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Impact of Tax Incentives on the Commercialization of Solar Thermal Electric Technologies Volume II Federal Revenue Considerations

P. B. Bos and G. P. Morris
Polydyne, Inc. and Associates
Menlo Park and Berkeley, California

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IMPACT OF TAX INCENTIVES ON THE COMMERCIALIZATION OF SOLAR THERMAL ELECTRIC TECHNOLOGIES VOLUME II FEDERAL REVENUE CONSIDERATIONS

Prepared by

Peter B. Bos
Gregory P. Morris
Polydyne, Inc. and Associates
Menlo Park and Berkeley, California

Prepared for

Sandia National Laboratories
Livermore, California

ABSTRACT

The purpose of this study was to quantify the impact of the Solar Thermal Central Receiver (STCR) tax incentives and commercialization on the federal treasury revenues. The initial STCR market penetration was assumed to take place in California, because of favorable local conditions. The initial financing was assumed to be underwritten by intermediary partnerships under long-term avoided cost contracts with the local utility companies with subsequent sale of the plants to utilities at competitive prices.

To estimate the impacts of these various tax incentives associated with the commercialization of the STCR technology, the tax revenues and costs for the STCR plants were compared with the tax revenues and costs for the displaced conventional power plants. This differential analysis takes into account the different operating expenses, as well as the different depreciation charges, financing costs, and tax credits associated with STCR and conventional plants. The study also evaluated the impact of both the previous (1983) and current (1984) proposed federal energy tax credits. The resulting total annual tax cash flows were subsequently cumulated to determine the aggregate tax revenues and costs throughout the 1985 to 2034 time period.

The results of this analysis indicate that the initial federal tax revenues are negative. With increasing market penetration, the installed costs of the STCR plants decrease rapidly and the net present values of the tax revenue cash flows associated with plants constructed after 1995 are positive, and become significantly larger than those for the corresponding displaced conventional plants.

The energy tax credits for STCR systems have the potential to provide the necessary incentives to commercialize a very attractive renewable energy resource at a very low total initial cost to the government as compared with the previous incentives provided for the commercialization of the current conventional energy technologies. In the long run, the commercialization of the STCR technology would save about 800 million barrels of oil or its gas equivalent through 2034, while providing long-term positive tax revenues to the treasury.

TABLE OF CONTENTS

SOLAR THERMAL TECHNOLOGY
FOREWORD

The research and development described in this document was conducted within the U.S. Department of Energy's (DOE) Solar Thermal Technology Program. The goal of the Solar Thermal Technology Program is to advance the engineering and scientific understanding of solar thermal technology, and to establish the technology base from which private industry can develop solar thermal power production options for introduction into the competitive energy market.

Solar thermal technology concentrates solar radiation by means of tracking mirrors or lenses onto a receiver where the solar energy is absorbed as heat and converted into electricity or incorporated into products as process heat. The two primary solar thermal technologies, central receivers and distributed receivers, employ various point and line-focus optics to concentrate sunlight. Current central receiver systems use fields of heliostats (two-axis tracking mirrors) to focus the sun's radiant energy onto a single tower-mounted receiver. Parabolic dishes up to 17 meters in diameter track the sun in two axes and use mirrors or Fresnel lenses to focus radiant energy onto a receiver. Troughs and bowls are line-focus tracking reflectors that concentrate sunlight onto receiver tubes along their focal lines. Concentrating collector modules can be used alone or in a multi-module system. The concentrated radiant energy absorbed by the solar thermal receiver is transported to the conversion process by a circulating working fluid. Receiver temperatures range from $100^{o}C$ in low-temperature troughs to over $1500^{o}C$ in dish and central receiver systems.

The Solar Thermal Technology Program is directing efforts to advance and improve promising system concepts through the research and development of solar thermal materials, components, and subsystems, and the testing and performance evaluation of subsystems and systems. These efforts are carried out through the technical direction of DOE and its network of national laboratories who work with private industry. Together they have established a comprehensive, goal directed program to improve performance and provide technically proven options for eventual incorporation into the Nation's energy supply.

To be successful in contributing to an adequate national energy supply at reasonable cost, solar thermal energy must eventually be economically competitive with a variety of other energy sources. Components and system-level performance targets have been developed as quantitative program goals. The performance targets are used in planning research and development activities, measuring progress, assessing alternative technology options, and making optimal component developments. These targets will be pursued vigorously to insure a successful program.

This study quantifies the impact of the Solar Thermal Central Receiver tax incentives and commercialization on the federal treasury revenues.

SUMMARY

This report is a sequel to SAND 83-8178 Report "Impact of Tax Incentives on the Commercialization of Solar Thermal Electric Technologies". The objective of this follow-on effort is to quantify the impact of the Solar Thermal Central Receiver (STCR) tax incentives and commercialization on the federal treasury revenues. To achieve this objectives, the STCR market penetration was estimated based upon logistic substitution by this technology of the potential market. Based upon previous studies, this initial substitution was assumed to take place in California, because of the favorable combination of solar insolation, avoided energy costs, and state tax incentives. The STCR plant costs were derived from the integrated market and cost analysis, where the subsystems costs are assumed to benefit from both the labor, materials and product innovation cost savings associated with increased levels of production (learning or experience curves). Because of the initial large difference between these estimated installed STCR plant costs and the values associated with electric utility ownership, and the availability of various regulatory and tax incentives, the initial financing was assumed to be underwritten by intermediary partnerships under long-term avoided cost contracts with the local utility companies. Subsequent to the expiration of the tax incentive benefits to these intermediary finance groups, the STCR plants are assumed to be sold to the utility company at competitive prices.

To estimate the impacts of these various tax incentives associated with the commercialization of the STCR technology, the tax revenues and costs for the STCR plants were compared with the tax revenues and costs for the displaced conventional power plants. Based upon previous analyses conducted, these displaced conventional plants in California are intermediate load oil- or gas-fired steam plants. In the differential analysis, the energy outputs of the STCR and conventional plant were assumed to be identical, based upon the utility demand considerations. The respective plant generating capacities, however, were adjusted to account for the lower capacity credit associated with the STCR plants. Consequently, the differential analysis takes into account the different operating expenses, as well as the different depreciation charges, financing costs and tax credits, associated with the respective STCR and conventional plants. The differential analysis was conducted for STCR plants with new plant operation commencing in 1985 and continuing through 2004, and assuming an operational lifetime of 30 years. To aggregate the total annual tax revenues and costs, the differential taxes were multiplied by the number of STCR plants estimated to penetrate the market at any given year. Because of the uncertainties inherent in any predictions of future market and cost scenarios, as a result of both systems, cost, and market estimation and unpredictable exogenous uncertainties, the analysis was conducted for optimistic, expected, and pessimistic scenarios.

The study also evaluated the impact of both the previous (1983) and current (1984) proposed federal energy tax credits. In both cases, the state (California) tax credits

reflect the most recent legislation, which provides for an extension of the 25% commercial energy tax credit through 1986. Additionally, a modified scenario was postulated for the expected case in which the federal tax credits were assumed to be 25% through 1990, with an affirmative commitment of 3 years, followed by a 15% energy tax credit through 1993 with an affirmative commitment of 2 years, combined with an extended state energy tax credit of 25% through 1990 without an affirmative commitment. This scenario has the merit of providing sufficient tax incentives for intermediary financing of the STCR commercialization for the expected case.

The resulting total annual tax cash flows were subsequently cumulated to determine the aggregate tax revenues and costs throughout the 1985 to 2034 time period. In addition, the net present value of these cash flows was computed, using a federal discount rate of 10 per cent.

The results of this analysis indicate that the initial federal tax revenues are negative, as a result of the very high initial costs associated with a STCR plant during the early years of the commercialization, which is typical of any new (energy) technology. However, these differential tax losses occur during the period when very few STCR plants will be constructed in accordance with the projected market penetration. As a result of the market penetration, the installed costs of the STCR plant decrease rapidly and, consequently, the net present values of the tax revenue cash flows associated with plants constructed after 1995 not only are positive, but become increasingly and significantly larger than those for the corresponding displaced conventional plants. These positive tax revenues occur during the period when the STCR technology achieves rapid market penetration, thus off-setting the initial energy tax credits provided.

In summary, the energy tax credits for STCR systems have the potential to provide the necessary incentives to commercialize a very attractive renewable energy resource at a very low total initial cost to the government as compared with the previous incentives provided for the commercialization of the current conventional energy technologies. The analysis clearly shows that in the long run the federal tax revenues are greatly enhanced by the commercialization of the STCR technology. However, as is typical with the development of any new energy technology, there will be a temporary loss of revenues during the early time period associated with the initial phases of technology transfer. This is the case for any of the tax incentive options examined under the expected scenario. As will be shown in the following sections of this report, the differences between these alternatives, both in annual or cumulative tax revenues are relatively minor as compared to the total tax revenues involved during the early years.

The annual difference in federal tax revenues between the 25% and 15% energy tax credit cases ranges from $10 to $20 million during the 1985 through 2000 time period, with the maximum net present value of the cumulative differential tax revenues less than $200 million over the entire commercialization time span.

Since the long-term differential tax revenues of the STCR plants as compared with the displaced conventional oil- or gas-fired steam plants become increasingly positive, the issue becomes whether to commercialize the STCR technology or not, as part of a long-term energy policy, and if so to provide adequate incentives for this commercialization to occur, such as incorporated in the modified expected scenario.

This study shows that the national benefits of commercialization of this STCR technology are extremely large by making an inexhaustible energy resource available to the electric utility industry and its customers, while saving 800 million barrels of oil or its gas equivalent through 2034, while providing providing for long-term positive tax revenues to the treasury.

INTRODUCTION

Having previously analyzed the impact of tax incentives on the commercialization of solar thermal central receiver (STCR) technologies (reference 1), it subsequently became important to examine the impact of the tax incentives on the federal treasury revenues. Consequently, the purpose of this follow-on effort was to assess the overall tax incentive consequences for the STCR market penetration scenarios of the above referenced report.

This analysis was conducted by considering the differential impact on the representative utility company's operating statement of either incorporating solar thermal central receiver plants or conventional oil- or gas-fired steam plants in their generation mix. Since the demand for electric energy in any given year is unaffected by the choice of power plant, the electric energy generated, and the associated utility revenues, for either the solar or conventional plant were assumed to be identical. However, since the capacity displacement of the STCR plant, even with storage, is somewhat lower than for a conventional steam plant of the same capacity rating, the relative capacities were adjusted to account for this difference. Furthermore, the capital costs of STCR plants per kilowatt are projected to be higher than for conventional steam plants. This is especially significant during the early phases of commercialization of the STCR technology in comparison with the mature oil- or gas-fired steam plants. These higher capital costs translate into correspondingly higher depreciation and financing costs. On the other hand, the operating costs of the STCR plants are projected to be much lower throughout the lifetime of the plant because of not incurring the expensive and potentially significantly escalating fuel costs associated with conventional plants.

The available energy tax credits (in addition to the normal investment tax credit) and the fast ACRS write-off only available to independent power producers, combined with favorable PURPA legislation provide the potential incentives for third-party or intermediary power producers to underwrite the initially high capital costs during the commercialization of the STCR technology. Under PURPA, the utility companies must legally provide long-term avoided cost contracts with these independent power producers based upon the highest marginal energy and capacity displacement costs. Consequently, this analysis assumes that the financing of the early STCR commercialization will involve intermediary investor limited partnerships as long as sufficient tax incentives are available. As soon as these tax incentives have been fully utilized, the STCR plants are assumed to be sold to the utility company at competitive costs. Since the initial penetration of the STCR plants is projected to occur in California, as a consequence of the combination of high avoided utility costs, high solar insolation and favorable state tax incentives, the various input parameters included in this study reflect the values associated with this geographic region (reference 2).

INTEGRATED MARKET AND COST ANALYSIS

Based upon the STCR analysis conducted in the previous report (reference 1), the STCR market penetration and associated plant costs were determined for the expected, optimistic, and pessimistic scenarios. The detailed computer print-outs for these integrated market and cost scenarios are included in Appendix B of this report. The market penetration of the STCR plants is assumed to follow a logistic diffusion of the potential STCR market, as discussed in detail in the preceding report (reference 1). The calculated annual and cumulative STCR market penetrations for these alternative scenarios are summarized in Table 2-1. Even though a STCR plant unit size of 30 MW has been assumed in this study, the actual plant size can be any multiple of this unit size once the annual market penetration warrants this.

The corresponding STCR plant capital costs (overnight construction) summarized in Table 2-2, reflect an 86.5% learning experience (LC) for the expected scenario, 85.8% LC for the optimistic scenario, and 87.5% LC for the pessimistic scenario, respectively. The STCR plant capital costs are shown both in constant 1982 dollars and current dollars, assuming a capital cost escalation equal to the assumed 6% rate of inflation. The STCR plant in this analysis incorporates 3-hours of storage capacity and an corresponding capacity factor of 35%. As can readily been seen from these tables, the initial high STCR plant costs are projected to decrease rapidly with market penetration.

This analysis determines the impact of the tax incentives associated with the commercialization of the STCR technology by comparison with the conventional power plants displaced. The differential effect of these alternative power plants on the operating statement of the utility company provides a comprehensive evaluation in terms of all the factors that impact the tax revenues. This differential analysis is conducted for each year of the operating lifetime of the respective plants, which was assumed to be 30 years. These individual plant annual cash flows were adjusted to correspond to the projected market penetration and subsequently summed to provide total annual tax revenue projections from 1985 through 2034.

