
```

Table C.3 (Continued)

```
DYNPRO DATA
 1980 1980    15
    0     1
     1994          8.        8.
  15                READ DISCOUNT RATE (%)  ON FOREIGN OPERATING COSTS
     8.0
  14                READ DISCOUNT RATE (%)  ON LOCAL OPERATING COSTS
     8.0
   3                READ MULTIPLIER ON FOREIGN COSTS
  1.2
  17                READ MULTIPLIERS ON DOMESTIC AND FOREIGN OPERATING COSTS
    1.00     1.00    1.00     1.00     1.10     1.00     1.00     1.00
    1.00     1.00    1.00     1.00     1.10     1.00     1.00     1.00
  16                READ SALVAGE VALUE OPTION
   1                SINKING FUND OPTION
   2                READ THERMAL PLANT CAPITAL COST DATA
    134.     586.     30.     0.0     86.0     24.0     8.0             1N600
    108.     480.     30.     0.0     79.0     24.0     8.0             2N10H
     65.     327.     30.     0.0      0.0     15.8     5.0             3C300
     51.     261.     30.     0.0      0.0     15.7     5.0             4C600
     43.     227.     30.     0.0      0.0     15.7     5.0             5C10H
     47.     239.     30.     0.0      0.0     15.7     5.0             6D600
     33.     132.     20.     0.0      0.0      8.0     2.0             7GT2H
                      50.
    387.     258.                              25.0     8.0             8VHYD1
    231.     154.                              12.2     4.0             8VHYD2
    513.     342.                              25.0     8.0             8VHYD3
    945.     630.                              25.0     8.0             8VHYD4
                      50.
    364.      78.                              24.0     6.0             9VPST1
     91.      78.                              12.0     3.0             9VPST2
     91.      78.                              12.0     3.0             9VPST3
   1000.     100.                              26.0     7.0             9VPST4
    270.     100.                              13.0     3.5             9VPST5
  12            READ CRITICAL LOLP
     1.0
  13            READ NUMBER OF SOLUTIONS TO REPORT
   5
  18            READ OUTPUT OPTION
   0            IAEA OPTION
   6            READ MAXIMUM BUILDING CONSTRAINT ON CANDIDATE UNITS
  10   10   10   10   10   10   10   10   10
  19

   1    1980
   1    1981
   1    1982
   1    1983
   1    1984
   1    1985
   1    1986
   1    1987
   1    1988
   1    1989
   1    1990
   1    1991
   1    1992
   1    1993
   1    1994
END OF DYNPRO DATA
```

Appendix D

Sample Output of Modified WASP-2B

CONTENTS

D.1. LOADSY sample output

```
THE NUMBER OF POINTS USED TO INVERT THE LD CURVE IS  1000
THE  MAXIMUM LENGTH OF THE E L D CURVE IS  2500

   NUMBER OF FOURIER CCEFF. IS    50
   HOURS IN PERICD    4380.0
   LOADS FOR THIS PUN DEVELOPED FOR     2 PERIODS/YEAR
```

PEAK LOAD FOR YEAR 1980 IS 1647.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
0.878200 1.000000

PERIOD 1

PEAK LOAD 1446.4 MW MIN. LOAD 860.6 MW
PIECEWISE-LINEAR LDC REPRESENTATION, WITH 720 POINTS

ENERGY UNDER LOAD DURATION CURVE
POLYNOMIAL 4452.4 GWH
FOURIER SERIES 4452.9 GWH

PERIOD LOAD FACTOR , PERCENT
POLYNOMIAL 70.28
FOURIER SERIES 70.29

FOURIER COEFFICIENTS FOR THIS PERIOD
CONSTANT , ACC IS 0.8812537
COEFFICIENTS OF COSINE TERMS ARE

0.6152533	0.1104627	-0.1530903	-0.0877959	0.0436816	0.0576932	0.0002386	-0.0285864	-0.0126941	0.0074655
0.0085098	0.0024106	0.0012477	-0.0021541	-0.0086378	-0.0038816	0.0098663	0.0103612	-0.0053236	-0.0132841
-0.0017778	0.0113696	0.0075743	-0.0060373	-0.0095413	0.0001894	0.0074776	0.0034778	-0.0032049	-0.0037811
-0.0006720	0.0014104	0.0022015	0.0016987	-0.0009842	-0.0035351	-0.0018438	0.0030671	0.0044159	-0.0006578
-0.0052186	-0.0022948	0.0038603	0.0042218	-0.0011598	-0.0042429	-0.0014186	0.0025714	0.0026168	-0.0002950

PERIOD 2

PEAK LOAD 1647.0 MW MIN. LOAD 980.0 MW
PIECEWISE-LINEAR LDC REPRESENTATION, WITH 720 POINTS

ENERGY UNDER LOAD DURATION CURVE
POLYNOMIAL 5069.9 GWH
FOURIER SERIES 5070.4 GWH

PERIOD LOAD FACTOR , PERCENT
POLYNOMIAL 70.28
FOURIER SERIES 70.29

FOURIER COEFFICIENTS FOR THIS PERIOD
CONSTANT , ACC IS 0.8812537
COEFFICIENTS OF COSINE TERMS ARE

0.6152533	0.1104627	-0.1530903	-0.0877959	0.0436816	0.0576932	0.0002386	-0.0285864	-0.0126941	0.0074655
0.0085098	0.0024106	0.0012477	-0.0021541	-0.0086378	-0.0038816	0.0098663	0.0103612	-0.0053236	-0.0132841
-0.0017778	0.0113696	0.0075743	-0.0060373	-0.0095413	0.0001894	0.0074776	0.0034778	-0.0032049	-0.0037811
-0.0006720	0.0014104	0.0022015	0.0016987	-0.0009842	-0.0035351	-0.0018438	0.0030671	0.0044159	-0.0006578
-0.0052186	-0.0022948	0.0038603	0.0042218	-0.0011598	-0.0042429	-0.0014186	0.0025714	0.0026168	-0.0002950

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                                                                              -0.0074655
                                                                              -0.0132861
                                                                              -0.0037811
                                                                              -0.0006578
                                                                              -0.0002950

     ANNUAL SUMMARY

  ENERGY DEMAND
     POLYNOMIAL                          9522.3 GWH
     FOURIER SERIES                      9523.3 GWH

  ANNUAL LOAD FACTOR
     POLYNOMIAL                        66.00
     FOURIER SERIES                    66.01

  * * * * * * * * * * * *  END OF DATA FOR YEAR 1980  * * * * * * * * * * * *
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PEAK LOAD FOR YEAR 1981 IS     1936.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
  0.878200  1.000000

                    PERIOD   1

   PEAK LOAD   1700.2 MW         MIN. LOAD   1011.6 MW

   ENERGY UNDER LOAD DURATION CURVE
        POLYNOMIAL                          5233.6 GWH
        FOURIER SERIES                      5234.2 GWH

   PERIOD LOAD FACTOR , PERCENT
        POLYNOMIAL                        70.28
        FOURIER SERIES                    70.29

                    PERIOD   2

   PEAK LOAD   1936.0 MW         MIN. LOAD   1151.9 MW

   ENERGY UNDER LOAD DURATION CURVE
        POLYNOMIAL                          5959.5 GWH
        FOURIER SERIES                      5960.1 GWH

   PERIOD LOAD FACTOR , PERCENT
        POLYNOMIAL                        70.28
        FOURIER SERIES                    70.29

        ANNUAL SUMMARY

   ENERGY DEMAND
        POLYNOMIAL                         11193.2 GWH
        FOURIER SERIES                     11194.3 GWH

   ANNUAL LOAD FACTOR
        POLYNOMIAL                        66.00
        FOURIER SERIES                    66.01

   * * * * * * * * * * * *  END OF DATA FOR YEAR 1981  * * * * * * * * * * * *
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PEAK LOAD FOR YEAR 1982 IS     2274.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD:
 0.878200  1.CC0000

                      PERIOD   1

    PEAK LOAD    1997.0 MW          MIN. LOAD    1188.2 MW

    ENERGY UNDER LOAD DURATION CURVE
         POLYNOMIAL                        6147.4 GWH
         FOURIER SERIES                    6148.0 GWH

    PERIOD LOAD FACTOR , PERCENT
         POLYNOMIAL                      70.28
         FOURIER SERIES                  70.29

                      PERIOD   2

    PEAK LOAD    2274.0 MW          MIN. LOAD    1353.0 MW

    ENERGY UNDER LOAD DURATION CURVE
         POLYNOMIAL                        7000.0 GWH
         FOURIER SERIES                    7000.7 GWH

    PERIOD LOAD FACTOR , PERCENT
         POLYNOMIAL                      70.28
         FOURIER SERIES                  70.29

         ANNUAL SUMMARY

    ENERGY DEMAND
         POLYNOMIAL                       13147.3 GWH
         FOURIER SERIES                   13148.7 GWH

    ANNUAL LOAD FACTOR
         POLYNOMIAL                      66.00
         FOURIER SERIES                  66.01

    * * * * * * * * * * * *  END OF DATA FOR YEAR 1982  * * * * * * * * * * * *
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PEAK LOAD FOR YEAR 1983 IS     2669.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
 0.878200  1.000000

                         PERIOD   1

    PEAK LOAD   2343.9 MW        MIN. LOAD   1394.6 MW

    ENERGY UNDER LOAD DURATION CURVE
         POLYNOMIAL                      7215.2 GWH
         FOURIER SERIES                  7215.9 GWH

    PERIOD LOAD FACTOR , PERCENT
         POLYNOMIAL                    70.28
         FOURIER SERIES                70.29

                         PERIOD   2

    PEAK LOAD   2669.0 MW        MIN. LOAD   1588.1 MW

    ENERGY UNDER LOAD DURATION CURVE
         POLYNOMIAL                      8215.9 GWH
         FOURIER SERIES                  8216.7 GWH

    PERIOD LOAD FACTOR , PERCENT
         POLYNOMIAL                    70.28
         FOURIER SERIES                70.29

         ANNUAL SUMMARY

    ENERGY DEMAND
         POLYNOMIAL                     15431.1 GWH
         FOURIER SERIES                 15432.7 GWH

    ANNUAL LOAD FACTOR
         POLYNOMIAL                    66.00
         FOURIER SERIES                66.01

    * * * * * * * * * * * *  END OF DATA FOR YEAR 1983  * * * * * * * * * * * *
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PEAK LOAD FOR YEAR 1984 IS 3129.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
0.978200 1.000000

PERIOD 1

PEAK LOAD 2747.9 MW MIN. LOAD 1635.0 MW

ENERGY UNDER LOAD DURATION CURVE

POLYNOMIAL	8458.7 GWH
FOURIER SERIES	8459.6 GWH

PERIOD LOAD FACTOR , PERCENT

POLYNOMIAL	70.28
FOURIER SERIES	70.29

PERIOD 2

PEAK LOAD 3129.0 MW MIN. LOAD 1861.8 MW

ENERGY UNDER LOAD DURATION CURVE

POLYNOMIAL	9631.9 GWH
FOURIER SERIES	9632.9 GWH

PERIOD LOAD FACTOR , PERCENT

POLYNOMIAL	70.28
FOURIER SERIES	70.29

ANNUAL SUMMARY

ENERGY DEMAND

POLYNOMIAL	18090.6 GWH
FOURIER SERIES	18092.5 GWH

ANNUAL LOAD FACTOR

POLYNOMIAL	66.00
FOURIER SERIES	66.01

* * * * * * * * * * * * END OF DATA FOR YEAR 1984 * * * * * * * * * * * *

PEAK LOAD FOR YEAR 1985 IS 3666.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
0.923700 1.000000

PERIOD 1
POLYNOMIAL COEFFICIENTS ARE
1.000000 -3.276890 15.080610 -32.553630 30.999200 -10.707710

PEAK LOAD 3386.3 MW MIN. LOAD 1833.9 MW

ENERGY UNDER LOAD DURATION CURVE
POLYNOMIAL 5866.8 GWH
FOURIER SERIES 5866.3 GWH

PERIOD LOAD FACTOR , PERCENT
POLYNOMIAL 66.52
FOURIER SERIES 66.52

FOURIER COEFFICIENTS FOR THIS PERIOD
CONSTANT , A00 IS 0.8630615
COEFFICIENTS OF COSINE TERMS ARE

0.6079188	0.1239694	-0.1350599	-0.0902357	0.0244641	0.0491803	0.0112987	-0.0154666	-0.0118187	-0.0018494
-0.0007392	0.0027018	0.0107662	0.0056098	-0.0111748	-0.0136094	0.0034873	0.0150837	0.0058163	-0.0096960
-0.0106020	0.0017335	0.0088998	0.0036289	-0.0033250	-0.0038687	-0.0015081	0.0002991	0.0024067	0.0034647
0.0005002	-0.0043273	-0.0043963	0.0017560	0.0061448	0.0022185	-0.0045379	-0.0047711	0.0009036	0.0043765
0.0021413	-0.0017397	-0.0026974	-0.0009533	0.0008523	0.0017514	0.0016014	-0.0003056	-0.0026357	-0.0020463

PERIOD 2
POLYNOMIAL COEFFICIENTS ARE
1.000000 -3.276890 15.080610 -32.553630 30.999200 -10.707710

PEAK LOAD 3666.0 MW MIN. LOAD 1985.4 MW

ENERGY UNDER LOAD DURATION CURVE
POLYNOMIAL 10681.8 GWH
FOURIER SERIES 10681.3 GWH

PERIOD LOAD FACTOR , PERCENT
POLYNOMIAL 66.52
FOURIER SERIES 66.52

FOURIER COEFFICIENTS FOR THIS PERIOD
CONSTANT , A00 IS 0.8630615
COEFFICIENTS OF COSINE TERMS ARE

0.6079198	0.1239694	-0.1350599	-0.0902357	0.0244641	0.0491803	0.0112987	-0.0154666	-0.0118187	-0.0018494
-0.0007392	0.0027018	0.0107662	0.0056098	-0.0111748	-0.0136094	0.0034873	0.0150837	0.0058163	-0.0096960
-0.0106020	0.0017335	0.0088998	0.0036289	-0.0033250	-0.0038687	-0.0015081	0.0002991	0.0024067	0.0034647
0.0005002	-0.0043273	-0.0043963	0.0017560	0.0061448	0.0022185	-0.0045379	-0.0047711	0.0009036	0.0043765
0.0021413	-0.0017397	-0.0026974	-0.0009533	0.0008523	0.0017514	0.0016014	-0.0003056	-0.0026357	-0.0020463

.8187	-0.0018494
8163	-0.0096960
4067	0.0034647
9036	0.0043765
6357	-0.0020463

ANNUAL SUMMARY

ENERGY DEMAND
POLYNOMIAL 20548.6 GWH
FOURIER SERIES 20547.7 GWH

ANNUAL LOAD FACTOR
POLYNOMIAL 63.99
FOURIER SERIES 63.98

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PEAK LOAD FOR YEAR 1986 IS      4290.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
  0.923700   1.000000

                    PERIOD    1
          POLYNOMIAL COEFFICIENTS ARE
     1.000000    -3.276890    15.080610   -32.553630    30.999200   -10.707710
     PEAK LOAD    3962.7 MW          MIN. LOAD    2146.1 MW

     ENERGY UNDER LOAD DURATION CURVE
          POLYNOMIAL                              11546.2 GWH
          FOURIER SERIES                          11545.7 GWH

     PERIOD LOAD FACTOR , PERCENT
          POLYNOMIAL                            66.52
          FOURIER SERIES                        66.52

                    PERIOD    2
          POLYNOMIAL COEFFICIENTS ARE
     1.000000    -3.276890    15.080610   -32.553630    30.999200   -10.707710
     PEAK LOAD    4290.0 MW          MIN. LOAD    2323.4 MW

     ENERGY UNDER LOAD DURATION CURVE
          POLYNOMIAL                              12500.0 GWH
          FOURIER SERIES                          12499.4 GWH

     PERIOD LOAD FACTOR , PERCENT
          POLYNOMIAL                            66.52
          FOURIER SERIES                        66.52

          ANNUAL SUMMARY

     ENERGY DEMAND
          POLYNOMIAL                              24046.2 GWH
          FOURIER SERIES                          24045.1 GWH

     ANNUAL LOAD FACTOR
          POLYNOMIAL                            63.99
          FOURIER SERIES                        63.98

     * * * * * * * * * * * *   END OF DATA FOR YEAR 1986   * * * * * * * * * * * *
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PEAK LOAD FOR YEAR 1987 IS    5017.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
  0.923700  1.000000

                    PERIOD   1
          POLYNOMIAL COEFFICIENTS ARE
 1.000000   -3.276890   15.080610  -32.553630   30.999200  -10.707710

    PEAK LOAD   4634.2 MW        MIN. LOAD   2505.8 MW

    ENERGY UNDER LOAD DURATION CURVE
          POLYNOMIAL                    13502.9 GWH
          FOURIER SERIES                13502.3 GWH

    PERIOD LOAD FACTOR , PERCENT
          POLYNOMIAL                  66.52
          FOURIER SERIES              66.52

                    PERIOD   2
          POLYNOMIAL COEFFICIENTS ARE
 1.000000   -3.276890   15.080610  -32.553630   30.999200  -10.707710

    PEAK LOAD   5017.0 MW        MIN. LOAD   2717.1 MW

    ENERGY UNDER LOAD DURATION CURVE
          POLYNOMIAL                    14618.3 GWH
          FOURIER SERIES                14617.6 GWH

    PERIOD LOAD FACTOR , PERCENT
          POLYNOMIAL                  66.52
          FOURIER SERIES              66.52

          ANNUAL SUMMARY

    ENERGY DEMAND
          POLYNOMIAL                    28121.2 GWH
          FOURIER SERIES                28119.9 GWH

    ANNUAL LOAD FACTOR
          POLYNOMIAL                  63.99
          FOURIER SERIES              63.98

    * * * * * * * * * * * *  END OF DATA FOR YEAR 1987  * * * * * * * * * * * *
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PEAK LOAD FOR YEAR 1988 IS 5863.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
0.923700 1.000000

PERIOD 1
POLYNOMIAL COEFFICIENTS ARE
1.000000 -3.276890 15.080610 -32.553630 30.999200 -10.707710

PEAK LOAD 5415.7 MW MIN. LOAD 2933.0 MW

ENERGY UNDER LOAD DURATION CURVE
POLYNOMIAL 15779.8 GWH
FOURIER SERIES 15779.1 GWH

PERIOD LOAD FACTOR , PERCENT
POLYNOMIAL 66.52
FOURIER SERIES 66.52

PERIOD 2
POLYNOMIAL COEFFICIENTS ARE
1.000000 -3.276890 15.080610 -32.553630 30.999200 -10.707710

PEAK LOAD 5863.0 MW MIN. LOAD 3175.3 MW

ENERGY UNDER LOAD DURATION CURVE
POLYNOMIAL 17083.3 GWH
FOURIER SERIES 17082.5 GWH

PERIOD LOAD FACTOR , PERCENT
POLYNOMIAL 66.52
FOURIER SERIES 66.52

ANNUAL SUMMARY

ENERGY DEMAND
POLYNOMIAL 32863.1 GWH
FOURIER SERIES 32861.7 GWH

ANNUAL LOAD FACTOR
POLYNOMIAL 63.99
FOURIER SERIES 63.98

* * * * * * * * * * * * END OF DATA FOR YEAR 1988 * * * * * * * * * * * *

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PEAK LOAD FOR YEAR 1989 IS     6845.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
  0.923700  1.000000

                    PERIOD    1
          POLYNOMIAL COEFFICIENTS ARE
   1.000000   -3.276890   15.080610  -32.553630   30.999200  -10.707710
     PEAK LOAD    6322.7 MW          MIN. LOAD    3424.3 MW

     ENERGY UNDER LOAD DURATION CURVE
          POLYNOMIAL                         18422.8 GWH
          FOURIER SERIES                     18422.0 GWH

     PERIOD LOAD FACTOR , PERCENT
          POLYNOMIAL                        66.52
          FOURIER SERIES                    66.52

                    PERIOD    2
          POLYNOMIAL COEFFICIENTS ARE
   1.000000   -3.276890   15.080610  -32.553630   30.999200  -10.707710
     PEAK LOAD    6845.0 MW          MIN. LOAD    3707.1 MW

     ENERGY UNDER LOAD DURATION CURVE
          POLYNOMIAL                         19944.6 GWH
          FOURIER SERIES                     19943.7 GWH

     PERIOD LOAD FACTOR , PERCENT
          POLYNOMIAL                        66.52
          FOURIER SERIES                    66.52

          ANNUAL SUMMARY

     ENERGY DEMAND
          POLYNOMIAL                         38367.4 GWH
          FOURIER SERIES                     38365.7 GWH

     ANNUAL LOAD FACTOR
          POLYNOMIAL                        63.99
          FOURIER SERIES                    63.98

     * * * * * * * * * * * *  END OF DATA FOR YEAR 1989  * * * * * * * * * * * *
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PEAK LOAD FOR YEAR 1990 IS 7985.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
0.954500 1.000000

PERIOD 1
POLYNOMIAL COEFFICIENTS ARE
1.000000 -3.519740 16.194260 -34.838050 33.057020 -11.373090

PEAK LOAD 7621.7 MW MIN. LOAD 3966.3 MW

ENERGY UNDER LOAD DURATION CURVE

POLYNOMIAL	21518.4 GWH
FOURIER SERIES	21521.8 GWH

PERIOD LOAD FACTOR , PERCENT

POLYNOMIAL	64.46
FOURIER SERIES	64.47

FOURIER COEFFICIENTS FOR THIS PERIOD
CONSTANT , A00 IS 0.8479258
COEFFICIENTS OF COSINE TERMS ARE

0.6026988	0.1356580	-0.1227057	-0.0933205	0.0124651	0.0447416	0.0166878	-0.0093284	-0.0098517	-0.0037525
-0.0053346	-0.0012518	0.0118991	0.0118847	-0.0062254	-0.0167119	-0.0048947	0.0120939	0.0121633	-0.0025020
-0.0111560	-0.0046847	0.0045166	0.0053033	0.0014730	-0.0009389	-0.0023745	-0.0033437	-0.0013212	0.0035488
0.0054462	0.0002653	-0.0060912	-0.0046495	0.0027456	0.0060386	0.0017325	-0.0036834	-0.0038719	-0.0000673
0.0025047	0.0020450	0.0005437	-0.0009539	-0.0023021	-0.0017696	0.0012486	0.0034454	0.0015649	-0.0025236

PERIOD 2
POLYNOMIAL COEFFICIENTS ARE
1.000000 -3.519740 16.194260 -34.838050 33.057020 -11.373090

PEAK LOAD 7985.0 MW MIN. LOAD 4155.4 MW

ENERGY UNDER LOAD DURATION CURVE

POLYNOMIAL	22544.2 GWH
FOURIER SERIES	22547.7 GWH

PERIOD LOAD FACTOR , PERCENT

POLYNOMIAL	64.46
FOURIER SERIES	64.47

FOURIER COEFFICIENTS FOR THIS PERIOD
CONSTANT , A00 IS 0.8479258
COEFFICIENTS OF COSINE TERMS ARE

0.6026988	0.1356580	-0.1227057	-0.0933205	0.0124651	0.0447416	0.0166878	-0.0093284	-0.0098517	-0.0037525
-0.0053346	-0.0012518	0.0118991	0.0118847	-0.0062254	-0.0167119	-0.0048947	0.0120939	0.0121633	-0.0025020
-0.0111560	-0.0046847	0.0045166	0.0053033	0.0014730	-0.0009289	-0.0023745	-0.0033437	-0.0013212	0.0035488
0.0054462	0.0002653	-0.0060912	-0.0046495	0.0027456	0.0060386	0.0017325	-0.0036834	-0.0038719	-0.0000673
0.0025047	0.0020450	0.0005437	-0.0009539	-0.0023021	-0.0017696	0.0012486	0.0034454	0.0015649	-0.0025236

-0.0037525
-0.0025020
0.C035488
-0.0000673
-0.C025236

-0.0037525
-0.0025020
0.C035488
-0.0000673
-0.0025236

ANNUAL SUMMARY

ENERGY DEMAND

POLYNOMIAL	44062.6 GWH
FOURIER SERIES	44069.5 GWH

ANNUAL LOAD FACTOR

POLYNOMIAL	62.99
FOURIER SERIES	63.00

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PEAK LOAD FOR YEAR 1991 IS     9307.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
 0.954500  1.000000

                    PERIOD   1
         POLYNOMIAL COEFFICIENTS ARE
 1.000000   -3.519740   16.194260  -34.838050   33.057020  -11.373090
    PEAK LOAD   8883.5 MW        MIN. LOAD   4623.0 MW

    ENERGY UNDER LOAD DURATION CURVE
         POLYNOMIAL                       25081.0 GWH
         FOURIER SERIES                   25084.9 GWH

    PERIOD LOAD FACTOR , PERCENT
         POLYNOMIAL                       64.46
         FOURIER SERIES                   64.47

                    PERIOD   2
         POLYNOMIAL COEFFICIENTS ARE
 1.000000   -3.519740   16.194260  -34.838050   33.057020  -11.373090
    PEAK LOAD   9307.0 MW        MIN. LOAD   4843.4 MW

    ENERGY UNDER LOAD DURATION CURVE
         POLYNOMIAL                       26276.6 GWH
         FOURIER SERIES                   26280.7 GWH

    PERIOD LOAD FACTOR , PERCENT
         POLYNOMIAL                       64.46
         FOURIER SERIES                   64.47

         ANNUAL SUMMARY

    ENERGY DEMAND
         POLYNOMIAL                       51357.7 GWH
         FOURIER SERIES                   51365.7 GWH

    ANNUAL LOAD FACTOR
         POLYNOMIAL                       62.99
         FOURIER SERIES                   63.00

    * * * * * * * * * * * *  END OF DATA FOR YEAR 1991  * * * * * * * * * * * *
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PEAK LOAD FOR YEAR 1992 IS   10837.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
 0.954500  1.000000

                    PERIOD   1
          POLYNCMIAL COEFFICIENTS ARE
 1.000000   -3.519740   16.194260  -34.838050   33.057020  -11.373090
    PEAK LOAD  10343.9 MW          MIN. LOAD    5383.0 MW

    ENERGY UNDER LOAD DURATION CURVE
          POLYNCMIAL                              29204.2 GWH
          FOURIER SERIES                          29208.7 GWH

    PERIOD LOAD FACTOR , PERCENT
          POLYNCMIAL                            64.46
          FOURIER SERIES                        64.47

                    PERIOD   2
          PCLYNCMIAL COEFFICIENTS ARE
 1.000000   -3.519740   16.194260  -34.838050   33.05702C  -11.373090
    PEAK LOAD  10837.0 MW          MIN. LOAD    5639.6 MW

    ENERGY UNCER LOAD DURATION CURVE
          PCLYNCMIAL                              30596.3 GWH
          FOURIER SERIES                          30601.1 GWH

    PERIOD LCAD FACTOR , PERCENT
          POLYNOMIAL                            64.46
          FOURIER SERIES                        64.47

          ANNUAL SUMMARY

    ENERGY DEMAND
          PCLYNCMIAL                              59800.5 GWH
          FOURIER SERIES                          59809.8 GWH

    ANNUAL LOAD FACTOR
          PCLYNOMIAL                            62.99
          FOURIER SERIES                        63.00

    * * * * * * * * * * * *  END OF DATA FOR YEAR 1992  * * * * * * * * * * * *
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PEAK LOAD FOR YEAR 1993 IS   12609.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
 0.954500  1.000000

                     PERIOD   1
          POLYNOMIAL COEFFICIENTS ARE
   1.000000   -3.519740   16.194260  -34.838050   33.057020  -11.373090
     PEAK LOAD  12035.3 MW         MIN. LOAD   6263.2 MW
     ENERGY UNDER LOAD DURATION CURVE
          POLYNOMIAL                          33979.4 GWH
          FOURIER SERIES                      33984.7 GWH
     PERIOD LOAD FACTOR , PERCENT
          POLYNOMIAL                         64.46
          FOURIER SERIES                     64.47

                     PERIOD   2
          POLYNOMIAL COEFFICIENTS ARE
   1.000000   -3.519740   16.194260  -34.838050   33.057020  -11.373090
     PEAK LOAD  12609.0 MW         MIN. LOAD   6561.7 MW
     ENERGY UNDER LOAD DURATION CURVE
          POLYNOMIAL                          35599.2 GWH
          FOURIER SERIES                      35604.8 GWH
     PERIOD LOAD FACTOR , PERCENT
          POLYNOMIAL                         64.46
          FOURIER SERIES                     64.47

          ANNUAL SUMMARY
     ENERGY DEMAND
          POLYNOMIAL                          69578.6 GWH
          FOURIER SERIES                      69589.5 GWH
     ANNUAL LOAD FACTOR
          POLYNOMIAL                         62.99
          FOURIER SERIES                     63.00

     * * * * * * * * * * * *  END OF DATA FOR YEAR 1993  * * * * * * * * * * * *
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PEAK LOAD FOR YEAR 1994 IS   14658.0 MW

PERIOD PEAK LOADS AS FRACTION OF ANNUAL PEAK LOAD
  0.954500  1.000000

                    PERIOD   1
          POLYNOMIAL COEFFICIENTS ARE
     1.000000  -3.519740   16.194260  -34.838050   33.057020  -11.373090

     PEAK LOAD  13991.1 MW          MIN. LOAD   7280.9 MW

     ENERGY UNDER LOAD DURATION CURVE
          POLYNOMIAL                           39501.2 GWH
          FOURIER SERIES                       39507.4 GWH

     PERIOD LOAD FACTOR , PERCENT
          POLYNOMIAL                          64.46
          FOURIER SERIES                      64.47

                    PERIOD   2
          POLYNOMIAL COEFFICIENTS ARE
     1.000000  -3.519740   16.194260  -34.838050   33.057020  -11.373090

     PEAK LOAD  14658.0 MW          MIN. LOAD   7628.0 MW

     ENERGY UNDER LOAD DURATION CURVE
          POLYNOMIAL                           41384.2 GWH
          FOURIER SERIES                       41390.6 GWH

     PERIOD LOAD FACTOR , PERCENT
          POLYNOMIAL                          64.46
          FOURIER SERIES                      64.47

          ANNUAL SUMMARY

     ENERGY DEMAND
          POLYNOMIAL                           80885.4 GWH
          FOURIER SERIES                       80898.0 GWH

     ANNUAL LOAD FACTOR
          POLYNOMIAL                          62.99
          FOURIER SERIES                      63.00

     * * * * * * * * * * * *  END OF DATA FOR YEAR 1994  * * * * * * * * * * * *
```

```
FIRST YEAR ? NO. OF SEASONS
 1980      2
```

