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Susitna Hydroelectric Project
FUTILE QUEST FOR A PLAN OF FINANCE

by Gordon S. Harrison

IN ALASKA two contemporary large-scale engineering projects are noteworthy. One is the development of North Slope oil resources, including construction of the trans-Alaska pipeline. This impressive achievement is the work of private companies and private capital. A second important contemporary megaproject in Alaska is one planned by a public agency of the state – the Susitna hydroelectric project. Planning activity on this project was recently suspended, and the current prospect for its revival is not good. Despite the unhappy fate of this project (or perhaps because of it), the Susitna project is an interesting case study of public sector planning for a major infrastructure development project.

This article considers only the financial aspect of the Susitna project. As it happens, this is the critical dimension, because the failure to devise a workable and acceptable financing plan led to the project's demise. In this paper I will review the history of financial planning for the project from 1982 (date of completion of the feasibility study) through March of 1986, when the project was put on the shelf. The objectives of this review are to explain why a workable plan of finance was so elusive and, more important, to seek insights from the history of the Susitna project that may benefit future planning for major energy projects.

PROJECT DESCRIPTION

The Susitna hydroelectric project was to include two dams along the Susitna River in the Talkeetna Mountains of southcentral Alaska. When completed, the project would have a combined installed capacity of 1620 megawatts and an average annual energy yield estimated at 6200 gigawatt-hours.

The Watana Dam, intended for operation in 1996, was to be a rock structure 885 feet high and 4100 feet long, capable of generating 1020 megawatts. At this height, Watana would be the fifth highest embankment dam in the world, and the highest in North America, exceeding the Mica Creek embankment dam in British Columbia (794 feet) and the Oroville Dam in California (771 feet). The Watana reservoir would extend upstream 48 miles; it would be 1 to 5 miles wide, and it would have a maximum depth of 680 feet.

The Devil Canyon Dam, located 32 miles downstream from Watana, was scheduled to be operating by 2002. It was to be a double-curved concrete arch 645 feet high and 1500 feet long, capable of generating 600 megawatts. The dam's height would include it among the nine tallest arch dams in the world, including the Hoover Dam in Arizona (725 feet) and Inguiri in the Soviet Union (892 feet). The reservoir for Devil Canyon would be 26 miles long, ½ mile wide at its widest point, and have a maximum depth of 550 feet.

ALASKA POWER AUTHORITY

In the United States, major public sector infrastructure projects are typically built, owned, and operated by quasi-independent public corporations. So it is in Alaska, where the Susitna project is under the jurisdiction of the Alaska Power Authority (APA). The APA is a public corporation governed by a board of directors appointed by the governor of Alaska. It has its own professional staff but relies heavily on consulting firms to provide engineering and other technical expertise.

APPROACHES TO STATE SUBSIDIZATION

Large infrastructure projects that are developed by public corporations usually rely on the sale of revenue bonds for financing. Revenue bonds are debt issues (the interest on which is usually exempt from state and federal taxation) sold in the national capital markets that are secured by income generated by the project (road tolls, electricity sales, gate receipts, and other fees charged to users of the project).

However, Susitna was such a large, expensive project that it could not be financed exclusively by conventional revenue bonds. Payment of interest and principal on revenue bonds sold to cover all project costs would result in an exorbitant price for electricity in the early years of the project. Therefore, it was always assumed that the State of Alaska would need to subsidize the project.[1]

Two forms of state subsidy for Susitna were proposed during the course of project planning. One was referred to as state "equity" investment in the project. In this case, state appropriations would be used to pay some or all construction costs, and thereby reduce or eliminate altogether the requirement for borrowing. The second form of state subsidy was referred to as "rate stabilization." In this case, state appropriations would be used to help make

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payments of principal and interest on revenue bonds. Thus, state subsidy would be used to service debt rather than reduce the overall amount of debt.

State subsidy to the project in the form of loans was among the financing mechanisms considered by project planners, but loan alternatives were never fully developed and incorporated into financing plans for Susitna.

The two main financing concepts of equity and rate stabilization can be illustrated graphically. Line AE in Figure 1 represents the real wholesale price of electricity from a large, hypothetical hydroelectric project that is financed entirely by debt. This line gradually slopes downward to point E because hydro projects are typically built to accommodate load growth (resulting in lower unit costs), and because of the effect of inflation on level nominal debt service. At point E, the initial debt is retired and the price of power thereafter is based on operation and maintenance costs.[2]

Line BD in Figure 1 represents the projection of wholesale electricity prices that would prevail without the hydro project. In the case of Susitna, this line represents the wholesale price of power in the Railbelt from gas- and coal-fired thermal plants. This projection assumes real price increases due to rising fossil fuel prices and other costs of operations.

Line BF in Figure 1 represents the wholesale price of electricity from the hydro project with a combination of revenue bonds and state equity. In this case, the size of the state's equity investment reduces the amount of debt to that level which produces an entry price of power from the hydro project equal to the price of power from the thermal alternative (point B). Increasingly larger equity investment in the project would further reduce the price of hydropower. If the project were entirely financed by cash grants from the state—100 percent equity financing—the wholesale cost of power would not have a debt service component, and it would represent the variable costs of operation and maintenance only (this scenario is not shown in Figure 1).

Figure 2 illustrates how rate stabilization works. Here, state contributions to the project do not reduce the amount of debt; rather, they reduce the price of hydropower (line AC) to the level of the thermal alternative (line BC) until the two are the same (at point C). Customers will pay for electricity along the line BC, with the state making up the difference through

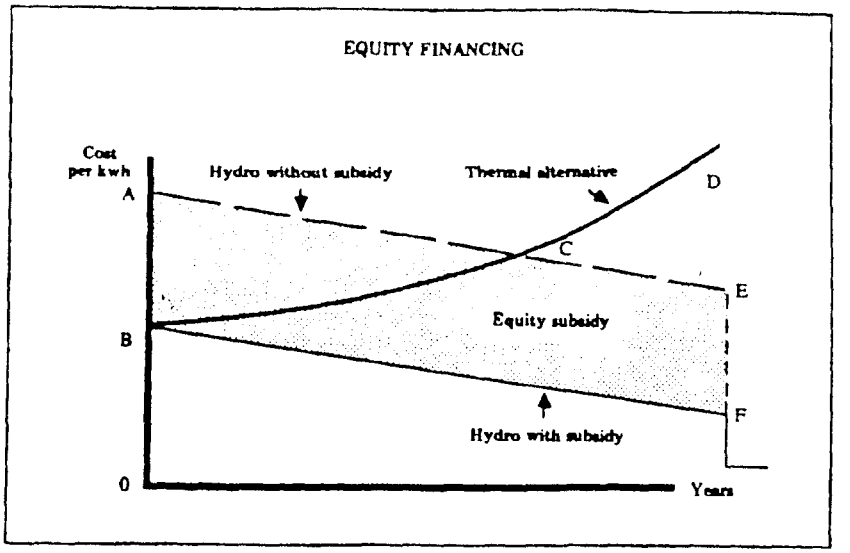

Figure 1. Providing state subsidy in the form of equity reduces the requirement for debt financing. In this figure, the shaded area represents the amount of equity needed to make the wholesale price of hydropower equal to the wholesale price of power from the thermal alternative.

