SUSITNA
HYDROELECTRIC PROJECT

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT No. 7114

ALASKA POWER AUTHORITY COMMENTS ON THE FEDERAL ENERGY REGULATORY COMMISSION DRAFT ENVIRONMENTAL IMPACT STATEMENT OF MAY 1984

VOLUME 2A
TECHNICAL COMMENTS
-NEED FOR POWER
-ALTERNATIVES

AUGUST 1984
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ALASKA POWER AUTHORITY

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Volume 2A

Technical Comments

- Need for Power
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Geothermal	NFP045, NFP106
Gold Creek Station	AQR008, AQR017, AQR069
Groundwater	AQR011, AQR014, AQR035 AQR036, AQR066, AQR105 AQR118, AQR134
Habitat	AQR019, AQR027, AQR050 AQR053, AQR068, AQR081 AQR084, AQR087, AQR090 AQR097, AQR104, AQR113 AQR115, AQR134, AQR140 AQR141 TRR003, TRR006, TRR009, TRR013, TRR017, TRR033, TRR035, TRR039, TRR048, TRR059, TRR061, TRR078
HEC-2 Model	AQR067
HEC-5 Model	NFP036
Housing	SSC110
Hydraulics	AQR007, AQR020, AQR022 AQR028, AQR040, AQR044 AQR070, AQR071, AQR073 AQR104, AQR113, AQR136
Hydroelectric	NFP053, NFP067, NFP077, ALT002, ALT003, ALT004, ALT009, ALT010, ALT011, ALT012, ALT013, ALT017, ALT018, ALT019, ALT025, ALT029, ALT030, ALT031, ALT032, ALT033, ALT046, ALT047, ALT048, ALT049, ALT050, ALT061, ALT062, ALT064, ALT065, ALT070, ALT071 SSC021, SSC022, SSC053, SSC054, SSC055, SSC076, SSC077, SSC091, SSC100
Ice Cover	AQR038, AQR116, AQR121 TRR068
Ice Model	AQR029
Ice Processes	AQR009, AQR037, AQR051 AQR071, AQR098, AQR120
Impacts	ALT001, ALT022, ALT035, ALT047, ALT052, ALT053, ALT054, ALT055, ALT056, ALT057, ALT058, ALT059,

SUBJECT	TECHNICAL COMMENT REFERENCE NUMBERS
Impacts	ALT064, ALT065, ALT068, AQR143 TRR008, TRR021, TRR023, TRR025, TRR026, TRR030, TRR031, TRR033, TRR034, TRR035, TRR036, TRR037, TRR039, TRR040, TRR041, TRR042, TRR043, TRR044, TRR045, TRR046, TRR051, TRR057, TRR064, TRR065, TRR067, TRR069, TRR070, TRR072, TRR076, TRR077, TRR078, TRR079, TRR080, TRR081 SSC003, SSC007, SSC015, SSC017, SSC023, SSC024, SSC025, SSC026, SSC028, SSC030, SSC031, SSC037, SSC039, SSC041, SSC042, SSC043, SSC044, SSC045, SSC046, SSC047, SSC048, SSC050, SSC051, SSC052, SSC053, SSC054, SSC056, SSC058, SSC059, SSC060, SSC061, SSC062, SSC063, SSC064, SSC067, SSC069, SSC076, SSC077, SSC081, SSC082, SSC083, SSC084, SSC085, SSC086, SSC087, SSC088, SSC089, SSC090, SSC091, SSC093, SSC094, SSC095, SSC106, SSC108, SSC109, SSC142, SSC144, SSC146, SSC149, SSC150, SSC153, SSC155, SSC156, SSC157, SSC159, SSC160, SSC161, SSC162, SSC163, SSC166, SSC168, SSC169, SSC170
Incubation	AQR045, AQR047, AQR048 AQR056, AQR077, AQR116 AQR117, AQR119, AQR120 AQR121, AQR137
Instream Flow	AQR059, AQR062, AQR067
Land Management	SSC006, SSC072, SSC078
Land Use	ALT046, ALT050, ALT062 SSC020, SSC032, SSC051, SSC053, SSC054, SSC073, SSC074, SSC075, SSC076, SSC077

SUBJECT	TECHNICAL COMMENT REFERENCE NUMBERS
Levelized Costs	NFP053, NFP055, NFP060, NFP061, NFP062, NFP068, NFP069, NFP070
Load Forecast	NFP013, NFP023, NFP024, NFP025, NFP027, NFP028, NFP029, NFP030, NFP031, NFP061, NFP083, NFP084, NFP085, NFP086, NFP096, NFP097
MAP Model	NFP029, NFP083, NFP097
Mainstem	AQR019, AQR027, AQR035 AQR039, AQR041, AQR045 AQR105, AQR115, AQR117
Mitigation	ALT019 AQR063, AQR064, AQR065 TRR002, TRR048 SSC001, SSC004, SSC005, SSC069, SSC078, SSC102, SSC142, SSC149, SSC159, SSC160
MJSENSO Model	NFP083
Monopoly Profit	NFP088, NFP090
Moose	TRR003, TRR021, TRR022, TRR023, TRR024, TRR034, TRR064, TRR065, TRR070, TRR074, TRR077
Multilevel Intake	AQR003, AQR032
Natural Gas Plants	NFP055, ALT007, ALT008 TRR012, TRR034, TRR076, TRR077 SSC017, SSC044, SSC045, SSC046, SSC088, SSC089
Natural Gas Price	NFP004, NFP015, NFP016, NFP058, NFP099, NFP100, NFP101
Natural Gas Resources	NFP015, NFP016, NFP017, NFP038, NFP047, NFP098
Net Benefits	NFP055, NFP060, NFP062, NFP063
Nitrogen Supersaturation	ALT039 AQR001, AQR004, AQR031 AQR075
OGP Model	NFP002, NFP003, NFP005, NFP050, NFP051, NFP054, NFP063

SUBJECT	TECHNICAL COMMENT REFERENCE NUMBERS
Oil (See World Oil)	
OPCOST Model	NFP002, NFP050, NFP051, NFP053, NFP063, NFP070,
Peat	NFP044, NFP105
Peregrine Falcon	TRR001, TRR002, TRR010, TRR011, TRR018, TRR032, TRR058
Pink Salmon	AQR055, AQR092, AQR093 AQR131, AQR144
Planning Horizon	NFP050
Population	TRR004, TRR025, TRR052 SSC008, SSC010, SSC028, SSC030, SSC057, SSC066, SSC106, SSC109, SSC111, SSC112
Population Projections	SSC008, SSC029, SSC033, SSC071, SSC103, SSC107, SSC113
PRODCOST Model	NFP003, NFP005, NFP050, NFP054, NFP055, NFP060, NFP062, NFP063, NFP068, NFP069, NFP070
Proposed Project	ALT057, ALT058, ALT059, ALT066, ALT067 AQR021 TRR010, TRR041, TRR046, TRR047, TRR064 SSC006, SSC007, SSC009, SSC011, SSC024, SSC025, SSC026, SSC033, SSC034, SSC035, SSC074, SSC075, SSC078, SSC080, SSC081, SSC083, SSC086, SSC097, SSC104, SSC108, SSC111, SSC112
Railbelt Economy	NFP009, NFP010, NFP011,
Raptors	TRR008, TRR030, TRR031, TRR045, TRR057, TRR067, TRR072, TRR076, TRR081
Rate Design	NFP049
Rearing	AQR081, ACR087, ACR097 ACR108
Recreation Resources	SSC007, SSC018, SSC021, SSC024, SSC026, SSC039, SSC044, SSC045, SSC047, SSC048, SSC052, SSC056, SSC064, SSC065, SSC079, SSC080, SSC081, SSC082,

SUBJECT	TECHNICAL COMMENT REFERENCE NUMBERS
Recreation Resources	SSC083, SSC084, SSC085, SSC086, SSC087, SSC088, SSC089, SSC090, SSC091, SSC092, SSC093, SSC094, SSC095
RED Model	NFP084, NFP085
Reliability	NFP034, NFP035
Reservoir	NFP065, NFP071, NFP073, NFP074, NFP075, NFP076 AQR002, AQR032, AQR038 AQR052, AQR061, AQR062 AQR064, AQR065, AQR076 AQR109, AQR131, AQR132 AQR133, AQR143 TRR019, TRR058, TRR068
Reservoir Temperature Model	AQR030, AQR038
Retirement Schedule	NFP032
Rime Ice	TRR020, TRR050
River Temperature Model	AQR033, AQR046, AQR066 AQR074, AQR098, AQR109 AQR122, AQR124
Salmon	ALT019, ALT030, ALT031, ALT032, ALT033, ALT049 AQR012, AQR013, AQR053 AQR054, AQR056, AQR063 AQR078, AQR080, AQR096 AQR100, AQR106, AQR115 AQR119, AQR126, AQR127 AQR129, AQR137, AQR141 AQR142
Salmon Access	AQR025, AQR058, AQR060 AQR072, AQR103, AQR107 AQR112, AQR114, AQR135
Salmon Growth	AQR042, AQR043, AQR046 AQR049, AQR050, AQR057 AQR082, AQR086, AQR101 AQR102, AQR110, AQR111 AQR123, AQR125, AQR138 AQR139
Salmon Outmigration	AQR051, AQR088, AQR128
Sediment	AQR006, AQR010, AQR023 AQR025, AQR026, AQR028 AQR121
Side Channel	AQR041
Side Slough	AQR007, AQR023, AQR068
Slough	AQR011, AQR014, AQR020 AQR022, AQR029, AQR035 AQR036, AQR047, AQR058

SUBJECT	TECHNICAL COMMENT REFERENCE NUMBERS
Slough	AQR070, AQR071, AQR072 AQR073, AQR103, AQR104 AQR105, AQR112, AQR113 AQR115, AQR116, AQR118 AQR120
Slough Access	AQR020, AQR024, AQR040 AQR044
Sockeye (Kokanee) Salmon	AQR052, AQR065, AQR083 AQR084, AQR085, AQR086 AQR087, AQR088, AQR133
Spawning	AQR013, AQR014, AQR039 AQR040, AQR041, AQR048 AQR079, AQR080, AQR083 AQR084, AQR085, AQR089 AQR090, AQR091, AQR092 AQR093, AQR095, AQR104 AQR107, AQR113, AQR115 AQR130, AQR132
Speculative In-migration	SSC030
Spiking Releases	NFP079, NFP081 AQR002, AQR060, AQR061
Subsistence	ALT029 SSC009, SSC010, SSC031, SSC104, SSC108
Sunshine Station	AQR005, AQR016
Susitna River	AQR005, AQR006, AQR008 AQR009, AQR012, AQR018 AQR033, AQR034, AQR037 AQR074, AQR094
Susitna Station	AQR069
Temperature	AQR003, AQR011, AQR032 AQR034, AQR035, AQR036 AQR042, AQR043, AQR045 AQR047, AQR048, AQR049 AQR051, AQR056, AQR057 AQR066, AQR077, AQR082 AQR086, AQR088, AQR099 AQR100, AQR101, AQR102 AQR107, AQR108, AQR109 AQR110, AQR111, AQR117 AQR118, AQR119, AQR120 AQR123, AQR124, AQR125 AQR127, AQR128, AQR129 AQR134, AQR137, AQR138 AQR139, AQR140, AQR141

SUBJECT	TECHNICAL COMMENT REFERENCE NUMBERS
Thermal	ALT020, ALT061 TRR059 SSC016, SSC019, SSC049, SSC063
Threatened/Endangered Species (See Endangered Species)	
Tidal Power	NFP046, NFP107
Transmission Lines and Corridors	NFP033, NFP056, NFP068 NFP069, NFP070 ALT012, ALT013, ALT014, ALT034, ALT035, ALT081 TRR001, TRR002, TRR009, TRR011, TRR024, TRR029, TRR032, TRR051, TRR074, TRR075 SSC027, SSC032, SSC036, SSC039, SSC061, SSC072, SSC073, SSC087, SSC098, SSC102, SSC129, SSC169, SSC170
Tributary	AQR025, AQR026, AQR107 AQR114, AQR115
Turbidity	AQR010, AQR030, AQR076 AQR126
Vegetation	TRR014, TRR019, TRR020, TRR024, TRR035, TRR042, TRR046, TRR049, TRR050, TRR051, TRR074
Visual Impacts	ALT020, ALT045 SSC027, SSC034, SSC035, SSC036, SSC049, SSC055, SSC096, SSC097, SSC098, SSC099, SSC100, SSC102
Visual Resources	SSC011, SSC016, SSC019, SSC022, SSC027, SSC099, SSC101
Watana	NFP064, NFP071, NFP072, NFP073, NFP074, NFP075, NFP076 ALT039 AQR002, AQR015, AQR032 AQR099, AQR114, AQR135 AQR136 SSC082, SSC144
Water Quality	NFP066, NFP077, NFP081, NFP082 ALT028, ALT047, ALT063 AQR004
Water Quantity	NFP066, NFP077, NFP081, NFP082, ALT027, ALT063

SUBJECT	TECHNICAL COMMENT REFERENCE NUMBERS
Wetlands	TRR043
Wildlife Resources	TRR012, TRR013, TRR017, TRR020, TRR033, TRR035, TRR036, TRR037, TRR039, TRR041, TRR047, TRR050, TRR059, TRR060, TRR061, TRR078
Wood	NFP020
Work Force	SSC112
World Economy	NFP089
World Oil Price	NFP023, NFP024, NFP026, NFP027, NFP042, NFP087, NFP088, NFP089, NFP090, NFP091, NFP092, NFP093, NFP094, NFP095, NFP096, NFP102
World Oil Production	NFP087, NFP095
World Oil Resources	NFP092

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TOPIC AREA: Alternatives, Expansion Plans

LOCATION IN DEIS: Vol. 1 Page xxiii Summary Paragraph 2 of the page

COMMENT IN REFERENCE TO: Alternative Developments

TECHNICAL COMMENT: In the DEIS' study of alternative developments, the period of analysis and computer models used differ for the thermal and hydroelectric alternatives. The differing period of analysis and computer applications used across alternative plans does not ensure that the electric generation plans in the DEIS systemwide studies provide equivalent capacity and energy, equal reliability, and comparable system costs.

In Appendix I, of this document the Applicant has updated fuel prices, OGP expansion planning studies and total system cost comparisons for the With- and Without-Susitna development plans. The results of the updated studies have confirmed that the proposed Susitna Project is economically more attractive than alternative thermal plans.

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TOPIC AREA: Alternatives, OPCOST, OGP, Expansion Plans

LOCATION IN DEIS: Vol. 1 Page xxiii Summary Paragraph 3-6 of the page

COMMENT IN REFERENCE TO: Development Schemes within the Susitna River Basin

TECHNICAL COMMENT: In the DEIS Susitna River Basin studies, the period of system expansion analyzed with OPCOST was not sufficiently long to permit full utilization of the power and energy capability of the Susitna River alternatives. Therefore, equivalent capacity and energy and equal reliability were not obtained in the Susitna and Non-Susitna Basin hydroelectric OPCOST evaluation. In addition, the evaluation was performed with Susitna Basin and Non-Susitna River hydroelectric project construction costs that are not developed to the same detail and levels of confidence. Therefore, the alternatives are not truly comparable since the construction costs of the Non-Susitna River hydroelectric alternatives were understated. Proper power and energy and cost comparisons have been developed and are shown in Appendix II of this document.

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TOPIC AREA: Alternatives, PRODCOST, OGP, Expansion Plans

LOCATION IN DEIS: Vol. 1 Page xxiii Summary Paragraph 7 and 8 of the page

COMMENT IN REFERENCE TO: Gas-fired Development Plan

TECHNICAL COMMENT: In the DEIS the PRODCOST production costing model was used to evaluate the gas scenario. Comparison of the PRODCOST simulation model with the OGP optimization model shows PRODCOST to be inferior because it is a simulation model, while OGP is an optimization model. Although the DEIS mentions a need for reinforcing the Anchorage-Fairbanks Intertie to serve load, no transmission facilities and their associated costs are included in the levelized total annual costs of the gas scenario. This significantly understates the costs of the plans.

In summary, the difference in periods of analysis and simulation tools across alternative plans does not ensure that the electric generation plans that have resulted from the systemwide studies in the DEIS provide equivalent capacity and energy, equal reliability, and associated total system costs.

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TOPIC AREA: Alternatives, Natural Gas Price

LOCATION IN DEIS: Vol. 1 Page xxiv Summary Paragraph 7 and 8 of the page

COMMENT IN REFERENCE TO: Gas-fired Development Plan

TECHNICAL COMMENT: If DEIS had used current contracts as representative of the gas price for incremental supply in the short term, it would, at the DEIS's oil price, yield a price in 1985-95 below $2 per MMBtu. But following the DEIS's steep price decline in the mid-1980's and outlook thereafter, the long term foreclosure of export markets would result in a lower negotiated price than achieved.

The DEIS offers no insight as to its assumed costs of gas exploration in the Cook Inlet. Actual costs are relatively high, deposits found to date have been relatively small, and it is prudent to anticipate that any new deposits found will be smaller. A relatively high Reserve Life Index must also be anticipated which also raises the cost per Mcf of production, which in recent years has been high. Overall, the cost per MCF of production must be considered as relatively high.

With high costs, limited markets consisting of very few buyers, and an uncertain potential for new discoveries, it is unwarrented for the DEIS to assume low gas prices and supply adequacy for new power plants. Additional data on Cook Inlet gas production and prices are provided in Appendix I of this document.

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TOPIC AREA: Alternatives, PRODCOST, OGP, Expansion Plans

LOCATION IN DEIS: Vol. 1 Page xxiii Summary Paragraph 9 of the page

COMMENT IN REFERENCE TO: Coal-fired Development Plan

TECHNICAL COMMENT: Since the coal expansion planning studies contain the irregularities and errors discussed for the hydroelectric and gas studies and are based on the use of the PRODCOST model, whose improper data assumption and inadequacies were discussed above, the DEIS conclusions are not valid.

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TOPIC AREA: Coal Plants, Coal Price

LOCATION IN DEIS: Vol. 1 Page xxiv Summary Paragraph 1 of the page

COMMENT IN REFERENCE TO: Coal plant location and coal price

TECHNICAL COMMENT: The DEIS assumes that all coal for the coal generation scenarios would be supplied from the Nenana coal field and burned in Nenana or Willow. The Applicant agrees that the first coal fired plant should be based on Nenana field coal, and should be installed in the Nenana region, for reliability reasons. The second Railbelt coal plant also would be located in the Nenana region, as a twin to the first unit, in order to capture available capital and O&M cost savings. Beyond these two plants, the Applicant's studies have indicated that the mine mouth plants in the Beluga region would be more cost effective than plants in Nenana or Willow.

The cost comparisons are biased in favor of coal scenarios. The coal fuel prices used in the analysis of $19.00/ton plus rail net out to $1.55/MMBtu without escalation. Currently, Fairbanks Municipal Utility System (FMUS) is paying $25.56/ton ($1.68/MMBtu) for its coal to Usibelli Coal Co. plus $7.80/ton ($0.51/MMBtu) to the Alaska Railroad for transportation (telephone call to Chena power station August 15, 1984) or a total of $2.19/MMBtu. Underestimation of coal prices, which are an input to the PRODCOST model used in the DEIS, result in underestimation of the present worth and levelized annual costs for coal scenarios. Appendix I of this document contains the Applicant's updated coal production and pricing studies.

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TOPIC AREA: Alternatives, Expansion Plans

LOCATION IN DEIS: Vol. 1 Page xxiv Summary Paragraph 2-10 of the page

COMMENT IN REFERENCE TO: Development Schemes Non-Susitna River Hydroelectric Projects

TECHNICAL COMMENT: Since equivalent capacity and energy and equal reliability were not obtained in the DEIS Susitna and Non-Susitna Basin hydroelectric evaluations the alternatives are not truly comparable.

In the evaluation performed in the DEIS the Susitna Basin and Non-Susitna River hydroelectric project construction costs were not developed to the same level of confidence. In additions, with the dispersed locations of the hydroelectric projects long transmission lines would be required to connect the projects to the Anchorage - Fairbanks intertic and the load centers. The costs of these facilities are not included in the project costs.

Since the hydroelectric evaluation was not performed on an equivalent power and energy basis, the construction costs do not reflect similar levels of detail and confidence, and the cost of transmission facilities have not been accounted for the DEIS Susitna and Non-Susitna Basin hydroelectric comparison and conclusions are not valid. Technical, cost, and environmental comparisons of the Susitna and Non-Susitna hydro alternatives are presented in Appendix I of this document.

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TOPIC AREA: Geographic

LOCATION IN DEIS: Vol. 1 Page 1-1 Section 1.2.1.1. Paragraph 2 and 4 of the page

COMMENT IN REFERENCE TO: Perspective on Geography and Economy of the Railbelt Region - "The so-called Southcentral portion of the Railbelt runs from the Matanuska and Susitna valleys north of Anchorage to the southern terminus of the Alaska Railroad at Seward on the Kenai Peninsula (See Figure 1.1)...Fairbanks is the transportation and business center of the interior section of the Railbelt".

TECHNICAL COMMENT: The DEIS confuses terminology used by the U.S. Census Bureau in designating the regions of Alaska with Railbelt geographical terms. For example, the label "Southcentral" is not normally used to refer to areas of the Railbelt. It is rather a U.S. Census Division of the State of Alaska. Moreover, Fairbanks is not located in the "interior" section of the Railbelt as stated in the DEIS, but rather the upper northeast section of the Railbelt as shown in the DEIS's Figure 1-1. Fairbanks is, however, located in the "Interior" division of the State of Alaska as designated by the U.S. Census Bureau.

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TOPIC AREA: Railbelt Economy

LOCATION IN DEIS: Vol. 1 Page 1-1 Section 1.2.1.1. Paragraph 5 of the page

COMMENT IN REFERENCE TO: Economy of the Railbelt Region - "Alaskan economic development during the 20th Century, including that of the Railbelt area, can be characterized as a sequence of boom periods and stagnations."

TECHNICAL COMMENT: To characterize the Alaska economy as merely a sequence of boom periods and stagnations is an unsupported oversimplification. Although the Alaska economy has been subject to upswings and downswings in various sectors such as fisheries, forest products, and mining from time to time, there is no discernible "periodicity" or specific sequential relationship that can be established. Also, the economy of Alaska has matured gradually during the 20th Century, enabling it to avoid overall stagnation, although certain sectors may experience unemployment and reduced demand for output during certain periods. For example, from 1961 to 1973 the economy of Alaska experienced considerable overall growth in spite of a decline in mining employment from 1969 to 1973 as shown by the following indicators (Kresge et al., 1977).

- production of goods and services had grown more than 6% a year;
- population grew at a rate of 2.8% a year; and
- real personal income grew at a rate of 7% a year.

Thus the DEIS characterization of the Alaska economy as a sequence of "booms" and "busts" misrepresents the actual historical economic record and exaggerates the degree of instability in the economy. This fails to acknowledge the sustained growth in the Alaska economy pre- and post-pipeline construction period.

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TOPIC AREA: Railbelt Economy

LOCATION IN DEIS: Vol. 1 Page 1-1 Section 1.2.1.1. Paragraph 5 of the page

COMMENT IN REFERENCE TO: Perspective on Geography and Economy of the Railbelt Region - "Since the paucity of region-specific data prevents exclusive treatment of the Railbelt, it is necessary to discuss the economy of the state as a whole, rather than confine the description to just the Railbelt".

TECHNICAL COMMENT: The conclusion in this section that there is a paucity of data on the Railbelt economy which mandates evaluation of the whole state economy is unwarranted because, in most cases, a considerable amount of economic and socio-demographic data can be obtained at various levels of aggregation pertaining to the Railbelt region. The extensive reference sources cited in the License Application, Volume 2B as well as the data base maintained by the Institute of Social and Economic Research (ISER) demonstrate the existence and availability of economic data sufficient to characterize the Railbelt region of Alaska. The use of Statewide figures to represent the Railbelt as done in the DEIS distorts the picture of actual economic activity in the region by masking important regional and sectoral differences that exist between the Railbelt and Alaska as a whole.

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TOPIC AREA: Railbelt Economy, Employment

LOCATION IN DEIS: Vol. 1 Page 1-3 Section 1.2.1.1. Paragraph 3 of the page

COMMENT IN REFERENCE TO: Economy of the Railbelt Region - "The construction boom brought about by the building of the oil pipeline transportation system from the North Slope altered the state and Railbelt economies appreciably."

TECHNICAL COMMENT: Although the pipeline construction period 1974-77 was indeed a "boom" period, the economy of Alaska did not experience a subsequent period of stagnation but rather entered a major new growth phase focused on developing its petroleum resources. Because of the magnitude of the construction effort, a number of Alaska resident workers had to find alternative occupations. Admittedly this adjustment took some time and may have affected certain occupations more severely than others but overall, the economy of Alaska reached a new plateau of growth which generated more income and employment opportunities than ever before in the state's history. The DEIS focuses too narrowly on construction employment changes related to the oil pipeline system. As a consequence, it overlooks the larger experience of further sustained economic growth and development which occurred.

