GL01253

# POSTULATED DGE DEVELOPMENT SCENARIOS

# FOR

# ELECTRIC GENERATING CAPACITY BY SITE

EXAMPLE - DRAFT COPY

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TABLE 1-1

POSTULATED DOE GEOTHERMAL DEVELOPMENT SCENARIOS[1]

| PROSPECT | GENERATING CAPACITY INSTALLED EACH YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre-1983 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | Post-1990 | TOTAL |
| **CALIFORNIA & HAWAII** | | | | | | | | | | | |
| Brawley, CA | — | 50 | — | 50 | — | 100 | 100 | 100 | 100 | 500 | 1,000 |
| Coso Hot Springs, CA | — | — | — | 50 | 50 | 50 | 150 | 150 | 150 | — | 600 |
| East Mesa, CA | — | — | — | 50 | — | — | 50 | — | — | — | 100 |
| Geysers, CA (liquid-dominated | — | — | — | 100 | 100 | 100 | 100 | 100 | 100 | 400 | 1,000 |
| Geyers, CA (steam) | 1678 | 160 | 220 | 110 | — | — | — | — | — | — | 2,168 |
| Glass Mt., CA | — | — | — | — | — | — | — | — | 50 | — | 50 |
| Heber, CA | — | 50 | — | 50 | — | 100 | 100 | — | — | 700 | 1,000 |
| Lassen, CA | — | — | — | — | — | 50 | — | — | 50 | — | 100 |
| Mono-Long Valley, CA | — | — | — | 50 | — | 100 | — | — | 100 | — | 250 |
| Puna, HI | — | — | — | — | — | — | — | — | 50 | 850 | 900 |
| Salton Sea, CA | — | 50 | — | 100 | 75 | 75 | 100 | 100 | 100 | 1400 | 2,000 |
| Surprise Valley, CA | — | — | — | — | 50 | — | 50 | 100 | 100 | 1700 | 2,000 |
| **NORTHWEST** | | | | | | | | | | | |
| Alvord, OR | — | — | — | — | — | 50 | — | — | 50 | 200 | 300 |
| Baker Hot Springs, WA | — | — | — | — | — | — | — | — | 50[2] | — | — |
| Bruneau-Grandview, ID | — | — | — | — | — | 50 | — | — | 100 | 3000 | 3,150 |
| Mt. Hood, OR | — | — | — | — | — | — | — | — | 50[2] | — | — |
| Raft River, ID | — | — | — | — | — | — | 50 | — | 50 | — | 100 |
| Vale Hot Springs, OR | — | — | — | — | — | — | 50 | — | 50 | 700 | 800 |
| Weiser-Crane Creek, ID | — | — | — | — | — | — | 50 | — | 100 | 850 | 1,000 |
| West Yellowstone, MT | — | — | — | — | — | — | — | — | 50[2] | — | — |
| **SOUTHWEST** | | | | | | | | | | | |
| Brady Hot Springs, NV | — | 50 | — | — | 50 | — | 100 | — | 100 | 700 | 1,000 |
| Beowawe, NV | — | 50 | — | — | 50 | — | 50 | — | 100 | 750 | 1,000 |
| Chandler, AZ | — | — | — | — | 50 | — | — | — | 100 | 80 | 230 |
| Cove Fort-Sulfurdale, UT | — | — | — | 50 | — | 50 | — | 50 | 50 | 1300 | 1,500 |
| Leach, NV | — | — | — | — | — | 50 | — | — | 50 | 1400 | 1,500 |
| Roosevelt Hot Springs, UT | — | 50 | — | — | 50 | — | 50 | — | 100 | 750 | 1,000 |
| Safford, AZ | — | — | — | — | — | 50 | — | — | — | 50 | 100 |
| Steamboat Springs, NV | — | — | — | 50 | — | — | 50 | — | 100 | — | 200 |
| Thermo, UT | — | — | — | — | — | — | 50 | — | — | 450 | 500 |
| Valles Caldera, NM | — | 50 | — | — | 100 | — | 100 | — | 100 | 1150 | 1,500 |
| **GULF COAST[3]** | | | | | | | | | | | |
| Acadia Parish, LA | — | — | — | — | — | 50 | — | — | 50 | 250 | 350 |
| Brazoria, TX | — | — | — | — | 25 | — | 100 | 100 | 200 | 1800 | 2,225 |
| Calcasieu Parish, LA | — | — | — | — | — | 50 | — | — | 50 | 250 | 350 |
| Cameron Parish, LA | — | — | — | — | — | 50 | — | — | 50 | 400 | 500 |
| Corpus Christi, TX | — | — | — | — | — | 50 | — | — | 50 | 1550 | 1,650 |
| Kenedy County, TX | — | — | — | — | — | 50 | — | — | 50 | 200 | 300 |
| Matagorda County, TX | — | — | — | — | — | 50 | — | — | 50 | 400 | 500 |
| Cumulative Power On Line | 1678 | 2188 | 2408 | 3068 | 3668 | 4793 | 6093 | 6793 | 9143 | 30923 | 30,923 |