	NAME	NO. OF SETS	MIN. LOAD MW	CAP-CITY MW	BASE LOAD HEAT RATE	AVGE INCR HEAT RATE	FUEL COSTS CENTS/MILLION DMSTC	FUEL COSTS CENTS/MILLION FORGN	TYPE	L C T N	FRCD OUT-AGE RATE	DAYS SCHL MAIN	MAIN CLAS	ENRGY GWH	O?M (FIX)	O?M (VAR)	FULL LOAD HEAT RATE	UNIT GENERATION COSTS ($/MWH) BASE DOM	BASE FRGN	FLD DOM	FLD FRGN
1	FHYD	1	159	324	0.	0.	0.0	0.0	5	0	0.0	0	0	2051.	0.300	0.0	0.	0.0	0.0	0.0	0.0
2	FEMH	1	44	44	2262.	2262.	10.00	980.00	-1	99	0.0	0	0	0.	0.300	0.0	2262.	0.2	22.2	0.2	22.2
3	FOIH	5	34	100	2490.	2190.	10.00	700.00	2	10	3.00	28	100	0.	2.300	0.0	2292.	0.2	17.4	0.2	16.0
4	FG50	8	25	50	2618.	2326.	10.00	700.00	2	10	3.00	28	50	0.	3.000	0.0	2472.	0.3	18.3	0.2	17.3
5	F025	3	20	25	2175.	1800.	10.00	980.00	4	20	1.00	14	25	0.	0.850	0.0	2100.	0.2	21.3	0.2	20.6
6	FGTH	5	29	97	6322.	2262.	10.00	980.00	1	72	2.50	14	50	0.	0.520	0.0	3476.	0.6	62.0	0.3	34.1
7	FPST	0	0	0	0.	0.	0.0	0.0	6	0	0.0	0	0	0.	0.325	0.0	0.	0.0	0.0	0.0	0.0
8		0	0	0	0.	0.	0.0	0.0	0	0	0.0	0	0	0.	0.0	0.0	0.	0.0	0.0	0.0	0.0

```
HYDRO SEASONAL FACTORS, CAPACITY MULTIPLIERBASE CAP MULTIPLIER, ENERGY ALLOCATION
   1.0000  0.8750
   1.0000  0.7707
   0.5427  0.4573
HYDRO CAPACITY FACTORS 78.4 75.5

EMERGENCY HYDRO CAPACITY SEASONAL MULTIPLIERS
  0.6541  1.0000

MULTIPLIERS ON HYDRO SEASONAL FACTORS FOR  3 CONDITION(S)
   BASFAC   TOTFAC   ENGFAC   EMGFAC    PROB
   1.0000   1.0000   1.0000   1.0000   0.6000
   0.5000   0.9500   0.8200   0.9000   0.2500
   1.5000   1.1500   1.2600   1.1000   0.1500

PUMPED STORAGE--PUMP EFF,GEN EFF,CYCLE EFF.
   0.8500   0.8800   0.7480

INDEX                        2
ADD     2 SETS TO PLANT       3

INDEX                   1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                 324      283
EMERGENCY HYDRO CAPACITY        38       44
PUMP STORAGE CAPACITY            0        0
ALL OTHER CAPACITY            1660     1660
TOTAL CAPACITY                2022     1987

END OF DATA FOR YEAR 1980 * * * * * * * * * * * * *
```

```
INDEX                                1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                    324        283
EMERGENCY HYDRO CAPACITY           38         44
PUMP STORAGE CAPACITY               0          0
ALL OTHER CAPACITY               1660       1660
TOTAL CAPACITY                   2022       1987
END OF DATA FOR YEAR 1981 * * * * * * * * * * * *

INDEX                                3
RETIRE     3 UNITS FROM PLANT      5
INDEX                                1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                    324        283
EMERGENCY HYDRO CAPACITY           38         44
PUMP STORAGE CAPACITY               0          0
ALL OTHER CAPACITY               1585       1585
TOTAL CAPACITY                   1947       1912

END OF DATA FOR YEAR 1982 * * * * * * * * * * * *

INDEX                                1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                    324        283
EMERGENCY HYDRO CAPACITY           38         44
PUMP STORAGE CAPACITY               0          0
ALL OTHER CAPACITY               1585       1585
TOTAL CAPACITY                   1947       1912

END OF DATA FOR YEAR 1983 * * * * * * * * * * * *

INDEX                                1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                    324        283
EMERGENCY HYDRO CAPACITY           38         44
PUMP STORAGE CAPACITY               0          0
ALL OTHER CAPACITY               1585       1585
TOTAL CAPACITY                   1947       1912
END OF DATA FOR YEAR 1984 * * * * * * * * * * * *

INDEX                                1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                    324        283
EMERGENCY HYDRO CAPACITY           38         44
PUMP STORAGE CAPACITY               0          0
ALL OTHER CAPACITY               1585       1585
TOTAL CAPACITY                   1947       1912
END OF DATA FOR YEAR 1985 * * * * * * * * * * * *
```

```
INDEX                        1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                    324       283
EMERGENCY HYDRO CAPACITY           38        44
PUMP STORAGE CAPACITY               0         0
ALL OTHER CAPACITY               1585      1585
TOTAL CAPACITY                   1947      1912

END OF DATA FOR YEAR 1986 * * * * * * * * * * * *

INDEX                        1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                    324       283
EMERGENCY HYDRO CAPACITY           38        44
PUMP STORAGE CAPACITY               0         0
ALL OTHER CAPACITY               1585      1585
TOTAL CAPACITY                   1947      1912
END OF DATA FOR YEAR 1987 * * * * * * * * * * * *

INDEX                        1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                    324       283
EMERGENCY HYDRO CAPACITY           38        44
PUMP STORAGE CAPACITY               0         0
ALL OTHER CAPACITY               1585      1585
TOTAL CAPACITY                   1947      1912

END OF DATA FOR YEAR 1988 * * * * * * * * * * * *

INDEX                        1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                    324       283
EMERGENCY HYDRO CAPACITY           38        44
PUMP STORAGE CAPACITY               0         0
ALL OTHER CAPACITY               1585      1585
TOTAL CAPACITY                   1947      1912

END OF DATA FOR YEAR 1989 * * * * * * * * * * * *

INDEX                        1
SYSTEM FIXED CAPACITY SUMMARY
HYDRO CAPACITY                    324       283
EMERGENCY HYDRO CAPACITY           38        44
PUMP STORAGE CAPACITY               0         0
ALL OTHER CAPACITY               1585      1585
TOTAL CAPACITY                   1947      1912

END OF DATA FOR YEAR 1990 * * * * * * * * * * * *
```

