CHAPTER 5

Key **Issues in the** Prototype Program

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Introduction

During the Program's designn phase and at the time of the lease sales, it was widely assumed by Government and industry spokesmen that shale oil production was close to commercial feasibility and that commercialization efforts would commence once industry was allowed access to rich oil shale deposits on Federal lands. Thererefore, the Program was focused solely on the leasing issue. I t lacked some of the features of Secretary Udall's program. such as consolidating scattcred private holdings and clearing disputed land titles. It also did not provide supporting R&D to resolve the technical problems that were apparent at the time and, more importantly, to provide expertise when new problems were encountered on the tracts. All of these efforts and capabilities rested in other branches of the Department of the Interior (DOI) or in other Federal agencies.

These deficiencies were partially compensated for by other aspects of thc Program such as the 'involvement of State government and public in the design and subsequent phases, the leasing terms, and the provisions for environmental protection. In addition it was intended that the Program change over time as knowledge was gained and problems encountered. Many such problems arose as the Program proceeded. These, along with the uncertainties they engendered, slowed the Program's progress, disrupted the original development schedules, and raised serious doubts about continuation of the entire effort. This chapter summarizes some of the technological, political, legal, environmental, and economic issues that surrounded the Program, and describes their effects on its schedules and status.

Technological Issues

The problems with low rock strength that were encountered on tract C-b led the lessees to adopt modified in situ (MIS) processing; development schedules were delayed by at least a year as a result.. Technologica1 uncertainties were also associated with MIS because it had not been tested in shales similar to those found on C-b. Similar complications arose when Rio Blaco decided to switch from open pit mining and above-ground retorting to MIS.

Process development work for the MIS technique includes partial Government funding of a retort development program on Occidental's land along Logan Wash in Colorado. In Phase I of this project, the Department of Energy (DOE) provided $14 million for comparing two retort designs that were being considered for commercial-scale operations on tract C-b. Oil recoverv was poor from the first test retort, and a struct ural failure occurred in the second retort soon n after the rubble was ignited. Operation of the second retort (the sixth that Occidental has created a t Logan Wash) has been completed and data have been acquired, However, MIS appears to have some technological problems. * To expedite the development of the first commercial-scale retort, the second design will be further tested in Phase II, also at Logan Wash. The Government is contributing $24 million (52 percent) of the Phase 11 cost.

The tract C-a lessees are also in the process-development stage as a result of their adoption of MIS methods. As mentioned previously, this tract original MIS concept was

* The problems with MIS and the other developement technologies are discussed in ch. 5 of vol.I

based on technology developed by the Lawrence Livermore Laboratory. It comprises a mathematical model supported by small-scale experiments in simulated in situ retorts. Rio Blanco had planned to advance its status with a modular retort development program on tract C-a. Now that Rio Blanco has access to Occidental's MIS technology, it should be possible to accelerate the program. Shaft sinking in preparation for the modular program has been completed, However, problems with large inflows of ground water necessitated modifying the mining plan and delayed the ignition of the first retort. The possibility of testing aboveground processes also exists with the announcement that Rio Blanco has obtained a license to investigate the use of Lurgi-Ruhrgas retorts for the mined portion of the shale.

It should be noted that DOE—and its predecessors the Federal Energy Administration and the Energy Research and Development Administration—has been the primary Federal agency stimulating private industry's development of commercial oil shale technologies. DOE has, and continues to finance a variety of mining and processing technologies. Some projects are of an R&D nature; others are specifically aimed at commercialization. * Certain goals of the Prototype Program, therefore, are being supported outside the formal framework of the Program,

*See vol. I, ch. **5, p. 172** for a description of DOE'S programs.

Environmental Issues

Oil shale development, and the Prototype program in particular, is permeated with highly controversial issues, because the physical and social environments will be altered. Careful planning and numerous safeguards will be needed to confine the disruptions to acceptable levels. This reality was acknowledged by the Program's authors and by the tract lessees whose development work is governed by environmental statutes and who state support for protecting the environment. The developers are also concerned about environmental standards that could preclude profitable projects.

To the proponents of oil shale development, the potential economic, social, and environmental benefits appear to outweigh the disadvantages. They maintain that the only way to obtain the benefits is to proceed with development while concurrently working on control and restoration techniques to minimize the ecological damage. They further maintain that sufficient work has been done with respect to spent shale disposal, airborne emissions, and land restoration, and that there is adequate information to justify taking the next step.