To make this type of differential analysis realistic, the alternative solar or conventional plants must be equivalent in terms of their energy and capacity displacement. For California, the conventional plant displaced by a STCR plant is an oil- or gas-fired steam plant (reference 2). Since the energy is determined by demand, the annual energy generated by either plant must be equivalent. On the other hand, the overall utility system's reliability to deliver this energy is determined by the capacity displacement potential, and thus the relative availability, of the respective solar and conventional plants. Based upon previous studies conducted (reference 2), the relative capacity credit

Table 2-1 SOLAR THERMAL CENTRAL RECEIVER MARKET PENETRATION SCENARIOS

O PLANT CAPACITY = 30 MW O STORAGE = 3 HOURS O CAPACITY FACTOR = 35 %

YEAR	EXPECTED			OPTIMISTIC			PESSIMISTIC		
	Units/Yr [1]	MW/Yr	MW Cum. [2]	Units/Yr	MW/Yr	MW Cum.	Units/Yr	MW/Yr	MW Cum.
1985	0	0	0	1	30	30	0	0	0
1986	1	30	30	1	30	60	0	0	0
1987	1	30	60	2	60	120	0	0	0
1988	1	30	90	2	60	180	1	30	30
1989	1	30	120	3	90	270	1	30	60
1990	2	60	180	5	150	420	1	30	90
1991	2	60	240	7	210	630	1	30	120
1992	3	90	330	9	270	900	1	30	150
1993	4	120	450	12	360	1260	2	60	210
1994	5	150	600	16	480	1740	2	60	270
1995	6	180	780	20	600	2340	2	60	330
1996	7	210	990	25	750	3090	3	90	420
1997	9	270	1260	30	900	3990	3	90	510
1998	11	330	1590	35	1050	5040	4	120	630
1999	14	420	2010	41	1230	6270	5	150	780
2000	17	510	2520	45	1350	7620	6	180	960
2001	20	600	3120	49	1470	9090	7	210	1170
2002	24	720	3840	53	1590	10680	8	240	1410
2003	28	840	4600	57	1710	12390	9	270	1680
2004	32	960	5640	59	1770	14160	11	330	2010

1 30 MWe Units

2 Cumulative Installed Capacity in Indicated Year

Table 2-2 SOLAR THERMAL CENTRAL RECEIVER TOTAL INSTALLED PLANT COST[1]

O PLANT CAPACITY = 30 MW O STORAGE = 3 HOURS O CAPACITY FACTOR = 35 %

	EXPECTED (86.5% LC)		OPTIMISTIC (85.8% LC)		PESSIMISTIC (87.5% LC)	
YEAR	1982 $	Current $	1982 $	Current $	1982 $	Current $
1983			5618	5955	7204	7636
1984	6561	7372	4026	4523	7204	8094
1985	4785	5698	4026	4795	5191	6182
1986	4785	6040	3456	4362	5191	6554
1987	4283	5733	3145	4209	4692	6279
1988	3988	5658	2906	4122	4692	6655
1989	3782	5687	2669	4014	4692	7055
1990	3563	5679	2472	3939	4395	6278
1991	3352	5664	2279	3850	4185	7070
1992	3167	5672	2111	3782	4027	7212
1993	2981	5660	1967	3733	3846	7301
1994	2828	5689	1835	3692	3669	7373
1995	2686	5729	1719	3665	3525	7519
1996	2550	5763	1616	3653	3390	7664
1997	2424	5809	1583	3794	3261	7815
1998	2302	5847	1583	4021	3142	7982
1999	2189	5893	1583	4263	3022	8138
2000	2087	5959	1583	4518	2916	8323
2001	2032	6148	1583	4789	2814	8514
2002	2032	6517	1583	5077	2713	8701
2003	2032	6908	1583	5381	2620	8907
2004	2032	7323	1583	5704	2540	9153

NOTE: Total Plant Capital Cost Escalation = 6%/Year (0% Real)

[1] Cost in $/kWe

of STCR plants with 3-hours of storage is approximately 85% of a corresponding conventional plant in a typical California utility generation mix. Consequently, the equivalent conventional oil-fired steam plant in this study is configured at 25 MW and a capacity factor of 42%, as compared with the STCR 30MW plant and 35% capacity factor. The characteristics of the equivalent oil-fired steam plant are summarized in Table 2-3.

Table 2-3 EQUIVALENT OIL-FIRED STEAM PLANT CHARACTERISTICS (1982 $)

CAPACITY OF EQUIVALENT PLANT	25 MWe	
ANNUAL AVERAGE CAPACITY FACTOR	42 %	
HEAT RATE	9680 BTU/kW-Hr	
TOTAL CAPITAL COST	$ 630/kW	
FIXED O&M COST	$ 1.80/kW-Yr	
VARIABLE O&M COST	1.7 mills/kW-Hr	
FUEL COST	$ 4.09/MMBTU	
CAPITAL COST ESCALATION[1]	6.0 %/Yr	
O&M COST ESCALATION[1]	6.0 %/Yr	
FUEL COST ESCALATION[1]	6.0 %/Yr	Through 1985 (0% real)
	8.12 %/Yr	After 1985 (2% real)

[1] Inflation = 6.0 %/Yr

SYSTEMS OPERATIONS AND FINANCING INPUTS

The systems and financial inputs for both the STCR and conventional plants are summarized in Appendix C. These data reflect the previous study inputs (reference 1), and the assumptions underlying these data will not be repeated here. The input data summarized in the Appendix include the previously described plant capital costs, as well as the recurring costs, for plants with different operational years corresponding to the various market, performance, and cost scenarios. When the tax credits are in effect, the STCR plants are assumed the be financed through intermediary limited partnerships during the first 5 years of operations, and thereafter sold to the utility company at competitive prices. Under PURPA in California, the intermediary financing groups have several standard long-term contract options available to them with the local utilities. The avoided cost contract selected for this analysis provides for levelized energy and capacity payments as approved by the Energy Commission, of which the details are described in the previous study (reference 1) and summarized in Appendix C. The corresponding marginal electricity prices and escalation rates are shown in Table 3-1, which is the basis for utility revenues in the case of both the STCR and conventional oil plants under utility ownership. The escalation rates shown assume a basic underlying rate of inflation of 6 percent, however the study results are independent of the rate of inflation assumed, since all the cost and financial rates are adjusted to reflect the real rate of escalation.* Insurance costs and property and sales taxes are summarized in Table 3-2.

The financial parameters, such as the required risk rates and debt interest rates reflect the risk associated with the stage of development of the STCR technology. As explained in detail in the preceding report, both the technological and financial risks during the initial phase of commercial development is quite high. As more STCR plants are built, the technological risks as perceived by the investors diminish gradually, resulting in lower financing costs for the subsequent plants. In addition, the real cost of money currently is still quite high as a result of the recent high rates of inflation, which may further decrease the underwriting costs, providing the current rate of inflation continues to be stable. The conventional oil-fired steam plant represents a mature technology and, consequently, neither the plant costs are expected to decrease further as a result of additional deployment nor will the financing costs decrease as a result of perceived reduced risk.

The expected scenario incorporates various alternative potential energy tax credit proposals. During 1983 several different bills were introduced in both the Senate and House of Representatives which would enhance and extend the federal energy tax credit for solar technologies to 25% through 1990, with an affirmative commitment for an additional four or five years, depending on the particular bill. The preceding STCR study (reference 1) investigated the impact of this energy tax credit proposal on the commercialization of this technology. Consequently, this follow-on study uses this tax

* Except for minor variations due to depreciation discounting

Table 3-1 ELECTRICITY PRICE PROJECTIONS

(1982 $)

ELECTRICITY COST	$ 0.06/kW-Hr
ELECTRICITY COST ESCALATION [1]	
EXPECTED SCENARIO	7.86 % (1.76 % Real)
OPTIMISTIC SCENARIO	8.80 % (2.64 % Real)
PESSIMISTIC SCENARIO	6.93 % (0.88 % Real)

[1] Inflation = 6.0 %/Yr. Escalation figures shown as %/Yr.

Table 3-2 CALIFORNIA STATE TAXES

MARGINAL INCOME TAX RATES	
CORPORATE	9.6 %
INDIVIDUAL	11.0 %
PROPERTY TAX	1 % OF PLANT CAPITAL COST
SALES TAX	6 % OF 50 % OF CAPITAL COST
INSURANCE	
INTERMEDIARY FINANCING	1 % OF PLANT CAPITAL COST
UTILITY FINANCING	0.5 % OF PLANT CAPITAL COST

credit scenario as the base case for evaluation of the treasury impact. Since none of these tax credit bills was passed during the previous year congressional year, several new energy tax credit bills have been introduced in the various congressional committees. A proposed bill to extend the current 15% energy tax credit for solar technologies for an additional three years through 1988 with an affirmative commitment for one year recently passed the Senate Finance Committee. As a result, this analysis also investigated the impact of a 15% energy tax credit on both the technology transfer potential and the treasury. However, this analysis assumes that these tax credits would eventually be extended through 1995. The California energy tax incentives were used as being the most representative state tax measures in terms of initial penetration. The California state energy tax credits are 25% for commercial solar applications and have recently been extended for an additional three years through 1986, without affirmative commitment provisions.

The currently proposed federal bills may provide for an energy tax credit enhancement to 25% for selected solar technologies, and, consequently, a modified expected scenario was also incorporated with the following considerations:

- o federal energy tax credit of 25% with affirmative commitment of 3 years through 1993,
- o a subsequent 15% federal energy tax credit from 1991 through 1993, with an affirmative commitment of 2 years through 1995,
- o combined with an extended state (California) energy tax credit of 25% through 1990, without any affirmative commitment.

As a result, this study investigated five alternative scenarios, including three possible alternative tax incentive packages for the expected market and cost scenario, and the optimistic and pessimistic scenarios.

COMPARATIVE INTEGRATED COST AND FINANCING ANALYSIS

For each of the scenarios considered, a detailed cash flow analysis was conducted for both the STCR plant and the displaced oil-fired steam plant commencing operations in 1985 through 2004. These annual cash flow analyses were conducted over the projected 30 year plant operating life times and incorporated detailed federal and state income statements to accurately account for all the revenue, expense, deduction, and tax considerations associated with the operation of these plants. During the period of projected solar energy tax credits, the initial financing and ownership of the STCR plants was assumed to be by intermediary financing limited partnerships under long-term avoided cost contracts with the local utility companies.

Because of the favorable combination of high avoided (oil) costs, excellent insolation, and attractive state solar energy tax credits with a large financial base to effectively utilize these tax credits, as well as a supportive state energy commission and forward looking utility companies, the initial STCR penetration was projected to occur in California. Furthermore, the projected load growth and existence of a large amount of financial resources in this state, supports this STCR market penetration during the early commercialization period. Consequently, thevarious financial, revenue, and tax considerations reflect those projected for California throughout this analysis.

Independent power producers in California can negotiate avoided energy and capacity cost agreements with the utility companies based upon a number of standard contracts approved by the Public Utilities Commission. This analysis assumes the standard contract providing for levelized energy and capacity avoided costs based upon a 15-year contract. Furthermore, the STCR plant with 3-hour storage capacity used in this study is projected to have an 85 percent capacity displacement and avoided capacity payments. At the end of a 5-year period, when the benefits of the various tax incentives have expired, the intermediary financing groups are assumed to sell the STCR plants to the local utility company at competitive prices. Consequently, utility ownership is assumed for the remaining 25-year STCR plant life.

The STCR capital and operating costs used for the comparative evaluation of each scenario correspond to the integrated market and cost analysis discussed previously. Since the electric energy generated is determined by demand, the utility revenues generated from either the STCR and conventional plant are identical, however, since the respective plant costs and operating characteristics are substantially different the various operating and financing costs, deductions and taxes are substantially different. The higher capital costs and energy tax credits associated with the STCR plants, especially during the early commercialization phases, as compared with the mature oil-fired steam plants, decrease the federal tax revenues during the early years of operation. On the other hand, STCR plants do not incur the high and escalating fuel costs associated with the conventional oil-fired plants, which result in relatively higher

federal tax revenues derived from STCR plant operations during the later years of operation.

Previous studies (references 2,3) have established that for California the STCR plants will displace intermediote load oil- or gas-fired steam plants. Therefore this study uses such conventional oil-fired steam plants of equivalent capacity and having identical energy output for the comparative evaluation. These conventional plants are owned and operated by the utility company for the entire projected 30 year lifetime. Because such oil-fired steam plants represent a mature technology, the capital and operating costs are assumed constant in terms of constant year dollars.

Detailed representative computer print-outs of the integrated cost and financial cash flow analysis covering the 30 year operating lifetimes of both a STCR plant and conventional oil-fired steam plant with 1986 year of commercial operation are included in Appendix D. These computer cash flow analyses were conducted for plants commencing operations during the period 1985 through 2004 and alternative scenarios. Because this analysis is concerned with the federal tax revenue considerations associated with the tax incentives provided and the corresponding commercialization of the STCR technology, these print-outs also show the market penetration and tax revenue matrices for each of the alternative technologies considered. In these matrices, the individual plant annual tax revenues are multiplied by the corresponding market penetration projections. By comparing the respective STCR and conventional tax revenues, the total annual differential tax revenues can be calculated and evaluated.

The various STCR scenarios considered in this analysis are summarized in Table 4-1. These scenarios and their underlying assumptions were discussed previously in this report. The results of the integrated cost and financial analysis are summarized in Table 4-2. Shown are the Modified Internal Rates of Return (MIRR) as compared to the Required Risk Rates (RR) for each scenario considered covering the plant start-up period from 1985 through 2004. The MIRR financial and risk analysis have been discussed in detail in the previous report (reference 1), and will not be repeated here, with the exception that for a project to be financially attractive to potential investors, the MIRR must be equal to or larger than the required risk rate commensurate with projects of similar perceived overall risks. These rates are calculated after taxes and reflect a Safe Rate of Return (SR) of 5 percent after taxes, reflecting treasury bill rates and an overall rate of inflation of 6 percent. As was mentioned previously, the financial results of this study are independent of the rate of inflation assumed, since all the financial parameters and rates are based upon real rates.*

The results of the financial analysis, as shown in Table 4-2, indicate that the expected scenario with 15% energy tax credits and the current California tax credit period do not provide adequate returns until 1994, and thus will require additional funding support prior to this time period to make the projected STCR penetration possible. Even the expected scenario with the 25% energy tax credit will require additional financial assistance

* Except for minor effects due to depreciation discounting

Table 4-1 FEDERAL AND STATE TAX CREDIT SCENARIOS USED IN THE ANALYSIS [1]

SCENARIO:	Expected - 25%	Expected - 15%	Expected - Mod. [2]	Optimistic	Pessimistic
Federal Tax Credit					
Level of Credit	25 %	15 %	25 %	25 %	25 %
Duration	Through 1990	Through 1990	Through 1990	Through 1990	Through 1990
Affirmative Comm.	5 Yrs.	5 Yrs.	3 Yrs.	5 Yrs.	5 Yrs.
			15 %		
			1991 - 1993		
			2 Yrs.		
State Tax Credit [3]					
Level of Credit	25 %	25 %	25 %	25 %	25 %
Duration	Through 1986	Through 1986	Through 1990	Through 1986	Through 1986
Affirmative Comm.	None	None	None	None	None

1 Intermediary Financing Through 1995

2 In the Modified version of the Expected Scenario, the level of the federal tax credit and the extent in time of the affirmative committments decrease step-wise in 1991.

