9-16-1986

# A Simple Solution for the Thorny Problem of Park Protection: Focusing on Alternatives

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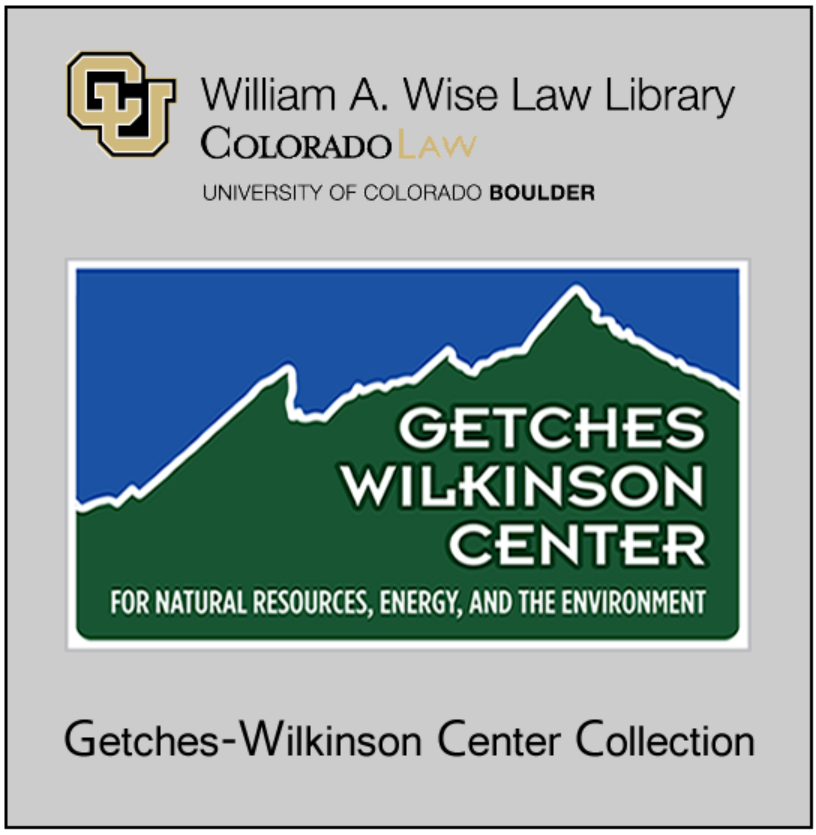


David Mastbaum, *A Simple Solution for the Thorny Problem of Park Protection: Focusing on Alternatives*, *in* EXTERNAL DEVELOPMENT AFFECTING THE NATIONAL PARKS: PRESERVING "THE BEST IDEA WE EVER HAD" (Natural Res. Law Ctr., Univ. of Colo. Sch. of Law 1986).

# A SIMPLE SOLUTION FOR THE THORNY PROBLEM OF PARK PROTECTION: FOCUSING ON ALTERNATIVES

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External Development Affecting the National Parks:
Preserving "The Best Idea We Ever Had"

Natural Resources Law Center
University of Colorado Law School

September 14-16, 1986
The Aspen Lodge
Estes Park, Colorado

## I. INTRODUCTION

The important natural and cultural values of virtually every unit of the National Park System are threatened by proposed activities on public and private lands beyond park boundaries. E.g., National Park Service, Dept. of the Interior, State of the Parks 1980: A Report to Congress (May, 1980) (State of the Parks); Cahn, Islands in a Storm: Our National Parks (Five-part series in the Christian Science Monitor beginning June 14, 1982, reprinted in Oversight on the Current State of the National Park System Before the Subcomm. on Public Lands and National Parks of the House Comm. on Interior and Insular Affairs, 97th Cong., 2nd Sess. 856-74 (1982). These "threats" include, inter alia, power plants, mining operations, timbering, road and utility corridor development, and subdivision construction. Id.

The Park Service has ample authority to protect the parks from incompatible development on federal lands under its organic act, 16 U.S.C. § 1 et. seq., and the National Environmental Policy Act of 1969, 42 U.S.C. § 4231 et seq., and from development on non-federal lands under the organic act when read together with the Constitution's Commerce Clause, U.S. Const. art. I, § 8, cl. 3, and Property Clause. U.S. Const. art IV, § 3, cl. 2 and the cases interpreting these constitutional provisions.

The crux of the problem is to develop an effective (politically realistic and economically sound) mechanism to ensure that the Park Service can protect the parks from external

development which poses a significant threat to park values and would impair the visitor experience. A recent study by the Conservation Foundation points out:

> ...available tools are often insufficient to protect the parks. The Park Service concedes that "external threats, though generally the most serious, are receiving little attention...because they are considered more complex and much more difficult to deal with." The serious impacts of projects outside the parks indicate that more must be done.
>
> Conservation Foundation, National Parks for a New Generation--Visions, Realities, Prospects 143 (1985) (Footnote ommitted).

Available tools are, indeed, inadequate to protect the parks from external development, as the Conservation Foundation suggests, but not because the Park Service does not have the authority to protect the parks, but because of a lack of imagination and aggressive stewardship on the part of the Park Service in the face of hostility from other entities. When a unit of the National Park system is threatened by external development, the Park Service must explore and develop alternatives to the proposal which could fulfill the needs the project is designed to meet without threatening park values. Practically, this is the only way to ensure that electric generation, mineral extraction, or high-level nuclear waste storage, which are almost always touted as essential to the national interest and critical to the local economy, will not override conflicting park values, for example, based upon aesthetics, recreation or solitude. Moreover, to the extent this approach is linked to economic efficien-

cy, it could minimize the pitfalls, failures, and increasing hostility, especially in the western states, to government control and regulation. After all, who can argue with protecting our parks and at the same time using our natural resources in the most economically efficient way? Many park-threatening activities are not the most efficient economically, but rather the result of historic business patterns, subsidies, and long-standing, but no longer appropriate governmental preferences which continue, for the most part, because of inertia. The most effective way to change government and private sector inertia is to force these entities to take a look at other ways of doing business by considering alternatives. This would include a fair financial comparison between the proponent's project and feasible alternatives.

Since most park-threatening development is capital intensive, such as power plants and large dams, alternatives such as conservation and increased efficiency will not only be more benign environmentally, but, for the most part, economically superior based on both private investment criteria and public resource utilization. This is particularly true when externalities, i.e., degradation of natural resources not captured in the market, are taken into consideration, and the enormous economic benefits derived from tourism in the parks are included in the analysis.

In those few cases where the economics of a park-threatening project may be superior to the alternatives, the limited govern-

ment and private money earmarked for park protection could be allocated to recapture leases, purchase non-federal land or development rights. This approach recognizes that people are willing to pay to protect the natural and cultural values of the parks. Of course, under certain circumstances if a proposed project would substantially harm park values and impair the visitor experience, to the extent it could be called a nuisance, compensation may not be necessary.

This proposal, relying on the use of the market, for the most part, to protect the parks, is similar to proposed reforms in allocating western water rights. See S. Williams, A Market-Based Approach to Water Rights: Evaluating Colorado's Water System, in Tradition, Innovation, and Conflict: Perspectives on Colorado Water Law (to be published by the Natural Resources Law Center, University of Colorado Law School--Fall 1986). Judge Williams' suggestions for protecting instream uses, including "the aesthetic contribution of water flowing freely in a stream" is directly applicable to protecting the natural and cultural values of the parks.

The first step in this process is to determine the significant natural and/or cultural values a park is intended to protect in order to evaluate whether a proposal may jeopardize a park and impair the visitor experience. Many of the statutes and proclamations establishing the parks contain information which will be useful in establishing these values. Moreover, numerous publications by the Park Service and others provide detailed information

on the significant natural and cultural values of each park.

Alternatives to a project which could harm park values would then be explored. For example, as an alternative to a large power plant, conservation, cogeneration, and small-hydro, could be considered in combination.

The Park Service has recognized the need to develop this kind of approach:

> The National Park Service cannot remain on the sidelines and expect to reject a proposed project merely because it poses a potential threat to park resources or park values. As Federal Land Managers, we must be prepared to identify viable alternatives in those situations where proposed development activity would damage the park.
>
> State of the Parks, supra at 35.

Professor Sax has also suggested this type of approach in his analysis of the internal management practices of the Park Service:

> If the goal is to encourage contemplative recreation in the parks, the way to do it is diligently to look for ways to meet other recreational demands more effectively at existing sites, and to scrutinize more carefully claims of need and demand. The strategy is to increase the burden that there is no alternative except the use of the parklands....
>
> J. Sax, Mountains Without Handrails: Reflections on the National Parks 66-67 (1980). (emphasis added).

There are historical precedents which demonstrate the importance of developing and promoting alternatives to avoid harm to the parks. Mastbaum, No Park is An Island: A Simple Solution for the Thorny Problem of Park Protection (see Appendix A). The

efforts of the Park Service to develop alternatives to the logging of Sitka spruce in Olympic National Park during World War II are described in National Park Service War Work (Dec. 7, 1941 to June 30, 1944), relevant portions of which are found in Appendix B. The alternative scenario developed by the Environmental Defense Fund to protect Bryce and Zion National Parks from the massive Allen-Warner Valley Energy Project is set out in Appendix C.

A clearly defined requirement to consider alternatives when important park values are threatened, hopefully, would lead to increased cooperation between the Park Service and other federal agencies, state and local governments, and commercial interests. These entities could jointly seek alternatives that would meet the needs the park-threatening development was intended to satisfy, while avoiding harm to the parks. This type of cooperation is virtually nonexistent today, given competing and conflicting responsibilities and goals. See, e.g., Keiter, On Protecting the National Parks From the External Threats Dilemma, 20 Land and Water L. Rev. 355, 394 n. 233 (1985).

As stated above, the obligation of the Park Service to consider alternatives should not be limited to development on federal lands or activity subject to a federal license or permit, but also development on state or private land. In the latter case, alternatives could include: 1) land exchanges; 2) zoning; 3) purchase; 4) purchase of development rights; 5) condemnation; and 6) nuisance-type litigation.

While the Park Service has ample legal authority, indeed the responsibility, to adopt a program to consider alternatives to park-threatening development, political realities suggest the need for legislation that requires the program suggested.

The following areas are discussed below: 1) the authority and responsibility of the Park Service under its organic act; 2) establishing the significant natural and cultural values a park is intended to protect; 3) consideration of alternatives under the National Environmental Policy Act; and, 4) the authority of the Park Service under its organic act when read together with the Constitution's Property and Commerce clauses to protect parks from external development on non-federal lands.

## II. NATIONAL PARK SERVICE ORGANIC ACT

The organic act which establishes the National Park Service and National Park System provides the framework for management and protection of the system. It directs the Park Service to administer the parks:

> ...by such means and measures as conform to the fundamental purpose of said parks, monuments, and reservations, which purpose is to conserve the scenery and the national and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will <u>leave them unimpaired for the enjoyment of future generations</u>.
>
> 16 U.S.C. § 1 (emphasis added).

A House Report on the 1916 act states that the primary purpose of the park service bill is to preserve "nature as it exists." H.R. Rep. No. 700, 64th Cong., 1st Sess. 3 (1916).

A 1978 amendment to the organic act reaffirms the authority and duty of the Park Service to protect the national park system. It provides, in part, that:

> ...The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these areas have been established....
>
> 16 U.S.C. § 1a-1.

The Senate Report on the 1978 amendment emphasizes that:

> The Secretary [of the Interior] has an absolute duty, which is not to be compromised, to fulfill the mandate of the 1916 Act to take whatever actions and seek whatever relief as will safeguard the units of the National Park System.
>
> Senate Report 95-528, 95th Cong., 1st Sess., 9 (Oct. 21, 1977) (emphasis added).

In the National Rifle Association v. Potter, 628 F. Supp. 903 (D.D.C. 1986), the court, in upholding regulations prohibiting hunting and trapping within units of the National Park System, quoted from a memorandum by former Secretary of the Interior Work, which it found to be a contemporaneous interpretation of the organic act entitled to "considerable deference":

> ...[t]he duty imposed upon the National Park Service in the organic act creating it to faithfully preserve the parks and monuments for posterity in essentially their natural state is paramount to every other activity."
>
> Id. at 910.

The organic act authorizes the Secretary of the Interior to

"make and publish such rules and regulations as he may deem necessary or proper for the use and management of the parks." 16 U.S.C. § 3.

In the litigation concerning the protection of Redwood National Park, the court held that the organic act and the Redwood National Park Act, 16 U.S.C. § 79a et seq., required the Secretary of the Interior to take affirmative actions to protect Redwood National Park from logging on adjacent land which was endangering the trees the park was created to protect. Sierra Club v. Department of the Interior, Id. 90 (N.D. Cal. 1974). The court's decision appears to be based upon both statutory obligations and a trust responsibility. 376 F. Supp. at 95. ("In view of the analogous trust responsibility of the Secretary of the Interior with respect to public lands...and the...specific set of objectives which the provisions of the Redwood National Park Act were designed to accomplish...").

In a later opinion in this litigation, the court held that the federal "defendants unreasonably, arbitrarily, and in abuse of discretion have failed to exercise and perform duties imposed" by "the organic act and Redwood National Park Act." 398 F. Supp. 284, 293 (1975). However, after the Secretary had requested, inter alia, funds from the Office of Management and Budget to purchase adjacent land, legislative action to regulate private actions beyond park boundaries and the Justice Department to sue the timber companies, he had met his duty to protect the park and it was up to Congress to provide sufficient funds for

park protection. 424 F. Supp. 172 (1976).

In Sierra Club v. Andrus, 487 F. Supp. 443 (D.D.C. 1980), the court recognized that the organic act and its 1978 amendment require the Secretary to protect park resources from activities beyond park boundaries. If water development activities outside of park boundaries were:

> ...a real and immediate water supply threat to the scenic, natural, historic or biotic resource values of Glen Canyon National recreation Area or Grand Canyon National Park, the Secretary must take appropriate action.

Id. at 448 (emphasis added).

Moreover, the court concluded that while the Secretary had broad discretion concerning the discharge of his park protection duties, the discretion was not unlimited. Id. Finally, the court found the Secretary's obligation to protect the parks was statutory and to the extent the Redwood National Park decisions suggested or found an independent trust obligation, the Andrus court disagreed. The practical distinction between a statutory and trust obligation to protect the parks from external development, however, is not clear at this point.

However, it is clear from the organic act, its legislative history, and court decisions interpreting it, that the Park Service has the authority and responsibility to protect units of the National Park System from incompatible external development which threatens important park values.

## III. PARK VALUES

The natural and cultural values a park was set aside to protect can be determined from the enabling legislation, presidential proclamation, or from numerous descriptive materials prepared by the Park Service and others.

Units of the national park system can be created by specific legislation, see, e.g., 16 U.S.C. § 21 (Yellowstone), 16 U.S.C. § 201 (Grand Canyon), 16 U.S.C. § 401 (Bryce Canyon), or by presidential proclamation. 16 U.S.C. § 431. These acts and proclamations may contain a statement of purpose concerning the significant natural and cultural values the park was set aside to protect. This information can be important when a park is threatened, to demonstrate the adverse effects on park values and the visitor experience.

For example, North Cascades National Park was established "[i]n order to preserve for the benefit, use, and inspiration of present and future generations certain majestic mountain scenery, snow fields, glaciers, alpine meadows, and other unique natural features...." 16 U.S.C. § 90. And Canyonlands National Park was established "[i]n order to preserve an area in the State of Utah possessing superlative scenic, scientific, and archeologic features for the inspiration, benefit and use of the public...." 16 U.S.C. § 271.

Since many of the enabling statutes do not contain detailed information on park values, it may be necessary to resort to the large body of literature that exists, prepared by the Park

Service and others, describing the important natural and cultural values of the parks. E.g.: National Park Service, Dept. of the Interior, National Park Portfolio (6th ed. 1931); F. Tilden, The National Parks (3rd rev. ed. 1986) (ed. by P. Schullery); Sierra Club, Guides to the National Parks, Rocky Mountains and the Great Plains (1984); Desert Southwest (1984); Pacific Southwest and Hawaii (1984); and, Pacific Northwest and Alaska (1985); A. Haines, Yellowstone National Park--Its Exploration and Establishment (1984) (prepared for National Park Service).

## IV. NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act of 1969 (NEPA) commands all federal agencies to: "[i]nclude in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment, a detailed statement by responsible officials on...(iii) alternatives to the proposed action.... (42 U.S.C. § 4332(c)(iii).)

NEPA also requires federal agencies to "study, develop and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." (Id. § 4332 (E).)

Section 4332(E) is not limited to "major federal actions" as is § 4332(c). E.g., Hanly v. Kleindienst, 471 F.2d 823, 834-36 (2d Cir. 1972), cert. denied, 412 U.S. 908 (1973).

Professor Rodgers states § 4332(E) is:

> ..."supplemental to and more extensive in its commands" than is, section 102(2)(c)(iii) [42 U.S.C. § 4332(c)(iii)], particularly as it requires not only the study and description of appropriate alternatives, but also that they be "developed." This directive imports not mere lip service to and discussion of alternatives; it presumes a degree of serious consideration, perhaps some preliminary research, contingency planning, and the assignment of personnel and equipment to pursue the possibilities. Section 1020(E) [42 U.S.C. § 4332(E)] may require a discussion of alternatives not only in greater depth, but also in wider range, perhaps including an indication of the "optimum" use of the resources at state.
>
> W. Rodgers, Environmental Law 724 (1977) (citations omitted).

The regulations of the Council on Environmental Quality (CEQ) provide that:

> Each agency shall be capable (in terms of personnel and other resources) of complying with the requirements enumerated below. Such compliance may include use of other resources, but the using agency shall itself have sufficient capability to evaluate what others do for it. Agencies shall
>
> * * *
>
> (d) Study, develop, and describe alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources. This requirement of section 102(2)(E) [42 U.S.C. § 4332(E)] extends to all such proposals, not just the more limited scope of section 102(2)(c)(iii) [42 U.S.C. § 4332(2)(c)(iii)], where the discussion of alternatives is confined to impact statements.
>
> 40 C.F.R. § 1507.2(d).

When park values are threatened by proposed development on federal land or by activities which require a federal license or permit, other responsible federal agencies, as well as the Park Service, must consider and develop alternatives to the proposal. The CEQ regulations provide detailed directions on considering alternatives and resolution of conflicts between federal agencies on environmentally unsatisfactory proposals. See 40 C.F.R. §§ 1501.6, 1502.14, 1503.4, part 1504, 1505.2(b). The obligation of federal agencies to consider alternatives to proposed agency actions and the scope of that obligation are discussed in, inter alia:

1) Jordan, Alternatives Under NEPA: Toward an Accommodation, 3 Ecol. L. Q. 705 (1973);

2) Picher, Alternatives Under NEPA: The Function of Objectives in an Environmental Impact Statement, 11 Harv. J. on Legis. 595 (1974).

3) Comment, The National Environmental Policy Act of 1969: What "Alternatives Must an Agency Discuss?, 12 Colum. J. L. & Soc. Probs. 221 (1976);

4) Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, 435 U.S. 519 (1978);

5) Trinity Episcopal School Corp. v. Romney, 523 F.2d 88 (2d Cir. 1975); and,

6) City of New York v. U.S. Department of Transportation, 715 F.2d 732 (2d Cir. 1983), see also the district court's opinion in this case which was reversed by the Second Circuit on other grounds. 539 F. Supp. 1237, 1276-81.

## V. CONSTITUTIONAL POWERS TO PROTECT PARKS FROM ACTIVITIES ON PRIVATE LANDS

The National Park Service has broad powers under its organic act when read together with the Constitution's Commerce Clause, U.S. Const. art. I, § 8, cl. 3, and Property Clause, U.S. Const. art IV, § 3, cl. 2, to protect parks from development on non-federal lands which threatens important natural and cultural values of units of the National Park System. See, e.g., Frank and Eckhardt, Power of Congress Under the Property Clause to Give Extraterritorial Effect to Federal Lands Law: Will "Respecting Property" Go the Way of "Affecting Commerce"? XV Nat. Res. Lawyer 663 (1983); Gaethe, The Boundary Waters Canoe Area--Wilderness Act of 1978; Regulating Non-Federal Property Under the Property Clause, 60 Ore. L. Rev. 157 (1981); L. Tribe, American Constitutional Law 232-44 (1978); Sax, Helpless Giants: The National Parks and Regulation of Private Lands, 75 Mich. L. Rev. 239 (1977); Knight v. United Land Association, 142 U.S. 161 (1891); Camfield v. United States, 167 U.S. 518 (1897); Kleppe v. New Mexico, 426 U.S. 529 (1976); United States v. County Board of Arlington, 487 F. Supp. 137 (E. D. Va. 1979).

In Clark v. Community for Creative Non-Violence (468 U.S. 288 (1984)), the court recognized that the "network of National Parks...are unique resources that the Federal Government holds in trust for the American people," id. at 290, and "the Government has a legitimate interest in ensuring that the National Parks are adequately protected." id. at 297.