The DEIS does not describe in any significant detail the industrial and commercial activities in the private sector. Agricultural development is briefly discussed but fishing, oil/gas and mineral developments, shipping, tourism, refining operations, and other important industrial/commercial or support activities are not given proper attention. Volumes 2A and 2B of the License Application provide discussion and extensive data on employment in agriculture, construction, fish harvesting, manufacturing, mining, and transportation sectors for the Railbelt region. In addition, there are other data such as the number of tourists, gross product in manufacturing, wages and salaries by sector of employment which could have been used in the DEIS to adequately describe the Railbelt economy and the private sector in particular. If these data had been employed, the diversification of the Railbelt economy as well as the diminishing role of the public sector would have been demonstrated. Also, the growth in employment, income, and output for the overall Railbelt economy, as well as output on a sectoral basis would have been established.

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TOPIC AREA: Energy Consumption

LOCATION IN DEIS: Vol. 1 Page 1-4, Section 1.2.1.2. Paragraphs 1 and 2 of the page

COMMENT IN REFERENCE TO: Energy Consumption (1970-1980)

TECHNICAL COMMENT: The DEIS presents data on residential electricity expenditures between 1970 and 1980 and other statistics related to energy consumption for the residential sector. The household or residential sector is not the only source of demand for energy. Energy consumption and related statistics for commercial, industrial, government, and other sectors must be evaluated in order to compare the sectors of demand and obtain a total view of historical energy demand. Only by evaluating total historical energy demand can an optimum generating system be developed. A utility system is not designed solely to meet residential demand. It must be designed to meet the combined characteristics of its total load.

Volume 2A of the License Application, pages B-5-2 to B-5-6 provide electric consumption data by customer class in 1982 for each of the major electric utilities in the Railbelt load centers. Although the residential customers represent the majority of individual customers on a utility's system in the Railbelt, they do not account for most of the electric sales (kWh). Table 1, presented below, denotes the importance of non-residential customers in terms of electric energy consumption as reflected by 1982 electric statistics.

The DEIS fails to present the electric consumption or energy demands of non-residential sectors although these sectors account for 79%, 66%, 83%, and 55% of 1982 energy sales for AMLP, CEA, FMUS, AND GVEA respectively. Overall, non-residential sales represented 69% of total energy sales in 1982 by the major Railbelt utilities, and in consequence non-residential demand is a key consideration in planning future generation.

Table 1

RAILBELT ELECTRIC ENERGY SALES (1982)

	Railbelt Utility									
	AMLP		CEA		FMUS		GVEA		TOTAL	
Sector	Number	Energy Sales (GWh)	Number	Energy Sales (GWh)	Number	Energy Sales (GWh)	Number	Energy Sales (GWh)	Number	Energy Sales (GWh)
Residential	14,745	129	46,560	547	4,663	28	16,176	150	82,144	854
Non-residential	3,229	482	4,907	1,083	1,195	135	2,102	183	11,433	1,883
TOTAL	17,974	611	51,467	1,630	5,858	163	18,278	333	93,577	2,737

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TOPIC AREA: Energy Consumption, Load Forecast

LOCATION IN DEIS: Vol. 1 Page 1-4 Section 1.2.1.2 Paragraphs 1 and 2 the of page

COMMENT IN REFERENCE TO: Energy Consumption (1970-1980), Need for Disaggregation

TECHNICAL COMMENT: The DEIS presents energy consumption, expenditure, and other statistics for the Railbelt or Alaska as a whole. More detailed data pertinent to the Anchorage-Cook Inlet and Fairbanks-Tanana Valley areas for the 1970-1980 period have been provided to FERC by the Power Authority in Volume 1, Appendix D and Volumes 2A, 2B, and 2C of the License Application; e.g. Tables 13.2-13.5 of Volume 2C, Table N.11 of Volume 2B and Tables B.84-B.85 of Volume 2A. This information better establishes historical energy conditions and trends as well as differences between the load centers of the Railbelt region.

The use by FERC staff of energy data disaggregated by load center and consumer sector over time in the DEIS would have demonstrated the relative importance of sectors in determining energy demands, fuel modes, trends in consumption by fuel type, and changes in the state of utilization of various energy forms in the two load centers. Volumes 2A, 2B, 2C, and Volume 1, Appendix D are sources of available data to analyse energy consumption in the Railbelt region on a detailed level.

There is a need to disaggregate energy consumption data in the Railbelt to accurately characterize electric load growth in the region and to analyse the forces that determined or affected energy consumption over the period 1970-1980. Because the load centers in the Railbelt differ in a number of significant economic, social, and climatic ways the causal factors behind energy prices, energy resource development, and energy demand differ as well. The existing electric systems were designed to meet these electric loads and the interconnected power system must also be designed to adequately meet the future energy and peak loads in the separate load centers. The use of average statistics to characterize historical energy consumption may distort the actual experience by "smoothing" out important differences; forecasting or further analysis based on such average statistics would then be flawed.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Energy Consumption

LOCATION IN DEIS: Vol. 1 Page 1-4 Section 1.2.1.2. Paragraphs 1 and 2 on page

COMMENT IN REFERENCE TO: Energy Consumption (1970-1980)

TECHNICAL COMMENT: The DEIS has relied upon undisclosed, uncited sources for the energy statistics used in its analysis and has overlooked the extensive information provided by the Power Authority on this subject. Such data are contained in Volumes 2A, 2B, 2C and Volume 1 Appendix D-1. Had they been properly used as the basis for FERC staff's DEIS analysis a more comprehensive and accurate appraisal would have been made related to relative energy prices, consumption by fuel type and sector demand, fuel modes changes, and sources of energy supply for the Railbelt load centers.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT
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TOPIC AREA: Energy Consumption, Natural Gas Resources, Natural Gas Price

LOCATION IN DEIS: Vol. 1 Page 1-5 Section 1.2.2. Paragraph 2 of the page

COMMENT IN REFERENCE TO: Current Energy Consumption - "Where a gas distribution pipeline system makes natural gas available to consumers, this fuel clearly is more cost effective to use (on a cost per Btu basis) than the alternatives - electricity -distillate oil or liquid propane - as shown in Table 1-2."

TECHNICAL COMMENT: The statement that natural gas via pipelines is more cost effective than electricity is appropriate for existing gas distribution systems under present or near term conditions in the Anchorage and Matanuska areas, but not for the Fairbanks area which is presently unserved. This statement is incorrect in the case of potential future gas pipeline systems such as TAGS or ANGST where the cost of constructing the system and transporting the gas would be great. (See also Fuel Use Act discussion in NFP047). The Applicant has shown that North Slope gas would be uneconomic when compared to electricity in Volume I Appendix D-1, Table D-1.10 of the License Application, and in a feasibility study performed for the Applicnt which considered North Slope Gas projects for heat and electricity in the Railbelt (Ebasco, 1983). Further, Appendix I of this document contains more recent data pertinent to North Slope gas and its projected delivered price in the Railbelt.

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TECHNICAL COMMENT FORM

TOPIC AREA: Natural Gas Resources, Natural Gas Price

LOCATION IN DEIS: Vol.1 Page 1-5 Section 1.2.2. Paragraph 3 of the page

COMMENT IN REFERENCE TO: Current Energy Consumption - "Natural gas is exceptionally inexpensive due to the bountiful supplies associated with petroleum production in the Cook Inlet area, coupled with the lack of an extensive export market.

TECHNICAL COMMENT: The statement that natural gas is "exceptionally inexpensive" at Cook Inlet due to "bountiful supplies...coupled with the lack of an extensive export market" is misleading in the sense that although present demand for natural gas in the Anchorage-Cook Inlet Area is not pressing on the capacity of the supply system nor exhausting local natural gas resources, this may not be the case around the year 2000 and afterwards. In the context of long term energy needs, Cook Inlet reserves cannot be characterized as "bountiful" because, as the Applicant has shown in Table D-1.3 of Volume I Appendix D-1, proven reserves will be exhausted in 1998 and proven but undiscovered reserves, in 2007. Therefore, Cook Inlet natural gas will not be available to serve domestic requirements. For further information on this point see Technical Comment NFP038.

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TECHNICAL COMMENT FORM

TOPIC AREA: Natural Gas Resources

LOCATION IN DEIS: Vol. 1 Page 1-6 Section 1.2.2. Paragraph 2 of the page

COMMENT IN REFERENCE TO: Current Energy Consumption - "Natural gas takes are almost evenly split, at 50 Bcf (1.4 billion m^3) per year each, between these latter two uses (LNG exports and ammonia/urea production)."

TECHNICAL COMMENT: This statement is not consistent with data furnished by the Applicant and provided to FERC in Volume 1 Appendix D-1, Table D-1.2 of the License Application. Table D-1.2 shows annual gas consumption of LNG sales and ammonia/urea production of 62 and 52 Bcf respectively.

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TOPIC AREA: Coal Resources

LOCATION IN DEIS: Vol. 1 Page 1-6 Section 1.2.2 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Major Coal fields and their resources within the Railbelt

TECHNICAL COMMENT: In the Applicant License Application, Volume 1, Exhibit D Apendix D-1, the following estimates of proven reserves and indicated resources were provided.

	Nenana	Beluga
Proven Reserves	457 Million Tons1/	Not Stated
Indicated Resource	7 Billion Tons	1.8 - 2.4 Billion Tons

The references for these data are the Department of Energy (DOE, 1980) and Energy Resource Company, (ERC, 1980). The DEIS offers estimates of proven reserves and indicated resources that differ from the Applicant's and supporting documentation is not provided.

In addition to Nenana and Beluga resources the Matanuska coal field, although not as extensive as the Beluga or Nenana fields, has sufficient reserves to sustain a 200 MW coal-fired power plant.

1/ 2,000 lbs. per ton.

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TECHNICAL COMMENT FORM

TOPIC AREA: Existing System

LOCATION IN DEIS: Vol. 1 Page 1-6 Section 1.2.2 Paragraph 4 of the page

COMMENT IN REFERENCE TO: 1982 installed capacity (nameplate rating) for Railbelt utilities.

TECHNICAL COMMENT: The Applicant has supplied information on the existing generation system in its License Application in Table D-13, Total Generating Capacity Within the Railbelt System-1982 and in Table D-14, Existing Generating Plants in the Railbelt Region. Both of these tables are in Volume 1, Exhibit D, dated July 11, 1983. The Applicant has updated its records of existing generating plant data (See Technical Comment NFP032) and suggests that the DEIS be udated to reflect this more current, and accurate data.

Based on the Applicant's data refinements the 1982 installed capacity (nameplate rating) in Table 1-3 should be as follows:

Hydro - MW	46.0
Diesel - MW	46.8
Combustion Turbines - MW	923.1
Steam Turbine - MW	68.0
Total	1,083.9

The combustion turbine total includes gas turbines, oil turbines, and combined cycle combustion turbines. Also, capacity at military installations should be 95 MW not 96 MW.

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TECHNICAL COMMENT FORM

TOPIC AREA: Wood, Energy Consumption

LOCATION IN DEIS: Vol. 1 Page 1-6 Section 1.2.2. Paragraph 6 of the page

COMMENT IN REFERENCE TO: Current Energy Consumption - "While a number of so-called "renewable" sources of energy are discussed in a subsequent section addressing non-hydroelectric alternatives, as well as Appendix B, one such fuel deserves mention as a significant component of the present energy picture within the Railbelt. That resource is wood. Currently, firewood find widespread use as a secondary fuel for space heating in residences. In the Matanuska Valley area of the Railbelt, 15% of the homes used wood as the primary means of heating."

TECHNICAL COMMENT: The DEIS gave considerable attention to wood fuel as an alternative fuel source. Any conclusion that wood fuel could be considered a viable long term fuel source is not supported by the facts. On page II-38 of the State of Alaska 1983 Long Term Energy Plan (AKDCED, 1983), it is stated that "Current prices for wood are in the vicinity of $100 to $120 per cord in the urban areas of Alaska; this compares favorably with fuel oil costs of $1.30 per gallon. In some cases, however, accessibility to woodland and harvesting costs may raise the cost of wood resources beyond levels competitive with oil." These relative prices, assuming 138,000 Btu/gal for oil and 22 x 10^6 Btu/cord for wood, are $9.42/Btu x 10^6 for oil and $5.70/Btu x 10^6 for wood. Both such prices are significantly in excess of the cost of coal or natural gas in Alaska.

In addition, the 1983 Long Term Energy Plan cites major problems with the use of wood as solid fuel for electricity. Problems associated with wood fired power plants include relatively small sizes. The two largest stand alone power generation units operating in the U.S. are in Burlington, Vt. and Kettle Falls, Wa. These are 45-50 MW in size. Such units are not the most cost effective thermal option, particularly in areas which lack

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TOPIC AREA: Existing System

LOCATION IN DEIS: Vol. 1 Page 1-8 Section 1.2.2

COMMENT IN REFERENCE TO: Table 1-4, Hydroelectric Plants in the Railbelt

TECHNICAL COMMENT: The Applicant has updated its record of existing generating plant data (See Technical Comment NFP032) and suggest the DEIS be updated to reflect this more current, and accurate data. In Table 1-4 the Eklutna Hydroelectric Project average annual energy generation should be 154 GWh not 148 GWh and the nameplate capacity of the Cooper Lake Hydroelectric Project should be 16 MW not 15 MW.

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TOPIC AREA: Existing System

LOCATION IN DEIS: Vol. 1 Page 1-8 Section 1.2.3

COMMENT IN REFERENCE TO: Table 1-5, Schedule of Planned Utility Additions

TECHNICAL COMMENT: Table 1-5 of the DEIS contains an incorrect value for average energy of the Grant Lake Hydroelectric Project. The correct estimate of average annual energy generation for Grant Lake is 25 GWh not 33 GWh. With this correction the total average energy in Table 1-5 would be 372 GWh not 380 GWh.

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TOPIC AREA: Load Forecast, World Oil Price

LOCATION IN DEIS: Vol. 1 Pages 1-8 Section 1.2.4.1 Paragraph 4 of the page

COMMENT IN REFERENCE TO: Applicant's Load Forecasts

TECHNICAL COMMENT: The DEIS has incorrectly characterized the Applicant's position as having submitted "a number of alternative load forecasts for the Railbelt." More precisely stated, the Applicant has submitted one Reference Case load forecast. In addition, three load forecasts; DOR Mean, DRI, and the -2%/yr growth rate; were carried through the economic analysis to test the sensitivity of world oil price on the need for power. The -2%/yr load forecast was analyzed at the request of FERC Staff. The FERC Staff also suggested sensitivity analyses of world oil price on the need for power with -1%, 0%, +1%, and +2% growth per year in world oil price. Since the Reference Case and DOR Mean forecasts resulted in oil price trajectories similar to the -1%, 0%, +1%, and +2%, these FERC Staff load forecast suggestions were not carried through the economic analysis. Figure B.99, Volume 2A, Exhibit B of the License Application contains a plot of the alternative world oil projections considered in Licensing studies. Appendix I of this document contains the Applicant's studies on recent world oil price forecasts. The resulting load forecast was substantially similar to the License Application forecast.

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TOPIC AREA: Load Forecast, World Oil Price

LOCATION IN DEIS: Vol. 1 Pages 1-9 Section 1.2.4.1.3 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Applicant's Oil Price and Load Forecast

TECHNICAL COMMENT: In describing the Reference Case as having been assigned only a 35% probability of occurrence. The DEIS has not provided a complete perspective on the forecasts. Actually, the Applicant developed three oil price scenarios, each with an assigned probability of occurrence, as summarized in the following table.

Scenario	Year 2010 World Oil Price ($/bbl)	Assigned Probability of Occurrence (%)
Base Case	75.75	40
No Supply Disruption (Reference Case)	50.39	35
Zero Economic Growth	45.11	25
		100

While the assigned probability of occurrence of the Reference Case is 35%, the probability of occurrence of an oil price scenario that is as high or higher is 75%. The probability of occurrence of an oil price scenario lower than the Reference Case is only 25%.

Further, the Applicant has had occasion to update these forecasts as shown in Appendix I of this document. In the Applicant's updated analysis, the NSD case is now considered to represent the most likely set of assumptions and is designated as SHCA's 1984 base case.

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TOPIC AREA: Load Forecast

LOCATION IN DEIS: Vol. 1 Pages 1-10 and 1-12 Section 1.2.4.1.3

COMMENT IN REFERENCE TO: Tables 1-6, 1-7, and 1-9, Applicant's Load Forecasts

TECHNICAL COMMENT: There are computation errors in DEIS Tables 1-6 and 1-9. In Table 1-6, the annual rate of change in world oil price for the period 1989 to 2010 should be 3.1 instead of 2.6.[1/] In Table 1-9, the annual load growth for the DOR Mean forecast for the period 1995 to 2000 should be 1.88% instead of 3.80%.[2/]

It should be noted for purposes of clarification that in Table 1-7 energy and peak demands are shown as sales at point-of-use (customer). Also, transmission line losses of 10 percent (See Technical Comment NFP033) should be added to energy requirements and peak demand to yield net generation requirements at sources. The electric sales data presented with the suggested correction would agree with Tables C.27 and C.28 contained in Volume 2C of the License Application.

1/ $\left(\frac{50.39}{26.30} \right)^{1/21}$

2/ $100 \times \left(\frac{879}{801} \right)^{1/5} -1$

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TOPIC AREA: World Oil Price

LOCATION IN DEIS: Vol. 1 Pages 1-9 and 1-15 Section 1.2.4.2

COMMENT IN REFERENCE TO: FERC Staff Projections

TECHNICAL COMMENT: The FERC staff presentation hinges on the projection of oil prices that are forecast to decline significantly through 1990 and to increase gradually after 1990, but only to the 1983 level ($29/bbl) by 2010. This world oil price scenario is much lower than SHCA-NSD scenario used in the License Application as the basis of the Applicant's Reference Case. For example, in the year 2010 the DEIS projects a world crude oil price of $29/bbl versus $50/bbl for the SHCA-NSD case.

The scenario projected by the DEIS does not represent a "middle ground" in the spectrum of accepted world oil price projections but rather represents an extreme case. Indeed, the 1983 National Energy Policy Plan prepared by the Department of Energy (DOE) shows a low economic scenario which contains a 2010 oil price of $60/bbl (1983 $; escalating 1982 prices by 6%). The DEIS identifies factors of consumption, fuel-switching, and stagnant world economic conditions, which it concludes will combine to lower world oil demand in the future at potentially the same annual rate experienced since 1979. This continued reduction will, in turn, press prices downward. The DEIS's assumptions about future world oil demand and price do not withstand scrutiny.

The Applicant has prepared detailed discussion on the pertinent factors used to project world oil prices in its review of the DEIS's Vol. 2 Appendix A. These factors and the corresponding Technical Comment are as follows:

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TOPIC AREA: World Oil Price, Load Forecast

LOCATION IN DEIS: Vol. 1 Page 1-15 Section 1.2.4.2 Paragraph 2 of the page

COMMENT IN REFERENCE TO: FERC Staff Load Forecasts

TECHNICAL COMMENT: The FERC staff medium load and high load projections shown in Figure 1-6 imply little difference in the assumptions made about the world crude oil price trajectories and the degree of uncertainty about those price predictions.

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TOPIC AREA: Load Forecast

LOCATION IN DEIS: Vol. 1 Pages 1-9 to 1-16 Section 1.2.4.2

COMMENT IN REFERENCE TO: FERC Staff Load Forecasts

TECHNICAL COMMENT: Although the DEIS medium oil scenario is similar to the DOR Mean scenario, the DEIS'resulting load forecast is lower than that produced by the Power Authority using DOR mean prices, as shown at Volume 2A of the License Application. For example, in 2010 FERC Staff projects load to be 5,234 GWh versus 5,399 GWh under the DOR Mean scenario. This discrepancy is unexplained. The use by FERC staff of more appropriate economic assumptions as contained in Appendix D-1 and Volume 2A of the License Application would have resulted in more reasonable and higher load forecasts consistent with the results of using the DOR Mean forecast.

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TOPIC AREA: MAP Model, Load Forecast

LOCATION IN DEIS: Vol. 1 Page 1-15 Section 1.2.4.2 Paragraph 3 of the page

COMMENT IN REFERENCE TO: FERC Staff Load Forecasts

TECHNICAL COMMENT: In the DEIS analysis, modifications or changes were attempted to the net migration equation of the MAP model, but were unsuccessful and therefore abandoned by FERC. However, the DEIS concludes that the model "could not be improved upon in the time allotted which suggests that the MAP Model is to some extent inadequate or deficient."

The discussion erroneously implies that the MAP model could be improved if more time were available. The MAP model uses "state-of-the-art" modeling approaches and estimation techniques in conjunction with the best available data and provides reasonable economic projections. The DEIS fails to identify any specific problem with MAP. Therefore, the model should be accepted "as is."

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TOPIC AREA: Load Forecast

LOCATION IN DEIS: Vol. 1 Pages 1-15 Section 1.2.4.2 Paragraph 3 of the page

COMMENT IN REFERENCE TO: FERC Staff Load Forecasts

TECHNICAL COMMENT: The footnote at the bottom of page 1-15 asserts that no projections could be generated that would be consistent with the FERC staff low world oil price path. However Tables 1-19 and 1-20 inconsistently refer to a "low load forecast", and Table 1-22 shows energy and peak load forecasts for the FERC Staff low world oil price scenario. If the FERC Staff made preliminary load projections based on the Applicant's low world oil price forecasts rather than Staff's low world oil price trajectory it should be so indicated in the relevant tables and an explanation of the methodology employed must be included in the FEIS.

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TOPIC AREA: Load Forecast

LOCATION IN DEIS: Vol. 1 Page 1-16 Section 1.2.4.2

COMMENT IN REFERENCE TO: Tables 1-10 and 1-11, FERC Staff Load Forecasts

TECHNICAL COMMENT: Tables 1-10 and 1-11 in the DEIS show energy and peak demand projections for the years 1983 to 2022 for both FERC Staff medium and high world oil price scenarios. Table 1-22 in the DEIS shows energy and peak demand projections for the years 1983 to 2040 for the FERC Staff high, medium and low load forecasts used in the alternatives evaluation.

RED Model projections are only made through 2010, therefore, the above forecasts were extrapolated beyond 2010.

It appears that FERC staff have extrapolated beyond 2010 using different computation methods in Table 1-10 and 1-11 as opposed to Table 1-22.

The Applicant provides load forecasts to 2010 based on the RED Model. For purposes of comparing thermal alternatives with the Susitna Hydroelectric Project, the Applicant extrapolates electric load beyond 2010 based on the average annual growth rate over the last ten years of projected loads (2000 to 2010). This method is explicity stated in Volume 1 of the License Application and is technically correct because it gives greater weight to the latter year projections which are more likely to indicate trends for the future.

In Table 1-22 of the DEIS the FERC Staff have employed the extrapolation method used by the Applicant in extending their load projections to 2040. In Tables 1-10 and 1-11 the FERC Staff have used a different method of extrapolating the loads to 2022. If the FERC Staff had used the Applicant's approach in Tables 1-10 and 1-11 for extrapolating loads it would have resulted in greater load requirements. The following tabulation shows electric load projections for 2010 and 2020 for the DEIS medium case and the Applicant's Reference Case.

	Energy (GWh)			Peak Demand (MW)		
Year	DEIS (Medium) Without Applicant's Approach	DEIS (Medium) With Applicant's Approach	Applicant's Reference Case	DEIS (Medium) Without Applicant's Approach	DEIS (Medium) With Applicant's Approach	Applicant's Reference Case
2010	5234	5234	5858	1086	1086	1217
2020	6424	6573	7481	1332	1362	1552

The DEIS energy forecast is 5234 GWh for 2010 and using the method of extrapolation adopted, it is projected to be 6424 GWh in 2020. However if the Applicant's extrapolation method is employed, the projected load for 2020 would be 6573 GWh which is approximately 2.3% greater than the 6424 GWh figure. Because of the multiplicative nature of applying a constant growth rate the gap between the DEIS forecasts "with" and "without" the Applicant's method would continue to increase. A similar demonstration is also made for peak loads.

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TOPIC AREA: Retirement Schedule, Existing System

LOCATION IN DEIS: Vol. 1 Page 1-18 Section 1.2.5

COMMENT IN REFERENCE TO: Tables 1-12 and 1-13 System Generation Capability and Schedule of Retirement

TECHNICAL COMMENT: The DEIS reflects incorrect data in both its Table 1-12, System Generation Capability and in Table 1-13, Schedule of Retirements. Note also that the retirement schedule in Table 1-13 is applicable to Susitna and Non-Susitna alternatives. The title of Table 1-13 should be therefore revised to state that it is a schedule of Railbelt System Retirements.

The Applicant has supplied information on the existing generation system in its License Application in Table D.13, Total Generating Capacity Within the Railbelt System-1982 and on retirement schedules in Table D.14, Existing Generating Plants in the Railbelt Region. Both of these tables are in Volume 1, Exhibit D. In addition to Tables D.13 and 14, Section 4.2-Retirement Schedule, of Volume 1, Exhibit D discusses the assumed lifetimes for the various types of generating units. Also, in July 1983 the Applicant submitted to FERC Supplemental Attachment 18-19(4) (SA 18-19(4)), which included copies of OGP 6 input data and output results and provided information on the existing generating system.

Subsequent to filing the above documents, the Applicant has continued to refine and revise, when necessary, basic data related to the existing Railbelt generation system. The changes have included updated retirement policies and elimination of inconsistencies between the generating plant data in Table D.14 and in the OGP 6 data contained in SA 18-19(4).