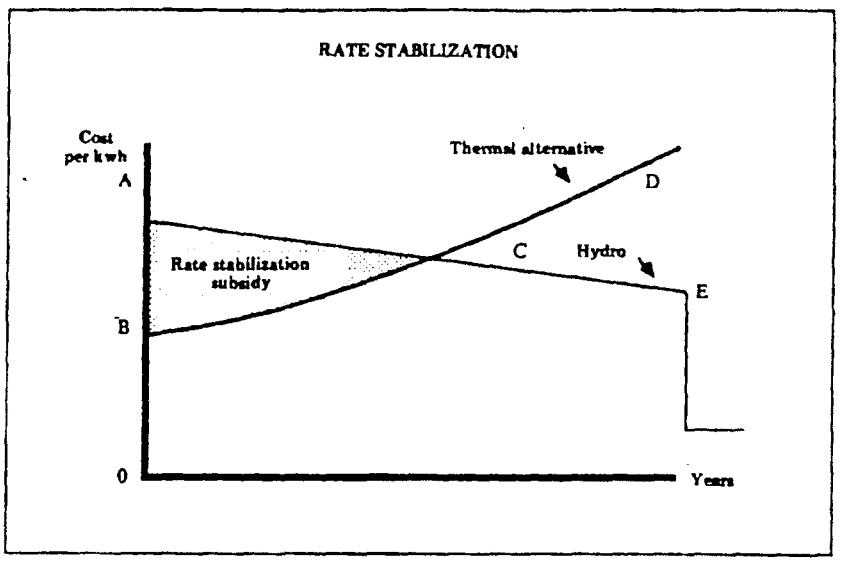

Figure 2. Providing state subsidy through rate stabilization requires utilities to pay for hydropower along the projected curve of the thermal alternative until the crossover point C is reached. This financing approach is more desirable than the equity approach from the state's point of view.

rate stabilization. At the crossover point C, hydropower becomes cheaper than the alternative, and no further subsidy is required (customers then pay along the line CE). An underlying assumption of this approach is that customers will not be willing to pay more than they would otherwise pay for electricity, notwithstanding future savings that the project will create.

It is evident from the relative size of the shaded area in these two figures that less state subsidy is involved with rate stabilization than with the equity approach (on the basis of the general assumptions underlying these curves). Also, it is no doubt evident that utility customers would prefer to pay along the line BF in Figure 1 than BCE in Figure 2.

REAL AND NOMINAL DOLLARS

Because of the long time involved in debt repayment, it is necessary to account for the effects of inflation when analyzing the cost of any major project. Thus, fi-

nance planners and economists distinguish between real (or constant) dollars, which exclude inflation, and nominal dollars, which include the effects of inflation. In those terms, the cost of the Susitna project was estimated to be about $5 billion at prices prevailing in 1985 (real dollars), but more than $12 billion at the prices prevailing when the expenditures actually would be made (nominal dollars).

REVIEW OF FINANCE PLANNING

A review of finance planning for the Susitna project is best approached chronologically, beginning in 1982 when a major feasibility study was completed.

1982

In 1982 a feasibility study of the project was completed and three financing options proposed. During this time, however, the long-term oil price outlook was deteriorating.

Acres American report. In March 1982, the firm Acres American released a major feasibility study of the Susitna project. The firm had been under contract to the APA since late 1979. The Acres American report proposed the two-stage construction schedule described above under "Project Description." This project configuration and the supporting analysis became the basis for APA's license application to the Federal Energy Regulatory Commission (FERC).

With regard to financing, the Acres American report proposed three options: (1) 100 percent state appropriation of the total cost of construction, estimated to be $5.1 billion in 1982 dollars; (2) a state appropriation of $3 billion (1982 dollars), with the remaining project cost financed with revenue bonds; or (3) a minimum state appropriation of $2.3 billion (1982 dollars) with the remaining project cost financed with revenue bonds. (The Acres American and other major financing proposals are summarized in Table 1.) It is noteworthy that one of the financing options was a cash grant from the state for the full cost of the project. At this time, it was widely presumed that Alaska's statewide hydroelectric development program would be funded entirely by state grants.

The other two financing options are variations of the equity approach shown in Figure 1. An equity contribution of $3 billion would represent an entry rate for the project somewhat below point B in the figure; an equity contribution of $2.3 billion was calculated to represent an entry rate at point B (i.e., at a price equal to the

Table 1. Finance Plans for the Susitna Project

Report[1]	Total costs (billions)				Revenue forecast	Finance options
	Constant $	Nominal $				Constant $ (Same year as "Constant $" column)
	Construction	Construction	Financing	Total		
Acres American Feasibility Study (Mar. 1982)	5.1 (Jan. 1982 $)	15.3	0.0	15.3	Battelle Report[2]	1. 100% state appropriation of total capital cost ($5.1 billion). Consistent with SB25.
		15.3	1.6	16.9		2. State appropriation of $3 billion with residual bond financing.
		15.3	1.7	17.0		3. Minimum state appropriation of $2.3 billion with residual bond financing.
FERC License Application (Feb. 1983)	5.1 (Jan. 1982 $)	15.3	2.0	17.3	Battelle Report	State appropriation of $1.8 billion with residual bond financing.
Kentco Report for the Anchorage Chamber of Commerce (Jan. 1984)	5.1 (1983 $)	13.4	3.4	16.8	DOR mean Sept. 1983	State appropriation of $800 million in equity and $778 million in rate stabilization. Remaining financing requirements met by combination of REA guaranteed loan and municipal bonds.
APA Economic and Financial Up-date (Feb. 1984)	5.4 (Jan. 1983 $)	11.8	5.2	17.0	DOR mean Dec. 1983	1. State appropriation of $1.5 billion in equity and $400 million in rate stabilization funds (RSF).
		11.8	4.4	16.2		2. State appropriation of $1.7 billion in equity and $350 million in RSF, plus an REA-guaranteed loan of $1.5 billion, with residual bond financing.
Draft FERC License Amendment (Nov. 1985)	5.4 (Jan. 1985 $)	12.7	7.8	20.5	DOR mean June 1985	State appropriation of $220 million for rate stabilization, with revenue bonding of full project cost.
APA Draft Plan of Finance (Jan. 20, 1986)	5.4 (Jan. 1985 $)	12.7	7.8	20.5	Not stated	State to provide $520 million for rate stabilization by appropriation or pledging earnings from the Permanent Fund. $2 billion (nominal $) of project revenue bonds to be secured by Railbelt utilities. Residual bond financing issued by state and secured by Permanent Fund earnings.

