

PACKAGE ID - 000303I303X00 PICES

KWIC TITLE - Utility Static Generation Reliability

AUTHORS - Greene, S.R.
Oak Ridge National Lab., TN (United States)

Poore, W.P.
Oak Ridge National Lab., TN (United States)

LIMITATION CODE -UNL **AUDIENCE CODE** - UNL

COMPLETION DATE - 10/01/1981 **PUBLICATION DATE** - 10/01/1981

DESCRIPTION - PICES (Probabilistic Investigation of Capacity and Energy Shortages) was developed for estimating an electric utility's expected frequency and duration of capacity deficiencies on a daily on and off-peak basis. In addition to the system loss-of-load probability (LOLP) and loss-of-load expectation (LOLE) indices, PICES calculates the expected frequency and duration of system capacity deficiencies and the probability, expectation, and expected frequency and duration of a range of system reserve margin states. Results are aggregated and printed on a weekly, monthly, or annual basis. The program employs hourly load data and either the two-state (on/off) or a more sophisticated three-state (on/partially on/fully off) generating unit representation. Unit maintenance schedules are determined on a weekly, levelized reserve margin basis. In addition to the 8760-hour annual load record, the user provides the following information for each unit: plant capacity, annual maintenance requirement, two or three-state unit failure and repair rates, and for three-state models, the partial state capacity deficiency. PICES can also supply default failure and repair rate values, based on the Edison Electric Institute's 1979 Report on Equipment Availability for the Ten-Year Period 1968 Through 1977, for many common plant types. Multi-year analysis can be performed by specifying as input data the annual peak load growth rates and plant addition and retirement schedules for each year in the study.

PACKAGE CONTENTS - Media Directory; Software Abstract; ORNL-5739;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 CD Rom

METHOD OF SOLUTION - Based on the unit specific data supplied by the user, PICES utilizes recursive techniques to calculate exact-state probability and departure rates for the range of possible system capacity deficiency states. The system load information is represented both as periodic cumulative load probability functions and load frequency functions. Unit maintenance is represented by deconvolving any units which are unavailable from the previously derived capacity deficiency probability and departure rate

PACKAGE ID - 000303I303X00 PICES

METHOD OF SOLUTION - (CONT) distributions. These probability and departure rate functions are combined with the load probability and frequency models to yield the probability and expected frequency and duration of the range of possible system reserve margin states.

COMPUTER - IBM303X

OPERATING SYSTEMS - OS/MVT or OS/MVS

PROGRAMMING LANGUAGES - FORTRAN IV

SOFTWARE LIMITATIONS - Maxima of 1000 system reserve margin states, 301 generating units, 20 years of simulated operation, and 5 generating units added or retired per year. Plant maintenance requirements must be specified as integer weeks, and generating units are represented by either two or three-state models. Changes in load cycle shape are not accommodated within the code; the new year's load record is derived from multiplying the annual hourly load value by the annual growth factor.

SOURCE CODE AVAILABLE (Y/N) - Y

UNIQUE FEATURES - PICES calculates the weekly, seasonal, and annual probability, expectation, and expected frequency and duration of the range of possible system reserve margin states, including the zero reserve margin state. Separate calculations can be performed for user-defined daily peak and off-peak periods.

HARDWARE REQS - 480K bytes of memory are required for execution.

TIME REQUIREMENTS - A typical 20 year study, for a 10,000 MW system comprised of 100 units employing a 25 MW table step-size, requires 23 minutes of CPU time. NESC executed the sample problem in 50 CPU seconds on an IBM370/195.

REFERENCES - S.R. Greene, PICES, A Computer Code for Evaluation of Electric Utility Static Generation Reliability, ORNL-5739, August 1981\ A.K. Ayoub and A.D. Patton, A Frequency and Duration Method for Generating System Reliability Evaluation, Institute of Electrical and Electronic Engineers Transactions on Power Apparatus and Systems, Vol. PAS-95, No. 6, pp. 1929-1933, November/December 1976.

ABSTRACT STATUS - Abstract first distributed January 1982. IBM3033 version submitted September 1981, sample problem executed by NESC October 1981 on an IBM370/195.

SUBJECT CLASS CODE - D

KEYWORDS -
COMPUTER PROGRAM DOCUMENTATION

PACKAGE ID - 000303I303X00 PICES

P CODES
PROBABILISTIC ESTIMATION
CAPACITY
ENERGY SHORTAGES
ELECTRIC UTILITIES
RELIABILITY
POWER PLANTS

EDB SUBJECT CATEGORIES -
990200 296000

SPONSOR - DOE/ER

PACKAGE TYPE - TESTED