3 California assumed

Table 4-2 SOLAR THERMAL CENTRAL RECEIVER
MODIFIED INTERNAL RATE OF RETURN (MIRR) VS. REQUIRED RISK RATE (RR)[1]

YEAR	EXPECTED[2] RR(AT)	25%	15%	MOD.[3]	OPTIMISTIC RR(AT)	MIRR	PESSIMISTIC RR(AT)	MIRR
1985	24.0	--	--	--	24.0	22.1	24.0	--
1986	23.0	18.5	14.2	18.5	23.0	27.5	23.0	--
1987	22.0	13.2	10.0	21.0	22.0	20.0	22.0	--
1988	21.0	14.2	10.6	22.9	21.0	24.2	21.0	11.5
1989	20.5	15.5	11.4	25.4	20.0	30.6	20.5	11.5
1990	20.0	17.6	12.8	30.0	19.0	35.0	20.0	12.5
1991	19.5	19.7	14.2	19.7	18.5	43.9	19.5	13.4
1992	19.0	22.4	16.1	22.4	18.0	57.2	19.0	14.5
1993	18.5	25.4	17.9	17.9	18.0	82.4	18.5	15.7
1994	18.5	28.7	19.9	19.9	17.5	High	18.5	17.5
1995	18.0	34.3	23.2	23.2	17.5	High	18.0	18.5
1996	17.5	17.0	17.0	17.0	17.5	19.9	17.5	14.8
1997	17.0	17.0	17.0	17.0	17.0	19.7	17.0	14.8
1998	17.0	17.3	17.3	17.3	17.0	19.9	17.0	14.8
1999	17.0	17.6	17.6	17.6	17.0	20.0	17.0	15.0
2000	16.5	17.6	17.6	17.6	16.5	20.0	16.5	15.1
2001	16.5	17.8	17.8	17.8	16.5	20.0	16.5	15.3
2002	16.5	17.9	17.9	17.9	16.5	20.0	16.5	15.5
2003	16.5	17.9	17.9	17.9	16.5	20.1	16.5	15.7
2004	16.5	18.0	18.0	18.0	16.5	20.2	16.5	15.9

[1] All data shown is in percent per year. The Safe Rate = 5% (after tax). Inflation = 6%/year.

[2] The MIRR is shown for three variants of the Expected scenario case.

[3] In the Modified Expected scenario case, the modified federal energy tax credit is combined with an extended state energy tax credit (through 1990).

through 1990, either in the form of direct funding support or extended state energy taxes, to realize the projected STCR potential. These considerations were the basis underlying the modified expected scenario, which incorporates both the 25% federal energy tax credits through 1990 (with affirmative commitments for 3 years) and extended state energy tax credits for an additional 4 years at 25%. As can be seen from this table, the MIRR s for this modified expected scenario potentially facilitate the attainment of the projected STCR market penetration.

The optimistic scenario with the 25% energy tax credits also has the potential for achieving the associated projected STCR market penetration. However, this scenario assumes the attainment of optimistic values for the performance, market, cost, and financing characteristics associated with the STCR technology. As can be seen, the pessimistic scenario with the 25% energy tax credits consistently has lower MIRR's than required by investors, and thus will require substantial other financial assistance to facilitate the STCR technology penetration.

INTEGRATED MARKET AND FEDERAL REVENUE ANALYSIS

For each of the scenarios investigated, detailed integrated cost and financial analyses were conducted to obtain the annual federal tax revenues associated with the alternative STCR and conventional oil-fired steam plants as described in the previous section. The annual federal tax revenues associated with plants commencing operations between 1985 and 2004 were multiplied by the appropriate projected market penetration, resulting in the total annual tax revenues over the 30 year operational plant life. These values were entered in a matrix and subsequently added together to determine the overall federal tax revenues for each year starting in 1984 and continuing through 2034. These matrices obviously become rather large and, consequently have been included in Appendix E of this report.

To obtain the relative federal tax revenue implications associated with the commercialization of the STCR technology, a differential analysis was conducted by comparing the STCR and equivalent conventional plant federal tax revenues. This is simply accomplished by taking the difference between the federal tax revenues of these alternative plants as shown in the individual matrices. The resulting differential federal tax revenues are also shown in matrix format in Appendix E for each of the scenarios investigated, together with the cumulative and net present values of these annual tax revenues. A federal discount rate of 10 percent was used to derive the net present values shown.

Because of the large size of the matrices shown in the Appendix and the associated large magnitude of data contained therein, the results of the differential federal tax revenue analysis are summarized in a number of derived tables in this section.

The nature of the 30 year annual federal tax revenues generated by a STCR power plant and a conventional oil-fired steam plant of equivalent size are quite different as a result of the differing characteristics of the alternative systems. In all cases examined in this study, which includes a time span of 20 years of plant start-ups (1985 through 2004), alternative intermediary and utility financing and ownership, and a variety of market penetration and tax credit scenarios, the same basic pattern can be observed. The STCR plant with its relatively larger capital cost, especially during the initial phases of commercialization, and associated greater depreciation and tax credits, always generates lower federal tax revenues and higher tax refunds in the early years of operation as compared with the conventional mature oil-fired steam plant. The availability of energy tax credits and accelerated depreciation (ACRS) in conjunction with intermediary financing further augments this situation. However, after a few years of operation (usually less than 10 years), the annual profitability of the STCR plant exceeds that of the comparable oil-fired steam plant, as a result of the higher and escalating fuel operating costs associated with these latter plants. (The annual revenues derived from the electric energy generated are identical for the equivalent alternative solar and steam

plants under utility ownership). Consequently, the STCR plants pay higher taxes during the remainder of their respective operating lives.

The best way to compare these differing tax revenue streams is by comparing their net present values (NPV). Table 5-1 compares the net present values (NPV) of the 30 year federal tax revenues for a single STCR and equivalent conventional steam plant for the different years of plant start of commercial operation for the modified expected scenario. Also shown are the projected market penetration (in terms of 30 MW STCR or 25MW steam units) for this scenario and the net difference of the NPV on a per plant basis. This table readily shows that the STCR plants have a large negative NPV during the initial time period, which is a result of the high capital costs, associated tax credits (conventional and energy), and short depreciation (ACRS) periods. In comparison the NPV for the mature conventional steam plants are positive throughout the entire time period. Subsequent to the termination of the energy tax credits, and thus the intermediary financing, the NPV of the federal tax revenues for the STCR plants becomes increasingly more positive as a combined result of the lower capital costs associated with increased penetration and technology maturity, lower tax credits due to the lower capital costs and end of the energy tax credits, and longer depreciation (ACRS) periods associate with utility ownership. By 1997 the NPV for the STCR plant becomes larger than for the alternative oil-fired steam plant. This can be observed from the difference of the NPV shown in the last column of this table. This NPV of the net differential federal tax revenues increases over time, even in real terms (the NPVs in the table are shown in current start-up year dollars) as a result of the real oil or gas price escalation projected in the long-run.

The projected STCR market penetration is very small during the initial period and thus the total revenue losses during this period are projected to be very small, whereas the market penetration increases substantially at the time that the relative tax revenues become increasingly positive. This combined market and tax revenue effect is shown in Table 5-2 for this modified expected scenario. Here the NPV of the differential tax revenues depicted per plant in Table 5-1 is multiplied by the number of plants projected to be installed under this scenario, as shown in the next to last column. The last column calculates the cumulative NPV of these total differential NPVs, again using the assumed 10 percent federal discount rate. As can be seen, this cumulative NPV of the differential federal tax revenues becomes positive as a result of the increasing STCR market and relative attractiveness shortly after full commercialization has been obtained. Consequently, these data clearly indicate the potential financial contribution and attractiveness of the STCR technology relative to the conventional oil-fired steam plant, even without the added advantages of scarce energy resources displacement by an inexhaustible and environmentally clean energy supply.

The previous data and discussion related to the modified expected scenario. Consequently, it is of interest to look at these same data for the other energy tax credit cases postulated with the expected scenario, and the impact of uncertainty in

Table 5-1 SOLAR THERMAL CENTRAL RECEIVER
NPV OF TAX REVENUES - MODIFIED EXPECTED SCENARIO
($1000 current)

Year of Plant Start-Up	No. New Plants	NPV FT per STCR Plant	NPV FT per Steam Plant	NPV net FT per Plant
1985	0	0	0	0
1986	1	-75126	8810	-83936
1987	1	-52796	9675	-62472
1988	1	-45560	10616	-56176
1989	1	-39378	11994	-51372
1990	2	-32125	13127	-45252
1991	2	-67333	14358	-81691
1992	3	-60035	15694	-75729
1993	4	-36814	17586	-54400
1994	5	-30460	19185	-49645
1995	6	-21647	20919	-42566
1996	7	18303	22798	-4494
1997	9	30494	25384	5110
1998	11	41474	27622	13852
1999	14	53257	30044	23212
2000	17	68015	33314	34701
2001	20	78934	36189	42746
2002	24	87705	39298	48407
2003	28	97318	42659	54659
2004	32	107851	46292	61558

Table 5-2 SOLAR THERMAL CENTRAL RECEIVER PLANT

NPV OF DIFFERENTIAL TAX REVENUES

MODIFIED EXPECTED SCENARIO

($1000 current)

Year of Plant Start-Up	No. New Plants	NPV net FT per Plant	NPV net FT Ann. Total	Cum. NPV FT (1985)
1985	0	0	0	0
1986	1	-83936	-83936	-76305
1987	1	-62472	-62472	-127935
1988	1	-56176	-56176	-170141
1989	1	-51372	-51372	-205228
1990	2	-45252	-90504	-261424
1991	2	-81691	-163382	-353649
1992	3	-75729	-227187	-470232
1993	4	-54400	-217600	-571744
1994	5	-49645	-248224	-677015
1995	6	-42566	-255397	-775482
1996	7	-4494	-31460	-786508
1997	9	5110	45991	-771854
1998	11	13852	152372	-727717
1999	14	23212	324971	-642142
2000	17	34701	589918	-500921
2001	20	42746	854911	-314867
2002	24	48407	1161763	-85019
2003	28	54659	1530455	190247
2004	32	61558	1969870	512337

performance, market penetration, cost, and financing parameters expressed by the optimistic and pessimistic scenarios.

The NPV and cumulative NPV of the total differential federal tax revenues for the expected scenario with the 25% and 15% federal energy tax credit alternatives are shown in Tables 5-3 and 5-4, respectively. As can be seen from these data, the difference in terms of the federal tax revenues for the alternative energy tax credits is relatively minor as compared with the total initial tax revenue losses during the early commercialization time period. As was shown previously in this study, the 15% energy tax credit by itself will probably not be sufficient to stimulate the STCR market, and this scenario thus assumes that other incentives would be made available to facilitate the technology transfer.

Considering the minor relative tax consequences associated with these alternative energy tax credit provisions for the expected scenario, the main issue becomes whether to commercialize the STCR technology as part of a long-term energy policy or not. If this decision is affirmative, then the appropriate tax credits, such as indicated for the modified expected scenario, should be made available for this commercialization to occur.

The sensitivity of the federal tax revenues as a result of uncertainty in the STCR performance, market penetration, installed capital costs, and financial parameters is shown in Tables 5-5 and 5-6 for the optimistic and pessimistic scenarios, respective ly, based upon the 25% energy tax credit assumption. As can be expected, the federal tax revenues improve dramatically with the optimistic scenario. In this case, the cumulative NPV of the differential federal tax revenues becomes positive in only eleven years, and provide increasingly larger additional revenues thereafter. Under the pessimistic scenario assumptions, the STCR technology will not likely achieve significant market penetration and thus the cost to the federal treasury will be inherently limited.

As discussed earlier, the annual differential federal tax revenue matrices, as derived from the detailed simulation analyses for the different scenarios, are included in Appendix E. The annual total differential federal tax revenues are summarized in Table 5-7, together with the cumulative NPV, for the various scenarios examined. Here again, the differences in annual federal tax revenues for the various energy tax credit cases examined for the expected scenario are relatively small during the early years. The annual revenue losses to the treasury increase from about $50 million in 1986 to approximately $500 million in 1995.