[1] All reports are available at the Alaska Power Authority, Anchorage.

[2] Alaska economic projections for estimating electricity requirements for the Railbelt, Vol. 9, by S. Goldsmith and E. Porter, ISER, University of Alaska-Anchorage, Sept. 1982 report, Battelle Pacific Northwest Laboratories.

price of electricity from natural gas generation at the time the project would begin operation).

Changing revenue outlook. Worldwide crude oil prices had escalated dramatically in the aftermath of the Iranian crisis of 1979. In February 1981, the contract price for Alaska North Slope crude on the Gulf Coast had peaked at $36.90 per barrel, with experts predicting that prices would steadily increase into the distant future. Long-term revenue forecasts prepared in mid-1981, consequently, indicated that the State of Alaska would be phenomenally wealthy. The Acres American feasibility study referenced the long-term revenue forecast published by Battelle Pacific Northwest Laboratories as part of a major study of alternatives to the Susitna project. Table 2 and Figure 3 show this revenue forecast. Clearly, cash financing of Susitna was a plausible option in 1981.

In mid-1982, however, a dramatic decline occurred in the long-term revenue forecast, as indicated in Table 2 and Figure 3. Full cash financing for the Susitna project was no longer an obvious possibility, but some form of state subsidy remained clearly plausible.

Because of the revised revenue outlook between 1981 and 1982, some disquieting commentary on the viability of the project began to appear. A report by Tussing and Erickson in September 1982, for example, argued that the oil prices of 1980 and 1981 were artificially high and could not continue to be tolerated in the marketplace; that lower oil prices nullified most of the economic assumptions used to justify the Susitna project; and that, by implication, the state would not be able to provide the cash grants necessary to finance the project.[3]

1983

In 1983 an application for a federal license for the Susitna project was filed; it proposed two financing options. In spite of this, however, the APA initiated new financial and economic analyses for the project because of continuing declines in oil prices.

FERC application. On 28 February 1983, an application was filed with FERC for a federal license to construct and operate the Susitna project. With regard to finan-

Table 2. State of Alaska General Fund Revenue Forecasts, 1981 to 1986.
(In $ millions, nominal.)

YEAR	1981	1982 MARCH	1982 JUNE	1982 SEPT.	1982 DEC.	1983 MARCH	1983 JUNE	1983 SEPT.	1983 DEC.
1985	8081	3487	3575	3567	2206	2981	3450	3514	3435
1986	9278	3979	4259	4261	3523	3198	3564	3892	3699
1987	10849	4569	4997	4817	3769	3385	3800	4240	4172
1988	12179	4709	5147	4901	4181	3540	3753	4106	4280
1989	13981	5242	5732	5379	4384	3554	3886	4442	4868
1990	15074	5141	5348	5096	4324	3658	4108	4606	5100
1991	16688	4717	4992	4549	4063	3374	3994	4290	4911
1992	17932	4696	4866	4441	3988	3298	3983	4157	4863
1993	19395	4611	4679	4235	3971	3250	4103	4105	4996
1994	20326	4577	4652	4163	3990	3232	4173	4077	5058
1995	20666	4268	4391	3892	3804	3092	3977	3827	4832
1996	20818	4033	4020	3608	3644	2930	3854	3612	4715
1997	20787	4246	4236	3786	3819	3008	4039	3741	4985
1998	20520	4296	4276	3837	3889	3023	4129	3737	5110

YEAR	1984 MARCH	1984 JUNE	1984 SEPT.	1984 DEC.	1985 MARCH	1985 JUNE	1985 SEPT.	1985 DEC.	1986 MARCH
1985	3521	3340	3458	3343	3277	3253	3266	3290	3260
1986	3702	3475	3584	3402	3037	2968	2954	3215	2721
1987	4042	3921	3958	3446	3001	2777	2609	2925	2077
1988	4194	3857	4065	3241	2764	2470	2243	2474	1614
1989	4649	4148	4360	3290	2694	2403	2106	2397	1454
1990	4837	4175	4425	3295	2652	2324	2048	2310	1419
1991	4466	4237	4414	3204	2582	2259	1926	2289	1312
1992	4394	4431	4561	3212	2515	2308	1950	2277	1232
1993	4521	4579	4639	3263	2647	2337	1958	2327	1155
1994	4535	4592	4490	3162	2551	2238	1862	2321	1096
1995	4510	4535	4479	3118	2445	2160	1824	2348	1045
1996	4516	4401	4465	3077	2315	2063	1753	2285	997
1997	4527	4248	4353	2999	2282	2040	1750	2307	1083
1998	4526	4125	4327	2931	2257	1998	1750	2307	1061

Note: The 1981 forecast was prepared by the Institute of Social and Economic Research, University of Alaska for Battelle Northwest Laboratories; derived from forecast of petroleum severance tax and royalty income by the Alaska Department of Revenue, June 1981. The 1982 -1986 forecasts were prepared by Alaska Office of Management and Budget; derived from forecasts of petroleum severance tax and royalty income made by the Alaska Department of Revenue. These forecasts represent the 50th percentile probability estimates (there is an equal chance that the actual value will be more or less than the forecasted value).

