PACKAGE ID - 001047C007400 GEOCITY

KWIC TITLE - Geothermal District Heating Economics

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

COMPLETION DATE - 10/01/1978 **PUBLICATION DATE -** 10/01/1978

DESCRIPTION - GEOCITY is a large-scale simulation model which combines both engineering and economic submodels to systematically calculate the cost of geothermal district heating systems for space heating, hot-water heating, and process heating based upon hydrothermal geothermal resources. The GEOCITY program simulates the entire production, distribution, and waste disposal process for geothermal district heating systems, but does not include the cost of radiators, convectors, or other in-house heating systems. GEOCITY calculates the cost of district heating based on the climate, population, and heat demand of the district; characteristics of the geothermal resource and distance from the distribution center; well-drilling costs; design of the distribution system; tax rates; and financial conditions.

PACKAGE CONTENTS - Media Directory; Software Abstract; PNL-2742; Media Includes Source Deck, Sample Problem Input and Output;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 CD Rom

METHOD OF SOLUTION - GEOCITY is composed of two principal parts: the geothermal reservoir submodel and the distribution system submodel. The reservoir submodel calculates the unit cost of energy by simulating the cash flows for the exploration, development, and operation of a hydrothermal reservoir from the beginning of exploration through the economic life of the distribution system. The reservoir submodel also simulates the transmission of the geothermal water through a fluid transmission system to the distribution center and the disposal of the used water from the distribution system. The distribution system submodel calculates the unit cost of heat by simulating the cash flows for the design and operation of the district heating distribution system. The

PACKAGE ID - 001047C007400 GEOCITY

METHOD OF SOLUTION -(CONT) distribution system submodel can simulate many designs for hot-water heating systems, including various material and configuration options for pipes, conduits, and insulation and an optional heat exchanger at the inlet to the distribution center. GEOCITY uses discounted cash flows analysis to calculate the unit cost of energy and the unit cost of heat for the district heating system based on the principle that the present worth of the revenues will be equal to the present worth of the expenses including investment return over the economic life of the distribution system. The present worth factor is determined by the capital structure and rates of return on invested capital for the system.

COMPUTER - CDC CYBER74

OPERATING SYSTEMS - SCOPE 3.4.2

PROGRAMMING LANGUAGES - FORTRAN IV

SOFTWARE LIMITATIONS - Current array dimensions provide for a maximum well-field size of 625 wells and maximum operating period of 50 years from reservoir exploration through the economic life of the district heating system.

SOURCE CODE AVAILABLE (Y/N) - Y

RELATED SOFTWARE - GEOCOST and GEOCOST-BC are used to calculate the cost of generating electricity from geothermal energy.

OTHER PROG/OPER SYS INFO - GEOCITY includes 63 subroutines comprising the 1967 ASME Steam Tables which are used to calculate the thermodynamic and physical properties of water, including pressure, temperature, enthalpy, specific volume, density, viscosity, and fluid quality. The NAMELIST utility is used to process the GEOCITY input data.

HARDWARE REQS - At least 54K (decimal) words of memory are required. 104,000 (octal) words of program storage were used for execution of the sample problem on a CDC7600 and 137,000 (octal) words were used on a CDC6600.

TIME REQUIREMENTS - From 6 seconds to 2 minutes is required for the majority of simulation cases. The sample problem took less than 2 seconds on a CDC7600 and less than 7 seconds on a CDC6600.

REFERENCES - H.D. Huber, C.L. McDonald, C.H. Bloomster, and S.C. Schulte, User Manual for GEOCITY: A Computer Model for Geothermal District Heating Cost Analysis, PNL-2742, October 1978.

ABSTRACT STATUS - Abstract first distributed October 1979. CDC CYBER74 version submitted March 1979, sample problem executed by NESC

PACKAGE ID - 001047C007400 GEOCITY

ABSTRACT STATUS -(CONT) September 1979 on a CDC6600 and a CDC7600.

SUBJECT CLASS CODE - TD

KEYWORDS -
COMPUTER PROGRAM DOCUMENTATION
G CODES
GEOTHERMAL DISTRICT HEATING
COMPUTERIZED SIMULATION
COST ESTIMATION

EDB SUBJECT CATEGORIES -
990200 151000

SPONSOR - DOE/CE

PACKAGE TYPE - AS - IS