Current retirement policy for the existing generating units is based on several sources, including the Applicant's feasibility study guidelines, the FERC's guidelines (FERC, 1979) and the Battelle Railbelt Alternatives Study (Battelle, 1982A). The following periods of economic lifetime have been adopted by the Applicant.

Coal-Fired Steam Turbine:	30 years
Oil-Fired Combustion Turbine:	20 years
Gas-Fired Combustion Turbines:	20 years
Diesel Generation:	20 years
Combined Cycle Combustion Turbines:	30 years
Hydroelectric Projects:	50 years

The inconsistencies identified between Table D.14 and the OGP 6 data contained in Supplemental Attachment 18-19(4) are as follows:

FMUS Diesel No. 1, 2.8 MW, listed in SA18-19(4) as a Gas-fired CT is actually a Diesel IC.

Chena No. 4, 7 MW, listed in SA18-19(4) as a Diesel IC is actually an Oil-fired CT.

Chena No. 6, listed in SA18-19(4) as a Gas-fired CT is actually an Oil-fired CT. Also, Chena No. 6 generating capacity is 28.8 MW not 23 MW as shown in Table D.14 and SA18-19(4).

Based on the adopted retirement policies and data refinements the Applicant has revised and attached the following tables:

License Application:

Table D.13 - Total Generating Capacity Within the Railbelt System-1982
Table D.14 - Existing Generating Plants in the Railbelt Region

DEIS:

Table 1-12 - System Generation Capability
Table 1-13 - Schedule of Railbelt System Retirement

The Applicant has updated its record of generating plant data and suggests that the DEIS data be updated to reflect this more current, and accurate data. With this revision, the projected DEIS reserve margins would shrink significantly as shown in the last line of Table 1-12 attached. For example, instead of the reserve capacity of 302 MW in 1993 projected by the DEIS under its medium oil price scenario, the system will have a reserve capacity of only 74 MW. By 1995, instead of a reserve capacity of a projected 203 MW, the system would have a 32 MW shortfall.

Revised DEIS Table 1-12
System Generation Capability (MW)
- Selected Years
(medium oil price level)

Parameter	1993	1994	1995	2000	2010	2020	2022
Existing Generating Capacity (1992)	848	848	848	848	848	848	848
Planned Additions (1988)	97	97	97	97	97	97	97
Available Capacity (1992)	945	945	945	945	945	945	945
Retirements	53	53	118	356	624	802	802
Net Available Capacity	892	892	827	589	321	143	143
Peak Load (as generated)	818	845	859	945	1184	1452	1513
Margin ( ) = deficit	74	47	(32)	(356)	(863)	(1309)	(1370)

Revised DEIS Table 1-13
Schedule of Railbelt System Retirements

	Capacity (MW) Retired						
		Combustion Turbine					
Year	Coal	Gas	Oil	Diesel	Combined Cycle	Annual Total	Cumulative
1993		53				53	53
1994						-	53
1995		58	7			65	118
1996			94			94	212
1997	25		65			90	302
1998		26				26	328
1999				1		1	329
2000	21			6		27	356
2001						-	356
2002		116				116	472
2003						-	472
2004						-	472
2005						-	472
2006						-	472
2007						-	472
2008						-	472
2009					139	139	611
2010						13	624
2011						-	624
2012					178	178	802
2013						-	802
2014						-	802
2015						-	802
Total							

Revised License Application Table D.13
Total Generating Capacity
Within the Railbelt System-1982(a)

Abbreviations	Railbelt Utility	Installed Capacity[1/]
ANCHORAGE AREA		
APAd	Alaska Power Administration	30.0
AMLP	Anchorage Municipal Light & Power Power Department	311.6
CEA	Chugach Electric Association	463.5
MEA	Matanuska Electric Association	0.9
HEA	Homer Electric Association	2.6
SES	Seward Electric System	5.5
FAIRBANKS AREA		
GVEA	Golden Valley Electric Association	221.6
FMUS	Fairbanks Municipal Utility System	74.2
U of A	University of Alaska	18.6
TOTAL		1128.5[2/]

(a) Source: Volume 1, Exhibit D, July 11, 1983

1/ Installed capacity as of 1982 at 0°F.
2/ Excludes National Defense installed capacity of 95.0 MW.

Revised August, 1984

Revised License Application Table D.14
(Sheet 1 of 6)

EXISTING GENERATION PLANTS IN THE RAILBELT REGION

Plant/Unit	Prime Mover	Fuel Type	Installation Date	Retirement Date	Nameplate Capacity (MW)	Generating Capacity @ 0°F (MW)	Heat Rate (Btu/kWh)
			Alaska Power Administration (APAd)				
Eklutna[(a)]							
Unit #1, 2	H	--	1955	2051	30.0	--	--
			Anchorage Municipal Light and Power (AMLP)				
Station #1[(b)]							
Unit #1	SCCT	NG/O	1962	1982	14.0	16.25	14,000
Unit #2	SCCT	NG/O	1964	1984	14.0	16.25	14,000
Unit #3	SCCT	NG/O	1968	1988	18.0	18.0	14,000
Unit #4	SCCT	NG/O	1972	1992	28.5	32.0	12,500
Diesel 1[(c)]	D	O	1962	--	1.1	1.1	10,500
Diesel 2[(c)]	D	O	1962	--	1.1	1.1	10,500
Station #2							
Unit #5,6,7[(d)]	CCCT	NG	1979	2009	--	139.0	8,500
Unit #8	SCCT	NG/O	1982	2002	73.6	90.0	12,500
			Chugach Electric Association (CEA)				
Beluga							
Unit #1	SCCT	NG	1968	1988	15.25	16.1	15,000
Unit #2	SCCT	NG	1968	1988	15.25	16.1	15,000
Unit #3	RCCT	NG	1973	1993	53.3	53.0	10,000
Unit #4[(e)]	SCCT	NG	1976	--	10.0	10.7	15,000
Unit #5	RCCT	NG	1975	1995	58.5	58.0	10,000
Unit #6,7,8(f)	CCCT	NG	1982	2012	--	178.0	8,500

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EXISTING GENERATION PLANTS IN THE RAILBELT REGION

Plant/Unit	Prime Mover	Fuel Type	Installation Date	Retirement Date	Nameplate Capacity (MW)	Generating Capacity @ 0°F (MW)	Heat Rate (Btu/kWh)
			Chugach Electric Association (CEA) (Continued)				
Cooper Lake(g)							
Unit #1,2	H	--	1961	2051	16.0	--	--
Unit #1	SCCT	NG	1964	1984	14.0	14.0	15,000
Unit #2	SCCT	NG	1965	1985	14.0	14.0	15,000
Unit #3	SCCT	NG	1970	1990	18.5	18.0	15,000
Bernice Lake							
Unit #1	SCCT	NG	1963	1983	7.5	8.6	23,400
Unit #2	SCCT	NG	1972	1992	16.5	18.9	23,400
Unit #3	SCCT	NG	1978	1998	23.0	26.4	23,400
Unit #4	SCCT	NG	1982	2002	23.0	26.4	12,000
Knik Arm(h)							
Unit #1	ST	NG	1952	--	0.5	0.5	--
Unit #2	ST	NG	1952	--	3.0	3.0	--
Unit #3	ST	NG	1957	--	3.0	3.0	--
Unit #4	ST	NG	1957	--	3.0	3.0	--
Unit #5	ST	NG	1957	--	5.0	5.0	--
			Matanuska Electric Association (MEA)				
Talkeetna							
Unit #1	D	O	1967	1987	0.9	0.9	15,000

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EXISTING GENERATION PLANTS IN THE RAILBELT REGION

Plant/Unit	Prime Mover	Fuel Type	Installation Date	Retirement Date	Nameplate Capacity (MW)	Generating Capacity @ 0°F (MW)	Heat Rate (Btu/kWh)
			Homer Electric Association (HEA)				
Kenai							
Unit #1	D	O	1979	1999	0.9	0.9	15,000
Pt. Graham							
Unit #1	D	O	1971	1991	0.2	0.2	15,000
Seldovia							
Unit #1	D	O	1952	1972	0.3	0.3	15,000
Unit #2	D	O	1964	1984	0.6	0.6	15,000
Unit #3	D	O	1970	1990	0.6	0.6	15,000
			Seward Electric System (SES)				
SES							
Unit #1	D	O	1965	1985	1.5	1.5	15,000
Unit #2	D	O	1965	1985	1.5	1.5	15,000
Unit #3	D	O	1965	1985	2.5	2.5	15,000
			Military Installations - Anchorage Area[j]				
Elmendorf AFB							
Total Diesel	D	O	1952	--	2.1	--	10,500
Total ST	ST	NG	1952	--	31.5	--	12,000
Fort Richardson							
Total Diesel[c]	D	O	1952	--	7.2	--	10,500
Total ST	ST	NG	1952	--	18.0	--	20,000

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EXISTING GENERATION PLANTS IN THE RAILBELT REGION

Plant/Unit	Prime Mover	Fuel Type	Installation Date	Retirement Date	Nameplate Capacity (MW)	Generating Capacity @ 0°F (MW)	Heat Rate (Btu/kWh)
			Golden Valley Electric Association (GVEA)				
Healy Coal	ST	Coal	1967	1997	25.0	25.0	13,200
Healy Diesel	D	O	1967	1987	2.8	2.8	10,500
North Pole							
Unit #1	SCCT	O	1976	1996	64.7	65.0	14,000
Unit #2	SCCT	O	1977	1997	64.7	65.0	14,000
Zendher							
Unit #1	SCCT	O	1971	1991	18.4	18.4	14,000
Unit #2	SCCT	O	1972	1992	17.4	17.4	14,000
Unit #3	SCCT	O	1975	1995	2.8	3.5	14,000
Unit #4	SCCT	O	1975	1995	2.8	3.5	14,000
Combined Diesel	D	O	1960-70	1985	21.0	21.0	14,000
			Fairbanks Municipal Utilities System (FMUS)				
Chena							
Unit #1	ST	Coal	1954	1984	5.0	5.0	18,000
Unit #2	ST	Coal	1952	1982	2.5	2.5	22,000
Unit #3	ST	Coal	1952	1982	1.5	1.5	22,000
Unit #4	SCCT	O	1963	1983	5.3	7.0	15,000
Unit #5	ST	Coal	1970	2000	21.0	21.0	13,320
Unit #6	SCCT	O	1976	1996	23.1	28.8	15,000
Diesel #1	D	O	1967	1987	2.8	2.8	12,150
Diesel #2	D	O	1968	1988	2.8	2.8	12,150
Diesel #3	D	O	1968	1988	2.8	2.8	12,150

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EXISTING GENERATION PLANTS IN THE RAILBELT REGION

Plant/Unit	Prime Mover	Fuel Type	Installation Date	Retirement Date	Nameplate Capacity (MW)	Generating Capacity @ 0°F (MW)	Heat Rate (Btu/kWh)
University of Alaska - Fairbanks (U of A)							
S1	ST	Coal	1980	2010	1.50	1.50	12,000
S2	ST	Coal	1980	2010	1.50	1.50	12,000
S3	ST	Coal	1980	2010	10.0	10.0	12,000
D1	D	O	1980	2000	2.8	2.8	10,500
D2	D	O	1980	2000	2.8	2.8	20,500
Military Installations - Fairbanks(j)							
Eielson AFB							
S1, S2	ST	O	1953	--	2.50	--	--
S3, S4	ST	O	1953	--	6.25	--	--
Fort Greeley							
D1, D2, D3(i)	D	O	--	--	3.0	--	10,500
D4, D5	D	O	--	--	2.5	--	10,500
Ft. Wainwright							
S1, S2, S3,	ST	Coal	--	1953	20	--	20,000
S4, S5(i)	ST	Coal	--	1953	2	--	--

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EXISTING GENERATION PLANTS IN THE RAILBELT REGION

Legend	H	- Hydro
	D	- Diesel
	SCCT	- Simple cycle combustion turbine
	RCCT	- Regenerative cycle combustion turbine
	ST	- Steam turbine
	CCCT	- Combined cycle combustion turbine
	NG	- Natural gas
	O	- Distillate fuel oil

Notes

(a) Average annual energy production for Eklutna is approximately 154 GWh.

(b) All AMLP SCCTs are equipped to burn natural gas or oil. In normal operation they are supplied with natural gas. All units have reserve oil storage for operation in the event gas is not available.

(c) These are black-start units only. They are not included in total capacity.

(d) Units #5, 6, and 7 are designed to operate as a combined cycle at plant. When operated in this mode, they have a generating capacity at 0°F of approximately 139 MW with a heat rate of 8500 Btu/kWh.

(e) Jet engine, not included in total capacity.

(f) Beluga Units #6, 7, and 8 operate as a combined-cycle plant. When operated in this mode, they have a generating capacity at 0°F of about 178 MW with a heat rate of 8500 Btu/kWh. Thus, Units #6 and 7 are retired from "gas turbine operation" and added to "combine-cycle operations."

(g) Average annual energy production for Cooper Lake is approximately 42 GWh.

(h) Knik Arm units are old and have higher heat rates; they are not included the in total capacity.

(i) Standby units.

(j) National Defense installed capacity is not included in Railbelt generating capacity used in OGP model.

Source: Battelle Pacific Northwest Laboratories. Existing Generating Facilities and Planned Addition for the Railbelt Region of Alaska, Volume VII, September, 1982; updated by Harza-Ebasco Susitna Joint Venture, August, 1984.

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TOPIC AREA: Transmission Lines and Corridors

LOCATION IN DEIS: Vol. 1 Page 1-15 Section 1.2.5 Paragraph 4 of this page

COMMENT IN REFERENCE TO: Transmission Loss - "The peak loads are the point-of-use figures given in Table 1-10 increased by an average 9% transmission loss to represent loads at the generator busbars."

TECHNICAL COMMENT: The DEIS offers no support for using an average 9% transmission loss factor instead of the 10% factor used by the Applicant in its studies. The Applicant's use of 10% is a reasonable assumption and is supported by the following circumstances.

The RED Model forecasts of peak power demand and energy requirements are computed at the customer or point-of-use level. The generation required to supply the customer loads at the point of generation should exceed the loads by bulk transmissions, distribution, and unaccounted losses. In the Applicant's expansion planning (OGP) studies the RED Model forecasts of peak power and energy were increased by 10 percent to reflect these losses.

Line losses were divided into two types, capacity and energy; and two systems, the bulk transmission system between major Utility substations, and the distribution system between Utility substations and the customers within the Utility's area.

The Applicant's estimate of bulk transmission capacity and energy losses between Utility sub-stations for two representative load levels were prepared using load flow over the transmission line configuration presented in the License Application.

The Applicant's estimates of distribution system capacity losses were based on available cable sizes, line lengths, and line voltages for the distribution system in the Anchorage area. The energy losses at the distribution system level were estimated by comparing utility net generation and sales figures included in Alaska power statistics.

The Applicant's loss factor analysis incorporates each of the components of the overall transmission system and estimates each components contribution to the total loss factor. The total loss factor from the foregoing, which was applied to both energy and peak demand as computed in the RED model analysis, was 1.10.

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TOPIC AREA: Reliability

LOCATION IN DEIS: Vol. 1 Page 1-15 Section 1.2.5 Paragraphs 4 of this page

COMMENT IN REFERENCE TO: "In the case of hydropower generation, energy limitations (water supply) may not permit a unit to develop its full power capability for each successive daily peak in the peak load period, thus restricting the load-carrying ability of a unit to less than its rating."

TECHNICAL COMMENT: The Applicant, in its License Application, has adequately acounted for the possibility of restricted load-carrying ability with the Susitna Project.

The amount of reliable generating capacity available to serve the Railbelt system loads is computed using a Loss of Load Probability (LOLP) model within the OGP Program. The load-carrying ability of the Susitna Project is simulated by scheduling the estimated average monthly firm energy of the project. Firm energy is defined as the maximum hydroelectric energy that can be produced during the year of most critical streamflow conditions.

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TOPIC AREA: Reliability

LOCATION IN DEIS: Vol. 1 Page 1-15, Section 1.2.5 Paragraph 5 of this page

COMMENT IN REFERENCE TO: Reliability Evaluation - "The load-carrying characteristics of the various forms of existing and planned Railbelt generation were examined in terms of the shape of the Railbelt load duration curve to determine the point at which further generation additions will be needed. This analysis showed that additional Railbelt generation will be needed in 1994 to limit the probable unserved system energy requirement."

TECHNICAL COMMENT: The DEIS does not document the system generation reliability approach or criteria that are used in the study. However, the DEIS implies that expected unserved energy is the criteria considered in deciding the timing of new generation.

The Applicant reviewed model descriptions of OPCOST and PRODCOST, the simulation programs used in the DEIS system planning studies. The OPCOST model description did not contain any explanation of, or reference to, a procedure that would ensure system reliability. The PRODCOST model computes both expected unserved energy and loss of load probability using system load characteristics, generator availability, and a pre-specificied system expansion plan. The model is not comprehensive enought to accept as input a reliabilility index and expand the generation system while meeting the reliability criteria imposed.

For the Applicant's generation planning, a single capacity expansion optimization model (OGP 6) was used to develop equivalent expansion plans. The OGP model is a superior model and is preferable for project evaluation because it has three major functions; 1) reliability evaluation, 2) capacity expansion optimization, and 3) electricity production simulation.

With respect to reliability, the Loss of Load Probability (LOLP) method is used in the OGP program. LOLP is the industry accepted measure of generation system reliability (AIEE, 1960). The LOLP technique is a probabilistic measurement of the expected number of days per year on which the available capacity cannot meet the load demand.

The Applicant has selected an LOLP index of 1 day in 10 years for its reliability index. This index provides a consistent and sensitive measure of generation system reliability.

To support its selection of the LOLP approach the Applicant reviewed the criteria in use by the nine reliability councils that make up the National Electric Reliability Council (NERC)(IEEE, 1977). Attachment 1 summarizes the nine councils' capacity planning criteria.

Of the nine reliability councils, MAAC and NPCC make specific reference to LOLP and the 1 day in 10 year criteria. ERCOT, MARCA and SPP require that a specific percent reserve be maintained. Industry literature (IEEE, 1982, 1975) shows that the percent reserve maintained by utilities employing that criteria is equivalent to the LOLP of 1 day in 10 years. ECAR, MAIN, SERC, and WSCC require that generation capacity outage as part of a single or multiple contingency case be taken into account. None of the Councils use expected unserved energy as their system reliability criteria, as was done in the DEIS.

In the Applicant's studies of the Railbelt system, the LOLP approach and a 1 day in 10 year index have been adopted as the most appropriate method of ensuring system reliability.

The DEIS lacks sufficient discussion of approaches to ensuring system reliability and does not clearly state the level of reliability assumed for the simulation models in the capacity planning studies. In addition the method of reliability evaluation adopted by the DEIS is not commmonly used by the nine reliability councils that make up the NERC.

Therefore, the DEIS system expansion analysis may not be adequate in relation to accepted industry practice and are not consistent with state of the art industry approach.

NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL
CAPACITY PLANNING CRITERIA

The following contains a summary of those portions of each Council's reliability criteria as they pertain to the subject of generation planning.

East Central Area Reliability Council (ECAR)

No specific numerical value is specified for reserve capacity, LOLP, or unserved energy. However, the criteria for simulated testing impose tests that have the effect of establishing reserve capacity or LOLP. The criteria relating to capacity are:

- o Sudden outage of any transmission circuit at a time when a combination of any three generating units is out of service.
- o Sudden outage of any double-circuit transmission tower line at a time when a combination of any two generating units is out of service.
- o Sudden outage of any generating unit at a time when any two other generating units are out of service.
- o Sudden outage of any generating capacity at any generating plant.
- o Sudden outage of any transmission station, including all generating capacity associated with such a station.

Electric Reliability Council of Texas (ERCOT)

"Sufficient generating capacity will be provided, as nearly as practicable, to ensure a reserve of at least 15 per cent of the forecasted maximum hour demand of the Interconnected System."

Testing criteria relating to generation capacity include the following:

- o Loss of all generating capacity at any generating station.
- o Loss of any two generating units.
- o Outage of any circuit or generating unit during scheduled maintenance on any other transmission line or generating unit.
- o Outage of any single or double circuit transmission line, generating unit, transformer, or bus.

Mid-Atlantic Area Council (MAAC)

The MAAC reliability standards are as follows:

"Installed generating capacity requirement: Sufficient Megawatt generating capacity shall be installed to insure that in each year for the MAAC system the probability of occurrence of load exceeding the available generating capacity shall not be greater, on the average, than one day in ten years.."

Tests of the adequacy of the plan include the following specific reference to generation:

- o Sudden loss of the entire generation capacity of any station for any reason.

Mid-American Interpool Network (MAIN)

There is no specific criterion for the application of a reserve capacity criteria such as percent reserve or LOLP. The extreme disturbance testing criteria inlcude the following specific references to generation.

- o Sudden outage of any transmission circuit at a time when a combination of any three generating units are out of service.

- o Sudden outage of any double-circuit transmission tower line at a time when a combination of any two generating units is out of service.
- o Sudden outage of any generating unit at a time when any two other generating units are out of service.
- o Sudden outage of all generating plant.
- o Sudden outage of any transmission station, including all generating capcity associated with such station.

Northeast Power Coordinating Council (NPCC)

"Generating capacity will be installed and located in such a manner that after the due allowance for required maintenance and expected forced outages, each area's generating supply will equal or exceed area load at least 99.9615 percent of the time. This is equivalent to a loss-of-load probability of one day in ten years."

Mid-Continental Area Power Pool (MARCA-MAPP)

The system design standards on generating capacity requirements

> "Each party's installed generating capacity (net capability) for any month, adjusted for power purchases and sales, shall be not less than its maximum integrated hour demand for that month plus a reserve of 12% (10% for a hydro system) of such demand for the twelve month period ending with the current month. The Council shall periodically review this reserve criteria by having reserve requirement studies conducted. These studies shall consider the effects of the probability of forced outages of generating units, deviations from load forecast, scheduled maintenance of generating units, power exchange arrangements with non-member systems, and transfer capabilities."

<u>Southeastern Electric Reliability Council</u> (<u>SERC</u>)

SERC has no specific requirement for capacity reserve or LOLP.

The requirements to avoid cascading break up of the interconnected system does make the following specific reference to generation.

"I-A. Sudden loss of entire generating capability in any one plant.

III-C. Sudden loss of a substation (limited to a single voltage level within the substation plus transformation from that voltage level within the substation plus transformation from that voltage level), including any generating capacity connected thereto."

<u>Southwest Power Pool</u> (<u>SPP</u>)

The SPP criteria for generation capacity are as follows:

> "Planning of capacity additions must provide that the total generating capacity available to each Group in the Southwest Power Pool system shall be such that the capacity available shall exceed the predicted annual peak load obligation by a margin of 15%, or as an alternative, a probability study made so as to insure that the probability of load exceeding capacity available to such Group shall not be greater than one occurrence in ten years provided that in no case shall the reserve be less than the peak load obligation by 12%."

"The method of calculating the probability of load exceeding available capacity shall include consideration of uncertainty in prediction of load and shall employ the best available statistical data on generator forced outage rates. The method will also consider hour-by-hour characteristics of the load, availablility of quick-start generation and effects of interconnections and agreements with neighboring compaines. There shall be no greater dependence upon interconnections with adjacent areas than is agreed to by said areas or is deemed prudent by good engineering judgement. The maximum capability assigned to any generating unit shall be that which has been demonstrated by actual test under the most adverse conditions that might exist during the loading period being considered."

Western System Coordinating Council (WSCC)

This reliability council covers a broad geographical area, and includes an extremly diverse group of electric utilities. In view of this, the reliability criteria concentrate on transmission system reliability.

There is no specific mention of generation capacity planning criteria, however, the Disturbance Performance table lists the outage of a generator, two generators, and the entire plant as contingency events to be planned for.

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TOPIC AREA: HEC-5, Energy Production

VOLUME/PAGE/PARAGRAPH: Vol. 1 Page 1-22 Section 1.3.1.3 Paragraph 6 of the page

COMMENT IN REFERENCE TO: HEC-5 Program - "The HEC-5 program was used to evaluate the energy potential of the Susitna alternatives by simulating the hydro operation of each project using 33 years of Susitna River flow records at Gold Creek and rule curves to simulate power operations. The constraints modeled were: minimum flow requirements at Gold Creek and tandem operation constraints of combined alternatives such as Watana and Devil Canyon. The tandem constraints included hydraulic balance of the turbines and usable reservoir storage of the respective reservoirs."

TECHNICAL COMMENT: The HEC-5 program is useful in analyzing river discharges and power production that can be obtained from various methods of reservoir control. However, the HEC-5 program primarily is intended to compute reservoir operation for functions such as flood control and low-flow augmentation, with energy production being secondary. The results obtained from the program depend upon the program input conditions. Energy is available according to the water supply, the generating capability, and the ability of the power system to use the energy and capacity. Energy production based on target monthly plant factors may restrict energy production unnecessarily and reduce computed energy production.

Unless the production of electrical capacity and energy by the various hydroelectric plants that were studied was related to the monthly and annual system electric load requirements in the License Application, Exhibit B, Volume 2A, Tables B.74, B.75, B.76, B.77, and B.100, the results obtained probably are erroneous.

The statement "hydraulic balance of the turbines and usable reservoir storage of the respective reservoirs" does not provide clear information. The hydraulic problem in analyzing a series of hydroelectric plants along a single river is to deliver the discharge requirement from the downstream plant while producing maximum usable energy from all of the plants involved. Simulating reservoirs individually as in the DEIS will not obtain this objective.