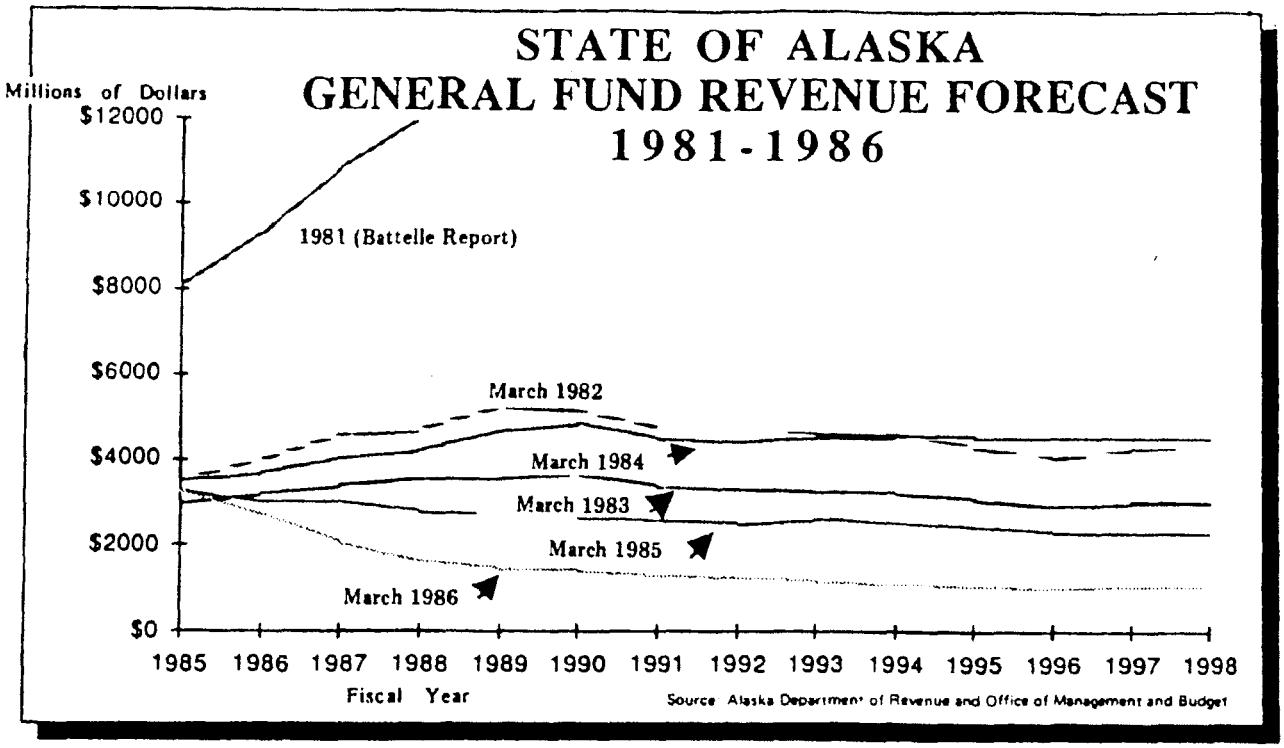

Figure 3. State of Alaska General Fund revenue forecast, 1981-1986.

cing, the license application stated that "costs for Watana through 1989 would be financed by $1.8 billion (1982 dollars) of state appropriations. Thereafter completion of Watana is expected to be accomplished by issuance of approximately $2.4 billion (1982 dollars) of revenue bonds." It also stated that the Devil Canyon phase would be financed entirely by revenue bonds. No doubt in response to revised revenue forecasts, the APA had dropped the full cash financing option, and recalculated the minimum state cash contribution to be $1.8 billion, or $500 million less than the minimum contribution of $2.3 billion identified earlier in the Acres American report.

Concern about the future price of crude oil—the keystone of the project's economic and financial feasibility assessments—was thereupon expressed by FERC's staff. Noting several deficiencies in the state's application, FERC called for the APA to incorporate updated oil price forecasts in its economic and financial feasibility studies. In response to this and to other critiques of the existing analysis, as well as to the changing oil price outlook generally, the APA contracted with the firm Sherman H. Clark and Associates (SHCA) to provide updated forecasts. In the meantime, a joint venture of two major engineering and construction firms, Harza Engineering and Ebasco Services (Harza-Ebasco), had been hired by the APA to provide engineering, design, and technical assistance in the FERC licensing process. Harza-Ebasco now initiated a review of the economic and financial studies for Susitna.

1984

During 1984 the financial dimension of the Susitna project began to receive serious attention from the APA, the legislature, and others. At mid-year, the long-term revenue outlook was robust enough to support an optimistic view that the project could be financed with the help of sizeable state grants. By the end of the year, however, it had become apparent to APA financial planners that a new approach was needed.

1984 Up-date. In February 1984 the APA released the draft report *Susitna Hydroelectric Project Economic and Financial Up-date*. Much of this report was the work of Harza-Ebasco; it incorporated the oil price forecasts of Sherman H. Clark and Associates. The report validated the economic feasibility of the project, but contained a lengthy discussion of the major unresolved financing issues facing the project. This report also introduced the subsidy mechanism of "rate stabilization."

Several financing options were reviewed by the authors of the report, but two were advanced as the most feasible: (1) state appropriations of $1.5 billion for equity in the project, and $400 million for rate stabilization, with the remaining costs financed by revenue bonds; or, (2) state appropriations of $1.7 billion for equity and $350 million for rate stabilization, plus a $1.5 billion loan guaranteed by the U.S. Rural Electrification Administration (REA), with the remaining costs financed by tax-exempt revenue bonds (all figures in 1984 dollars).

Thus, under these financing proposals, the state would not only pay a substantial portion of the project's construction costs, but would also create and finance a rate stabilization fund. This fund (as explained under "Approaches to State Subsidization") would then be used to offset enough debt service on the outstanding bonds to keep the project's wholesale cost of power equal to the cost of the best thermal alternative until such time as

the cost of alternative power for the project surpassed the cost of hydropower (i.e., until the "crossover point" was reached).

What characterizes the 1984 APA *Update* is its somber assessment of the many conditions that would have to be met, and the public policy decisions and commitments that would have to be made, to finance the Susitna project successfully using multi-billion-dollar debt issues. Among these were the necessity for: (1) recognizing Susitna as one of the state's highest capital funding priorities; (2) providing adequate security for the very high volume of debt, which might require a constitutionally dedicated stream of revenue from the state's petroleum resources; (3) obtaining tax-exempt status for Susitna bonds; and (4) immediately providing for sizeable state appropriations to the Susitna fund, as well as for the retention in the fund (by annual appropriation, if necessary) of the interest earned on that money.

Kentco report. Also early in 1984, a report on the Susitna project was issued by the consulting firm of William Kent and Company (Kentco), which was working under a contract with the Anchorage Chamber of Commerce. This report, too, recommended a combination of state equity, a rate stabilization fund, and residual revenue bond financing. The proposal, however, called for a larger rate stabilization fund ($778 million) and less equity ($800 million) than the 1984 *Update.* (These amounts are 1983 dollars.) The report further called for a majority of the debt to be guaranteed by REA, with the remainder to be tax-exempt municipal debt.

The Kentco report was optimistic in its treatment of the financing issue.[4] Addressing the Anchorage Chamber of Commerce, consultant William Kent stressed that his finance plan "allowed a minimum need for state investment, spread the need for state appropriation over a larger number of years, and did not present a tax exemption problem." The plan, he said, "suggests a need to start appropriating from 178 to 226 million dollars annually starting with this legislative session."