Activities on private land within park boundaries

(inholdings) which threaten park values are subject to regulation by the Park Service. Minnesota v. Block, 660 F.2d 1240 (8th Cir. 1981), cert. denied, 455 U.S. 1007 (1982). There is no reason to distinguish between activities on private land, whether within or without park boundaries, that threaten essential park values. When park-threatening activities are proposed for non-federal land, the Park Service should consider, inter alia: 1) land exchanges; 2) zoning; 3) purchase; 4) purchase of development rights; 5) condemnation; and 6) nuisance-type litigation.

## VI. CONCLUSION

The use of alternatives, as a means to protect the parks from incompatible external development, as suggested above, is within the authority of the Park Service. However, because of the pressure applied on the Park Service by other federal agencies, state and local governments, private development interests, and politicians, Congress should adopt a clear legislative program that would force consideration of alternatives when important natural and cultural values of a park are potentially jeopardized. To the extent this approach relies on economic efficiency, as opposed to government control, it avoids, or at least minimizes the hostility towards regulation, especially in the the western states.

APPENDIX A

# No Park is An Island: A Simple Solution for the Thorny Problem of Park Protection

by
David Mastbaum

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"Simplification of Means and
Elevation of Ends is the Goal"
- Henry David Thoreau

The year 1864 was a particularly savage one in the fratricidal conflict between the federal government and the confederate states. In May alone, during the battles of the "Wilderness" and "Spotsylvania Courthouse," Grant lost over 36,000 soldiers and Lee's losses exceeded 17,000. It was during this year, also, that President Lincoln signed into law a bill ceding to California, for use as a park only, and for all time, the "'cleft' in the Granite Peak of the Sierra Nevada," the incomparable valley—Yosemite—and the nearby Mariposa Big Trees, the magnificent *Sequoiadendron Gigantea*. This legislation, passed and signed at the height of Civil War misery and brutality, was the seminal point in the eventual birth of the national park system, which Joe Sax of Michigan Law School calls one of "the few unambiguous triumphs of American public policy," and Wallace Stegner, the respected historian, writer, and conservationist, simply calls "the best idea we ever had."

**Evolution of the National Park Idea**

The Yosemite bill was the first time federal land had been dedicated to a non-utilitarian purpose. It marked the beginning of a change in the notion, which had been the cornerstone of American public land policy up to that time, that nature should be subdued and used, to the idea that it should be respected, indeed preserved. This transformation, probably, had its roots in the writings of the famous early nineteenth-century traveler and painter of American Indians, George Catlin, and the great transcendental philosophers of New England, Thoreau and Emerson.

The thrust of the 1864 Yosemite legislation—America's unique natural wonders required special protection if they were to be enjoyed by future generations—was formally translated into the national park idea with the creation of Yellowstone National Park a few years later in 1872. Setting aside an area larger than Rhode Island and Delaware combined, "as a public park or pleasuring ground for the benefit and enjoyment of the people," and placing its enormous natural resource potential off limits to private resource development interests was a dramatic step. However, Yellowstone, like all of the early national parks of the West, was an island in the vast American wilderness and because of the great abundance of land, commercial interests did not feel threatened. Indeed, certain business interests, such as the railroads, became major supporters of the parks, providing not only access, but also offering a wide variety of services for tourists.

"The Loch" — Rocky Mountain N.P., CO. *Photo by Bill Sontag.*

The national park idea was a success. Newspapers and magazines, caught up in the uniqueness and romance of creating great outdoor museums, supported the parks strongly and often. People flocked to the parks and western politicians pushed for new parks to be established.

By 1916, eighteen parks existed and Congress and the President recognized the need to establish a comprehensive and systematic protection scheme. The National Park System Organic Act was adopted and a National Park Service was created to manage the parks "in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The first Park Service Director, the charismatic and indefatigable Steven Mather was a master of the public relations game, and he made certain the word got out about these parks. He achieved his goal, probably beyond his wildest expectations. Visitor increases, especially with the coming of the automobile and its new highway system were staggering.

Today the system has over 330 units, a potpourri of America's natural and cultural heritage—from the great natural parks, to the historical parks, to the very popular urban recreation areas. This amounts to nearly 80 million acres—one percent of the land in the continental United States and fourteen percent of Alaska. In 1985, these parks had over 250 million recreation visits.

**Managing and Protecting the Parks**

Despite this enormous popularity, indeed, in part because of it, all is not well with the parks. Severe overcrowding at some parks, along with pressure from political and commercial interests to take advantage of the bonanza, means that crucial internal management policies, about the type of recreational experience that the parks will offer, must be shaped. Matters that require attention

include limitations on the number of visitors, entrance and user fees, determining how much of the park system should remain as wilderness or primitive areas, and the type of facilities that should be made available.

Park decision-makers are being forced to shape the future of these great enclaves with a shrinking budget, despite increased visitation, and in a political arena where the major actors seem genuinely confused about park management, given the tension between their conventional political wisdom of less government and the obvious need to protect the crown jewels of America's public lands. Joe Sax, in his thoughtful book, "Mountains Without Handrails: Reflections on the National Parks," tackles the internal management quagmire well. While one may disagree with Sax's rendition of why the parks were created and for whom, he has proffered sensible solutions designed to restore and preserve the parks. These solutions don't require a lot of money, but an awareness that in visiting a national park, one should "[p]ut aside the plastic alligators of the amusement park" and focus on nature, which "taken on its own terms, has something to say that will you will be glad to hear."

**External Threats to the Parks**

The greatest challenge to the national parks system, however, is not correcting the course of internal management policies, but incompatible development beyond park boundaries. Examples of external park-threatening activities can be found throughout the system. Yellowstone's famous geysers are threatened by proposed geothermal development. The critical habitat of its endangered grizzly bears is threatened by oil and gas exploration and development. The burgeoning demand for domestic, commercial, and agricultural water in south Florida has impaired the natural flow into Everglades National Park, endangering the park's fauna and flora. Oil, gas, and coal exploration and timbering are threatening Glacier's bears and elk by jeopardizing habitat. At Dinosaur National Monument, which straddles the Colorado-Utah border, proposed dams would reduce and alter stream flow endangering riparian plants and wildlife.

The thorny problem of external threats raises as many issues as does attempted reform in that arcane kingdom known as western water. While the Constitution's Commerce and Property clauses, the Organic Act of the Park Service, and the specific legislation required to create a national park all suggest that the Secretary of the Interior has an affirmative obligation to protect the parks from threatening development on adjacent lands, in practice the too-general commands in these laws do not provide sufficient muscle for a well-meaning, but weak and weary Park Service.

Moreover, other federal, state, and local environmental and land use laws, while establishing general standards, do not take account of the special natural and cultural values for which the parks were created, and therefore fail to protect them. Finally, and perhaps the crux of the problem, cooperation between the National Park Service, other federal agencies, and state and local governments with regard to park protection is difficult, at best, given the competing and at times conflicting responsibilities and goals of these entities. For example, the Department of Energy viewed Park Service concerns about the proposed siting of the high-level radioactive waste dump, a stone's throw away from Canyonlands National Park in southeastern Utah, as the ravings of a single-purpose agency with little or no understanding of a serious national dilemma.

The problem of incompatible development beyond park boundaries is one of relatively recent vintage. During most of the first one hundred years of their existence, the national parks were protected, for the most part, from external development by their isolation. However, beginning in the 1970s the natural buffers around the parks rapidly began to disintegrate with increased demand for timber, minerals, hydrocarbon fuels, and urban encroachment. In addition, air quality degradation in and around some parks from a combination of old and new air pollution sources, some of which are situated hundreds of miles from any park, creates an administrative nightmare with all of the accompanying technical difficulties, political sensitivities, and economic consequences.

**The Saga of the Kaiparowits Plateau**

The enormous vulnerability of the parks to development beyond their borders and the ephemeral nature of their *de facto* buffers was dramatically brought to the country's attention in the isolated desert country of south-central Utah in the early 1970s. In 1972, then Secretary of the Interior, Rogers C.B. Morton, announced a plan to build enough new power plants in the Southwest to produce an additional thirty thousand megawatts of capacity. The flagship of this scheme, the Kaiparowits project, was originally planned as a mine-mouth, five-thousand megawatt (later reduced to three thousand megawatts), coal-fired plant. It would have been been the largest single power plant ever built. The project was to be financed primarily by California utilities, to whom most of the energy would go.

The proposed project site was within a 250-mile radius of the "Golden Circle" of southwestern desert parks—at the time comprising more than 25 percent of the country's national park land. This area contains some of the most majestic and unusual desert landscape in the world. The local people, county and municipal governments, and the State of Utah strongly supported the project because they saw it as a panacea for a depressed economy with chronic unemployment. However, air pollution from the project would have significantly reduced the magnificent vistas in this mysterious land of red rocks, deep blue sky, intricate carved canyons, and bizarre rock formations—land set aside as national parks for all the people.

Primarily because of increasing construction costs, reduced demand for energy in California, and strong public support for park protection (especially after Robert Redford appeared on Sixty Minutes to discuss what the Kaiparowits project would do to the "Golden Circle" of parks), the utilities abandoned the project in 1976. Even after Kaiparowits was scrapped, however, and despite numerous studies which established that very few jobs would be created directly for local people because of the skills required, and that tourism was the best hope for the economy of southern Utah, local support for massive energy development remained high, with a symbolic environmentalist, Robert Redford, being burned in effigy in Kanab, Utah.

The Kaiparowits controversy should have triggered an awareness of the need for a systemwide Park Service strategy to ensure that the parks would be protected from external threats. The problems of protecting national parks

from development beyond their borders were focused sharply—a project offered in the national interest which would impair essential park values, conflict between the Park Service and other pro-development federal agencies, and strong local support for the project. However, the death of the project and the election of Jimmy Carter, perceived to be pro-park and pro-environment, lulled people to sleep.

**Redwood National Park: Designed to Fail**

The mid-1970s also saw an intense struggle to save Redwood National Park from the effects of logging operations on adjacent lands, which were causing severe erosion and stream sedimentation and, thereby, threatening to destroy the very trees the park was intended to protect. Redwood National Park was created in 1968. The political compromises surrounding the establishment of the park's boundaries ignored ecological principles, particularly the need for watershed protection necessary for the survival of the giant trees. Unlike most of the other great national parks in the West, which were created long before adjacent development posed a problem, Redwood's boundaries were drawn to ensure that logging would continue unabated on abutting lands which also ensured that the Park would fail.

The responsibility and authority of the Secretary of the Interior to protect Redwoods was litigated and, in a series of three somewhat confusing court decisions, that responsibility and authority were established. However, despite the mandatory duty of the Secretary to protect the park from external threats, the Interior Department lacked sufficient funds to purchase adjacent lands—the only realistic solution—and the court found the Secretary had done all that he could. The ball was now passed to Congress.

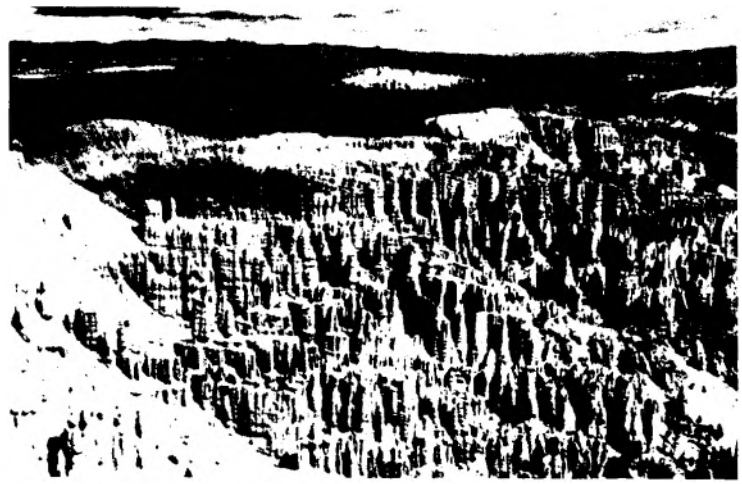
Congress did act in 1978 and authorized additional funds to protect and rehabilitate the Park. Congress also realized, at the time, that parks were vulnerable to increasing development beyond their boundaries and amended the Park Service Organic Act. It added vague and general language about the "high public value" of the park system and the need to manage the system to protect "the values and purposes for which these areas have been established."

Unfortunately, this rhetoric, like the 1916 statute, while well-meaning and establishing good policy objectives, neither provides the specificity nor creates the non-discretionary duty which would ensure that the Park Service, in the face of strong opposition from other federal agencies, local governments, and commercial interests (whose projects are often touted as essential to the national interest) can meet its obligation to protect the parks.

**Allen-Warner Valley—Parks vs. Energy**

The conflict between park values and development on adjacent land took center stage in the late 1970s. A massive energy project, identified by its proponents as essential to the national interest, was pitted against the esthetic and recreational values of two very popular national parks.

The Allen-Warner Valley Energy system called for two coal-fired power plants (one only 17 miles upwind from Zion National Park) with a combined capacity of 2500 megawatts, a large strip mine virtually abutting Bryce



Bryce Canyon N.P., Utah. *Photo by Bill Sontag.*

Canyon and only about three miles from its scenic Yovimpa Point overlook, hundreds of miles of pipeline to transport the coal (in semi-liquid form) from the mine to the power plants, a dam, and reservoir. This cumbersome proposal was the kind of outlandishly complicated stuff that technological satirist Rube Goldberg's cartoon character, Professor Lucifer Gorgonzola Butts, might have concocted.

The absurd and unnecessary complexity of the project, however, was not the real problem. Air pollution from the power plants would have had a serious effect on Zion's and the region's air quality. The strip mine near Bryce Canyon would have imperiled the magnificent panorama from the southwestern part of the park. Mining operations would be visible from Yovimpa Point and other parts of the park, and there would have been disturbing noise from blasting and machinery operation heard throughout the park. Moreover, the project would cost a lot more than alternatives that were also environmentally better and would avoid harm to the parks.

Most of the five billion dollars required to build the project was to come from California's two largest electric utilities. Therefore, before the project could proceed, a certificate of public convenience and necessity was required from the California Public Utilities Commission (CPUC). The CPUC had for years paid lip service to the notion that cheaper energy alternatives such as conservation, cogeneration, small-hydro, and geothermal should be the first choice of utilities before nuclear and coal plants. The availability and cost of these alternatives were, therefore, central issues in the proceeding, which lasted over 100 days. The evidence (to the surprise of even the CPUC and its staff) was overwhelming—a combination of alternative energy sources could replace Allen-Warner Valley and would not only be cheaper for rate payers, but also would provide substantial benefits for the utilities shareholders. The utilities, after the close of the hearing, but before the CPUC could issue its decision, saw the handwriting on the wall and abandoned the project in favor of the alternatives.

This meant, of course, that California could meet its energy needs without jeopardizing the important natural values Bryce and Zion were established to protect. Ironically, President Carter and his Interior Department, which had done so much for the national park system by adding millions of acres of parkland in Alaska, instead of supporting and advocating the alternatives which could

have avoided harm to Bryce and Zion, embraced Allen-Warner Valley and even attempted to undermine the California proceeding. Luckily, the attempt was not successful.

The administration saw this project as a way to reduce dependence on unreliable and expensive foreign oil supplies at the time of the Iranian hostage crisis and placed it on the "Critical Energy Facilities" list, a fast-track for favored projects. They saw Allen-Warner Valley as a symbol that the administration (contrary to the opinion polls) was not inept, at least in the energy field, and could make a big energy project happen. Apparently smaller, cheaper, and more environmentally benign alternatives, which could also reduce the use of oil, were not as symbolic as big coal plants and untested synfuel schemes. The well-meaning Park Service, despite its clear legal authority to protect the parks and despite the command of the National Environmental Policy Act that, where conflicts exist in using resources alternatives should be pursued vigorously, was caught between its trust responsibilities and the illogical, politically motivated, energy policy of the President.

The CPUC proceeding had provided a forum to examine alternatives to Allen-Warner Valley, and the system worked despite the hostility of the Carter Administration. While Park Service personnel informally supported the effort to develop alternatives which would avoid harm to Bryce and Zion, they did not actively develop and promote alternatives or participate in the California proceedings. Yet, there was strong historical support for this type of aggressive and vigorous stewardship.

**Protecting Olympic's Sitka Spruce—**
**A Paradigm of Effective Stewardship**


Sitka Spruce — Olympic National Park. *Photo by D. Huff*

When World War II broke out, the frames of airplanes, for the most part, were made of wood. The shortage of metals at the start of the war made the need for timber to construct airframes particularly important. Sitka spruce wood was ideal for this purpose, and the most concentrated and accessible stands of Sitka spruce were those of Olympic National Park.

Olympic National Park is located on a peninsula on the western edge of Washington State. The Pacific slope of the park is a primeval rain forest with magnificent conifer stands, which grow up the lower slopes of the glacier-carved Olympic Range. These mountains have about sixty glaciers and rise to nearly 8,000 feet. Sitka spruce grows very well under the ideal conditions found on Olympic's western slopes.

The War Production Board—the federal agency responsible for ensuring adequate war materials—Northwest timber and commercial interests, and Great Britain and France (with an acute need for airframe timber) placed substantial pressures on the Park Service to allow logging of Sitka spruce in Olympic. Then Park Service Director Newton Drury, with support of the Secretary of the Interior, the tough and resourceful Harold Ickes, began actively to pursue the availability of alternatives to Sitka spruce to avoid or at least minimize the sacrifice of Olympic. Understanding the tension between park preservation and the harsh realities of war, Drury confronted the issue directly:

> ...[T]he virgin forests in the national parks should not be cut unless the trees are absolutely essential to the prosecution of the war, with no alternative, and only as a last resort. Critical necessity rather than convenience should be the governing reason for such sacrifice of an important part of our federal estate.

Clearcutting — Olympic National Forest. *Photo by D. Huff*

The National Park Service sought out alternative supplies of Sitka spruce as well as substitute materials for constructing airframes. Substantial and accessible stands of these trees were found in British Columbia and Alaska. Moreover, increased supplies of aluminum became available, a material that was found to be better than wood for airframes. Thus, there was no need to log in Olympic and the War Production Board withdrew its order to the Park Service.

The Park Service strategy of aggressively investigating and pursuing alternatives to Olympic's Sitka spruce worked. Undertaken in the midst of World War II, with all of its patriotic fervor, it is a clear example of the kind of stewardship needed to protect the national parks now, as external threats loom larger and larger. However, despite having clear authority and responsibility actively to seek out alternatives when parks are threatened, without a specific and unambiguous legislative command, as the Allen-Warner Valley case illustrates, the Park Service may not be as bold as it was under the leadership of Drury and Ickes during World War II.

**Some Final Thoughts**

In a report entitled *State of the Parks—1980,* initiated by Congress and prepared by the Park Service, the magnitude of the external threats issue becomes too apparent. While the report is not perfect (its underlying data are certainly difficult to decipher), its central conclusion is beyond dispute—the parks are in trouble from incompatible development on adjacent land. The Park Service, in this report, specifically recognizes the importance of a park protection strategy based on developing alternatives to park-threatening activities:

> The National Park Service cannot remain on the sidelines and expect to reject a proposed project merely because it poses a potential threat to park resources or park values. As Federal Land Managers, we must be prepared to identify viable alternatives in those situations where proposed development activity would damage the parks.

Yet, nearly six years have passed since *State of the Parks* was released and the Park Service has been unable to implement a formal program to ensure that alternatives are vigorously pursued and considered when a park is threatened by external development. While Congress has considered some legislation to protect the parks from external threats, these legislative proposals, for the most part, just restate the problem rather than provide needed additional clout for the Park Service, and they have gone nowhere. It is true that the Park Service has ample legal authority and, in fact, the legal responsibility to establish the procedures that would ensure the kind of alternatives review suggested above. Yet the political reality is that resource development, these days, is seen by too many politicians as more important than protecting the natural and cultural values of the national parks. However, because so many millions of people from all walks of life have found this great and unique American institution to be so important a sanctuary, the choices we make today about protecting the parks will be a good measure of the quality of our society.

* * * * * * * * *

At the height of World War II, a former park ranger then in military service wrote to Park Service Director Drury, urging that the parks remain open for the duration of the war. It was important, this soldier concluded, especially during the terrible crisis at hand to have:

> ...recreation areas where inspiration combines with relaxation to give a new lease on life and hope for the future.

**Suggested Reading on the National Parks**

*Books*


Everhart, William C., *The National Park Service* (rev. ed. Boulder: Westview Press, 1983).

Ise, John, *Our National Park Policy: A Critical History* (Baltimore: John Hopkins Press, 1961).

Runte, Alfred, *National Parks: The American Experience* (Lincoln: University of Nebraska Press, 1979).

Sax, Joseph L., *Mountains Without Handrails: Reflections on the National Parks* (Ann Arbor: University of Michigan Press, 1980).

Shankland, Robert, *Steven Mather of the National Parks* (rev. ed. New York: Alfred A. Knopf, 1970).


*Periodicals*


Comment, "Protecting Parks From Development Beyond Their Borders," 132 U. Pa. L. Rev. 1189 (1984).

Hudson, "*Sierra Club v. Department of the Interior:* The Fight to Preserve Redwood National Park," 7 Ecol. L. Q. 781 (1978).