[1] Pilot plants are not included in this table.

[2] MITRE-assumed plant capacities for analysis.

[3] These geopressured sites are postulated to produce 29,315 MW thermal equivalent of methane by 1985.

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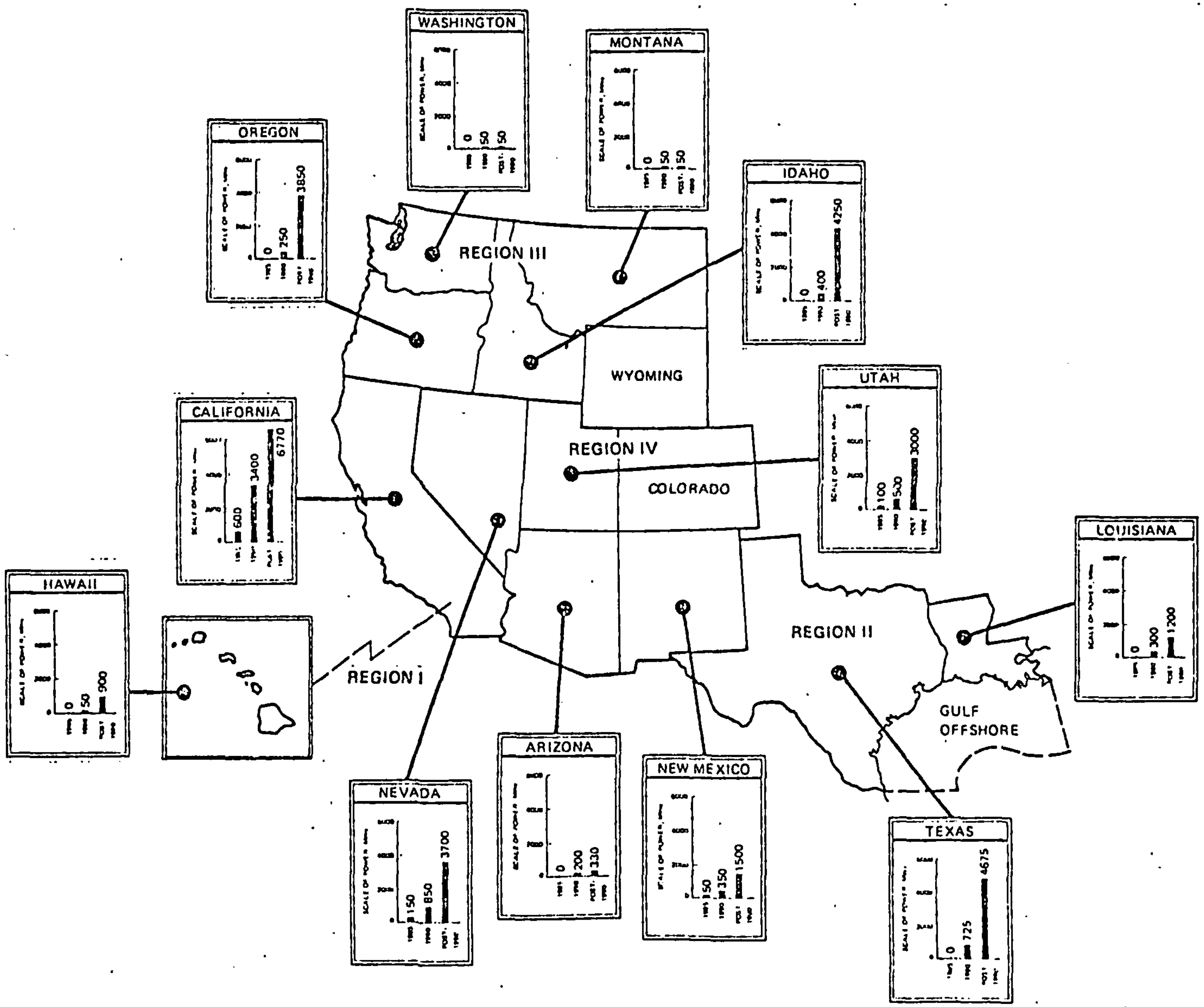