Legislative action. During the 1984 legislative session (January to June), two measures were enacted that dealt with Susitna financing: (1) the legislature approved the Watana project at a cost of $3.75 billion in 1983 dollars; and (2) the legislature made a continuing appropriation for "equity investment in and rate stabilization for the Susitna project" in the amounts of $100 million for fiscal year 1985 and $200 million for each of the six succeeding fiscal years.[5]

While the Watana construction cost figure of $3.75 billion was traceable to the Harza-Ebasco *Up-date,* the origin of the $1.3 billion (nominal dollars) total set aside by the continuing appropriation was a mystery. Many people assumed that it was based on the Kentco report and William Kent's Chamber of Commerce speech. In any case, it bore no resemblance to the finance plans proposed in the *Up-date* or those being discussed by the APA staff and board.

Meanwhile, APA staff continued to maintain that some $2 billion (constant dollars) was needed from the state to help finance the project. Thus, instead of the $200 million per year for FY1986-1991 appropriated by the legislature, $578 million per year would be required—or at least $316 million per year if interest could accumulate in the Susitna fund.[6]

Revenue outlook. Was it reasonable to expect that $316 million a year (plus interest earnings of the fund) would be forthcoming from the legislature for six successive years to finance Susitna? In mid-1984, a plausible argument indeed could be made that the money was available, *if* the legislature had the will to see the project through. Note that the revenue projections shown in Table 2 and Figure 3 for 1984 are significantly higher than those made the previous year. If one were to project that the state's operating budget would grow at the rate of inflation (approximately 5 percent) from a base of approximately $2.2 billion in FY1984, then the 1984 revenue forecasts suggest that the State would have over $1 billion a year during FY 1986-1991 to allocate for the capital projects and loan programs. Under these fiscal circumstances, appropriations of $316 million per year to a fund retaining its own investment earnings certainly was not, on the face of it at least, impossible.

By the end of 1984, however, revenue forecasts had fallen to their 1983 levels.[7] Also, additional oil price reductions seemed probable, due to a steady erosion of OPEC's influence over oil prices.

There were other reasons, as well, to believe that the expectation of massive and continuing state appropriations for Susitna was unrealistic. Notably, the 1984 Legislature had appropriated only $100 million for Susitna for FY 1985, while total capital appropriations that session exceeded $1.2 billion, comprising the largest unrestricted general fund capital budget in the state's history. This was hardly a good indication of legislative will to sacrifice other capital projects in order to pay for Susitna.

1985

During 1985 the APA and its consultants redesigned the Susitna project in an effort to facilitate its financing. Toward the end of the year a team of financial experts initiated work on a definitive plan of finance based on the reconfigured project.

Staging Proposal

At its meeting of January 23, 1985, the board of directors of the APA adopted a staff recommendation for a Susitna plan of finance that called for state appropriations of $1.94 billion over the fiscal years 1985-1995 to a fund that would retain its interest earnings. This money would be used for both equity and rate stabilization. Minutes of the meeting show that the board considered this option the best presented to date, and directed the staff to continue refining it.

By this time, however, it was increasingly apparent to many people that if the project were to go forward, it would have to do so under a financing scheme that did not require such large state cash contributions. Among those recognizing this were high-level individuals in the parent companies of the Harza-Ebasco joint venture, who in January 1985 held informal meetings with the Governor, APA executive staff, and board members to discuss a proposal for staging the construction of the Watana dam. Under this approach, Watana would be constructed in two phases (the first and the third phase); the Devil Canyon dam would be the second, middle phase of the project. The virtue of developing the project in three phases instead of two was primarily financial. Three phases of construction would match more closely than two phases the growth of electricity demand in the Railbelt. As a consequence, there would be less unused capacity in the Watana dam in the early years of project operation, and therefore a greater ability of utility customers to carry the burden of revenue bond financing. Thus, according to the staging proposal, all three phases would be financed entirely by revenue bonds, with a comparatively modest state cash contribution remain-

ing necessary for rate stabilization only in the early years.

In February the Board received a public presentation of the conceptual proposal and authorized Harza-Ebasco to develop it further in an expeditious manner. At its meeting of May 3, 1985, the Board approved the staged approach, and directed the APA staff to begin preparing an amendment to the FERC license application that incorporated the reconfigured project.

By October, APA staff and consultants had prepared a comprehensive analysis of the economic and financial aspects of the new three-phase project. On the basis of assumptions about the cost of generating power from natural gas and coal (the next best alternatives to Susitna), the APA staff calculated that a rate stabilization fund adequate to keep the wholesale cost of Susitna power equal to its thermal competitor would require as little as $253 million (1985 dollars). During the 1985 legislative session the continuing appropriation to Susitna of $200 million had been made, so there was already enough money in the bank to finance the project under this scheme (provided the interest on this money was allowed to accumulate in, or was annually appropriated to, the fund).

When the APA released its draft License Application Amendment in November, the estimate of state contributions to a rate stabilization fund had decreased further to $220 million (1985 dollars). The primary reason for these low estimates of rate stabilization was the assumption that without Susitna large-scale coal plants would be required in the 1990s to meet Railbelt energy demand, causing substantial rate increases.

Preparation of a financial plan. By late 1985 it was increasingly evident that the question of financing was critical for the Susitna project. In particular, financial advisers to the APA were concerned about the real-world problems of selling so much debt for a single project in the national market. These were the same individuals who had contributed the lengthy discussion of these problems to the 1984 *Update*. The task of marketing Susitna bonds was much more problematic now that the state equity contribution had been eliminated altogether.

Pressure also was coming from the legislature for the APA to produce a credible plan of finance for Susitna. Finally, critics of the project, such as representatives of public interest advocacy groups and the environmental lobby, were openly asserting that the project was not financially viable. They claimed that the bond market would not absorb so much debt for a single massive project intended for a comparatively small market area that was isolated from the power grid of the continental United States.

Late in 1985, APA's executive director assembled a team of financial advisers (including several bond underwriters, bond lawyers, and others) to begin preparing a definitive plan of finance for the project.

1986

The team of financial advisers charged with preparing a workable financing plan for the Susitna project presented a draft plan of finance to the board of directors on January 23, 1986. The revelations contained in this document led directly to the termination of the project two months later.

> *". . . the finance team concluded that only a commitment of the earnings of the Alaska Permanent Fund would suffice to secure the state's special revenue bonds."*

Plan of finance. The draft finance plan presented to the Board in January was built on the premise that very little state cash would be available, and that all project costs would therefore have to be covered through the sale of revenue bonds. Summed over time, these bonds would total more than $20 billion (nominal). The key question was whether the utilities and the state could successfully carry that much debt.