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Sax, "Buying Scenery: Land Acquisitions For the National Park Service," 1980 Duke L. J. 709 (1980).

Stegner, "The Best Idea We Ever Had," Wilderness, Spring 1983 at 4.

Tarlock, "For Whom the National Parks?" 34 Stan. L. Rev. 255 (1981) (Book review).


# Publications And Materials Of The Natural Resources Law Center

**Books**

- *Tradition, Innovation, and Conflict: Perspectives on Colorado Water Law,* Lawrence J. MacDonnell, ed. (forthcoming Sept. 1986). $15.
- *Special Water Districts: Challenge for the Future,* James N. Corbridge, ed. Book containing edited papers from the workshop on Special Water Districts, Sept. 11-13, 1983. $15.

**Conference Materials**

- *Western Water: Expanding Uses/Finite Supplies,* 406-page notebook of outlines and materials from 3-day, June 1986 conference. $60.
- *Getting a Handle on Hazardous Waste Control,* 361-page notebook of outlines and materials from 2-day, June 1986 conference. $50.
- *Western Water Law in Transition,* 415-page notebook of outlines and materials from 3-day, June 1985 conference. $60.
- *Public Lands Mineral Leasing: Issues and Directions,* 472-page notebook of outlines and materials from 2-day, June 1985 conference. $40.
- *The Federal Impact on State Water Rights,* 365-page notebook of outlines and materials from 3-day, June 1984 conference. $60.
- *The Federal Land Policy and Management Act,* 350-page notebook of outlines and materials from 3-day, June 1984 conference. $60.
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- *New Sources of Water for Energy Development and Growth: Interbasin Transfers,* 645-page notebook of outlines and materials from 4-day, June 1982 water law short course. $55.

**Occasional Papers**

- "Regulation of Wastes from the Metal Mining Industry: The Shape of Things to Come," Lawrence J. MacDonnell, NRLC Occasional Papers Series. 32 pages. $3.
- "Emerging Forces in Western Water Law," Steven J. Shupe, Water Resource Consultant, NRLC Occasional Papers Series. 21 pgs. $2.50

- "The Rights of Communities: A Blank Space in American Law," Joseph L. Sax, Professor of Law, University of Michigan, NRLC Occasional Papers Series. 16 pgs. $2.50.
- "Nuisance and the Right of Solar Access," Adrian Bradbrook, Reader in Law, University of Melbourne, Australia. NRLC Occasional Papers Series. 54 pgs. $5.
- "Tortious Liability for the Operation of Wind Generators," Adrian Bradbrook, Reader in Law, University of Melbourne, Australia. NRLC Occasional Papers Series. 74 pgs. $5.
- "The Access of Wind to Wind Generators," Adrian Bradbrook, Reader in Law, University of Melbourne, Australia. NRLC Occasional Papers Series. 77 pgs. $5.

**Research Reports**

- "The Endangered Species Act and Water Development Within the South Platte Basin," Lawrence J. MacDonnell, Colorado Water Resources Research Institute (Completion Report No. 137). $6.
- "Guidelines for Developing Area-of-Origin Compensation," Lawrence J. MacDonnell, Charles W. Howe, James N. Corbridge, W. Ashley Ahrens. NRLC Research Report Series. 70 pgs. $5.

**Reprints**

- "Implied Covenants in Oil and Gas Leases," reprint of two articles by Stephen F. Williams, Professor of Law, University of Colorado. 40 pgs. $4.50.

**Audio Tapes**

- *Western Water Law in Transition,* cassette tapes of speakers' presentations. Full 3 days--$150. Half-day segments--$35 each.
- *Public Land Mineral Leasing: Issues and Directions,* cassette tapes of speakers' presentations. Full 2 days-- $100. Half-day segments--$35 each.

**Other Materials**

- *Symposium: Workshop on Natural Gas Prorationing and Ratable Take Regulation.* 57 U. of Colorado L. Rev./Issue 2/Winter 1986 (special issue containing papers and proceedings from workshop sponsored by the NRLC). $7.50.

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# NATIONAL PARK SERVICE WAR WORK

December 7, 1941 to June 30, 1944

Prepared by

National Park Service

Newton B. Drury, Director.

Edited by

Charles W. Porter III

Branch of History

NOTE: 1986: This information was provided to the Natural Resources Law Center by Susan Schultz, Park Historian, National Park Service, Olympic National Park.

1.9

1. Sitka Spruce Problem.

Sitka spruce, which grows in Washington and Oregon, British Columbia, and Alaska, is the most desirable source of lumber for use in the manufacture of airplanes. Since the First World War, much of the most accessible supply of Sitka spruce had been cut and used for other purposes than airplane manufacture, largely because of the change from wood to aluminum in airplane construction. With the advent of the new war in Europe, the supply of metal became inadequate and suitable woods, particularly Sitka spruce, were in urgent demand for airplane manufacture by the United Kingdom and France.

On May 4, 1939, Secretary Ickes, as Administrator of Public Works, had allotted $1,750,000 of Public Works funds to the National Park Service for the acquisition in the State of Washington of a corridor along the Queets River between Olympic National Park and the Pacific Coast, and its extension northward along the cost to Ozette Lake, for parkway purposes. The lands contemplated for purchase within the Queets Corridor amounted to 13,353 acres and were estimated to contain 51,618,000 ft. B. M. of Sitka spruce in mixture with other species. In the Ocean strip the contemplated acreage was 37,007 acres and the estimated stand of Sitka spruce was 75,103,000 ft. B. M., but for the most part inaccessible and not of a quality suitable for airplane stock. Later, due to a shortage of funds to purchase all of the area originally contemplated, these acreages and estimates were reduced to 11,731 acres for the Queets Corridor, with an estimated stand of 39,743,000 ft. B. M. of Sitka spruce of which 6,017,000 ft. B. M. were rated as first class: and 33,071 acres for the Ocean Strip, with an estimated 57,860,000 ft. B. M. of Sitka spruce, 12,319,000 ft. B. M. of which were rated first class.

After the entry of Great Britain and France into the war in September 1939, the demand for Sitka spruce airplane lumber from the Pacific Northwest to help meet the needs of those countries became quite acute. The Queets Corridor contained some of the best and most accessible of the remaining Sitka spruce most suitable for airplane lumber, and therefore became the objective of searchers for spruce to meet these war requirements. The Polson Logging Company, owners of some of the land and timber proposed for condemnation in the Queets Corridor, were logging spruce in that area, part of which was destined for Great Britain and France. This company wrote to the Secretary under date of May 3, 1940, requesting authority to continue the logging of spruce on its lands within the corridor and on other lands within the corridor in which it held an interest.

The question as to the acuteness of the spruce airplane lumber situation was referred by the Secretary's office to Mr. Lee Muck, at that time Director of Forests in the Department. A memorandum

dated May 17, 1940, for Mr. Burlew in this regard was prepared jointly by Chief Forester John D. Coffman of the National Park Service and Mr. Lee Muck. As a result of the study of this situation, some of the spruce lands contemplated for condemnation were excluded from the acquisition program, and on some of the other lands retained in the program the owners were permitted, through stipulations entered in the condemnation proceedings, to log spruce and Douglas-fir on their lands, thus averting interference with the war needs of the United Kingdom and France. This released a large part of the airplane spruce in the Queets Corridor.

The passage of Lend-Lease legislation, which was approved March 11, 1941, and the increasing tempo of defense preparations by the United States, created a greater demand for airplane spruce lumber, accompanied by numerous requests that the Queets Corridor and Olympic National Park be opened to the logging of Sitka spruce. Continuing studies were made in the field and in Washington as to the spruce airplane lumber requirements for the United States and our allies, and as to the possibility of supplying an increasing proportion of the needs for the United Kingdom by increased production in British Columbia and the initiation of spruce production from the national forest in southeast Alaska. The question of substitute species was also given attention.

Close touch was maintained in Washington, D. C. with the Lumber and Lumber Products Division of the War Production Board, with members of Congress from the State of Washington, and with other sources of information relating to the Sitka spruce situation.

The National Park Service viewpoint was expressed in Director Newton B. Drury's memoranda of November 18, 1941, to the First Assistant Secretary and is summarized in the following quotation:

> (1) "Selective cutting" in portions of the Queets Corridor and Coastal Strip might be authorized as a last resort if immediate public necessity in the emergency as distinguished from the convenience of specific operators, can be shown.
>
> (2) This will be a distinct sacrifice of park values in the interest of national defense. Selective cutting, together with the activities incident thereto, will largely destroy the qualities for which these lands are being acquired.
>
> (3) Legislation to permit logging in Olympic National Park should be resisted.
>
> (4) In order to insure an adequate supply of airplane spruce, and at the same time to relieve the pressure on the

Olympic National Park, the possibility of utilizing the large spruce resources in Alaska should be investigated at once, with a view to making this large body of spruce available for purposes of national defense.

The lands in the Queets Corridor purchased by the Federal Government from Public Works funds for parkway purposes are not a part of Olympic National Park and are therefore not subject to the provisions of law precluding commercial sales of timber from national park lands. As the pressure for Sitka spruce airplane stock became more intensive, the representatives of the War Production Board suggested the release of government owned Sitka spruce in the Queets Corridor as a contribution to the war program. This meant a distinct sacrifice of parkway features, but in order to assist the war program and at the same time hoping to lighten the pressure for Sitka spruce from national park lands, the Service recommended to the Secretary the approval of a sale of spruce and Douglas-fir on government owned lands within the Queets Corridor, to be marked on a careful selective basis, and with provision for retention of a forest screen along the road. The Secretary approved and, after advertising, a sale of 3,000,000 board feet of Sitka spruce and 800,000 board feet of Douglas-fir was made to L. J. Esses, of Montesano, Washington, the only bidder, on February 6, 1943. Delays in cutting operations by the purchaser and modifications in the cutting area later reduced this sale by approximately a million board feet.

On January 20, 1943, F. H. Brundage, Western Log and Lumber Administrator for the War Production Board wrote the Department of the Interior setting forth the critical need for Sitka spruce and requesting that the Hoh River and Bogachiel River areas within Olympic National Park be opened at an early date for the cutting of high quality spruce and Douglas-fir.

Beginning in 1940 close touch was maintained with Colonel Wm. B. Greeley, Secretary-Manager of the West Coast Lumbermen's Association, Seattle, Washington, who is one of the best informed men on the timber and lumber situation in the Northwest. Opportunities for conference with Colonel Greeley occurred during his trips to Washington, D. C., and during the visits of Service officials to Seattle, Washington. The monthly reviews of the lumber situation issued by the West Coast Lumbermen's Association were obtained and read with care. Similar contact was also maintained with Mr. Brundage after his appointment to the post of Western Log and Lumber Administrator for the War Production Board. Both of these authorities on the spruce situation counseled that the National Park Service should hold itself in readiness to make spruce available from Olympic National Park if and when that became essential for the prosecution of the war program, and should in the meantime develop a definite plan as to the manner in which

such action could be initiated without delay when the need arrived. Both declared the absence of logging within the national park had not up to that time delayed the war program, but they believed that some of the park spruce would be needed and that the National Park Service should be ready and willing to make the sacrifice.

As the pressure for spruce from Olympic National Park grew in intensity, National Park Service efforts grew apace to obtain accurate statistics of the supply of spruce timber, both in this country and in British Columbia, and the production from each of these sources; the amounts required by the United States as compared with the amounts required by the United Kingdom; the proportion of the United Kingdom spruce requirements furnished by the United States as compared with the amount furnished from British Columbia; what species furnished satisfactory substitutes for spruce airplane stock, and the abundance and accessibility of the timber stands of such substitute species.

These studies required a large amount of investigation in the Northwest by National Park Service officers; the obtaining of the best available statistics of the spruce resources of British Columbia; a visit to the Forest Products Laboratory at Madison, Wisconsin, to ascertain the facts regarding the qualities of spruce and spruce substitutes for aircraft manufacture; visits to airplane factories in the vicinity of Chicago manufacturing training planes for the Army and Navy; obtaining of information from the Forest Service, from the Department of Commerce and from Army representatives; and conferences with members of the Lumber and Lumber Products Division of the War Production Board.

The officials of the Lumber and Lumber Products Division were quite cooperative in making available the confidential figures as to United States Army and Navy estimates of requirements, which varied greatly from time to time, and also the figures relating to production in this country of spruce, noble, fir, western hemlock, and Douglas-fir aircraft lumber and the amounts of each supplied to the United Kingdom and to the United States. These statistics indicated that the supply of Sitka spruce aircraft lumber produced in the United States was very carefully divided between the United States and the United Kingdom. It was, however, impossible to ascertain the amount of Sitka spruce that was furnished to the United Kingdom from British Columbia. These statistics were held by the Canadian government as confidential war information. Without that information it was impossible to determine whether Canada was exerting herself to supply all possible aircraft spruce to meet the requirements of the United Kingdom or whether the United States was being forced to shoulder the larger share of the burden while the spruce forests of British Columbia were being conserved as compared with the Sitka spruce resources of Washington and Oregon. It appeared as if all efforts to solve

this question were being shunted aside when they reached the Lend-Lease authorities who were responsible for the aircraft lumber shipments to the United Kingdom. However, in August 1943, there finally appeared publicity on spruce production in British Columbia, published in the Pacific Coast lumber journals, which indicated that much greater activity had been injected into spruce production by government controlled Aero Timber Products, Ltd. of Canada with greatly increased supplies of aircraft lumber from British Columbia.

The sale made in the Queets Corridor failed to halt the demand for the release of spruce from within the Olympic National Park. The Chamber of Commerce in Port Angeles, Washington, the Grays Harbor War Production Council and the Washington State Planning Council were all pressing for the release of timber from Olympic National Park. On May 6, 1943, Director Drury, Regional Director Tomlinson, Superintendent Macy, and members of his staff, and Chief Forester Coffman met in Port Angeles with a small group representing business interests and the Chamber of Commerce of that town to exchange ideas on this subject. The Chamber of Commerce had adopted a resolution recommending the elimination from the national park and the transfer to the Olympic National Forest of that portion of the Calawah River and Pogachiel River drainages west of the township line between Ranges 9 and 10 West, Willamette Meridian, and north of the township line between Townships 26 and 27 North. The intent of this resolution was clearly to make a part of the park timber available for normal postwar needs as well as to furnish materials needed in the war program. Mr. Drury indicated that he was there to discuss only the question of war needs.

In response to an urgent invitation to meet with the representatives of the lumber and war industries of Grays Harbor, Director Drury, Regional Director Tomlinson, Superintendent Macy, and Chief Forester Coffman met with a group of 14 at a luncheon at Aberdeen, Washington, on May 8, 1943, arranged by C. A. Pitchford, Chairman of the Grays Harbor War Production Council. Mr. Drury explained that the cutting of any of the live forests within the national parks under any system of logging, however selective and restrictive, is contrary to the principles upon which the national parks were established; that once the logging of timber is introduced, the area no longer exists as a superlative virgin forest. Mr. Drury also explained that before consideration could be given to logging within the national park all other available sources of supply should be investigated and developed and there would have to be a definite showing that the war requirements could not be met from these other sources.

Letters presented to Mr. Drury at this luncheon showed definitely that the Grays Harbor interests were attempting to open up the entire Olympic National Park to logging, with the exception

of the former small Olympic National Monument area which occupies the highest portion of the park and contains little forest that could be considered of commercial character. Their demands were not restricted to Sitka spruce to meet the war requirements for airplane materials, but included all species of timber needed on a permanent basis to maintain the Grays Harbor industries after the war as well as during the war. As at Port Angeles, Mr. Drury indicated that he was there to discuss only the question of war needs. Quite a number of the business men, and one labor representative, in attendance at the luncheon were emphatic in their criticism of the stand taken by the National Park Service.

Under date of May 12, 1943, P. H. Brundage, Western Log and Lumber Administrator for the War Production Board, wrote the Aberdeen Chamber of Commerce advising them that he had in December 1942, strongly urged the Lumber & Lumber Products Division of the War Production Board in Washington, D. C. to take action which would make spruce and Douglas-fir within Olympic National Park available to the lumber industry. This was welcome incentive to the lumber interests for the organization of a concerted movement to force the opening of the park to logging. A resolution recommending reduction in the area of Olympic National Park was adopted by the Seattle Chamber of Commerce on June 1, 1943, and numerous editorials supporting this idea appeared in Seattle newspapers and in papers published in Olympia and in the Olympic peninsula. The park, however, was not devoid of friends and defenders.

This effort to open Olympic National Park to logging reached its climax during the hearings of the House Subcommittee on Lumber Matters in Seattle, Washington, July 12 to 14, 1943, when the proponents of the scheme endeavored to obtain consideration for logging within Olympic National Park, not only to meet war needs, but more especially to maintain their operations in the postwar period. The Chairman of the Subcommittee, Representative Henry M. Jackson of Washington, informed the witnesses that the Secretary of the Interior was prepared to release from the park whatever timber was needed in the prosecution of the war and was not available from any other source; that the Subcommittee was not authorized to go into the matter of postwar needs; and that Congress had settled the question of park boundaries when it enacted legislation in 1938 establishing Olympic National Park.

In order to be prepared for prompt action if it should finally be shown that the logging of spruce in Olympic National Park was imperative for the prosection of the war, careful consideration was given by the National Park Service, the Office of the Solicitor and the Office of the Secretary to the question of the method by which this action legally could be authorized. A careful study was likewise made by members of the park and regional office personnel to determine the boundaries of the several spruce areas within the

western portion of the park and the sequence in which they should be sacrificed to meet war needs if that became necessary.

The exchange of correspondence between the Secretary and Chairman Donald M. Nelson of the War Production Board as the result of Mr. Brundage's letter of January 20, 1943, finally culminated in Secretary Ickes' lengthy letter of September 14, 1943, listing eight measures which might help to relieve the critical Sitka spruce situation without inroads upon Olympic National Park, and Mr. Nelson's reply of September 23, 1943, withdrawing the request of the War Production Board for spruce from Olympic National Park unless future unforeseen conditions should arise making a renewal of that request necessary.

At the hearings held in Washington, D. C., on October 11 and 12, before the House Subcommittee on Lumber Matters, J. Philip Boyd, Director of the Lumber and Lumber Products Division of the War Production Board, testified that the logging of Sitka spruce from the Olympic National Park is not at this time necessary to meet war aircraft needs, and that the Department of the Interior had been so notified. Mr. Boyd stated that a change in aircraft lumber requirements had occurred while discussions were in progress between the War Production Board and the Department of the Interior; that the decision not to construct C-76 cargo planes of wood, changes in other types of planes, and the increase in the supply of aluminum available for aircraft production had helped the situation.

With increased spruce aircraft lumber production in British Columbia, increased production from the Alaska Spruce Log Program, and greater availability of aluminum for aircraft manufacture, the situation had eased very materially by October 1943.

In the June 1944 issue of The Timberman Mr. Brundage is quoted as stating that after September or at the latest October, and perhaps earlier, Treasury Procurement through Lend-Lease will take no more spruce aircraft lumber for delivery to the United Kingdom. Thus the threat of invasion of Olympic National Park by logging appears to have been safely outridden.

The following conversation between Colonel William B. Greeley, Secretary-Manager of the West Coast Lumbermen's Association, Seattle, Washington, and Director Newton B. Drury at the Cosmos Club, Washington, D. C., on May 26, 1944, epitomizes National Park Service policy in this crisis and illustrates the spirit in which negotiations were conducted:

W.B.G. Good day, sir.

N.B.D. Good day, Colonel Greeley. Did the spruce situation come out to your satisfaction?

W.B.G. As a practical matter, yes.

N.B.D. We did what you asked of us--put ourselves in a position where we could move quickly if war need were shown.

W.B.G. Of course I don't like the idea that when our boys are being drafted etc., etc., it is necessary to hold park timber to the last and compel a showing that it is absolutely needed. I don't think it should be sacrosanct.

N.B.D. That's just what I do think. If it isn't sacrosanct, it shouldn't be in a national park.

W.B.G. Well, I have always thought that Olympic National Park was too large.

N.B.D. That is of course debatable. It is a separate issue that can better be studied in calmer times. At both meetings I attended on the Olympic Peninsula to consider war needs, the discussion quickly veered to the question of using park timber to sustain local industries. We were not there to discuss that. I hope to see you in the Northwest,

W.B.G. I hope so, too. Good day, sir.

We might add that the final outcome of the spruce situation was also to the satisfaction of the National Park Service.

2. Contributions to the National Lumber Supply.

While the Sitka spruce negotiations were progressing, the Service gave evidence of its willingness to cooperate loyally in the war program by making available needed timbers from various sources not entailing the mutilation of the parks. Such evidences of loyalty and good will helped the Service to withstand direct attacks on park resources.

For instance, an unexpected source of good airplane timber was provided by the blowing down of Douglas-fir trees on Finley Creek, in the Quinault River drainage within Olympic National Park, creating a high fire hazard. This area adjoined privately-owned cutover lands on which there was a considerable amount of unburned slash, which exposed the windthrown and standing timber on national park lands to greater danger. As a fire hazard reduction measure, a sale of the fallen and badly leaning trees was made on July 10,1943,

to the M. and D. Timber Company of Aberdeen, Washington, which has resulted in the removal of approximately 2,000,000 board feet of timber, predominantly Douglas-fir, which was utilized in connection with the war program.