FIGURE 1-1
POSTULATED GROWTH OF INSTALLED GEOTHERMAL ELECTRIC CAPACITY

EXAMPLE

DEVELOPMENT SCENARIO - ROOSEVELT HOT SPRINGS, UTAH

<u>Draft Copy</u>

ROOSEVELT HOT SPRINGS, UTAH

Postulated Development Scenario

| PLANT NUMBER | INSTALLED CAPACITY (MWe) | PLANT ON-LINE DATE |
|---|---|---|
| 1 | 50 | 1983 |
| 2 | 50 | 1986 |
| 3 | 50 | 1988 |
| 4 | 100 | 1990 |
| SUBSEQUENT PLANTS | 750 | 1991-1998 |
| TOTAL | 1000 | to 1998 |

Estimates of Resource Characteristics

| RESOURCE CHARACTERISTIC | ESTIMATE |
|---|---|
| Subsurface Fluid Temperature (°C) | Range: 204-260<br>Best Estimate: 230 |
| Total Dissolved Solids (PPM) | 7,800 |
| Electric Energy Potential (MWe 30 Years) | 100 |
| Overlying Rock | Medium-Hard: Sediments, metamorphics, and volcanics |
| Depth to Top of Reservoir (Meters) | 830 |
| Land Status | |
| Total KGRA acres | 29,791 |
| Total Federal acres | 24,592[1] |
| Federal acres leased | 24,592 |
| Total State and private acres | 5,199 |
| State and private acres leased | No data |

[1] All Federal land in the KGRA was offered in the Federal lease sales. Through first and second offerings, nearly all has been leased. The site is now unitized, and Phillips Petroleum Company is the operator of the land holdings, according to recent information from DOE/DGE.

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Development Status and Activity

Thermal Power Company, a subsidiary of Natomas Company, has completed a joint venture well which was drilled to 382 meters (1254 feet). Preliminary testing demonstrated a well-head pressure of 25 $kg/cm^2$ (355 lbs./sq. inch) and temperature of 222°C (132°F). Projected total mass flow capability of well is one million lb/hr of steam and hot water.

Phillips Petroleum Company reports that an 823-840 meter (2700-2800 foot) test well had an initial flow rate of 90,700 kg/hr (200,000 lb/hr) of steam at 204°C (400°F). Phillips has now completed 10 production wells and is negotiating with several potential hydrothermal users including the City of Burbank, Utah Power & Light Company, and other firms interested in nonelectric applications such as hybrid coal power plant/geothermal process heat uses.

Thermal Power Company plans to build a larger test facility to determine more precisely the electric generating capability potential. Thermal Power holds options to drill on an additional three sections of geothermal leaseholds in the Roosevelt fields. Two wells drilled in 1976, at the site of a significant new field discovery the year before, were both successful producers. One was 1860 meters (6100 feet) deep and the other only 380 meters (1250 feet) deep. The latter produced steam at 300 feet, 700 feet, and 1200 feet and a total mass flow of about one million lb/hr.

## Major Development Problems

No major development problems are currently evident at the Roosevelt Hot Springs hydrothermal site. However, technological areas which could entail a moderate risk include:

- fluid disposal
- high silica content of brine
- cooling water availability/subsidence.

## Postulated Development Scenario: Status and Implications

### First Commercial-Scale Plant: 50 MWe in 1983

Based on the number of developers and the recent field activity at Roosevelt Hot Springs, this appears to be one of the more attractive candidates for development. Phillips Petroleum Company holds Federal leases on which Utah Power Company is planning to build an electric generating plant. The resource temperatures indicate a commercial effectiveness of installing a flash conversion process at this site. As shown in Figure 26-1, the first 50-MWe plant is scheduled to go on line in 1983. Accordingly, the commitment to develop must be made in 1978 and plant final designs must be ready by 1980. Moreover, any technological RD&D, in order to be incorporated in the design specifications and installations must be completed by 1980. Figure 26-2 shows the scheduled activities of principal participants in the development of all the plants at the Roosevelt Hot Springs prospect.