The NPV of these negative tax revenues during the ten-year period is approximately $1.1 billion, which is a relatively small amount for developing a new inexhaustible energy resource. The NPV difference between the 25% and 15% energy tax credit cases is only $200 million over this ten-year period. However, without additional financial assistance, the 15% energy tax credit will probably not be sufficient by itself to stimulate the STCR

Table 5-3 SOLAR THERMAL CENTRAL RECEIVER PLANT
NPV OF DIFFERENTIAL TAX REVENUES
EXPECTED SCENARIO - 25% ENERGY TAX CREDIT
($1000 current)

Year of Plant Start-Up	No. New Plants	NPV net FT per Plant	NPV net FT Ann. Total	Cum. NPV FT (1985)
1985	0	0	0	0
1986	1	-83936	-83936	-76305
1987	1	-98329	-98329	-157569
1988	1	-93334	-93334	-227692
1989	1	-90509	-90509	-289511
1990	2	-86362	-172724	-396758
1991	2	-81691	-163382	-488983
1992	3	-75729	-227187	-605566
1993	4	-69528	-278113	-735308
1994	5	-64858	-324288	-872838
1995	6	-57837	-347024	-1006631
1996	7	-4494	-31460	-1017657
1997	9	5110	45991	-1003003
1998	11	13852	152372	-958866
1999	14	23212	324971	-873291
2000	17	34701	589918	-732070
2001	20	42746	854911	-546016
2002	24	48407	1161763	-316168
2003	28	54659	1530455	-40902
2004	32	61558	1969870	281188

Table 5-4 SOLAR THERMAL CENTRAL RECEIVER PLANT
NPV OF DIFFERENTIAL TAX REVENUES
EXPECTED SCENARIO - 15% ENERGY TAX CREDIT
($1000 current)

Year of Plant Start-Up	No. New Plants	NPV net FT per Plant	NPV net FT Ann. Total	Cum. NPV FT (1985)
1985	0	0	0	0
1986	1	-67597	-67597	-61451
1987	1	-82872	-82872	-129940
1988	1	-78122	-78122	-188634
1989	1	-75217	-75217	-240009
1990	2	-71136	-142271	-328348
1991	2	-66507	-133014	-403431
1992	3	-60567	-181700	-496672
1993	4	-54400	-217600	-598184
1994	5	-49645	-248224	-703455
1995	6	-42566	-255397	-801921
1996	7	-4494	-31460	-812948
1997	9	5110	45991	-798294
1998	11	13852	152372	-754157
1999	14	23212	324971	-668582
2000	17	34701	589918	-527360
2001	20	42746	854911	-341307
2002	24	48407	1161763	-111458
2003	28	54659	1530455	163808
2004	32	61558	1969870	485897

Table 5-5 SOLAR THERMAL CENTRAL RECEIVER PLANT
NPV OF DIFFERENTIAL TAX REVENUES
OPTIMISTIC SCENARIO - 25% ENERGY TAX CREDIT
($1000 current)

Year of Plant Start-Up	No. New Plants	NPV net FT per Plant	NPV net FT Ann. Total	Cum. NPV FT (1985)
1985	1	-57521	-57521	-57521
1986	1	-45594	-45594	-98970
1987	2	-55874	-111748	-191323
1988	2	-49249	-98498	-265326
1989	3	-41597	-124790	-350560
1990	5	-33930	-169651	-455900
1991	7	-23040	-161279	-546937
1992	9	-12530	-112766	-604804
1993	12	-1872	-22459	-615281
1994	16	9806	156893	-548743
1995	20	20411	408227	-391354
1996	25	65447	1636164	182111
1997	30	75834	2275025	907004
1998	35	84789	2967622	1766619
1999	41	94686	3882122	2788903
2000	45	106675	4800372	3938074
2001	49	118808	5821607	5205025
2002	53	132196	7006386	6591201
2003	57	146961	8376803	8097843
2004	59	163240	9631173	9672617

Table 5-6 SOLAR THERMAL CENTRAL RECEIVER PLANT

NPV OF DIFFERENTIAL TAX REVENUES

PESSIMISTIC SCENARIO - 25% ENERGY TAX CREDIT

($1000 current)

Year of Plant Start-Up	No. New Plants	NPV net FT per Plant	NPV net FT Ann. Total	Cum. NPV FT (1985)
1985	0	0	0	0
1986	0	0	0	0
1987	0	0	0	0
1988	1	-97242	-97242	-73059
1989	1	-100554	-100554	-141739
1990	1	-93047	-93047	-199514
1991	1	-87909	-87909	-249136
1992	1	-83448	-83448	-291959
1993	2	-77134	-154268	-363926
1994	2	-70603	-141206	-423811
1995	2	-64996	-129991	-473928
1996	3	-62766	-188297	-539925
1997	3	-57030	-171090	-594440
1998	4	-53831	-215323	-656811
1999	5	-49683	-248415	-722227
2000	6	-43101	-258603	-784134
2001	7	-38527	-269690	-842827
2002	8	-33654	-269229	-896092
2003	9	-48084	-432759	-973927
2004	11	-23488	-258363	-1016172

Table 5-7 SOLAR THERMAL CENTRAL RECEIVER PLANT COMPARATIVE ANNUAL AND CUMULATIVE NPV OF DIFFERENTIAL TAX REVENUES FOR ALTERNATIVE SCENARIOS

(1000 current)

	Expected Scenario						Optimistic Scenario		Pessimistic Scenario	
	Extended TC Case		Base Case		15% TC Case					
Year	Net FT 1000C$	NPV (1985) Cum.net FT	Net FT 1000C$	NPV (1985) Cum.net FT	Net FT 1000C$	NPV (1985) Cum.net FT	Net FT 1000C$	NPV (1985) Cum.net FT	Net FT 1000C$	NPV (1985) Cum.net FT
1985	0	0	0	0	0	0	-44417	-44417	0	0
1986	-56301	-51183	-56301	-51183	-36490	-33173	-49259	-89198	0	0
1987	-64802	-104738	-89142	-124854	-71532	-92290	-132075	-198351	0	0
1988	-77864	-163239	-105031	-203766	-88738	-158960	-152512	-312936	-89778	-67446
1989	-92750	-226588	-119635	-285478	-104250	-230165	-221873	-464478	-111661	-143712
1990	-159680	-325737	-209211	-415381	-176455	-339730	-335314	-672682	-127231	-222712
1991	-215094	-447152	-217699	-538267	-186027	-444737	-438268	-920072	-144502	-304280
1992	-287863	-594871	-281674	-682810	-232656	-564126	-552257	-1203467	-162679	-387760
1993	-311151	-740025	-378363	-859319	-313176	-710225	-697846	-1529018	-258238	-508230
1994	-404422	-911540	-487368	-1066011	-406363	-882563	-903487	-1912185	-252535	-615329
1995	-489374	-1100215	-589180	-1293165	-492370	-1072393	-1058570	-2320309	-272647	-720446
1996	-288566	-1201355	-277460	-1390413	-295849	-1176086	-315699	-2430959	-167628	-779199
1997	-325366	-1305027	-315236	-1490857	-330328	-1281339	-256263	-2512613	-182634	-837392
1998	-313911	-1395956	-308555	-1580234	-319646	-1373929	-165961	-2560686	-199373	-895143
1999	-299470	-1474816	-300011	-1659236	-306071	-1454527	14524	-2556861	-186579	-944275
2000	-263676	-1537937	-271248	-1724171	-271248	-1519462	329495	-2477982	-215579	-995893
2001	-339928	-1611916	-348588	-1800034	-348588	-1595325	469623	-2375779	-292338	-1059504
2002	-768431	-1763946	-778307	-1954018	-778307	-1749308	-504390	-2475570	-464282	-1151360
2003	-885596	-1923228	-896831	-2115321	-896831	-1910611	-290501	-2527819	-537677	-1248066
2004	-1011495	-2088615	-1024247	-2282793	-1024247	-2078084	24224	-2523858	-650927	-1354498
2005	-309373	-2134602	-323817	-2330927	-323817	-2126217	1413935	-2313686	-384175	-1411603
2006	-112081	-2149747	-128411	-2348279	-128411	-2143570	1950390	-2050128	-312197	-1453769
2007	83243	-2139521	64812	-2340317	64812	-2135608	2506317	-1742237	-244178	-1483785
2008	267355	-2109663	246588	-2312779	246588	-2108069	3063944	-1400062	-183576	-1504287
2009	441723	-2064817	418357	-2270305	418357	-2065595	3636975	-1030816	-127507	-1517232
2010	632731	-2006419	606477	-2214329	606477	-2009620	4263706	-637293	-65312	-1523260
2011	850078	-1935092	820616	-2145475	820616	-1940766	4995481	-218145	8590	-1522539
2012	1087290	-1852157	1054268	-2065058	1054268	-1860349	5801025	224344	85158	-1516043
2013	1351773	-1758420	1314801	-1973885	1314801	-1769176	6697340	688760	172733	-1504066
2014	1649315	-1654448	1607963	-1872520	1607963	-1667811	7699235	1174115	274658	-1486751
2015	1981521	-1540890	1935315	-1761610	1935315	-1556901	8815619	1679326	388336	-1464496
2016	2352908	-1418307	2301327	-1641714	2301327	-1437005	10037075	2202244	514489	-1437692
2017	2726916	-1289153	2669382	-1515286	2669382	-1310576	11287749	2736859	644900	-1407148
2018	3131706	-1154312	3080409	-1382653	3080409	-1177944	12633102	3280800	788544	-1373196
2019	3581154	-1014137	3538310	-1244155	3538310	-1039445	14098574	3832653	916231	-1337332
2020	3899642	-875372	3867857	-1106521	3867857	-901811	15449784	4382420	973868	-1302678
2021	4218084	-738920	4218084	-970069	4218084	-765360	16869145	4928123	1039823	-1269041
2022	4593248	-603840	4593248	-834989	4593248	-630280	18323258	5466980	1105965	-1236516
2023	4967636	-471031	4967636	-702180	4967636	-497471	19797792	5996271	1171791	-1205188
2024	5334147	-341388	5334147	-572537	5334147	-367827	21222042	6512061	1177198	-1176577
2025	5686991	-215734	5686991	-446883	5686991	-242174	22507861	7009370	1169346	-1150741
2026	6018015	-94854	6018015	-326003	6018015	-121294	23595138	7483309	1145780	-1127726
2027	6296354	20119	6296354	-211030	6296354	-6321	24261264	7926327	1183664	-1106108
2028	6478225	127659	6478225	-103490	6478225	101219	24458730	8332348	1217138	-1085904
2029	6536834	226307	6536834	-4842	6536834	199867	24059211	8695428	1215992	-1067553
2030	6387038	313932	6387038	82783	6387038	287493	22822690	9008538	1171895	-1051475
2031	5978161	388492	5978161	157343	5978161	362052	20736482	9267163	1075421	-1038063
2032	5254839	448072	5254839	216923	5254839	421633	17616593	9466904	916116	-1027676
2033	4082660	490154	4082660	259005	4082660	463714	13247944	9603456	682802	-1020638
2034	2367317	512337	2367317	281188	2367317	485897	7380765	9672617	476603	-1016172

market penetration. This additional financial assistance will most likely be significantly higher than the $200 million NPV difference in tax revenues. Consequently, the issue is whether or not to develop the STCR option as part of a long-term energy policy.

FUEL DISPLACEMENT CONSIDERATIONS

Since the major policy decision may be whether or not to develop the STCR option, and thus to provide the necessary incentives to implement this strategy, this analysis examined the potential oil displacement associated with the expected STCR market penetration scenario. The complete matrix representation for the projected oil displacement is included in Appendix F of this report.

These data are summarized in Table 6-1. Shown in this table are both the annual and cumulative oil displacement and their associated value in terms of a 1984/5 oil price of $29 per barrel (1984 dollars) for the expected scenario. As can be seen from this table, the STCR plants are projected to displace almost 10 million barrels of oil annually by the year 2000 with a value of approximately $280 million per year, and 26.5 million barrels annually by the year 2005 with a 1984 value of $770 million per year. The corresponding cumulative oil displacements are about 40 million barrels of oil by the year 2000 with a total value of $1.2 billion, and 134 million barrels by 2005 with a total value of $3.9 billion (1984 dollars).

The total oil displacement over the 30 year operating lifetime of the STCR plants build through 2004 under the expected scenario is 800 million barrels or $23.2 billion (1984 dollars). Consequently, the STCR technology option has the potential for significant oil displacement, and thus assists in the balance of payments and the energy independence of this country.

Table 6-1 SOLAR THERMAL CENTRAL RECEIVER OIL DISPLACEMENT (EXPECTED SCENARIO)

YEAR	ANNUAL OIL DISPLACEMENT (10^6 BBLS/YR)	ECONOMIC [1] VALUE (10^6 $/YR)	CUMULATIVE OIL DISPLACEMENT (10^6 BBLS)	CUMULATIVE [1] VALUE (10^6 $)
1990	0.6	17	1.4	41
1995	2.8	81	10.0	290
2000	9.5	276	41	1,200
2005	26.5	770	134	3,900
2010	26.5[2]	770 [2]	267	7,750
2015	"	"	400	11,600
2020	"	"	532	15,400
2025	"	"	656	19,000
2030	"	"	758	22,000
2035	"	"	800	23,200

[1] In terms of 1984/85 oil price of $ 29.00/barrel

[2] Data shown refers to oil displaced by plants built through the year 2004, consistent with the study ground rules. Annual oil displacement will continue to increase with additional market penetration of STCR plants after the year 2004.

CONCLUSIONS

A detailed differential federal tax revenue analysis was conducted to evaluate the relationship between alternative energy tax credit proposals and their impact on the commercialization of the STCR technology and the associated impact on the federal treasury. This document describes the federal tax revenue analysis, whereas the preceding report (reference 1) covers the integrated market, cost, and financing aspects associated with the commercialization of this technology.

The integrated market and federal tax revenue analysis shown in this report is quite detailed and thus complex in order to realistically evaluate all the various tax revenue aspects associated with the market penetration of the STCR technology. Since the STCR plant market penetration is characterized by logistic substitution of conventional plants, this analysis analyzed the differential tax revenues on an annual basis between the STCR and equivalent displaced conventional plants by evaluating the relative impacts on the utility operating statement. In addition, during the period of available energy tax credits, the early financing of the STCR plants was assumed to be underwritten by intermediary limited partnerships under avoided cost contracts with the local utility companies. Because the revenues reflect the number of kilowatt-hours generated, which is determined by the demand regardless of the type of generation deployed, no net revenue difference accrues to the utility because of alternative types of generation*. However, because of the significant differences in capital costs and operating characteristics between the STCR and conventional plant, the relative operating costs, financing charges, depreciation, and tax treatment are substantially different, resulting in different tax revenue streams to the treasury.

Because of the favorable conditions in terms of energy costs, insolation, state incentives, and financial resources, the initial STCR was projected to occur in California. Because of the large potential market there, all of the revenue calculations thus incorporated the California tax requirements and considerations, to include: state income taxes , property and sales taxes, and available state energy tax credits. Previous generation expansion analyses have indicated that the STCR plant in California would substitute for an oil- or gas-fired steam plant. Furthermore, the STCR plant with 3-hours of storage capacity has a capacity displacement potential of approximately 85 percent as compared with the displaced conventional steam plant. Consequently, the relative plant capacities in this study were adjusted to account for this difference.

