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QF VIABILITY IN YEAR 11: UTILITY FORECASTS AND PARTNERSHIP OPTIONS

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ABSTRACT

In order to project future QF power production, SCE has attempted to quantify the long-term viability of its geothermal projects. SCE has particularly focused on the potentially large decrease in the energy price paid when these projects transition from guaranteed prices to short-run avoided cost prices in the eleventh contract year. Revenues and typical O&M cost data were acquired and analyzed to assess 11th year operational viability. This paper discusses these data, the conclusions reached, and possible future QF and/or SCE actions. The major conclusion is that the "typical" geothermal project will remain operationally viable when paid short-run avoided cost prices in Year 11 and beyond.

BACKGROUND

SCE receives energy and capacity from approximately 680 MW of on-line geothermal projects. All of these projects have an Interim Standard Offer #4 (ISO4) contract or a negotiated contract modeled on the ISO4 contract. All contracts feature 10 years of pre-determined escalating energy prices and up to 30 years of pre-determined fixed firm capacity prices. After 10 years of pre-determined energy prices, the annual energy prices are equal to the then-current annual avoided cost prices. For example, if a project commenced firm operation in 1988, it will receive 13.6 cents/kWh for its energy in 1997. However, in 1998, the 11th year, it will receive a much smaller energy price. This 1998 price is currently forecasted to be approximately 3.33 cents/kWh.

ANALYSIS PURPOSE

The potentially dramatic decrease in energy prices noted above could produce severe economic dislocations for select QFs. This paper describes Edison's efforts to quantify the percentage of geothermal QFs likely to suffer this dislocation and to develop policies/programs as needed to assist affected QFs while satisfying CPUC mandates.

DATA ACQUISITION EFFORTS

In mid-1992, Edison retained Weiss Associates, a California corporation which provides environmental and geologic services, to assist it in understanding the geothermal QF situation. Weiss Associates then commenced telephone contacts with operating personnel at major geothermal projects. A major result of those contacts was that a face-to-face meeting between Edison and geothermal QFs was deemed timely. On July 28, Edison held a Geothermal Technology Day at Rosemead. 90% of Edison's geothermal QFs were represented; also in attendance were those Edison personnel involved in QF matters. Vikram S. Budhraja, Vice President, System Planning and Operations, addressed the group. The following items were discussed:

- the Year 11 issue,
- Edison's information gathering activities with respect to operations and maintenance data,
- Edison's intended use of any acquired (O&M) data, and
- negotiation guidelines and opportunities for contract modifications.

In a follow-up letter, Edison's preferences with respect to coordination of scheduled maintenance were discussed; in addition, O&M data, on an individual or aggregated basis, were solicited.

With respect to data sharing, also included in the follow-up letter was a legal analysis of Edison's ability to preserve the confidentiality of data provided to it and which could be requested by various regulatory agencies.

No offers of individual or aggregated project data were received. Hence, data from public domain sources and from experts, based on "good engineering practices", were subsequently used for the analysis.

O&M DATA RESULTS

The data shown in Table 1 reflects O&M cost ranges for different power cycles and resource temperatures and salinity. Each data entry is a rather broad range of costs, expressed in 1991 dollars. These broad ranges reflect the inherent uncertainties in our data acquisition approach. However, these data were intended merely to provide Edison with a starting point in its analysis.

The average O&M cost number was 2.84 cents/kWh in 1991 dollars. This was assumed to escalate at 5%/year in the base case. This number was consistent with data from other sources:

Source	Cost	1991 cents/kWh @ 5% escalation
Recommendation of GRA regarding geothermal costs (November 18, 1991):	$150/kW + 1 cent/kWh (1989 $s)	3.20
CPUC Decision re Geothermal IDR:	$127.50/kW + 0.91 cents/kWh (1989 $s)	2.79
CA Energy Company Offering Memorandum		2.69

THE MANY FACES OF "VIABILITY"

There are two viability measures for power generation projects. A project is considered **economically viable** if, for all or most operational years, revenues exceed costs, including debt service, fixed O&M costs, variable O&M costs, fuel costs, etc.; the resulting net cash flow should be sufficient to reimburse the lenders and provide a reasonable rate of return for the equity contribution, commensurate with the risks involved.