INDEX	1	
SYSTEM FIXED CAPACITY SUMMARY		
HYDRO CAPACITY	324	283
EMERGENCY HYDRO CAPACITY	38	44
PUMP STORAGE CAPACITY	0	0
ALL OTHER CAPACITY	1585	1585
TOTAL CAPACITY	1947	1912

END OF DATA FOR YEAR 1991 * * * * * * * * * * * *

INDEX	1	
SYSTEM FIXED CAPACITY SUMMARY		
HYDRO CAPACITY	324	283
EMERGENCY HYDRO CAPACITY	38	44
PUMP STORAGE CAPACITY	0	0
ALL OTHER CAPACITY	1585	1585
TOTAL CAPACITY	1947	1912

END OF DATA FOR YEAR 1992 * * * * * * * * * * * *

INDEX	1	
SYSTEM FIXED CAPACITY SUMMARY		
HYDRO CAPACITY	324	283
EMERGENCY HYDRO CAPACITY	38	44
PUMP STORAGE CAPACITY	0	0
ALL OTHER CAPACITY	1585	1585
TOTAL CAPACITY	1947	1912

END OF DATA FOR YEAR 1993 * * * * * * * * * * * *

INDEX	1	
SYSTEM FIXED CAPACITY SUMMARY		
HYDRO CAPACITY	324	283
EMERGENCY HYDRO CAPACITY	38	44
PUMP STORAGE CAPACITY	0	0
ALL OTHER CAPACITY	1585	1585
TOTAL CAPACITY	1947	1912

END OF DATA FOR YEAR 1994 * * * * * * * * * * * *

D.3. VARSYS sample output

```
      2         9
        CARD IMAGE   CARD IMAGE  CARD IMAGE CARD IMAGE CAR'D IMAGE  CARD IMAGE  CARD IMAGE   CARD IMAGE
```

	NAME	NO. OF SETS	MIN. LOAD MW	CAP-CITY MW	BASE LOAD HEAT RATE	AVGE INCR HEAT RATE	FUEL COSTS CENTS/MILLION DMSTC	FUEL COSTS CENTS/MILLION FORGN	TYPE	LCT N	FRCD OUT-AGE RATE	DAYS SCHL MAIN	MAIN CLAS	ENRGY GWH	O?M (FIX)	O?M (VAR)	FULL LOAD HEAT RATE	UNIT GENERATION COSTS ($/MWH) BASE DOM	BASE FRGN	FLD DOM	FLD FRGN
1	N600	0	400	600	2568.	2363.	0.0	142.00	0	5	12.00	42	600	0.	0.990	0.0	2500.	0.0	3.6	0.0	3.5
2	N10H	0	667	1000	2566.	2361.	0.0	134.00	0	5	16.00	42	1000	0.	0.730	0.0	2498.	0.0	3.4	0.0	3.3
3	C300	0	100	300	2480.	2180.	450.00	0.0	3	10	7.00	35	300	0.	1.200	0.0	2280.	11.2	0.0	10.3	0.0
4	C600	0	200	600	2460.	2160.	450.00	0.0	3	10	12.00	42	600	0.	0.710	0.0	2260.	11.1	0.0	10.2	0.0
5	C10H	0	334	1000	2440.	2140.	450.00	0.0	3	10	16.00	42	1000	0.	0.560	0.0	2240.	11.0	0.0	10.1	0.0
6	O600	0	200	600	2440.	2140.	10.00	700.00	2	10	10.00	42	600	0.	0.670	0.0	2240.	0.2	17.1	0.2	15.7
7	GT2H	0	58	192	6322.	2262.	10.00	980.00	1	73	1.25	14	50	0.	0.520	0.0	3488.	0.6	62.0	0.3	34.2
8	VHYD	4	0	0	0.	0.	0.0	0.0	5	0	0.0	0	0	0.	0.0	0.0	0.	0.0	0.0	0.0	0.0

```
PROJECT DATA
  233  233 1500.     0  0.0       0.0      1982 1
   1.0000  0.6700
   1.0000  0.6700
   0.5900  0.4100
   0.0     0.0

CUMULATIVE OPTIONAL HYDRO ADDITION CONSTS THRU PROJ     1 YEAR AVAILABLE  1982
BASE CAP.     233 CAPACITY    233 ANNUAL ENERGY  1500.00 AVAIL. EMERGENCY CAPACITY     0
   1.0000  0.6700
   1.0000  0.6700
   0.5900  0.4100
   0.0     0.0

PROJECT DATA
    0  349  780.     92  0.0       0.0      1984 1
   1.0000  0.9748
   0.0     0.0
   0.3987  0.6013
   0.8816  1.0000

CUMULATIVE OPTIONAL HYDRO ADDITION CONSTS THRU PROJ     2 YEAR AVAILABLE  1984
BASE CAP.     233 CAPACITY    582 ANNUAL ENERGY  2280.00 AVAIL. EMERGENCY CAPACITY    92
   1.0000  0.8528
   1.0000  0.6700
   0.5246  0.4754
   0.8816  1.0000
```

```
PROJECT CATA
  106  616 2611.   138  0.0      0.0     1986 1
   1.0000  0.8300
   1.0000  0.3206
   C.6702  0.3298
   0.8837  1.0000

CUMULATIVE OPTIONAL HYCRO ADDITION CONSTS THRU PROJ     3 YEAR AVAILABLE  1986
BASE CAP.     339 CAPACITY  1198 ANNUAL ENERGY   4891.00 AVAIL. EMERGENCY CAPACITY    230
   1.0CC0  0.8411
   1.0000  0.5607
   0.6023  0.3977
   0.8829  1.0000

PROJECT CATA
  150  600 2800.     0  0.0      0.0     1990 1
   1.0000  0.8000
   1.COCO  0.6761
   0.5961  0.4039
   0.0     0.0

CUMULATIVE OPTICNAL HYCRO ADDITICN CONSTS THRU PROJ     4 YEAR AVAILABLE  1990
BASE CAP.     489 CAPACITY  1798 ANNUAL ENERGY   7691.00 AVAIL. EMERGENCY CAPACITY    230
   1.0000  0.8274
   1.COCO  0.5961
   0.6060  0.4000
   0.8829  1.0000

   9    VPST    5    0    0    0.    0.    0.0    0.0    6   0   0.0    0    0    0. 0.325 0.0    0.   0.0   0.0   0.0   0.0

PROJECT CATA
  240  240  218.    0  0.8500  0.8800 1984 0

CUMULATIVE,EFFECTIVE OPTIONAL P.STGE. CONSTS THRU PROJ     1 YEAR AVAILABLE  1984
PUMP CAP    240GEN. CAP.   240 MAXIMUM ENERGY 218.00 GWH, CYCLE EFF. 0.748

PROJECT CATA
  240  240  218.    0  0.8500  0.8800 1985 0

CUMULATIVE,EFFECTIVE OPTIONAL P.STGE. CONSTS THRU PROJ     2 YEAR AVAILABLE  1985
PUMP CAP    480GEN. CAP.   480 MAXIMUM ENERGY 436.00 GWH, CYCLE EFF. 0.748

PROJECT CATA
  240  240  218.    0  0.8500  0.8800 1985 0

CUMULATIVE,EFFECTIVE OPTIONAL P.STGE. CONSTS THRU PRCJ     3 YEAR AVAILABLE  1985
PUMP CAP    720GEN. CAP.   720 MAXIMUM ENERGY 654.00 GWH, CYCLE EFF. 0.748

PROJECT CATA
  240  240  218.    0  0.8500  0.8800 1986 0

CUMULATIVE,EFFECTIVE OPTIONAL P.STGE. CONSTS THRU PRCJ     4 YEAR AVAILABLE  1986
PUMP CAP    960GEN. CAP.   960 MAXIMUM ENERGY 872.00 GWH, CYCLE EFF. 0.748

PROJECT CATA
  240  240  218.    0  0.8500  0.8800 1986 0

CUMULATIVE,EFFECTIVE OPTIONAL P.STGE. CONSTS THRU PROJ     5 YEAR AVAILABLE  1986
PUMP CAP   1200GEN. CAP.  1200 MAXIMUM ENERGY ****** GWH, CYCLE EFF. 0.748
```

D.4. MATURE sample output

COMBINED FIXSYS AND VARSYS PLANT LIST

1 FHYD	2 FFMH	3 F01H	4 F050	5 FD25	6 FGTH	7 FPST	8 N600	9 N10H	10 C300
11 C600	12 C10H	13 0600	14 GT2H	15 VHYD	16 VPST	17	18	19	20

PLANT ADJUSTING FACTORS

YEAR	PLANT NUMBER	PLANT NAME	ADJUSTING FACTORS FOR EACH PERIOD	
YEAR: 1980				
	1	FHYD	0.900	0.900
	3	F01H	0.900	0.900
	4	F050	0.900	0.900
	11	C600	0.900	0.900
YEAR: 1981				
	2	FEMH	1.100	1.100
	4	F050	1.100	1.100
	5	FD25	0.900	0.900
	6	FGTH	1.100	1.100
	10	C300	1.100	1.100
YEAR: 1982				
	1	FHYD	0.0	0.0
	5	FD25	0.0	0.0
YEAR: 1983				
YEAR: 1984				
YEAR: 1985				
	1	FHYD	0.0	0.0
	5	FD25	0.0	0.0
YEAR: 1986				
YEAR: 1987				
YEAR: 1988				
YEAR: 1989				
	1	FHYD	0.801	0.801
	6	FGTH	0.801	0.801
YEAR: 1990				
YEAR: 1991				
YEAR: 1992				
YEAR: 1993				
YEAR: 1994				

D.5. Sample output of PWCONGEN run 1

NUMBER OF PWCONGEN RUNS IS 1
NUMBER OF POINTS FOR ILDC REPRESENTATION IS 1000
PLANT AVAILABILITY CHANGES OPTION IN EFFECT

NUMBER OF ALTERNATIVES FROM WHICH TO CHOOSE IS 9
NUMBER OF PERIODS IN YEAR IS 2
NUMBER OF FOURIER COEFF. IS 50

	NAME	NO. OF SETS	MIN. LOAD MW	CAP-CITY MW	BASE LOAD HEAT RATE	AVGE INCR HEAT RATE	FUEL COSTS CENTS/MILLION DMSTC	FORGN	TYPE	LCTN	FRCD OUT-AGE RATE	DAYS SCHL MAIN	MAIN CLAS	ENRGY GWH	O?M (FIX)	O?M (VAR)
FIXED SYSTEM																
1	FHYD	1	159	324	0.	0.	0.0	0.0	5	0	0.0	0	0	2051.	0.300	0.0
2	FEMH	1	44	44	2262.	2262.	10.00	980.00	-1	99	0.0	0	0	0.	0.300	0.0
3	FOIH	5	34	100	2490.	2190.	10.00	700.00	2	10	3.00	28	100	0.	2.300	0.0
4	FC50	8	25	50	2618.	2326.	10.00	700.00	2	10	3.00	28	50	0.	3.000	0.0
5	FD25	3	20	25	2175.	1800.	10.00	980.00	4	20	1.00	14	25	0.	0.850	0.0
6	FGTH	5	29	97	6322.	2262.	10.00	980.00	1	72	2.50	14	50	0.	0.520	0.0
7	FPST	0	0	0	0.	0.	0.0	0.0	6	0	0.0	0	0	0.	0.325	0.0
VARIABLE SYSTEM																
8	N600	0	400	600	2568.	2363.	0.0	142.00	0	5	12.00	42	600	0.	0.990	0.0
9	N10H	C	667	1000	2566.	2361.	0.0	134.00	0	5	16.00	42	1000	0.	0.730	0.0
10	C300	0	100	300	2480.	2180.	450.00	0.0	3	10	7.00	35	300	0.	1.200	0.0
11	C600	0	200	600	2460.	2160.	450.00	0.0	3	10	12.00	42	600	0.	0.710	0.0
12	C10H	C	334	1000	2440.	2140.	450.00	0.0	3	10	16.00	42	1000	0.	0.560	0.0
13	0600	0	200	600	2440.	2140.	10.00	700.00	2	10	10.00	42	600	0.	0.670	0.0
14	GT2H	0	58	192	6322.	2262.	10.00	980.00	1	73	1.25	14	50	0.	0.520	0.0
15	VHYD	4	0	0	0.	0.	0.0	0.0	5	0	0.0	0	0	0.	0.0	0.0
16	VPST	5	0	0	0.	0.	0.0	0.0	6	0	0.0	0	0	0.	0.325	0.0

POSITION OF HYDRO EMERG.H. PUMPED STG

POSITION OF	HYDRO	EMERG.H.	PUMPED STG
	1	2	7

```
INDEX READ     7
INDEX READ     6
INDEX READ     5
INDEX READ     4
INDEX READ     3
INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1980
MINIMUM REQUIRED OF EACH ALTERNATIVE     0   0   0   0   0   0   0   0   0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0   0   0   0   0   0   0   0   0
RESERVE RANGE PERMITTED CRITICAL PER      0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
           ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1660      324       38        0
      1660      283       44        0
CRITICAL PERIOD IS       2 CAPACITY RANGE IS       1647       2470
INST. CAP DURING CRIT PER        1987.0
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC   CAP     LOLP         SEASONAL LOLP              ACCEPTED CONFIGURATION

  THIS IS THE FIRST PWCCNGEN RUN AND LOLP VALUES ARE MEANINGLESS
    1    1  1987   2.52861   0.6262 4.4310 0.0     0.0          0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0
    1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                1
CONFIGURATIONS THROUGH THIS YEAR        1
* * * * * * * * * * * * * * * * * * * END OF YEAR 1980 * * * * * * * * * * * * * * * * * *
```

```
INDEX READ     2
INDEX READ     1
CONDITICNS GOVERNING ALTERNATIVE GENERATICN, YEAR 1981
MINIMUM REQUIRED OF EACH ALTERNATIVE     0    0    1    0    0    0    0    C    0
MAXIMUM ADDITICNAL EACH  ALTERNATIVE     0    0    0    0    0    0    0    C    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0       50.0000
OPTICN FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =   182.500
        ANNUAL LOSS OF LOAD PRCBABILITY =  1.00000    EQUIVALENT CAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,FHYD,PSTGE
     1660      324       38        0
     1660      293       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       1936       2904
INST. CAP DURING CRIT PER       2287.0
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASCNAL LOLP          ACCEPTED CONFIGURATION

  THIS IS THE FIRST PWCCNGEN RUN AND LOLP VALUES ARE MEANINGLESS
    2    1   2287   4.86542   1.5672 8.1637 0.0     0.0          0    0    1    0    0    0    0    0    0
   0    0    1    0    0    0    0    C    0
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR      2
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1981  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
```

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```
INDEX READ     2
INDEX READ     1
CONDITICAS GOVERNING ALTERNATIVE GENERATION, YEAR 1982
MINIMUM REQUIRED OF EACH ALTERNATIVE     0   0   2   0   0   0   0   1   0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0   0   0   C   0   0   0   C   0
RESERVE RANGE PERMITTED CRITICAL PER       0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   182.500
              ANNUAL LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
       1585      324       38        0
       1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       2274       3411
INST. CAP DURING CRIT PER       2668.1
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS    5