Oil shale's critics, on the other hand, maintain that there are more attractive energy sources than shale oil, that critical environmental information is lacking, and that it will be very difficult, if not impossible, to develop oil shale without unacceptable environmental damage. They further maintain that commercial-scale facilities should not be permitted until there are better answers to the technological and environmental questions. They generally approve of Government support of research activities aimed at answering these questions. However, they view as inappropriate any Government actions that are directed at near-term commercialization, land exchanges for the purpose of creating commercial-size tracts, attempts to lease additional tracts within the Prototype Program, large-scale subsidy programs, offtract waste disposal, increases in lease tract size to encourage larger scale operations, and suspensions of leasing provisions in an attempt to avoid due diligence requirements.

Proponents and critics also disagree about the overall purpose of the Prototype Program, at least with respect to its goal of environmental protection. The Secretary of the Inte-

rior, in his decision statement regarding the Program, identified as one of its major goals:[1]

> To insure the environmental integrity of the affected areas and, concurrently, define, describe, and develop a full range of environmental safeguards and restoration techniques that can reasonably be incorporated into the planning of a mature oil shale industry.

This statement has led to much controversy. For example, the phrase "insure integrity'* could be interpreted to imply preservation of the existing environment. This would preclude oil shale development on any scale as well as many other activities within or near the affected areas. Another interpretation would imply that adverse impacts will be minimized and mitigated and that some form of ecological balance, although not necessarily the original one, will be established on completion of the development work. This interpretation would allow development if undertaken in recognition of environmental requirements and regulations. Critics tend to prefer the former interpretation; proponents the latter. The phrase "that can reasonably be incorporated, " similarly allows differing interpretations.

In 1976, a DOI official restated the Department's philosophy regarding the Prototype Program as follows:'

> The Department of the Interior has not changed its views on the importance of our oil shale resources and the value of the Prototype Program to learn how best to develop this resource under strict controls. In announcing suspension of operations on August 20, 1976, the Secretary stated that "We have not relinquished our goal of demonstrating the feasibility of shale oil production on a commercial basis. " The Department does not consider the problems facing oil shale development to be insurmountable either individually or in aggregate.

Some environmental conservation groups have identified these and other aspects of the Program as basic inconsistencies. They maintain that commercialization cannot proceed, nor can a base for such commercialization be established, while maintaining environmental integrity. Although DOI incorporated environmental protection provisions into the tract leases, critics have expressed concern that these provisions are not adequate to prevent damage to the physical and social environments. They argue that the Program should have been structured as an R&D effort, rather than as the first step towards a commercial oil shale industry. Some concerns over the evolution of the Program were expressed by a representative of the Colorado Open Space Council in 1977 testimony before the Senate:

> The prototype program is still active but it is a much different beast than the limited, experimental program as advertised. Serious problems have plagued the program since the final design was announced in November 1973. We trace these problems to the continuous efforts to re-define and/or expand the program and the lack of specific criteria by which to judge the success or failure of the program, to govern the workings of the program and time limits. These efforts have been made by the lessees, the Department of Interior and other Federal agencies, and by Congress. In other words, instead of running a carefully controlled and defined experiment, whose results of success or failure would be equally informative, it has been an attempt to make it succeed by almost any means . . . I would like to briefly list the items: One is suspension of bonus payments due on the oil shale leases, . . . the attempt to add two more lease tracts supposedly for in situ development to the prototype program, land trades that have been proposed, subsidy programs that have been proposed, and off-site dumping.

DOI has not accepted the definition of the Prototype Program as an R&D project, and has continued to act to support facilitating development of a base for an oil shale industry. Officials emphasize that one of the Program's major objectives was to develop

*The statement also critixized DOI's actions with respect to preparation of an environmental impact statement (EIS) for the Colony project, These actions were taken outside of the Program and with not he discussed here. The additional leases proposed for in situ developement are discussed later

environmental safeguards and restoration techniques in conjunction with establishing an industrial base. They maintain that only with such a base can environmental impacts be determined, and mitigation procedures verified or disproved.

Along with their perception of inconsistent goals, critics of the Prototype Program have stated that the Area oil Shale Supervisor (DOI's control official for the lease tracts) is forced to act in the dual role of promoter and regulator and that these roles conflict to the detriment of maintaining the environment. On the one hand, the Supervisor is responsible for advancing the Program in a timely manner. On the other hand, he is required to ensure that regulatory laws are obeyed, even though adherence may disrupt or delay activ-it ies on the lease tracts, Critics have expressed the concern that, with his dual responsibility, the Supervisor may choose the promoter role too often.