A project is **operationally viable** as long as revenues exceed the costs of operating the plant. Debt service and equity return are not considered in this determination.

In this analysis, Edison was primarily concerned with operational viability. There were two reasons for this:

(1) Edison lacked data for estimating economic viability. If Edison had little data about O&M costs, it had even less data about the capitalization structure and debt balance for projects. If a project had refinanced, the annual debt cost was even more uncertain. Absent knowledge about the capitalization structure and debt balance, Edison had no basis for estimating the funds required to make debt- and equity-related payments.

(2) Edison focused on the probability that QFs would operate. Edison believed that, as long as revenues covered operational costs, the QFs would operate, even if debt and equity participants might have to reduce their expectations or sell their interests. In other words, a QF which was operationally viable might not be economically viable.

EXPECTED OPERATIONAL VIABILITY OF A TYPICAL GEOTHERMAL PROJECT IN YEAR 11

With respect to operational viability, Edison's analysis involved:

- projecting energy and capacity revenues
- projecting O&M costs
- comparing revenues and costs.

INPUT ASSUMPTIONS:

The input assumptions for the analysis were:

Parameter	Value	Source
Year 11	1998	defined
Project Size	50 MW	defined
Capacity factor	90%	observed performance
O&M cost (1991 $'s)	2.84 cents/kWh	consultant input
O&M cost escalation	5%/yr	consultant guesstimate
O&M cost (1998 $'s)	4.00 cents/kWh	calculated
Avoided cost in 1998	3.47 cents/kWh	Power Contracts
Capacity price	$184/kW	Average price paid in '91

Two approaches were taken: (1) Single-Year Analysis of Year 11, and (2) Annual Cash Flow in Period 2.

(1) SINGLE-YEAR ANALYSIS:

Annual Revenues:

Capacity revenues = 50,000 kW * $184/kW = $9.2 million

Energy revenues = 50,000 * 0.90 * 8760 hrs * $0.0347
= $13.7 million

Total annual revenues = $22.9 million

O&M Costs:

At 4 cents/kWh,

O&M costs = 50,000 * 0.90 * 8760 * 0.04
= $15.8 million

Net Operating Income:

Net Operating Income before debt/equity/ taxes/ royalties = $7.1 million

The conclusion is that the typical geothermal project will be operationally viable. However, if a particular project experiences costs at the upper extreme of the range (e.g., 5.7 cents/kWh in 1991 dollars), this project is not operationally viable, for its net operating income before debt/equity/taxes is <$8.8 million>.

(2) ANNUAL CASH FLOW

For the base case O&M assumption of 2.84 cents/kWh in 1991, escalating at 5%, the Internal Rate of Return (IRR) is 38%. Based on the current forecast of avoided cost prices, the maximum O&M cost, escalating at 5%, was calculated so that the cash flow in all years was still positive. This maximum O&M cost was 3.9 cents/kWh in 1991 (5.5 cents/kWh in 1998), 37% greater than our base case assumption). This produces an IRR of 26%.

EXPECTED ECONOMIC VIABILITY OF A TYPICAL GEOTHERMAL PROJECT IN YEAR 11

Edison did attempt to approximate debt, equity, and taxes to understand the economic viability of a typical 50 MW geothermal facility. Critical assumptions were that the debt was retired in 10 years and that the capital cost of the plant was $3100/kW, of which 20% was funded with equity ($31 million).

Two approaches were taken: (1) Single-Year Analysis and (2) Annual Cash Flow Analysis.

(1) SINGLE-YEAR ANALYSIS:

If, in year 11, net operating income before equity and taxes is $9.5 million and taxes are 40%, the after-tax cash flow (i.e., the return realized by the equity holders) is $4.75 million, a 15% cash-on-cash return in that year. Such a plant is considered to be economically viable, assuming that the debt has been fully retired.