In contrast, the License Application in Volume 2, Exhibit B, Chapters 2, 3, and 4 presented analyses which describe and provide supporting documention in great detail for the subjects and computations described above. The DEIS, in giving differing results, without providing any foundation or support does not give a reliable alternative to the License Appliction analysis. Therefore, the License Application calculations of the Susitna energy potential should have been adopted.

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TOPIC AREA: Construction Cost, Energy Production

LOCATION IN DEIS: Vol. 1 Pages 1-20 and 1-24 Section 1.3.1.3

COMMENT IN REFERENCE TO: Table 1-14 and 1-15, Summary of FERC staff studies of Upper Susitna Basin

TECHNICAL COMMENT: The comparison of alternative scenarios for meeting the future Railbelt energy demands is primarily dependent upon the capital and operating cost of the alternatives and the quantity of energy they produce. Thus, it is important that the basis for any estimated costs and energy outputs used in the analysis of alternatives be supported by adequate data.

A comparison of the DEIS and Applicant's cost estimate for the proposed project is shown below:

Plant	Applicant's Cost Estimate Exhibit D Table D-1	DEIS Cost Estimate Table 1-15
	$ million	$ million
Watana	3,596	4,062
Watana plus Devil Canyon	5,150	5,565

The construction cost estimate for the proposed project used in the DEIS is the Ebasco check estimate presented in Table D.9, Volume 1, Exhibit D of the License Application. Table D.9 was an improper estimate to use because the Ebasco estimate was presented only as an independent check, or verification.

The estimate which should have been used in the DEIS is presented in Volume 1, Exhibit D, Table D.1. Table D.1 is a summary of Tables D.2, D.3, and D.4. Tables D.2, D.3, and D.4 obviously provide the great detail which is the necessary formulation of a reliable cost estimate.

The listing of project costs and energy productions in DEIS Table 1-15 does not produce correct results. A comparison of DEIS Table 1-15 with Application Tables D.1, B.55 and B.56 shows the following:

Plant or Plants	Watana	Watana Plus Devil Canyon
DEIS Table 1-15		
Project Cost $ million	4,062	5,565
Annual energy GWh	3,260	6,574
Project cost per annual KWh	$1.25	$0.85
License Application		
Table D.1		
Project cost - $ million	3,596	5,150
Table B.55 or B.56 Annual energy - GWh	3,499	6,934
Project cost per annual KWh	$1.03	$0.74

In DEIS Table 1-15, the above cost of $0.85 per annual KWh for the proposed Project is less than for any other single dam or combination in the table, except for Watana I plus Devil Canyon, which computes at $0.82. The difference of $0.03 is insignificant and would disappear in the DEIS if evaluated in conjunction with usefulness of the energy. The above reduction from $0.85 for Watana plus Devil Canyon to $0.74 demonstrates the attractiveness of the proposed Project to the other alternatives. With the $320 million construction cost savings ($4,830 million as opposed to $5,150 million) from the Applicant's design refinements, which were submitted to the FERC in August 1984, the proposed project is more attractive.

Discussion of the derivation of the costs estimates for the other plants in Table 1-15 should be provided in the DEIS and a discussion of the relative levels of confidence in the cost estimates.

With reference to Table 1-15, the fourth entry, H. Devil Canyon presents inconsistent capacity and energy data. The 800 MW installed capacity corresponds to H. Devil Canyon, however, the 2034 GWh energy production appears to correspond to Modified High Devil Canyon.

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TOPIC AREA: Natural Gas Resources

LOCATION IN DEIS: Vol. 1 Page 1-30 Section 1.3.3.2 Paragraph 6 of the page

COMMENT IN REFERENCE TO: Proven Gas Reserves

TECHNICAL COMMENT: DEIS states that there are 3.4 Tcf of proven gas reserves in the Cook Inlet and quotes USGS estimates of 1.3 to 13 Tcf of additional gas as yet undiscovered. On this basis, Staff concludes that "there should be more than adequate gas to meet the Railbelt's power needs for the next half century." This conclusion in the DEIS is seriously in error for several reasons.

With respect to reserves, the DEIS is correct that proven recoverable reserves were 3.4 Tcf as of December 31, 1982. But by the end of 1983, reserves had dropped to 3.2 Tcf, continuing a steady decline for the past three years. Annual reserves additions versus production have trended as follows (AK O&GCC, 1983):

	Reserves Additions Bcf	Production Bcf
1982	13.5	181.5
1982	44.0	216.0
1983	38.4	196.4
Average 1981-3	32.0	198.0

Demand is expected to increase because of growing high priority requirements, and if all power needs were to be met by gas, demand would increase appreciably over the next half century. But even if production were held at the recent level (approximately 200 Bcf/yr), the present proven reserves would be exhausted in 16 years (1999). If the recent rate of reserves additions were maintained (32 Bcf/yr), production could be extended only another 3 years. In actual practice, even with reserves additions continuing at the recent level, production will have to commence declining by the early 1990's.

The U.S.G.S. estimate of the undiscovered resource was made in 1980, and the 13 Tcf estimate should not have been referred to at all because the U.S.G.S. applied only a 5 percent probability to it. The mean estimate is 5.7 Tcf; no higher estimate should have been used, particularly in view of recent experience in reserves additions and a more recent estimate of the undiscovered resource. Assuming that the 5.7 Tcf mean estimate were still reaslistic, annual reserves additions should not be expected to exceed 200 Bcf per year for the next 20 years (4 Tcf total), with annual additions gradually declining thereafter and spread over the following 20 years. With growing high priority requirements, and assuming growing power generation met by gas, production would have to increase to 250-300 Bcf/yr early in the next century; but by then, proven reserves would be down to 2.0-2.5 Tcf and the reserve life index would be down to 10 years or less. Production would in fact be forced into the ultimate decline. Thus, even using the U.S.G.S. estimate, it would be a serious mistake to plan for any new gas-fired power plants.

But the outlook for gas availability is even more serious than this. Reserves additions have been low for the past three years. Drilling since the U.S.G.S. made its estimate has been disappointing and has reduced the expectations. The Alaska Department of Natural Resources made an estimate of the undiscovered resource base in 1983; their estimate was only 2 Tcf.

At this magnitude, annual reserves additions could not be expected to exceed an average of 100 Bcf/yr. for the next 10 years -- three times as high as in the past 3 years -- with the remaining 1 Tcf added over at least 20 additional years, on a gradually declining basis. Over the next 10 years, and assuming a constant rate of production of 200 Bcf/yr. instead of the DEIS's expected increase, the trends would be as follows:

	Reserves Additions Bcf	Production Bcf	Reserves[2/] Bcf	RLI, yrs.
1983	100	200	3.2	16
1984	100	200	3.1	
1985	100	200	3.0	15
1986	100	200	2.9	
1987	100	200	2.8	14
1988	100	200	2.7	
1989	100	200	2.6	13
1990	100	200	2.5	
1991	100	200	2.4	14
1992	100	200	3.3	
1993	100	200	2.2	11

2/ December 31

On this basis, by the mid-1990's if not earlier, Cook Inlet production will have to commence declining, and this is the basis that should have been used for assessing gas availability for power generation. The conclusion that should have been drawn in the DEIS is that gas from the Cook Inlet cannot be counted on for new power generation.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Gas Price

LOCATION IN DEIS: Vol. 1 Page 1-33 Section 1.3.3.2 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Gas Price Projections

TECHNICAL COMMENT: Recent contracts for the sale of Cook Inlet gas are at a price that is a signficant increase for the local market. The base price as of November 1982 was $2.72 per MMBtu versus an average 1982 power plant price of $0.71 per MMBtu.

As shown in Attachment A to this comment, the price of LNG delivered to Japan equates essentially to the price of crude oil, and was approximately $5 per MMBtu in 1983. With the DEIS's oil price projections, the LNG delivered price in 1990, 1995, and 2000 will be, respectively in 1983 dollars per MMBtu: $3.45, $3.79, and $4.14. At these delivered prices, the price into the liquefaction plant in the Cook Inlet would be about 50 cents to $1 per MMBtu and the netback at the well head would be negative to barely positive--for the existing LNG project.

The DEIS adopted projections of gas price, as shown in Table 1-23, show a decline in price for the next decade and it is about 16 years from the present before prices rise above the current level. This price projection projection is very extreme and would not ensure exploration, but rather will discourage exploration.

PERTINENT OIL AND GAS PRICES RELATED TO
DEIS ADOPTED CRUDE OIL PRICES
(1983 Dollars)
1983 - 2050

	Marker Crude per Deis		Loser 48 (dollars per MMbtu)			Japan (dollars per MMBtu)
	Dollars per Barrel	Dollars per MMBtu	High Sulfur Fuel Oil	Average Field Price*	City Gate Price+	LNG Delivered
Actual						
1983	$29.00	$ 5.00	$ 4.50	$ 2.92	$ 4.23	$ 5.00
1984	27.62	4.76	4.30	2.75	4.00	4.76
DEIS						
1985	24.00	4.14	3.80	2.25	3.50	4.14
1990	20.00	3.45	3.00	2.00	3.00	3.45
1995	22.00	3.79	3.30	2.30	3.30	3.79
2000	24.00	4.14	3.80	2.80	3.80	4.14
2010	29.00	5.00	4.50	3.50	4.50	5.00
2020	36.00	6.21	5.70	4.70	5.70	6.21
2030	44.00	7.59	7.10	7.00	7.10	7.59
2040	54.00	9.31	8.80	8.50	8.80	9.31
2050	66.00	11.38	10.88	9.30	10.88	11.38

* Interstate.
\+ East North Central (Chicago).

Source: Developed by SHCA.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Export Market, Coal Price

LOCATION IN DEIS: Vol. 1 Page 1-33 Section 1.3.3.3 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Export Market Prospects - "The outlook for (export market) expansion is mixed."

TECHNICAL COMMENT: The analysis of export markets conducted by the Applicant indicates, to the contrary, that the outlook for the export market is quite robust.

Coal can be produced from new mines in the Beluga coal field at a cost which will be highly competitive with the cost of production at steam coal export mines in Australia, Canada and the Lower-48. While it is true that real growth in oil prices may be negative for the next few years, this does not imply a dim prognosis for Alaska coal exports. First, the oil price analysis prepared for the License Application and subsequently updated, as discussed in Appendix I of this document, indicates that very significant oil price increases (and consequently gas price increases) will occur in this century and into the next. As a result, oil will continue to lose market share to coal in some applications. As the DEIS correctly points out, coal is far from being a perfect substitute for oil. However, oil is still being used in significant quantities for electric power generation and industrial steam raising in the Pacific Rim industrialized countries (Japan, Korea, Taiwan). Eventually many of these oil uses will be replaced with coal, either through direct conversion of existing facilities to coal or through construction of new replacement units.

Second, of even more consequence in terms of potential coal markets, is the continuing economic growth of the Pacific Rim nations. This economic growth, even under a regime of high energy prices, will necessitate the use of more electric power and industrial steam. As a result, over the long term, that is between 1990 and 2050, a tremendous growth in the coal requirements of Japan, Korea, Taiwan and emerging energy users, such as Hong Kong, Singapore, Malaysia, and the Philippines can be expected.

Analysis conducted by the Applicant shows (1) that Alaska coal will be relatively low cost to produce, and (2) that large and growing market will develop. Thus, there is every reason to believe that Alaska coal from the Beluga field could be sold in large volumes in the Pacific market. This projection was developed using conservative assumptions on demand growth and on the market penetration of Alaska coal. For example, our projections assume that, due to the low calorific value of Beluga coal, it can be used only in new power plants which would be specifically designed to burn subituminous coal. This is a conservative assumption because in addition to this limited use, plant replacements for older plants, blending in existing plants, and use in industrial application would increase the demand for Alaska coal even beyond that projected.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Coal Price

LOCATION IN DEIS: Vol. 1 Page 1-33 Section 1.3.3.3 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Production Cost Basis for Coal Value - "Thus, the value of the coal...within the Railbelt is likely to be the cost of extracting and transporting it to the generator."

TECHNICAL COMMENT: The logic for this conclusion (See also DEIS Vol. 2, at Section B-4, Section B.3.1) rests on the DEIS's view of declining real oil prices, hence the lack of expansion markets for coal. The basic flaw of the oil price outlook (See Technical Comment NFP087 through 095) is that the DEIS long-term fossil fuel analysis is clouded by its near-term perspective. The oil price growth projection carries into the distant future the existing near-term characteristics of oil markets. These near-term characteristics suggest that coal in the Railbelt market might only be sold at a cost to cover production and transportation. However, the first coal plants would be required in the middle 1990's according to the License Application and by then fossil fuel markets will have changed.

The Applicant's analysis (See Technical Comment NFP-040 and Appendix I of this document) shows that by the end of the century, there will be a significant and growing Pacific Rim coal demand that can be met most economically by Alaska exports. An export market will develop, beginning in the early 1990s. Adopting the DEIS logic thus implies that "the export price that coal commands will constitute the real cost of consuming coal locally" (See Vol. 2 App. B page B-8, para. 2).

Studies conducted by the Applicant indicate that the most economical coal generation mix for the thermal alternative would include a mix of coal from the Nenana coal field and the Beluga coal field (for use in mine-mouth plant). This analysis shows that coal from the Usibelli mine or other mines which could be developed in the Nenana field will probably not be competitive with Beluga field coal in the Pacific coal market due to the high rates charged by the Alaska Railroad for shipment (from the Suntrana load-out) to Seward for export.

Therefore, minimum prices of coal from the Nenana coal field would be determined by the cost of production, plus transportation to a suitable power plant site. Maximum prices for both Nenana and Beluga coal would be determined by inside Alaska fuel alternatives and Pacific coal market forces.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Coal Price, World Oil Price

LOCATION IN DEIS: Vol. 1 Page 1-33 Section 1.3.3.3 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Coal Price Relationship to Crude Oil Prices - "Coal as an energy source is not linked... to the price of crude oil... [because] coal is not a close substitute for oil."

TECHNICAL COMMENT: This assumption regarding lack of an economic linkage between oil and coal prices in the DEIS is not borne out by historic data and is inconsistent with other price assumptions made in the DEIS. Research has demonstrated a positive cross-price elasticity between the price of oil and the long run demand for coal; i.e., a rise (fall) in the price of oil will cause an increase (decrease) in the demand for coal. The DEIS validates this precise concept on page 1-33 (See also Vol. 2, App. B page B-8, para. 2 and para. 3).

> The motivating factor for the diversification away from petroleum and into coal...has diminished measurably during the last 18 months as the outlook for real escalation in world prices has moderated and the prospects for falling crude prices have become reality.

A positive cross-price elasticity confirmed by the DEIS logic quoted above indicates that if oil prices resume their upward movement the demand for coal and coal prices will rise as well.

This is confirmed as well in the DEIS in Vol. 2, App. B (last two sentences, page B-7 and first sentence, page B-8).

> Initiatives...to diversify...reliance on alternative energy sources...represent the major link between coal markets and the price of crude oil. If crude prices climb, then the economic potential for substitution will continue to increase; the market for coal will expand, and there will be upward pressure on the price of coal.

Clearly, the DEIS's assertion regarding the unrelatedness of oil and coal prices is inconsistent with their assertions on the same page about the market relationship. The Susitna Project Feasibility Report (Acres, 1983) shows that coal and oil prices have correlation coefficients greater than 0.90 since 1950. This is a high value, insofar as a perfect correlation would have a coefficient of 1.0. Although coal is not a substitute for transportation fuels in the long run, coal-fired power plants can (and will) be built to replace fuel oil or gas-fired plants if coal's relative abundance acts to lessen the relative rate of advance in coal prices.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Coal Price

LOCATION IN DEIS: Vol. 1 Page 1-33 Section 1.3.3.3 Paragraph 4 of the page

COMMENT IN REFERENCE TO: Coal Price Escalation - "Given the vast supplies available to serve both domestic as well export markets, there is no persuasive reason to anticipate that the real cost of supplying the coal will escalate."

TECHNICAL COMMENT: The size of Alaska coal reserves is not the determining factor of whether the real cost of supplying the coal will escalate. Real costs will escalate if real costs of factors of production escalate, or if forces exogenous to coal markets occur, such as rapidly rising oil prices which will ratchet up coal prices. Estimates developed by the Applicant indicate that variable production costs will escalate at 1.2% annually based on labor rates, fuel oil prices, and electricity prices. Real costs will also escalate as a function of increased mining difficulty and haulage distance if Alaska reserves evidence increasing stripping ratios. These cost escalations are typically passed on to utilities through cost of service clauses in coal supply contracts. (See Appendix I of this document).

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Peat

LOCATION IN DEIS: Vol. 1 Page 1-33 Section 1.3.3.4 Paragraph 5 of the page

COMMENT IN REFERENCE TO: Unconventional Sources of Energy

TECHNICAL COMMENT: It is recognized that Alaska in general, and the Railbelt region in particular, contain significant resources of peat. However the DEIS is incorrect to suggest that peat could be economically competitive at $2.00 per million Btu. The Applicant's data in support of the license application shows peat to be significantly higher in cost. (Battelle, 1982B). The data available suggests that economically useful peat should be available in bogs of 80-320 acres/mi^2, within thirty truck miles of any proposed power plant, and within five miles of a major road (Ekono, 1980). Given the limited rail and road infrastructure in Alaska, the availability of commercially developable peat may be limited. Further the data concerning peat availability in the Anchorage area (e.g. The Susitna Valley) indicate highly variable ash contents ranging from 13.4% to 74.2%, with most values in excess of the threshold 25% ash (Ekono, 1980).

Given the issues of fuel variability, plant sizing, and other related concerns, Battelle (Battelle, 1982) found that power generated from the combustion of peat would cost 40-70% more than power from a 20 MW plant based upon Nenana or Beluga coal.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Geothermal

LOCATION IN DEIS: Vol. 1 Page 1-33 Section 1.3.3.5 Paragraph 6 of the page

COMMENT IN REFERENCE TO: Unconventional Sources of Energy

TECHNICAL COMMENT: The Applicant agrees with the conclusion in the DEIS that geothermal energy is not an alternative, or component of an alternative, to the Susitna Project.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Tidal Power

LOCATION IN DEIS: Vol. 1 Page 1-33 Section 1.3.3.6 Paragraph 1 of the page

COMMENT IN REFERENCE TO: Unconventional Sources of Energy

TECHNICAL COMMENT: The DEIS identifies the Cook Inlet area as a major potential resource for tidal power energy. The DEIS incorrectly attempts to present capacity and energy numbers from a tidal facility as if they are comparable to the capacity and energy numbers from a conventional hydroelectric project. They are not comparable for the following reasons:

1. Tidal facilities are cyclical, producing power in relation to tidal action rather than energy demand; and tidal facilities only produce dependable capacity and energy when retiming and storage (e.g. pumped storage) is incorporated into the design; and

2. Tidal facilities have contiuously changing capacities, producing at the peak only when the tides are at their peak.

When these factors are taken into consideration, the total tidal capacity available from the four most attractive sites in the Railbelt appears to be only 4.5 GW. Further, the power costs for tidal power facility are significantly higher than those associated with Susitna, particlarly when storage and retiming are considered (Battelle, 1982B).

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Natural Gas Resources, Fuel Use Act

LOCATION IN DEIS: Vol. 1 Page 1-34 Section 1.3.4 Paragraph 3 of the page

COMMENT IN REFERENCE TO: National Energy Act of 1978

TECHNICAL COMMENT: The State of Alaska is presently exempt from the provisions of the Fuel Use Act (FUA) which require utilities to present a plan to the U.S. Department of Energy (DOE) for converting existing gas or oil plants to coal or another fuel. Therefore, utilities in Alaska can continue to use existing gas-fired plants until their retirement date. Chugach Electric Association sought an amendment to the FUA that allowed a three-year window for new increments of gas-fired generation.

The Alaska Public Utilities Commission (APUC) has considered the PURPA standards and the reporting requirements under Section 133 as well as Section 210 of PURPA. The APUC regulates CEA, the only utility with sufficient electric sales that it must satisfy the PURPA Section 133 reporting requirements. The APUC issued an order to utilities to promote cogeneration and small power production and to negotiate purchase agreements based on the utilites' full avoided cost as dictated by PURPA. The effect of these implementation activities such as adopting the various PURPA standards, setting up load management and research programs, utility signing of contracts with cogenerators for electric capacity and energy, etc have been considered in the License Application. However, Alaska's unique conditions must be recognized and the applicability of certain standards and programs aimed at energy conservation should be put in a proper perspective. The acts under the National Energy Act of 1978 are relevant to Alaska and the License Application takes this fully into consideration in the analysis of conservation impacts on the electric load forecasts, as well as, in the development of thermal generation alternatives.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Conservation

LOCATION IN DEIS: Vol. 1 Page 1-34 Section 1.3.4.1 Paragraph 4 of the page

COMMENT IN REFERENCE TO: "To date, most conservation measures have been voluntary and have been encouraged through public education or Federal Programs."

TECHNICAL COMMENT: While much conservation in Alaska has been achieved through price or public education impacts, not all conservation programs have been voluntary in nature. For example, in 1977 Golden Valley Electric Association placed a moratorium on all-electric home hook ups which has not been rescinded to date. The impact of this moratorium in conjunction with electric price increases and other factors on electric energy savings was demonstrated in Table B.82 of Volume 2A of the License Application. The data show a reduction from 17,332 kWh per household in 1975 to a load of 9,080 kWh per household in 1981. It is true that educational programs and reliance on market forces have been strongly pursued by utilities and public bodies to encourage the adoption of cost effective measures in the Railbelt but these efforts have been bolstered by electric rate designs such as time-of-use rates for customers on electric space heating, load management rates for commercial customers, city street light conversions, weatherization programs for low income families, etc. Although the Applicant agrees with FERC staff that future electric prices will be the prime mover driving electric energy savings, this does not mean that programmatic conservation has not been promoted extensively in Alaska's Railbelt. These programs were summarized on pages B-5-10 to B-5-15 of Volume 2A of the License Application. In addition, Appendix B of Volume 2C contains data and analysis of programmatic conservation in the Railbelt. The DEIS has provided an overall view of programmatic conservation which understates the efforts of federal, state, and local government and particularly the electric utilities to achieve electric energy savings over the last decade.

The impacts of market forces on energy consumption are taken into account in the RED model through the price elasticity equations. It is the Power Authority's view that program-induced conservation would yield little energy savings above those which will be achieved in response to market forces.

This assumption about low savings yield from conservation programs is based on the following considerations. First the most promising area for energy conservation is the space heating market, in which insulation, blanketing of water heaters and weatherization can be implemented. Electricity, however, accounts for a relatively small share of this market. Most thermal energy in the Railbelt is currently supplied by fossil fuels and, therefore, most programmatic conservation efforts would affect fossil fuels.

Second, because conservation measures have been implemented and have been ongoing in the Railbelt area for sometime, the savings benefits from these programs have been largely realized already, or will be achieved in the next three years. The Power Authority obtained these data and insights concerning Railbelt utility and state conservation programs by conducting a series of personal interviews of utility and state officials in 1983. The conservation programs and their impacts in the Railbelt, as stated above, are provided in Volume 2A and 2C of the License Application.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Rate Design

LOCATION IN DEIS: Vol. 1 Page 1-35 Section 1.3.4.2 Paragraphs 1,2 and 3 of the page

COMMENT IN REFERENCE TO: Effects of Rate Revisions on Demand

TECHNICAL COMMENT: The Applicant agrees with the DEIS that innovative rate designs encourage conservation but results in practice have been uncertain.

The Railbelt utilites have innovative rates in effect such as AMLP's experimental time-of-day rates for customers dependent on electric space heating; GVEA offers reduced rates to commercial customers maintaining specified demand levels us well as rates for cogenerators and small power producers. These rates and tariff structures as well as other revisions such as demand charges and interruptible rates have helped somewhat to reduce electric demand in the Railbelt. However these efforts aimed at reducing system peak demand and substituting for utility generation plants are not likely to have any significant effect on the need for additional generating capacity in the near future.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Expansion Plans, Planning Horizon, OPCOST, PRODCOST, OGP

LOCATION IN DEIS: Volume 1 Pages 1-35 and 36 Section 1.4.1, 1.4.2

COMMENT IN REFERENCE TO: Planning horizon and system expansion analysis

TECHNICAL COMMENT: The use of OPCOST in the DEIS to simulate only 20 years of expansion with the Susitna and Non-Susitna hydroelectric alternatives does not ensure equivalence across alternatives, negatively effects the Susitna projects economics, and favors the selection of the Non-Susitna hydroelectric and thermal combination.

In the OPCOST analysis, system expansion and costs are simulated from 1993 to 2013. Long-term system costs from 2014 to 2042 are computed by extending the 2013 annual costs assuming constant loads and constant real fuel prices.