Some environmental activist groups also claim that they were improperly excluded from the design phase of the Prototype Program, and that they have subsequently been excluded from the decisionmnaking processes that have shaped its evolution. In particular, they claim that the Oil Shale Environmental Advisory Panel, which was established by DOI to review the program's actions and advise the Supervisor on key environmental issues, is not truly a public body. Concern has been expressed that the panel included too many representatives of Government agencies and interest groups that may have a pro-development bias. In this regard, 3 of the 30 members of the original panel were associated with environmental activist groups. The panel was recently reconstituted, and now comprises 26 representatives of the following organizations:

- the Bureau of Land Management;
- the U.S. Geological Survey:
- the Bureau of Mines;
- the Fish and Wildlife Service;
- the Water Power Resources Service (formerly the Bureau of Reclamation);
- the Bureau of Indian Affairs:
- the Solicitor General's Office of DOI;
- the Environmental Protection Agency (EPA);
- one from each of certain Federal executive branch departments;*
- two each from the State legislatures and agencies of Colorado, Utah, and Wyoming, to be designated by the respective Governors;**
- one each from the regional planning commissions or boards of supervisors in areas of Colorado and Utah that include the lease tracts; and
- four to be designated by the Secretary of the Interior including two persons active in environmental or other public interest matters and two persons active in industry or energy matters.***

Differences both in perception and in value judgments have made environmental issues the most highly polarized of oil shale's many issue areas. Disputes will no doubt persist for the duration of the Prototype Program, and will certainly be encountered in any other commercialization programs. It is anticipated that environmental conservation groups will continue to monitor activities on and off the lease tracts, and will appeal to the courts for relief when they feel that environmental statutes are being violated. To date, appeals to the courts have not significantly affected developer schedules.

Just as some of the technological goals of the program are being met by DOE, some of the environmental ones are being met by EPA. An annotated listing of the Agency's research can be found in EPA's Program Status Report, "Oil Shale 1979 Update. "[4] This publication

*The May 2-3, 1979, panel meeting was attended by representatives of the Departments of Transportation; Energy; Housing and Urban Developent; and Health, Education, and Welfare.

**The May 2-3, 1979, panel meeting was attended by representatives of the Colorado Department of Health, the Colorado Department of Natural Resources, the Utah Division of State Lands, and the Utah legislature.

***The May 2-3, 1979, panel meeting was attended by representatives of the Friends of the Earth and the Institute for Environmental Studies of the University of Washington, and by two consultants to industry.

provides details of EPA's multimillion-dollar funding of oil shale environmental R& D.* Like the support from DOE, this work falls outside The specific framework of the Prototype Program.

*Many of these efforts are discussed in Ch.8 of vol.1.

Legal and Political Issues

Legal and political uncertainties have pervaded the Prototype Program since its inception, One of the more complex legal issues was associated with the ownership of the Utah lease tracts. The suit over the in-lieu lands has now been settled in favor of the Federal Government. The issue of unpatented mining claims, however, appears to be further clouded. The Court decided in favor of the owners of unpatented mining claims in Colorado, and if the decision is applied to unpatented claims overlying the Utah lease tracts, ownership of the tracts could revert to private parties, Continuation of tract development would then depend on negotiation with the new owners.

'The magnitude of the potential effects of the validation of other pre-1920 claims will depend on their number and location. Between 36,000 and 40,000 oil shale placer claims were located before 1920 in the tristate region. Between 1920 and 1960, when DOI stopped issuing patents, 2,326 claims covering 349,088 acres were patented, In 1968, based on a detailed analysis in Colorado and on old records and a preliminary review in Utah and Wyoming, DOI estimated that there were approximately 36,000 unpatented shale claims remaining. There were also about 16,500 unpatented metalliferous claims that were located mostly during a claims rush in 1966-67, just before withdrawal of oil shale land from any further locations of any kind of mining claims. Most, if not all, of these metalliferous claims have been canceled for lack of discovery or failure to satisfy other requirements of the Mining Law See table 3.