(2) ANNUAL CASH PRE-TAX FLOW ANALYSIS:

Debt retirement in the first ten years appears to be quite viable. If debt is at 10% for 10 years (annual payment = $20.2 million), the equity is in the form of subordinated debt at 20% over 15 years (annual payment = $6.6 million), and O&M is 2.84 cents/kWh in 1991 dollars and escalates or de-escalates at 5%, the annual cash flow for each of the first 10 years (from 1988 through 1997) is positive.

For the base case O&M assumption of 2.84 cents/kWh in 1991 dollars, escalating at 5%, the IRR is about 38%. In fact, the O&M cost can increase by approximately 38% (from 2.84 to 3.91 cents/kWh in 1991 dollars, escalating at 5%) while maintaining positive cash flow in all years. The IRR becomes 26%.

If the annual O&M escalation is 6%, the 1991 value can increase by approximately 22% (from 2.84 to 3.46 cents/kWh in 1991 dollars) while still maintaining positive cash flow in all years. The IRR becomes 31%.

POTENTIAL YEAR 11 EFFECTS

Edison's analysis shows that, for its base case assumptions concerning revenues and operational costs, geothermal projects will be operationally viable. However, those projects whose revenues and costs are significantly different than the base case assumptions may in fact have insufficient revenues to cover operational costs, particularly in the first few years after the 10th year. Edison believes that a relatively small number of geothermal QFs will be in this situation. It is more likely that geothermal projects will have insufficient revenues to cover all costs, including debt service and equity returns. In this case, the following is possible: reserve funds may be used, ownership may change hands and/or debt may be restructured.

EDISON PRINCIPLES FOR CONTRACT RESTRUCTURING:

1. Keep rates as low as possible
2. If the period 2 payment is a problem, the problem should be solved, if possible, and not postponed.
3. Restructuring contracts must provide commensurate customer benefits.
4. Edison customers should not assume additional uncompensated risk.
5. Payments should not be based on forecasts.
6. Edison should not be required to be the judge of prudency.
7. Insure mechanism is robust on a public policy basis.

COMMISSION GUIDANCE:

In Decision 93-01-048, January 22, 1993, the CPUC stated that, after a period of fixed energy prices, QFs with ISO4 contracts are required to switch to energy payments based on the purchasing utility's SRACs.

> "It is not our intent to subsidize or rescue any QFs who are unable to continue to operate profitably under their existing contracts after the tenth year. It is our goal to promote competition in electricity generation and we recognize that the failure of some participants is one of the characteristics of a healthy, competitive industry. Even if the owner of a particular facility should go bankrupt, the facility and its generating capability continue to exist; unless the facility is uncompetitive and inefficient; in most cases we expect that a new owner will purchase the asset at a price that will allow profitable operation and the ISO4 contract will be assigned to and performed by the new owner.
>
> "Thus we view the year 11 issue not as a problem but as a chance to restructure the ISO4 payment stream in a way that will benefit all affected parties."

Principles proffered by the CPUC included:

(1) ratepayers should be no worse than indifferent on a NPV basis; it is desirable that modifications, whenever feasible, offer ratepayers economic gain.

(2) Any modifications based on forecasts extending very far into the future should have periodic checkpoints that would allow for revisions to bring the arrangements in line with actual circumstances.

POSSIBLE SOLUTIONS SUGGESTED BY CPUC

The CPUC suggested various options for dealing with the cliff:

- deferral of payments and then an adder: This can be done by the QF independent of the utility (it is called "saving for a rainy day"). The only advantage to utility involvement would be if the utility could generate more interest earnings than could the QF—an unlikely proposition.
- tracking account, added to in Period 1, drawn on in Period 2: See comments above.
- identification of additional sources of ratepayer value (e.g., curtailment provisions of FSO4): Edison realizes maximum value from real-time dispatch.