During the system expansion, period load requirements are such that the hydroelectric developments in the Susitna basin are not sufficiently absorbed in the system to accurately reflect the Susitna projects ultimate economics. The Applicant's proposed Susitna Development has 1,620 MW of capacity (See Table 1-15 pg. 1-24) while the With-Chakachamna alternative, which includes a coal plant, has 1,043 MW of capacity (See Table 1-18 and 1-20). In the year 2013 the FERC's Mid-load forecast peak demand is about 1,200 MW and the With-Chakachamna alternative is in the more favorable position of having its output usable, whereas Susitna is not utilized by 2013. If the DEIS hydroelectric expansion studies had been performed through 2022, like the PRODCOST thermal studies, the Susitna and Non-Susitna hydro plans would have been compared on an equivalent basis. The With-Chakachamna alternative would require 810 MW of additional thermal capacity (3-200 MW combined cycle units and 3-70 MW combustion turbines, see Table 2-6 pg. 2-45) and the associated costs of these developments would be factored into the analysis.

During the period 2013 to 2022 the Applicant's Susitna alternative would only require 200 MW of thermal capacity and substantially reduced costs to meet the same loads as the With-Chakachamna alternative.

In computing the long-term system costs 2042 was selected as the last year of the long-term costs. The period over which long-term costs are estimated should reflect the full economic lives of the generation resources.

The planning horizons and project evaluation procedures used in the DEIS in determining the economic justification of alternative expansion plans are contrary to the FERC's published guidelines for the economic justification of non-federal hydroelectric projects (FERC, 1979).

According to the FERC report:

> "The objective of economic comparisons is to determine whether the proposed hydroelectric project or its competing alternatives will produce the total electric energy demanded by the consumers at the lowest total cost throughout the entire period of analysis. For this reason, a systemwide study of production costs with the proposed hydroelectric project and with each of the likely thermal-electric alternatives generally should be made for a true economic comparison...The economic justification study usually requires that the total annual cost of operating the proposed project be compared with the total annual cost of obtaining equivalent capacity and energy, with equal reliability, from a practical alternative source...The economic analysis of a potential hydroelectric development may be based on a period of 100 years or the estimated service life of the project, whichever is shorter. Dam and reservoir facilities of a major project will normally

have service lives of at least 100 years. Specific power facilities, which comprise principally the powerhouse and generating equipment therein, will usually have service lives in the range of 50 to 75 years."

The International Bank for Reconstruction and Development (IBRD) regularly performs analyses requiring the application of economic principals. IBRD studies commonly require decisions between large investments in hydroelectric power now or a series of smaller investments in thermal power later. As part of continuing work in the IBRD Economics Department the IBRD publishes papers that document the practice of sound economic approaches to project development (Van der Tak, 1966).

The IBRD defined the period of analysis for project evaluation as comprising two parts:

"The first period covers the years of expansion of the system. It continues until the year whereafter the relative costs of alternative ways of further expanding the system are no longer signficantly prejudiced by the investment decision now taken. This period defines the alternative system developments to be compared. Often it will end in the year of full utilization of the power capacity of a hydro dam. For the purpose of calculating the return on additional hydro investment, expansion of the system stops in that year. The cash flows, however, should be further extended for a second period which extends until differences in costs of operating the alternative systems at the constant level reached become insignificant in terms of their discounted present worth".

In contrast to the DEIS approach the Applicant has evaluated the total system costs of the alternatives over the estimated full service life of the project or 50 years from the completion of Devil Canyon. The Applicant's planning horizon was defined as the period over which load forecasts were developed and energy supply plans were formulated and compared. For the Applicant's electric generation planning, a single capacity expansion optimization model was used to develop equivalent expansions plans.

The Applicant's project evaluation procedure covers the useful life of the Susitna Project, reflecting the FERC's published economic justification guidelines as well as Van der Tak's definition of project evaluation procedures.

Using the Optimized Generation Planning (OGP) program, the Applicant developed alternative expansion plans for the period from January 1993 to December 2020 to establish the least-cost system for that period with and without the Susitna Project. In the With-Susitna case, it was assumed that Watana would start operation in 1993 and Devil Canyon in 2002. All of the Susitna Project's energy would be absorbed in the system by about the year 2020. In the Without-Susitna alternative plan, coal-fired and gas-fired thermal generation are added to the existing units. The total costs for the alternatives include all costs of fuel and the O&M costs of the generating units. In addition, the production cost includes the annualized investment costs of any plants and transmission facilities added during the period. The annual costs from 1993 through 2020 are developed by the OGP model and are converted to a 1982 present worth.

The long-term system costs (2021-2051) are estimated by extending the 2020 annual costs, with no load growth and fuel prices adjusted for real fuel price escalation, for the 30-year period. The selection of 2051 as the last year of the planning horizon reflects the full 50-year economic life of Devil Canyon project which is added to the With-Susitna plan in 2002. This extended period of time is necessary to ensure that the hydroelectric options were operated for their full economic lives and that their full impact on the cost of the generation system are taken into account. The With-Susitna and Without-Susitna expansion plans are then compared on the basis of the sum of present worths from 1993 to 2051.

In the system planning studies and economic analyses performed by the Applicant long-term world oil and fuel price projections have been performed because the State's economy is linked to petroleum production and revenues and the analysis of hydroelectric and thermal alternatives must reflect long-term operating costs.

In addition, the period of analysis for the Susitna Project extends to the year 2051, the last year in the economic life of the Devil Canyon Project. It is therefore appropriate that real cost escalation be included to that year in the analyses.

The Applicant has provided a complete explanation of the derivation of long-term (1982-2040) world oil prices and alternative fuel prices and real escalation rates for coal, natural gas, and fuel oil in its License Application dated July 11, 1983. Also, the Applicant has updated its long-term (1983-2050) oil and fuel prices and real escalation rates in Appendix I to this document.

The Applicant's long-term projections are consistent with observable events in world economics and are appropriately conservative forecasts of fuel prices and real escalation rates when compared to projections prepared by others. Therefore, the Applicant has included real fuel price escalation in its system costs beyond the system expansion period.

In the DEIS, system expansion analysis and economic comparison of the Susitna Basin and Non-Susitna River hydroelectric alternatives were not performed on an equivalent basis. System expansion and associated costs for the Susitna Basin and Non-Susitna River hydroelectric alternatives should be developed through 2020, and costs should be evaluated through 2051, to ensure that these alternatives are compared on an equivalent capacity and energy, equal reliability and total cost basis.

In Appendix I, to this document the Applicant has updated OGP expansion planning studies and total system cost comparisons for the With- and Without-Susitna development plans. The results of the update studies have confirmed the fact that the Susitna Project is economically more attractive than thermal alternative plans.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Expansion Plans, OPCOST, OGP

LOCATION IN DEIS: Vol. 1 Page 1-35 Section 1.4.1 Paragraphs 5 and 6 of the page

COMMENT IN REFERENCE TO: The OPCOST model description

TECHNICAL COMMENT: The system expansion period for OPCOST, 1993 through 2013, is not consistent with established guidelines and inappropriate for the reasons described in Technical Comment No. NFP050. Further, Applicant's review of the OPCOST program model description provided by FERC (letter dated July 17, 1984 from FERC to Applicant's Counsel) indicates that the unit loading order adopted for the DEIS expansion simulations is suspect. OPCOST's Order Subroutine devises the order of priority with which generating units are committed to meet system loads. The user has two loading Order options. One option is for the user to specify the loading order. The second option is to allow the Order Subroutine to establish a loading order. If the Order Subroutine option is used, thermal units classified as base load and intermediate load are ordered by their minimum load portions from lowest generating cost to highest cost. After the generating unit minimum loadings have been satisfied (by filling the lower position in the loading order), conventional hydro plants are conditionally loaded subject to the system load. Even though the loading order positions of conventional hydro immediately follows the minimum load portions of base and intermediate thermal units, hydro will not automaticaly be loaded during program execution.

If the Order Subroutine was used as described, then hydroelectric generation was not given the correct priority in the loading order. Existing hydroelectric generation, which has zero fuel costs, should be given priority on the loading order and used to displace higher-cost thermal generation.

Based on the description of OPCOST, it appears that the model simply simulates the operation of a pre-determined expansion schedule, and has no economic capacity optimization capability. The OGP model used by the Applicant is a superior model and is preferable for project evaluation because it has three major functions; 1) reliabiliity evaluation, 2) capacity expansion optimization, and 3) electricity production simulation. The model automatically selects the most economical expansion plan from the user-specified basic criteria. OGP's optimization is performed on a year-to-year basis with a look-ahead feature that compares different expansion alternatives using costs levelized over the number of years specified in the look-ahead period. Thus the OGP model provides a systematic evaluation of timing, type, and size of new thermal capacity.

The DEIS fails to adequately document the selection of the system expansion alternatives. The DEIS should discuss in more detail how the alternatives were developed, including the reliability criterion adopted, and the year-by-year expansion plans which resulted for all of the alternatives analyzed. The OPCOST Model simulates the hour by hour operation of a system. The hourly loads used in the DEIS study were synthesized from the OGP-6 hourly load model provided by the Applicant and data on Railbelt electric demand (Woodward-Clyde, 1980) according to a description provided by FERC (letter dated August 7, 1984 from FERC to Applicant's Counsel). The synthesized hourly load data used for the DEIS studies and a detailed explanation of the derivation of these data, have not been provided in the DEIS.

In contrast to the DEIS, the License Application provides a detailed discussion of the Applicant's evaluation of system expansion plans (Vol. 1, Exhibit D, Section 4). The Applicant's use of the OGP optimization model ensures that a consistent evaluation of optimization sub-alternatives is made, and that the selected alternative is optimal. The DEIS approach, which manually specifies the expansion alternative to be evaluated, is subjective and does not guarantee that the most attractive expansion plan is determined.

In Appendix I to this document the Applicant has updated expansion planning studies and total system cost comparison for the With- and Without-Susitna development plans. The results of the update studies have confirmed the fact that the Susitna Project is economically more attractive than thermal alternaive plans.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Discount Rate

LOCATION IN DEIS: Vol. 1 Pages 1-35 Section 1.4.1 Paragraph 7 of the page

COMMENT IN REFERENCE TO: DEIS range of real discount rates

TECHNICAL COMMENT: The economic analysis in the DEIS was performed using three real discount rates; 3.5, 5.2, and 7.0 percent. There is no discussion of how the capital costs and replacement costs were computed in the levelized total power costs. In performing economic comparisons it is standard practice to select and support with analysis one discount rate. This discount rate is used to compute the total costs of the broad range of alternatives and select the most attractive alternative. Sensitivity analyses would then be conducted for the preferred alternative and the next best alternative, in which, the discount rate is allowed to vary. The sensitivity analyses provide an indication of the projects margin of attractiveness by monitoring the change in net benefits as a function of the discount rate.

Since the DEIS did not select and support a discount rate, but presented results for three rates, analysis and comparison of system costs across alternatives is cumbersome and without focus. Support for and discussion of the treatment of capital costs in the levelized total power cost analysis is a necessity to allow proper understanding of the costs.

In contrast to the DEIS the Applicant's License Application studies were performed with a real discount rate was 3.0 percent and discount rate sensitivity was tested using 2.0 percent and 5.0 percent rates. In the Applicant's updated economic studies contained in Appendix I to this document a current assessment of appropriate real discount rates results in the selection of 3.5% and investment costs in the Applicant's study were annualized using fixed charge rates.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Expansion Plans, Hydroelectric, OPCOST, Levelized Costs

LOCATION IN DEIS: Vol. 1 Pages 1-36 and 37 Section 1.4.1 and 1.4.2

COMMENT IN REFERENCE TO: Tables 1-19 and 1-20 OPCOST Model Results

TECHNICAL COMMENT: DEIS Tables 1-19 and 1-20 contain levelized total power costs for FERC's preliminary high load and low load forecasts for Susitna and Non-Susitna hydroelectric expansion plans, and no data on the mid forecast. Since, the mid forcast data are available (Letter dated August 7, 1984 from FERC to Applicant's Counsel) it should be included so the thermal alternatives can be compared for the mid forecast.

The DEIS examined several Susitna Basin and Non-Susitna River hydroelectric alternatives. However, the evaluation was not performed on an equivalent energy and capacity and equal reliability basis (See Technical Comments NFP035 and 050), and the construction costs (See Technical Comment NFP037) used in the comparison do not reflect similar levels of confidence.

The DEIS indicates that the three preferred alternatives for Susitna Basin hydroelectric development include Watana I (Water surface elevation 2100 feet). The choice of reservoir elevation is sensitive to the economic parameters and methodology used to perform the analysis. As stated in Technical Comments NFP050 and 051, the Applicant has serious reservations about the use of the OPCOST model and the planning horizon selected. These factors could lead to an incorrect choice of the Watana reservoir elevation.

Applicant's studies of the Watana reservoir level presented in the License Application Exhibit B, Section B 2.2 describe the methodology which was used to select El. 2185 as the level for Watana. Specifically, Table B.25 and Figure B.19 show a minimum present worth of long-term production costs in the range of El. 2140 to El. 2180. Geotechnical considerations limited the maximum reservoir level to El. 2185. Since the economic evaluation was relatively insensitive to reservoir elevation, and since the applicant wished to maximize the use of the resource, a reservoir level of 2185 was selected.

Since the Hydroelectric studies presented in Table 1-19 and 1-20 contain the irregularities and errors discussed above and are based on the use of the OPCOST model whose improper data assumptions and inadequacies were discussed in Technical Comment NFP051 the DEIS conclusions are not valid.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Expansion Plans, PRODCOST, OGP

LOCATION IN DEIS: Vol. 1 Page 1-37 Section 1.4.3.1 Paragraphs 2 and 3 of the page

COMMENT IN REFERENCE TO: Planning horizon and the PRODCOST model: "The gas scenario was evaluated by determining the annual operating costs associated with the scenario, as developed by the PRODCOST production costing model over the 30-year period 1993-2022."

TECHNICAL COMMENT: In the DEIS the planning horizon and selection of production simulation model are different for the thermal scenarios than for the hydroelectric alternatives. This approach is invalid for the reasons discussed in Technical Comment NFP050. For the thermal alternatives the system expansion period was defined from 1993 to 2022 and the production cost simulation was performed with PRODCOST. For the Susitna Basin and Non-Susitna River Hydro Alternatives system expansion periods were defined from 1993 to 2013 and the production cost simulation was performed with the OPCOST program. In each case, the costs in the last year of system simulation (i.e. 2013 and 2022) were extended to 2042 assuming constant load and constant real fuel cost (See Technical Comment NFP050).

The differing planning horizons and production simulation tools used across alternative plans does not ensure that the electric generation plans that have resulted from the DEIS systemwide studies provide equivalent capacity and energy, equal reliability, and comparable system costs.

The DEIS shows that the PRODCOST production costing model was used to evaluate the gas (also coal, and on a limited basis the proposed project) scenario. Comparison of the PRODCOST simulation model with the OGP optimization model shows PRODCOST to be inferior in that PRODCOST is a simulation model, while OGP is an optimization model.

With the PRODCOST simulation model, the anlaysis is performed on a pre-determined system. The modeler is forced to analyze a number of sub-optimal expansion plans in order to establish the optimum. The OGP model used by the Applicant is a superior model and is preferable for project evaluation because it has three major functions; 1) reliability evaluation, 2) capacity expansion optimization, and 3) electricity production simulation. The model automatically selects the most economical expansion plan from the user-specified basic criteria. OGP's optimization is performed on a year-to-year basis with a look-ahead feature that compares different expansion alternatives using costs levelized over the number of years specified in the look-ahead period. Thus the OGP model provides a systematic evaluation of timing, type, and size of new thermal capacity.

The system expansion alternatives are pre-determined outside of PRODCOST, but the DEIS fails to discuss how the alternatives were developed. No justification has been provided for the reliability criterion adopted, or the year-by-year expansion plans which resulted.

In its application of PRODCOST, the DEIS has used a planning horizon of 50 years (1993 to 2042). Criticism of the selection of the planning horizon has been addressed earlier in this commentary and in detail in Technical Comment NFP050.

In Appendix I to this document the Applicant has updated OGP expansion planning studies and total system cost comparisons for the With- and Without-Susitna development plans. The results of the update studies have confirmed that the proposed Susitna Project is economically more attractive than alternative thermal plans.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Expansion Plans, PRODCOST, Natural Gas Plants, PRODCOST, Net Benefits, Levelized Costs

LOCATION IN DEIS: Vol. 1 Page 1-37 Section 1.4.3.1 Paragraphs 3 and 4 of the page and Table 1-21

COMMENT IN REFERENCE TO: Summary of Gas Analysis Results in Table 1-21. "Total power costs of each year include the operating and maintenance cost of that year plus the plant investments made in that year... Costs were examined for high and medium demand levels, with both high and medium fuel escalation rates. Results of the analysis are shown Table 1-21."

TECHNICAL COMMENT: It is unclear from the DEIS discussion if capital costs are treated in the year they are incurred or if they are annualized using fixed charge rates as in the Applicant's analysis. If costs are treated in the year they are incurred replacement costs must be added during the extension period (through 2042). Support for and discussion of the capital costing approach should be provided in the DEIS.

There is an error in Table 1-21. At the 7.0% discount rate, the Levelized Annual Cost (LAC) for the gas scenario under the high forecast and mid fuel escalation rate should be $117.60 million instead of $178.62.

Table 1-21 contains levelized total power costs for the FERC's preliminary mid load and high load forecasts, but no data for the low load forecast. Since the hydroelectric alternatives were evaluated with the low load forecast, comparison among scenarios for the low load forecast cannot be made.

Since the gas studies presented in Table 1-21 contain the irregularities and errors discussed above and are based on the use of the PRODCOST model whose improper data assumptions and inadequacies were discussed in Technical Comment NFP054 the DEIS conclusions are not valid.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alterantives, Expansion Plans, Transmission Lines and Corridors, Gas Price

LOCATION IN DEIS: Vol. 1 Page 1-39 Section 1.4.3.2 Paragraphs 1 and 2 of the page

COMMENT IN REFERENCE TO: Technical Data and Transmission Requirements: "As did the Applicant, the Staff assumed.... that the siting flexibility of gas-fired combustion turbines and gas-fired combined cycle facilities justified analysis without consideration of transmission requirements for unit additions. Location of generating resources in the Cook Inlet area would probably require reinforcement of intertie transmission to serve load in the Fairbanks area."

TECHNICAL COMMENT: The DEIS states that the Anchorage-Fairbanks Intertie would probably require reinforcement, however, costs for doing so are not included in the evaluation. This was the result of an incorrect interpretation of the Applicant's analysis and documentation. The Applicant's assumption regarding flexibility of siting gas-fired generation was made within the context of a mixed coal/gas Non-Susitna scenario. In conjunction with the first installation of a coal-fired plant in 1993, $220 million was considered to be expended to connect the station to the intertie, upgrade the initial Anchorage-Fairbanks intertie line from 138 kV to 345 kV, and construct a second independent 345 kV line. In conjunction with the installation of the third coal-fired plant an additional $117 million was expended to connect the station to the intertie and provide increased capacity within the transmission system. Therefore, having made the capital investments required to upgrade the intertie, connect the coal-fired plants, and increase transmission capacity within the system, the assumption regarding transmission requirements for gas-fired plants is realistic and reasonable. In the absence of such investments, the assumption is not valid. Therefore, the DEIS studies must assume investments in transmission facilities for the gas-fired alternative. Doing so will result in higher levelized total power costs which reflect necessary transmissions.

In the DEIS Gas Scenario, significant installations of combined-cycle generation are made at Beluga and Kenai, yet no costs for upgrading the intertie are included. Since the maximum load which can be transferred over the 138 kV intertie is about 70 MW, the Fairbanks load cannot be met. Therefore, not only are the costs of the DEIS Gas Scenario incorrect, but the Gas Scenario is technically infeasible in its present form.

Table 1-22 in the DEIS states that for its OPCOST and PRODCOST analyses load growth is constant after the last year of simulation or 2013 and 2022, respectively. From a expansion planning standpoint it seems irrevelant to present load forecasts beyond the last year of simulation.

In Table 1-23 it appears that the DEIS is based on one gas price for all gas-fired generation. The Applicant used a base price for gas-fired generation located in the Beluga field, at the source of the gas. A higher price was used for gas-fired generation located in Anchorage to reflect the additional cost of transporting the gas (via pipeline) from Beluga to the plants. The transportation cost used was $0.30/MMBtu. This additional cost which should be included for gas-fired generation in Anchorage would increase the levelized total power costs of the development plans.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Expansion Plans, Coal Resources, Coal Price, Coal Plants

LOCATION IN DEIS: Vol. 1 Page 1-39 Section 1.4.4 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Nenana/Willow Coal Scenario

TECHNICAL COMMENT: The DEIS states that the coal-fired generation scenarios would utilize Nenana field coal, with three power plants being located in Nenana and two in Willow. The DEIS notes that this arrangement would "...increase the coal scenario slightly but would not alter the general cost comparison with the Susitna project."

In order for the coal price projections in the DEIS to be valid for a Nenana coal field only supply case, the projections would have to include:

1. Rail transportation costs from Healy to Nenana or Willow and real escalation of these costs;

2. Production costs for opening new mining areas in the Nenana field and associated infrastructure expenditures; and

3. Expansion into higher cost of production reserves in the Nenana field than are presently being mined.

As noted in Technical Comment NFP059 in connection with Table 1-23, these conditions are not satisfied. Although the DEIS does not substantiate the basis for initial costs below the selling price plus transportation, it is apparent that the above listed factors (1) and (2) are not fully accounted for. Furthermore, the zero or low cost escalation rate assumed in the DEIS does not allow for higher cost production as less suitable Nenana field reserves are mined. Therefore, the statement that a Nenana-only coal scenario would "...not alter the cost comparison... " is not valid.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Natural Gas Price

LOCATION IN DEIS: Vol. 1 Page 1-40 Section 1.4.3.2

COMMENT IN REFERENCE TO: Table 1-23, Fuel Price Projections

TECHNICAL COMMENT: Table 1-23 provides gas price projections for different scenarios. Statistics for the medium gas price forecast for 1983, 1985, and 1990 are as follows:

Year	Price ($/MMBtu)
1983	2.68
1985	2.39
1990	2.16

The actual price to power plants was about 75 cents per MMBtu in 1982 (1983 dollars) and less than $1 in 1983. The mid-1984 price is about $1.30 per MMBtu (1983 dollars).

If the DEIS had used the Enstar contract as representative of the price for incremental supply in the short term, it would, at the DEIS's oil price, yield a price in 1985-95 below $2 per MMBtu. But following the DEIS's steep price decline in the mid-1980s and outlook thereafter, the long term foreclosure of export markets would result in a lower negotiated price than Shell and Marathon achieved with Enstar.

The DEIS offers no insight into its assumed costs of gas exploration and development in the Cook Inlet. Analysis conducted by the Applicant and provided in support of the License Application in Volume 1 Appendix D-1 suggests that costs are relatively high, deposits found to date have been relatively small, and it is reasonable to anticipate that any new deposits found will be small.

With high production costs, limited market at the present time consisting of very few buyers, and an uncertain potential for new discoveries, it is unwarrantedly optimistic for FERC Staff to assume supply adequacy for new power plants in a timely manner. It is more likely that high production costs when combined with uncertain potential for success, and limited markets will be a disincentive for significant exploration and development of supply.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Coal Price

LOCATION IN DEIS: Vol. 1 Pages 1-40 and 43 Section 1.4.3.2 and 1.4.4

COMMENT IN REFERENCE TO: Table 1-23, Coal Price and Price Projections

TECHNICAL COMMENT: The coal price projections shown in Table 1-23 are below current market conditions and not substantiated by quantitative documentation. The projections start without documentation from an initial price corresponding to $19/ton plus rail fees which is lower than the current selling price. FMUS for example, now pays $25.68/ton to Usibellli Coal Co. and $7.50/ton to the Alaska Railroad for transportation to the plant. The DEIS price of $1.55/MMBtu is either held constant through 2050 (in the "Medium Price Scnario") or escalated at an average real rate of 0.33 percent (in the "High Price Scenario"). Analysis conducted by the Applicant substantiates a 1.2 percent real escalation, based on variable production cost (See Appendix I to this document). Furthermore, factors other than production cost escalation will operate to drive coal prices above the escalating cost of production.

Because the coal price projections in Table 1-23 drive the economic analysis contained in the DEIS to its conclusion that the Nenana coal scenario is preferred to Susitna, the coal price projections will be addressed in detail.

Apparent basis for DEIS Price Projections: The only reference to the coal prices in Table 1-23 is the statement on page 1-43, "the staff's electric power demand projections are shown in Table 1-22 and fuel costs in Table 1-23." Subsequent inquiry has shown that the price is based upon a quote to FERC Saff by Usibelli Coal Co. From page 5, 1-39, it is clear that only coal from Nenana is considered. From the statement on page 1-33,

....Thus the value of coal available for electricity generation within the railbelt is likely to be the cost of extracting it and transporting it to the generator.

it can be assumed that the prices on Table 1-23 include production cost and transportation costs. Although it may be argued that "value" and "price" equal production cost only under a very restrictive set of circumstances, it can be demonstrated that even under the DEIS assumptions, the prices in Table 1-23 are underestimated.

Initial Prices: The average 1983 tipple price for Usibelli mine coal (the only existing producer) was $1.50 per million Btu (MMBtu). According to information obtained from the producer, the next 1 million ton expansion to the existing Usibelli mine operation would result in a production cost of $1.40 (1983 $) per MMBtu. The 1983 Alaska Railroad tariffs from Healy to Nenana and Willow were $0.36 and $0.60 per MMBtu, respectively.[1/] This yields FOB price of $1.76 to $2.00 for coal delivered to Nenana or Willow. These prices are between 14 and 29 percent higher than the $1.55 price indicated on Table 1-23 and consistent with FMUS costs disucssed above.