The pre-1 920 shale claims, according to the DOI estimates, encompassed approximately 5 million acres. This is roughly two-thirds of the Federal and half of the total land with commercial potential. (See table 4), In Colorado, the estimated 400,000 acres of unpatented claims generally are located along the southern and western edges of the Piceance basin. The center of the basin, where the richest shale lies and the present Prototype leases are located, is almost entirely Federal land for the most part free of pre-1920 claims. The claims in Colorado encompass only about one-fourth of the Federal total acreage. In Utah and Wyoming, however, over two-thirds of the Federal land had overlying unpatented claims, according to the 1968 DOI estimates, although it has been more recently reported that no pre-1920 claims remain in Wyoming.[5]

More accurate and timely information about the number and location of the unpat-

Table **3.–Mining Claims in the Tristate Oil Shale Region, 1968**

	Number of claims			
	Colorado	Utah	Wyoming	Total
Pre 1920011 shale	9000	15,000	12000	36,000
Post 192(I metalllferous				
Dawsonite	3,450	1,750	–	*5,200*
Platinum	2 150			*2,150*
Gold gilsonite uranium others	600	3550	5000	*9150*
Subtotal metalilferous	6200	5,300	5,000	16500
Total claims	15.200	20 300	17000	52. 500

SOURCE: U.S. Department of the Interior, *Prospects for Oil Shale Development: Colorado, Utah, and Wyoming*, 1968

Table 4.–Nature of Claims on Oil Shale Lands With Commercial Potential, 1968
(thousands of acres, estimated)

	Colorado	Utah	Wyoming	Total
Land with commercial potential				
Total	*1,800*	*4,900*	4,300	11,000
Federally owned	*1,420*	*3,780*	2,670	7,870
Percent of total	*79'YO*	*77YO*	62'Yo	72%
Non-Federal oil shale land				
011 shale patents	*260*	90		350
Indian, State, homestead, etc	*140*	2,610		2,750
Subtotal	*400*	1,100	1,600	3,100
Percent of total land	*22%*	*22%*	37?0	28Y0
Unpatented claims				
Pre-1966 (almost all 011 shale)	*400*	*2,600*	2<200'	*5,200*
Percent of Federal land	*28'Yo*	*69Y0*	82%	*66Y0*
Percent of total	*22%*	*53Y0*	51 Yo	*47'YO*
1966-67 (all metalllferous)b	*700*	*400*	400	1,500
Percent of Federal land	*49Y0*	11%	15Y0	19Y0
Percent of total land	39%	8Y0	9%	1470
Total claims	1,100	3,000	2,600	6,700
Percent of Federal land	77'0/0	79%	97Y0	85%
Percent of total land	617,	61 ~,	60Y0	61'h
Federal land without unpatented claims	320	780	70	1,170
Percent of Federal land	23Y0	21 ?0	3%	1570
Percent of total land	18'Yo	16'?/0	2Y0	11 "/0

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ented claims should be available soon, Section 314 of The Federal Land Policy and Management Act (FLPMA)[6] requires, for the first time, that mining claims be recorded with the Federal Government. The owner of an unpatented claim must have filed before October 22, 1979 (and must file before December 31 of each subsequent year), with the appropriate State land office, either a notice of intention to hold the claim or an affidavit of any assessment work that was performed. A copy of the notice or affidavit, including a description of the location, must also be filed with the Bureau of Land Management in DOI, With this information, it will be possible to determine the possible effects of any future validation of unpatented shale claims.

Two issues related to environmental protection have prompted legal action. The first case began on December 21, 1976, when the Environmental Defense Fund, the Colorado Open Space Council, the Friends of the Earth, and the Denver Audubon Society filed a suit against DOI that questioned DOI'S authority to grant suspensions of lease terms. The case was dismissed without prejudice because of improper jurisdiction, and because indispensable parties (the lessees) were not included among the defendants,

The second case opened on December 6, 1977, when the Environmental Defense Fund, the Colorado Open Space Council, and the Friends of the Earth filed suit in the U.S. District Court in Denver seeking an injunction against further development of tracts C-a and C-b until site-specific EISS for each of the tracts were prepared and processed according to the procedures established under the National Environmental Policy Act (NEPA). The defendants were the Secretary of the Interior, the Area Oil Shale Supervisor of the U.S. Geological Survey, the director of the Colorado State Office of the Bureau of Land Management, Gulf Oil Corp. and Standard Oil Co. of Indiana (the C-a lessees), and Ashland Oil Co. and Occidental Oil Shale, Inc. (the C-b lessees at that time).