STATE IC   CAP     LOLP        SEASONAL LOLP            ACCEPTED CONFIGURATION

 THIS IS THE FIRST PKCCNGEN RUN ANC LOLP VALUES ARE MEANINGLESS
   3   1   2668  *******  ****** ****** 0.0      0.0          0   0   2   0   0   0   0   1   0
   0   0   2   0   C   0   0   1   0
   1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR                 1
CONFIGURATIONS THROUGH THIS YEAR         3
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1982  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITICNS GOVERNING ALTERNATIVE GENERATICN, YEAR 1983
MINIMUM REQUIRED OF EACH ALTERNATIVE      0    0    4    0    0    0    0    1    0
MAXIMUM ADDITICNAL EACH  ALTERNATIVE      0    C    0    0    0    0    0    C    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0       50.0000
OPTION FCR MODE CF GENERATION (ICPTN)       1
MAXIMUM PERIOD LOSS OF LCAD PRCBABILITY =  1.C0000   EQUIVALENT DAYS/YR =  182.500
        ANNUAL LCSS OF LOAD PRCBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
    1585     324     38      0
    1585     283     44      0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      2669      4003
INST. CAP DURING CRIT PER      3268.1
MINIMUM NUMBER CF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC   CAP    LOLP       SEASCNAL LOLP          ACCEPTED CONFIGURATION
  THIS IS THE FIRST PWCONGEN RUN AND LOLP VALUES ARE MEANINGLESS
    4   1  3268  *******  ****** ****** 0.0    0.0        0   0   4   0   0   0   0   1   0
   0   0   4   C   C   0   0   1   0
   1   1   1   1   1   1   1   1   1
CCNFIGURATICNS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR      4
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1983  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1984
MINIMUM REQUIRED OF EACH ALTERNATIVE      0    0    4    0    0    0    0    2    0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPIN)         1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =   182.500
               ANNUAL LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT CAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1585      324       38        0
      1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       3129       4693
INST. CAP DURING CRIT PER        3700.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASCNAL LOLP            ACCEPTED CONFIGURATION

 THIS IS THE FIRST PWCCNGEN RUN AND LCLP VALUES ARE MEANINGLESS
    5   1  3700  *******  ****** ****** 0.0      0.0          0    0    4    0    0    0    0    2    0
   0    0    4    0    0    0    0    2    0
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR               1
CONFIGURATIONS THROUGH THIS YEAR       5
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1984  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1985
MINIMUM REQUIRED OF EACH ALTERNATIVE      0    0    4    1    0    0    0    2    1
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    C    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   182.500
            ANNUAL LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
       1585      324       38       0
       1585      283       44       0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       3666      5499
INST. CAP DURING CRIT PER       4540.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASCNAL LOLP          ACCEPTED CONFIGURATION

 THIS IS THE FIRST PWCCNGEN RUN ANC LOLP VALUES ARE MEANINGLESS
   6   1   4540   *******  ****** ****** 0.0     0.0          0    0    4    1    0    0    0    2    1
  0    0    4    1    0    C    0    2    1
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR             1
CONFIGURATIONS THROUGH THIS YEAR     6
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *   END OF YEAR 1985   *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITICNS GOVERNING ALTERNATIVE GENERATION, YEAR 1986
MINIMUM REQUIRED OF EACH ALTERNATIVE     1   0   4   1   0   0   0   2   2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0   0   0   C   0   0   0   C   0
RESERVE RANGE PERMITTED CRITICAL PER      0.0      50.0000
OPTION FCR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
               ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585      324      38       0
     1585      283      44       0
CRITICAL PERIOD IS    2 CAPACITY RANGE IS      4290      6435
INST. CAP DURING CRIT PER       5380.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPCNCING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASCNAL LOLP            ACCEPTED CONFIGURATION
 THIS IS THE FIRST PWCCNGEN RUN AND LOLP VALUES ARE MEANINGLESS
   7   1   5380  *******  ****** ****** 0.0     0.0        1   0   4   1   0   0   0   2   2
   1   0   4   1   0   0   0   2   2
   1   1   1   1   1   1   1   1   1
CCNFIGURATIONS THIS YEAR                 1
CONFIGURATIONS THROUGH THIS YEAR         7
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1986  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1987
MINIMUM REQUIRED OF EACH ALTERNATIVE     1   0   4   2   0   0   0   2   2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0   0   0   0   0   0   0   C   0
RESERVE RANGE PERMITTEC CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.C0000   EQUIVALENT DAYS/YR =  182.500
           ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1585      324       38        0
      1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       5017       7525
INST. CAP DURING CRIT PER         5980.3
MINIMUM NUMBER CF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASCNAL LOLP           ACCEPTED CONFIGURATION

  THIS IS THE FIRST PWCONGEN RUN AND LOLP VALUES ARE MEANINGLESS
    8   1  5980  ******* ****** ****** 0.0     0.0        1   0   4   2   0   0   0   2   2
   1   0   4   2   0   0   0   2   2
   1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR      8
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1987  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITICNS GOVERNING ALTERNATIVE GENERATICN, YEAR 1988
MINIMUM REQUIRED OF EACH ALTERNATIVE      1    0    4    5    0    0    0    2    2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    C    0
RESERVE RANGE PERMITTEC CRITICAL PER       0.0         50.0000
OPTION FOR MODE OF GENERATION (IOPIN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
           ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTCE
      1585      324       38        0
      1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       5863       8794
INST. CAP DURING CRIT PER       7780.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASCNAL LOLP            ACCEPTED CONFIGURATION

 THIS IS THE FIRST PWCCNGEN RUN ANC LOLP VALUES ARE MEANINGLESS
   9   1   7780  *******  ****** ****** 0.0     0.0          1    0    4    5    0    0    0    2    2
  1    0    4    5    0    0    0    2    2
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR      9
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1988  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ    2
INDEX READ    1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1989
MINIMUM REQUIRED OF EACH ALTERNATIVE     1   0   4   7   0   0   0   2   2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0   0   0   0   0   0   0   0   0
RESERVE RANGE PERMITTED CRITICAL PER      0.0      50.0000
OPTION FOR MODE OF GENERATION (IOPIN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
         ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585     324      38       0
     1585     293      44       0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      6845      10267
INST. CAP DURING CRIT PER     8980.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS    5

STATE IC   CAP     LOLP       SEASONAL LOLP          ACCEPTED CONFIGURATION

 THIS IS THE FIRST PWCCNGEN RUN AND LOLP VALUES ARE MEANINGLESS
  10   1  8980  *******  ****** ****** 0.0     0.0          1   0   4   7   0   0   0   2   2
   1   0   4   7   0   0   0   2   2
   1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR            1
CONFIGURATIONS THROUGH THIS YEAR    10
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1989  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ    2
INDEX READ    1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1990
MINIMUM REQUIRED OF EACH ALTERNATIVE     2   0   4   7   0   0   0   2   3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0   0   0   C   0   0   0   C   0
RESERVE RANGE PERMITTED CRITICAL PER      0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPIN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
           ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585      324       38        0
     1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       7985      11977
INST. CAP DURING CRIT PER        9820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC    CAP     LOLP       SEASONAL LOLP          ACCEPTED CONFIGURATION

 THIS IS THE FIRST PWCCNGEN RUN AND LOLP VALUES ARE MEANINGLESS
  11    1   9820   *******  ****** ****** 0.0     0.0         2   0   4   7   0   0   0   2   3
   2    0    4    7    C    0    0    2    3
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                 1
CONFIGURATIONS THROUGH THIS YEAR        11
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *   END OF YEAR 1990  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1991
MINIMUM REQUIRED OF EACH ALTERNATIVE      2   2   4   7   0   0   0   2   3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0   0   0   0   0   0   0   C   0
RESERVE RANGE PERMITTED CRITICAL PER     0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
              ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585     324      38       0
     1585     283      44       0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      9307      13960
INST. CAP DURING CRIT PER      11820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC   CAP    LOLP        SEASONAL LOLP          ACCEPTED CONFIGURATION
 THIS IS THE FIRST PWCONGEN RUN AND LOLP VALUES ARE MEANINGLESS
  12   1 11820  ******* ****** ****** 0.0     0.0          2   2   4   7   0   0   0   2   3
  2   2   4   7   0   0   0   2   3
  1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR                 1
CONFIGURATIONS THROUGH THIS YEAR        12
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1991  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITICNS GOVERNING ALTERNATIVE GENERATION, YEAR 1992
MINIMUM REQUIRED OF EACH ALTERNATIVE      2   4   4   7   0   0   0   2   3
MAXIMUM ADDITICNAL EACH  ALTERNATIVE      0   0   0   0   0   0   0   C   0
RESERVE RANGE PERMITTEC CRITICAL PER       0.0         50.C000
OPTION FCR MODE OF GENERATION (IOPIN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =  182.500
            ANNUAL LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1565      324       38        0
     1565      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       10837      16255
INST. CAP DURING CRIT PER     13820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC    CAP     LOLP        SEASONAL LOLP           ACCEPTED CONFIGURATION
  THIS IS THE FIRST PWCONGEN RUN ANC LOLP VALUES ARE MEANINGLESS
   13    1 13820  *******  ****** ****** 0.0     0.0         2   4   4   7   0   0   0   2   3
   2   4   4   7   0   0   0   2   3
   1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR     13
* * * * * * * * * * * * * * * * * * *  END OF YEAR 1992  * * * * * * * * * * * * * * * * * *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1993
MINIMUM REQUIRED OF EACH ALTERNATIVE     2    7    4    7    0    0    0    2    3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPIN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
            ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585      324      38       0
     1585      283      44       0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      12609      18913
INST. CAP DURING CRIT PER     16820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC   CAP    LOLP       SEASONAL LOLP          ACCEPTED CONFIGURATION

 THIS IS THE FIRST PWCCAGEN RUN AND LOLP VALUES ARE MEANINGLESS
  14   1 16820  *******  ****** ****** 0.0    0.0        2   7   4   7   0   0   0   2   3
   2   7   4   7   0   0   0   2   3
   1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR     14
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1993  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ    2
INDEX READ    1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1994
MINIMUM REQUIRED OF EACH ALTERNATIVE      2    9    4    7    0    0    0    2    3
MAXIMUM ADDITICNAL EACH  ALTERNATIVE      0    C    0    C    0    0    0    C    0
RESERVE RANGE PERMITTEC CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPIN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
            ANNUAL LCSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXEC CAPACITY--OTHER,HYCRO,EHYD,PSTGE
     1585      324      38      0
     1585      293      44      0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      14658      21987
INST. CAP DURING CRIT PER     18821.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC   CAP     LOLP        SEASCNAL LOLP          ACCEPTED CONFIGURATION

 THIS IS THE FIRST PWCONGEN RUN AND LOLP VALUES ARE MEANINGLESS
  15    1 18820  *******  ****** ****** 0.0      0.0        2    9    4    7    0    0    0    2    3
  2    9    4    7    0    0    0    2    3
  1    1    1    1    1    1    1    1    1
CCNFIGURATIONS THIS YEAR                 1
CONFIGURATIONS THROUGH THIS YEAR        15
* * * * * * * * * * * * * * * * * * * *  END OF YEAR 1994  * * * * * * * * * * * * * * * * * * *
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LIST OF > OF CONFIGURATIONS PER YEAR

1980	1
1981	1
1982	1
1983	1
1984	1
1985	1
1986	1
1987	1
1988	1
1989	1
1990	1
1991	1
1992	1
1993	1
1994	1
TOTAL	15

D.6. Sample output of PWCONGEN run 2

NUMBER OF PWCONGEN RUNS IS 2
NUMBER OF POINTS FOR ILDC REPRESENTATION IS 1000
PLANT AVAILABILITY CHANGES OPTION IN EFFECT

NUMBER OF ALTERNATIVES FROM WHICH TO CHOOSE IS 9
NUMBER OF PERIODS IN YEAR IS 2
NUMBER OF FOURIER COEFF. IS 50

	NAME	NO. OF SETS	MIN. LOAD MW	CAP-CITY MW	BASE LOAD HEAT RATE	AVGE INCR HEAT RATE	FUEL COSTS CENTS/MILLION DMSTC	FUEL COSTS CENTS/MILLION FORGN	TYPE	LCTN	FRCD OUT-AGE RATE	DAYS SCHL MAIN	MAIN CLAS	ENRGY GWH	O?M (FIX)	O?M (VAR)
FIXED SYSTEM																
1	FHYD	1	159	374	0.	0.	0.0	0.0	5	0	0.0	0	0	2051.	0.300	0.0
2	FEMH	1	44	44	2262.	2262.	10.00	980.00	-1	99	0.0	0	0	0.	0.300	0.0
3	F01H	5	34	100	2490.	2190.	10.00	700.00	2	10	3.00	28	100	0.	2.300	0.0
4	F050	8	25	50	2618.	2326.	10.00	700.00	2	10	3.00	28	50	0.	3.000	0.0
5	F025	3	20	25	2175.	1800.	10.00	980.00	4	20	1.00	14	25	0.	0.850	0.0
6	FGTH	5	29	57	6322.	2262.	10.00	980.00	1	72	2.50	14	50	0.	0.520	0.0
7	FPST	0	0	0	0.	0.	0.0	0.0	6	0	0.0	0	0	0.	0.325	0.0
VARIABLE SYSTEM																
8	N600	0	400	600	2568.	2363.	0.0	142.00	0	5	12.00	42	600	0.	0.990	0.0
9	N10H	0	667	1000	2566.	2361.	0.0	134.00	0	5	16.00	42	1000	0.	0.730	0.0
10	C300	0	100	300	2480.	2180.	450.00	0.0	3	10	7.00	35	300	0.	1.200	0.0
11	C600	0	200	600	2460.	2160.	450.00	0.0	3	10	12.00	42	600	0.	0.710	0.0
12	C10H	0	334	1000	2440.	2140.	450.00	0.0	3	10	16.00	42	1000	0.	0.560	0.0
13	0600	0	200	600	2440.	2140.	10.00	700.00	2	10	10.00	42	600	0.	0.670	0.0
14	GT2H	0	58	192	6322.	2262.	10.00	980.00	1	73	1.25	14	50	0.	0.520	0.0
15	VHYD	4	0	0	0.	0.	0.0	0.0	5	0	0.0	0	0	0.	0.0	0.0
16	VPST	5	0	0	0.	0.	0.0	0.0	6	0	0.0	0	0	0.	0.325	0.0

POSITION OF	HYDRO	EMERG.H.	PUMPED STG
	1	2	7

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INDEX READ     7
INDEX READ     6
INDEX READ     5
INDEX READ     4
INDEX READ     3
INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1980
MINIMUM REQUIRED OF EACH ALTERNATIVE     0    0    0    0    0    0    0    C    0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0    0    0    0    0    0    0    C    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =  182.500
            ANNUAL LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1660      324       38       C
     1660      293       44       0
CRITICAL PERIOD IS    2 CAPACITY RANGE IS      1647       2470
INST. CAP DURING CRIT PER      1987.0
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS    5

STATE IC   CAP    LOLP        SEASONAL LOLP            ACCEPTED CONFIGURATION

   1   1  1987  0.03973  0.0C08 0.0787 0.0     0.0          0    0    0    0    0    0    0    0    0
  0   C   0   0   0   C   0   0   0
  1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR           1
CONFIGURATIONS THROUGH THIS YEAR   1
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1980  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ    2
INDEX READ    1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1981
MINIMUM REQUIRED OF EACH ALTERNATIVE      0    0    1    0    0    0    0    0    0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
            ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1660      324       38        0
      1650      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       1936       2904
INST. CAP DURING CRIT PER      2287.0
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASONAL LOLP           ACCEPTED CONFIGURATION

    2    1  2287  0.00002  0.0     0.0000 0.0     0.0        0    0    1    0    0    0    0    0    0
  0    0    1    0    0    0    0    0    0
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR      2
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1981  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1982
MINIMUM REQUIRED OF EACH ALTERNATIVE     0    0    2    0    0    0    0    1    0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =  182.500
            ANNUAL LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1555      324       38        0
      1555      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      2274       3411
INST. CAP DURING CRIT PER       2668.1
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS      5

STATE IC    CAP     LOLP        SEASONAL LOLP           ACCEPTED CONFIGURATION

    3    1   2668  0.02315  0.0002 0.0461 0.0     0.0          0    0    2    0    0    0    0    1    0
  0    0    2    0    0    0    0    1    0
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR            1
CONFIGURATIONS THROUGH THIS YEAR    3
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1982  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1983
MINIMUM REQUIRED OF EACH ALTERNATIVE      0   0   4   0   0   0   0   1   0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0   0   0   0   0   0   0   0   0
RESERVE RANGE PERMITTED CRITICAL PER     0.0      50.0000
OPTION FOR MODE OF GENERATION (IOPTN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
        ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585      324      38      0
     1585      293      44      0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       2669       4003
INST. CAP DURING CRIT PER      3268.1
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP       SEASONAL LOLP              ACCEPTED CONFIGURATION

    4   1  3268  0.01293  0.0002 0.0257 0.0    0.0          0   0   4   0   0   0   0   1   0
   0   0   4   0   0   0   0   1   0
   1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR                  1
CONFIGURATIONS THROUGH THIS YEAR          4
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1983  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1984
MINIMUM REQUIRED OF EACH ALTERNATIVE     0   0   4   0   0   0   0   2   0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0   0   0   0   0   0   0   0   0
RESERVE RANGE PERMITTED CRITICAL PER     0.0      50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
         ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585      324      39       0
     1585      293      44       0
CRITICAL PERIOD IS    2 CAPACITY RANGE IS       3129       4693
INST. CAP DURING CRIT PER       3700.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASONAL LOLP              ACCEPTED CONFIGURATION