Other ways in which the Service was able to make timber resources available and other minor threats to Service forested areas are discussed below:

Dead Chestnut for Extract Wood. Shenandoah National Park, Blue Ridge Parkway and Great Smoky Mountains National Park lie within the natural range of the chestnut (Castanea dentata), and include some heavy stands of this species. The chestnut was one of the most valuable commercial species in eastern United States until the chestnut blight (Endothia parasitica), an exotic fungous disease, first observed in this country in New York City in 1904, spread through the eastern forests, resulting in the death of the chestnut. Chestnut wood contains a high percentage of tannin and the standing dead trees retain commercial value for a long period of years for certain types of lumber, for veneer core stock in the manufacture of plywood, and for tannin extract wood.

A considerable quantity of dead chestnut was cut along the skyline drive in Shenandoah National Park by the Civilian Conservation Corps some years back as a fire hazard reduction project and public safety measure, and for improvement of the scenic and aesthetic features. At that time an attempt was made to interest a tannin extract plant in Luray, Virginia, in this material, but the financial condition of the company was such that it was not prepared to haul and utilize the material even with no charge for it. The wood was accordingly used so far as possible for lumber within the park and for firewood in the CCC camps, and was also made available to the local residents who were willing to haul it away.

Some inquiries were made before the war by manufacturers of casket wood and tannin extract as to the availability of dead chestnut within Great Smoky Mountains National Park. Examination by park officials showed that logging operations within that park would result in severe erosion and injury to park values.

During the war, especially during that period when enemy submarines were operating actively in the Caribbean waters, causing a shortage in the importation of tannin extract wood, the demand for chestnut in order to meet war requirements for tannin became very acute. Request was made by tannin extract manufacturers and also by representatives of the War Department and the War Production Board that consideration be given by the National Park Service to the release of some of the dead chestnut which was readily available along the Blue Ridge Parkway. A study was made of the most accessible dead chestnut stands and it was found that removal of

APPENDIX C

# AN ALTERNATIVE TO THE ALLEN-WARNER VALLEY ENERGY SYSTEM:

# A TECHNICAL AND ECONOMIC ANALYSIS

BY

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JULY 1980

# Executive Summary

California's two largest utilities are planning to build a series of new coal plants, beginning with the 2500 MW Allen-Warner Valley energy system in Utah and Nevada. This analysis looks at an alternative: getting the same amount of new energy from conservation and various alternative energy sources. It finds that such an alternative is fully feasible, and that if the utilities pursued it instead of Allen-Warner Valley and other planned development, they would save approximately $500 million (in present value) for their ratepayers between now and 1992.

Because the full energy yield of the planned coal plants can be obtained through utility development of conservation and alternative sources instead, providing the same energy in the same time frame with the same reliability, and because to do so is more financially advantageous than building the coal plants, this analysis concludes that the Allen-Warner Valley system is unnecessary.

The results of the computer-based financial analysis show that there is a clear choice for the utilities (and their regulators), between building Allen-Warner Valley and other planned coal plants on the one hand, and developing energy alternatives and conservation on the other. And the choice is inescapable. The analysis shows that developing some of both, an option often proposed as a compromise, is financially a worst choice for ratepayers, resulting in the highest bills of any of the scenarios analzyed. This is so, even accounting for the benefits of very high reductions in oil and gas use. (As analyzed, the development of alternatives and conservation by themselves would reduce oil and gas consumption in power plants by approximately 73% and 86% respectively for the two utilities, between now and 1992, or 59% and 62% counting cogeneration.)

The alternatives analyzed are all preferred under California energy policy. They include: increased end-use efficiency in residential, commercial and industrial sectors; increased distribution efficiency; and increased development of geothermal, cogeneration, wind, and biomass.

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## TECHNICAL APPENDIX FIGURES

# I. INTRODUCTION

In the next decade, California's two largest utilities are planning a major shift to coal as a source of electric power. The first of several new large coal projects in which they intend to participate is the Allen-Warner Valley Energy System (AWV Energy System), a 2500 MW complex which includes two generating sites, a water project, a coal mine, and a coal slurry transportation system in southwestern Utah and southern Nevada, near Bryce Canyon and Zion National Parks. At the same time, the utilities plan not to proceed with full scale development of alternative energy sources, including conservation.

This report looks at what would happen if the two utilities did develop alternative energy sources in California, in reasonable and feasible amounts. It shows that the alternatives, which are preferred under California energy policy, are available to the utilities in large enough amounts that they can fully match the AWV Energy System and other projected power plants, in terms of energy, capacity, reliability, and timeliness, for all purposes including reduction of oil and gas use. Significantly for the ratepayers who must foot the bill, developing the alternatives is also a cheaper way to meet the same energy needs. In other words, the AWV Energy System and the other conventional power plants on the drawing board are unnecessary.

Whether the AWV Energy System is needed or not is a question now pending before the California Public Utilities Commission (CPUC), since the two utilities, Southern California Edison Co. (SCE) and Pacific Gas and Electric Co. (PG&E) have applied for a certificate of public convenience and necessity for that specific project. The

decision is particularly important, because the data strongly suggest that participation by SCE and PG&E in the AWV Energy System would seriously impede utility efforts to increase energy efficiency and develop alternative generating resources, which the CPUC five years ago called "the most important task facing utilities," and which it then stated would be "a key question in future rate proceedings and decisions on supply authorization."[1/] The California Energy Commission also has made the point:

> The next 12 to 18 months can make a critical difference in California's energy future. Energy Commission studies of alternative energy futures for California indicate that, without new initiatives, we may miss major opportunities to obtain the benefits of a transition to conservation, renewable energy sources and other preferred technologies. Our studies suggest that California is already committed to a largely conventional energy future through the 1980s, and will increasingly depend on this future unless dramatic steps are taken to include conservation and alternatives in energy planning.
>
> California Energy Commission, 1979 Biennial Report at 55.

Simply stated, the AWV proposal puts California at an energy crossroads, where a decision must be made between competing methods of energy growth.

This report, which finds one choice clearly preferable to the other in terms of financial impact, risk, and state policy, relies on a computer-based analysis of the financial consequences of SCE's and PG&E's announced supply plans (the utilities' scenario), compared side by side with the financial consequences of a plan made up of reasonable energy alternatives in feasible amounts (the EDF scenario). An earlier version of the analysis was

applied by the Environmental Defense Fund to PG&E's supply plan in 1978, caused the CPUC to begin its own investigation into the extent to which energy alternatives could replace large new central station plants for PG&E, and led to the conclusion last year that PG&E could be making much greater use of the cogeneration alternative.[2/]

The measures in the EDF scenario are already known to the utilities, and all of them are already relied on to some degree in the utilities' supply plans. The utilities' scenario simply puts less emphasis on them than does EDF's scenario. These measures include increased efficiency in residential, commercial, and agricultural end-uses of electricity, and increased development of geothermal, cogeneration, wind, and biomass.

## Footnotes

1/ CPUC Decision 84902 (1975).

2/ CPUC Decision 91109 (1979).

## II. PURPOSE OF REPORT

The purpose of this report is to evaluate the economic consequences for California if the AWV Energy System is developed, and to compare these systematically to the economic consequences of developing a set of reasonable alternatives that would yield the same results. The economics are vital because California ratepayers and utilities would have to pay for a large part of the AWV Energy System as proposed; if there are reasonable alternatives that are financially more attractive in comparison, then both state policy and common sense dictate that these alternatives should be developed instead.

Thus, the economic analysis performed for this report goes directly to the question of need for the AWV Energy System. If there is an economically preferable alternative, which is feasible and reasonable, then the AWV Energy System is not needed. SCE and PG&E have asserted the need for AWV to the CPUC, and have put need in issue by applying for a certificate of public convenience and necessity for the project.[1/] The CPUC has explicitly recognized that "a thorough evaluation of the economic effects of the [AWV] project compared to other alternatives" must be performed as part of its consideration of need for the project.[2/] The focus of this report is precisely that kind of comprehensive financial comparison using computer simulation.

The U.S. Department of the Interior recently concluded that energy alternatives are a complete and feasible substitute for the AWV Energy System.[3/] The Department's Draft EIS evaluates "energy conservation and the development of alternative energy sources" as an alternative to the AWV Energy System, and finds that alternative to be reasonable,

technically feasible, and capable of supplying not only all capacity represented by the proposed 2500 MW project, but also a surplus of more than 4000 additional MW over the needs of SCE and PG&E.[4/] The specific measures considered are very similar to those in the EDF scenario. They include conservation and load management, cogeneration, geothermal, wind, and biomass.[5/] The Draft EIS considers only those alternatives that could be installed by 1991, based on technical, economic and other feasibility criteria, and which are not already in the SCE and PG&E resource plans available to the Draft EIS authors.[6/] Thus, at the Draft EIS stage, federal analysts confirm that energy alternatives, developed in reasonable and feasible amounts, could fully replace the AWV Energy System.

The Draft EIS does not, however, purport to make any evaluations of comparative cost. The analysis reported here provides that missing link, by evaluating the costs of the AWV Energy System and a program of alternatives in exhaustive detail, and comparing them side by side.

Analysis of alternatives is also particularly appropriate in this case, because the proposed AWV project, due to its location and characteristics, would have an unusually severe impact on majestic national trust lands and on vital indigenous water resources. The AWV Energy System is thus likely to face considerable difficulties in obtaining necessary permits and approvals, and thus its reliability as a source of electricity in the projected time frame is uncertain. If there is an alternative which avoids these impacts and risks, at no higher cost, the CPUC should be particularly interested in pursuing that alternative in this case.

## Footnotes

1/ CPUC Appl. 59308. The Application was accepted for filing on January 9, 1980.

2/ CPUC Appl. 59308, Decision 91968, p. 4 (1980).

3/ U.S. Department of the Interior, Bureau of Land Management, Allen-Warner Valley Energy System Draft Environmental Impact Statement pp. S-15 through S-16, 2-40 through 2-53, and 4-143 through 4-148 (June 20, 1980) (Draft EIS).

4/ Ibid.

5/ Ibid.

6/ Ibid., p. 2-46.

# III. DESCRIPTION OF ANALYSIS

## A. METHOD

The analysis reported here makes an economic comparison of two resource plans, or scenarios. The first scenario is what is set forth in the officially reported resource plans of SCE and PG&E, which include development of the AWV Energy System. The second scenario, or resource plan, consists of the development of preferred alternative resources, and does not include the AWV Energy System. Both scenarios meet the same energy needs for SCE and PG&E, in the same time frame.

The basic thrust of the analysis is comparative. It provides information to answer the question: all other things being equal, what financial difference would it make to follow one scenario or the other. To make a fair comparison, the utilities' scenario and the EDF scenario are assembled and analyzed using a common set of economic assumptions in both cases. (With a few exceptions, these are the same assumptions used by the utilities themselves in planning.) Thus, when financial results are calculated and compared, the differences are the differences caused by the use of different energy resources, and not differences caused by the use of varying economic assumptions (e.g., different results caused by assuming different future inflation rates).

Each scenario is constructed with a large body of data sufficient to capture the relevant financial effects at approximately the same level of accuracy as that achieved by utilities themselves in supply planning.[1/] The financial consequences of each scenario are derived by computer

simulation using the same calculating methods in both cases. These methods, contained in a financial model designed for computer use, are closely patterned after the financial models used by utilities themselves in calculating the financial consequences of their own resource plans for internal planning purposes.

The model used is the ELFIN computer model, designed and owned by the Environmental Defense Fund. ELFIN simulates the financial and generation system operations of a utility given the utility's construction plans, generating resources, fuel costs, etc.[2/] The result is a comprehensive and systematic financial simulation for the utilities' scenario on the one hand, and the EDF scenario on the other, throughout the 1980-1992 planning period, which can then be compared.

A full comparison is complicated by effects that may occur beyond the 1980-1992 planning period. These effects are highly uncertain due to the nature of any economic assumptions for the post-1992 (and, indeed, post-2000) period. Nevertheless, for purposes of completeness, they have been explored in this analysis by calculating life-cycle costs of the proposed projects and their alternatives. Details are given in the Technical Appendix.

## Footnotes

1/ The data are the utilities' own, with a few exceptions. See the Technical Appendix.

2/ EDF's ELFIN model was the subject of a special hearing before the CPUC. Order Instituting Investigation (OII) No. 26. The updated version of the ELFIN model, used in this analysis, differs in some respects from the version that was reviewed in the OII 26 hearing. See the Technical Appendix.

## B. DESCRIPTION OF UTILITY AND EDF SCENARIOS

Table 1 displays the resource additions planned in the utilities' scenario and the alternative resource additions in EDF's scenario in the 1980-1992 period. These are shown in terms of installed capacity.

The utilities' scenario includes development of two major coal projects besides the AWV Energy System: SCE's California Coal project (620 MW for SCE's planning area in the 1991-1992 period) and PG&E's Montezuma facility (1600 MW in 1989-1990).

EDF's scenario substitutes additional end-use efficiency improvements, geothermal, cogeneration, wind, and biomass for the utilities' planned coal development. Year-by-year details of the resource additions in EDF's scenario are described in Section VI, below. Figure 1 illustrates the sources of energy production in the utilities' scenario and the EDF scenario in 1992.

Figure 2 illustrates the reserve margins in 1992 for the utilities' scenario and the EDF scenario. Both the utilities' scenario and the EDF scenario provide reserve margins that are more than adequate. In fact, 1992 reserve margins are 42% for SCE and 29% for PG&E under the EDF scenario, and 35% and 34% under the utilities' scenario, not counting wind generating capacity.[1/]

These reserve margins need not be considered excessive. They are simply the result of shifting oil- and gas-fired generating facilities from active use to reserve status. Since adequate reserves will be available, the need for new facilities to meet peak loads is not an important consideration for SCE and PG&E beyond the very-near term.[2/] For the same reason, load-leveling measures such as load

TABLE 1

Capacity Additions 1980-1992
(MW)

SCE

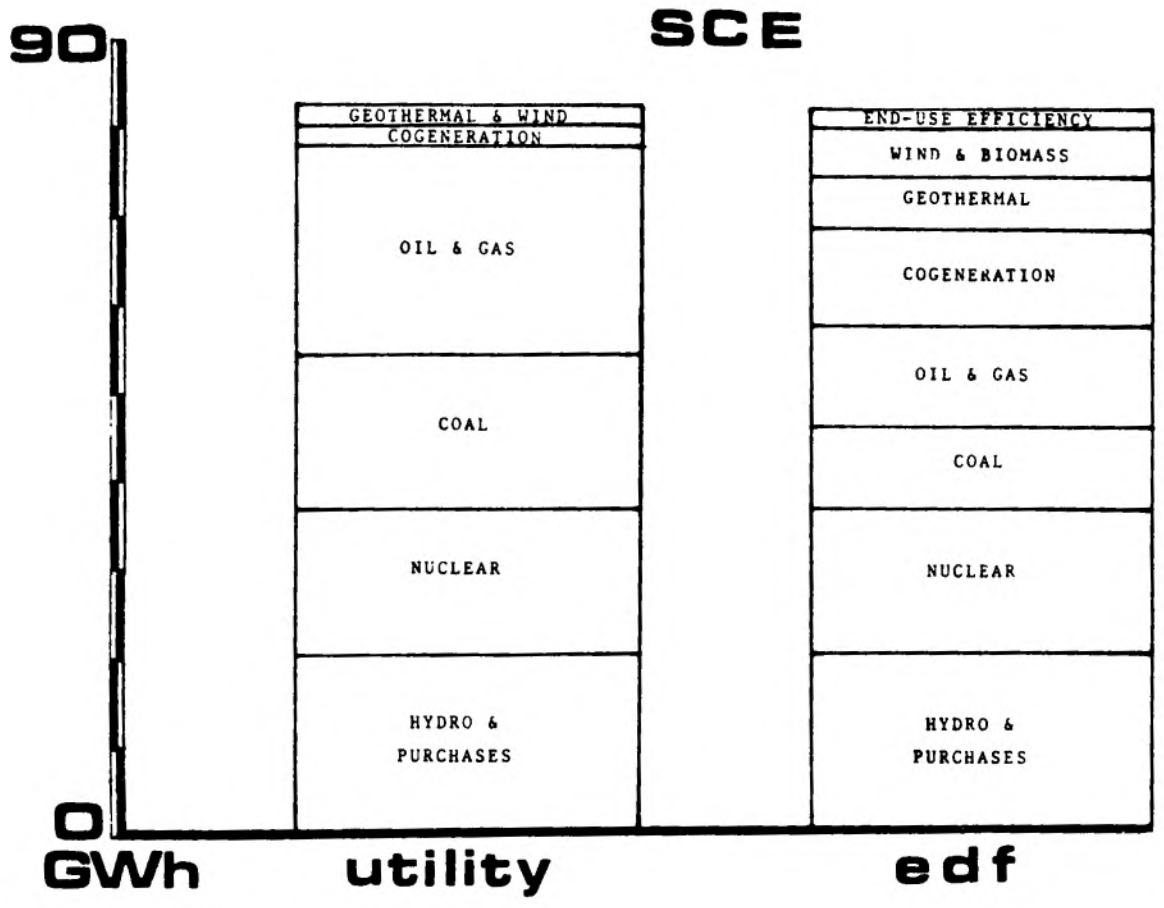
| | Utility Scenario | EDF Scenario |
|---|---|---|
| Geothermal | 170 | 1009 |
| Cogeneration | 374 | 1630 |
| Wind | 249 | 1333 |
| Biomass | 0 | 180 |
| End-use Efficiency | 96 | 289 |
| Fuel Cells | 26 | 26 |
| Coal | 1665 | 0 |
| Oil & Gas | - 547 | - 547 |
| Nuclear | 2322 | 2322 |
| Hydro & Purchases | 1180 | 1180 |
| Total | 5535 | 7422 |

PG&E

| | Utility Scenario | EDF Scenario |
|---|---|---|
| Geothermal | 1301 | 1741 |
| Cogeneration | 992 | 1719 |
| Wind | 223 | 1333 |
| Biomass | 130 | 290 |
| End-use Efficiency | 124 | 526 |
| Coal | 2645 | 0 |
| Oil & Gas | 82 | 82 |
| Nuclear | 2253 | 2253 |
| Hydro Pump storage & Purchases | 531 | 531 |
| Total | 8281 | 8475 |