The plaintiffs maintained that NEPA had been circumvented in that the development methods proposed for both tracts had not

been described and their effects evaluated in the 1973 EIS which, according to the plaintiffs, only evaluated the leasing of lands, Thus, a new site-specific EIS was required for each tract. Approval of the detailed development plans (DDPs) in the absence of such analyses was therefore unlawful. According to the plaintiffs, the sole issue in the litigation was the adequacy and the legality of the procedures followed in preparing, reviewing, and approving the DDPs, The plaintiffs' motion for summary judgment stated:[7]

> Specifically, the plaintiffs contend that the federal defendants must prepare and circulate an environmental impact statement ("EIS") prior to acting upon detailed development plans (" DDPs'") submitted by the lessees of federal prototype oil shale tracts C-a and C-b and the numerous associated right-of-way applications across federal lands .... It is crucial to note what plaintiffs' motion does not seek. It does not seek to terminate the prototype oil shale leasing program. It does not seek to force the lessees to relinquish their leases. It seeks only to have this court require the federal defendants to prepare an EIS which analyzes the serious environmental and human health risks posed by planned operations on the federal oil shale tracts and by the associated rights-of-way prior to approving these plans.

In response to this motion and the plaintiffs' extensive exhibits, the defendants submitted a memorandum and exhibits that included the 1973 EIS, the modified DDPs for the tracts, reports of public meetings held in regard to the DDPs, and other supporting reports and correspondence. Judge Finesilver reviewed the various submissions and other information for several months. On August 28, 1978, he delivered a bench ruling upon cross motions for summary judgment. The record includes the following remarks:[8]

> In summary, we have found that the agency decisions made in ' 77 and '78 which determined that the DDPs and several rights-of-way applications could be approved without the preparation of supplemental EIS and made in full compliance with procedures mandated by NEPA, those decisions cannot be set aside by the Court, nor is there sufficient showing to warrant this Court in reversing that action , . . We are of the view that there has been compliance by the Defendant, the Federal Defendants in this case within the spirit and tenor of NEPA within the parameters of the EIS . . . That there is no viable action that has been substantiated that would lie against the Defendants in this case, The spirit and tenor of NEPA has continued throughout the implementation and operation of the leases . . . We are of the view further that the compliance of the Federal officials in this case has not been the minimum mandated by NEPA or Federal regulations, but it has gone above and beyond what we can describe as the minimal standards have (sic) that the compliance of activity by the Federal Defendants has been extensive in this project . . . Appropriate judgment shall enter in favor of the Defendants, and each of them individually against the Plaintiffs.

The plaintiffs appealed, and Judge Finesilver's decision was affirmed by a three-judge panel of the Ioth Circuit Court of Appeals in April of 1980. A petition for a rehearing en banc was denied. Plaintiffs had not decided as of this writing, whether to appeal further.

Changes in the interpretation of environmental regulations have had immediate implications both for the Prototype Program and for other developments that were being considered for the oil shale region. An example is the questionable significance of the high background levels of particulate, hydrocarbons, and ozone that were measured on the lease tracts during the baseline monitoring programs, This potential problem was identified by the lessees as a justification for the suspensions in 1976. The ruling of EPA's Regional Administrator, which was based on analysis of the origin of ozone and hydrocarbons and the properties of rural fugitive dust, appeared to remove the impediment to development, allowing a resumption of activities late in 1977.

However, on March 3, 1978, EPA headquarters in Washington declared that Rio Blanco County (in which tracts C-a and C-b were located] and the southern half of Uintah

County (including tracts U-a and U-b) were not in compliance with air quality standards because of high ozone concentrations." This ruling was a reversal of EPA's position in mid-1977. It restored the impediment because major construction, that would have increased the extent of the violation, would be banned. The tract C-a lessees, Occidental Oil Shale, and Rio Blanco County subsequently petitioned the Circuit Court of Appeals to review EPA's latest decision,[10-12] 1. The petitions were filed on April 4, 1978. On September 11, before the court could rule on the merits of the case, EPA again reversed positions and designated the areas as ones that "cannot be classified.[13]

Should this most recent decision prove to be the final one, then the issue is settled and oil shale plants would be allowed in the area if their control systems can be designed and operated in compliance with other air quality standards. However, some uncertainty lingers. In a letter dated November 8, 1978, to the Area Oil Shale Supervisor, an EPA official stated:[14]

> In my opinion the , ., settlement provides additional, but probably not complete, certainty that development of an oil shale industry will not be significantly constrained by the existing ozone concentrations.

Other uncertainties are associated with forthcoming PSD regulations for other air pollutants, and for visibility maintenance, as discussed in chapter 8 of volume I.