To assess the debt capacity of the utilities, the finance team calculated the maximum annual revenue that the utilities could generate for debt service, using as a basis the assumption that the utilities' customers could tolerate a maximum rate increase of 3 percent (real) per year. Then, using a 25 percent estimate for the maximum tolerable one-time rate hike that the Railbelt ratepayers could withstand in the event the project never operated, the finance team estimated the maximum security that the Railbelt utilities could offer bondholders against the risk of the project's never being completed.

The results of this analysis indicated that the upper limit of indebtedness for the utilities for the project was $2 billion (nominal). Thus, the State of Alaska would have to issue special revenue bonds to cover the remaining project costs. The State of Alaska, however, could not adequately secure that amount of bonds, even with the pledge of its general obligation debt capacity. After reviewing all plausible alternative sources of security, consequently, the finance team concluded that only a commitment of the earnings of the Alaska Permanent Fund would suffice to secure the state's special revenue bonds.

The financial team also concluded that, beyond issuing special revenue bonds and pledging the income from the Permanent Fund as security, the State of Alaska would also have to provide a rate stabilization fund of $520 million (1985 dollars; or $2.3 billion in nominal dollars) and an additional $323 million (1985 dollars) preconstruction licensing and development costs. The reason the rate stabilization requirement was higher than the APA estimate published in the draft FERC license amendment ($220 million, 1985 dollars) is that the draft finance plan stabilized rates to the level of a 3 percent (real) annual increase in retail electric rates, rather than to the somewhat higher level of electric rates estimated by the APA to result from the best thermal alternative.

At its meeting of January 23, the APA board requested its executive director to submit the draft Susitna plan of finance to rigorous scrutiny by a major municipal bond underwriting firm, to test the validity of the finance team's findings. Under contract to APA, the firm of Prudential-Bache Securities then reviewed the analysis and conclusions of the plan, and concurred with them in a report dated March 21, 1986. Three days later, at its meeting of March 24, the APA board voted to withdraw the Susitna license application.

REFLECTIONS ON THE QUEST FOR FINANCE: PROBLEMS WITH RATE STABILIZATION

Even if a politically acceptable means of securing the state's Susitna revenue bonds had been found, it is doubtful that negotiations between the APA and the Railbelt utilities would have been consum-

mated under the finance plan advocated by the APA—that is, with rate stabilization providing the only vehicle of state subsidy.

At the time the Susitna project collapsed, negotiations between the Railbelt utilities and the APA for conditional power sales contracts had been under way for some time, but they were still in very preliminary stages. The underlying problems of developing a contract that incorporated a rate stabilization fund were therefore never fully identified nor confronted by the negotiators.

Neither of the existing contracts between APA and purchasers of power from its projects (the four-dam pool and Bradley Lake) incorporate rate stabilization. Therefore the following analysis of the rate stabilization approach is speculative insofar as the concept has yet to be implemented. Nonetheless, in the course of financial planning for the Susitna project, several seriously complicating features of rate stabilization emerged.

Problems with Rate Stabilization

There are two reasons for doubting that power sales contracts placing significant reliance on a rate stabilization fund could have been successfully negotiated between the APA and Railbelt utilities. The first has to do with the pervasive public opinion in the Railbelt region that the Susitna project was going to bring immediate rate relief, or at least stabilize electric energy prices at their then-current level. The second is that probably neither the utilities nor the state would have been willing to expose themselves to the risks that rate stabilization entails.

Public expectations. Financing for APA's other major hydroelectric projects, the four projects of the so-called "four-dam pool" and Bradley Lake, relies on state subsidy in the form of equity. In both cases, state cash appropriations to the projects cover approximately half of the cost of construction, with the remainder of project costs covered by borrowing.[8] This financing assures customers of a wholesale cost of power that is comparable at the outset to the cost of power from thermal plants.

Railbelt residents had come to expect the same of the Susitna project. The project, after all, had long been touted as the most economical source of Railbelt power available, and the best defense against sudden and dramatic rate increases likely to be caused by the expiration of existing favorable contracts which made Cook Inlet natural gas some of the cheapest fuel in the country.

By the time rate stabilization entered the financial picture in 1984, however, Susitna could promise favorable rates to consumers only in the long run. With rate stabilization, utility customers would have to pay along the price curve of the thermal alternative until a point somewhere in the distant future (10 or more years after the project was operating). That price curve, consequently, would expose utility customers to the very same near-term rate shocks from rising fuel costs that Susitna was presumed to avoid.

As this realization permeated the utilities' governing boards, the municipal governments, and the public generally, it is reasonable to expect that negotiations over Susitna power sales agreements would have become very protracted and complicated indeed.

"Thus, a definite risk existed that the Railbelt utilities might have to pay a substantial premium for Susitna power. Further, the potential magnitude of this premium was very great . . . ."

Allocation of risk. Among the risks associated with any major energy project, two are crucial: (1) the risk that the project will cost substantially more to build than assumed in feasibility studies; and (2) the risk that the price of competing energy sources will not perform as expected (i.e., will fail to increase, or not increase as rapidly as thought).[9] Either eventuality will leave the project an overpriced producer in the market, at least in the near term. Somehow, then, these risks must be borne by the developer of an energy project or the purchasers of the power, or allocated between them.

In the case of Susitna, contract negotiations between the APA and Railbelt utilities never progressed to the issue of the allocation of these risks. Nevertheless, the approach to project financing adopted by the APA after 1985—i.e., subsidy to be used exclusively for rate stabilization—so accentuated the risk of falling alternative energy prices that neither the utilities nor the state would have been willing to assume it.

The risk of cost overruns on any major engineering project is always present, and has many potential sources. In the case of Susitna, the probability of significant cost overruns was not especially high when compared to major projects using new and complex technology and subject to strict governmental regulation (as in the case of nuclear power plants, for example). Nonetheless, it is unlikely that the utilities would have accepted any of this risk in power sales agreements with the APA.

A risk that was more difficult to analyze and to deal with in the Susitna case surrounds the behavior of alternative energy prices. Here is where the risk-related problems inherent in rate stabilization financing became apparent. A rate stabilization fund of a fixed amount for Susitna would guarantee a floor on wholesale electricity prices, based on a projection of prices from the thermal alternative. If alternative energy prices were to fall below this projected floor, access to them would be blocked by a Susitna power sales agreement. Thus, a definite risk existed that the Railbelt utilities might have to pay a substantial premium for Susitna power. Further, the potential magnitude of this premium was very great, as revealed in an analysis prepared by the APA in October 1985.