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FIGURE 26-1

DEVELOPMENT SCHEDULE FOR FIRST PLANT: ROOSEVELT HOT SPRINGS, UTAH

| OPERATING ENTITIES | ACTIVITY | RECIPIENTS | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BLM | Issue STC Permit | Developer | ASSUMED COMPLETED | | | | | | | | | | |
| USGS | Issue Drilling Permits | Developer | ASSUMED COMPLETED | | | | | | | | | | |
| BLM | Process EIA/EIS | CEQ | ASSUMED COMPLETED | | | | | | | | | | |
| County Gov't | Issue Land Use Permit | Developer | ASSUMED COMPLETED | | | | | | | | | | |
| Developer | Preliminary Geophysical Exploration | | ASSUMED COMPLETED | | | | | | | | | | |
| Developer | Exploratory Drilling and Reservoir Assessment | | ASSUMED COMPLETED | | | | | | | | | | |
| Developer | Develop Utility Interest | | ASSUMED COMPLETED | | | | | | | | | | |
| Developer Utility | Feasibility Study | | ASSUMED COMPLETED | | | | | | | | | | |
| Producer/(Developer) and Utility | Financial Negotiations | | — | — | | | | | | | | | |
| Producer | Site Selection | | | — | | | | | | | | | |
| Producer/ Utility | Design | | | — | — | | | | | | | | |
| Producer/ Utility | Prepare Master Development Plan | BLM, USGS | | — | — | | | | | | | | |
| Utility | Prepare Environmental Data Statement | BLM, FPC, State, County | | — | — | | | | | | | | |
| Producer/ Utility | Commitment to Development | | | Δ | | | | | | | | | |
| BLM, FPC, State, USGS | Certify Plant and Site, Issue Permits | Producer & Utility | | | — | — | | | | | | | |
| USGS | Process EIA/EIS (Drilling) | CEQ | | | — | — | | | | | | | |
| FPC | Process EIA/EIS (Plant) | CEQ | | | — | — | | | | | | | |
| FPC | Process EIA/EIS (Transmission Line) | CEQ | | | — | — | | | | | | | |
| Producer | Development Drilling | | | | | — | — | — | | | | | |
| Utility | Plant Construction | | | | | | — | — | — | | | | |
| Utility | Install Transmission Line (96.5km) | | | | | | — | — | — | | | | |

FIGURE 26-1

FIGURE 26-2

DEVELOPMENT SCHEDULE FOR ALL PLANTS: ROOSEVELT HOT SPRINGS, UTAH

| OPERATING ENTITIES | ACTIVITY | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Owner | Lease Land, Issue Prospecting Permit | | | | | | | | | | | |
| County | Process Environmental Report - Pre-lease | | | | | | | | | | | |
| | Issue Land Use Permit | | | | | | | | | | 5 | |
| | Process Environmental Report - Drilling | | | | | | | | | | | |
| State | Process Environmental Report, Lease Land | | | | | | | | | | | |
| | Issue Prospecting/Exploration Permits | | | | | | | | | | | |
| | Issue Drilling Permits | | | | | | | | | | | |
| | Certify Plant and Site - Issue Permits | | | 1 | | | | | | | | |
| | Process Environmental Reports - Drilling, Plant Construction, Transmission Lines | | | | | | | | | | | |
| Developer | Exploration and Reservoir Evaluation | | | | | | | | | | 5 | |
| | Commit to Development | | | Δ1 | | | | Δ | | Δ | | Δ |
| | Prepare Master Development Plan | | 1 | | | | | | | | | |
| | Development Drilling | | | | 1 | | | | | | | |
| Utility | Commit to Development | | | Δ1 | | | | Δ | | Δ | | Δ |
| | Prepare Environmental Data Statement and Master Development Plan | | 1 | | | | | | | | | |
| | Construct Plant, Install Transmission Lines | | | | | 1 | | | | | | |
| | Power on Line | | | | | | | 50 ▲1 | | | 50 ▲ | |
| DOI/USGS | Issue Drilling Permit | | | | | | | | | | 5 | |
| | Process EIA/EIS - Drilling | | | 1 | | | | | | | | |
| DOI/BLM | Process EIA/EIS, Lease Land | | | | | | | | | | | |
| | Issue STG Drilling Permit | | | | | | | | | 5 | | |
| | Certify Plant and Site, Issue Permits | | | 1 | | | | | | | | |
| DOI/USFS | Process EIA/EIS, Lease Land | | | | | | | | | | | |
| | Issue STG Drilling Permit | | | | | | | | | | | |
| FPC | Certify Plant and Site, Issue Permits | | | 1 | | | | | | | | |
| | Process EIA/EIS - Plant & Transmission Line | | | 1 | | | | | | | | |
| BIA | Process EIA/EIS, Lease Land | | | | | | | | | | | |
| | Issue Drilling Permits | | | | | | | | | | | |