The Program has also been affected by political difficulties, partly because of the manner in which it was initiated and partly because of shifts in the political environment during its implementation, Like the 1968 leasing attempt, DOI developed the Program within the provisions of the Mineral Leasing Act of 1920, although it also considered more recent legislation. The lease terms were similar to those developed for exploring and extracting petroleum resources on the Outer Continental Shelf, Direct subsidies and other aspects that would have required congressional approvaI were avoided, and additional enabling legislation was not needed,

Thus, the Program was a product of the executive branch of the Federal Government. It was strongly supported by individual Senators and Representatives, especially from the oil shale States, but it did not enjoy majority support in the Congress, and efforts to obtain congressional approval of legislation that would have benefited the lessees were not successful. Examples include the failure of DOI'S attempt to obtain secretarial discretion in granting use of off tract lands for waste disposal and for facility siting and the subsequent passage of FLPMA's restrictions, the rejection of a proposal to use Federal land for housing areas in the town of Rangely, and the denial of loan guarantees and other subsidies for shale oil and other synthetic fuels. These actions conveyed, to the lessees, an impression of congressional hostility or at least disinterest, and contributed to concerns about the long-term economic feasibility of oil shale development.

Economic Issues

In his 1973 decision statement on the Prototype Program, Secretary Morton provided the following comments on economic aspects of oil shale development:

> Private sector participation in the design of the program, the provisions incorporated in the lease to encourage timely development, and of course, the rapidly rising price of crude oil, all suggest convincingly that there is high interest in the prototype program.
>
> But uncertainty in estimates about the cost of production of shale oil is very great, and for some technologies, estimates are quite pessimistic, The prototype offering of six sites was planned to allow trial of alternate methods of extraction,

> However, the best incentive we have to offer is the availability. at a fair return to the public. of the rich shale lands in the public domain. Therefore, I do not believe that under present circumstances a subsidy is either wise or necessary for this program.

At the time, conditions certainly appeared favorable for oil shale development, which seemed to offer secure resources to those oil companies that had previously relied on supplies from the Middle East, The recent tripling of world oil prices seemed to assure the profitability y of oil shale projects.

However, with the preparation of detailed engineering plans for specific oil shale plants, construction cost estimates soon began a precipitous rise. With rising costs, and with the emergence or intensification of risks and problems that were not foreseen in 1974, the attractiveness of oil shale projects declined. Rising project costs were most obvious with above-ground retorting technologies in the early years of the Program, perhaps because these technologies were sufficiently advanced to permit reasonably accurate cost estimates. However, cost escalations have since affected the relatively new concept of MIS processing, which in 1976 was claimed to be a much less costly approach to shale oil extraction. In March 1976, the DDP for tract C-b estimated a capital cost of $921 million for a 50,000 bbl/d above-ground retorting facility. In February 1977, the modified plan estimated a cost of $443 million for a 57,000-bbl/d facility based on Occidental's MIS technology. It was predicted that the project would reach commercial levels of production by 1983. [16] In April 1978, a spokesman for Occidental stated that cost estimates had risen to the range of $650 million to $750 million, 17 More recent estimates indicate a cost of at least $1 billion, and that commercial-scale operation is scheduled to begin in 1986. '[18]

The 1976 estimate corresponded to a unit investment of $7,750/bbl of daily production, the April 1978 estimate about $12,000 per daily bbl, and the more recent estimate about $17,500 per daily bbl. For comparison, recent estimates for TOSCO 11 above-ground retorts indicate an investment of about $25,000 per daily bbl. The economic advantage of the MIS approach has therefore decreased significantly.

A representative of Tosco has identified the major constraints on oil shale development as: [19]

1. risks inherent in scale-up of unproven processing technologies.
2. risks of noncompliance with existing environmental regulations,
3. risks of more severe regulations in the future, and
4, risks that the value of shale oil will be regulated to below its fair market value in comparison with imported crude.

Risks in the first category are real and will remain so until the first commercial-scale retorts are built and operated. With respect to the second category, current State and Federal standards do allow initital levels of development on all lease tracts and on many privately owned sites. Risks in the third category are real because future standards might be imposed that could prohibit development of large-scale plants, With respect to the fourth category, shale oil producers can expect world oil prices for their product. Those prices are high, and most financial analysts expect them to rise further. However, as described in chapter 6 of volume 1, the future price of world oil is uncertain, It could be depressed in the future to below the recovery cost of shale oil. Therefore, although concessions have been made to oil shale development, risks remain that raise questions about the willingness of energy companies and financial institutions to invest in a capital-intensive, long-term project whose success largely rests with unproven technology,

Chapter 5 References

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