The APA's 1985 risk analysis for Susitna investigated the sensitivity of the requirement for rate stabilization to certain fossil fuel price assumptions.[10] It showed, in particular, that the present value of the cost of a rate stabilization fund was only $253 million using a "base case" set of assumptions about (a) long-term crude oil price trends, (b) the future availability of Cook Inlet natural gas for electrical generation, and (c) the method by which Cook Inlet gas prices would be set in the future. When those "base case" assumptions were relaxed, however, the present value of the cost of the rate stabilization fund soared. Under conservative but very reasonable assumptions, for example, the analysis showed that a fund of between $1 billion and $2 billion in 1985 dollars would be necessary to stabilize Susitna's rates at the level of the thermal alternative (natural gas). The difference between the "base case" estimate of $253 million and this estimate, consequently, represented

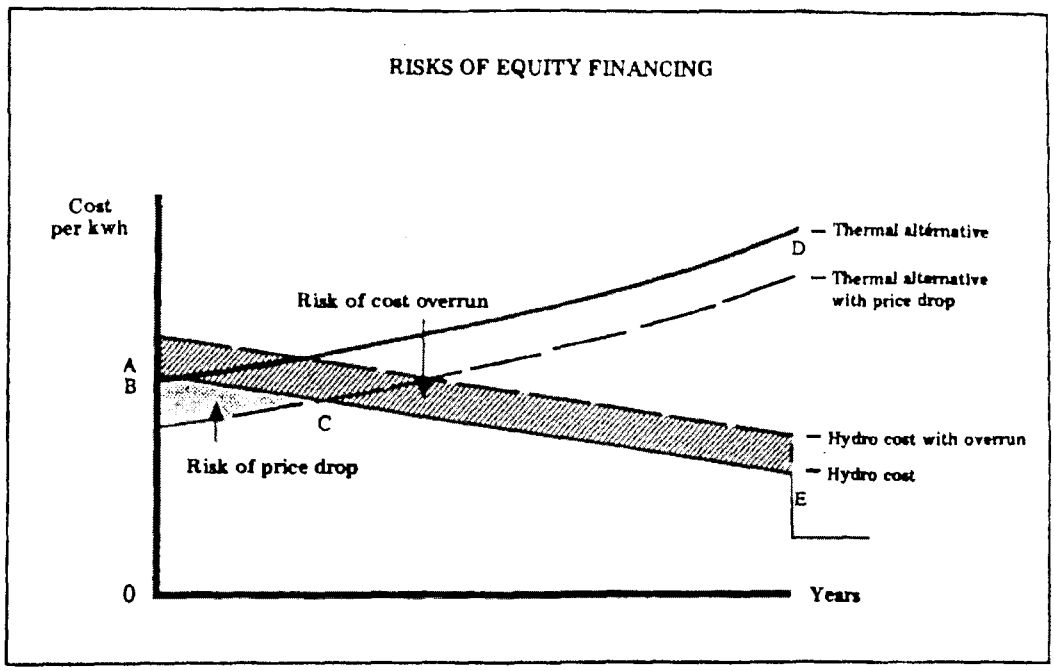

Figure 4. Risk of cost overrun is the same under either form of subsidy, but the risk of fossil fuel prices being lower than expected is less with equity than with rate stabilization, Figure 5.

the magnitude of the total rate premium that Susitna customers might have to pay if those conservative but reasonable assumptions proved true.

Exposure to the risk of declining alternative (fossil) fuel prices is significantly less under the equity financing approach than the rate stabilization approach. This is because the gap between the cost of power from the hydro project and the cost of power from the thermal alternative will close sooner under equity financing. The differences between rate stabilization and equity in this respect are best explained graphically. Figures 4 and 5 illustrate that the risk of cost overruns are identical under both financing approaches, but that the risk of declining fossil fuel prices is greater under rate stabilization. The crossover point C in Figure 4 occurs much sooner than the crossover point C in Figure 5, thereby reducing the length of time consumers would have to pay a premium for hydropower in the early years, if an unexpected decline in fossil fuels should occur.

From the consumers' perspective, a sizeable equity contribution is the preferred method of providing state subsidy to an energy project such as Susitna, because it minimizes risk and offers the prospect of rates lower than those that would otherwise prevail. From the state's perspective, on the other hand, rate stabilization is the preferred approach because it minimizes the state subsidy. The experience of the APA with the Susitna project suggests that to the extent it is relied upon exclusively, rate stabilization may simply not be viable, particularly when used for a sizeable project and particularly in a period of unstable fossil fuel prices. When state subsidy in the form of cash grants is made to a project, the money should be used to reduce the overall level of debt for the project, rather than reduce the debt service burden in the early years of operation with the aim of keeping wholesale electricity costs comparable to a long-term projection of the avoided costs from alternative generation sources.

SUMMARY

In the course of planning for the Susitna project, three sources of financing were proposed: (1) state appropriations to cover some portion of construction costs (equity); (2) state appropriations to cover some portion of the debt service on revenue bonds during the early years of project operation (rate stabilization); and (3) revenue bonds.

Planning for the Susitna project began with the assumption that cash appropriations from the state's general fund would cover all project costs—i.e., a 100 percent equity approach. Later, it was proposed that a mix of state equity and revenue bonds be used to finance the project. Following that, the concept of a rate stabilization fund was added to the combination of equity and revenue bonds (because rate stabilization tended to reduce the amount of required state equity). Finally, the equity component was eliminated altogether, and it was decided that financing for the Susitna project would be accomplished entirely by revenue bonds and a rate stabilization fund.

This evolution of Susitna's financial planning was driven by the eroding outlook for state revenues and by uncertain evidence of legislative resolve regarding financial commitment to the project. From the beginning, it was recognized that Susitna would require a substantial subsidy from the state. Ultimately, an acceptable plan of finance for the project eluded the APA because the state did not have enough money to provide the subsidy the project needed. The end came because of the problem of providing adequate security for the large volume of revenue bonds called for by the finance plan, and this problem stemmed from the state's inability to provide equity investment in the project sufficient to reduce borrowing requirements to levels that could be secured by the utilities through conventional power sales contracts.