The differential analyses were conducted for a twenty-year STCR market penetration and for different tax credit scenarios. To examine the impact of uncertainty in performance, market penetration, costs, and financial parameters, both optimistic and

* Except for minor differences due to avoided cost financing.

pessimistic scenarios were evaluated in addition to the expected scenario. The complete results of the analysis are included in the appendices of the report and are summarized in the previous sections. The interpretation of this large amount of data in the most meaningful way must be done with great care. The analysis clearly shows that in the long run the federal tax revenues are greatly enhanced by the commercialization of the STCR technology. However, as is typical with the development of any new energy technology, there will be a temporary loss of revenues during the early time period associated with the initial phases of technology transfer. This is the case for any of the tax incentive options examined under the expected scenario; as was shown in a previous section of this report, the differences between these alternatives, both in annual or cumulative tax revenues are relatively minor as compared to the total tax revenues involved during the early years. The annual difference in federal tax revenues between the 25% and 15% energy tax credit alternatives ranges from $10 to $20 million during the 1985 through 2000 time period, with the maximum net present value of the cumulative differential tax revenues less than $200 million over the entire commercialization time span.

Subsequent to the expiration of the proposed energy tax credits and affirmative commitments (1995), and the projected commercialization of the STCR technology, the net present values of the 30-year lifetime tax revenues of the STCR plants become increasingly larger than those of the equivalent oil-fired steam plants. Consequently, the issue becomes whether to commercialize the STCR technology or not, as part of a long-term energy policy, and if so to provide adequate incentives for this commercialization to occur, such as incorporated in the modified expected scenario.

The benefits of the STCR technology commercialization are not only positive in terms of future tax revenues, but in providing an environmentally clean energy source with the capacity to displace 800 million barrels of oil or equivalent by the year 2034 under the expected scenario, with a total value of $23.2 billion in terms of 1984 oil prices. Consequently, the STCR technology has the potential to become a significant energy option for a large part of the United States, which is projected to grow rapidly in terms of population, industry, and electric power demand. Furthermore, the STCR technology, once developed, has the potential to be applied in many other parts of the world.

APPENDIX A

REFERENCES

APPENDIX

REFERENCES

1. P. B. Bos and J. M. Weingart, **Impact of Tax Incentives on the Commercialization of Solar Thermal Electric Technologies.** Prepared for Sandia National Laboratories, Livermore, California, Report SAND83-8178, August 1983.

2. General Electric Company, **Requirements Assessment of Photovoltaic Power Plants in Electric Utility Systems.** Prepared for the Electric Power Research Institute, Palo Alto, California, Report ER-685, Volumes 1, 2, and 3, June 1978.

3. P. B. Bos, **Comparative Evaluation of Planar Photovoltaic and Solar Thermal Electric Dish Systems.** Prepared for Sandia National Laboratories, Livermore, California, April 1982.

APPENDIX B

INTEGRATED MARKET AND COST ANALYSIS

MARKET ANALYSIS

EXPECTED SCENARIO

PROJECT DESCRIPTION STCR MARKET/COST (Expected)

SYSTEM PARAMETERS

System Size	30 MW
Project Period	15 yrs
Operation Year	1985
Base Year Dollar	1982
R&D Expenditure Period	2 yrs
Capital Cost Escalation	6.00 %

POTENTIAL MARKET INPUTS:

Base Year Market	1980
Capacity @ Base Year	580 GW
Capacity Growth Parameter	4.041705 %/yr
Curve Fit Parameter (alpha)	-.000935
Curve Fit Parameter (beta)	.0000033
Replacement Time	40 yrs

POTENTIAL MARKET PENETRATION

Base year - Mkt. Penetration	1980
New Capacity @ Base Year	7.25 %
New Capacity (delta)	.08
New Capacity (epsilon)	0
Replacement Capacity @ t0	7.80
Replacement Capacity (delta)	.12
Replacement Capacity (epsilon)	0
Fuel Cell Market (%total)	36.00 %

PROJECTED MARKET PENETRATION

Initial Penetration	1 %
Corresponding year	
Diffusion Time (1 to 99%)	40 yrs
Market Fit--Year	1982
Market Fit--Cum. Capacity	23 MW

MARKET SHARE

Market Share @ mkt. fit yr	100.00 %
Market Share Growth	.00 %/yr
Market Share Maximum	100.00 %
Market Share Minimum	50.00 %

PROJECTED LEARNING EXPERIENCE

Year of First Unit	1982	
First Unit Cost (fob Factory)	4817 $B/kW	
Mfg. Indirect Cst. (% Direct)	2.00%	
Indirect Costs (% Direct Cost)	36.20 %	
Percent Learning	86.46 %	
Unit Cost Production Rate	units/yr	MW/yr
Production Unit Cost	$B/kW	
Minimum Unit Cost	1492 $B/kW	
Decr. Cum. Units	0	

INDIRECT COSTS

Mfg. O/H & Profit	40 % of Mfg. Cost
Spare Parts	2 % of above
Process Contingencies	0 % of above
Royalties	10 % of above
Shipping	3 % of Mfg. Price
A&E Fees	9 % of Mfg. Price
Constr. Mgmt./Owner's Cst	5 % of Mfg. Price
Project Contingencies	20 % of above

MARKET PENETRATION ANALYSIS

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Potential Market (GW)	626	649	672	694	715	736	756	775	794	811
Market Growth (%)	3.67	3.49	3.31	3.13	2.96	2.78	2.61	2.44	2.27	2.10
New Capacity Additions (MW/yr)	23003	22659	22233	21725	21137	20470	19728	18913	18028	17078
Replacement Capacity (MW/yr)	3223	3579	3963	4376	4819	5290	5792	6322	6882	7471
Potl. Mkt. Penetration (MW/yr)	809	870	931	990	1049	1107	1163	1218	1272	1325
Proj. Mkt. Penetration (MW/yr)	5	7	10	13	17	22	29	39	50	65
Cum. Mkt. Penetration (MW)	23	30	40	52	69	92	121	160	210	275
Proj. Mkt. Penet'n (Units/yr)	0	0	0	0	1	1	1	1	2	2
Cum. Mkt. Penetration (units)	1	1	1	2	2	3	4	5	7	9
Market share for XYZ (MW/yr)	5	7	10	13	17	22	29	39	50	65
Cum. Mkt. Share (MW)	23	30	40	52	69	92	121	160	210	275
Market Share (Units/yr)	0	0	0	0	1	1	1	1	2	2
Cumulative Production (Units)	1	1	1	2	2	3	4	5	7	9
Manufacturing Costs ($B/kW)	4817			3513		3145	2928	2777	2616	2461
Manufacturing Costs ($C/kW)	4817			4184		4209	4154	4176	4170	4159
Plant Price (fob factory)$C/kW	4913			4267		4293	4237	4259	4253	4242
Plant Cost (installed) $C/kW (Overnight Construction)	6561			5698		5733	5658	5687	5679	5664
Total Revenues ($millionC/yr)						129	127	128	255	255

1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
828	844	858	871	883	894	904	912	919	925	930	933	935
1.94	1.78	1.62	1.46	1.30	1.15	1.00	.85	.70	.55	.41	.26	.12
16067	14999	13881	12717	11513	10275	9008	7720	6415	5101	3782	2466	1158
8087	8729	9396	10085	10795	11522	12264	13018	13779	14544	15310	16070	16821
1376	1426	1475	1523	1570	1616	1662	1707	1751	1794	1837	1879	1921
84	108	138	175	220	275	341	418	508	609	722	843	972
359	467	604	779	999	1274	1615	2033	2541	3151	3872	4716	5688
3	4	5	6	7	9	11	14	17	20	24	28	32
12	16	20	26	33	42	54	68	85	105	129	157	190
84	108	138	175	220	275	341	418	508	609	722	843	972
359	467	604	779	999	1274	1615	2033	2541	3151	3872	4716	5688
3	4	5	6	7	9	11	14	17	20	24	28	32
12	16	20	26	33	42	54	68	85	105	129	157	190
2325	2189	2076	1972	1872	1780	1690	1607	1532	1492	1492	1492	1492
4164	4156	4177	4207	4232	4265	4293	4327	4373	4514	4785	5072	5376
4248	4239	4261	4291	4316	4350	4379	4413	4461	4604	4881	5174	5484
5672	5660	5689	5729	5763	5809	5847	5893	5957	6148	6517	6908	7323
382	509	639	772	906	1175	1445	1854	2275	2763	3514	4346	5265

COMPUTED PARAMETERS

Mkt. Penetration:	
1% Penetration Year	1984
50% Penetration Year	2004
99% Penetration Year	2024
Logistics Coefficient	.2297560
Learning Curve Parameters:	
Percent Learning	86.46 %
Learning Curve Coefficient	-.209895

MARKET ANALYSIS

OPTIMISTIC SCENARIO

PROJECT DESCRIPTION STCR MARKET/COST (Optimistic)

SYSTEM PARAMETERS

System Size	30 MW
Project Period	15 yrs
Operation Year	1985
Base Year Dollar	1982
R&D Expenditure Period	2 yrs
Capital Cost Escalation	6.00 %

POTENTIAL MARKET INPUTS:

Base Year Market	1980
Capacity @ Base Year	580 GW
Capacity Growth Parameter	4.041705 %/yr
Curve Fit Parameter (alpha)	-.000935
Curve Fit Parameter (beta)	.0000033
Replacement Time	40 yrs

POTENTIAL MARKET PENETRATION

Base year - Mkt. Penetration	1980
New Capacity @ Base Year	7.25 %
New Capacity (delta)	.08
New Capacity (epsilon)	0
Replacement Capacity @ t0	7.80
Replacement Capacity (delta)	.12
Replacement Capacity (epsilon)	0
Fuel Cell Market (%total)	36.00 %

PROJECTED MARKET PENETRATION

Initial Penetration	1 %
Corresponding year	
Diffusion Time (1 to 99%)	28 yrs
Market Fit--Year	1982
Market Fit--Cum. Capacity	23 MW

MARKET SHARE

Market Share @ mkt. fit yr	100.00 %
Market Share Growth	.00 %/yr
Market Share Maximum	100.00 %
Market Share Minimum	50.00 %

PROJECTED LEARNING EXPERIENCE

Year of First Unit	1982	
First Unit Cost (fob Factory)	4305 $B/kW	
Mfg. Indirect Cst. (% Direct)	2.00%	
Indirect Costs (% Direct Cost)	30.50 %	
Percent Learning	85.83 %	
Unit Cost Production Rate	units/yr	MW/yr
Production Unit Cost	$B/kW	
Minimum Unit Cost	1213 $B/kW	
Decr. Cum. Units	0	

INDIRECT COSTS

Mfg. O/H & Profit	40 % of Mfg. Cost
Spare Parts	2 % of above
Process Contingencies	0 % of above
Royalties	10 % of above
Shipping	3 % of Mfg. Price
A&E Fees	9 % of Mfg. Price
Constr. Mgmt./Owner's Cst	5 % of Mfg. Price
Project Contingencies	15 % of above

MARKET PENETRATION ANALYSIS

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Potential Market (GW)	626	649	672	694	715	736	756	775	794	811
Market Growth (%)	3.67	3.49	3.31	3.13	2.96	2.78	2.61	2.44	2.27	2.10
New Capacity Additions (MW/yr)	23003	22659	22233	21725	21137	20470	19728	18913	18028	17078
Replacement Capacity (MW/yr)	3223	3579	3963	4376	4819	5290	5792	6322	6882	7471
Potl. Mkt. Penetration (MW/yr)	809	870	931	990	1049	1107	1163	1218	1272	1325
Proj. Mkt. Penetration (MW/yr)	7	11	16	24	35	51	73	104	145	201
Cum. Mkt. Penetration (MW)	23	34	51	75	110	161	234	337	483	684
Proj. Mkt. Penet'n (Units/yr)	0	0	1	1	1	2	2	3	5	7
Cum. Mkt. Penetration (units)	1	1	2	2	4	5	8	11	16	23
Market share for XYZ (MW/yr)	7	11	16	24	35	51	73	104	145	201
Cum. Mkt. Share (MW)	23	34	51	75	110	161	234	337	483	684
Market Share (Units/yr)	0	0	1	1	1	2	2	3	5	7
Cumulative Production (Units)	1	1	2	2	4	5	8	11	16	23
Manufacturing Costs ($B/kW)	4305		3085		2648	2410	2227	2045	1894	1746
Manufacturing Costs ($C/kW)	4305		3466		3343	3225	3159	3075	3018	2950
Plant Price (fob factory)$C/kW	4391		3536		3410	3290	3222	3137	3079	3009
Plant Cost (installed) $C/kW (Overnight Construction)	5618		4523		4362	4209	4122	4014	3939	3850
Total Revenues ($millionC/yr)					102	197	193	282	462	632

1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
828	844	858	871	883	894	904	912	919	925	930	933	935
1.94	1.78	1.62	1.46	1.30	1.15	1.00	.85	.70	.55	.41	.26	.12
16067	14999	13881	12717	11513	10275	9008	7720	6415	5101	3782	2466	1158
8087	8729	9396	10085	10795	11522	12264	13018	13779	14544	15310	16070	16821
1376	1426	1475	1523	1570	1616	1662	1707	1751	1794	1837	1879	1921
274	366	478	609	754	908	1064	1215	1356	1483	1596	1695	1781
958	1324	1802	2410	3165	4073	5138	6353	7709	9193	10789	12484	14265
9	12	16	20	25	30	35	41	45	49	53	57	59
32	44	60	80	105	136	171	212	257	306	360	416	476
274	366	478	609	754	908	1064	1215	1356	1483	1596	1695	1781
958	1324	1802	2410	3165	4073	5138	6353	7709	9193	10789	12484	14265
9	12	16	20	25	30	35	41	45	49	53	57	59
32	44	60	80	105	136	171	212	257	306	360	416	476
1618	1507	1406	1317	1238	1213	1213	1213	1213	1213	1213	1213	1213
2898	2860	2829	2808	2799	2907	3081	3266	3462	3670	3890	4124	4371
2956	2918	2886	2865	2855	2965	3143	3332	3532	3743	3968	4206	4459
3782	3733	3692	3665	3653	3794	4021	4263	4518	4789	5077	5381	5704
798	1050	1385	1719	2141	2669	3300	4098	4768	5503	6309	7193	7892