FIGURE 1

Energy Production -- 1992



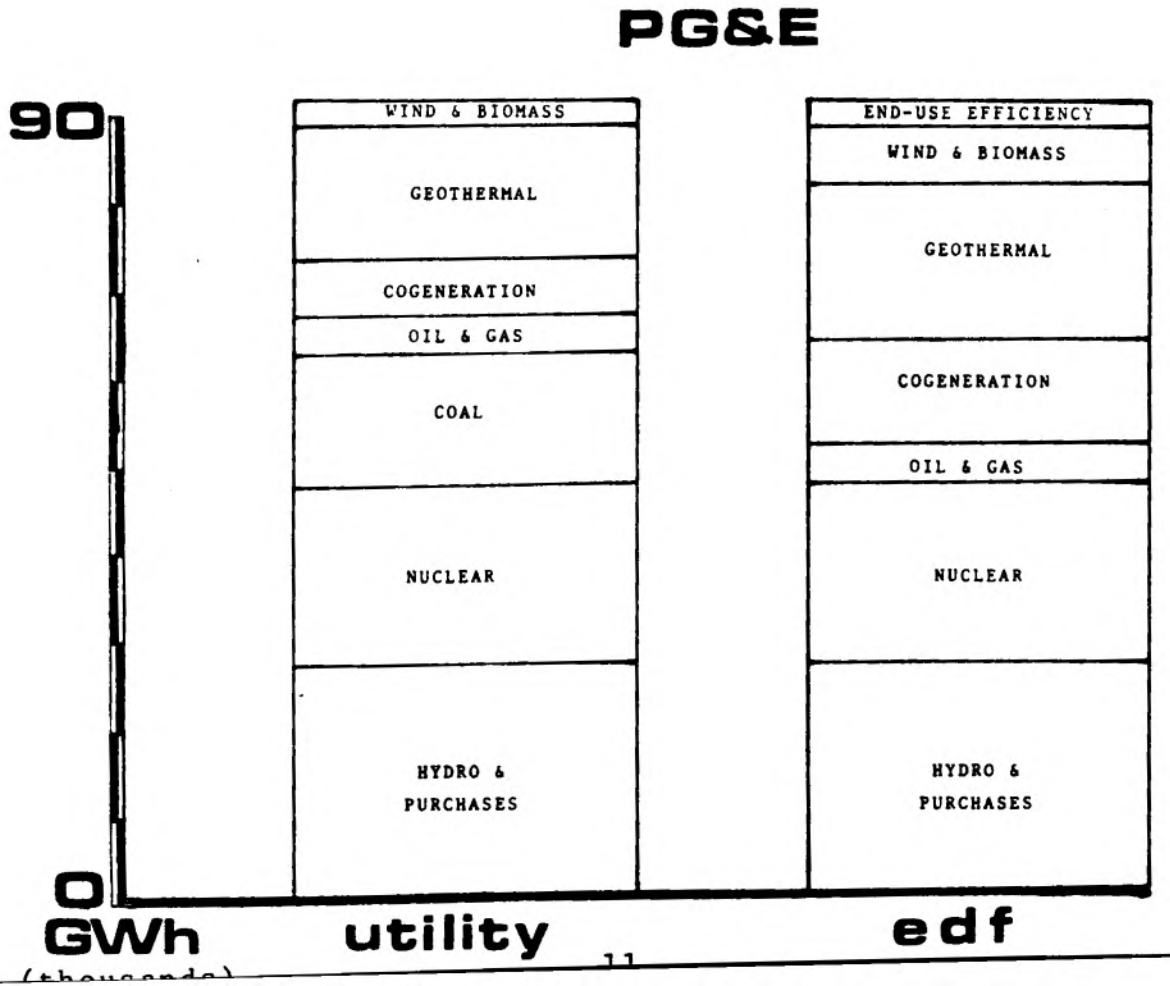
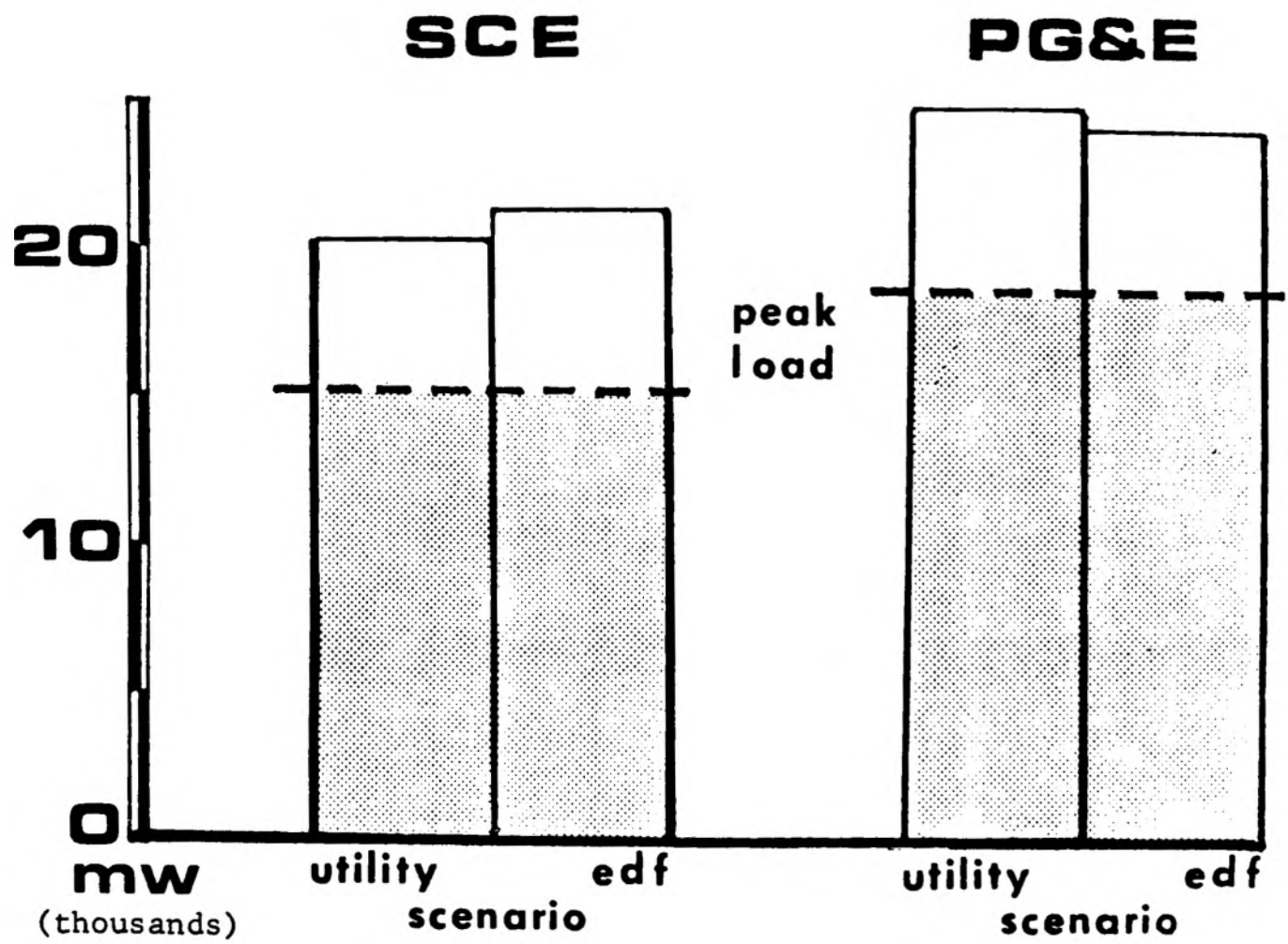



FIGURE 2

Installed Capacity and

Peak Loads -- 1992*

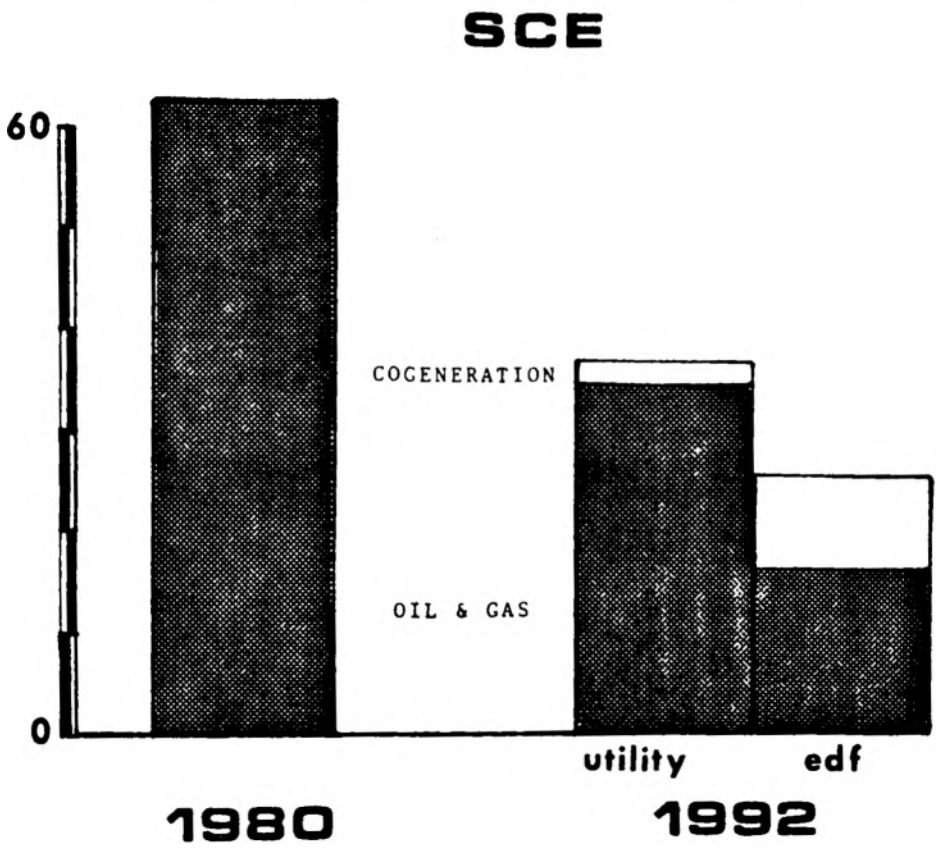



* excluding wind capacity

FIGURE 3

Oil and Gas Consumption

(millions of equivalent barrels*)




* One barrel = 6.25 million Btu

management are not as attractive for SCE and PG&E as they may be in other cases, and are, therefore, not considered in this report.

Figure 3 illustrates the level of oil and gas use in the utilities' scenario and the EDF scenario in 1980 and 1992.

## Footnotes

1/ In fact, some portion of wind generating capacity can be reliably counted for purposes of meeting peak load. Reserve margins are more than adequate, however, even if no firm wind capacity is included.

2/ In the 1980-1982 period reserve margins are narrow. The EDF scenario is more reliable than the utilities' scenario in the near-term because end-use efficiency improvements are available much sooner than the AWV Energy System.

# IV. RESULTS

Using computer simulation, detailed financial results for the utilities' scenario and the EDF scenario are produced. When those results are compared, three principal findings are apparent:

1. There are economic benefits for SCE's and PG&E's ratepayers if the EDF scenario is developed instead of the utilities' scenario. Benefits over the 1980-1992 planning period are approximately $500 million in present value terms, measured in today's dollars.

2. There are financial benefits for SCE's and PG&E's shareholders if the EDF scenario is developed instead of the utilities' scenario, in terms of quality of earnings and reduced risk to utility shareholders, which suggest that, in monetary terms, shareholders, at the very least, are equally well off, and may be better off, under the EDF scenario.

3. The EDF scenario is of equal or greater financial feasibility than the utilities' scenario.

Detailed financial results of the computer simulation are presented in table form in Appendix II.

## A. RATEPAYER EFFECTS

For ratepayers, the financial effect of a given scenario of energy development by their utility is the amount of money that will be collected from them to pay

for it; in other words, the revenues that the utility must collect to support that development. The value of those revenues is measured here in present-value 1980 dollars.[1/]

The EDF scenario, if developed instead of SCE's and PG&E's current resource plans, would result in a present-value savings of $500 million ($200 million to SCE's customers and $300 million to PG&E's) over the 1980-1992 period. See Appendix II, Tables 1 and 2. Life-cycle analysis also suggests that there would be a net benefit for ratepayers under the EDF scenario.[2/] The $500 million saving represents approximately 5% of the present value of the revenues required to support the utilities planned coal projects.[3/] Simply stated, the AWV Energy System and other coal projects planned by SCE and PG&E will cost their ratepayers $500 million more between now and 1992, than the energy alternatives set out in the EDF scenario, measured in today's dollars.

## B. SHAREHOLDER EFFECTS

The computer simulation uses the assumption that, in each scenario, the utilities' shareholders will receive the same rate of return on equity. (The purpose of this assumption is to permit a fair comparison of the effect on ratepayers, undistorted by rate of return differentials.) Thus, by definition, shareholders will be equally well off, in gross dollar terms, in both scenarios.

However, results indicate that shareholders would prefer the financial outcome of EDF's scenario because the quality of earnings in that scenario is improved.[4/] See Appendix II, Tables 3 and 4. This improvement would bene-

fit shareholders (and ratepayers as well) as a result of improved bond ratings and reduced financing costs. In addition, the EDF scenario reduces the risks to shareholders of major construction delays, since it avoids dependence on large, central station facilities with long lead times.

## C. FINANCIAL FEASIBILITY

The EDF scenario involves a level of direct construction expenditures, not counting the Allowance for Funds Used During Construction (AFUDC), that is higher than the level of the utilities'plans. See Appendix II, Tables 5 and 6. Thus, it would appear that the EDF scenario is more expensive than the utilities' scenario. This notion is incorrect, however, because it fails to measure the ultimate benefit to ratepayers from reduced financing costs (due to lower AFUDC) and reduced fuel costs.

The financial feasibility of the EDF scenario and the utilities' scenario can be evaluated by examining the detailed results of the computer simulation. The financial results indicate that the level of construction expenditures in the EDF scenario is as readily supportable as the utilities' planned levels. First, AFUDC is significantly lower in the EDF scenario. See Appendix II, Tables 7 and 8. Second, key financial ratios show that the financial health of the utilities is at least as great under the EDF scenario as under the utilities' scenario. Internal financing as a portion of total construction expenditures is as great under the EDF scenario, as compared to the utilities' plan. See Appendix II, Tables 9 and 10. Bond interest coverage--utility operating income as a multiple of bond interest payments--is at least as great

in the EDF scenario as compared to the utilities' scenario. See Appendix II, Tables 11 and 12.

## D. ADDITIONAL SCENARIO: COAL PLUS ALTERNATIVES

A computer simulation was made for an additional scenario in which the utilities' planned coal development takes place along with some development of alternatives. Two alternatives are developed (cogeneration and end-use efficiency measures), and the level of oil and gas use is reduced even further in the 1990s than in the utilities' scenario or the EDF scenario.[5/]

The purpose of analyzing this scenario is to investigate what would happen if a combination of coal development and alternatives is used, in order to achieve a very high level of oil and gas reduction. It is generally assumed that oil and gas reduction results in financial benefits. However, developing this scenario turns out to cost ratepayers an extra $600 million in 1980 present-value over the 1980-1992 period, as compared to the EDF scenario; and it is actually more expensive than the utilities' scenario as well.[6/] In other words, using coal development to achieve very high levels of oil and gas reduction can be financially counter-productive.

The results of this scenario indicate there is a necessary choice which must be made, between the utilities' planned coal development and development of preferred alternatives. Both together are a poor financial option.

## E. ADDITIONAL SCENARIO: LOW FUEL COSTS FOR COAL

This scenario accepts the utilities' estimate of coal fuel costs (including inflation) for the AWV Energy System.

This results in a lower cost for ratepayers than the EDF scenario (in 1980 present value terms). Life-cycle analysis indicates this scenario has a cost advantage in the long term of $600 million in 1980 present value (although in the 1980-1992 period this scenario costs ratepayers $300 million more than the EDF scenario).

These results depend entirely on the utilities' estimated fuel costs. The estimated coal costs for the AWV Energy System in 1986 are 13% to 37% lower than the utilities' estimates for their other coal projects.[7/] In addition, the utilities' estimates of annual coal fuel inflation rates for the AWV Energy System are 1.1% below the coal fuel inflation rates for their other coal projects and .7% below their estimates of general inflation. The current utility fuel cost estimates for the AWV Energy System are implausible, and recognized by the utilities themselves as highly speculative.[8/] Therefore, the utilities' present planning seems to be based to a large degree on unrealistically optimistic assumptions with regard to fuel costs for the AWV Energy System.

## Footnotes

1/ A discount rate of 12% is used, which is the same discount rate used by SCE and PG&E in Appl. 59308.

2/ Life-cycle benefits of EDF's scenario are $150 million in 1980 present value terms. These net benefits, however, are not distributed evenly to both SCE and PG&E. There is a net benefit to SCE of $200 million, while there is a net cost to PG&E of $50 million. The Technical Appendix describes how these life-cycle costs are calculated.

3/ Over the economic life of the utilities' planned coal projects, the present value of revenues required to support these projects is approximately $10 billion, based on a 1985 levelized cost of 15.6 cents/kWh (Additional Testimony of W.M. Gardner, CPUC Appl. 59038/ Exh. 71), a 30 year economic life, and a 12% discount rate.

4/ Quality of earnings measures that portion of reported earnings which is cash, excluding Allowance For Funds Used During Construction which is a non-cash item.

5/ SCE's oil and gas use in 1992 is 19.2 million barrels and PG&E's is 1.5 million barrels (excluding cogeneration) under this scenario. Including co-generation the figures are 28.3 and 11.4 million barrels for SCE and PG&E, respectively.

6/ The additional costs are $250 million for SCE's customers, and $350 million for PG&E's. Life-cycle analysis shows that these results hold over the economic lives of the proposed projects. Present-value costs through the year 2015 are $800 million greater in this scenario (coal plus alternatives) than in the EDF scenario ($400 million for SCE and $400 million for PG&E).

7/ This comparison is made on the basis of cost per kilo-watt-hour, which takes account of differences in coal quality and heat rate. See the Technical Appendix, Table 1.

8/ See CPUC Appl. 59308/Tr. 1555-66 and 1613.

# V. IMPEDIMENTS TO THE ALLEN-WARNER VALLEY ENERGY SYSTEM

## A. INTRODUCTION

There are several regulatory and political obstacles to development of the AWV Energy System as proposed.[1/] The existence of these obstacles raises serious questions about the wisdom of relying on this project as a potential source of electric power in the proposed time frame, as well as about ultimate project costs.

The two most significant unresolved issues surrounding the AWV Energy System are (1) impairment of vital water supplies in Utah, and (2) the adverse effect of the project on Bryce Canyon and Zion National Parks.

The available data suggest that the project as proposed would have serious effects on both the quality and quantity of surface and groundwater resources in southwestern Utah. The Division of Water Rights of the Utah Department of Natural Resources has stated unequivocally that it will not grant water rights for the mine and slurry line "if there is known or even suspected interference possible" with existing water rights.[2/]

The data also suggest that the project would adversely affect both Bryce Canyon and Zion National Parks. The National Park Service has made clear its very serious concerns about any impairment of these unique national trust lands.[3/] [4/]

In the following sections, the AWV Energy System and some of its major components are described, and the most significant obstacles to the development of the project as

a reliable and economic source of electric energy are discussed.[5/]

## Footnotes

1/ U.S. Department of the Interior Bureau of Land Management "Allen-Warner Valley Energy System Draft Environmental Impact Statement," June 1980. The unresolved issues are discussed on pp. S-16 through S-18.

2/ Letter from Gerald W. Stoker, Area Engineer, Utah Department of Natural Resources Division of Water Rights to J. Kent Giles, U.S. Bureau of Land Management, June 30, 1977. Appendix 14, U.S. Dept. of Interior, Ibid.

3/ Letter from Glen T. Bean, Regional Director, Rocky Mountain Region, National Park Service to William Curtiss and David Mastbaum, November 28, 1979. Included in the Technical Appendix to this report.

4/ U.S. Department of the Interior Bureau of Land Management, op. cit.

5/ Supplemental material explaining the technical issues in more detail is contained in the Technical Appendix.

## B. PROJECT DESCRIPTION

The AWV Energy System is a joint proposal by Southern California Edison Co., Pacific Gas and Electric Co., Nevada Power Co., and the city of St. George, Utah, to develop 2500 MW of coal-fired capacity in Utah and Nevada.[1/] It includes a large surface and underground coal mine near Bryce Canyon National Park (Alton mine), two coal slurry pipelines (one approximately 75 miles long to the Warner Valley site and one approximately 185 miles long to the Harry Allen site), an off-stream reservoir with a storage capacity of 55,000 acre feet, near St. George, Utah, and two generating complexes (Warner Valley, a 500 MW plant near Zion National Park and Harry Allen, a 2000 MW plant in Southern Nevada).

### The Alton Mine

The proposed Alton coal mine extends to within two miles of Bryce Canyon National Park. The most recent information indicates that 70% of the coal would be surface-mined and 30% would be extracted using underground methods[2/] with approximately 10,000 acres disturbed by surface mining operations.

Development of the mine is dependent, in part, on the regulatory and political acceptability of the hydrologic, erosional, and esthetic consequences of mining in the Alton area. And these consequences are related, in part, to the success or failure of efforts to reclaim the mined area in accordance with existing federal standards. Evaluation of the soils, vegetation and climatic conditions at Alton suggests that reclamation, if possible, would be very expensive.

The Alton area's soils pose a major obstacle to reclamation. Successful reclamation requires stockpiling and re-

spreading surface soils in order to establish a "diverse, effective and permanent vegetative cover."[3] The physical and chemical characteristics of both topsoils and overburden in the area suggest that there is an inadequate supply of material that is suitable for revegetation. Among the physical and chemical problems are high clay content, high sodium content, high salt concentrations, high pH, low available moisture holding capacity and low phosphorus availability.[4][5]

Precipitation in the Alton area averages only about 16 inches per year, and is very sporadic. The U.S. Bureau of Reclamation concluded on the basis of a precipitation frequency analysis that without irrigation, revegetation efforts would fail about one-third of the time and have an even chance of success another third of the time.[6] The quality of water available for irrigation ranges from moderate to poor, and would decline as a result of mining operations.[7]

The actual reclamation costs for the Alton field are difficult to estimate, since a mine and reclamation plan are not available. It is likely, however, that these costs would be higher than at other surface mines in the West. Seventy to ninety percent of reclamation costs are attributable to earthmoving and grading.[8] Since parts of the Alton field are relatively steep and dissected by streams, the earthmoving and regrading costs would be higher at Alton than at most other western mines.

A combination of sporadic but intense precipitation, steep slopes, and relatively impermeable soils makes the Alton area particularly vulnerable to hydrologic damage. During mining operations, soils and overburden would be temporarily stockpiled. These piles, along with the regraded but unreclaimed areas would be vulnerable to increased

wind and water erosion. The various kinds of mining-related surface disturbances (removal of vegetation, surface stripping, road construction, and regrading) would increase stormflow peaks[9/] by both decreasing infiltration capacity and decreasing the concentration time for storm runoff.

Increased stormflow peaks and sediment discharge downstream from the mine area could increase channel and bank erosion in Johnson and Kanab Creeks. This could result in the destruction of portions of alluvial terraces along those creeks that are presently used for agriculture. Increased discharge of fine-grained sediment would also seal the beds of streams intersecting the Navajo Sandstone aquifer, resulting in a decrease in groundwater recharge.[10/]

Mining in the Alton area would permanently destroy 22 springs in the area of the mine, and alter the flow and quality of nearby springs.[11/] These springs are essential for wildlife and livestock. Their loss would be difficult if not impossible to mitigate.