FIGURE 26-2, Concluded

DEVELOPMENT SCHEDULE FOR ALL PALNTS: ROOSEVELT HOT SPRINGS, UTAH

| OPERATING ENTITIES | ACTIVITY | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Owner | Lease Land, Issue Prospecting Permit | | | | | | | | | | | |
| County | Process Environmental Report - Pre-lease | | | | | | | | | | | |
| | Issue Land Use Permit | | | | | | | | | | | |
| | Process Environmental Report - Drilling | | | | | | | | | | | |
| State | Process Environmental Report, Lease Land | | | | | | | | | | | |
| | Issue Prospecting/Exploration Permits | | | | | | | | | | | |
| | Issue Drilling Permits | | | | | | | | | | | |
| | Certify Plant and Site - Issue Permits | | | | | | | | | | | |
| | Process Environmental Reports - Drilling, Plant Construction, Transmission Lines | | | | | | | | | | | |
| Developer | Exploration and Reservoir Evaluation | | | | | | | | | | | |
| | Commit to Development | | | | | | | | | | | |
| | Prepare Master Development Plan | | | | | | | | | | | |
| | Development Drilling | | | | | | | | | | | |
| Utility | Commit to Development | | | | | | | | | | | |
| | Prepare Environmental Data Statement and Master Development Plan | | | | | | | | | | | |
| | Construct Plant, Install Transmission Lines | | | | | | | | | | | |
| | Power on Line | 50 ▲ | | 100 ▲ | 100 ▲ 5 | 100 ▲ | 100 ▲ | 100 ▲ | 100 ▲ | 100 ▲ | 100 ▲ | 50 ▲ 12 |
| DOI/USGS | Issue Drilling Permit | | | | | | | | | | | |
| | Process EIA/EIS - Drilling | | | | | | | | | | | |
| DOI/BLM | Process EIA/EIS, Lease Land | | | | | | | | | | | |
| | Issue STG Drilling Permit | | | | | | | | | | | |
| | Certify Plant and Site, Issue Permits | | | | | | | | | | | |
| DOI/USFS | Process EIA/EIS, Lease Land | | | | | | | | | | | |
| | Issue STG Drilling Permit | | | | | | | | | | | |
| FPC | Certify Plant and Site, Issue Permits | | | | | | | | | | | |
| | Process EIA/EIS - Plant & Transmission Line | | | | | | | | | | | |
| BIA | Process EIA/EIS, Lease Land | | | | | | | | | | | |
| | Issue Drilling Permits | | | | | | | | | | | |

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Development Problems. There are a number of site-related technological problems of moderate concern. The reservoir/return formation is fractured volcanic, capped with medium-to-hard overlying rock and, consequently, its ability to absorb return flows of return flows of brine over extended operating times is in question.

In addition, although quantitative data have not been well established for silica content in produced brines, there are some indications that silica carryover and scaling may be problems at the Roosevelt Hot Springs site. Similarly, maintaining long-term flows from production wells could be a significant consideration.

Environmental concerns are relevant, particularly regarding potential land settlement in that locale: recent withdrawals from (nearer-surface) aquifers have resulted in observed subsidences of six feet. The possible impacts of seismic excitation are also a moderate concern.

Surface water for evaporative cooling is generally unavailable in the region. This water shortage may not be a problem should the underground brine-receiving formations be able to tolerate a slight deficit in reinjection (i.e., based on tradeoffs in cooling versus subsidence and reservoir depletion).

Economic Analysis. The projected economics of electrical generation at the Roosevelt Hot Springs geothermal power prospect are presented in Table 26-I.