COMPUTED PARAMETERS

Mkt. Penetration:

1% Penetration Year	1982
50% Penetration Year	1996
99% Penetration Year	2010
Logistics Coefficient	.3282228

Learning Curve Parameters:

Percent Learning	85.83 %
Learning Curve Coefficient	-.220446

MARKET ANALYSIS

PESSIMISTIC SCENARIO

PROJECT DESCRIPTION STCR MARKET/COST (Pessimistic)

SYSTEM PARAMETERS

System Size	30	MW
Project Period	15	yrs
Operation Year	1985	
Base Year Dollar	1982	
R&D Expenditure Period	2	yrs
Capital Cost Escalation	6.00	%

POTENTIAL MARKET INPUTS:

Base Year Market	1980	
Capacity @ Base Year	580	GW
Capacity Growth Parameter	4.041705	%/yr
Curve Fit Parameter (alpha)	-.000935	
Curve Fit Parameter (beta)	.0000033	
Replacement Time	45	yrs

POTENTIAL MARKET PENETRATION

Base year - Mkt. Penetration	1980	
New Capacity @ Base Year	7.25	%
New Capacity (delta)	.08	
New Capacity (epsilon)	0	
Replacement Capacity @ t0	7.80	
Replacement Capacity (delta)	.12	
Replacement Capacity (epsilon)	0	
Fuel Cell Market (%total)	36.00	%

PROJECTED MARKET PENETRATION

Initial Penetration	1	%
Corresponding year		
Diffusion Time (1 to 99%)	52	yrs
Market Fit--Year	1982	
Market Fit--Cum. Capacity	23	MW

MARKET SHARE

Market Share @ mkt. fit yr	100.00	%
Market Share Growth	.00	%/yr
Market Share Maximum	100.00	%
Market Share Minimum	50.00	%

PROJECTED LEARNING EXPERIENCE

Year of First Unit	1982		
First Unit Cost (fob Factory)	5077	$B/kW	
Mfg. Indirect Cst. (% Direct)	2.00%		
Indirect Costs (% Direct Cost)	41.90	%	
Percent Learning	87.53	%	
Unit Cost Production Rate		units/yr	MW/yr
Production Unit Cost		$B/kW	
Minimum Unit Cost	1865	$B/kW	
Decr. Cum. Units	0		

INDIRECT COSTS

Mfg. O/H & Profit	40 % of Mfg. Cost
Spare Parts	2 % of above
Process Contingengies	0 % of above
Royalties	10 % of above
Shipping	3 % of Mfg. Price
A&E Fees	9 % of Mfg. Price
Constr. Mgmt./Owner's Cst	5 % of Mfg. Price
Project Contingengies	25 % of above

MARKET PENETRATION ANALYSIS

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Potential Market (GW)	626	649	672	694	715	736	756	775	794	811
Market Growth (%)	3.67	3.49	3.31	3.13	2.96	2.78	2.61	2.44	2.27	2.10
New Capacity Additions (MW/yr)	23003	22659	22233	21725	21137	20470	19728	18913	18028	17078
Replacement Capacity (MW/yr)	1826	2057	2312	2590	2893	3223	3579	3963	4376	4819
Potl. Mkt. Penetration (MW/yr)	760	812	862	910	956	1000	1041	1081	1117	1152
Proj. Mkt. Penetration (MW/yr)	4	5	7	8	10	13	16	20	24	29
Cum. Mkt. Penetration (MW)	23	28	35	43	53	66	82	101	125	155
Proj. Mkt. Penet'n (Units/yr)	0	0	0	0	0	0	1	1	1	1
Cum. Mkt. Penetration (units)	1	1	1	1	2	2	3	3	4	5
Market share for XYZ (MW/yr)	4	5	7	8	10	13	16	20	24	29
Cum. Mkt. Share (MW)	23	28	35	43	53	66	82	101	125	155
Market Share (Units/yr)	0	0	0	0	0	0	1	1	1	1
Cumulative Production (Units)	1	1	1	1	2	2	3	3	4	5
Manufacturing Costs ($B/kW)	5077				3811		3445		3227	3073
Manufacturing Costs ($C/kW)	5077				4811		4886		5143	5193
Plant Price (fob factory)$C/kW	5179				4907		4984		5245	5296
Plant Cost (installed) $C/kW (Overnight Construction)	7204				6827		6934		7297	7368
Total Revenues ($millionC/yr)	0				0		150		157	159

1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
828	844	858	871	883	894	904	912	919	925	930	933	935
1.94	1.78	1.62	1.46	1.30	1.15	1.00	.85	.70	.55	.41	.26	.12
16067	14999	13881	12717	11513	10275	9008	7720	6415	5101	3782	2466	1158
5290	5792	6322	6882	7471	8087	8729	9396	10085	10795	11522	12264	13018
1184	1215	1244	1271	1298	1323	1348	1373	1398	1424	1450	1478	1507
36	44	53	64	77	93	112	134	160	190	225	265	312
191	235	288	352	429	523	634	768	928	1117	1342	1607	1919
1	1	2	2	3	3	4	4	5	6	7	9	10
6	8	10	12	14	17	21	26	31	37	45	54	64
36	44	53	64	77	93	112	134	160	190	225	265	312
191	235	288	352	429	523	634	768	928	1117	1342	1607	1919
1	1	2	2	3	3	4	4	5	6	7	9	10
6	8	10	12	14	17	21	26	31	37	45	54	64
2957	2824	2690	2588	2506	2423	2330	2237	2155	2083	2010	1938	1874
5295	5361	5413	5520	5666	5807	5920	6024	6152	6304	6446	6590	6753
5401	5468	5521	5631	5779	5923	6038	6144	6275	6430	6575	6722	6888
7514	7607	7681	7833	8040	8240	8400	8548	8730	8945	9147	9351	9583
162	164	331	338	520	533	725	737	941	1157	1381	1815	2067

COMPUTED PARAMETERS

Mkt. Penetration:

1% Penetration Year	1986
50% Penetration Year	2012
99% Penetration Year	2038
Logistics Coefficient	.1767354

Learning Curve Parameters:

Percent Learning	87.53 %
Learning Curve Coefficient	-.192151

APPENDIX C

ANALYSIS INPUT DATA

STCR DATA INPUT, EXPECTED SCENARIO MODIFIED

PROFORMA FINANCIAL ANALYSIS INPUT DATA--EXTENDED STATE TAX CREDIT SCENARIO
PROJECT DESCRIPTION: SOLAR THERMAL CENTRAL RECEIVER

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
System Size (MW)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Operation Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Base Year Dollar	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982
Inflation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Plant Cost ($B/KW)	4705	4705	4283	3908	3782	3563	3352	3167	2981	2828	2686	2550	2424	2302	2189	2087	2032	2032	2032	2032
Interconnect Cost ($B/KW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction Interest (%)	15	14.5	14	13.5	13.5	13	13	12.5	12.5	12.5	12	11	10.5	10.5	10.5	10	10	10	10	10
Construction Period (Yrs)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Construction Cash Flows		-5	-4	-3	-2	-1	0													
Percent		0	0	0	10	45	45													
Owner's Costs (%)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Capital Cost Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Capacity Factor (%)	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Energy Sales (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Avoided Costs ($C/KWh)	.12	.13	.14	.15	.165	.18	.195	.21	.225	.24	.26									
Avoided Cost Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	.00	.00	.00																	
Contract Capacity (MW)	30	30	30	30	30	30	30	30	30	30	30									
Capacity Contract Price ($C/KW-yr)	80	85	90	95	101	107	114	121	128	135	143									
Capacity Cost Escalation (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenues ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenue Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Fuel Price ($B/MBTU)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Price Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	6.00	8.12	8.12																	
Intermediate Heat Rate (BTU/KWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fixed O & M ($B/KW-yr)	45	44	43	42	41	40	39.5	39	38.5	38	37.5	37	36.5	36	35.5	35	35	35	35	35
Variable O & M (MillsB/KWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O & M Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Management Fees ($1000C/yr)	100	100	100	100	100	100	100	100	100	100	100									
Syndication Fee (%)	8	8	8	8	8	8	8	8	8	8	8									
Lease Expenses ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Royalties (% of Rev)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales Tax (%, of 50% of PC)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Insurance Rate-Intermediary (%)	1	1	1	1	1	1	1	1	1	1										
Insurance Rate-Utility (%)	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50
Property Tax Rate (%)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Marginal Tax Rates-Intermediary																				
Federal (%)	50	50	50	50	50	50	50	50	50	50	50									
State (%)	11	11	11	11	11	11	11	11	11	11	11									
Marginal Tax Rates-Utility																				
Federal (%)	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
State (%)	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
Electricity Price ($B/KWh)	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
Electricity Price Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	7.86	7.86	7.86																	
Market Penetration	0	1	1	1	1	2	2	3	4	5	6	7	9	11	14	17	20	24	28	32
Market Penetration (cum.)	0	1	2	3	4	6	8	11	15	20	26	33	42	53	67	84	104	128	156	188

PROFORMA FINANCIAL ANALYSIS INPUT DATA--EXTENDED STATE TAX CREDIT SCENARIO
PROJECT DESCRIPTION: SOLAR THERMAL CENTRAL RECEIVER

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Project Period-Intermediary (yrs)	5	5	5	5	5	5	5	5	5	5	5									
Project Period-Utility (yrs)	25	25	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30
Financing-Intermediary																				
Risk (Equity) Rate (% AT)	24	23	22	21	20.5	20	19.5	19	18.5	18	18									
Debt Ratio (%)	21	22.5	28	32.5	37	43	46	48	50	52	54									
Loan Term (yrs)	15	15	15	15	15	15	15	15	15	15	15									
Loan Interest (%)	15	14.5	14	13.5	13.5	13	13	12.5	12.5	12.5	12									
Financing-Utility																				
Risk (Equity) Rate (% AT)	19	19	19	18.5	18.5	18.5	18	18	18	17.5	17.5	17.5	17	17	17	16.5	16.5	16.5	16.5	16.5
Debt Ratio (%)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Loan Term (yrs)	25	25	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30
Loan Interest (%)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Safe Rate of Return (% AT)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Cost of Capital (% AT)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Investment Tax Credit																				
Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
State (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Tax Credit																				
Federal (%)	25	25	25	25	25	25	25	25	15	15	15	0	0	0	0	0	0	0	0	0
State (%)	25	25	25	25	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation Period-Intermediary																				
Federal (Years)	5	5	5	5	5	5	5	5	5	5	5									
State (Years)	3	3	3	3	3	3	5	5	5	5	5									
Depreciation Base-Intermediary																				
Federal (%)	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	87.5	87.5	87.5									
State (%)	75	75	75	75	75	75	100	100	100	100	100									
Depreciation Period-Utility																				
Federal (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
State (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Depreciation Base-Utility																				
Federal (Years)	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
State (Years)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Depreciation Schedules (%)

Year:	Federal 5 yr ACRS	Federal 15 yr ACRS	State 3 yr DD	State 5 yr S/L	State 15 yr S/L
0	15	0	0	0	0
1	22	5	66.7	20	6.67
2	21	10	22.2	20	6.67
3	21	9	11.1	20	6.67
4	21	8	0	20	6.67
5	0	7	0	20	6.67
6	0	7	0	0	6.67
7	0	6	0	0	6.67
8	0	6	0	0	6.67
9	0	6	0	0	6.67
10	0	6	0	0	6.67
11	0	6	0	0	6.67
12	0	6	0	0	6.67
13	0	6	0	0	6.67
14	0	6	0	0	6.67
15	0	6	0	0	6.67

Sales/Salvage Value ($/kW)	1500	1530	1561	1592	1624	1656	1689	1723	1757	1793	1828									
Capital Gains Tax-State (%)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Capital Gains Tax-Federal (%)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Discount Rates-State (%)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Discount Rates-Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

BTCR DATA INPUTS, EXPECTED SCENARIO
25% ETC

PROFORMA FINANCIAL ANALYSIS — INPUT DATA--EXPECTED (BASE CASE) SCENARIO
PROJECT DESCRIPTION: SOLAR THERMAL CENTRAL RECEIVER

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
System Size (MW)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Operation Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Base Year Dollar	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982
Inflation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Plant Cost ($B/KW)	4785	4785	4283	3988	3782	3563	3352	3167	2981	2828	2686	2550	2424	2302	2189	2087	2032	2032	2032	2032
Interconnect Cost ($B/KW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction Interest (%)	15	14.5	14	13.5	13.5	13	13	12.5	12.5	12.5	12	11	10.5	10.5	10.5	10	10	10	10	10
Construction Period (Yrs)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Construction Cash Flows		-5	-4	-3	-2	-1	0													
Percent		0	0	0	10	45	45													
Owner's Costs (%)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Capital Cost Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Capacity Factor (%)	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Energy Sales (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Avoided Costs ($C/KWh)	.12	.13	.14	.15	.165	.18	.195	.21	.225	.24	.26									
Avoided Cost Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	.00	.00	.00																	
Contract Capacity (MW)	30	30	30	30	30	30	30	30	30	30	30									
Capacity Contract Price ($C/KW-yr)	80	85	90	95	101	107	114	121	128	135	143									
Capacity Cost Escalation (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenues ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenue Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Fuel Price ($B/MBTU)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Price Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	6.80	8.12	8.12																	
Intermediate Heat Rate (BTU/KWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fixed O & M ($B/KW-yr)	45	44	43	42	41	40	39.5	39	38.5	38	37.5	37	36.5	36	35.5	35	35	35	35	35
Variable O & M (MillsB/KWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O & M Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Management Fees ($1000C/yr)	100	100	100	100	100	100	100	100	100	100	100									
Syndication Fee (%)	8	8	8	8	8	8	8	8	8	8	8									
Lease Expenses ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Royalties (% of Rev)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales Tax (%, of 50% of PC)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Insurance Rate-Intermediary (%)	1	1	1	1	1	1	1	1	1	1										
Insurance Rate-Utility (%)	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50
Property Tax Rate (%)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Marginal Tax Rates-Intermediary																				
Federal (%)	50	50	50	50	50	50	50	50	50	50	50									
State (%)	11	11	11	11	11	11	11	11	11	11	11									
Marginal Tax Rates-Utility																				
Federal (%)	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
State (%)	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
Electricity Price ($B/KWh)	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
Electricity Price Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	7.86	7.86	7.86																	
Market Penetration	0	1	1	1	1	2	2	3	4	5	6	7	9	11	14	17	20	24	28	32
Market Penetration (cum.)	0	1	2	3	4	6	8	11	15	20	26	33	42	53	67	84	104	128	156	188