Furthermore, the $1.40 per MMBtu production cost only applies to the first incremental one million ton per year production increase, likely to be consumed by coal exports to Korea under the Suneel contract. According to detailed estimates prepared by the Applicant (See Appendix I to this document), an incremental 2 million tons of production from reserves held by Usibelli adjacent to the present working mine would cost $1.50 per MMBtu in constant 1983 dollars. This assumes that the incremental coal will share existing facilities with the currently operating mine. Further, additional production from the Nenana field would necessitate opening a new mine in a

1/ Assuming coal which has a heat value of 15.2 million BTUs per ton.

new area. This would involve additional facilities and longer road hauls. According to The Applicant's estimates a new Nenana field mine would cost $1.73 per MMBtu FOB Healy (Suntrana). Rail costs to a Nenana or Willow plant site would further increase this amount.

Cost Escalation: Table 1-23 sssumes that coal prices will remain constant from 1983 to 2050 under the medium fuel price projection or that they will escalate at an average annual rate of less than 0.4 percent under the high price projection. Both of these escalation rates are significantly lower than the price escalation estimates developed by the Applicant. The Applicant estimates that the cost of coal production will escalate at a real annual rate of approximately 1.2 percent as a function of the cost of production factors such as labor, diesel fuel and electricity. Labor costs, which account for about 60 percent of production costs have, over the past 80 years, exhibited a real growth rate of 1.5 percent. These costs are typcially contained in the price escalation clauses in utility coal supply contracts. Labor, coupled with projected increases in diesel and electricity prices contained in the License Application result in an annual escalation rate which is more than four times as large as that used in the "High Price Scenario" of the DEIS. According to an analysis of coal transportation (as contained in the U.S. Producer Price Index), costs have escalated at a real annual rate of 1.8 percent over the past decade. In selecting the very low projected escalation rate for its analysis, the DEIS ignores the need for a realistic escalation component which factors in likely increases in all the above-identified areas of cost.

Production Cost Pricing: Cost of production, the basis upon which the DEIS's coal prices were apparently estimated, provides the minimum value or floor for a reasonable price projection; that is, it should be assumed that a producer would not reasonably sell his product over the long term for less than his full production costs. Other bases exist for estimating future prices, including net-back price for export market, and the cost of the lowest cost alternative fuels (residual oil or natural gas). These bases result in significantly higher price estimates. Updated data of these bases for cost estimation are provided in Appendix I to this document.

Conclusion: The entire analysis of coal alternatives contained in the DEIS is flawed, because it is based on unsubstantiated and underestimated coal prices. The 1983 initial price quoted in the DEIS is well below current actual prices. This problem is compounded by assuming a zero real escalation rate, a rate which is significantly below historical trends. Finally, market pricing forces which would tend to raise coal prices above the cost of production and transportation are apparently ignored.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Expansion Plans, Coal Plants, PRODCOST, Net Benefits, Levelized Costs

LOCATION IN DEIS: Vol. 1 Page 1-42 Section 1.4.4.2

COMMENT IN REFERENCE TO: Table 1-24

TECHNICAL COMMENT: The cost comprisons contained in Table 1-24 are biased in favor of coal scenarios. The coal fuel prices used in the analysis are underestimated. Underestimation of coal prices, which are an input to the PRODCOST model used in the DEIS, result in underestimation of the present worth and levelized annual costs for coal scenarios shown in Table 1-24.

Since the coal studies presented in Table I-24 contain the irregularities and errors discussed above and are based on the use of the PRODCOST model (whose improper data assumptions and inadequacies were discussed in Technical Comment NFP054) the DEIS conclusions are not valid.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Load Forecast, Levilized Costs

LOCATION IN DEIS: Vol. 1 Page 1-43 Section 1.4.4.2 Paragraphs 2 of the page

COMMENT IN REFERENCE TO: "The forecast demands shown in Table 1-22 are preliminary figures used for computer analysis of the various scenarios. They are somewhat higher in the later years than the latest staff projections shown in Table 1-6 and result in slightly higher total costs for thermal generation. However, the slight difference has no impact on the conclusions reached by the Staff in their analyses."

TECHNICAL COMMENT: The latest staff load projections are shown in Tables 1-10 and 1-11, not in Table 1-6 (Table 1-6 is oil price projections).

In year 2020, the medium or mid energy demand forecasts differ by 6.5 percent (Table 1-10 vs. 1-22.[1/]). For the high forecasts, the 2020 energy demands differ by 12.8 percent (Table 1-11 vs. 1-22[2/]). These differences may be significant.

1/ $\frac{6844}{6424} = 1.065$

2/ $\frac{7437}{6591} = 1.128$

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: PRODCOST, Coal Prices, Net Benefits, Levelized Costs

LOCATION IN DEIS: Vol. 1 Page 1-44 Section 1.4.5.3

COMMENT IN REFERENCE TO: Table 1-26, Coal Fuel Prices Used in PRODCOST Analysis

TECHNICAL COMMENT: As noted in comments with regard to Tables 1-23, coal-fuel prices used in the DEIS are underestimated. These underestimated prices, when input to the PRODCOST model yield underestimates of the levelized total power costs for all coal or coal and gas mixed scenarios shown in Table 1-26.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Expansion Plans, OPCOST, PRODCOST, OGP, Net Benefits

LOCATION IN DEIS: Vol. 1 Page 1-43, Sections 1.4.5.1, 1.4.5.2, and 1.4.5.3

COMMENT IN REFERENCE TO: Summary Tables 1-25 and 1-26 and conclusions drawn therefrom

TECHNICAL COMMENT: The DEIS examined several alternative power resource development scenarios for the Railbelt. Review of Attachment 1 which shows the planning horizons and expansion planning tools as used by the Applicant and in the DEIS, demonstrates the inconsistent application of planning methodology in the DEIS.

The comparison of Susitna and Non-Susitna Basin hydroelectric plans are sumarized in Table 1-25 on page 1-44 of the DEIS. Discussion of the hydroelectric comparisons contained in Technical Comments NFP050 through 053 are summarized here for easy reference.

- The system expansion period (1993-2013) was not sufficiently long enough to permit full utilization of the power and energy capability of the Applicant's proposed Susitna Project.

- Equivalent capacity and energy and equal reliability were not obtained in the DEIS Susitna and Non-Susitna Basin hydroelectric evaluation, which was studied with the OPCOST simulation program. Therefore, alternatives are not truly comparable.

- With reference to DEIS Tables 1-19, 1-20 and 1-25, the evaluation is performed with Susitna Basin and Non-Susitna River hydroelectric project construction costs that are not developed to the same level of confidence. Therefore, the alternatives are not truly comparable since since the construction costs of the Non-Susitna River hydroelectric alternatives are understated.

- o With the dispersed locations of the Non-Susitna River Hydroelectric alternatives long transmission lines operating at low voltages would be required to connect the projects to the load centers. The costs of these facilities are not included in the project costs. Therefore, the alternatives are not truely comparable because levelized total power costs are understated.

- o Since the hydroelectric evalution was not performed on an equivalent basis, and the construction costs do not reflect similar levels of detail and confidence, and the cost of transmission facilities have not been accounted for, the DEIS Susitna Basin and Non-Susitna River hydroelectric comparison and conclusions are not valid.

The evaluation in the DEIS of coal, gas, and a coal/gas mix is summarized in Table 1-26 on page 1-44 of DEIS. The Applicant's detailed comments on the thermal scenario studies are contained in Technical Comments NFP054 through 062 and are summarized here for easy reference.

- o The planning horizon in the DEIS has been defined differently for the hydroelectric and thermal alternatives. Therefore, the development plans and levelized total power costs are not comparable.

- o The systemwide studies of the DEIS used two production simulation programs. OPCOST was used to evaluate the Susitna and Non-Susitna hydroelectric alternatives and PRODCOST was used to evaluate the thermal alternatives. Therefore, the plans were not developed and analyzed on a comparable basis.

- Although the DEIS mentions a need for reinforcing the Anchorage-Fairbanks Intertie to serve load, no transmission facilities and their associated costs are included in the levelized total annual costs of the gas and coal scenarios. This significantly understates the cost of the plans.

The Applicant has avoided the above inconsistencies and distortions in its expansion planning and economic analyses. The Applicant's planning horizon was defined as the period over which load forecasts were developed and energy supply plans were formulated and compared (1993 through 2020). All of the proposed Susitna Project's energy would be absorbed in the system about 2020. For the Applicant's electric generation planning, a single capacity expansion optimization model was used to develop equivalent expansion plans.

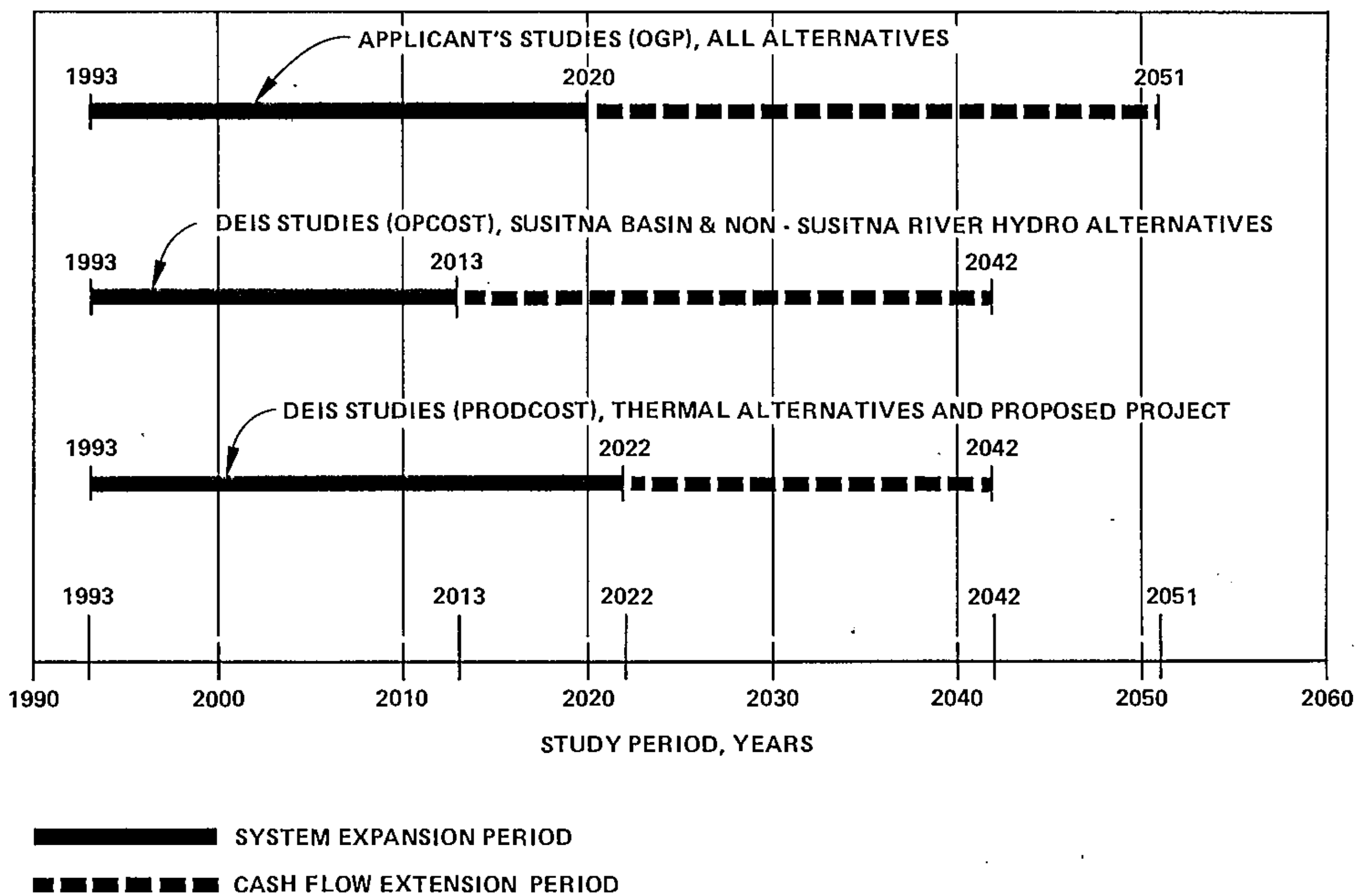
The long-term system costs (2021-2051) are estimated by extending the 2020 annual costs, with adjustments for fuel escalation, for the 30-year peirod. The selection of 2051 as the last year of the planning horizon reflects the full 50-year economic life of Devil Canyon project which is added to the WIth-Susitna plan in 2002. This extended period of time is necessary to ensure that the hydroelectric options were operated for their full economic lives and that their full impact on the cost of the generation system are taken into account. The With-Susitna and Without-Susitna expansion plans are then compared on the basis of the presents worths from 1993 to 2051.

In a summary, the difference in planning horizons and simulation tools across alternative plans does not ensure that the electric generation plans that have resulted from the systemwide studies in the DEIS provide equivalent capacity and energy, equal reliability, and assoicated system costs. Also, the selection of 2042 as the last year of the horizon does not reflect the full economic life of the Devil Canyon hydroelectric project which is added to the proposed Susitna alternative in 2002.

Table 1-25 does not contain levelized total power costs for the preliminary mid forecast and Table 1-26 does not contain levelized total power costs for the preliminary low forecast. Since mid forecast data are availalbe (See Technical Comment NFP053) for the hydroelectric alternatives it should be included. Low load forecast power costs for the thermal alternatives should be provided.

The DEIS conclusion favoring the use of Non-Susitna River hydroelectric projects supplemented by thermal generation is not valid.

In Appendix I to this document the Applicant has updated fuel prices, OGP expansion planning studies and total system cost comparison for the With- and Without-Susitna development plans. The results of the update studies have confirmed the fact that the Susitna Project is economically more attractive than thermal alternative plans.



ATTACHMENT 1
Technical Comment NFP063
Page 5

SUSITNA HYDROELECTRIC PROJECT

COMPARISON OF PLANNING HORIZONS

HARZA - EBASCO Susitna Joint Venture - August 1984

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Watana

LOCATION IN DEIS: Vol. 1 Page 2-2 Section 2.1.2.1 and Figure 2-4

COMMENT IN REFERENCE TO: Proposed Project, Watana Development

TECHNICAL COMMENT: Figure B.7 - Watana Hydro Development Fill Dam from Exhibit B of the Application was mistakenly selected to represent the Watana Facilities -- Sections, (Figure 2-4) in the DEIS. The figures that show the cross section for the Watana development as proposed in the License Application are contained in Exhibit F of the Application and are as follows:

Plate F6 Watana Main Dam Section
Plate F7 Watana Main Dam Profile and Detail
Plate F12 Watana Main Spillway General Arrangement
Plate F21 Watana Power Facilities General Arrangement

Figure 2-4 in the DEIS should be replaced by Plates F6, F7, F12 and F21 as appropriate, depending on the level of detail to be presented in the DEIS.

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TOPIC AREA: Reservoir

LOCATION IN DEIS: Vol. 1 Page 2-8 Section 2.1.5.1.2 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Quoted active storage volumes and Watana drawdown

TECHNICAL COMMENT: With reference to the DEIS, Volume 1, Main Text, in paragraphs 2 and 3 on page xxi of the summary and the last paragraph of Section 2.1.5.1.2 on page 2-8 of the text, the following quantities should be used in describing the project:

Parameter	Watana Reservoir	Devil Canyon Reservoir
Normal Maximum Operating Level (ft)	2185	1455
Reservoir Storage at Normal Maximum Operating Level (acre-ft)	9.47×10^6	1.09×10^6
Maximum Drawdown (ft)	120	50
Minimum Operating Level (ft)	2065	1405
Reservoir Live Storage (acre-ft)	3.74×10^6	0.35×10^6

Any other quantities included in the text should either be consistent from one point of usage to the next or the difference should be explained.

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TOPIC AREA: Flow Regime, Water Quantity, Water Quality

LOCATION IN DEIS: Vol. 1 Page 2-23 Section 2.1.2.2 Paragraph 6 of the page

COMMENT IN REFERENCE TO: Selecting Appropriate Flow Regime for Reservoir Operation

TECHNICAL COMMENT: As the paragraph is written, the discharge quantities that are stated could be construed as being measured at either Watana or Devil Canyon tailraces, which is not factual and could be misleading. The discharges controlling project operation for fishery habitat reasons will be measured at Gold Creek, per the Application statement in Exhibit E, Chapter 3, Volume 6A, Section 2.4.4 (a) (iii), page E-3-162.

Applicant, in co-operation with State of Alaska environmental agencies, is continuing to study the flow regime, as stated on page E-3-163 of the Application (See also Technical Comments AQR059 and 061).

Thus, while the discharges stated represented the Applicant's assessment of the fishery habitat flow requirements when preparing the License Application, the discharges will be subject to the control and mitigation plans finally adopted, and the plans will be sumbitted to the FERC for appropriate review and approval.

SUSITNA HYDROELECTRIC PROJECT
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TOPIC AREA: Alternatives, Hydroelectric

LOCATION IN DEIS: Vol. 1 Page 2-33 Section 2.2.4

COMMENT IN REFERENCE TO: Watana development

TECHNICAL COMMENT: Section 2.2.4 of the DEIS briefly describes three alternative developments, shown below, which include Watana I (water surface elevation 2100 feet). The choice of reservoir elevation is sensitive to the economic parameters and methodology used to perform the analysis (See Technical Comment NFP053).

Watana I - Devil Canyon
Watana I - Modified High Devil Canyon
Watana I - Reregulating Dam

The discussion of Section 2.2.4.2 states:

> "This development would be identical to the proposed project, with the exception that Watana dam would be scaled down to have a crest elevation of 2,125 ft (648 m) and a normal reservoir level of 2100 ft (640 m), [versus 2,210 ft (674 m) and 2185 ft (666 m), respectively, for the proposed dam]." The change in Watana Dam applies to all three combinations.

The statement is incorrect and is misleading. For example in DEIS Table 1-15, the total installed capacity at the Watana site is shown not to be identical, but to be reduced from 1020 MW to 900 MW. Also, the DEIS appears to attempt to obtain the same degree of river regulation (and hence energy production proportional to the gross head) which would require that the reservoir drawdown would have to be increased from the proposed 120 ft to approximately 180 ft. With such enlarged drawdown, average head would be reduced to less than the proportion of gross heads, and the energy production from Watana I would be reduced to a smaller ratio of Watana production than is implied.

With the dam crest 85 feet lower, damsite topography would require revision to layouts of the dam and the spillway. If turbine discharge capacity of Watana I is intended to equal Watana's, the capacity has to be provided at lower head. This enlarges physical dimensions and cost of turbines, generators, powerstation, and major appurtenances. Numerous other less significant changes would be required in the Watana general arrangement for a dam with a crest elevation of 2125 ft.

Considering the magnitude of the changes in the project general arrangement necessary to accommodate an 85 ft lower dam at the Watana site, a bland statement that the Susitna Project and the alternative have identical characteristics is unwarranted and incorrect.

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TOPIC AREA: Alternatives, Expansion Plans, PRODCOST, Levelized Costs, Transmission Lines and Corridors

LOCATION IN DEIS: Vol. 1 Page 2-37 Sections 2.3.1, 2.3.2, 2.3.3 and 2.3.4

COMMENT IN REFERENCE TO: Alternative Generation Facilities

1) Planning horizon and PRODCOST model
2) Table 2-4
3) Transmission system

TECHNICAL COMMENT: Refer to Technical Comment NFP054.

Table 2-4: The planned outage rate for a combustion turbine should be 3.2% instead of 32%. The unit capital costs with interest during construction (IDC) are based on a 3% discount rate. For analyses performed with different discount rates, the IDC component should be based on the discount rate being used. It is not apparent from supporting documentation if IDC was computed properly. The use of the incorrect interest rate in the IDC computation will lead to incorrect levelized total power costs.

Refer to Technical Comment NFP056. The DEIS has not adequately addressed transmission requirements and costs for the gas scenario.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Expansion Plans, PRODCOST, Levelized Costs, Transmission Lines and Corridors

LOCATION IN DEIS: Vol. 1 Page 2-39 Sections 2.4.1, 2.4.2, 2.4.3 and 2.4.4

COMMENT IN REFERENCE TO: Alternative Generation Facilities

"The technical parameters and economic assumptions for capital cost, operation and maintenance costs, and economic life are listed in Table 2-5."

"The coal scenario analysis indicated that five 200-MW coal-fired units and ten combustion turbines would be required to serve anticipated load growth through the year 2022."

Last paragraph of Section 2.4.3.

TECHNICAL COMMENT: In Table 2-5, the unit capital costs with interest during construction (IDC) are based on a 3% discount rate. For analyses performed with different discount rates, the IDC component should be based on the discount rate being used. It is not apparent from supporting documentation if IDC was computed properly. The use of the incorrect real interest rate for IDC will lead to incorrect levelized total power costs.

Refer to Technical Comment NFP054 for comments on expansion plan simulation with PRODCOST.

Section 2.4.3 provides a more detailed discussion of transmission requirements than for any of the other plans. However, the costs of the transmission facilities discussed in Section 2.4.3 have not been included in the DEIS basic analyses.

The coal scenario with transmission (Table 1-24) was treated as a sensitivity case. Coal scenarios without such transmission facilities are technically infeasible. (See Technical Comment NFP056).

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TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Expansion Plans, OPCOST, PRODCOST, Levelized Costs, Transmission Lines and Corridors

LOCATION IN DEIS: Vol. 1 Pages 2-41 and 45 Section 2.5.2

COMMENT IN REFERENCE TO: Thermal Units in Combined Hydro-Thermal Scenario

> "...the most prudent Railbelt generation expansion plan would be a mix of non-Susitna hydroelectric resources with a combination of gas-fired combined cycle generation in the Cook Inlet area and coal-fired generation in the Nenana area."

TECHNICAL COMMENT: Section 2.5 discusses this plan in greater detail. Table 2-6 shows the thermal plant requirements for a mixed thermal and Non-Susitna River hydroelectric plan with and without Chakachamna. Nowhere are the present worth and levelized total power costs of the mixed thermal and Non-Susitna River Hydroelectric plan presented.

Transmission requirements for this plan, especially as related to the Non-Susitna hydropower sites, are discussed in general. However, voltage levels, number of lines, and associated costs are not indicated or included in the analysis. Refer to Technical Comment NFP056 for transmission requirements and costs for thermal scenarios.

The DEIS analysis of the development plan including Non-Susitna River hydroelectric projects supplemented by thermal generation was not simulated by either the OPCOST or PRODCOST models, the construction costs used for the Non-Susitna hydro are not at the same level of confidence as the other alternatives, and transmission facilities and their costs have not been included in the plan. Therefore, the DEIS conclusion favoring this plan is not valid.

In Appendix II of this document the Non-Susitna River Hydroelectric projects are discussed in detail. This Appendix concludes that the With-Susitna alternative is the preferred development plan.

SUSITNA HYDROELECTRIC PROJECT
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TECHNICAL COMMENT FORM

TOPIC AREA: Flow Regime, Reservoir, Watana

LOCATION IN DEIS: Vol. 1 Page 4-6 Section 4.1.3.1.1 Paragraph 9 of the page

COMMENT IN REFERENCE TO: Post-project flows

> "The Watana reservoir would be operated in a store-and-release mode, resulting in a general increase in low-flows during the winter months (November-April) and a decrease in peak-flows during the summer months (May-October)."

TECHNICAL COMMENT: The general statement in the DEIS does not represent projected flow patterns precisely, and could be interpreted inaccurately. More detail is available in the License Application and Supplemental materials.

The basic data for discharges at Gold Creek under the flow regime are presented in the License Application in Exhibit E, Volume 5A, Table E.2.45. The data show the following effects of Watana operation on monthly mean discharges (all figures in cfs):

Winter Months - (November - April)

	Minimum	Mean	Maximum
November	Increased 1,215 to 6,742	Increased 2,577 to 9,186	Increased 4,192 to 11,980
December	Increased 866 to 7,679	Increased 1,807 to 10,693	Increased 3,264 to 13,380
January	Increased 824 to 7,179	Increased 1,474 to 9,708	Increased 2,452 to 11,342
February	Increased 768 to 6,437	Increased 1,249 to 8,951	Increased 2,028 to 10,344
March	Increased 713 to 6,577	Increased 1,124 to 8,324	Increased 1,900 to 9,412
April	Increased 745 to 5,811	Increased 1,362 to 7,740	Increased 2,650 to 9,354

Summer Months (May - October)

	Minimum	Mean	Maximum
May	Increased 3,745 to 6,061	Reduced 13,240 to 10,405	Reduced 21,890 to 18,135
June	Reduced 15,530 to 6,000	Reduced 27,815 to 11,420	Reduced 50,580 to 26,092
July	Reduced 18,093 to 6,484	Reduced 24,445 to 9,185	Reduced 34,400 to 15,152
August	Reduced 16,220 to 12,000	Reduced 22,228 to 13,378	Reduced 38,538 to 26,494
September	Increased 6,881 to 12,000	Reduced 13,321 to 9,840	Reduced 21,240 to 13,506
October	Increased 3,124 to 6,222	Increased 5,771 to 8,014	Increased 8,212 to 11,782

In the winter months, high and mean discharges, as well as low discharges, are increased, and in the summer months, with a few exceptions discussed below, small and mean discharges, as well as peak discharges, are reduced.