TABLE 26-I

ECONOMIC ANALYSIS: ROOSEVELT HOT SPRINGS, UTAH

FLASH SYSTEM , 50 MW ELECTRIC PLANT
FIRST PLANT ON LINE DATE : 1983

TEMPERATURE IN CENTIGRADE DEGREES (BEST ESTIMATE) : 230
WELL DEPTH IN METERS : 1300
BRINE SALINITY : LOW
OVERLYING ROCK TYPE : MEDIUM HARD
SPECIFIED WELL FLOW RATE (KGM./HR.) : 363000
THE COST PER PRODUCTION WELL IS NOT SPECIFIED : THE DEFAULT COST PER PRODUCTION WELL ($) = 533136.2
THE COST PER INJECTION WELL IS NOT SPECIFIED : THE DEFAULT COST PER INJECTION WELL ($) = 533136.2

PRODUCER FINANCIAL DATA

| | |
|---|---|
| DEBT FRACTION : | 0.30 |
| ANNUAL INTEREST RATE ON DEBT (FRACTION) : | 0.08 |
| REQUIRED RATE OF RETURN ON EQUITY (FRACTION) : | 0.20 |
| PROPERTY TAX RATE (FRACTION) : | 0.01 |
| REVENUE TAX RATE OR ROYALTY (FRACTION) : | 0.10 |
| EFFECTIVE TOTAL INCOME TAX RATE (FRACTION) : | 0.50 |
| EFFECTIVE INVESTMENT TAX CREDIT (FRACTION) : | 0.04 |
| ESCALATION FACTOR FOR O&M COSTS : | 0.05 |
| ESCALATION FACTOR FOR ENERGY COSTS : | 0.05 |
| ESCALATION FACTOR FOR CAPITAL COSTS : | 0.05 |
| LIFE SPAN OF PRODUCTION WELLS (YEARS) : | 10.00 |
| LIFE SPAN OF INJECTION WELLS (YEARS) : | 10.00 |
| LIFE SPAN OF PRODUCER PLANT (YEARS) : | 20.00 |
| START UP COST MULTIPLIER : | 1.081 |

UTILITY FINANCIAL DATA

| | |
|---|---|
| DEBT FRACTION : | 0.50 |
| ANNUAL INTEREST RATE ON DEBT (FRACTION) : | 0.08 |
| REQUIRED RATE OF RETURN ON EQUITY (FRACTION) : | 0.12 |
| PROPERTY TAX RATE (FRACTION) : | 0.01 |
| REVENUE TAX RATE OR ROYALTY (FRACTION) : | 0.0 |
| EFFECTIVE TOTAL INCOME TAX RATE (FRACTION) : | 0.50 |
| EFFECTIVE INVESTMENT TAX CREDIT (FRACTION) : | 0.04 |
| ESCALATION FACTOR FOR O&M COSTS : | 0.05 |
| ESCALATION FACTOR FOR ENERGY COSTS : | 0.05 |
| ESCALATION FACTOR FOR CAPITAL COSTS : | 0.05 |
| LIFE SPAN OF UTILITY PLANT (YEARS) : | 30.00 |
| ULTIMATE CAPACITY FACTOR : | 0.80 |
| START UP COST MULTIPLIER : | 1.038 |

* NUMBER OF WELLS , CAPITAL COSTBASIS AND O&M COSTS , AND REVENUE REQUIREMENTS WITHOUT ANY R&D IMPACTS *

CAPITAL COSTBASIS (1977 $M)

| | | |
|---|---|---|
| 7 PRODUCTION WELLS : | 4.492 | |
| 6 INJECTION WELLS : | 3.850 | |
| PRODUCER PLANT EXCLUDING WELLS : | 4.708 | |
| REPLACEMENT PRODUCTION WELLS : | 3.836 | |
| REPLACEMENT INJECTION WELLS : | 3.288 | |
| REPLACEMENT PLANT : | 2.077 | |
| TOTAL FOR PRODUCTION FIELD : | | 22.253 |
| GENERATING PLANT : | | 24.113 |
| TOTAL : | | 46.366 |

O&M COSTS (1977 $M/YR.)