    5   1  3700  0.01562  0.0001 0.0311 0.0     0.0          0   0   4   0   0   0   0   2   0
   0   0   4   0   0   0   0   2   0
   1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR            1
CONFIGURATIONS THROUGH THIS YEAR    5
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *   END OF YEAR 1984  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1986
MINIMUM REQUIRED OF EACH ALTERNATIVE      1   0   4   1   0   0   0   2   2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0   0   0   0   0   0   0   0   0
RESERVE RANGE PERMITTED CRITICAL PER      0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =  182.500
            ANNUAL LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585      324      38      0
     1585      283      44      0
CRITICAL PERIOD IS    2 CAPACITY RANGE IS       4290       6435
INST. CAP DURING CRIT PER       5380.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC   CAP    LOLP       SEASONAL LOLP           ACCEPTED CONFIGURATION

    7   1  5380  0.01907  0.0023 0.0359 0.0     0.0         1   0   4   1   0   0   0   2   2
  1   0   4   1   0   0   0   2   2
  1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR               1
CONFIGURATIONS THROUGH THIS YEAR       7
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *   END OF YEAR 1986  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1985
MINIMUM REQUIRED OF EACH ALTERNATIVE     0    0    4    1    0    0    0    2    1
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
               ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585 *    324        38        0
     1585      283        44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       3666       5499
INST. CAP DURING CRIT PER        4540.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASONAL LOLP           ACCEPTED CONFIGURATION

    6   1   4540   0.01621   0.0011 0.0313 0.0     0.0         0    0    4    1    0    0    0    2    1
  0    0    4    1    0    0    0    2    1
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                1
CONFIGURATIONS THROUGH THIS YEAR        6
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1985  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1987
MINIMUM REQUIRED OF EACH ALTERNATIVE      1    0    4    2    0    0    0    2    2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE    0    0    0    0    0    0    0    C    0
RESERVE RANGE PERMITTEC CRITICAL PER      0.0          50.0000
OPTION FOR MODE OF GENEPATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.C0000     EQUIVALENT DAYS/YR =   182.500
                ANNUAL LOSS OF LOAD PROBABILITY =   1.00000     EQUIVALENT DAYS/YR =   365.000
FIXEC CAPACITY--OTHER,HYDRC,FHYD,PSTGE
       1585        324        38         0
       1585        283        44         0
CRITICAL PERIOD IS      2 CAPACITY RANGE IS        5017        7525
INST. CAP DURING CRIT PER          5980.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASCNAL LOLP             ACCEPTED CONFIGUPATION

    8    1   5980   0.07653   0.0155 0.1375 0.0      0.0          1    0    4    2    0    0    0    2    2
   1    0    4    2    0    C    0    2    2
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                   1
CONFIGURATIONS THROUGH THIS YEAR           8
* * * * * * * * * * * * * * * * * * * *   END OF YEAR 1987  * * * * * * * * * * * * * * * * * *
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INDEX READ      2
INDEX READ      1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1988
MINIMUM REQUIRED OF EACH ALTERNATIVE      1    0    4    5    0    0    0    2    2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    C    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.C0000    EQUIVALENT DAYS/YR =  182.500
               ANNUAL LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1585      324       38       0
      1565      283       44       0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      5863       8794
INST. CAP DURING CRIT PER       7780.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE  IC    CAP     LOLP         SEASCNAL LOLP              ACCEPTED CONFIGURATION

    9   1   7783   0.01136   0.0021 0.0206 0.0     0.0        1    0    4    5    0 . 0    0    2    2
   1    0    4    5    0    0    0    2    2
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR               1
CONFIGURATIONS THROUGH THIS YEAR       9
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1988  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1989
MINIMUM REQUIRED OF EACH ALTERNATIVE      1    0    4    7    0    0    0    2    2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    C    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.CC000    EQUIVALENT DAYS/YR =  182.500
            ANNUAL LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585      324      38       0
     1585      283      44       0
CRITICAL PERIOD IS    2 CAPACITY RANGE IS      6845      10267
INST. CAP DURING CRIT PER      8980.3
MINIMUM NUMBER CF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC   CAP    LOLP       SEASONAL LOLP          ACCEPTED CONFIGURATION

   10   1  8980  0.02142  0.0043 0.0385 0.0     0.0        1    0    4    7    0    0    0    2    2
   1    0    4    7    0    0    0    2    2
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR     10
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1989  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1990
MINIMUM REQUIRED OF EACH ALTERNATIVE      2    0    4    7    0    0    0    2    3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   182.500
           ANNUAL LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
    1565      324       38        0
    1565      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS        7985      11977
INST. CAP DURING CRIT PER       9820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC    CAP     LOLP        SEASONAL LOLP              ACCEPTED CONFIGURATION

  11    1  9820   0.05163   0.0214 0.0819 0.0      0.0          2    0    4    7    0    0    0    2    3
   2    0    4    7    0    0    0    2    3
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                 1
CONFIGURATIONS THROUGH THIS YEAR        11
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1990  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1991
MINIMUM REQUIRED OF EACH ALTERNATIVE      2    2    4    7    0    0    0    2    3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)         1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000   EQUIVALENT DAYS/YR =  182.500
               ANNUAL LOSS OF LOAD PROBABILITY =   1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,FHYD,PSTGE
      1585      324      38       0
      1565      283      44       0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS        9307      13960
INST. CAP DURING CRIT PER     11820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC    CAP     LOLP         SEASONAL LOLP              ACCEPTED CONFIGURATION

   12    1 11820   0.05676   0.0256 0.0880 0.0      0.0         2    2    4    7    0    0    0    2    3
   2    2    4    7    0    0    0    2    3
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                 1
CONFIGURATIONS THROUGH THIS YEAR        12
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *   END OF YEAR 1991  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1992
MINIMUM REQUIRED OF EACH ALTERNATIVE      2    4    4    7    0    0    0    2    3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   182.500
               ANNUAL LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1565      324       38        0
      1565      283       44        0
CRITICAL PERIOD IS    2 CAPACITY RANGE IS      10837     16255
INST. CAP DURING CRIT PER     13820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS    6

STATE IC   CAP     LOLP        SEASONAL LOLP            ACCEPTED CONFIGURATION

   13    1 13820  0.07103   0.0337 0.1C84 0.0    0.0        2    4    4    7    0    0    0    2    3
  2    4    4    7    0    0    0    2    3
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR     13
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1992  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1993
MINIMUM REQUIRED OF EACH ALTERNATIVE        2    7    4    7    0    0    0    2    3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE        0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =   182.500
            ANNUAL LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1585      324       38        0
      1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      12609      18913
INST. CAP DURING CRIT PER     16823.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC    CAP     LOLP        SEASONAL LOLP            ACCEPTED CONFIGURATION

   14    1 16820  0.03290  0.0151 0.0507 0.0     0.0          2   7   4   7   0   0   0   2   3
   2    7    4    7    0    0    0    2    3
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR     14
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1993  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1994
MINIMUM REQUIRED OF EACH ALTERNATIVE       2    9    4    7    0    0    0    2    3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE       0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   182.500
            ANNUAL LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585      324       38        0
     1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      14658      21587
INST. CAP DURING CRIT PER     18820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC    CAP     LOLP        SEASONAL LOLP           ACCEPTED CONFIGURATION

  15    1 18820  0.07498  0.0358 0.1141 0.0     0.0          2    9    4    7    0    0    0    2    3
   2    9    4    7    0    0    0    2    3
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR            1
CONFIGURATIONS THROUGH THIS YEAR     15
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *   END OF YEAR 1994  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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LIST OF > OF CCNFIGURATIONS PER YEAR

1980	1
1981	1
1982	1
1983	1
1984	1
1985	1
1986	1
1987	1
1988	1
1989	1
1990	1
1991	1
1992	1
1993	1
1994	1
TOTAL	15

D.7. MERSIM sample output based on PWCONGEN runs

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 THIS IS THE FIRST MERSIM RUN AND SIMULOLD FILE
 WILL NOT BE CONSIDERED
FILE 10(FIXED SYS)SUCCESSFULLY OPENED
BASE YEAR FOR PRES.WORTH CALC.IS  1980
BASE YEAR FOR ESCALATION CALC.IS  1980

FILE 11(VAR.ALTS) SUCCESSFULLY OPENED
FILE 12(LOADS)SUCCESSFULLY OPENED
FILE 13(CONFIGURATIONS) SUCCESSFULLY OPENED

LOADING ORDER INPUT DATA:

GIVEN LOADING ORDER IS CONSTANT, READ FROM CARDS AND ON A PLANT BASIS
NORDER
          9              8             12             11             10            1009
       1008             13              3              4           1012            1011
       1010           1013           1003           1004              5              14
          6           1005           1014           1006              7

*********************************** L O A D I N G   O R D E R ***********************************

     N10H (BASE)    N600 (BASE)    C10H (BASE)    C600 (BASE)    C300 (BASE)    N10H (PEAK)
     N600 (PEAK)    O600 (BASE)    FO1H (BASE)    FO50 (BASE)    C10H (PEAK)    C600 (PEAK)
     C300 (PEAK)    O600 (PEAK)    FO1H (PEAK)    FO50 (PEAK)    FD25 (BASE)    GT2H (BASE)
     FGTH (BASE)    FD25 (PEAK)    GT2H (PEAK)    FGTH (PEAK)    FPST (BASE)

*************************************************************************************************

SHADOW EXCHANGE RATE--LOCAL VS FOREIGN EXCHANGE
USED HERE TO INFLUENCE PUMPED STORAGE OPERATION ONLY  1.2000
IOPT =      0
RATE OF INTEREST APPLIED TO ALL DOMESTIC OPER COST =       0.0
RATE OF INTEREST APPLIED TO ALL FOREIGN OPER COST =        0.0
********** PERMITTED NUMBER FOR IHYDIS IS 1. INPUT OF    3 WILL BE CHANGED TO 1
NUMBER OF HYDRO CONDITIONS CONSIDERED     1
NUMBER OF FOURIER COEFF. USED IN THIS SIMULATION   20

LOADING ORDER INPUT DATA:
CALCULATION OF LOADING ORDER ON A UNIT BASIS NOT PERMITTED IF A PUMPED STORAGE PLANT EXISTS
OPTION LBASE RESET TO 0 BY PROGRAM
LOADING ORDER CALCULATED ON A PLANT BASIS

CALCULATED LOADING ORDER BASED ON THE FOLLOWING SEQUENCE, READ FROM CARDS
NORDER
          9              8             12             11             10             13
          3              4              5             14              6              7
NUMBER OF HYDRO CONDITIONS CONSIDERED     1
LOCAL & FOREIGN INTEREST RATES ON OPERATION
LOCAL      0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
FORGN      0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
LOCAL & FOREIGN ESCALATION RATES ON OPERATION
LOCAL      1.00      1.00      1.00      1.00      1.00      1.00      1.00      1.00
FORGN      1.00      1.00      1.00      1.00      1.00      1.00      1.00      1.00

LOADING ORDER INPUT DATA:
LOADING ORDER CALCULATED ON A PLANT BASIS

LOADING ORDER INPUT DATA:
LOADING ORDER CALCULATED ON A PLANT BASIS
```

```
1
0 SEQU.     RELIABILITY     DAYS/YR      CONFIGURATIONS FOR YEAR **** 1980 ****
0    1      0.39732F-03     0.14502        0    0    0    0    0    C    0    0    0
0                                         -1
0 SEQU.     RELIABILITY     DAYS/YP      CONFIGURATIONS FOR YEAR **** 1981 ****
0    2      0.15597E-06     0.00006        0    0    1    C    C    0    0    0    0
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1982 ****
0    3      0.23146E-03     0.08448        0    0    2    0    0    0    0    1    0
0                                         -1
0 SEQU.     RELIABILITY     DAYS/YR      CONFIGURATIONS FOR YEAR **** 1983 ****
0    4      0.12930E-03     0.04719        0    0    4    0    0    C    0    1    0
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1984 ****
0    5      0.15621F-03     0.05702        C    0    4    0    0    C    0    2    0
0                                         -1
0 SECU.     RELIABILITY     DAYS/YR      CONFIGURATIONS FOR YEAR **** 1985 ****
0    6      0.16212E-03     0.05917        0    0    4    1    0    0    0    2    1
0                                         -1
0 SECU.     RELIABILITY     DAYS/YR      CONFIGURATIONS FOR YEAR **** 1986 ****
0    7      0.19072E-03     0.06961        1    0    4    1    0    0    0    2    2
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1987 ****
0    8      0.76529E-03     0.27933        1    0    4    2    0    C    0    2    2
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1988 ****
0    9      0.11362E-03     0.04147        1    0    4    5    0    C    0    2    2
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1989 ****
0   10      0.21421E-03     0.07819        1    0    4    7    0    0    0    2    2
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1990 ****
0   11      0.51625E-03     0.18843        2    0    4    7    0    C    0    2    3
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1991 ****
0   12      0.56762E-03     0.20718        2    2    4    7    0    0    0    2    3
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1992 ****
0   13      0.71029E-03     0.25926        2    4    4    7    0    0    0    2    3
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1993 ****
0   14      0.32899E-03     0.12008        2    7    4    7    0    0    0    2    3
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1994 ****
0   15      0.74981F-03     0.27368        2    9    4    7    0    0    0    2    3
0                                         -1
0 SEQU.     RELIABILITY     CAYS/YR      CONFIGURATIONS FOR YEAR **** 1995 ****
0                                         -1
```

7 1980 1 15 2 7

STATE 2	0	0	0	0	0	0	0	0	0
STATE 3	0	0	1	0	0	0	0	0	0
STATE 4	0	0	2	0	0	0	0	1	0
STATE 5	0	0	4	0	0	0	0	1	0
STATE 6	0	0	4	0	0	0	0	2	0
STATE 7	0	0	4	1	0	0	0	2	1
STATE 8	1	0	4	1	0	0	0	2	2
STATE 9	1	0	4	2	0	0	0	2	2
STATE 10	1	0	4	5	0	0	0	2	2
STATE 11	1	0	4	7	0	0	0	2	2
STATE 12	2	0	4	7	0	0	0	2	3
STATE 13	2	2	4	7	0	0	0	2	3
STATE 14	2	4	4	7	0	0	0	2	3
STATE 15	2	7	4	7	0	0	0	2	3
STATE 16	2	9	4	7	0	0	0	2	3

```
1
1
        102         9
  BASE YEAR FOR PRES. WORTH CALC. IS 1980
  BASE YEAR FOR ESCALATION CALC IS 1980
  DURATION OF STUDY IS    15 YEARS
  IOPW =     0            NUM1 =    1
  LAST YEAR THAT FOLLOWING RATES ARE TO BE USED. IYRL =  1994
  (IF IYRL = LAST YEAR OF STUDY, PROGRAM INCREASES IYRL BY ONE)
  RATE OF INTEREST APPLIED TO ALL LOCAL     CAPITAL =          8.00
  RATE OF INTEREST APPLIED TO ALL FOREIGN   CAPITAL =          8.00
  INDEX =     15
  RATE OF INTEREST APPLIED TO ALL FOREIGN OPER COST =          8.00
  INDEX =     14
  RATE OF INTEREST APPLIED TO ALL DOMESTIC OPER COST =         8.00
  INDEX =     3
  SHADOW EXCHANGE RATE--LOCAL VS FOR. EX.    1.2000
  INDEX =     17
  LOCAL & FOREIGN MULTIPLYER ON COST OF OPERATION
  LOCAL          1.00        1.00        1.00        1.00        1.10        1.00        1.00        1.00
  FORGN          1.00        1.00        1.00        1.00        1.10        1.00        1.00        1.00
  INDEX =     16
  USE SINKING FUND DEPRECIATION FOR SALVAGE VALUE
  INDEX =     2
 OPLANT           CAPITAL COST            FUEL INV.         PLANT LIFE
              LOCAL      FOREIGN      LOCAL      FOREIGN       YRS
 ON600        134.0       586.0        0.0        86.0         30.
 ON100        108.0       480.0        0.0        79.0         30.
 OC300         65.0       327.0        0.0         0.0         30.
 OC600         51.0       261.0        0.0         0.0         30.
 OC10H         43.0       227.0        0.0         0.0         30.
 OC600         47.0       239.0        0.0         0.0         30.
 OGT0H         33.0       132.0        0.0         0.0         20.
 OVHYD          0.0         0.0        0.0         0.0         50.
 OHYDRO PROJECT CAPITAL COSTS.
 OVHYD        387.0       258.0
 OVHYD        231.0       154.0
 OVHYD        513.0       342.0
 OVHYD        945.0       630.0
 OVPST          0.0         0.0        0.0         0.0         50.
 OPUMPED STORAGE PROJECT CAPITAL COSTS
 OVPST        364.0        78.0
 OVPST         91.0        78.0
 OVPST         91.0        78.0
 OVPST       1000.0       100.0
 OVPST        270.0       100.0
  INDEX =     12
  CRITICAL LOSS OF LOAD PROBABILITY IS 1.0000
  INDEX =     13
  NUMBER OF SOLUTIONS REQUESTED IS      5
  INDEX =     18
  OPTION FOR SUMMARY LIST =    0    ( IAEA VERSION )
  INDEX =     6
  UPPER LIMIT ON NUMBER OF UNITS THAT CAN BE ADDED FOR EACH CANDIDATE IN EACH YEAR
               10    10    10    10    10    10    10    10    10
  INDEX =     19
  LEVELIZED FIXED CHARGE RATES =
                0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
  INDEX =     1
  OBJECTIVE FUNCTION STATE     2 TO    2
        184771.
              1
  INDEX =     1
```