Effects of Watana on October discharge are similar to the effects on winter discharge, so that hydrologically October should be characterized as a "winter month". Also, Watana operation increases monthly minimum flows in two "summer months", May and September, rather than decreasing them, as indicated in the DEIS.

In general, Watana increases river discharges that naturally were small and reduces discharges that naturally were large. The above table shows changes in discharge as presented in the License Application and depicts the general effects of reservoir operation, although there is potential for adjustments to the changes as a result of mitigation studies now underway (See also Technical Comments AQR059 and 061).

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TECHNICAL COMMENT FORM

TOPIC AREA: Flow Regime, Watana

LOCATION IN DEIS: Vol. 1 Page 4-6 Section 4.1.3.1.1 Paragraph 10 of the page

COMMENT IN REFERENCE TO: Construction diversion

> "All flows less than 30,000 cubic feet per second (cfs) [850 cubic meter per second (m^3/s)] would be routed through diversion tunnels without impoundment. This would cause the dewatering of a 1-mi 1.6-km) section of the mainstem of the Susitna River."

TECHNICAL COMMENT: The reference to dewatering a 1-mile section of river is unclear and may be misleading.

The License Application described dewatering and its futuer effects in Volume 1, Exhibit A, Section 1.3; Volume 5A, Exhibit E, Section 4.1.2; and Volume 6A, Exhibit E, Section 2.3.1. The cofferdams are temporary and they will cause a reach of approximately one mile of river to be de-watered. However, the de-watering is the beginning of a permanent condition.

The riverbed area dewatered by the cofferdam mostly will be filled with fill material in the main dam, as stated in the License Application, Exhibit E, Chapter 3, Volume 6A, Section 2.3.1 (a) (i), pages E-3-73 and E-3-74. The main dam, of course, is a permanent structure. Upstream from the dam, the riverbed and the upstream face of the dam will be under the reservoir.

Downstream from the dam, either the cofferdam may be breached to form a permanent small pool between the coefferdam and the downstream face of the main dam or the area otherwise occupied by the small pool may be backfilled.

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TOPIC AREA: Flow Regime, Reservoir, Watana

LOCATION IN DEIS: Vol. 1 Page 4-7 Section 4.1.3.1.1 Paragraph of the page Figures 4-1

COMMENT IN REFERENCE TO: Susitna River flows during Watana filling

> "Filling of Watana Reservoir would require the impoundment of 9.47 million acre-feet (ac-ft) [11.7 billion cubic meters (m^3)] from mainstem Susitna River flows over a 28- to 30-month period. Only flows between May and October would be used in filling. This process would result in a major reduction in natural flows during the summer months (Fig. 4-1)."

TECHNICAL COMMENT: Figure 4-1 in the DEIS is an extract from and development based on the Application, Exhibit E, Chapter 2, Volume 5B, Figure E.2.138.

Application Figure E.2.138 contains graphs showing river discharge at Gold Greek during Watana reservoir filling under dry weather conditions (90% exceedance probability), median conditions (50% exceedance probability), and wet weather conditions (10% exceedance probability). DEIS Figure 4-1 reproduces the 50% probability discharges at Gold Creek. By omitting probabilities other than 50%, the DEIS does not provide a clear picture of the flow conditions that could occur.

Computation of the reservoir filling and resultant river flows downstream is complex. It is necessary to plan reservoir filling in advance even though there is no way of knowing what the reservoir inflow will be. The Application, Exhibit E, Chapter 2, Volume 5A, Table E.2.8 shows that in 32 years of discharges there never was a situation in which reservoir inflow had the same precentage of exceedance for any 2 or 3 successive years. Hence, it is necessary to present the data in the manner of License Application Figure E.2.138. The significant information on the Figure is the envelope, or outer limits, of Gold Creek river discharges and Watana reservoir elevation during the Watana reservoir filling period rather than the median quantities chosen for Figure 4.1. The envelope of possible river discharges and Watana elevations defines the expected limits. Figure 4-1 would be more valuable if it had presented the data in the manner of Application Figure E.2.138.

Special note should be taken of the significant statement in the License Application, Exhibit E, Chapter 2, Volume 5A, Section 4.1.2(a)(i), Page E-2-78; "During summer, runoff will be captured and stored in the reservoir in a manner similar to that which will occur during Project operation. Therefore, the downstream flow requirements selected for project operation from May through September were adopted for the Watana reservoir filling period". The summer flow requirements referred to are the May-September minimum discharges at Gold Creek in Application Exhibit E, Chapter 2, Table 2.34, Case C. The minimum requirements for river discharges at Gold Creek are under continuing study in cooperation with agencies of the State of Alaska.

The important overall point is the Applicant's intent to observe, during reservoir filling and subsequent plant operation, reasonable requirements for specified minimum river discharges at Gold Creek.

The lack of reference to the location where the discharges are to be provided is discussed in Technical Comment NFP066. Studies are continuing and the effects if the final flow regime may be changed also are discussed in Technical Comment NFP066.

SUSITNA HYDROELECTRIC PROJECT
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TECHNICAL COMMENT FORM

TOPIC AREA: Flow Regime, Reservoir, Watana, Energy Production

LOCATION IN DEIS: Vol. 1 Page 4-7 Section 4.1.3.1.1 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Watana operation

> "Watana dam would be operated for baseload power generation until the Devel Canyon development was completed. Daily operaion would be determined by the proposed rule curve for the reservoir, minimum flow requirements (Table 4-1), and power demands. Flows in excess of the minimum flow requirement and the power demand would be stored in the reservoir unless its volume was greater than the rule curve."

TECHNICAL COMMENT: To a large extent the DEIS statements in the particular paragraph are supported by the License Application; however, it is important to clarify certain points.

Watana is described as being operated for baseload power generation until Devil Canyon is completed in the License Application, Exhibit B, Volume 2, Section 3.7, page B-3-11 and in Volume 2, Section 4.3(c), pages B-4-7 and B-4-8. The term "baseload power generation" reflects the status of reservoir and power operation studies as of the date of the License Application, and the relationship of those studies to environmental studies.

The important concept is daily and hourly discharge control within a week. There are operating conditions caused by environmental release requirements or the reservoir being full in which all of the water released from Watana could produce more energy than the power system can use. If the discharge from Watana can supply power exceeding system minimum load, Watana can provide part of the system peak load requirement just by hourly transfer of water between turbines and cone valves. Such operation may or may not be termed "base load", but it does accompany a base discharge and does not involve hourly fluctuation in the amount of water being discharged.

Likewise, there is indication from continuing environmental studies in cooperation with Alaska agencies that Watana discharge can be varied hourly during a day within prescribed lower and upper limits in response to system power requirements. There also is indication that, within prescribed daily lower and upper discharge limits, hourly rate of change limits on discharge may not be needed.

In the License Application, Exhibit B, Volume 2, Chapter 4, Section 4.2(b), page B-4-5 states that attainment of certain operating objectives can be aided by a reservoir elevation rule curve. The DEIS changes this to "Daily operation would be determined by the proposed rule curve...". The License Application reflects the status of reservoir operation studies as of the date of the License Application. Reservoir control is under continuing study and details of the rule curves remain to be determined.

Note that the reference in the Application to Figure B-68 contains a typographical error; the correct number is B-69.

The statement in the DEIS "unless its volume was greater than the rule curve" is unclear, and generally contrary to the License Application. In Exhibit B, Chapter 4, Volume 2, Section 4.2(b), Page B-41-4 the Application states: "In wetter years when the reservoir level surpasses the target level, energies greater than firm energy can be provided, but only as great as the system demand allows." There is no statement or implication that water in excess of system energy demand will be released just because the reservoir level is above the rule curve. The intent is, as stated on License Application page B-4-5, to retain water to produce energy in the winter.

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TECHNICAL COMMENT FORM

TOPIC AREA: Flow Regime, Reservoir, Watana, Energy Production

LOCATION IN DEIS: Vol. 1 Page 4-7 Section 4.1.3.1.1 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Mean annual floods

> "All estimates of operational flows are based on the Applicant's projected electrical demand for the years 2002 and 2010 (Exhibit E, Vol. 5A Chap. 2, p. E-2-55). It is expected that operation of the Watana development alone would result in a reduction in mean annual floods at Gold Creek, Sunshine, and Sunshine Station of 60%, 32%, and 19%, respectively (Exhibit E, Vol. 5A, Chap. 2, p. E.2.108)."

TECHNICAL COMMENT: The numbers quoted appear to be derived from mean annual flood data Exhibit E, Chapter 2, Volume 5A, Section 4.1, page E-2-108 of the License Application. The numbers quoted represent general magnitudes, although percentage reduction in flood discharges depends upon magnitude and time of occurence of the flood. The fact that the numbers represents general approximations should be emphasized.

The typographical error "Sunshine Station" should be corrected to "Susitna Station."

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TECHNICAL COMMENT FORM

TOPIC AREA: Flow Regime, Reservoir, Watana, Energy Production

LOCATION IN DEIS: Vol. 1 Page 4-7 Section 4.1.3.1.1 Paragraph 5 of the page), and Figure 4-2

COMMENT IN REFERENCE TO: Post-project flows

> "Although monthly flows under the combined operation would be very similar to those for Watana alone, there would be a general decrease in the mean flows during the months May through August and a reduction in the year-to-year variability in flows (Fig. 4-2)."

TECHNICAL COMMENT: The reference in DEIS Figure 4-2 to License Application Table E.2.24 is incorrect. The error evidently is typographic and reference should be to Table E.2.34. However, there also should be reference to License Application Table E.2.45, (Exhibit E, Chapter 2, Volume 5A), since that table is the source of most of the data on DEIS Figure 4-2.

The shaded area in September for minimum flow is incorrect on DEIS Figure 4-2. Table 2-2 in the DEIS and License Application Tables E.2.34 and E.2.36 show that in September the minimum Gold Creek discharge reduces from 12,000 cfs to 6,000 cfs from September 14 to September 20, holds at 6,000 cfs until the end of September, and then drops to the October minimum of 5,000 cfs. Footnote 2 of Table 4-1 is also incorrect in this regard. The Figure and Table should be corrected as noted.

Figure 4-2 is subject to the same principles as other DEIS references to regulated discharges. The data depicted generally are correct, but continuing studies may result in changes.

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TOPIC AREA: Alternatives, Hydroelectric, Water Quantity, Water Quality

LOCATION IN DEIS: Vol. 1 Page 5-5 Section 5.1.2.3 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Water quantity and quality impacts

1) "Adoption of any of the alternative Susitna Basin dam designs or configurations would result in modification of the basin in a manner similar to, but to a lesser degree than, the proposed project."

2) "Development of non-Susitna hydropower alternatives would result in modification of the rivers upon which dams would be constructed. The Chakachamna project would divert the Chakachatna River into the McArthur River drainage."

TECHNICAL COMMENT: The statement in 1) generally is true, but the words "to a lesser degree than" are ambiguous. Differences in results of flow regulation between the various alternatives could be major. For example, for alternatives chosen by the Applicant with reservoirs smaller than Watana water released other than through the turbines would be increased. To prevent more spillway discharge, more cone valve discharge would be needed. If the cone valves could be provided practicably, nitrogen supersaturation would be similar to Watana's. If the cone valve discharge could not be increased sufficiently by practical means, then more water would be discharged through the spillway and the alternative would be less favorable than Watana in that particular instance.

In Paragraph 2) the effects of the non-Susitna hydro alternatives either should have been stated in more detail or a convenient reference should be provided to explanations in the DEIS.

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TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Expansion Plans

LOCATION IN DEIS: Vol. 1 Page 5-7 Section 5.2.1

COMMENT IN REFERENCE TO: Power Generation Recommendations

TECHNICAL COMMENT: The comparison of Susitna and Non-Susitna Basin hydroelectric plans are summarized in Table 1-25 on page 1-44 of the DEIS. Discussion of the hydroelectric comparisons are contained in Technical Comments NFP050 through 053.

The evaluation in the DEIS of coal, gas, and a coal/gas mix is summarized in Table 1-25 on page 1-44 of DEIS. The Applicant's detailed comments on the Thermal scenario studies are contained in Technical Comments NFP054 through 062.

As previously stated in the Applicant's technical comments referenced above, the difference in planning horizons and simulation tools across alternative plans does not ensure that the electric generation plans that have resulted from the systemwide studies in the DEIS provide equivalent capacity and energy, equal reliability, and associated system costs. Also, the selection of 2042 as the last year of the horizon does not reflect the full economic life of the Devil Canyon hydroelectric project which is added to the proposed Susitna alternative in 2002. Therefore, the DEIS conclusion favoring the use of Non-Susitna river hydroelectric projects supplemented by thermal generation is not valid.

In Appendix I of this document the Applicant has updated OGP expansion planning studies and total system cost comparisons for the With- and Without-Susitna development plans. The results of the update studies have confirmed the fact that the Susitna Project is economically more attractive than thermal alternative plans.

SUSITNA HYDROELECTRIC PROJECT
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TECHNICAL COMMENT FORM

TOPIC AREA: Flow Regime, Spiking Releases

LOCATION IN DEIS: Vol. 1 Page 5-8 Section 5.2.2 Paragraph 1 of the page

COMMENT IN REFERENCE TO: Minimum flow releases

> "The Application considered a range of flow release scenarios. The minimum flow during salmon spawning (August 1 to September 15) is proposed to be 12,000 cubic feet per second (cfs) [340 cubic meters per second (m^3/s)], which will subject an estimated 50% of side slough habitat to acute access limitations. To reduce these access restrictions, the Staff has recommeded that spiking flows of 20,000 cfs (566 m^3/s) be implemented during the salmon spawning season. These spike releases should occur for at least three continuous days, and should occur during at least three different periods between August 1 and September 15."

TECHNICAL COMMENT: The 12,000 cfs minimum flow at the Gold Creek Gage is quoted from the Application but, as stated in Technical Comment NFP071, 073 and 076, studies of discharge regime are continuing. Discharge figures in the License Application represent information developed to the date of the License Application, and discharges should not be established in the DEIS. The DEIS offers no specific derivation to support the discharges.

"Spike" discharges are among the subjects being studied cooperatively with Alaska agencies and, until the studies are completed, no specific numbers should be advocated (See also Technical Comment AQR059).

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TECHNICAL COMMENT FORM

TOPIC AREA: Flow Regime

LOCATION IN DEIS: Vol. 1 Page 5-8 Section 5.2.2 Paragraph 2 of the page

COMMENT IN REFERENCE TO: May-June-July minimum flows

> "Minimum flows during salmon emergence, outmigration, and rearing (May, June, and July) should also be reevaluated in light of presently on-going studies. All phases of the life cycles of salmon should be provided for the minimum flow regimes for the project."

TECHNICAL COMMENT: Applicant agrees with the paragraph. The discharges are being analyzed as part of the Applicant's continuing study program.

SUSITNA HYDROELECTRIC PROJECT
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TECHNICAL COMMENT FORM

TOPIC AREA: Flow Regime, Water Quantity, Water Quality, Spiking Releases

LOCATION IN DEIS: Vol. 1 Page 5-9 Section 5.3.3 Paragraphs 6-8 of the page

COMMENT IN REFERENCE TO: Release limitations

TECHNICAL COMMENT: Studies of the subjects recommended are underway, as stated elsewhere in these responses. The studies also include economic effects of flow regimes and mitigation measures. Until the studies are complete, stating numbers in the DEIS is premature.

In paragraph 1, the third sentence states "spiked" releases to be necessary. The subject is under study and until studies are complete the conclusion is unwarranted, as stated in Technical Comment NFP079 (See also Technical Comments AQR059 and 073).

The Applicant concurs with the DEIS statement that "... the definition of release constaints should be negotiated after current field studies have been completed. A schedule for these negotiations is an integral part of the mitigation policy." The Applicant is proceeding with these suggestions, including also the associated impacts on project economics.

The basis for the second paragraph of 5.3.3 is not stated. The numbers and some of the principles in it may or may not be correct. In any event, as stated above, the subject is under study.

The "spiked" discharge numbers and durations are discussed in Technical Comment NFP079.

SUSITNA HYDROELECTRIC PROJECT
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TECHNICAL COMMENT FORM

TOPIC AREA: Flow Regime, Water Quantity, Water Quality

LOCATION IN DEIS: Vol. 1 Page 5-10 Section 5.3.3. Paragraph 1-3 of the page

COMMENT IN REFERENCE TO: Minimum flows for May, June, and July

"The minimum flows for May, June and July should also be reconsidered. No evidence has yet been presented by the Applicant to support the assumption that the 6,000 cfs (170 m^3/s) minimum flows during this period adequately protect salmon emergence, outmigration, and rearing."

"Minimum release policies should be required at all hydropower alternatives. Information available for the proposed project would be sufficient to evaluate instream flow needs for the in-basin alternatives. However, site-specific studies would have to be conducted at the out-of-basin alternatives, especially Johnson and Browne, where baseline information is limited."

"The implementation of a water-resource modeling program within the Susitna River Basin should be included in mitigation planning. the objectives of such a program should be to achieve state-of-the-art forecasting of streamflows within the basin and to improve reservoir operation by allocating streamflows in excess of power demands to optimize fisheries production below the dams.

TECHNICAL COMMENT: The Applicant has the subject of minimum flows under study, as stated elsewhere in these commentaries. The Applicant's proposed 6,000 cfs was intended only as a working number to be used until a better one could be established (See Technical Comment AQR059).

It is presumed that the first sentence applies to alternatives to the Susitna Project and not to hydroelectric plants in general; since Watana need not have a minimum release after Devil Canyon is completed.

Applicant is satisfied that its evaluations to date in Exhibit E, Chapter 10 and Exhibit B, Volume 2, Sections 1 and 2 and Volume 2A have eliminated the alternatives selected in the DEIS (See also Appendix II to the this document). In any event, when studies show a hydro site to be uneconomical or to otherwise contain some "fatal flaws" there is no need to perform detailed environmental studies.

This statement recommends water resource modeling using flow forecasting and allocating stream flows in excess of power needs. A discussion of streamflow forecasting in contained in Technical Comment AQR062.

Nearly all of the streamflow can be used for power, so there is very little streamflow in excess of power needs. Current operation studies involve an overall small amount of release that could not be utilized through the turbines after the reservoir fills to ensure that the reservoir contains as much water as possible for the following winter season.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Load Forecast, MAP Model, MJSENSO Model

LOCATION IN DEIS: Vol. 2 Page A-3 Section A.1 Paragraph 3 of the page

COMMENT IN REFERENCE TO: "While the many simultaneous and recursive relationships, as well as the large number of equations (more than 1,000) contained in MAP, suggest a highly complex forecasting system (which it is), it is also the case that a great deal of critical information concerning the Railbelt economy has to be forecast exogenous to the MAP model. For instance, employment projections for the most important sectors of the economy have to be assumed. Similarly, large compoments of the state's projected revenues -- a dominant influence in the Railbelt economy-- have to be assumed in order to generate forecast with MAP."

TECHNICAL COMMENT: Most regional economic models are driven partially by exogenously developed forecasts of economic activity in those sectors whose markets are controlled by forces outside the region. In some models thse exogenous forecasts are derived through a disaggregation process in which national forecasts are broken down into states or regions for use in the state or regional model. The disaggregation process is conducted by evaluating the market share of each state or region and expected shifts in those shares over time.

In the MAP Model the exogenous projections of employment in basic industries are derived from an industry by industry assessment of the potential for development in light of the state's resources and national and international economic conditions and expectations. It is not feasible to disaggregate national forecasts to the state level in Alaska's basic industries are relatively small and young, and their development is not directly related to national trends. For example, development in several important industries, timber, fising, coal, and tourism, is linked closely to international economic and demographic forces. For these reasons industrial development scenarios must be formulated on the basis of the best available information for each of these sectors.

Future state revenues from petroleum royalties and severance taxes are a function primarily of oil production and oil prices, so the level of future revenues does not depend upon other economic developments in Alaska. Revenue forecasts therefore must be forecasted exogenously to the MAP Model. This task is conducted by the MJSENSO revenue forecasting model, which takes into account all the various factors that effect the level of royalties and severance taxes that the state collects.

The use of information on future economic conditions in basic industrial sectors developed exogenously to the MAP Model is a conventional and necessary forecasting procedure.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Load Forecast, RED Model

LOCATION IN DEIS: Vol. 2 Page A-3 Section A.1 Paragraph 6 of the page

COMMENT IN REFERENCE TO: "The business consumption portion of the RED model actually encompasses the commercial, small industrial, and government sectors of the Railbelt. Aggregate electricity consumption in the absence of any change in fuel prices is forecast as a function of regional commercial floor space, which is derived from an ad hoc assumption regarding future trends in the relationships between floor space and total employment."

TECHNICAL COMMENT: The statement that regional commercial floor space is derived from an "ad hoc" assumption regarding future trends in the relationships between floor space and total employment is inaccurate and misleading. Although the estimation approach is simple, the method is not uncommon in practice and therefore cannot be considered arbitrary or without foundation for the sole purpose of forecasting floor space in the Railbelt.

This approach was taken for a number of reasons. Firstly, because of the diverse and less well known end uses of electricity in the commercial, small industrial and government sectors relative to the residential sector, the Business Consumption Model of the RED model forecasts electric use on an aggregate basis rather than by end use. Also, alternative methods to forecast change in floor space stock were attempted but a satisfactory statistical relationships for predicting floor space was not obtained.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Load Forecast, RED Model

LOCATION IN DEIS: Vol. 2 Page A-4 Section A.1 Paragraph 2 of the page

COMMENT IN REFERENCE TO: "In addition to the residential, business, and miscellaneous sectors, a fourth component of electricity consumption is appended to each years's kWh projection. This component is identified as "exogenous industrial load." The kWh load projected for this customer category is an ad hoc forecast based on the judgement of a consulting firm that participated in the preparation of the License Application".

TECHNICAL COMMENT: Again, the DEIS in appropriately uses the term "ad hoc" to characterize forecast methods. The exogenous industrial loads were based on a complete survey of military installations in the Anchorage and Fairbanks areas to ascertain future loads. This survey was conducted in conjunction with the adoption of the preliminary large commercial load forecast prepared by Burns & McDonnell for Homer Electric Association (HEA). The final forecast, prepared by Burns & McDonnell, which was incorporated in HEA's official 1983 Power Requirements study, was much higher. For FERC to assert that the forecast is "ad hoc" belies the facts. It was based on a detailed survey and power requirements study.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Load Forecast

LOCATION IN DEIS: Vol. 2 Page A-4 Section A.2 Paragraph 4 of the page

COMMENT IN REFERENCE TO: "The Applicant has prepared load projections for 1983-2010 under a wide range of alternative scenarios."

TECHNICAL COMMENT: The Applicant has one Reference Case forecast to support the License Application and others for sensitivity analysis, several of which were prepared at FERC staff requests (See Technical Comment NFP023. The other forecasts were provided to test the reasonableness of the Reference Case forecast. The DEIS may characterize or view the forecasts as providing a "wide range", but the Applicant does not consider the other forecasts as having the same significance as does the Reference Case forecast.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: World Oil Price, World Oil Production

LOCATION IN DEIS: Vol. 2 Page A-4 Section A.3.1 Paragraph 6 of the page

COMMENT IN REFERENCE TO: Current price of oil and OPEC oil production

TECHNICAL COMMENT: The DEIS world oil price forecast has already proven to be low, by several dollars per barrel. As shown in Attachment 1, the spot price for marker crude was quite stable from April 1983 through May 1984, generally running 25 cents to 50 cents per barrel below the posted price. There can be a seasonal summer decline in spot price due to a seasonal decline in demand and a failure of production in the second quarter to anticipate the summer decline in demand. The spot price is now about $1.30 below posted but is expected to firm again in the fall to within plus or minus 50 cents of posted. The posted price remains at $29 per barrel and the most recent meetings of OPEC's official committee have affirmed both the existing production quotas and the posted price.

Thus, DEIS assumptions about near term market or OPEC behavior have not been realized. Neither spot nor posted price has fallen by $3 or $4 per barrel, as projected by the DEIS, nor is there need for OPEC to search for a lower price level at which their market will stabilize. Although production should and probably will drop to 15 million barrels per day (MMBD) to 16 MMBD for the next several months, the average for the year should be 18 MMBD, plus or minus 0.5 MMBD, very close to last year's average. In 1985, their production could be marginally improved, but it will most probably not be several MMBD lower as the DEIS seems to indicate.

The minimum production quotas assumed for OPEC are strictly an assumption, and the production/price balances are predicted on a distorted evaluation of economic growth, oil demand, and non-OPEC production. Changing these factors to probable trends can result in OPEC production at a level of 18 to 20

MMBD with essentially no change in the present real price. As for the "minimums" that OPEC can tolerate, OPEC has already demonstrated that it can function at an output level of 14 MMBD, which is not necessarily the minimum. The minimums assumed are strictly speculation, and no foundation for judgement in determining such thresholds has been established.

The reference case oil price forecasts are based on near term developments in oil pricing and supply quite similar to conditions as they are evolving rather than the conditions postulated in the DEIS, which have neither occurred nor should be expected to occur. Even near term events, therefore, support the reference case forecasts and their application in economic analyses of the Susitna Hydroelectric Project.