| | | |
|---|---|---|
| PRODUCER | | |
| GENERAL : | 0.224 | |
| WELL : | 0.069 | |
| DEEP WELL PUMP : | 0.0 | |
| SPENT BRINE TREATMENT : | 0.0 | |
| CHEMICAL & MECHANICAL CLEANING : | 0.0 | |
| TOTAL : | | 0.294 |
| UTILITY | | |
| GENERAL : | 0.703 | |
| CHEMICAL & MECHANICAL CLEANING : | 0.0 | |
| TOTAL : | | 0.703 |

** REVENUE REQUIREMENTS **

PRODUCER : 13.744 MILLS/KWHR
UTILITY : 7.016 MILLS/KWHR
* TOTAL : 20.760 MILLS/KWHR *

ROOSEVELT H.S. , NEVADA
(CONTINUED)

* R&D IMPACTS FOR PLANT NO. 1 - ON LINE DATE : 1983 *

| R&D COMPONENT | ANTICIPATED CHANGE (%) | CHANGE IN REVENUE REQUIREMENTS (MILLS/KWHR) |
|---|---|---|
| CAPITAL COST PER PRODUCTION WELL | -5.00 | -0.2576 |
| CAPITAL COST PER INJECTION WELL | -5.00 | -0.2208 |

** REVENUE REQUIREMENTS WITH ALL THE R&D IMPACTS INCLUDED. **

PRODUCER : 12.266 MILLS/KWHR
UTILITY : 7.016 MILLS/KWHR
* TOTAL : 19.283 MILLS/KWHR *

* SENSITIVITY OF COST OF ELECTRICITY (FROM PLANT NO. 1 , R&D IMPACTS INCLUDED) *

| RESOURCE & OPERATING PARAMETERS | MILLS/KWHR |
|---|---|
| HIGH RESOURCE TEMPERATURE ESTIMATE (260 DEGREES CENTIGRADE) | 15.330 |
| LOW RESOURCE TEMPERATURE ESTIMATE (200 DEGREES CENTIGRADE) | 33.178 |
| HIGH CAPACITY FACTOR VALUE : 0.85 | 18.148 |
| LOW CAPACITY FACTOR VALUE : 0.60 | 25.710 |
| EXPENSING OF INTANGIBLE DRILLING COSTS ( 70.0% OF WELL COSTS EXPENSED) | 17.812 |
| DEPLETION ALLOWANCE ( 22.0% OF GROSS INCOME) | 16.873 |
| INVESTMENT TAX CREDIT ( 26.2% GROSS, 15.0% EFFECTIVE) | 18.198 |

ROOSEVELT H.S. , NEVADA
(CONTINUED)

* R&D IMPACTS FOR PLANT NO. 2 - ON LINE DATE : 1986 *

| R&D COMPONENT | ANTICIPATED CHANGE (%) | CHANGE IN REVENUE REQUIREMENTS (MILLS/KWHR) |
|---|---|---|
| NUMBER OF PRODUCTION WELLS | -3.00 | -0.7358 |
| CAPITAL COST PER PRODUCTION WELL | -12.00 | -0.6181 |
| CAPITAL COST PER INJECTION WELL | -12.00 | -0.5298 |
| CAPITAL COST OF GATHERING SYSTEM | -10.00 | -0.0649 |
| CAPITAL COST OF DISTRIBUTION SYSTEM | -10.00 | -0.0254 |
| CAPITAL COST OF TURBINE GENERATOR | -3.00 | -0.0728 |
| CAPITAL COST OF PROCESS MECHANICAL (UTILITY) | -10.00 | -0.0270 |
| LIFE SPAN OF PRODUCTION WELLS | 20.00 | -0.3758 |
| LIFE SPAN OF INJECTION WELLS | 100.00 | -0.9828 |
| START UP COST MULTIPLIERS | (PRODUCER: -4.16 , UTILITY: -2.12) | -0.7208 |

** REVENUE REQUIREMENTS WITH ALL THE R&D IMPACTS INCLUDED. **

PRODUCER : 10.264 MILLS/KWHR
UTILITY : 6.770 MILLS/KWHR
* TOTAL : 17.034 MILLS/KWHR *

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ROOSEVELT H.S. , NEVADA
(CONTINUED)