```
      2
INDEX =        1
OBJECTIVE FUNCTION STATE     4 TO    4
    926130.
      3
INDEX =        1
OBJECTIVE FUNCTION STATE     5 TO    5
   1306372.
      4
INDEX =        1
OBJECTIVE FUNCTION STATE     6 TO    6
   1597599.
      5
INDEX =        1
OBJECTIVE FUNCTION STATE     7 TO    7
   1965116.
      6
INDEX =        1
OBJECTIVE FUNCTION STATE     8 TO    8
   2406457.
      7
INDEX =        1
OBJECTIVE FUNCTION STATE     9 TO    9
   2715788.
      8
INDEX =        1
OBJECTIVE FUNCTION STATE    10 TO   10
   3125289.
      9
INDEX =        1
OBJECTIVE FUNCTION STATE    11 TO   11
   3455328.
     10
INDEX =        1
OBJECTIVE FUNCTION STATE    12 TO   12
   3831580.
     11
INDEX =        1
OBJECTIVE FUNCTION STATE    13 TO   13
   4286571.
     12
INDEX =        1
OBJECTIVE FUNCTION STATE    14 TO   14
   4671695.
     13
INDEX =        1
OBJECTIVE FUNCTION STATE    15 TO   15
   5030395.
     14
INDEX =        1
OBJECTIVE FUNCTION STATE    16 TO   16
   5296329.
     15
1
0SOLUTION #   1 VARIABLE ALTERNATIVES BY YEAR
OCONFIGURATION FOR YEAR 1994 INDEX      16
 N600      0    2    600      1200
 N10H      0    9   1000      9000
 C300      3    4    300      1200
 C600      3    7    600      4200
 C10H      3    0   1000         0
 G600      2    0    600         0
 GT2H      1    0    192         0
 VHYD      5    2      0         0
 VPST      6    3      0         0
                               PWCONCST   PWOPCST  PWSALVAL  OBJTVFTN   PLOL
```

[illegible] 15

N600	0	2	600	1200
N10H	0	7	1000	7000
C300	3	4	300	1200
C600	3	7	600	4200
C10H	3	0	1000	0
0600	2	0	600	0
GT2H	1	0	192	0
VHYD	5	2	0	0
VPST	6	3	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
859089	224263	724652	5030395	0.0003

OCONFIGURATION FOR YEAR 1992 INDEX 14

N600	0	2	600	1200
N10H	0	4	1000	4000
C300	3	4	300	1200
C600	3	7	600	4200
C10H	3	0	1000	0
0600	2	0	600	0
GT2H	1	0	192	0
VHYD	5	2	0	0
VPST	6	3	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
618543	245241	478661	4671694	0.0007

OCONFIGURATION FOR YEAR 1991 INDEX 13

N600	0	2	600	1200
N10H	0	2	1000	2000
C300	3	4	300	1200
C600	3	7	600	4200
C10H	3	0	1000	0
0600	2	0	600	0
GT2H	1	0	192	0
VHYD	5	2	0	0
VPST	6	3	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
668027	260829	473865	4286570	0.0006

OCONFIGURATION FOR YEAR 1990 INDEX 12

N600	0	2	600	1200
N10H	0	0	1000	0
C300	3	4	300	1200
C600	3	7	600	4200
C10H	3	0	1000	0
0600	2	0	600	0
GT2H	1	0	192	0
VHYD	5	2	0	0
VPST	6	3	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
281873	277873	183494	3831579	0.0005

OCONFIGURATION FOR YEAR 1989 INDEX 11

N600	0	1	600	600
N10H	0	0	1000	0
C300	3	4	300	1200
C600	3	7	600	4200
C10H	3	0	1000	0
0600	2	0	600	0
GT2H	1	0	192	0
VHYD	5	2	0	0
VPST	6	2	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
218628	240261	128851	3455328	0.0002

OCONFIGURATION FOR YEAR 1988 INDEX 10

N600	0	1	600	600
N10H	0	0	1000	0
C300	3	4	300	1200
C600	3	5	600	3000
C10H	3	0	1000	0
0600	2	0	600	0

```
                                                          PWCONCST   PWOPCST   PWSALVAL  OBJTVFTN    PLOL
                                                            354178    245704    193381   3125288   0.0001
  OCONFIGURATION FOR YEAR 1987 INDEX       9
     N600       0      1     600        600
     N10H       0      0    1000          0
     C300       3      4     300       1200
     C600       3      2     600       1200
     C10H       3      0    1000          0
     0600       2      0     600          0
     GT2H       1      0     192          0
     VHYD       5      2       0          0
     VPST       6      2       0          0
                                                          PWCONCST   PWOPCST   PWSALVAL  OBJTVFTN    PLOL
                                                            127504    244245     62418   2715788   0.0008
  OCONFIGURATION FOR YEAR 1986 INDEX       8
     N600       0      1     600        600
     N10H       0      0    1000          0
     C300       3      4     300       1200
     C600       3      1     600        600
     C10H       3      0    1000          0
     0600       2      0     600          0
     GT2H       1      0     192          0
     VHYD       5      2       0          0
     VPST       6      2       0          0
                                                          PWCONCST   PWOPCST   PWSALVAL  OBJTVFTN    PLOL
                                                            383495    231933    174078   2406456   0.0002
  OCONFIGURATION FOR YEAR 1985 INDEX       7
     N600       0      0     600          0
     N10H       0      0    1000          0
     C300       3      4     300       1200
     C600       3      1     600        600
     C10H       3      0    1000          0
     0600       2      0     600          0
     GT2H       1      0     192          0
     VHYD       5      2       0          0
     VPST       6      1       0          0
                                                          PWCONCST   PWOPCST   PWSALVAL  OBJTVFTN    PLOL
                                                            223465    237876     93824   1965116   0.0002
  OCONFIGURATION FOR YEAR 1984 INDEX       6
     N600       0      0     600          0
     N10H       0      0    1000          0
     C300       3      4     300       1200
     C600       3      0     600          0
     C10H       3      0    1000          0
     0600       2      0     600          0
     GT2H       1      0     192          0
     VHYD       5      2       0          0
     VPST       6      0       0          0
                                                          PWCONCST   PWOPCST   PWSALVAL  OBJTVFTN    PLOL
                                                            106653    228982     44418   1597599   0.0002
  OCONFIGURATION FOR YEAR 1983 INDEX       5
     N600       0      0     600          0
     N10H       0      0    1000          0
     C300       3      4     300       1200
     C600       3      0     600          0
     C10H       3      0    1000          0
     0600       2      0     600          0
     GT2H       1      0     192          0
     VHYD       5      1       0          0
     VPST       6      0       0          0
                                                          PWCONCST   PWOPCST   PWSALVAL  OBJTVFTN    PLOL
                                                            217859    234405     72021   1306372   0.0001
  OCONFIGURATION FOR YEAR 1982 INDEX       4
     N600       0      0     600          0
     N10H       0      0    1000          0
     C300 [illegible]  2     300        600
```

```
  . . ,        ,     -      ...           .
  C10H         3     C      1000          0
  0600         2     0      600           0
  GT2H         1     0      192           0
  VHYD         5     1      0             0
  VPST         6     0      C             0
                                                PWCONCST    PWOPCST   PWSALVAL   OBJTVFTN    PLOL
                                                  256796     227010      84298     926130    0.0002
 OCONFIGURATION FOR YEAR 1981 INDEX      3
  N600         0     0      600           0
  M10H         0     0      1000          0
  C300         3     1      300         300
  C600         3     0      600           0
  C10H         3     0      1000          0
  0600         2     0      600           0
  GT2H         1     0      192           0
  VHYD         5     0      0             0
  VPST         6     0      C             0
                                                PWCONCST    PWOPCST   PWSALVAL   OBJTVFTN    PLOL
                                                  127055     248006      34010     526622    0.0000
 OCONFIGURATION FOR YEAR 1980 INDEX      2
  N600         0     0      600           0
  N10H         0     0      1000          0
  C300         3     0      300           0
  C600         3     0      600           0
  C10H         3     0      1000          0
  0600         2     0      600           0
  GT2H         1     0      192           0
  VHYD         5     0      0             0
  VPST         6     0      0             0
                                                PWCONCST    PWOPCST   PWSALVAL   OBJTVFTN    PLOL
                                                       0     184770          C     184770    0.0004
   1980    1
      0    0    0    0    0    0    0    0    C
   1981    1
      0    0    1    0    0    0    0    0    0
   1992    1
      0    0    2    0    0    0    0    1    C
   1983    1
      0    0    4    0    0    0    0    1    0
   1984    1
      0    0    4    0    0    C    0    2    C
   1985    1
      0    0    4    1    0    0    0    2    1
   1986    1
      1    0    4    1    0    0    0    2    2
   1987    1
      1    0    4    2    0    0    0    2    2
   1988    1
      1    0    4    5    0    0    0    2    2
   1989    1
      1    0    4    7    0    0    0    2    2
   1990    1
      2    0    4    7    0    0    0    2    3
   1991    1
      2    2    4    7    0    0    0    2    3
   1992    1
      2    4    4    7    0    0    0    2    3
   1993    1
      2    7    4    7    0    0    0    2    3
   1994    1
      2    9    4    7    0    0    0    2    3
 ALL POSSIBLE PATHS TRACED
```

D.9. Sample output of fourier CONGEN, MERSIM and DYNPRO

```
NUMBER OF ALTERNATIVES FROM WHICH TC CHOOSE IS    9
NUMBER OF PERIODS IN YEAR IS    2
NUMBER OF FOURIER COEFF. IS    50
```

	NAME	NO. OF SETS	MIN. LOAD MW	CAP-CITY MW	BASE LOAD HEAT RATE	AVGE INCR HEAT RATE	FUEL COSTS CENTS/MILLION DMSTC	FUEL COSTS CENTS/MILLION FORGN	TYPE	LCTN	FRCD OUT-AGE RATE	DAYS SCHL MAIN	MAIN CLAS	ENRGY GWH	O?M (FIX)	O?M (VAR)
FIXED SYSTEM																
1	FHYD	1	159	324	0.	0.	0.0	0.0	5	0	0.0	0	0	2051.	0.300	0.0
2	FEMH	1	44	44	2252.	2262.	10.00	980.00	-1	99	0.0	0	0	0.	0.300	0.0
3	F01H	5	34	100	2490.	2193.	10.00	700.00	2	10	3.00	28	100	0.	2.300	0.0
4	F050	8	25	50	2618.	2326.	10.00	700.00	2	10	3.00	28	50	0.	3.000	0.0
5	F025	3	20	25	2175.	1833.	10.00	980.00	4	20	1.00	14	25	0.	0.850	0.0
6	FGTH	5	29	97	6322.	2262.	10.00	980.00	1	72	2.50	14	50	0.	0.520	0.0
7	FPST	0	0	0	0.	0.	0.0	0.0	6	0	0.0	0	0	0.	0.325	0.0
VARIABLE SYSTEM																
8	N600	0	400	600	2568.	2363.	0.0	142.00	0	5	12.00	42	600	0.	0.990	0.0
9	N10H	0	667	1000	2566.	2361.	0.0	134.00	0	5	16.00	42	1000	0.	0.730	0.0
10	C300	0	100	300	2480.	2180.	450.00	0.0	3	10	7.00	35	300	0.	1.200	0.0
11	3600	0	200	600	2460.	2160.	450.00	0.0	3	10	12.00	42	600	0.	0.710	0.0
12	C10H	0	334	1000	2440.	2140.	450.00	0.0	3	10	16.00	42	1000	0.	0.560	0.0
13	0600	0	200	600	2440.	2140.	10.00	700.00	2	10	10.00	42	600	0.	0.670	0.0
14	GT2H	0	58	192	6322.	2262.	10.00	980.00	1	73	1.25	14	50	0.	0.520	0.0
15	VHYD	4	0	0	0.	0.	0.0	0.0	5	0	0.0	0	0	0.	0.0	0.0
16	VPST	5	0	0	0.	0.	0.0	0.0	6	0	0.0	0	0	0.	0.325	0.0

POSITION OF	HYDRO	EMERG.H.	PUMPED STG
	1	2	7

```
INDEX READ     7
INDEX READ     6
INDEX READ     5
INDEX READ     4
INDEX READ     3
INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1980
MINIMUM REQUIRED OF EACH ALTERNATIVE     0    0    0    0    0    0    0    0    0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0    0    0    C    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000   EQUIVALENT DAYS/YR =   182.500
            ANNUAL LOSS OF LOAD PROBABILITY =   1.00000   EQUIVALENT DAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1660      324       38        0
     1663      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       1647       2470
INST. CAP DURING CRIT PER       1987.0
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASONAL LOLP            ACCEPTED CONFIGURATION

   1    1   1987  0.00789  0.0072 0.0086 0.0     0.0         0    0    0    0    0    0    0    0    0
  0    C    0    0    0    0    0    0    0
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                1
CONFIGURATIONS THROUGH THIS YEAR        1
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *   END OF YEAR 1980  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1981
MINIMUM REQUIRED OF EACH ALTERNATIVE     0    0    1    C    0    0    0    0    0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     J    J    J    0    0    0    0    C    0
RESERVE RANGE PERMITTED CRITICAL PER        0.0         50.0000
OPTION FOR MODE OF GENERATION (IOPTN)          1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =  182.500
          ANNUAL LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1660      324       38        0
     1660      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       1936       2904
INST. CAP DURING CRIT PER      2287.0
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE  IC    CAP     LOLP        SEASONAL LOLP            ACCEPTED CONFIGURATION

    2    1   2287   0.02512   0.0068 0.0434 0.0     0.0          0   0   1   0   0   0   0   0   0
  0    0    1    0    0    C    0    0    0
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR          1
CONFIGURATIONS THROUGH THIS YEAR    2
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *   END OF YEAR 1981  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1982
MINIMUM REQUIRED OF EACH ALTERNATIVE      0   0   2   0   0   0   0   1   0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0   0   0   0   0   0   0   0   0
RESERVE RANGE PERMITTED CRITICAL PER       0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
           ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1585       324       38        0
      1585       283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       2274      3411
INST. CAP DURING CRIT PER      2668.1
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

 STATE IC    CAP    LOLP       SEASONAL LOLP          ACCEPTED CONFIGURATION

   3   1   2668  0.03349  0.0073 0.0596 0.0    0.0        0   0   2   0   0   0   0   1   0
  0   0   2   0   0   0   0   1   0
  1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR      3
 *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1982  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1983
MINIMUM REQUIRED OF EACH ALTERNATIVE      0    0    4    0    0    0    0    1    0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
         ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585     324      38       0
     1565     283      44       0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      2669      4003
INST. CAP DURING CRIT PER      3268.1
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS    5

STATE IC   CAP    LOLP       SEASONAL LOLP          ACCEPTED CONFIGURATION

   4   1  3268  0.02177  0.0070 0.0365 0.0    0.0       0    0    4    0    0    0    0    1    0
   0   0   4    0    0    0    0    1    0
   1   1   1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR            1
CONFIGURATIONS THROUGH THIS YEAR    4
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1983  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1984
MINIMUM REQUIRED OF EACH ALTERNATIVE      0    0    4    0    0    0    0    2    0
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =   182.500
        ANNUAL LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585       324       38        0
     1585       283       44        0
CRITICAL PERIOD IS      2 CAPACITY RANGE IS       3129       4693
INST. CAP DURING CRIT PER      3700.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS      5

STATE IC    CAP    LOLP        SEASONAL LOLP               ACCEPTED CONFIGURATION

    5    1  3700  0.02411  0.0073 0.0410 0.0    0.0          0    0    4    0    0    0    0    2    0
  0    0    4    0    0    0    0    2    0
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                       1
CONFIGURATIONS THROUGH THIS YEAR               5
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1984  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1985
MINIMUM REQUIRED OF EACH ALTERNATIVE      0    0    4    1    0    0    0    2    1
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =  182.500
             ANNUAL LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585     324      38      0
     1585     283      44      0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      3666      5499
INST. CAP DURING CRIT PER      4540.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP    LOLP        SEASONAL LOLP            ACCEPTED CONFIGURATION

   6    1   4540  0.02133  0.0051 0.0376 0.0     0.0       0    0    4    1    0    0    0    2    1
  0    0    4    1    0    0    0    2    1
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR         1
CONFIGURATIONS THROUGH THIS YEAR       6
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1985  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1986
MINIMUM REQUIRED OF EACH ALTERNATIVE      1    0    4    1    0    0    0    2    2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0         50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
           ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGF
    1585     324      38       0
    1585     283      44       0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       4290       6435
INST. CAP DURING CRIT PER       5380.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP    LOLP        SEASONAL LOLP           ACCEPTED CONFIGURATION

   7   1   5380  0.02391   0.0062 0.0416 0.0    0.0         1   0   4   1   0   0   0   2   2
  1   0   4   1   0   0   0   2   2
  1   1   1   1   1   1   1   1   1
CONFIGURATIONS THIS YEAR            1
CONFIGURATIONS THROUGH THIS YEAR        7
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1986  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ      2
INDEX READ      1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1987
MINIMUM REQUIRED OF EACH ALTERNATIVE       1    0    4    2    0    0    0    2    2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE       0    0    0    C    0    0    0    C    0
RESERVE RANGE PERMITTED CRITICAL PER     0.0         50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
         ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
    1585      324       38        0
    1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       5017       7525
INST. CAP DURING CRIT PER       5980.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP    LOLP        SEASONAL LOLP          ACCEPTED CONFIGURATION