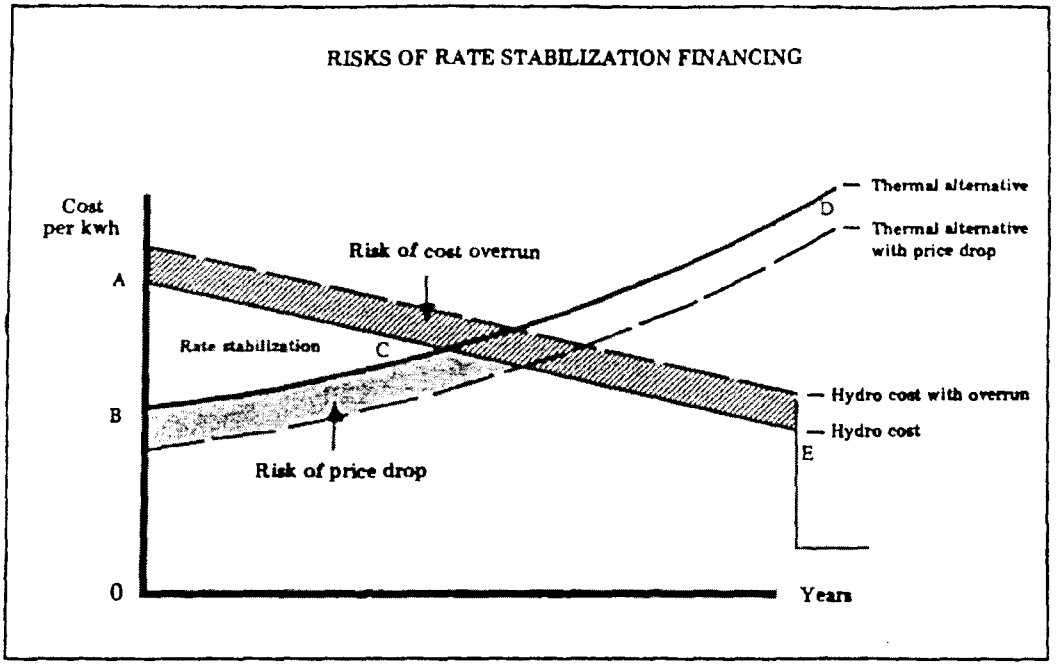

Figure 5. Risk of fossil fuel prices being lower than expected is greater under the rate stabilization subsidy approach because it takes longer to reach the crossover point than with the equity approach, Figure 4.

Even if a politically acceptable means had been devised to secure the Susitna project revenue bonds, it is unlikely that a workable contract could have been successfully negotiated between the Railbelt utilities and the APA that relied heavily on a rate stabilization fund of a fixed amount. There are two reasons for this evaluation of the situation: (1) utility customers in the Railbelt expected the Susitna project to protect them from retail electricity rate hikes, when in fact the rate stabilization approach assured them of rate hikes and would not result in savings to customers for many years, and (2) the concept of rate stabilization entailed risks that neither the state nor the utilities would be willing to assume. From the point of view of public policy considerations, rate stabilization might be the preferred approach to providing state subsidy to large energy projects because it minimizes state contribution. However, the experience of the Susitna project suggests that it is not practical. State subsidy for future hydroelectric projects (to the extent it is necessary and available) should take the form of equity, i.e., it should reduce the need for borrowing.

NOTES

[1] State subsidy was regarded by many people as desirable from a public policy perspective, because it provides a means of distributing the state's oil wealth to citizens. Other aspects of the issue of subsidy for the project are discussed in Gordon S. Harrison, "Science, Susitna and political decision making." *The Northern Engineer*, 1984, Vol. 16, No. 3.

[2] In the real world, a project would never be without debt, because major renewals and replacements of the turbine, generator, and switchyard equipment would have to be financed through the issue of new debt.

[3] Arlon R. Tussing and Gregg K. Erickson, "Alaska Energy Planning Studies," Policy Analysis Paper No. 82-13, a review of three consultant studies submitted to Alaska state agencies in fiscal year 1982, November 18, 1982. See also, Richard Emerman, "The Probable Effect of Lower State Revenue Forecasts on the Projection of Electricity Demand in the Railbelt," policy and analysis paper 82-10, Division of Policy and Development and Planning, Office of the Governor, September 21, 1982. See testimony of Gregg Erickson on SB 25, SB 26, and SB 244 before House Finance Committee on May 18, 1981 (minutes, p. 1325).

[4] The Kentco plan of finance was not realistic, however, because of cutbacks in federal funds for REA. In any case, the Susitna project would not have received favorable consideration by that agency because most of the power from the project would be sold to "urban cooperatives," which are accorded a low priority in the distribution of REA funds. See "Transcript of Questions and Answer Session" following address by U.S. Senator Ted Stevens to the Thirteenth Alaska State Legislature, February 1984.

[5] The continuing appropriation was declared unconstitutional on August 30, 1985, by the Alaska Superior Court.

[6] See minutes of APA board meeting of November 9, 1984.

[7] It should be noted that the 30th percentile, risk-adjusted forecasts developed by the Department of Revenue were even lower, significantly, than the mean probability forecast shown in Table 2. The 30th percentile forecast reflects a 70 percent probability that the estimate will be exceeded, and is used by the executive and legislative branches for budgeting purposes.

[8] In the case of the four-dam pool, the debt component is a state-funded long-term subsidized loan. In the case of Bradley Lake, which has just begun construction, the debt component will be project revenue bonds issued by the APA and secured by contracts with the utilities purchasing power from the project.

[9] A third major risk is that the forecast demand for the output of the project will not materialize. This was a major risk of the Susitna project, but one that was not taken seriously by Railbelt utility managers, who constantly chided the APA for its conservative estimates of load growth. Thus, it seems unlikely that allocation of this risk would have impeded contract negotiations with APA.

[10] The results of the analysis, in table format, were included in a package of material prepared by APA staff and consultants and distributed to the Board of Directors at the meeting of October 2, 1985. The table is titled "Sensitivity Analysis," but has neither table number nor page number. Further, the table is not reproduced in the APA's draft FERC license amendment, although the general outcome of the sensitivity analysis is alluded to in Exhibit D, p. D-4-5, of the draft amendment. ♦

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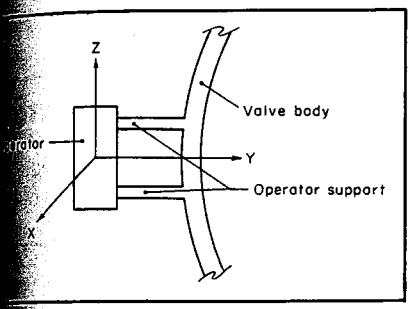

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COVER

This striking example of the recent erosion of the banks of the Kuskokwim River in Bethel, Alaska, is viewed downstream from the end of the bulkhead (see page 32). The building was moved to another site shortly after this autumn 1985 picture was taken. (Photo by James H. Barker.)

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