* R&D IMPACTS FOR PLANT NO. 3 - ON LINE DATE : 1988 *

| R&D COMPONENT | ANTICIPATED CHANGE (%) | CHANGE IN REVENUE REQUIREMENTS (MILLS/KWHR) |
|---|---|---|
| NUMBER OF PRODUCTION WELLS | -3.00 | -0.7358 |
| CAPITAL COST PER PRODUCTION WELL | -12.00 | -0.6181 |
| CAPITAL COST PER INJECTION WELL | -12.00 | -0.5298 |
| CAPITAL COST OF GATHERING SYSTEM | -10.00 | -0.0649 |
| CAPITAL COST OF DISTRIBUTION SYSTEM | -10.00 | -0.0254 |
| CAPITAL COST OF TURBINE GENERATOR | -3.00 | -0.0728 |
| CAPITAL COST OF PROCESS MECHANICAL (UTILITY) | -10.00 | -0.0270 |
| LIFE SPAN OF PRODUCTION WELLS | 20.00 | -0.3835 |
| LIFE SPAN OF INJECTION WELLS | 100.00 | -0.9958 |
| START UP COST MULTIPLIERS | (PRODUCER: -4.16 , UTILITY: -2.12) | -0.7208 |

** REVENUE REQUIREMENTS WITH ALL THE R&D IMPACTS INCLUDED. **

PRODUCER : 10.247 MILLS/KWHR
UTILITY : 6.770 MILLS/KWHR
* TOTAL : 17.017 MILLS/KWHR *

ROOSEVELT H.S. , NEVADA
(CONTINUED)

* R&D IMPACTS FOR PLANT NO. 4 - ON LINE DATE : 1990 *

| R&D COMPONENT | ANTICIPATED CHANGE (%) | CHANGE IN REVENUE REQUIREMENTS (MILLS/KWHR) |
|---|---|---|
| NUMBER OF PRODUCTION WELLS | -3.00 | -0.7358 |
| CAPITAL COST PER PRODUCTION WELL | -20.00 | -1.0302 |
| CAPITAL COST PER INJECTION WELL | -20.00 | -0.8830 |
| CAPITAL COST OF GATHERING SYSTEM | -10.00 | -0.0649 |
| CAPITAL COST OF DISTRIBUTION SYSTEM | -10.00 | -0.0254 |
| CAPITAL COST OF TURBINE GENERATOR | -3.00 | -0.0728 |
| CAPITAL COST OF PROCESS MECHANICAL (UTILITY) | -10.00 | -0.0270 |
| LIFE SPAN OF PRODUCTION WELLS | 20.00 | -0.3835 |
| LIFE SPAN OF INJECTION WELLS | 100.00 | -0.9958 |
| START UP COST MULTIPLIERS | (PRODUCER: -4.16 , UTILITY: -2.12) | -0.7208 |

** REVENUE REQUIREMENTS WITH ALL THE R&D IMPACTS INCLUDED. **

PRODUCER : 9.672 MILLS/KWHR
UTILITY : 6.770 MILLS/KWHR
* TOTAL : 16.442 MILLS/KWHR *

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The levelized busbar cost of flash-conversion electricity[1] from this site is estimated to be 20.8 mills/kWh using currently available technology. Accounting for anticipated cost reductions from the RD&D program, the first commercial-scale plant at this site, postulated to come on line in 1983, is expected to have a levelized busbar energy cost of 19.3 mills/kWh.

It is assumed that geothermal electric plants in this region will be competing primarily against new western coal-fired power plants. The levelized busbar cost of electricity from these sources is expected to be about 20.0 mills/kWh in 1985, rising to 20.6 mills/kWh in 1990 under assumptions of the National Energy Plan scenario for escalation of coal prices.

The costs of electricity (with RD&D benefits) at this prospect are therefore competitive without the advantage of Federal subsidies.

Subsequent Plants

The second plant at Roosevelt, also a 50-MWe plant, is scheduled to go on line in 1986. Its construction must commence in 1984, the design must be completed in 1984, and the commitment to develop this expanded capacity must be made by 1982. With a required RD&D cutoff time of 3 years before power on line, no operating experience will be

[1] See Chapter 2 for a detailed description of the computer print-out and assumptions and data used in this analysis.

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available for Plant 2 from any of the new 1983 plants, including Roosevelt Hot Springs Plant 1. The projected cost of electricity from Plant 2 is 17.0 mills/kWh (Table 26-I). Plant 3 will realize benefits from the same RD&D contributions and, since it will be the same size as Plant 2, will have similar power production costs.

Plant 4, 100-MWe capacity in 1990, will benefit from further RD&D impacts (Table 26-I) and will produce electricity at a favorable 16.4 mills/kWh.