   8   1  5980  0.08548  0.0256 0.1503 0.0    0.0         1    0    4    2    0    0    0    2    2
  1   0    4    2    0    C    0    2    2
  1   1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR      8
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *   END OF YEAR 1987  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1988
MINIMUM REQUIRED OF EACH ALTERNATIVE     1    0    4    5    0    0    0    2    2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE     0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   182.500
            ANNUAL LOSS OF LOAD PROBABILITY =   1.00000    EQUIVALENT DAYS/YR =   365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGF
     1585       324        38         0
     1585       283        44         0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       5863       8794
INST. CAP DURING CRIT PER        7780.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASONAL LOLP             ACCEPTED CONFIGURATION

    9   1   7780   0.01581   0.0C55 0.0261 0.0     0.0          1    0    4    5    0    0    0    2    2
  1    0    4    5    0    0    0    2    2
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                 1
CONFIGURATIONS THROUGH THIS YEAR         9
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1988  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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 INDEX READ     2
 INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1989
MINIMUM REQUIRED OF EACH ALTERNATIVE       1   0   4   7   0   0   0   2   2
MAXIMUM ADDITIONAL EACH  ALTERNATIVE       0   0   0   0   0   0   0   0   0
RESERVE RANGE PERMITTED CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =  182.500
            ANNUAL LOSS OF LOAD PROBABILITY =  1.00000    EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1585        324        38        0
      1585        283        44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       6845       10267
INST. CAP DURING CRIT PER       8980.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     5

STATE IC    CAP     LOLP        SEASONAL LOLP             ACCEPTED CONFIGURATION

   10   1   8980  0.01975  0.0065 0.0330 0.0      0.0          1   0   4   7   0   0   0   2   2
   1    0    4    7    0    0    0    2    2
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                  1
CONFIGURATIONS THROUGH THIS YEAR         10
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1989  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1990
MINIMUM REQUIRED OF EACH ALTERNATIVE      2    0    4    7    0    0    0    2    3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER      0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
           ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
      1585      324       38        0
      1585      283       44        0
CRITICAL PERIOD IS    2 CAPACITY RANGE IS       7985      11977
INST. CAP DURING CRIT PER       9820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC    CAP    LOLP       SEASONAL LOLP           ACCEPTED CONFIGURATION

   11   1  9820  0.07559  0.0417 0.1095 0.0    0.0         2    0    4    7    0    0    0    2    3
   2    0    4    7    0    0    0    2    3
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR     11
* * * * * * * * * * * * * * * * * * *  END OF YEAR 1990  * * * * * * * * * * * * * * * * * *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1991
MINIMUM REQUIRED OF EACH ALTERNATIVE      2    2    4    7    0    0    0    2    3
MAXIMUM ADDITICNAL EACH  ALTERNATIVE      0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER     0.0       50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
          ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
    1585      324       38        0
    1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS       9307      13960
INST. CAP DURING CRIT PER     11820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC    CAP     LOLP        SEASCNAL LOLP            ACCEPTED CONFIGURATION

  12    1 11820   0.07948   0.0466 0.1124 0.0     0.0          2    2    4    7    0    0    0    2    3
   2    2    4    7    0    0    0    2    3
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR                 1
CONFIGURATIONS THROUGH THIS YEAR        12
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *   END OF YEAR 1991  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1992
MINIMUM REQUIRED OF EACH ALTERNATIVE      2   4   4   7   0   0   0   2   3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE      0   0   0   0   0   0   0   0   0
RESERVE RANGE PERMITTED CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)      1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
            ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYDRO,EHYD,PSTGE
     1585      324       38        0
     1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      10837      16255
INST. CAP DURING CRIT PER      13820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC    CAP     LOLP        SEASONAL LOLP           ACCEPTED CONFIGURATION

   13    1 13820  0.69400  0.0547 0.1333 0.0     0.0         2   4   4   7   0   0   0   2   3
   2    4    4    7    0    0    0    2    3
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR     13
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1992  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ      2
INDEX READ      1
CONDITIONS COVERNING ALTERNATIVE GENERATION, YEAR 1993
MINIMUM REQUIRED OF EACH ALTERNATIVE       2   7   4   7   0   0   0   2   3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE       0   0   0   0   0   0   0   0   0
RESERVE RANGE PERMITTED CRITICAL PER      0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)       1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
        ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYCRO,FHYD,PSTGE
     1585      324       38        0
     1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      12609      18913
INST. CAP DURING CRIT PER     16820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC    CAP     LOLP        SEASONAL LOLP            ACCEPTED CONFIGURATION

   14   1 16820  0.05406  0.0350 0.0731 0.0     0.0         2   7   4   7   0   0   0   2   3
   2    7    4    7    0    0    0    2    3
   1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR              1
CONFIGURATIONS THROUGH THIS YEAR     14
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1993  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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INDEX READ     2
INDEX READ     1
CONDITIONS GOVERNING ALTERNATIVE GENERATION, YEAR 1994
MINIMUM REQUIRED OF EACH ALTERNATIVE       2    9    4    7    0    0    0    2    3
MAXIMUM ADDITIONAL EACH  ALTERNATIVE       0    0    0    0    0    0    0    0    0
RESERVE RANGE PERMITTED CRITICAL PER       0.0        50.0000
OPTION FOR MODE OF GENERATION (IOPTN)        1
MAXIMUM PERIOD LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  182.500
         ANNUAL LOSS OF LOAD PROBABILITY =  1.00000   EQUIVALENT DAYS/YR =  365.000
FIXED CAPACITY--OTHER,HYCRO,EHYD,PSTGE
     1585      324       38        0
     1585      283       44        0
CRITICAL PERIOD IS     2 CAPACITY RANGE IS      14658      21587
INST. CAP DURING CRIT PER      18820.3
MINIMUM NUMBER OF FOURIER COEFF. CORRESPONDING TO MAXIMUM RESERVE MARGIN IN CRIT PER IS     6

STATE IC   CAP    LOLP       SEASONAL LOLP          ACCEPTED CONFIGURATION

   15   1 18820  0.09894  0.0572 0.1407 0.0   0.0        2    9    4    7    0    0    0    2    3
  2    9    4    7    0    0    0    2    3
  1    1    1    1    1    1    1    1    1
CONFIGURATIONS THIS YEAR          1
CONFIGURATIONS THROUGH THIS YEAR     15
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  END OF YEAR 1994  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
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LIST OF > OF CONFIGURATIONS PER YEAR

1980	1
1981	1
1982	1
1983	1
1984	1
1985	1
1986	1
1987	1
1988	1
1989	1
1990	1
1991	1
1992	1
1993	1
1994	1
TOTAL	15

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 THIS IS THE FIRST MERSIM RUN AND SIMULOLD FILE
 WILL NOT BE CONSIDFPED
FILE 10(FIXED SYS)SUCCFSSFULLY OPENED
BASE YEAR FOR PRES.WORTH CALC.IS  1980
BASE YEAR FOR ESCALATION CALC.IS  1980

FILE 11(VAR.ALTS) SUCCESSFULLY OPENED
FILE 12(LOADS)SUCCESSFULLY OPENED
FILE 13(CONFIGURATIONS) SUCCESSFULLY OPENED

LOADING ORDER INPUT DATA:

GIVEN LOADING CRDER IS CONSTANT, READ FRCM CARDS AND ON A PLANT BASIS
NORDER
         9                8               12              11              10           1009
      1008               13                3               4            1012           1011
      1010             1013             1003            1004               5             14
         6             1005             1014            1006               7

********************************** L O A D I N G   O R D E R ********************************

    N10H (BASE)      N600 (BASE)      C10H (BASE)      3600 (BASE)      C300 (BASE)      N10H (PEAK)
    N600 (PEAK)      G600 (BASE)      F01H (BASE)      F050 (BASE)      C10H (PEAK)      3600 (PEAK)
    C300 (PEAK)      0600 (PEAK)      F01H (PEAK)      F050 (PEAK)      FD25 (BASE)      GT2H (BASE)
    FGTH (BASE)      FD25 (PEAK)      GT2H (PEAK)      FGTH (PEAK)      FPST (BASE)

********************************************************************************************

SHADOW EXCHANGE RATE--LOCAL VS FOREIGN EXCHANGE
USED HERE TO INFLUENCE PUMPED STORAGE OPERATION ONLY  1.2000
IOPT =     0
RATE OF INTEREST APPLIED TO ALL DOMESTIC OPER COST =        0.0
RATE OF INTEREST APPLIED TO ALL FOREIGN OPER COST =         0.0
********** PERMITTED NUMBER FOR IHYDIS IS 1. INPUT OF    3 WILL BE CHANGEE TO 1
NUMBER OF HYDRO CONDITIONS CONSIDERED     1
NUMBER OF FOURIER COFFF. USED IN THIS SIMULATICN   20

LOADING ORDER INPUT DATA:
CALCULATION OF LCADING CRDER ON A UNIT BASIS NOT PERMITTED IF A PUMPED STCRAGE PLANT EXISTS
OPTION LBASF RESET TO 0 BY PROGRAM
LOADING ORDER CALCULATED ON A PLANT BASIS

CALCULATED LOADING ORDER BASED CN THE FOLLOWING SEQUENCE, READ FROM CARDS
NORDER
         9                8               12              11              10             13
         3                4                5              14               6              7
NUMBER OF HYDRO CONDITIONS CONSIDERED     1
LOCAL & FOREIGN INTEREST RATES CN OPERATION
LOCAL      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
FORGN      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
LOCAL & FOREIGN ESCALATION RATES ON OPERATION
LOCAL     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
FORGN     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00

LOADING ORDER INPUT DATA:
LOADING ORDER CALCULATED ON A PLANT BASIS

LOADING ORDER INPUT DATA:
LOADING ORDER CALCULATED ON A PLANT BASIS
```

```
1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1980 ****
0    1     0.78941E-04    0.02891         0    0    0    0    0    0    0    0    0
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1981 ****
0    2     0.25118E-03    0.09168         0    0    1    0    0    0    0    0    0
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1982 ****
0    3     0.33491E-03    0.12224         0    0    2    0    0    0    0    1    0
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1983 ****
0    4     0.21774E-03    0.07947         0    0    4    0    0    0    0    1    0
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1984 ****
0    5     0.24113E-03    0.08801         0    0    4    0    0    0    0    2    0
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1985 ****
0    6     0.21331E-03    0.07786         0    0    4    1    0    0    0    2    1
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1986 ****
0    7     0.23906E-03    0.08726         1    0    4    1    0    0    0    2    2
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1987 ****
0    8     0.85476E-03    0.31199         1    0    4    2    0    0    0    2    2
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1988 ****
0    9     0.15812E-03    0.05772         1    0    4    5    0    0    0    2    2
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1989 ****
0   10     0.19755E-03    0.07210         1    0    4    7    0    0    0    2    2
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1990 ****
0   11     0.75588E-03    0.27589         2    0    4    7    0    0    0    2    3
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1991 ****
0   12     0.79478E-03    0.29009         2    2    4    7    0    0    0    2    3
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1992 ****
0   13     0.94003E-03    0.34311         2    4    4    7    0    0    0    2    3
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1993 ****
0   14     0.54059E-03    0.19732         2    7    4    7    0    0    0    2    3
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1994 ****
0   15     0.98943E-03    0.36114         2    9    4    7    0    0    0    2    3
0                                        -1
0 SEQU.    RELIABILITY    DAYS/YR      CONFIGURATIONS FOR YEAR **** 1995 ****
0                                        -1
```

	7 1980	1 15	2	7					
STATE 2	0	0	0	0	0	0	0	0	0
STATE 3	0	0	1	0	0	0	0	0	0
STATE 4	0	0	2	0	0	0	0	1	0
STATE 5	0	0	4	0	0	0	0	1	0
STATE 6	0	0	4	0	0	0	0	2	0
STATE 7	0	0	4	1	0	0	0	2	1
STATE 8	1	0	4	1	0	0	0	2	2
STATE 9	1	0	4	2	0	0	0	2	2
STATE 10	1	0	4	5	0	0	0	2	2
STATE 11	1	0	4	7	0	0	0	2	2
STATE 12	2	0	4	7	0	0	0	2	3
STATE 13	2	2	4	7	0	0	0	2	3
STATE 14	2	4	4	7	0	0	0	2	3
STATE 15	2	7	4	7	0	0	0	2	3
STATE 16	2	9	4	7	0	0	0	2	3

```
1
1
       102         9
   BASE YEAR FOR PRES. WORTH CALC. IS 1980
   BASE YEAR FOR ESCALATION CALC IS 1980
   DURATION OF STUDY IS    15 YEARS
   IOPW =    0          NUM1 =    1
   LAST YEAR THAT FOLLOWING RATES ARE TO BE USED. IYRL =  1994
   (IF IYRL = LAST YEAR OF STUDY, PROGRAM INCREASES IYRL BY ONE)
   RATE OF INTEREST APPLIED TO ALL LOCAL      CAPITAL =          8.00
   RATE OF INTEREST APPLIED TO ALL FOREIGN   CAPITAL =          8.00
   INDEX =    15
   RATE OF INTEREST APPLIED TO ALL FOREIGN OPER COST =         8.00
   INDEX =    14
   RATE OF INTEREST APPLIED TO ALL DOMESTIC OPER COST =         8.00
   INDEX =     3
   SHADOW EXCHANGE RATE--LOCAL VS FOR. EX.     1.2000
   INDEX =    17
   LOCAL & FOREIGN MULTIPLYER ON COST OF OPERATION
   LOCAL         1.00        1.00        1.00        1.00        1.10        1.00        1.00        1.00
   FORGN         1.00        1.00        1.00        1.00        1.10        1.00        1.00        1.00
   INDEX =    16
   USE SINKING FUND DEPRECIATION FOR SALVAGE VALUE
   INDEX =     2
 0PLANT          CAPITAL COST              FUEL INV.          PLANT LIFE
              LOCAL      FOREIGN     LOCAL      FOREIGN          YRS
 0N600        134.0       586.0       0.0        86.0           30.
 0N104        108.0       480.0       0.0        79.0           30.
 0C300         65.0       327.0       0.0         0.0           30.
 03600         51.0       261.0       0.0         0.0           30.
 0C10H         43.0       227.0       0.0         0.0           30.
 00600         47.0       239.0       0.0         0.0           30.
 0GT2H         33.0       132.0       0.0         0.0           20.
 0VHYD          0.0         0.0       0.0         0.0           50.
 0HYDRO PROJECT CAPITAL COSTS
 0VHYD        387.0       258.0
 0VHYD        231.0       154.0
 0VHYD        513.0       342.0
 0VHYD        945.0       630.0
 0VPST          0.0         0.0       0.0         0.0           50.
 0PUMPED STORAGE PROJECT CAPITAL COSTS
 0VPST        364.0        78.0
 0VPST         91.0        78.0
 0VPST         91.0        78.0
 0VPST       1000.0       100.0
 0VPST        270.0       100.0
   INDEX =    12
   CRITICAL LOSS OF LOAD PROBABILITY IS 1.0000
   INDEX =    13
   NUMBER OF SOLUTIONS REQUESTED IS     5
   INDEX =    18
   OPTION FOR SUMMARY LIST =   0    ( IAEA VERSION )
   INDEX =     6
   UPPER LIMIT ON NUMBER OF UNITS THAT CAN BE ADDED FOR EACH CANDIDATE IN EACH YEAR
              10    10    10    10    10    10    10    10    10
   INDEX =    19
   LEVELIZED FIXED CHARGE RATES =
              0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
   INDEX =     1
   OBJECTIVE FUNCTION STATE    2 TO    2
       184771.
              1
   INDEX =    1
```

```
   [illegible].
            2
 INDEX =    1
 OBJECTIVE FUNCTION STATE    4 TO   4
     926130.
            3
 INDEX =    1
 OBJECTIVE FUNCTION STATE    5 TO   5
    1306373.
            4
 INDEX =    1
 OBJECTIVE FUNCTION STATE    6 TO   6
    [illegible].
            5
 INDEX =    1
 OBJECTIVE FUNCTION STATE    7 TO   7
    [illegible].
            6
 INDEX =    1
 OBJECTIVE FUNCTION STATE    8 TO   8
    2406457.
            7
 INDEX =    1
 OBJECTIVE FUNCTION STATE    9 TO   9
    2715789.
            8
 INDEX =    1
 OBJECTIVE FUNCTION STATE   10 TO  10
    3125289.
            9
 INDEX =    1
 OBJECTIVE FUNCTION STATE   11 TO  11
    3455329.
           10
 INDEX =    1
 OBJECTIVE FUNCTION STATE   12 TO  12
    3831580.
           11
 INDEX =    1
 OBJECTIVE FUNCTION STATE   13 TO  13
    4286571.
           12
 INDEX =    1
 OBJECTIVE FUNCTION STATE   14 TO  14
    4671695.
           13
 INDEX =    1
 OBJECTIVE FUNCTION STATE   15 TO  15
    5030395.
           14
 INDEX =    1
 OBJECTIVE FUNCTION STATE   16 TO  16
    5296329.
           15
1
0SOLUTION #  1 VARIABLE ALTERNATIVES BY YEAR
0CONFIGURATION FOR YEAR 1994  INDEX    16
 N600       0    2    600        1200
 N10H       0    9   1000        9000
 C300       3    4    300        1200
 3600       3    7    600        4200
 C10H       3    0   1000           0
 0600       2    0    600           0
 GT2H       1    0    192           0
 VHYD       5    2      0           [illegible]
```