PROFORMA FINANCIAL ANALYSIS — INPUT DATA--EXPECTED (BASE CASE) SCENARIO
PROJECT DESCRIPTION: SOLAR THERMAL CENTRAL RECEIVER

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Project Period-Intermediary (yrs)	5	5	5	5	5	5	5	5	5	5	5									
Project Period-Utility (yrs)	25	25	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30
Financing-Intermediary																				
Risk (Equity) Rate (% AT)	24	23	22	21	20.5	20	19.5	19	18.5	18	18									
Debt Ratio (%)	21	22.5	28	32.5	37	43	46	48	50	52	54									
Loan Term (yrs)	15	15	15	15	15	15	15	15	15	15	15									
Loan Interest (%)	15	14.5	14	13.5	13.5	13	13	12.5	12.5	12.5	12									
Financing-Utility																				
Risk (Equity) Rate (% AT)	19	19	19	18.5	18.5	18.5	18	18	18	17.5	17.5	17.5	17	17	17	16.5	16.5	16.5	16.5	16.5
Debt Ratio (%)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Loan Term (yrs)	25	25	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30
Loan Interest (%)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Safe Rate of Return (% AT)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Cost of Capital (% AT)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Investment Tax Credit																				
Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
State (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Tax Credit																				
Federal (%)	25	25	25	25	25	25	25	25	25	25	25	0	0	0	0	0	0	0	0	0
State (%)	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation Period-Intermediary																				
Federal (Years)	5	5	5	5	5	5	5	5	5	5	5									
State (Years)	3	3	5	5	5	5	5	5	5	5	5									
Depreciation Base-Intermediary																				
Federal (%)	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5									
State (%)	75	75	100	100	100	100	100	100	100	100	100									
Depreciation Period-Utility																				
Federal (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
State (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Depreciation Base-Utility																				
Federal (Years)	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
State (Years)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Depreciation Schedules (%)

Year:	Federal 5 yr ACRS	Federal 15 yr ACRS	State 3 yr DD	State 5 yr S/L	State 15 yr S/L
0	15	0	0	0	0
1	22	5	66.7	20	6.67
2	21	10	22.2	20	6.67
3	21	9	11.1	20	6.67
4	21	8	0	20	6.67
5	0	7	0	20	6.67
6	0	7	0	0	6.67
7	0	6	0	0	6.67
8	0	6	0	0	6.67
9	0	6	0	0	6.67
10	0	6	0	0	6.67
11	0	6	0	0	6.67
12	0	6	0	0	6.67
13	0	6	0	0	6.67
14	0	6	0	0	6.67
15	0	6	0	0	6.67

Sales/Salvage Value (MM$)	1500	1530	1561	1592	1624	1656	1689	1723	1757	1793	1828										
Capital Gains Tax-State (%)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Capital Gains Tax-Federal (%)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Discount Rates-State (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discount Rates-Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

STCR DATA INPUTS, EXPECTED SCENARIO
15% ETC

PROFORMA FINANCIAL ANALYSIS — INPUT DATA--15% TAX CREDIT SCENARIO
PROJECT DESCRIPTION: — SOLAR THERMAL CENTRAL RECEIVER

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
System Size (MW)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Operation Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Base Year Dollar	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982
Inflation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Plant Cost ($B/kW)	4785	4785	4283	3988	3782	3563	3352	3167	2981	2828	2686	2550	2424	2302	2189	2087	2032	2032	2032	2032
Interconnect Cost ($B/kW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction Interest (%)	15	14.5	14	13.5	13.5	13	13	12.5	12.5	12.5	12	11	10.5	10.5	10.5	10	10	10	10	10
Construction Period (Yrs)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Construction Cash Flows		-5	-4	-3	-2	-1	0													
Percent		0	0	0	10	45	45													
Owner's Costs (%)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Capital Cost Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Capacity Factor (%)	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Energy Sales (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Avoided Costs ($C/kWh)	.12	.13	.14	.15	.165	.18	.195	.21	.225	.24	.26									
Avoided Cost Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	.00	.00	.00																	
Contract Capacity (MW)	30	30	30	30	30	30	30	30	30	30	30									
Capacity Contract Price ($C/kW-yr)	80	85	90	95	101	107	114	121	128	135	143									
Capacity Cost Escalation (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenues ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenue Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Fuel Price ($B/MBTU)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Price Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	6.00	8.12	8.12																	
Intermediate Heat Rate (BTU/kWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fixed O & M ($B/kW-yr)	45	44	43	42	41	40	39.5	39	38.5	38	37.5	37	36.5	36	35.5	35	35	35	35	35
Variable O & M (Mills$/kWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O & M Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Management Fees ($1000C/yr)	100	100	100	100	100	100	100	100	100	100	100									
Syndication Fee (%)	0	0	0	0	0	0	0	0	0	0	0									
Lease Expenses ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Royalties (% of Rev)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales Tax (%, of 50% of PC)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Insurance Rate-Intermediary (%)	1	1	1	1	1	1	1	1	1	1										
Insurance Rate-Utility (%)	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50
Property Tax Rate (%)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Marginal Tax Rates-Intermediary																				
Federal (%)	50	50	50	50	50	50	50	50	50	50	50									
State (%)	11	11	11	11	11	11	11	11	11	11	11									
Marginal Tax Rates-Utility																				
Federal (%)	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
State (%)	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
Electricity Price ($B/kWh)	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
Electricity Price Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	7.06	7.06	7.06																	
Market Penetration	0	1	1	1	1	2	2	3	4	5	6	7	9	11	14	17	20	24	28	32
Market Penetration (cum.)	0	1	2	3	4	6	8	11	15	20	26	33	42	53	67	84	104	128	156	188

PROFORMA FINANCIAL ANALYSIS INPUT DATA--15% TAX CREDIT SCENARIO
PROJECT DESCRIPTION: SOLAR THERMAL CENTRAL RECEIVER

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Project Period-Intermediary (yrs)	5	5	5	5	5	5	5	5	5	5	5									
Project Period-Utility (yrs)	25	25	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30
Financing-Intermediary																				
Risk (Equity) Rate (% AT)	24	23	22	21	20.5	20	19.5	19	18.5	18	18									
Debt Ratio (%)	21	22.5	28	32.5	37	43	46	48	50	52	54									
Loan Term (yrs)	15	15	15	15	15	15	15	15	15	15	15									
Loan Interest (%)	15	14.5	14	13.5	13.5	13	13	12.5	12.5	12.5	12									
Financing-Utility																				
Risk (Equity) Rate (% AT)	19	19	19	18.5	18.5	18.5	18	18	18	17.5	17.5	17.5	17	17	17	16.5	16.5	16.5	16.5	16.5
Debt Ratio (%)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Loan Term (yrs)	25	25	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30
Loan Interest (%)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Safe Rate of Return (% AT)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Cost of Capital (% AT)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Investment Tax Credit																				
Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
State (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Tax Credit																				
Federal (%)	15	15	15	15	15	15	15	15	15	15	15	0	0	0	0	0	0	0	0	0
State (%)	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation Period-Intermediary																				
Federal (Years)	5	5	5	5	5	5	5	5	5	5	5									
State (Years)	3	3	5	5	5	5	5	5	5	5	5									
Depreciation Base-Intermediary																				
Federal (%)	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5									
State (%)	75	75	100	100	100	100	100	100	100	100	100									
Depreciation Period-Utility																				
Federal (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
State (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Depreciation Base-Utility																				
Federal (Years)	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
State (Years)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Depreciation Schedules (%)

Year:	Federal 5 yr ACRS	Federal 15 yr ACRS	State 3 yr DD	State 5 yr S/L	State 15 yr S/L
0	15	0	0	0	0
1	22	5	66.7	20	6.67
2	21	10	22.2	20	6.67
3	21	9	11.1	20	6.67
4	21	8	0	20	6.67
5	0	7	0	20	6.67
6	0	7	0	0	6.67
7	0	6	0	0	6.67
8	0	6	0	0	6.67
9	0	6	0	0	6.67
10	0	6	0	0	6.67
11	0	6	0	0	6.67
12	0	6	0	0	6.67
13	0	6	0	0	6.67
14	0	6	0	0	6.67
15	0	6	0	0	6.67

Sales/Salvage Value ($/kW)	1500	1530	1561	1592	1624	1656	1689	1723	1757	1793	1828										
Capital Gains Tax-State (%)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Capital Gains Tax-Federal (%)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Discount Rates-State (%)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Discount Rates-Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

STCR DATA INPUT, OPTIMISTIC SCENARIO
25% ETC

PROFORMA FINANCIAL ANALYSIS INPUT DATA--OPTIMISTIC SCENARIO
PROJECT DESCRIPTION: SOLAR THERMAL CENTRAL RECEIVER

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
System Size (MW)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Operation Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Base Year Dollar	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982
Inflation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Plant Cost ($B/KW)	4026	3456	3145	2906	2669	2472	2279	2111	1967	1835	1719	1616	1583	1583	1583	1583	1583	1583	1583	1583
Interconnect Cost ($B/KW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction Interest (%)	15	14.5	14	13.5	13	13	12.5	12	12	11.5	11.5	11	10.5	10.5	10.5	10	10	10	10	10
Construction Period (Yrs)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Construction Cash Flows		-5	-4	-3	-2	-1	0													
Percent		0	0	0	10	45	45													
Owner's Costs (%)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Capital Cost Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Capacity Factor (%)	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Energy Sales (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Avoided Costs ($C/KWh)	.12	.135	.145	.16	.17	.185	.2	.215	.235	.255	.275									
Avoided Cost Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	.00	.00	.00																	
Contract Capacity (MW)	30	30	30	30	30	30	30	30	30	30	30									
Capacity Contract Price ($C/KW-yr)	80	85	90	95	101	107	114	121	128	135	143									
Capacity Cost Escalation (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenues ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenue Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Fuel Price ($B/MBTU)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Price Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	6.80	9.18	9.18																	
Intermediate Heat Rate (BTU/KWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fixed O & M ($B/KW-yr)	45	44	43	41	40	39	38	37.5	37	36	35.5	35	35	35	35	35	35	35	35	35
Variable O & M (MillsB/KWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O & M Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Management Fees ($1000C/yr)	100	100	100	100	100	100	100	100	100	100	100									
Syndication Fee (%)	8	8	8	8	8	8	8	8	8	8	8									
Lease Expenses ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Royalties (% of Rev)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales Tax (%, of 50% of PC)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Insurance Rate-Intermediary (%)	1	1	1	1	1	1	1	1	1	1										
Insurance Rate-Utility (%)	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50
Property Tax Rate (%)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Marginal Tax Rates-Intermediary																				
Federal (%)	50	50	50	50	50	50	50	50	50	50	50									
State (%)	11	11	11	11	11	11	11	11	11	11	11									
Marginal Tax Rates-Utility																				
Federal (%)	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
State (%)	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
Electricity Price ($B/KWh)	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
Electricity Price Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	8.8	8.8	8.8																	
Market Penetration	1	1	2	2	3	5	7	9	12	16	20	25	30	35	41	45	49	53	57	59
Market Penetration (cum.)	1	2	4	6	9	14	21	30	42	58	78	103	133	168	209	254	303	356	413	472

PROFORMA FINANCIAL ANALYSIS INPUT DATA--OPTIMISTIC SCENARIO
PROJECT DESCRIPTION: SOLAR THERMAL CENTRAL RECEIVER

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Project Period-Intermediary (yrs)	5	5	5	5	5	5	5	5	5	5	5									
Project Period-Utility (yrs)	25	25	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30
Financing-Intermediary																				
Risk (Equity) Rate (% AT)	24	23	22	21	20	19	18.5	18	18	17.5	17.5									
Debt Ratio (%)	27	37	44	53	61	65	65	65	65	65	65									
Loan Term (yrs)	15	15	15	15	15	15	15	15	15	15	15									
Loan Interest (%)	15	14.5	14	13.5	13	13	12.5	12	12	11.5	11.5									
Financing-Utility																				
Risk (Equity) Rate (% AT)	19	19	19	18.5	18.5	18.5	18	18	18	17.5	17.5	17.5	17	17	17	16.5	16.5	16.5	16.5	16.5
Debt Ratio (%)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Loan Term (yrs)	25	25	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30
Loan Interest (%)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Safe Rate of Return (% AT)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Cost of Capital (% AT)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Investment Tax Credit																				
Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
State (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Tax Credit																				
Federal (%)	25	25	25	25	25	25	25	25	25	25	25	0	0	0	0	0	0	0	0	0
State (%)	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation Period-Intermediary																				
Federal (Years)	5	5	5	5	5	5	5	5	5	5	5									
State (Years)	3	3	5	5	5	5	5	5	5	5	5									
Depreciation Base-Intermediary																				
Federal (%)	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5									
State (%)	75	75	100	100	100	100	100	100	100	100	100									
Depreciation Period-Utility																				
Federal (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
State (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Depreciation Base-Utility																				
Federal (Years)	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
State (Years)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Depreciation Schedules (%)