Surface mining at Alton would also have an adverse effect on visitor experience at Bryce Canyon National Park. Recent tests have shown that blasting at the mine site would be audible throughout the Park and would be disturbing to Park visitors.[12/] Much of the surface mine itself would be visible from Yovimpa Point, an overlook visited by more than 100,000 people yearly.[13/] Visibility from Yovimpa Point could be reduced by dust from the mine by as much as 45 miles under some conditions.[14/] Park Service policy is to protect visibility in National Parks from any perceptible impairment.[15/][16/]

Many of these issues concerning the proposed Alton mine are discussed, in detail, in the petition filed by the Environmental Defense Fund and others, including several local farmers and ranchers, with the U.S. Department of the Interior's Office of Surface Mining and Enforcement.

This petition asks that the Alton area be declared unsuitable for surface coal mining operations.[17/] If even a portion of the proposed mine area is declared unsuitable, the economics of the AWV Energy System, as proposed, would become less favorable.

The Coal Slurry Pipeline

Alton coal would be transported from the mine to the generating plants by two slurry lines. A 12-inch line would run approximately 75 miles from the Alton area to the Warner Valley site and a parallel 22-inch line would run approximately 185 miles to the Allen site.

The most serious water-related impediment to the AWV Energy System is the effect of pumping approximately 9700 acre-feet per year from the Navajo Sandstone aquifer in the Alton area to supply the coal slurry pipeline and preparation plant. This is the only source of water for the slurry.

The Navajo Sandstone is a large regional aquifer that outcrops in a broad band south of the proposed mine area. It dips slightly toward the north and is dissected near the proposed mine area by southward flowing streams, chiefly the Virgin River, Kanab Creek, and Johnson Canyon. The main recharge area for the aquifer is probably in the upper reaches of these streams.[18/] The groundwater in the Navajo Sandstone generally moves south, reemerging in springs and seeps to feed the lower reaches of the same streams. The community of Kanab, Utah and the farms at the mouth of Johnson Canyon are dependent on the flow of springs and wells that tap the Navajo Sandstone.[19/] The crucial issue is the effect of pumping the well field over the life of the project on the supply of water to springs, streams, and wells five to fifteen miles south of the project area.

The U.S. Geological Survey recently completed a study on groundwater conditions in the Alton area.[20/] This study used data from existing wells to determine the hydrologic characteristics of the Navajo Sandstone. Using conservative values for aquifer properties, this study indicates that pumping to supply the coal slurry could cause a lowering of the water table of 60 feet at a distance of 10 miles after 27 years. A drawdown of this magnitude would decrease the flow of springs, wells and streams in Johnson Canyon and Kanab Creek. The area of drawdown could also intersect the groundwater divide between the Kanab drainage and drainages of the Sevier and Paria Rivers, causing a shift in groundwater from the latter basins to the former. It could reach the groundwater basin of the East Fork of the Virgin River, decreasing the summer low-flow in that stream.[21/] The East Fork of the Virgin River passes through Zion National Park, and helps maintain streamflow that supports the endangered woundfin minnow.

Aside from decreasing the flow of springs and wells that presently tap the Navajo Sandstone, groundwater pumping could also decrease the quality of both groundwater and surface water.[22/] This would occur because pumping would draw more mineralized water from underlying and overlying aquifers into the Navajo Sandstone, and increase the proportion of more mineralized water in streamflow.

Long-term pumping from the Navajo Sandstone for the coal slurry could seriously impair the water supplies in the farming communities to the south of the proposed mine area. As previously noted, the state of Utah has indicated that an application to appropriate water for the Alton mine project will not be granted if there is even a suspected possibility of interference with existing wells.

The Warner Valley Water Project

Cooling and other water for the Warner Valley generating plant would be supplied by the proposed Warner Valley water project. This would consist of a diversion dam on the Virgin River, an off-stream reservoir with an annual yield of about 32,600 acre feet (ac.ft.) and a delivery system. The plant would use a maximum of 10,000 ac.ft./year, and 8,000 ac.ft./yr. would be used for supplemental irrigation. Present supply systems for local communities for domestic and other purposes are more than adequate for the next 20 to 40 years.[23/] Thus the annual yield of the system would be at least 14,600 acre feet in excess of the projected demand.

This water system would have adverse effects on both water quality and flow regimes in the Virgin River. Flow in the river below the diversion would be reduced 38% on an annual basis and over 50% during winter and spring. Of the 265,000 tons of sediment diverted in an average year, 53,000 tons would be returned to the river. The average annual sediment concentration in the river would be increased by as much as 80%.[24/] Reduced flow, especially in a segment of the river affected by mineral springs, would increase the concentration of dissolved solids and increase temperature extremes.[25/]

Reduction of flows in the Virgin River would adversely affect the endangered woundfin minnow and the Virgin River roundtail chub which has been proposed as an endangered species. The U.S. Fish and Wildlife Service, in its official biological opinion on the effects of the project, stated that:

> ...The Warner Valley project as now proposed will be likely to jeopardize the continued existence of the endangered woundfin by adversely modifying its present habitat in the Virgin River. The habitat is considered essential for survival of the species

> and has been proposed for designation as "Critical Habitat" as provided for by the Endangered Species Act of 1973....[26/]

The Washington County Water Conservancy District has not agreed to the minimum flow releases deemed necessary by the U.S. Fish and Wildlife Service.[27/] The BLM has stated that the water project would adversely affect the habitat of the roundtail chub, but the Fish and Wildlife Service has not yet issued its official opinion on that fish.[28/]

The Warner Valley Power Plant

The proposed 500 MW Warner Valley power plant would be located approximately 17 miles west of Zion National Park and about 13 miles southeast of St. George, Utah. The available evidence and modeling studies show that the Warner Valley power plant would exceed existing air quality standards. Sulfur dioxide emissions from the plant would exceed the allowable increment under the federal prevention of significant deterioration (PSD) program. This would occur for both Class II areas in the vicinity of the plant and for the Class I area of Zion National Park.[29/] Under certain conditions a yellow-brown haze from the plant would be visible from points within Zion National Park.[30/] The resulting reduction in visibility would be a violation of established Park Service policy.[31/]

The Warner Valley power plant could also adversely affect two species of endangered plants.[32/] The solid waste disposal area would destroy habitat and 80 to 100 individuals of the Siler pincushion cactus. The only known habitat of the endangered dwarf bearclaw poppy would be disrupted by the construction and operation of the Warner Valley plant and water project. One of the two existing populations of this species occurs near existing roads between St. George, Utah, and the power plant site; accelerated population

growth and road use would pose an immediate threat to this species. Construction of the slurry pipeline near St. George would destroy some individual plants of both of these species.[33/]

The Allen Plant

The proposed 2000 MW Allen power plant would be located in Dry Lake, approximately 25 miles northeast of Las Vegas, Nevada. The plant would emit 41 tons per day of sulfur dioxide, 8.2 tons per day of particulates and 136 tons per day of nitrogen oxides. Sulfur dioxide emissions from the plant would exceed the Class II PSD increment near the plant.[34/] The Class I sulfur dioxide increment would be exceeded in the potential Class I Valley of Fire State Park. The plant would also cause plume blight and reductions in visible range in the Piute Primitive Area and Valley of Fire State Park. Emissions from the Allen plant would exacerbate existing air quality problems associated with the Reid Gardner plant and city of Las Vegas.[35/]

The Clark County Health District has raised a number of issues regarding the air quality impacts of the Allen plant.[36/] Among these are: (1) the cooling towers will release ammonium, which will react with sulfate to produce aerosols and reduce visibility more than previous estimates indicate; (2) short-term increases in nitrogen oxides could exacerbate ozone problems in Las Vegas as well as visibility problems; (3) current reliability estimates for air pollution control equipment are overly optimistic. A more realistic appraisal of equipment reliability would yield more pessimistic estimates of potential air quality problems.

## Footnotes

1/ The generating capacity of the system will be shared among the participants as follows:

| | |
|---|---|
| Nevada Power Co. | 285 MW |
| Southern California Edison Co. | 1045 MW |
| Pacific Gas & Electric Co. | 1045 MW |
| City of St. George | 125 MW |

U.S. Department of the Interior Bureau of Land Management "Allen-Warner Valley Energy System Draft Environmental Impact Statement," June 1980, p. S-1.

2/ Utah International, Inc., Fact Sheet, Alton Project, June 1980.

3/ 30 U.S.C.§1265(b)(19); 30 C.F.R. §816.111.

4/ U.S. Bureau of Reclamation, U.S. Bureau of Land Management, and U.S. Geological Survey, "Energy Mineral Rehabilitation Inventory and Analysis." Alton Coal Field, Kane County, Utah," 1975.

5/ Utah International, Inc., "Environmental Assessment, Allen-Warner Valley Energy System, Vol. 5, Alton Coal Field," 1975.

6/ U.S. Bureau of Reclamation, op.cit.

7/ U.S. Department of the Interior, Geological Survey, Development of Coal Resources in Southern Utah, Final Environmental Statement, Part 2, Site Specific Analysis.

8/ Daniel Weiner, Reclaiming the West: The Coal Industry and Surface-Mined Lands, Inform, Inc. New York, NY, p.377.

9/ T. Verma, "Stripmining and Hydrologic Environment on Black Mesa." in L. Thomas, ed., Reclamation and Use of Disturbed Land in the Southwest, University of Arizona Press, Tucson, Arizona, 1977, pp. 161-166. This study showed much higher volumes and stormflow peaks in the mined and regraded watershed than in the undisturbed control area.

10/ G.W. Sandberg, "Hydrologic Evaluation of the Alton Reclamation Study Site, Alton Coal Field, Utah." U.S. Geological Survey Open-File Report 79-346, Salt Lake City, Utah, 1979, p. 53.

11/ U.S. Department of the Interior Geological Survey, op.cit.

12/ Personal communication with Keith Kirk, U.S. Office of Surface Mining and Enforcement, July 1980.

13/ U.S. Department of the Interior Geological Survey, op.cit., p. A-II-19. The figure of 100,000 visitors is for 1976.

14/ Michael Williams, "Affidavit in support of the Petition Before the Office of Surface Mining and Enforcement Designating Certain Federal Lands in Kane and Garfield Counties, Utah, Abutting Bryce Canyon National Park and Dixie National Forest as Unsuitable for Surface Coal Mining Operation," Berkeley, California, November 1979.

15/ U.S. Department of the Interior Bureau of Land Management, op.cit.

16/ Letter from Glen T. Bean, Regional Director, Rocky Mountain Region, National Park Service to William Curtiss and David Mastbaum, November 28, 1979. Included in the Technical Appendix to this report.

17/ Environmental Defense Fund, et al., "Petition Before the Office of Surface Mining and Enforcement Designating Certain Federal Lands in Kane and Garfield Counties, Utah, Abutting Bryce Canyon National Park and Dixie National Forest as Unsuitable for Surface Coal Mining Operations," Berkeley, California, November 1979.

18/ H.D. Goode, "Reconnaissance of Water Resources of a Part of Western Kane County, Utah," Utah Geological and Mineral Survey and Utah Water and Power Board, Water Resources Bulletin 5, 1964, p.62.

19/ R.M. Cordova, "Groundwater Conditions in the Upper Virgin River and Kanab Creek Basins Area,Utah, With Emphasis on the Navajo Sandstone," U.S. Geological Survey Open-File Report 80-524-W, Salt Lake City, Utah, 1980, p. 121.

20/ Ibid.

21/ Personal communication with Thomas Schultz, U.S. Office of Surface Mining and Enforcement, July, 1980.

22/ Cordova, op.cit.

23/ U.S. Department of the Interior, op.cit.

24/ Ibid.

25/ Ibid.

26/ H. Willoughby. Memorandum to State Director, Bureau of Land Management, from Regional Director, U.S. Fish and Wildlife Service, Denver, Colorado, regarding the effects of the Allen-Warner Valley Energy System, 1978. Included as Appendix 13, U.S. Department of the Interior Bureau of Land Management, op.cit.

27/ U.S. Department of the Interior Bureau of Land Management op.cit.

28/ Ibid.

29/ Environmental Protection Agency, "Screening Modeling of Harry Allen Powerplant using the VALLEY Model," Region IX, San Francisco, California, 1978.

30/ M.D. Williams, "Warner Valley Visibility Analysis--Zion Plume Blight," National Park Service, Air Office, Denver Service Center, Denver, Colorado, 1980.

31/ U.S. Department of the Interior Bureau of Land Management, op.cit.

32/ Ibid.

33/ Ibid.

34/ Ibid.

35/ Ibid.

36/ Letter from Michael Naylor, Director of Air Pollution Control Division, Clark County Health District, Las Vegas, Nevada, to District Manager, Cedar City District, Bureau of Land Management, July 17, 1980.

# VI. DETAILED DESCRIPTION OF ALTERNATIVES

## A. INTRODUCTION

The individual components of the EDF scenario, both end-use efficiency improvements (non-generation resources), and preferred generation resources are discussed below. The consequences of developing these components have been evaluated by simulating their combined use in the electric systems of SCE and PG&E. There are two distinct aspects to this simulation: (1) economic parameters (e.g., capital costs and economic lives) and (2) technical parameters (e.g., energy production and reliability).

The economic simulation of end-use efficiency improvements treats these alternatives analogously to the utilities' generation facilities. The utilities bear the full costs of these efficiency measures and subsequently recover these costs from their customers in the same manner they recover costs for conventional facilities. The analysis accounts for differences in tax treatment between non-generation measures and power generation facilities.[1/] With respect to potential differences in accounting and ratemaking treatment, the analysis assumes a "worst case," e.g., neither the use of subsidiary project financing to lower financing costs of residential end-use efficiency improvements, nor the use of special ratemaking treatments such as a balancing account (similar to the Energy Cost Adjustment Clause) are considered. By using this "worst case" assumption, the results of this analysis are not tied to any particular scheme of collecting the costs of improved-efficiency measures. This means the results of the analysis remain valid regardless of how regulatory policy issues associated

with the distribution of costs and benefits among ratepayers are ultimately resolved.

The economic simulation of the preferred generation resources is straightforward: The alternatives are treated on par with the utilities' conventional investments. The utilities bear the full costs of these facilities and subsequently recover these costs from their customers.

The technical simulation of end-use efficiency improvements is performed by estimating the reductions in load, both for energy and peak, that result from development of these efficiency improvements. Details of the estimates are given in the Technical Appendix.

The technical simulation of preferred generation resources, on the other hand, is analogous to the production simulation employed for the utilities' conventional generating units. The operating characteristics and availability of the alternative resources is taken into account. For example, EDF's analysis assumes that maintenance of cogeneration units cannot be scheduled in an optimal manner. The random availability of wind generation is accounted for by assuming average random availability at all times (despite evidence that wind generation will have greater than average availability at times of system peak[2/]).

## Footnotes

1/ EDF's analysis assumes that no utility tax credit nor accelerated depreciation are available for those non-generation alternatives which are not utility-owned.

2/ See testimony of R.B. Williams (CPUC Appl. 59308/Tr. 2250:12-16, and 2770:5-8).

## B. NON-GENERATION ALTERNATIVES

The EDF scenario includes a number of measures to improve the efficiency with which electricity is used. These measures, which affect end-use efficiency in the residential, commercial, and agricultural sectors, are described in the following sections.

All of these measures achieve efficiency gains beyond those forecast by the utilities themselves and by the California Energy Commission in its 1979 Biennial Report. These additional measures do not exhaust the possibilities for increased end-use efficiency, since only those savings which could be accurately quantified using existing data have been included. With more complete data on each sector, the number of measures and the concomitant electricity savings could be expanded. For example, commercial building lighting improvements, or additional conservation voltage regulation programs ("Phase II") have not been included in the EDF scenario.

The CPUC has adopted the electricity sales forecast prepared by the California Energy Commission in the 1979 Biennial Report as a basis for determining need for the AWV Energy System.[1/] This forecast provides a complete breakdown of anticipated electricity consumption by individual end-uses. It accounts for many efficiency improvements that will occur as a result of state and federal law; most importantly it includes efficiency improvements that result from state and federal appliance efficiency standards and state building standards. In addition, the 1979 Biennial Report forecast takes into account, except as noted below, the impact on electricity use of existing utility-sponsored programs.

The implementation of the efficiency measures included in the EDF scenario is based largely on utility conservation

financing proposals currently being considered by the CPUC. These recent proposals were not included in the 1979 Biennial Report forecast.

## 1. RESIDENTIAL EFFICIENCY IMPROVEMENTS

For the residential sector, the EDF scenario includes a set of measures to improve the efficiency of five end-uses of electricity: (a) space heating; (b) water heating; (c) air conditioning; (d) lighting; and (e) refrigeration. None of these measures involves a lifestyle change. All of the measures are in addition to the projected efficiency improvements that are already included in the California Energy Commission's 1979 Biennial Report forecast.

Table 2 summarizes the 1992 savings in each of the five end-uses resulting from this set of efficiency improvements. The measures to accomplish these improvements are described below. Sample calculations are included in the Technical Appendix.

### (a) Space Heating

The EDF scenario includes the following five measures for electrically heated single-family homes: sealing attic bypasses; adding storm windows; caulking; additional R-19 insulation in attics; and weatherstripping. Estimated savings are based only on single-family homes of 1980 vintage or older remaining in 1992. Although large potential savings exist in multifamily dwellings and mobile homes, as well as in improved design and construction of new homes, they are not included because data to document these savings are not yet available.

Average costs and savings for SCE and PG&E for each retrofit measure are shown in Table 3.

TABLE 2

1992 Residential Energy Savings From End-Use Efficiency Improvement Measures In The EDF Scenario (GWh/year)*

| | PG&E | SCE |
|---|---|---|
| Space heating | 457 | 140 |
| Water heating | 262 | 292 |
| Air Conditioning | 59 | 31 |
| Lighting | 653 | 514 |
| Refrigeration | 292 | 381 |
| TOTAL | 1723 | 1358 |

*beyond utility programs and the California Energy Commission's 1979 Biennial Report

TABLE 3

Average Costs and Energy Savings

of Space Heating Retrofit Measures

| | Average cost per retrofit (1980 $) | Average energy savings (kWh/year)* | |
|---|---|---|---|
| | | PG&E | SCE |
| Seal attic bypasses | 75 | 463 | 357 |
| Storm windows | 580 | 1311 | 1009 |
| Caulking | 220 | 520 | 400 |
| Additional insulation | 470 | 430 | 330 |
| Weatherstripping | 200 | 237 | 183 |

*Wright, et al. estimate 30% more energy for heating in Northern California than in Southern California. The savings are adjusted accordingly.

Source:

Janice Wright, et al., "Supplying Energy Through Greater Efficiency: The Potential for Energy Conservation in California's Residential Sector," Lawrence Berkeley Laboratory (draft), 1980.

It is assumed that 60% of the electrically heated 1980-vintage and older single-family houses remaining in 1992 are retrofit with each measure, except "additional insulation" for which the portion retrofitted is 48%.[2/] "Seal attic bypasses" refers to identifying and eliminating air circulation paths which reduce the effectiveness of existing attic insulation. "Additional insulation" refers to adding another layer of R-19 insulation onto the existing attic insulation. Caulking and weatherstripping serve to reduce infiltration from small leaks, and around windows and doors. Adding storm windows increases the low thermal resistance of single-pane glass.

Calculations of savings and costs are contained in the Technical Appendix.

(b) Water Heating

The EDF scenario includes two measures that reduce the use of electricity for domestic water heating: solar water heaters and heat-pump water heaters. Estimated savings are based on retrofitting 25% of single- and multifamily electric water heaters with solar units and 55% with heat-pump units by 1991. The CPUC-ordered demonstration program for utility financing of solar units (OII 42), that will result in retrofit of 10% of existing electric water heaters by 1983 has been included in both the utility and EDF scenarios as an additional program that was not accounted for in the California Energy Commission's 1979 Biennial Report forecast.

Solar water heaters save approximately 60% of the electricity used for domestic hot water.[3/] Costs are $3000 per single-family unit and $1000 per multifamily unit.[4/] Savings from heat pump water heaters are approximately 50%.[5/] The average cost is $700 per installation.[6/]

(c) Air Conditioning

The EDF scenario includes one measure for single-family homes with central air conditioning: retrofitting walls with R-11 insulation. This measure reduces central air conditioning unit energy consumption by 17%, on average, without changing the comfort of retrofit homes.[7] Estimated savings are based on retrofit of 42% of centrally air conditioned homes of 1980 vintage or older remaining in 1992.[8] The average cost of this measure is $270.[9]

(d) Lighting

The EDF scenario includes a variety of light bulb retrofit measures to improve the efficiency of residential lighting. They are: (1) replacing incandescent bulbs in older kitchens with higher efficiency fluorescent bulbs; (2) replacing exterior incandescent bulbs with screw-in fluorescent units; (3) replacing 2-Way lights with screw-in fluorescents and "Halarc" bulbs; and (4) replacing 75 Watt and 100 Watt interior incandescent bulbs with fluorescent bulbs.[10] The percentage of homes assumed to be retrofitted ranges from 15% to 48%, depending on the measure.[11] Savings are estimated statewide and adjusted for SCE and PG&E according to each utility's share of residential customers. Average cost per home varies, according to the number of bulbs retrofit.