```
[illegible]
N600       0    2     600       1200
NIOH       0    7    1000       7000
C300       3    4     300       1200
3600       3    7     600       4200
C1OH       3    0    1000          0
O600       2    0     600          0
GT2H       1    0     192          0
VHYD       5    2       0          0
VPST       6    3       0          0
                                          PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                           859089     224263    724652    5030395   0.0005
OCONFIGURATION FOR YEAR 1992 INDEX    14
N600       0    2     600       1200
NIOH       0    4    1000       4000
C300       3    4     300       1200
3600       3    7     600       4200
C1OH       3    0    1000          0
O600       2    0     600          0
GT2H       1    0     192          0
VHYD       5    2       0          0
VPST       6    3       0          0
                                          PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                           618543     245241    478661    4671695   0.0009
OCONFIGURATION FOR YEAR 1991 INDEX    13
N600       0    2     600       1200
NIOH       0    2    1000       2000
C300       3    4     300       1200
3600       3    7     600       4200
C1OH       3    0    1000          0
O600       2    0     600          0
GT2H       1    0     192          0
VHYD       5    2       0          0
VPST       6    3       0          0
                                          PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                           668027     260829    473865    4286571   0.0008
OCONFIGURATION FOR YEAR 1990 INDEX    12
N600       0    2     600       1200
NIOH       0    0    1000          0
C300       3    4     300       1200
3600       3    7     600       4200
C1OH       3    0    1000          0
O600       2    0     600          0
GT2H       1    0     192          0
VHYD       5    2       0          0
VPST       6    3       0          0
                                          PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                           281873     277873    183494    3831580   0.0008
OCONFIGURATION FOR YEAR 1989 INDEX    11
N600       0    1     600        600
NIOH       0    0    1000          0
C300       3    4     300       1200
3600       3    7     600       4200
C1OH       3    0    1000          0
O600       2    0     600          0
GT2H       1    0     192          0
VHYD       5    2       0          0
VPST       6    2       0          0
                                          PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                           218628     240261    128851    3455328   0.0002
OCONFIGURATION FOR YEAR 1988 INDEX    10
N600       0    1     600        600
NIOH       0    0    1000          0
C300       3    4     300       1200
3600       3    5     600       3000
C1OH       3    0    1000          0
O600       2    0     600          0
```

```
 VHYD     5     2      0          0
 VPST     6     2      0          0
                                              PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN    PLOL
                                                354178    245704     190381    3125289    0.0002
0CONFIGURATION FOR YEAR 1987 INDEX         9
 N600     0     1    600        600
 N10H     0     0   1000          0
 C300     3     4    300       1200
 3600     3     2    600       1200
 C10H     3     0   1000          0
 0600     2     0    600          0
 GT2H     1     0    192          0
 VHYD     5     2      0          0
 VPST     6     2      0          0
                                              PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN    PLOL
                                                127504    244245      62418    2715788    0.0009
0CONFIGURATION FOR YEAR 1986 INDEX         8
 N600     0     1    600        600
 N10H     0     0   1000          0
 C300     3     4    300       1200
 3600     3     1    600        600
 C10H     3     0   1000          0
 0600     2     0    600          0
 GT2H     1     0    192          0
 VHYD     5     2      0          0
 VPST     6     2      0          0
                                              PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN    PLOL
                                                383485    231933     174078    2406457    0.0002
0CONFIGURATION FOR YEAR 1985 INDEX         7
 N600     0     0    600          0
 N10H     0     0   1000          0
 C300     3     4    300       1200
 3600     3     1    600        600
 C10H     3     0   1000          0
 0600     2     0    600          0
 GT2H     1     0    192          0
 VHYD     5     2      0          0
 VPST     6     1      0          0
                                              PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN    PLOL
                                                223465    237876      93824    1965116    0.0002
0CONFIGURATION FOR YEAR 1984 INDEX         6
 N600     0     0    600          0
 N10H     0     0   1000          0
 C300     3     4    300       1200
 3600     3     0    600          0
 C10H     3     0   1000          0
 0600     2     0    600          0
 GT2H     1     0    192          0
 VHYD     5     2      0          0
 VPST     6     0      0          0
                                              PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN    PLOL
                                                106663    228982      44418    1597599    0.0002
0CONFIGURATION FOR YEAR 1983 INDEX         5
 N600     0     0    600          0
 N10H     0     0   1000          0
 C300     3     4    300       1200
 3600     3     0    600          0
 C10H     3     0   1000          0
 0600     2     0    600          0
 GT2H     1     0    192          0
 VHYD     5     1      0          0
 VPST     6     0      0          0
                                              PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN    PLOL
                                                217859    234405   [illegible]
0CONFIGURATION FOR YEAR 1982 INDEX         4
 N600     0     0    600
 N10H
```

```
 3600      3     0    600          0
 C10H      3     0   1000          0
 0600      2     0    600          0
 GT2H      1     0    192          0
 VHYD      5     1      0          0
 VPST      6     0      0          0
                                        PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                          256796    227010      84298     926130   0.0003
0CONFIGURATION FOR YEAR 1981 INDEX          3
 N600      0     0    600          0
 N10H      0     0   1000          0
 C300      3     1    300        300
 3600      3     0    600          0
 C10H      3     0   1000          0
 0600      2     0    600          0
 GT2H      1     0    192          0
 VHYD      5     0      0          0
 VPST      6     0      0          0
                                        PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                          127055    248807      34010     526622   0.0003
0CONFIGURATION FOR YEAR 1980 INDEX          2
 N600      0     0    600          0
 N10H      0     0   1000          0
 C300      3     0    300          0
 3600      3     0    600          0
 C10H      3     0   1000          0
 0600      2     0    600          0
 GT2H      1     0    192          0
 VHYD      5     0      0          0
 VPST      6     0      0          0
                                        PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                               0    184770          0     184770   0.0001
 1980   1
    0   0    0    0    0    0    0    0    0
 1981   1
    0   0    1    0    0    0    0    0    0
 1982   1
    0   0    2    0    0    0    0    1    0
 1983   1
    0   0    4    0    0    0    0    1    0
 1984   1
    0   0    4    0    0    0    0    2    0
 1985   1
    0   0    4    1    0    0    0    2    1
 1986   1
    1   0    4    1    0    0    0    2    2
 1987   1
    1   0    4    2    0    0    0    2    2
 1988   1
    1   0    4    5    0    0    0    2    2
 1989   1
    1   0    4    7    0    0    0    2    2
 1990   1
    2   0    4    7    0    0    0    2    3
 1991   1
    2   2    4    7    0    0    0    2    3
 1992   1
    2   4    4    7    0    0    0    2    3
 1993   1
    2   7    4    7    0    0    0    2    3
 1994   1
    2   9    4    7    0    0    0    2    3
 ALL POSSIBLE PATHS TRACED
```

1

D.10. DYNPRO sample output using the fixed charge rate option (FCR = 15%)

```
[illegible]
 N600       0    2    600       1200
 N10H       0    7   1000       7000
 C300       3    4    300       1200
 3600       3    7    600       4200
 C10H       3    0   1000          0
 0600       2    0    600          0
 GT2H       1    0    192          0
 VHYD       5    2      0          0
 VPST       6    3      0          0
                                          PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                            238812    224263          0    6365604   0.0003
0CONFIGURATION FOR YEAR 1992 INDEX   14
 N600       0    2    600       1200
 N10H       0    4   1000       4000
 C300       3    4    300       1200
 3600       3    7    600       4200
 C10H       3    0   1000          0
 0600       2    0    600          0
 GT2H       1    0    192          0
 VHYD       5    2      0          0
 VPST       6    3      0          0
                                          PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                            248487    245241          0    5902528   0.0007
0CONFIGURATION FOR YEAR 1991 INDEX   13
 N600       0    2    600       1200
 N10H       0    2   1000       2000
 C300       3    4    300       1200
 3600       3    7    600       4200
 C10H       3    0   1000          0
 0600       2    0    600          0
 GT2H       1    0    192          0
 VHYD       5    2      0          0
 VPST       6    3      0          0
                                          PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                            344908    260829          0    5408799   0.0006
0CONFIGURATION FOR YEAR 1990 INDEX   12
 N600       0    2    600       1200
 N10H       0    0   1000          0
 C300       3    4    300       1200
 3600       3    7    600       4200
 C10H       3    0   1000          0
 0600       2    0    600          0
 GT2H       1    0    192          0
 VHYD       5    2      0          0
 VPST       6    3      0          0
                                          PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                            183187    277873          0    4803061   0.0005
0CONFIGURATION FOR YEAR 1989 INDEX   11
 N600       0    1    600        600
 N10H       0    0   1000          0
 C300       3    4    300       1200
 3600       3    7    600       4200
 C10H       3    0   1000          0
 0600       2    0    600          0
 GT2H       1    0    192          0
 VHYD       5    2      0          0
 VPST       6    2      0          0
                                          PWCONCST   PWOPCST   PWSALVAL   OBJTVFTN   PLOL
                                            157551    240261          0    4342000   0.0002
0CONFIGURATION FOR YEAR 1988 INDEX   10
 N600       0    1    600        600
 N10H       0    0   1000          0
 C300       3    4    300       1200
 3600       3    5    600       3000
 C10H       3    0   1000          0
 0600       2    0    600          0
```

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
VPST	6	2	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
287448	245704	0	3944187	0.0001

0CONFIGURATION FOR YEAR 1987 INDEX 9

N600	0	1	600	600
N10H	0	0	1000	0
C300	3	4	300	1200
3600	3	2	600	1200
C10H	3	0	1000	0
0600	2	0	600	0
GT2H	1	0	192	0
VHYD	5	2	0	0
VPST	6	2	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
114219	244245	0	3411034	0.0008

0CONFIGURATION FOR YEAR 1986 INDEX 8

N600	0	1	600	600
N10H	0	0	1000	0
C300	3	4	300	1200
3600	3	1	600	600
C10H	3	0	1000	0
0600	2	0	600	0
GT2H	1	0	192	0
VHYD	5	2	0	0
VPST	6	2	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
374167	231933	0	3052569	0.0002

0CONFIGURATION FOR YEAR 1985 INDEX 7

N600	0	0	600	0
N10H	0	0	1000	0
C300	3	4	300	1200
3600	3	1	600	600
C10H	3	0	1000	0
0600	2	0	600	0
GT2H	1	0	192	0
VHYD	5	2	0	0
VPST	6	1	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
230306	237876	0	2446468	0.0002

0CONFIGURATION FOR YEAR 1984 INDEX 6

N600	0	0	600	0
N10H	0	0	1000	0
C300	3	4	300	1200
3600	3	0	600	0
C10H	3	0	1000	0
0600	2	0	600	0
GT2H	1	0	192	0
VHYD	5	2	0	0
VPST	6	0	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
118700	228982	0	1978286	0.0002

0CONFIGURATION FOR YEAR 1983 INDEX 5

N600	0	0	600	0
N10H	0	0	1000	0
C300	3	4	300	1200
3600	3	0	600	0
C10H	3	0	1000	0
0600	2	0	600	0
GT2H	1	0	192	0
VHYD	5	1	0	0
VPST	6	0	0	0

PWCONCST	PWOPCST	PWSALVAL	OBJTVFTN	PLOL
255931	234405	0	1630602	0.0001

0CONFIGURATION FOR YEAR 1982 INDEX 4

N600	0	0	600	0
N10H	0	0	1000	0

```
      C10H     3    0    1000          0
      0600     2    0     600          0
      GT2H     1    0     192          0
      VHYD     5    1       0          0
      VPST     6    0       0          0
                                                 PWCONCST   PWOPCST   PWSALVAL  OBJTVFTN     PLOL
                                                   316392    227010          C   1140266    0.0002
    0CONFIGURATION FOR YEAR 1981 INDEX        3
      N600     0    0     600          0
      N10H     0    0    1000          0
      C300     3    1     300        300
      3600     3    0     600          0
      C10H     3    0    1000          0
      0600     2    0     600          0
      GT2H     1    0     192          0
      VHYD     5    0       0          0
      VPST     6    0       0          0
                                                 PWCONCST   PWOPCST   PWSALVAL  OBJTVFTN     PLOL
                                                   163285    248807          C    596863    0.0002
    0CONFIGURATION FOR YEAR 1980 INDEX        2
      N600     0    0     600          0
      N10H     0    0    1000          0
      C300     3    0     300          0
      3600     3    0     600          0
      C10H     3    0    1000          0
      0600     2    0     600          0
      GT2H     1    0     192          0
      VHYD     5    0       0          0
      VPST     6    0       0          0
                                                 PWCONCST   PWOPCST   PWSALVAL  OBJTVFTN     PLOL
                                                        0    184770          0    184770    0.0000
      1980     1
         0     0    0    0    0    0    0    0    0
      1981     1
         0     0    1    0    0    0    0    0    0
      1982     1
         0     0    2    0    0    0    0    1    0
      1983     1
         0     0    4    0    0    0    0    1    0
      1984     1
         0     0    4    0    0    0    0    2    0
      1985     1
         0     0    4    1    0    0    0    2    1
      1986     1
         1     0    4    1    0    0    0    2    2
      1987     1
         1     0    4    2    0    0    0    2    2
      1988     1
         1     0    4    5    0    0    0    2    2
      1989     1
         1     0    4    7    0    0    0    2    2
      1990     1
         2     0    4    7    0    0    0    2    3
      1991     1
         2     2    4    7    0    0    0    2    3
      1992     1
         2     4    4    7    0    0    0    2    3
      1993     1
         2     7    4    7    0    0    0    2    3
      1994     1
         2     9    4    7    0    0    0    2    3
      ALL POSSIBLE PATHS TRACED
```

APPENDIX E

On-Site Test of Modified WASP-2B

On-site technical assistance was provided to the FPSC during the week of May 14, 1979.

The NRRI representative worked with project coordinator from FPSC's engineering department and scientific programmer from the computer applications department. The following is a brief description of the on-site technical assistance provided by NRRI.

Monday, May 14, 1979

All WASP modifications were outlined to FPSC's staff. The basic functions of each module of the WASP package were identified and the major effects of the modifications were briefly analyzed.

The work schedule suggested by the NRRI representative for his stay at FPSC was discussed. Arrangements were made to assure accessibility of computer facilities all times the FPSC computer was on-line.

Mounting the WASP tape and loading the card-decks on disk required a visit to the Florida State University's central computer terminal. The WASP modules were then copied from the tape on disk so that they could be more easily accessible.

An attempt to compile the VARSYS module showed that IBM and CDC Fortran compilers were slightly different. Some minor modifications of the source statements were necessary in order to compile VARSYS on the CDC computer. The same changes were subsequently performed on all programs transformed to FPSC. VARSYS test runs proved successful.

Tuesday, May 15, 1979

FIXSYS and LOADSY modifications were presented to FPSC's staffs. The LOADSY module was analyzed in detail and the modified fortran statements were explained. Data preparation procedures were outlined and sample test data were analyzed.

FIXSYS and LOADSY modules were compiled after the necessary source modifications. Test runs with sample data were successful.

Wednesday, May 16, 1979

A source listing of NATURE and CATCH22* programs showed that several character changes were necessary before compilation. These character differences appeared only in programs transferred by card decks and not in those transferred by tape. This occurred because the tape was written after the IBM's EBCPIC character system was translated to BCD system for use by the CDC computer.

CATCH22 was successfully run and binary file LOADDATA (created by LOADSY through logical unit 22) was retrieved and listed. Careful examination of the file's contents showed no flaws in the piecewise representation of the inverted load duration curve.

MATURE program was run successfully with test data.

Thursday, May 17, 1979

The modifications made in CONGEN were analyzed. Sample data were presented. The program was compiled and run successfully after the necessary source character changes.

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* CATCH22 is an auxiliary program that is used to retrieve binary files LOADDATA or FIXELDC for debugging purposes.

PWCONGEN was expounded to FPSC's staff. Subroutines PWLOLP, PWADD and function PWFUN were analyzed and detailed fortran programming information was provided. Data compilation procedures were explained and sample data analyzed. The proper method of using PWCONGEN in conjunction with MATURE was emphasized.

The necessary changes of source characters were made before successfully compiling PWCONGEN. Running procedures were established and the results from the test runs were checked for errors and analyzed in detail.

Since the CDC's single precision accuracy is compatible to IBM's double precision, it was decided to change all double-precision variables to single precision. This required extensive source changes in the LOADSY and PWCONGEN modules. Both modules were then compiled and the test runs showed no accuracy differences in LOLP calculations. Hence, the same changes were performed in MERSIM and DYNPRO sources.

Friday, May 18, 1979

MERSIM and DYNPRO modifications were explained and data compilation procedures were analyzed. The DYNPRO depreciation algorithm was extensively discussed in both the salvage value and fixed change rate options. The proper running procedures were presented.

Compilation and test runs of MERSIM and DYNPRO modules were successful. The results were analyzed and properly interpreted.

The results of the test runs of all modified WASP modules were checked again and compared to those obtained at OSU. The changes from double to single precision in LOADSY and PWCONGEN did not affect the accuracy of loss-of-load probability calculations as was expected.

The test runs were also compared to those listed in the WASP procedures manual. The comparison showed no inconsistencies.

Saturday, May, 19, 1979

NRRI and FPSC's staffs met to discuss the modified WASP applicability in rate cases and power pooling studies. The NRRI representative extensively analyzed the proper procedures for data compilation for both of the above cases. Supplemental instructions were provided for the use of two auxiliary load forecasting models that FPSC had acquired and intends to use for load forecasting.

Several suggestions were made by FPSC staffs for further minor modifications of WASP. These were later implemented and are included in a tape that will be sent to FPSC along with the final report. After lengthy discussion on DYNPRO depreciation algorithm, it was agreed that although the currently available options (salvage value or fixed charge rate) are reasonably accurate, further research is needed in this subject in order to increase the efficiency of calculations.