decouple QF prices from natural gas prices: If one expects that an index such as an inflation index to rise more slowly that gas prices and one agrees that the present value of two escalating energy price streams should be the same, then the starting price for the inflation-indexed price will be greater than that for the gas-indexed price. This amounts to front-end loading of the price stream and could be sufficient to enable a QF to overcome a few years of negative cash flow. For example, for a 20-year period using an 11% discount rate, a starting price of 4 cents escalating at 7% (e.g. gas) is equivalent to a starting price of 5 cents escalating at 4% (e.g., inflation). Note that such yields a 25% increase in the first-year price. Edison has three concerns about this approach: (1) A security deposit is required since there is an overpayment unless the indices escalate as expected and the QF operates for the full 20 years; (2) The CPUC has said that any modifications based on forecasts extending very far into the future should have periodic checkpoints that would allow for revisions to bring the arrangements in line with actual circumstances. Hence, over time, either the security deposit amount must change or the payment stream must vary; and (3) As the electric industry moves toward a fully competitive market for electricity generation, Edison must have a market for its power, at the then-current prices. There is an upper limit on the price paid to QFs in any given year, defined by Edison's maximum electricity offering price (to its customers) which does not cause a reduction in Edison sales.

OTHER OPTIONS:

Redefinition of SRAC: The above analysis assumes a certain level of avoided costs in the late 1990s. If the methodology used to reflect the utility's price of energy, but for the QF, were to cause an increase in avoided costs, the QFs margins would be increased. Of course, the opposite is also true. To the extent that competition in the electricity marketplace is enhanced, prices may be reduced.

Tighten the belts: Increased operational efficiencies create savings which go directly to the bottom line. PG&E suggests that a "repower year" be allowed so that upgrades can be effected.

Better TOD management of kWh sales: Magma has recently purchased full interest in San Francisco-based pumped-storage developer Peak Power Company, so as (i) to convert geothermal into a fully dispatchable resource and (ii) to provide a cost-effective use of off-peak geothermal energy production.

Peddle to the metal: If a plant's operational viability in year 11 and thereafter is seriously in question, a strategy might be to incur only those costs which allow the plant to last until the end of the 10th year, allowing investors to withdraw maximum benefits prior to plant shutdown in year 11. This strategy will be thwarted to the extent that the debt term extends beyond the 10th year and lenders require assurances that a maintenance plan stressing plant longevity is in place and is being followed. Edison would be most concerned about such a strategy, for firm capacity QFs owe Edison a capacity repayment if they terminate prior to the end of the contract term. If all geothermal QFs were to terminate operations in the year 2000, the total capacity repayment due Edison would be approximately $400 million (or $800/kW), in year 2000 dollars.

Alternative purchasers: Sales to other entities for which the electricity has greater value can improve project economics.

Fuel conversion: In situations where fuel costs are a major cost element, seek necessary approvals for use of a cheaper alternative fuel.

Green pricing-based subsidies: The CPUC has stated that pricing after the 10th year shall be short-run avoided cost (SRAC) pricing. This precludes the inclusion of environmental/fuel diversity premiums (as are included in long-run avoided cost (LRAC) pricing (and as was suggested by the GRA/IEP in their August 17, 1993 "Motion to Establish Procedural Schedule"). One way that renewables in financial difficulty might obtain additional funds might be to request the public (i) to pay extra for electricity and (ii) to authorize that collected funds be used to assist troubled projects.

CONCLUSIONS

1. While reduced prices will create some liquidity problems for geothermal QFs, advance planning and belt tightening will likely preclude the termination of operations for most of Edison's geothermal QFs.

2. Edison is committed to working with the QFs in understanding the problem and in considering various solutions, within CPUC guidelines and sound business practices.

3. CPUC guidelines do not allow for much flexibility for the utility and QF in resolving QF liquidity problems. However, the earlier the parties consider this issue, the greater the probability that they can exploit the flexibility that does exist.

Table 1. Operations & Maintenance Cost Ranges

Technology	Temperature	Salinity	O&M Cost Range ('91 $/kWh)
Binary	low/moderate	low/moderate	$0.017 - 0.057
Binary	high	high	$0.029 - 0.057
Binary	low	low	$0.017 - 0.057
Double Flash	high	high	$0.029 - 0.044
Double Flash	moderate	low/moderate	$0.015 - 0.029
Double Flash	high	low/moderate	$0.015 - 0.029