Year:	Federal 5 yr ACRS	Federal 15 yr ACRS	State 3 yr DD	State 5 yr S/L	State 15 yr S/L
0	15	0	0	0	0
1	22	5	66.7	20	6.67
2	21	10	22.2	20	6.67
3	21	9	11.1	20	6.67
4	21	8	0	20	6.67
5	0	7	0	20	6.67
6	0	7	0	0	6.67
7	0	6	0	0	6.67
8	0	6	0	0	6.67
9	0	6	0	0	6.67
10	0	6	0	0	6.67
11	0	6	0	0	6.67
12	0	6	0	0	6.67
13	0	6	0	0	6.67
14	0	6	0	0	6.67
15	0	6	0	0	6.67

Sales/Salvage Value ($/kW)	1500	1530	1561	1592	1624	1656	1689	1723	1757	1793	1828										
Capital Gains Tax-State (%)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Capital Gains Tax-Federal (%)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Discount Rates-State (%)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Discount Rates-Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

STCR DATA INPUTS, PESSIMISTIC SCENARIO
25% ETC

PROFORMA FINANCIAL ANALYSIS — INPUT DATA--PESSIMISTIC SCENARIO
PROJECT DESCRIPTION: — SOLAR THERMAL CENTRAL RECEIVER

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
System Size (MW)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Operation Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Base Year Dollar	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982
Inflation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Plant Cost ($B/KW)	5191	5191	4692	4692	4692	4395	4185	4027	3846	3664	3525	3390	3261	3142	3022	2916	2814	2713	2620	2540
Interconnect Cost ($B/KW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction Interest (%)	15	14.5	14	13.5	13.5	13	13	12.5	12.5	12.5	12.5	11	10.5	10.5	10.5	10	10	10	10	10
Construction Period (Yrs)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Construction Cash Flows		-5	-4	-3	-2	-1	0													
Percent		0	0	0	10	45	45													
Owner's Costs (%)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Capital Cost Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Capacity Factor (%)	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Energy Sales (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Avoided Costs ($C/KWh)	.12	.125	.135	.145	.155	.165	.18	.195	.21	.225	.235									
Avoided Cost Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	.00	.00	.00																	
Contract Capacity (MW)	30	30	30	30	30	30	30	30	30	30	30									
Capacity Contract Price ($C/KW-yr)	80	85	90	95	101	107	114	121	128	135	143									
Capacity Cost Escalation (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenues ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenue Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Fuel Price ($B/MBTU)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel Price Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	6.00	7.06	7.06																	
Intermediate Heat Rate (BTU/KWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fixed O & M ($B/KW-yr)	45	44	43	42	41	40	39.5	39	38.5	38	37.5	37	36.5	36.5	36	35.5	35	35	35	35
Variable O & M (MillsB/KWh)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O & M Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Management Fees ($1000C/yr)	100	100	100	100	100	100	100	100	100	100	100									
Syndication Fee (%)	8	8	8	8	8	8	8	8	8	8	8									
Lease Expenses ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Royalties (% of Rev)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales Tax (%, of 50% of PC)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Insurance Rate-Intermediary (%)	1	1	1	1	1	1	1	1	1	1										
Insurance Rate-Utility (%)	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50
Property Tax Rate (%)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Marginal Tax Rates-Intermediary																				
Federal (%)	50	50	50	50	50	50	50	50	50	50	50									
State (%)	11	11	11	11	11	11	11	11	11	11	11									
Marginal Tax Rates-Utility																				
Federal (%)	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
State (%)	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
Electricity Price ($B/KWh)	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
Electricity Price Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	6.93	6.93	6.93																	
Market Penetration	0	0	0	1	1	1	1	1	2	2	2	3	3	4	5	6	7	8	9	11
Market Penetration (cum.)	0	0	0	1	2	3	4	5	7	9	11	14	17	21	26	32	39	47	56	67

PROFORMA FINANCIAL ANALYSIS INPUT DATA--PESSIMISTIC SCENARIO
PROJECT DESCRIPTION: SOLAR THERMAL CENTRAL RECEIVER

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Project Period-Intermediary (yrs)	5	5	5	5	5	5	5	5	5	5	5									
Project Period-Utility (yrs)	25	25	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30
Financing-Intermediary																				
Risk (Equity) Rate (% AT)	24	23	22	21	20.5	20	19.5	19	18.5	18.5	18									
Debt Ratio (%)	0	0	0	24.5	25	29	32	36	39	42.5	44									
Loan Term (yrs)	15	15	15	15	15	15	15	15	15	15	15									
Loan Interest (%)	15	14.5	14	13.5	13.5	13	13	12.5	12.5	12.5	12.5									
Financing-Utility																				
Risk (Equity) Rate (% AT)	19	19	19	18.5	18.5	18.5	18	18	18	17.5	17.5	17.5	17	17	17	16.5	16.5	16.5	16.5	16.5
Debt Ratio (%)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Loan Term (yrs)	25	25	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30
Loan Interest (%)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Safe Rate of Return (% AT)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Cost of Capital (% AT)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Investment Tax Credit																				
Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
State (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Tax Credit																				
Federal (%)	25	25	25	25	25	25	25	25	25	25	25	0	0	0	0	0	0	0	0	0
State (%)	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation Period-Intermediary																				
Federal (Years)	5	5	5	5	5	5	5	5	5	5	5									
State (Years)	3	3	5	5	5	5	5	5	5	5	5									
Depreciation Base-Intermediary																				
Federal (%)	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5									
State (%)	75	75	100	100	100	100	100	100	100	100	100									
Depreciation Period-Utility																				
Federal (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
State (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Depreciation Base-Utility																				
Federal (Years)	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
State (Years)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Depreciation Schedules (%)

Year:	Federal 5 yr ACRS	Federal 15 yr ACRS	State 3 yr DD	State 5 yr S/L	State 15 yr S/L
0	15	0	0	0	0
1	22	5	66.7	20	6.67
2	21	10	22.2	20	6.67
3	21	9	11.1	20	6.67
4	21	8	0	20	6.67
5	0	7	0	20	6.67
6	0	7	0	0	6.67
7	0	6	0	0	6.67
8	0	6	0	0	6.67
9	0	6	0	0	6.67
10	0	6	0	0	6.67
11	0	6	0	0	6.67
12	0	6	0	0	6.67
13	0	6	0	0	6.67
14	0	6	0	0	6.67
15	0	6	0	0	6.67

Sales/Salvage Value ($/kW)	1500	1530	1561	1592	1624	1656	1689	1723	1757	1793	1828									
Capital Gains Tax-State (%)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Capital Gains Tax-Federal (%)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Discount Rates-State (%)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Discount Rates-Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

OIL-FIRED STEAM PLANT, DATA INPUT

PROFORMA FINANCIAL ANALYSIS INPUT DATA
PROJECT DESCRIPTION: RFO-FIRED POWER PLANT

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
System Size (MW)	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Operation Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Base Year Dollar	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982
Inflation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Plant Cost ($B/KW)	630	630	630	630	630	630	630	630	630	630	630	630	630	630	630	630	630	630	630	630
Interconnect Cost ($B/KW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction Interest (%)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Construction Period (Yrs)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Construction Cash Flows		-5	-4	-3	-2	-1	0													
Percent		0	0	8	30	35	27													
Owner's Costs (%)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Capital Cost Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Capacity Factor (%)	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Energy Sales (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Avoided Costs ($C/KWh)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Avoided Cost Escalation																				
Year Interval	1982	1985	1990																	
Percent Escalation	.00	.00	.00																	
Contract Capacity (MW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capacity Contract Price ($C/KW-yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capacity Cost Escalation (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenues ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Revenue Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Fuel Price ($B/MBTU)	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09
Fuel Price Escalation	Expected				Optimisitic				Pessimistic											
Year Interval	1982	1985	1990		1982	1985	1990		1982	1985	1990									
Percent Escalation	6.00	8.12	8.12		6.00	9.18	9.18		6.00	7.06	7.06									
Intermediate Heat Rate (BTU/KWh)	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600	9600
Fixed O & M ($B/KW-yr)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Variable O & M (MillsB/KWh)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
O & M Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Management Fees ($1000C/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syndication Fee (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Expenses ($1000B/yr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lease Escalation (%)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Royalties (% of Rev)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales Tax (%, of 50% of PC)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Insurance Rate-Utility (%)	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50
Property Tax Rate (%)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Marginal Tax Rates-Utility																				
Federal (%)	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
State (%)	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
Electricity Price ($B/KWh)	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
Electricity Price Escalation	Expected				Optimisitic				Pessimistic											
Year Interval	1982	1985	1990		1982	1985	1990		1982	1985	1990									
Percent Escalation	7.86	7.86	7.86		8.8	8.8	8.8		6.93	6.93	6.93									

PROFORMA FINANCIAL ANALYSIS INPUT DATA
PROJECT DESCRIPTION: RFO-FIRED POWER PLANT

Year of Plant Start-Up:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Project Period-Utility (yrs)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Financing-Utility																				
Risk (Equity) Rate (% AT)	19	19	19	18.5	18.5	18.5	18	18	18	17.5	17.5	17.5	17	17	17	16.5	16.5	16.5	16.5	16.5
Debt Ratio (%)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Loan Term (yrs)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Loan Interest (%)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Safe Rate of Return (% AT)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Cost of Capital (% AT)	12	12	12	12	11.5	11.5	11.5	11.5	11	11	11	11	10.5	10.5	10.5	10	10	10	10	10
Investment Tax Credit																				
Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
State (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Tax Credit																				
Federal (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
State (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation Period-Utility																				
Federal (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
State (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Depreciation Base-Utility																				
Federal (Years)	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
State (Years)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Depreciation Schedules (%)

Year:	Federal 15 yr ACRS	State 15 yr S/L
0	5	0
1	10	6.67
2	9	6.67
3	8	6.67
4	7	6.67
5	7	6.67
6	6	6.67
7	6	6.67
8	6	6.67
9	6	6.67
10	6	6.67
11	6	6.67
12	6	6.67
13	6	6.67
14	6	6.67
15	0	6.67

Sales/Salvage Value ($/KW)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital Gains Tax-State (%)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Capital Gains Tax-Federal (%)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Discount Rates-State (%)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Discount Rates-Federal (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

APPENDIX D

INTEGRATED COST AND FINANCIAL ANALYSIS

APPENDIX E

COMPARATIVE TAX REVENUE MATRICES

APPENDIX F

STCR OIL DISPLACEMENT MATRIX

Note: Contact author to obtain above appendices.

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P.O. Box 3999, MS87-63
Seattle, WA 98124
Attn: W. D. Beverly

California Energy Commission
1516 North Street
M/S40
Sacramento, CA 95814
Attn: A. Jenkins

El Paso Electric Company
P.O. Box 982
El Paso, TX 79946
Attn. J. E. Brown

Electric Power Research Institute
P.O. Box 10412
Palo Alto, CA 94303
Attn: E. DeMeo

Foster Wheeler Development Corporation
12 Peach Tree Hill Road
Livingston, NJ 07039
Attn: R. J. Zoschak

Garrett-AiResearch Mfg. Co.
2525 W. 190th Street
Torrance, CA 90509
Attn: M. Combs

G. A. Technologies
P. O. Box 85608
San Diego, CA 92138
Attn: G. Besenbruch

Georgia Institute of Technology
Atlanta, GA 30332
Attn: R. A. Cassanova

Gibbs and Hill, Inc.
393 Seventh Avenue
New York, NY 10001
Attn: R. Prieto

Hy-Two Research
60 White Barn Drive
Pleasant View, UT 84404
Attn: M. G. Bowman

IEA/SSPS Project
Apartado 649
Almeria, Spain
Attn: C. Arano

Los Angeles Department of Water and Power
111 North Hope St.
Los Angeles, CA 90051
Attn: D. Chu

McDonnell Douglas Astronautics Company
5301 Bolsa Avenue
Huntington Beach, CA 92647
Attn: R. L. Gervais

Olin Chemical Company
120 Long Ridge Road
Stamford, CT 06904
Attn: L. C. Firouccio

Pacific Gas and Electric Company (3)
3400 Crow Canyon Road
San Ramon, CA 94526
Attn: G. Braun
J. Iannucci
C. Weinberg

Pacific Northwest Laboratory (2)
P. O. Box 999
Richland, WA 99352
Attn: K. Drost
T. Williams

The Ralph M. Parsons Company
100 West St.
Pasadena, CA 91124
Attn: N. W. Snyder

Polydyne, Inc. (20)
1900 S. Norfolk St., Suite 209
San Mateo, CA 94403
Attn: P. B. Bos

Resource Analysis International
c/o P.F.R. Engineering
6151 W. Century Blvd.
Los Angeles, CA 90045
Attn: T. Rosenman

Rockwell International
Energy Systems Group
8900 De Soto Avenue
Canoga Park, CA 91304
Attn: T. Springer

Rockwell International
Rocketdyne Division
6633 Canoga Avenue
Canoga Park, CA 91304
Attn: J. M. Friefeld

San Diego Gas and Electric Company
Mechanical Engineering
P.O. Box 1831
San Diego, CA 92112
Attn: R. E. Potthoff

Solar Energy Industries Association
1717 Massachusetts Ave., N.W.
Suite 503
Washington, D.C. 20035
Attn: C. LaPorta

Solar Energy Research Institute (5)
1617 Cole Boulevard
Golden, CO 80401
Attn: F. A. Black
B. Gupta
D. Johnson
K. Olsen
J. Thornton

Solar Power Engineering Co.
P. O. Box 91
Morrison, CO 80465
Attn: H. C. Wroton

Southern California Edison
P.O. Box 800
Rosemead, CA 92807
Attn: J. N. Reeves

Spectra Technology, Inc.
2755 Northrup Way
Bellevue, WA 98004
Attn: R. R. Taussig

Stearns Catalytic Corp.
P.O. Box 5888
Denver, CO 80217
Attn: W. R. Lang

University of California
Lawrence Livermore Natl. Lab.
Livermore, CA 94550
Attn: O. Walton, L-200

E. H. Beckner, 6000; Attn: V. Dugan, 6200

D. G. Schueler, 6220; Attn: J. V. Otts, 6222
J. A. Leonard, 6227

R. S. Claassen, 8000; Attn: E. E. Ives, 8100
A. N. Blackwell, 8200
D. L. Hartley, 8300

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