Calculations of savings and costs are provided in the Technical Appendix.

(e) Refrigeration

The EDF scenario contains two measures for increasing the efficiency of refrigeration in residences: (1) a program to remove under-utilized second refrigerators; and (2) an incentive program for purchases of refrigerators which are

more efficient than existing state and federal standards.

To remove under-utilized second refrigerators, SCE and PG&E have begun pilot programs of bounties, paid to customers for their second refrigerators.[12/] The EDF scenario provides for a bounty of $80 and assumes that with such an incentive 30% of second refrigerators will be collected.

For purchases of more efficient refrigerators, the incentive program in the EDF scenario provides an incentive of $30 for each refrigerator purchased from 1982-1992 which is as efficient as the most efficient refrigerator being marketed in 1980. This incentive is more than double the average premimum that customers must now pay for top efficiency (i.e., the cost differential between those refrigerators which meet current appliance efficiency standards, and the most efficient available models.)[13/] Savings are based on the assumption that only half of the full potential savings under the program are realized.

A more detailed discussion of both refrigerator programs, including calculations, is presented in the Technical Appendix.

## Footnotes

1/ CPUC Decision 91968 (1980).

2/ Percentage based on estimates of eligibility in Janice Wright, et al., "Supplying Energy Through Greater Efficiency: The Potential for Energy Conservation in California's Residential Sector," Lawrence Berkeley Laboratory (draft), 1980. For details see the Technical Appendix.

3/ Actual figures range from 56% in PG&E's area to 76% in SCE's. California Energy Commission, "Technical Documentation of the Residential Sales Forecasting Model: Electricity and Natural Gas," October 1979, Appendix L.

4/ These estimates are used by both SCE and PG&E in their compliance filings for CPUC Order Instituting Investigation (OII) No. 42 Decision 19272. See OII-42/Exh. 57-G (SCE) and Exh. 70 (PG&E).

5/ As reported by SCE in OII-42/Exh. 57-G.

6/ SCE estimates costs of $600-$700. Ibid.

7/ Wright et al., op.cit., Appendix 3, p.25.

8/ Based on estimates of eligibility in Wright et al., op.cit.

9/ Total cost of the measure is $900; however, 70% of the cost is assigned to gas space heating savings. (See the Technical Appendix) Wright et al., op.cit.

10/ Savings vary greatly according to the number of hours per year a particular bulb operates. Wright et al., op.cit., consider usage frequency for eight different household lights.

11/ Based on estimates of eligibility in Wright et al., op.cit.

12/ Incentives for customers were $25 under the PG&E program and $65 under the SCE program, with additional payments to the charity or contractor collecting the refrigerators. For details see the Technical Appendix.

13/ Wright et al., op.cit.

## 2. COMMERCIAL SECTOR EFFICIENCY MEASURES

Although studies have reported that a large potential exists for increased efficiency in commercial electricity use, there are insufficient data refined enough to be used in a systematic analysis such as EDF's.[1/] For that reason the EDF scenario includes only one efficiency measure in the commercial sector.

That measure is the replacement of electric water heaters in commercial buildings with heat pump water heaters. This measure saves about 50% of electric consumption for water heating in the average commercial building.[2/] The EDF scenario assumes that 30% of commercial buildings with electric water heating will convert to heat pumps under the program.

Energy savings are 264 GWh/year in 1992 for SCE and 308 GWh/year for PG&E. The Technical Appendix provides detailed cost and savings calculations.

### Footnotes

1/ A report to PG&E by Arthur D. Little, Inc., Conservation Potential in the PG&E Service Area, June 1980, concludes that large potential savings exist for a number of commercial end-uses of electricity, including lighting, refrigeration, water heating, and space heating and cooling. As an example, for space heating and cooling, potential reductions by 1990 in energy intensity below 1975 levels for existing commercial buildings are, on average, 32% and 40% respectively. For new commercial buildings the potential reductions were even greater: 59% for space heating and 48% for cooling. A.D. Little, Table IV-14, pp.IV-78, 79.

2/ Based on savings for heat pumps in the residential sector. For discussion, see the Technical Appendix.

## 3. AGRICULTURAL SECTOR EFFICIENCY IMPROVEMENTS

Water pumping is the main end-use of electricity in the agricultural sector. Both SCE and PG&E have programs for testing and adjusting agricultural pumps.[1/] The EDF scenario provides for expanding these programs. Over a three year period (1982-1984) about one-half of each utility's agricultural pumping customers are reached by the expanded program. Energy savings are 94 GWh/year in 1992 for SCE and 468 GWh/year for PG&E. Savings and costs are derived from SCE's program and from the California Energy Commission's 1979 Biennial Report forecast, and are shown in the Technical Appendix.

### Footnote

1/ CPUC, "Analysis of Energy Conservation Programs of Southern California Edison Company Test Year 1981," April 11, 1980, p. 4-6. PG&E, "Report on 1979 Energy Conservation Activities," March 31, 1980, p. 40. For a description of these programs, see the Technical Appendix.

## 4. DISTRIBUTION EFFICIENCY

Energy can be saved by increasing the efficiency of electricity distribution. Conservation voltage regulation--maintaining service voltages in the lower half of the 114 to 126 volt range--is one method; upgrading the distribution network is another.

The EDF scenario includes only one measure to increase distribution efficiency: expansion of PG&E's current distribution network upgrading program to convert primary distribution feeders to 21-kilovolt operation. The effect of PG&E's current program is included in both the utility and EDF scenario as an additional measure that was not included in the 1979 Biennial Report. PG&E's "Montezuma Study" notes that an additional 569 distribution circuits could be upgraded.[1/] The EDF scenario expands PG&E's existing program to upgrade these additional circuits, resulting in additional savings of 290 GWh/year in 1991.[2/] Cost estimates are based entirely on PG&E's existing program. The Technical Appendix provides details.

EDF's scenario does not include any additional conservation voltage regulation beyond existing programs ("Phase I") already included in the 1979 Biennial Report forecast. Although there is evidence that a significant amount of additional cost-effective savings is available,[3/] data to quantify these savings are currently unavailable. Therefore the EDF scenario does not include any savings from Phase II projects.

## Footnotes

1/ PG&E, "Montezuma Power Plant Project Assessment Interim Report," May 2, 1980 (CPUC Appl. 59308/ Exh. 64), p. VII-26.

2/ Ibid., p. VII-62.

3/ San Diego Gas and Electric plans on spending $1.45 million in 1981 on conservation voltage regulation Phase II programs. SCE, five times as large, is spending half that amount: proportional to size, only one-tenth of SDG&E's program. For that reason, the CPUC staff has recommended that SCE triple its test-year 1981 projected Phase II spending, to $2.4 million. (CPUC Appl. 59351/Exh. 116).

## C. GENERATION ALTERNATIVES

The EDF scenario includes expansion of existing utility programs for four electric-generation technologies: geothermal, cogeneration, wind, and biomass. The scenario does not represent the maximum amount of capacity that could be obtained from any of these power options; rather, it includes levels of capacity for each technology which can be reliably achieved by 1992.

Moreover, the set of generation options included in the EDF scenario does not exhaust the preferred generation alternatives available in the time frame under consideration. Expansion of hydroelectric generation through capacity additions at existing facilities, accelerated development of photovoltaics, and other measures could provide significant generation sources by 1992.

1. GEOTHERMAL

In their current resource plans through 1992, PG&E[1] and SCE[2] project 2211 MW and 170 MW respectively of geothermal capacity. EDF's scenario includes an additional 1279 MW in the same time period. Table 4 provides a year-by-year breakdown of capacity under each schedule.

The EDF scenario for PG&E adopts PG&E's planned dry steam geothermal additions at The Geysers through 1988, but includes 440 MW of dry steam capacity in addition to the 200 MW of PG&E hot water geothermal additions in 1989-1992, for a total of 2651 MW.[3]

For SCE, the EDF scenario adopts the company plan for 41 MW through 1983, then includes 839 MW of additional hot water capacity beyond the 129 MW planned by the company in 1984-1992, for a total of 1009 MW. All of EDF's proposed additions to SCE's plan are hot water flash geothermal, with the alternative possibility of binary units after 1986. All units are at Imperial Valley locations.

For PG&E and SCE combined, the EDF scenario through 1992 includes 3660 MW of geothermal, compared to 2381 MW now planned by the utilities.

Discussion

California's total geothermal potential is far higher than either the utility or EDF scenario through 1992. The U.S. Geological Survey places the total electric energy in identified hydrothermal systems in California at 13,800 MW, and estimates that an accessible resource base of even larger dimension remains undiscovered.[4] Thus, the only issue for resource planning purposes is that of dependable near-term and mid-term levels of geothermal capacity: what pace of development is practicable.

TABLE 4

Geothermal Capacity in EDF and Utility Scenarios

(MW)

| | PG&E | | SCE | |
|---|---|---|---|---|
| | Utility Scenario | EDF Scenario | Utility Scenario | EDF Scenario |
| 1980 | 910 | 910 | - | - |
| 1981 | 968 | 968 | - | - |
| 1982 | 1241 | 1241 | - | - |
| 1983 | 1406 | 1406 | 41 | 41 |
| 1984 | 1571 | 1571 | 50 | 150 |
| 1985 | 1571 | 1571 | 50 | 150 |
| 1986 | 1736 | 1736 | 59 | 159 |
| 1987 | 1791 | 1791 | 59 | 259 |
| 1988 | 2011 | 2011 | 96 | 409 |
| 1989 | 2061 | 2171 | 96 | 559 |
| 1990 | 2111 | 2331 | 170 | 709 |
| 1991 | 2161 | 2491 | 170 | 859 |
| 1992 | 2211 | 2651 | 170 | 1009 |

Sources:

PG&E -- CFM III, Form R-4A, June 1980.

SCE -- "Summary of Loads and Resources," June 10, 1980

Various studies[5/6/7/] have evaluated the feasibility of accelerated schedules of geothermal development; a summary of the results of several of these is shown in Table 5. The yearly survey performed by the Electric Power Research Institute (EPRI) is particularly significant since it is compiled from the utilities' own estimates of future additions. Table 6 shows the full results of the 1979 EPRI survey for California. Most notable is the gap between the "announced" and "probable" levels of development. This gap--between what the state's utilities have included in supply plans and the level of geothermal development they themselves consider "probable"--amounts to 1765 MW by 1990 statewide, or 1200-1600 MW for PG&E and SCE.

Dry Steam

At The Geysers dry steam field, the EDF scenario differs from the PG&E plan by including an additional 440 MW of dry steam capacity after 1988; this results in a projection of 2451 MW of dry steam potential through 1992. Independent assessments of the potential of the dry steam field show that this additional dry steam capacity is available at The Geysers.[8/]

Hot Water

For The Geysers hot water field, the PG&E supply plan includes 200 MW of hot water geothermal capacity in 1989-1992. Although several studies have concluded that significantly higher amounts of hot water capacity could be operating at The Geysers by 1992[9/], the EDF scenario includes no additional capacity for PG&E at this location. Other hot water fields in Northern California, including Mono-Long Valley, Surprise Valley,

TABLE 5

Recent Projections of Potential
Geothermal Development
(Geysers and Imperial Valley Locations Only)

| | (MW) | |
|---|---|---|
| | 1985 | 1990 |
| Jet Propulsion Laboratory (1977)[a/] | 2508 | 4560 |
| Interagency Geothermal Coordinating Council (1979)[b/] | 2670 | 4720 |
| Electric Power Research Institute (1979)[c/] | 2154 | 3457 |
| Environmental Defense Fund (1980) | 1721 | 3040 |

a/ See footnote 5.

b/ See footnote 6.

c/ This is the "Probable" forecast by California's utilities as reported by the Electric Power Research Institute (see footnote 7 and Table 6). The 1985 and 1990 figures shown here have been reduced by 200 MW and 500 MW respectively to adjust the EPRI survey, which covered geothermal capacity statewide, to Geysers and Imperial Valley locations only.

TABLE 6

1979 EPRI Utility Geothermal Survey*

California Capacity By Year
(MW)

| | "Announced" | "Probable" | "Possible" |
|---|---|---|---|
| 1985 | 2007 | 2354 | 2739 |
| 1990 | 2192 | 3957 | 5517 |
| 1995 | 2462 | 5158 | 7608 |

"Announced": "Either publicly or through PUC-type biennial reports."

"Probable": Estimated by California utilities; "based on successful demonstration of technology for using liquid-dominated geothermal resources."

"Possible": Estimated by California utilities; "based additionally on removal of institutional barriers, governmental incentives and R&D support."

*See footnote 7.

and Glass Mountain, could also provide several hundred megawatts, with development beginning in the late 1980s.[10] However, the EDF scenario assumes development at these locations is deferred until after 1992.

For Imperial Valley locations, the EDF scenario through 1992 includes an additional 839 MW of hot water capacity beyond the 170 MW in the SCE supply plan. EDF's schedule of new units takes into account the chief determinant of the pace of hot water capacity increments--the need to allow a three year interval between completion of the first commercial scale units and operation of additional plants.[11] To provide for the possibility of difficulties and delays at a particular location, the EDF scenario limits additions in any year to 150 MW, or one 50 MW unit at three out of the five Imperial Valley locations (Heber, Brawley, Salton Sea, Westmorland, and East Mesa).

The EPRI study notes that achieving the "probable" level of development projected by the state's utilities in the EPRI survey depends on "successful demonstration of technology for using liquid-dominated geothermal resources," i.e., hot water geothermal.[12] According to SCE, the major question associated with feasibility of hot water geothermal technology in California is adaptability of flash plants to the highly saline brines encountered at some hot water fields.[13]

Hot water geothermal technology is not new: plants have operated for years in Italy (400 MW), New Zealand (190 MW), Mexico (150 MW), Turkey, the Philippines, El Salvador, the U.S.S.R., Iceland, and Japan.[14] Salinity is not a constraint to the level of development in the EDF scenario, since most of California's hot water resource, including over 1000 MW at Imperial Valley sites, is in fields less saline than Mexico's Cerro Prieto

field, where the commercial hot water technology has been proven successful. For a more extensive discussion of the consequences of salinity for hot water geothermal development, see the Technical Appendix.

### Costs and Technical Parameters

With the exception of capital cost and fuel cost for SCE's hot water geothermal plants, which are derived in the Technical Appendix, all assumptions regarding costs and technical parameters for geothermal are in agreement with estimates made by SCE and PG&E.

## Footnotes

1/ PG&E, CFM III, Form R-4, June 1980.

2/ SCE, "Summary of Loads and Resources," June 10, 1980.

3/ Both the PG&E resource plan and the EDF scenario include a 53 MW NCPA unit in 1981, a 53 MW NCPA unit in 1982, a 55 MW SMUD unit in 1983, and a 55 MW SMUD unit in 1984.

4/ L.J.P. Muffler, ed., Assessment of Geothermal Resources of the United States -- 1978, U.S. Geological Survey Circular 790, 1979, Tables 4 and 8.

5/ C.D. Fredrickson, "Analysis of Requirements for Accelerating the Development of Geothermal Energy Resources in California," Jet Propulsion Laboratory, 1977.

6/ Interagency Geothermal Coordinating Council, "Third Annual Report, Geothermal Energy Research Development & Demonstration Program," March, 1979.

7/ Vasel Roberts and Paul Kruger, Electric Power Research Institute, "Utility Industry Estimates of Geothermal Electricity," Geothermal Resources Council Transactions, Vol. 3, September, 1979.

8/ L.J.P. Muffler, op.cit.; California Energy Commission, "Comparative Evaluation of Nontraditional Energy Resources," 1980; Thomas A.V. Cassel et al., "Geothermal Investment Analysis With Evaluation of California and Utah Resource Areas," Technecon Analytic Research, Inc. and the University of Pennsylvania, Oct. 1979; personal communication from L.J.P. Muffler, U.S.G.S., July 17, 1980; personal communication from David Hill, California Energy Commission, July 11, 1980. For discussion, see the Technical Appendix.

9/ Fredrickson, op.cit.; Interagency Geothermal Coordinating Council, op.cit.; R. Trehan et al., Site Specific Analysis of Geothermal Development--Scenarios and Requirements, Volume II, Mitre Corporation, April 1978.

10/ Cassel, op.cit.; Fredrickson, op.cit.; Interagency Geothermal Coordination Counsel, op.cit.; Trehan, op.cit.

11/ Personal communication with Edward Ennis, California Energy Commission, Geothermal Division, June 20, 1980.

12/ Roberts and Kruger, op.cit.

13/ SCE and PG&E, "Proponents Environmental Assessment," Allen-Warner Valley Energy System, 10.15.1.6. See also "Prepared Testimony of S.P. Barrett," (CPUC Appl. 59308/ Exh. 18 and Tr. 1183:17-19).

14/ "Tapping the Main Stream of Geothermal Energy," EPRI Journal, Vol. 5, No. 4, May 1980; and Ronald Di Pippo, A Summary of the Technical Specifications of the Geothermal Power Plants on the World, Revision 1, July 1979, cited in PG&E, "Montezuma Power Plant Assessment Interim Report," May 2, 1980 (CPUC Appl. 59308/Exh. 64).

## 2. COGENERATION

Through 1992, PG&E[1/] and SCE[2/] project that 992 MW and 374 MW respectively of new cogeneration will be added to their systems. For PG&E, this new cogeneration is entirely accounted for in the company's resource plan. SCE includes 116 MW in its resource plan and 258 MW as a reduction in sales.[3/]

For PG&E, the EDF scenario through 1992 includes a total of 1719 MW of new cogeneration, 727 MW beyond the utility scenario. For SCE, the EDF scenario includes a total of 1630 MW of new cogeneration, 1256 MW beyond the cogeneration included in the utility scenario.

Table 7 provides a year-by-year comparison of total cogeneration for the utilities' scenario and the EDF scenario.

Table 8 provides a breakdown of 1992 cogeneration capacity under each scenario into two categories: (1) commercial and industrial cogeneration, and (2) cogeneration in thermal enhanced heavy oil recovery operations.

### Discussion

The primary issues in determining dependable levels of near-term and mid-term cogeneration capacity are the total economic potential in a given utility's service area, and how much of the potential can be realized in light of institutional constraints. Perhaps the single most important factor is the degree of utility and regulatory commitment to cogeneration development. Although cogeneration technology is well established, providing as much as 10 percent of the electric energy in countries such as West Germany, utility practices in the United States have inhibited the development of this country's enormous cogeneration potential.

At present, public policy in the U.S. is shifting toward encouragement of cogeneration due to mounting recognition

TABLE 7

Cogeneration Capacity in EDF and Utility Scenarios

(MW)

| | PG&E | | SCE | |
|---|---|---|---|---|
| | Utility Scenario | EDF Scenario | Utility Scenario | EDF Scenario |
| 1979 | 179 | 179 | 20 | 20 |
| 1980 | 204 | 204 | 21 | 21 |
| 1981 | 221 | 221 | 55 | 55 |
| 1982 | 273 | 273 | 90 | 90 |
| 1983 | 335 | 431 | 133 | 168 |
| 1984 | 398 | 563 | 161 | 246 |
| 1985 | 821 | 911 | 199 | 324 |
| 1986 | 871 | 1107 | 259 | 502 |
| 1987 | 921 | 1239 | 277 | 860 |
| 1988 | 971 | 1371 | 303 | 1038 |
| 1989 | 1021 | 1502 | 321 | 1316 |
| 1990 | 1071 | 1634 | 342 | 1494 |
| 1991 | 1121 | 1766 | 369 | 1572 |
| 1992 | 1171 | 1898 | 394 | 1650 |

Sources:

PG&E -- CFM III, Form R-4A, June 1980.

SCE -- "Summary of Loads and Resources," June 10,1980.

TABLE 8

Cogeneration Capacity in 1992
Under Utility and EDF Scenarios
(MW)

| | Commercial and Industrial Cogeneration | Oil Field Cogeneration |
|---|---|---|
| PG&E | | |
| Utility Scenario | 823 | 348 |
| EDF Scenario | 1550 | 348 |
| SCE* | | |
| Utility Scenario | 394 | - |
| EDF Scenario | 870 | 780 |

*Includes firm and nonfirm cogeneration

Sources:

PG&E -- CFM III, Form R-4A, June 1980.

SCE -- "Summary of Loads and Resources, June 10, 1980.

of the inherent efficiency of the technology. The Public Utility Regulatory Policies Act of 1978 removed the most significant constraint to cogeneration by requiring purchase of cogenerated power by utilities at their avoided cost. Although progress in facilitating cogeneration through public policy has been briefly stalled by contradictory fuel oil reduction measures--chiefly the restrictions on use of petroleum fuels in the Powerplant and Industrial Fuel Use Act of 1978--this problem appears to be approaching resolution at the federal level. The basis for this conclusion is detailed in the Technical Appendix.

In California, state policy strongly supports development of cogeneration to the full economic potential. Noting that cogeneration "is the most efficient means of utilizing fuels to produce power," Governor Brown on June 3, 1980, set 6000 MW of cogeneration by 1990 as a goal for California's utilities.[4/] And in a pair of unprecedented decisions, the California Public Utilities Commission on December 19, 1979, penalized PG&E $7.2 million in 1980 for that company's failure to pursue cogeneration as a major resource despite cogeneration's clear potential and repeated CPUC warnings.[5/] The CPUC set as reasonable goals for PG&E an additional 600 MW of new cogeneration by the end of 1980, achievement of which will cause the penalty to be lifted.[6/] The CPUC also found reasonable an additional 400 MW by the end of 1981, and 1000 MW by the end of 1985, for a total of 2000 MW which could reasonably be expected to be available to PG&E as new plannable resources in the near term. (As of June 1980, PG&E had no new cogeneration under contract.)

A number of estimates have been made of cogeneration potential for various utility service areas and various categories of process heat use. Unfortunately, there is no study that systematically considers statewide cogeneration potentials in all categories. Assumptions and results

of the existing studies are presented in the Technical Appendix.

The EDF scenario of dependable cogeneration capacity which could be operating by 1992 consists of three categories--heavy oil recovery operations, large sites (greater than or equal to 7 MW), and small sites (less than 7 MW). The construction of the schedule for each category, and its justification, is described below.

Oil Field Cogeneration

According to the California Energy Commission, electrical capacity associated with generation production of steam for thermal enhanced heavy oil recovery operations in California could provide 2500 MW by 1991 and 9000 MW by the year 2000.[7/] Several cogeneration options are possible. Crude oil gasification systems and distillate-fired gas turbine systems would yield about 210 MW or 350 MW respectively, at each of four to six sites: Kern River, Midway Sunset, Belridge, and McKittrick in Kern County; San Ardo in Monterey County; and Santa Maria in Santa Barbara County.[8/]

A different system, consisting of small modular cogeneration units, is under development by Optimum Energy Development (OED); the first such unit is planned to begin operation in August 1980.[9/] At a size of 1.3 MW each, these modular gas turbines are sized to replace the typical oil field steam boiler, and are unique in using crude oil as fuel.[10/] A contract has been signed between PG&E and OED for power and PG&E includes 68 MW of these units in its most recent supply plan.[11/] The potential for modular unit cogeneration at existing oil field sites has been estimated to be in the range of 2000-4000 MW.[12/]

Since August 1979, when some price controls on heavy oil were lifted, and especially since December 1979, when additional decontrol was effected, a boom of major proportions

has been underway in Kern County and other locations.[13] Even before the magnitude of this boom was apparent, additional cogeneration potential by 1982 in the southern San Joaquin Valley oil fields was expected to be 2000 MW.[14] In July 1980, the total potential at the Bakersfield and Kern River sites was placed at 6000 MW.[15]

In its current resource plan, PG&E includes 348 MW of oil field cogeneration: 68 MW in modular units, beginning operation in 1981-1983, and 280 MW in one oil gasification/gas turbine topping cycle system at Getty Oil's Kern River field.[16] SCE's resource plan includes no oil field cogeneration.

The EDF scenario includes development of 1128 MW of oil field cogeneration by 1992. For PG&E, EDF's scenario follows the company plan. For SCE, EDF's scenario includes a 280 MW unit in 1987 and an additional 500 MW in 1986-1990, consisting either of a pair of 210-350 MW units or a large number of small modular units. Since most heavy oil recovery operations are located in PG&E's service area, involvement by SCE in oil field cogeneration would require wheeling arrangements between the two utilities.

Commercial and Industrial Cogeneration

The EDF scenario through 1992, for PG&E and SCE combined, includes 1831 MW of new commercial and industrial cogeneration at large sites; i.e., those greater than or equal to 7 MW, which are covered by the provisions of the Powerplant and Industrial Fuel Use Act of 1978 (FUA). For sites smaller than 7 MW, the EDF scenario includes 390 MW for the two utilities through 1992: 185 MW for PG&E, 205 MW for SCE. The EDF scenario is based on projections prepared by the California Energy Commission, disaggregated to service areas in proportion to commercial and industrial electrical consumption.

For sites larger than or equal to 7 MW, the EDF scenario includes 1831 MW for the two utilities through 1992: 1186 MW for PG&E, 645 MW for SCE. The scenario is based on a statewide estimate of "financially acceptable" industrial cogeneration prepared by Resource Planning Associates (RPA).[17/] The statewide estimate is adjusted for the service areas of PG&E and SCE according to the relative consumption of energy by the seven industries examined by RPA.[18/] A detailed discussion of EDF's estimation procedure for both small and large cogeneration is provided in the Technical Appendix.

It should be noted that the EDF scenario covering PG&E includes even less cogeneration than the modest goals set for PG&E by the PUC, and far less for both utilities than their proportional share of Governor Brown's announced goal.

## Footnotes

1/ PG&E, CFM III, Form R-4.

2/ SCE, "Summary of Loads and Resources," June 10, 1980.

3/ The capacity equivalent of SCE's sales reducing (non-firm) cogeneration is derived from SCE's estimate of its energy production

4/ Office of the Governor, State of California, Press Release, June 3, 1980.

5/ CPUC, Decision 91107, Decision 91109. The penalty will apply in 1980 and again in 1981 if PG&E does not sign contracts for 600 MW of cogeneration.

6/ Ibid.

7/ California Energy Commission, Looking Ahead, March 1979, p. 171.

8/ Mark Henwood, "Feasibility and Economics of Cogeneration in California's Thermal Enhanced Oil Recovery Operations,"

Consultant Report to California Energy Commission, December 1978, p. 118.

9/ Personal communication with James Noe, Alpha National Corp., July 18, 1980.

10/ Ibid.

11/ Ibid.

12/ Estimates of potential for modular unit cogeneration at existing oil field sites:

(a) 2000-3000 MW-- Personal Communication with Richard Grix, California Energy Commission, December 19, 1979;

(b) 3468 MW based on 1977 production in the southern San Joaquin Valley oil fields-- Al Stoddart, Optimum Energy Development (CPUC OII 26/Tr. 1030-1047).

13/ "Decontrol Signals State Oil Boom," Sacramento Bee, December 22, 1979, p. 1.

14/ Al Stoddart, op. cit.

15/ Personal communication with James Noe, op. cit.

16/ PG&E, CFM III, Form R-4, op. cit.

17/ Resources Planning Associates, "The Potential for Cogeneration in California by 1985," prepared for the California Energy Commission, July 1978.

18/ U.S. Department of Commerce, "Annual Survey of Manufactures," 1976. For calculations see the Technical Appendix.

## 3. WIND

In their current resource plans through 1992, SCE and PG&E include 249 MW and 222.5 MW, respectively, of wind generation.[1/2/] EDF's scenario includes a total of 2665 MW for both utilities through 1992. Table 9 provides a year-by-year comparison between the utilities' scenario and the EDF scenario.

SCE plans to begin testing two Wind Turbine Generators (WTGs) in 1980: a 3 MW Schachle-Bendix machine and a 500 kW Alcoa vertical-axis machine. SCE's resource plan shows the first WTG (3 MW nameplate, 1 MW at peak) starting commercial production in 1984, with additional units providing commercial power beginning in 1986.

PG&E's resource plan includes one 2.5 MW WTG in 1982, then a four-unit 10 MW cluster in 1985, and additional capacity each year from 1988-1992.

The EDF scenario includes testing of three candidate WTG models beginning in 1982. In 1983 two clusters or three clusters, totalling 20 WTGs, begin operation. For all WTGs added in 1982 and 1983, commercial production of power begins one year after initial operation, to allow time for testing. In 1986, the selected WTG model is deployed in a small wind farm of 75 MW capacity. From 1987-1992, 200 MW of wind capacity are added each year.

### Discussion

Several studies indicate that the available wind resource at high performance sites is much larger than would be developed under either the utilities' scenario or EDF's scenario. According to Klems of Lawrence Berkeley Laboratory, the "currently practical size" of the California wind resource is roughly equal to present statewide electricity production (about 500 x $10^{12}$Btu).[3/] A recent

TABLE 9

Wind Capacity in the EDF and Utility Scenarios (MW)

| | PG&E | | SCE | |
|---|---|---|---|---|
| | Utility Scenario | EDF Scenario | Utility Scenario | EDF Scenario |
| 1980 | -- | -- | -- | -- |
| 1981 | -- | -- | -- | -- |
| 1982* | 2.5 | 7.5 | -- | 7.5 |
| 1983* | 2.5 | 57.5 | -- | 57.5 |
| 1984 | 2.5 | 57.5 | 3 | 57.5 |
| 1985 | 12.5 | 57.5 | 3 | 57.5 |
| 1986 | 12.5 | 132.5 | 9 | 132.5 |
| 1987 | 12.5 | 332.5 | 24 | 332.5 |
| 1988 | 22.5 | 532.5 | 54 | 532.5 |
| 1989 | 42.5 | 732.5 | 84 | 732.5 |
| 1990 | 82.5 | 932.5 | 129 | 932.5 |
| 1991 | 142.5 | 1132.5 | 189 | 1132.5 |
| 1992 | 222.5 | 1332.5 | 249 | 1332.5 |

* Capacity installed in 1982 and 1983 enters commercial production after one year of testing (i.e., in 1983 and 1984 respectively).

Sources:

PG&E -- CFM III, Form R-4A, June 1980.

SCE -- "Summary of Loads and Resources," June 10, 1980.

study performed for SCE concludes: "The development of a number of large scale wind arrays for electricity production in the Palm Springs-Whitewater Region is a realistic goal."[4/] The study found that 2900 4-MW wind turbine generators (WTGs) could be sited in this region including 650 4-MW WTGs in its most promising subregion.[5/] According to PG&E's "Montezuma Study," prospecting data already collected shows that two sites, one at Altamont Pass and another in Solano County, could support 396 2.5-MW WTGs, i.e., 990 MW of wind capacity.[6/] Another study prepared for PG&E[7/] concluded that a wind potential of 3975 MW exists at non-wilderness sites.

The important question, therefore, is not the size of the available wind resource, but what level of wind capacity could be developed in the current time frame for supply planning. Two sets of issues are relevant: (1) technical issues (the reliability of individual WTGs; performance of WTGs in clusters; and power system interaction of WTG arrays) and (2) site-specific deployment issues (e.g., competing land uses, noise, and television interference).

According to a PG&E expert, the technical problems associated with wind are resolvable.[8/] However, neither SCE nor PG&E has adopted an optimal strategy for minimizing the risks of early commercial utilization for wind, a technology that is still undergoing development. SCE and PG&E each show plans to test only one megawatt-scale, horizontal axis WTG model,[9/] despite the availability of WTGs from several major engineering companies, including Boeing, Hamilton Standard, and Bendix. Testing more than one model at once would reduce risk and cut lead times. In addition, the utilities plan to wait until after testing of the first WTG model before testing small clusters of WTGs. This will further delay the construction of significant arrays of WTGs.

The EDF scenario prescribes a means of deriving conclusive answers to both machine reliability and cluster performance issues at an earlier date. It departs from the testing schedule of the utilities in two major respects:

1. At least three manufacturers' WTG models are tested simultaneously, beginning in 1982;
2. Cluster testing is initiated in 1983, overlapping single machine testing.

Testing more than one manufacturer's WTG enables the utility to conduct "fly-offs," ensuring that the model chosen is the most dependable and cost-effective available, and avoids the risk of delays in the schedule, which might otherwise result from the failure of a particular machine. Initiation of cluster testing in the year following operation of the first models allows for three years of operating experience with groups of machines prior to deployment of the first wind farm.

The concept of multiple-design WTG testing has been developed by the Swedish Energy Source Development Board, and is discussed in the Technical Appendix. Significantly, PG&E itself appears on the verge of announcing a multiple-design, overlapping testing program. According to a spokesman for Hamilton Standard, PG&E has issued a request for proposals to several WTG manufacturers.[10/] Under the terms of the request, the manufacturer must be able to supply three WTGs, the first for installation by January 31, 1982, and two more for initiation of cluster testing by mid-1983.[11/] In mid-August, 1980, PG&E will announce which manufacturer(s) it has selected.[12/]

Due to the possibility that delays will occur even under a multiple-model testing program, the EDF scenario is constructed in such a way that up to three years of delay can occur without curtailment of the total operating capacity included in the scenario in 1992.

The Technical Appendix includes a more detailed description of the utility and EDF scenarios and an analysis of lead times, fabrication capacity, and other factors governing the pace of WTG development.

Deployment

Areas with high wind regimes, which would support several thousand MW, have already been surveyed, as discussed above. With regard to the question whether these areas can actually be utilized for wind power generation, a number of factors have been identified as possible impediments: television interference, hazards to migrating birds, small aircraft navigational hazards, esthetic degradation, land use conflicts, and noise.

Information from both SCE and PG&E indicates that none of these potential problems poses a constraint to the level of development set out in the EDF scenario. For SCE, this conclusion is supported by the findings of the Palm Springs-Whitewater Region Study. After reviewing all the factors cited above, the study concludes that:[13/]

> --At this level of analysis there do not appear to be significant environmental or institutional issues which would impede turbine installation in the area.

This conclusion is supported by PG&E's discussion in the AWV Energy System Proponents' Environmental Assessment,[14/] which states:

> Concerns that have been expressed about bird strikes, audible noise, and climatic and habitat disruption appear to have largely been resolved by the performance characteristics of the MOD-0 and MOD-0A machines in operation. The MOD-0 at Sandusky, Ohio, operated during three nights of heavy migration with no evidence of bird injury. The sound produced by these slowly rotating machines is a gentle "swish" as each blade tip

> approaches the ground, but the noise at Sandusky is reported to be inaudible beyond a range of 66 feet. The potential for damage from a thrown blade through stress fracturing is recognized and can be minimized by creating larger easements around each machine.

PG&E notes that a wind farm might conflict with some land uses such as housing development but not with others such as cattle raising or logging. With respect to the overall impacts of WTGs, the company concludes: "Except for aesthetic issues and construction impacts, their environmental impact would be minimal."15/

Costs and Technical Parameters

EDF's estimates regarding costs and technical parameters for wind power are based entirely on figures provided by SCE and PG&E, as detailed in the Technical Appendix.

## Footnotes

1/ PG&E, "Common Forecasting Methodology--III," June 1980, Form R-4A.

2/ SCE, "Summary of Loads and Resources," June 10, 1980.

3/ J.H. Klems, "The California Wind Energy Resource," prepared by Lawrence Berkeley Laboratory for the Department of Energy, September 1977, pp. 20, 33.

4/ Thomas Zambrano, et al., Wind Energy Assessment of the Palm Springs-Whitewater Region, Final Report, prepared by AeroVironment, Inc. for SCE, February 1980, p. 7-12.

5/ Ibid., Table 5-1, p. 5-12.

6/ PG&E, "Montezuma Power Plant Project Assessment Interim Report," May 2, 1980, p. VII-32, (CPUC Appl. 59308/Exh. 64).

7/ Study performed by Dr. Albert Miller and Richard Simon of San Jose State University; results reported in PG&E, "PG&E Electric Supply Planning Process and Current Supply Plan," Vol. II, pp. A-24, A-26 (prepared for CPUC OII-26).

8/ "As far as technological problems are concerned,... with intensified efforts by the manufacturers that have sufficient resources behind them to solve problems, such as Boeing and others, I think the technological problems can be solved." (CPUC Appl. 59308/Tr 2142:26-30).

9/ SCE does plan to test a 500 kW vertical axis WTG in addition to the 3 MW Schachle-Bendix model; however, SCE as yet has announced no plans to test the two-to-five-MW horizontal-axis WTGs offered by major manufacturers such as Boeing and Hamilton Standard.

10/ Personal communication with Tony Quattrochi, Senior Marketing Engineer, Hamilton Standard, July 24, 1980.

11/ Ibid.

12/ Ibid.

13/ Zambrano, et al. op.cit.

14/ SCE and PG&E, "Allen-Warner Valley Energy System Proponents' Environmental Assessment," November 1979, pp. 10-29.

15/ Ibid.

## 4. BIOMASS

PG&E and SCE do not plan to build any biomass generation projects between 1980 and 1922, although PG&E does include in its current resource plan 130 MW of biomass projects owned by other entities. The EDF scenario through 1992 includes an additional 160 MW for PG&E and 180 MW for SCE. Table 10 provides a year-by-year breakdown of capacity under each scenario.

The 130 MW of biomass in PG&E's scenario consists of one 50 MW and one 40 MW forestry-agricultural waste (FAW) project in 1981 and 1984 respectively, and one 40 MW municipal solid waste (MSW) project in 1984. The EDF scenario adopts PG&E's biomass plans through 1984, then adds four 40 MW forestry-agricultural waste projects in 1985-1988.

For SCE, the EDF scenario includes 140 MW of FAW projects (one 60 MW project in 1984; one 40 MW project each year in 1985 and 1986), and one 40 MW municipal solid waste project in 1986.

### Discussion

The California Energy Commission estimates the maximum reasonable potential for MSW and FAW to be 350 MW and 500 MW respectively by the year 2000, and states that 120 MW and 400 MW respectively could be installed by 1991. 1/

For MSW, a 40 MW project is already planned for PG&E's service area. Since the counties in SCE's service area account for 44% of statewide municipal solid wastes, at least 40 MW of MSW capacity should also by available to SCE. 2/

Most forestry and agricultural wastes are produced in Northern California; therefore, the bulk of FAW capacity will be in PG&E's service area. Under the EDF scenario the amount of FAW capacity developed by PG&E and SCE is 250 MW and 140 MW respectively. Development of this level for SCE may require that some of SCE's capacity be located within

TABLE 10

Biomass Capacity in the EDF and Utility Scenarios

(MW)

| | PG&E | | SCE | |
|---|---|---|---|---|
| | Utility Scenario | EDF Scenario | Utility Scenario | EDF Scenario |
| 1980 | - | - | - | - |
| 1981 | 50 | 50 | - | - |
| 1982 | 50 | 50 | - | - |
| 1983 | 50 | 50 | - | - |
| 1984 | 130 | 130 | - | 60 |
| 1985 | 130 | 170 | - | 100 |
| 1986 | 130 | 210 | - | 180 |
| 1987 | 130 | 250 | - | 180 |
| 1988 | 130 | 290 | - | 180 |
| 1989 | 130 | 290 | - | 180 |
| 1990 | 130 | 290 | - | 180 |
| 1991 | 130 | 290 | - | 180 |
| 1992 | 130 | 290 | - | 180 |

Sources:

PG&E - CFM III, Form R-4A, June 1980.

PG&E's service area; this would require wheeling arrangements between the two utilities.

With respect to environmental impacts, combustion of forestry and agricultural wastes is considered preferable to fossil fuel generation, since sulfur emissions are absent and particulates can be controlled using wet-stack scrubbers.[3/] Nor would the EDF scenario for FAW entail any added risk of soil depletion, since the level of capacity included is based entirely on the use of forestry and agricultural residues which are presently burned or buried.[4/]

## Costs and Technical Parameters

For both MSW and FAW, EDF's cost and technical assumptions have been adopted from the cost of power study prepared by PG&E as part of its evaluation of the proposed Montezuma power plant.[5/] Details are provided in the Technical Appendix.

## Footnotes

1/ California Energy Commission, "Comparative Evaluation of Nontraditional Energy Resources," Staff Report, February 1980, p. B21, B31.

2/ Inventory of biomass fuel resources by county provided in Stanford Research Institute, "Program Definition for Fuels From Biomass," prepared for the California Energy Commission, October 1976, Table 2, p. 12.

3/ Brian Barrette et al., "Energy From Wood," California EIR Monitor, Vol. 4, No. 9, May 2, 1977.

4/ Ibid. See also Stanford Research Institute, op. cit. pp. 16-25.

5/ G.T. Skidmore, PG&E, memorandum to E.E. Hall, PG&E, "Cost of Power Analysis for Montezuma Task Force," March 27, 1980 (CPUC Appl. 59308/Exh. 66).

# VII. CONCLUSION

The encouraging finding of this report is that if energy alternatives which are preferred under California energy policy are developed in reasonable and feasible amounts they can fully replace the AWV Energy System and other coal projects proposed by SCE and PG&E. Significantly, development of these preferred alternatives would have economic benefits for SCE's and PG&E's ratepayers and shareholders.

These findings are of particular importance because the AWV Energy System, as proposed, would have an unusually severe impact on majestic national trust lands and vital indigenous water resources. Therefore, the AWV Energy System faces considerable difficulties in obtaining necessary permits and approvals, and thus its reliability as a source of electricity in the projected time frame is uncertain.

Simply stated, preferred energy alternatives can fully match the AWV Energy System in terms of energy, capacity, reliability, and timeliness, without the adverse economic and environmental risks of that project. The AWV Energy System is clearly an inferior choice.

NOTE: Technical Appendices, not reproduced here, are available on request.