SPOT VERSUS POSTED PRICE OF MARKER CRUDE
(Dollars per Barrel)
April 1983 - June 1984

	Mideast Light -- 34°			Saudi Arabia Light -- 34°			Saudi Arabia, Arab Light -- 34°		
	Posted	Spot*	Difference	Posted	Spot**	Difference	Posted	Spot***	Difference
1983									
April	$29.00	$28.70	$+0.30	$29.00	$29.05	$-0.05	$29.00	$28.71	$+0.29
May	29.00	28.50	+0.50	29.00	28.65	+0.35	29.00	28.57	+0.43
June	29.00	28.75	+0.25	29.00	28.98	+0.02	29.00	28.83	+0.17
July	29.00	29.00	+0.00	29.00	29.13	-0.13	29.00	28.98	+0.02
August	29.00	28.90	+0.10	29.00	28.98	+0.02	29.00	28.91	+0.09
September	29.00	28.60	+0.40	29.00	28.61	+0.39	29.00	28.66	+0.34
October	29.00	28.60	+0.40	29.00	28.56	+0.44	29.00	28.57	+0.43
November	29.00	28.30	+0.70	29.00	28.28	+0.72	29.00	28.29	+0.71
December	29.00	28.25	+0.75	29.00	28.26	+0.74	29.00	28.28	+0.72
1984									
January	29.00	28.60	+0.40	29.00	28.64	+0.36	29.00	28.63	+0.37
February	29.00	28.55	+0.45	29.00	28.61	+0.39	29.00	28.50	+0.50
March	29.00	28.50	+0.50	29.00	28.57	+0.43	29.00	28.49	+0.51
April	29.00	28.39	+0.61	29.00	28.40	+0.40	29.00	28.38	+0.62
May	29.00	28.43	+0.57	29.00	28.39	+0.39	29.00	28.41	+0.59
June (prel.)	29.00	28.45	+0.55	29.00	28.14	+0.14	29.00	28.18	+0.82

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* Petroleum Intelligence Weekly, various issues.
** OPEC Bulletin, May 1984 through April 1984. Wall Street Journal, April through June.
*** Platt's Oilgram Price Report, various issues.

Source: SHCA.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: World Oil Price, Monopoly Profit

LOCATION IN DEIS: Vol.2 Page A-4 Section A.3.1 Paragraph 6 of the page

COMMENT IN REFERENCE TO: Marginal cost of oil

TECHNICAL COMMENT: The terminology used by FERC Staff--marginal barrel cost and revenue--is somewhat ambiguous, because it is really the incremental (i.e., additional to present production) barrel that is of concern. The cost relationship between the marginal and the incremental barrel depends on the slope of the supply curve--if the slope is steep, the cost of the incremental barrel will exceed the cost of the marginal barrel, often considerably; if the slope is flat, as FERC Staff assumes, the cost of the incremental barrel will be similar to that of the marginal barrel. Considering the growing difficulty encountered in the production of incremental quantities of oil (due to such factors as increasing share of offshore production, greater water depth, greater depth of the formation itself, more difficult geological structures in or around the formation), a relatively steep slope of the supply curve appears to be more prudent assumption.

FERC Staff claims that that relationship today is one of $15 cost and $29 price. This relationship is exaggerated. Market prices of oil (i.e., spot prices) declined to today's level ($28 to $29 per barrel) for the first time in February of 1982 and have remained at that level or above it for the last 27 months, as shown below (Saudi Arabian Light Crude Spot Price in dollars per barrel):

	1982	1983	1984
January	$33.88	$30.36	$28.63
February	29.92	28.98	28.50
March	28.43	28.00	28.49
April	31.01	28.71	28.38
May	33.37	28.57	28.41
June	32.68	28.83	28.31
July	31.73	28.98	
August	31.44	28.91	

From the Applicant's perspective, costs to find, develop, and produce the incremental barrel, would appear to be more reasonable benchmark of marginal costs than the "assumption" made by the DEIS. This does not preclude a gradual decline in the real price of oil in the near term, such as the next two years, but it does preclude the major decline (by almost 20% from 1983 to 1985, and by more than 30% from 1983 to 1990) that FERC Staff postulates.

The confusion expressed in the DEIS about marginal costs of production and related pricing is due to certain misconceptions. The first one is equating accountant's costs with economist's costs. The latter includes a nominal rate of return but all of the costs quoted by the DEIS are costs without any capital recovery, i.e., no rate of return is included. In addition, the industry generally excludes indirect costs such as overhead and "rents" such as lease acquisition costs.

The DEIS's second mistake is equating costs per barrel of reserves with costs per barrel of production. As indicated above, the costs are on an accounting basis and include no rate of return, but most frequently they are also quoted as a cost per barrel of reserves added. Expressed in 1983 dollars, the Lower 48 cost per barrel of reserves additions was $11 per barrel in 1982, and the average for 1980-82 was $8 per barrel. But in the Lower 48 the reserves added in a given year are produced over a period of 10 to 20 years and the first year's production is perhaps 10% of those reserves. With the early costs mostly capital, the addition of the nominal rate of return can greatly increase the total production costs above the costs of reserves added.

Practically all of the lowest cost resource is concentrated in the Middle East and accounts for two-thirds of the free world's reserves and perhaps a higher percentage of the remaining conventional resource in place. The cost per barrel of producting this oil may be $3 per barrel today but could be as low as $1 per barrel. At the other extreme are large known resources not yet developed: heavy crude, tar sands, shale oil, oil that might be produced from coal, and the last increments of crude oil in place in fields now being produced. The costs for these resources vary widely but for most of these resources the cost can be expected to be $60 per barrel up to more than $100 per barrel. The projects being supported by the U.S. Synfuels Corporation and their general lack of economic feasibility clearly demonstrate this range of costs.

The DEIS forecasts a 5% per year increase in non OPEC production, which on 22 MMBD of non-OPEC crude production currently would yeld 37.6 MMBD by 1995. Presumably, this rate of increase would be maintained even at $20 per barrel because this price would yield very high profits and permit large capital budgets for exploration and production. In contrast, SHCA estimates that non-OPEC production--at $29 per barrel--will soon peak at close to 22 MMBD and will be somewhat below that level by 1995. At a price of $20 per barrel through 1995, SHCA would forecast the decline in non-OPEC production sooner and production in 1995 would drop below 20 MMBD rather than the DEIS's projection of 37 MMBD—for the same price the range is almost two to one.

Finally, the DIES fails to specifically recognize the "rent" components, as through "perfect competition" were going to lead to an elimination of all rents in this industry, at leat in non-OPEC countries.

The fact is that all summer of rent is firmly entrenched in this industry. In the pre-embargo period at prices of $4 per barrel or less, there was royalty, FIT, various state taxes, and lease acquisition costs. The windfall profits tax has become law, adding another element to the price fo oil although this tax would drop to zero at a low enough price. Every other country taxes oil at even higher rates; these rates may be adjusted for changes in price and cost but the practice is nevertheless well entrenched, and often results in a "rent" drag on exploration and development. On average, this is a major factor in the producers' total cost structure but in general it eliminates most changes of "windfall" profits, results in lower rates of exploration, and can be attributed primarily to the fundamental characteristic of the industry.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: World Oil Price, World Economy

LOCATION IN DEIS: Vol. 2 Page A-5 Section A.3.1 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Free World Economy

TECHNICAL COMMENT: The DEIS's low economic projection for free world economies is not consistent with actual growth experienced in 1984. With almost six months of actual data available, economic growth estimates for the year 1984 are as follows (SHCA, 1984):

	1983 Percent of Total Free World Economy	1984 Percent Growth Rate
United States	27.5%	5.9%
Canada	2.6	5.0
Japan	11.5	3.9
Western Europe	36.4	2.0
Indonesia	0.8	5.0
Nigeria	0.7	0.0
Israel	0.2	2.0
South Korea	0.7	8.0
Taiwan	0.5	9.0
Australia	1.5	5.0
Thailand	0.4	6.5
Total	82.8%	3.8%
Rest of world	17.2%	0.0%

Almost 83% of the free world economy is accounted for in the above listing and the average 1984 growth rate is estimated at 3.8%. Even if these countries experience zero growth in 1984, the average free world growth rate will be in excess of 3%. The free world has in fact been growing for the past half year at about twice as fast a rate as adopted by the DEIS. There is every indication that the full year 1984 will be at an average rate between 3% and 4%.

Indeed economic organizations that forecast free world economic activity together with companies engaged in world trade that formally prepare free world economic forecasts demonstrate that none of these forecasts are below an average of about 3% for 1984-90:

DRI	3.3%/yr
Wharton	3.0
Standard Oil of California	3.5
Exxon	3.0

DEIS's analysis of the world economy not only ignores the high economic growth countries but treats the depressing forces as being unreasonable when in fact they re resolvable:

- o High real interest rates will be reduced over the next few years.

- o With a decline in interest rates, the value of the dollar will fall, and oil prices in most foreign currencies will fall appreciably, so the cost of energy as a percent of GNP will be declining over the next few years.

- o With a decline in interest rates, the international debt will become more manageable and actions can be anticipated, to lessen the impact of world debt on economic growth. It is a mistake to assign too much weight on a long term basis to the conditions prevailing during this maneuvering period. FERC staff has converted the possible outlook of very low economic growth into the probable outlook. The forecasts identified above take the obvious economic problems facing the world into account and still arrive at forecasts of 3% per year growth or higher.

If the DEIS had used a more reasonable rate of world economic growth, its entire energy framework would have been strikingly different, with a higher growth in energy demand, higher oil and gas prices, export markets developing for Alaska gas and coal which in turn would result in higher gas and coal prices, higher Alaska power demand, and higher state oil revenue.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: World Oil Price, Monopoly Profit

LOCATION IN DEIS: Vol. 2 Pages A-5 Section A.3.1 Paragraph 2 of the page

COMMENT IN REFERENCE TO: OPEC market power and monopoly profit

TECHNICAL COMMENT: The DEIS analysis attributes the oil price increase over the last decade to the ascendancy of OPEC "market power" that has allowed OPEC to set oil prices at a level to include a hugh "monopoly profit"; consequently, it is argued in the DEIS that the loss of that "market power" and the subsequent reduction or elimination of the "monopoly profit" will result in the predicted decline of oil prices during the remainder of this decade. OPEC's behavior does not bear out the DEIS theory of a profit maximizing monopolist or perfect cartel, however. OPEC's efforts to set production ceilings for member states and to set marker prices on crude may influence prices, but the DEIS overstates OPEC's effect.

It was not solely the ascendancy of OPEC "market power" that caused the huge rise in world oil prices since 1973 but rather the destruction of the former market structure and power that determined oil price development prices to 1973. Before 1973 the major international oil companies controlled virtually all aspects of free world production, transportation, processing, and distribution of oil; probably an excess of 90% of free world oil can be considered to have been controlled by these oil companies. In terms of the purchase of crude from the producers the major international oil companies represented a true oligopsony.

After the oil embargo in 1973 the major oil companies could no longer control oil production and a price adjustment process took place which increased prices rapidly to their market level; however, as is often the case with very rapid adjustment, the correct long term level was somewhat overshot, and a correction (i.e., no real increase) took place during the ensuing four years. When demand for oil was still growing too rapidly, a sudden reduction in oil supply (the Iranian revolution) triggered another adjustment. The long term equilibrium price level was again overshot, and a correction began which is still on going. All these adjustments and corrections were market induced and not the result of OPEC market power.

To be sure the above reasoning does not indicate that curde oil prices wil not decline, however, it does indicate that there is no compelling reason for prices to decline as the DEIS assumes. A price decline wil not automatically follow a reduction in OPEC "market power", as the DEIS projects, because OPEC has never had the absolute market control in the past which the DEIS attributed to it.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: World Oil Price

LOCATION IN DEIS: Vol. 2 Pages A-5 Section A.3.3 Paragraph 6 of the page

COMMENT IN REFERENCE TO: Current Views/Inventory Charges/Recent Trends

TECHNICAL COMMENT: The reduced share of oil relative to total energy consumption reflects the intended and expected economic adjustment of higher oil prices since 1974 and 1979. The leveling out of oil prices has retarded further movement to alternative fuels, suggesting perhaps a new equilibrium in world energy markets. Therefore, the DEIS statement that the rapid loss in market share indicates that oil is currently overpriced relative to other fuels is inaccurate. Also, the figures on production percentages (7% vs. 2%) are not synonymous with market share because the former may fluctuate in response to price and demand whereas the latter is relevant in the context of imperfect markets and suggests collusion.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: World Oil Price, World Oil Resources

LOCATION IN DEIS: Vol. 2 Page A-5 Section A.3.2 Paragraph 3 of this page

COMMENT IN REFERENCE TO: Effect of oil inventory changes and "---the true demand for OPEC oil still appears to be declining"

TECHNICAL COMMENT: The International Energy Agency (IEA, 1984), SHCA, and others such a British Petroleum (BP, 1984) engaged in assessing oil trends adjust for inventory changes in developing estimates of oil consumption. Based on the Applicant's knowledge, none of these organizations has claimed that oil consumption increased in 1983 or even held constant. Although specific estimates vary somewhat, 1982 and 1983 estimates by three different organizations of free world oil consumption are tabulated below in million of B/D:

	SHCA	IEA	BP
1982	45.8	45.5	45.2
1983	45.0	44.4	44.7
Decline in 1983	-0.8	-0.8	-0.5

The issue is not whether actual consumption declined in 1983 but rather whether consumption is still declining in 1984 and whether it will continue to decline thereafter. The DEIS appears to conclude that consumption is still declining and will continue to do so. To research this conclusion the DEIS has simply extrapolated the experience in 1980-1983 and in doing so has missed the basic change in trend that has begun. Inventory change has not masked consumption trends, rather the DEIS's analysis has failed to assess the impact of the oil price reduction that has already been experienced. The DEIS has accordingly, been unduly pessimistic on world economic growth in assessing world oil demand.

The IEA estimates that consumption -- after allowing for inventory changes -- will increase 1 million B/D in 1984; SHCA estimates 0.5 million B/D. The IEA stated that actual consumption to date in 1984 has increased by several percent over actual usage in the comparable period in 1983. Therefore, inventory shifts that occurred during 1982 and 1983 should not be viewed as an indication that oil demand will continue to fall and depress oil prices.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: World Oil Price, Fuel Switching

LOCATION IN DEIS: Vol.2 Page A-5 Section A.3.3 Paragraph 8 of the page

COMMENT IN REFERENCE TO: Market Share, Oil, Gas, Coal

TECHNICAL COMMENT: Oil cannot be expected to maintain a constant share of energy demand. In "Future World Oil Prices," (Paper cited in DEIS as source of il price analysis) Figure 3, total energy increases at 2.5% per year. If oil were to increase at that rate, demand in 2000 would be 68 MMBD and in 2010, 83 MMBD. Precedent from 1973 and 1978 experience has demonstrated that if demand for OPEC crude reaches 30 MMBD or more, the price will have increased sharply. This is likely to happen in the future even given lower rates of production. With OPEC production limited to roughly 25 MMBD, non-OPEC production in 2000 would have to be about 40 MMBD and in 2010, about 55 MMBD. This is far beyond any rational expectation for non-OPEC production at any price, let alone a price maintained at $20 to $25 per barrel. At such price levels the following energy developments are likely to occur.

The DEIS has also totally ignored the impact of its oil price on gas supply and the resulting impact on interfuel competition, as well as the coal/oil price relationships required for conversion to coal and equivalent competitive position in the new market. Oil does not have to be priced at the Btu equivalent of coal to be competitive, even for new facilities. The DEIS has simply evaluated oil's market share trend in 1975-78 and extrapolated from that experience. But 1975-78 was a totally different era for gas, as compared with 1985-2010, and the price elasticity effects in 1975-78--after the first major oil price increase--on transportation and other applications are quite different from what can be expected in 1985-2010 at the DEIS oil prices. The DEIS's asumptions lead to a distorted outlook for interfuel competition.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: World Oil Price, Conservation, Fuel Switching

LOCATION IN DEIS: Vol. 2 Page A-5 Section A.3.3 Paragraph 9 of the page

COMMENT IN REFERENCE TO: Reduction of Oil Consumption

TECHNICAL COMMENT: The DEIS identifies factors of consumption, fuel-switching, and stagnant world economic conditions, which it concludes will combine to lower world oil demand in the future at potentially the same 2% annual rate experienced since 1979. This continued reduction will, in turn, press prices downward. The DEIS's assumptions about continued reduction of world oil demand do not withstand scrutiny.

The DEIS has apparently assumed conservation to be the major factor responsible for the reduction of energy consumption during the last decade, and further assumes that conservation will continue at the same intensity in the future even under the DEIS oil price scenarios. This overlooks the fact that the major force behind conservation is price elasticity of demand, i.e., the cost of energy exceeded its utilization value in certain applications or investments in energy saving processes or devices became economical. With cost of energy declining, based on the FERC Staff forecast, the trade-off between energy price on the one hand, and energy utilization or investment in energy saving processes or devices on the other will shift back again. While investments once made will likely not be undone by reduced energy cost, new investments in energy saving processes or devices will occur only at a much reduced level. Also, some energy conservation that took place in the past because energy prices exceeded its utilization value will be undone. Yet the DEIS assumes, based on the paper "Future World Oil Prices--Will They Rise Or Fall?" (FWOP) that conservation will continue unabated (p. 10 of FWOP) at the rate of 2%, though the price of oil is assumed to decline to the level that existed prior to the experienced conservation. The continuation of the 2% rate of conservation in light of declining oil prices is not explained in the DEIS.

The DEIS may have erroneously attributed a past fall off in world oil demand to conservation or fuel switching, when that crop has actually been caused by a temporary reduction in world industrial production.

Data on free world oil consumption indicates that consumption declined from 52.8 MMB/D in 1979 to 45.1 MMB/D in 1982, or by 7.7 MMB/D. Of this total decline in oil consumption, the developed countries (the United States, Canada, Western Europe and Japan) accounted for some 5.7 MMB/D, or almost 75%. Analysis of the oil consumption in the developed countries by end use reveals a distinctly different pattern of fuel switching and/or conservation depending on end use (in MMB/D):

	1979	1982	Change
Residential and commercial	6.6	5.3	1.3
Industrial and power plant	11.0	7.7	3.3
Transportation	17.4	16.3	1.1
Total	35.0	29.3	5.7

The composite reduction of 16.3% of the oil consumption during the three year period consists of a 20% reduction in residential and commercial consumption, a 30% reduction in industrial (including power plant) consumption, and only a 6% reduction in the largest consuming segment, transportation. Portions of the reduction in oil demand are attributable to general economic conditions, other portions are attributable to fuel switching (mostly in the residential/commercial/industrial/power plant sectors), and others are attributable to conservation (mostly in the transportation sector).

During the 1979-1982 period the index of industrial production in the developed countries declined by 4%. This trend is not anticipated to continue (See Technical Comment NFP089). As industrial production regains strength, energy consumption will accordingly rise.

Although the DEIS is somewhat vague with respect to the rate of economic growth assumed for the world, some such growth is not predicted. If we therefore assume that industrial prduction in the developed world would increase by 4% during the three year period 1982-1985 instead of a decline by 4, such reversal of economic growth would have to be reflected in the oil consumption of the individual sectors. The DEIS, however, assumes a reduction by over 30% between 1983 and 1990 which all considered, must be judged unappropriate.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: World Oil Price, World Oil Production

LOCATION IN DEIS: Vol. 2 Page A-6 Section A.3.3 Paragraph 1 of the page

COMMENT IN REFERENCE TO: Non OPEC Oil Production

TECHNICAL COMMENT: The Applicant agrees with DEIS that non-OPEC production has been increasing for about the past decade. However, the Applicant disagree with the DEIS analysis of non-OPEC production. FERC Staff seems to have taken the 5.3% compound annual growth rate experience in overall non-OPEC production since 1976, and projected a continuation of this growth rate into the indefinite future. This approach is unsupported and ignores indications that non-OPEC production will peak in 1984 or 1985, and will commence to decline before the end of this decade--even if present prices are maintained. Those who predict rising production rely solely on the trend of the past decade and simply extrapolate it, and/or cite Mexico and the North Sea as primary examples of sources of growing production. This overlooks the fact that the 5.3% overall growth has been achieved by spectacular increases in production in a few countries, notably Mexico, Brazil, and the North Sea, and is not characteristic of non-OPEC sources as a whole. Once these never producing areas begin to stabilize production, growth in non-OPEC production cannot be maintained unless other new large reserves are discovered. It is not realistic to expert Mexico and the North Sea to keep up the growth rate in production for which they have been responsible in the past. Mexico has maintained an essentially constant rate of production for the past 18 months. Several sources indicate a peaking of production in 1984 or 1985 for North Sea production or for the United Kingdom outlook alone.

Production in most other non-OPEC countries has been essentially static for years, and there is no indication of any material change ahead. Also, the claim that large profits will continue to draw large capital funds for exploration and production in non-OPEC countries is contrary to the facts.

In the Lower 48, oil exploration and development expenditures declined by one-third in 1983, and footage drilled dropped by roughly 20%, from 193 million feet in 1982 to 169 million feet in 1983. Expenditures and footage drilled are not likely to change materially in 1984. Abroad, the latest indications are that drilling is still declining.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: World Oil Price, Load Forecast

LOCATION IN DEIS: Vol. 2 Pages A-6 to A-13 Section A.3.4

COMMENT IN REFERENCE TO: APA oil prices and load projections

TECHNICAL COMMENT: Technical Comments NFP023 through 025 provided on Section 1.2.4.1 of the DEIS should be consulted as they are pertinent to this topic area.

Although the assumption made by DRI and SHCA concerning the influence of OPEC or would oil markets and U.S. economic growth are similar, these assumptions are, of course, not the only ones upon which the forecasts are based. As a consequence, one would expect the DRI and Reference Case world oil price forecasts to differ. The DEIS asserts that there is a noticeable difference between DRI's forecast and the Reference Case scenario, shown in Table A-3. To consider the forecasts as "noticeably different" is a subjective view, apparently held by FERC staff. It should be noted that such a comparison is hampered by the use of different year classifications for oil prices and annual rates of change in price for Applicant's Reference Case as shown in Table A-1 and the DRI "Base Case" as depicted in Table A-3.

The Applicant has one load projection which is based on the Reference Case world oil price scenario. Other world oil price forecasts have been provided for "sensitivity analysis." It is expected that such forecasts would tend to be close in the early forecast years for which more information is available and uncertainity less than for the latter years of the forecast. On page A-9, the DEIS states that "By 1990, however, significant difference exist in the forecast." The DEIS staff provides no analysis to support the notion of "significance."

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TOPIC AREA: Load Forecast, MAP Model

LOCATION IN DEIS: Vol. 2 Pages A-13 to A-17 Section A.3.5

COMMENT IN REFERENCE TO: FERC Projections

TECHNICAL COMMENT: Comments provided on Section 1.2.4.2 should be consulted, as relevant to this topic area.

The DEIS refers to load projections based on high world oil price assumptions on page A-13, paragraph 4, but does not identify the oil prices nor assumptions. Also, the differences between oil price trajectories (high and medium FERC cases) are not disclosed.

In comparing the alternative oil price forecasts the DEIS characterized load forecasts as exhibiting an "insulation" between electricity and oil prices that is inappropriate. The MAP model provides for reasonable economic measures to offset downswings in the state economy due to reduced petroleum related revenues. The DEIS uses the term "insulation" on page A-15, paragraphs 2 and 4, which has a pejorative meaning and taints the readers impression of the model. The MAP model is simply attempting to consider explicity the possible effect on the state economy of fiscal policy measures imposed to adjust for significant changes in economic conditions anticipated in the future.

The DEIS considers the annual average rate of per capita usage (kWh) of 0.6% over 1985 to 2010 to represent a "<u>significant</u>" upward trend but does not measure or explain its notion of "significance." When viewed in the light of anticipated energy markets in the Railbelt over this period, the significance of the rate of increase, is questionable.

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TECHNICAL COMMENT FORM

TOPIC AREA: Natural Gas Resources

LOCATION IN DEIS: Vol. 2 Page B-4 Section B.3.1. Paragraph 2 of the page

COMMENT IN REFERENCE TO: Proven Gas Reserves

TECHNICAL COMMENT: DEIS states in Section B.3.1 that there are 3.4 Tcf of proven gas reserves in the Cook Inlet and quotes USGS estimates of 1.3 to 13 Tcf of additional gas as yet undiscovered. On this basis, Staff concludes that "there should be more than adequate gas to meet the Railbelt's power needs for the next half century." This conclusion in the DEIS is in error for several reasons.

With respect to reserves, the DEIS is correct that proven recoverable reserves were 3.4 Tcf as of December 31, 1982. But by the end of 1983, reserves had dropped to 3.2 Tcf, continuing a steady decline for the past three years. Annual reserves additions versus production have trended as follows (OGCC, 1983):

	Reserves Additions Bcf	Production Bcf
1982	13.5	181.5
1982	44.0	216.0
1983	38.4	196.4
Average 1981-3	32.0	198.0

Reference

State of Alaska, Alaska Oil and Gas Conversation Commission (OGcc), "Statistical Report", 1983.

Demand is expected to increase because of growing high priority requirements, and if all power needs were to be met by gas, demand would increase appreciably over the next half century. But even if production were held at the recent level (approximately 200 Bcf/yr), the present proven reserves would be exhausted in 16 years (1999). If the recent rate of reserves additions were maintained (32 Bcf/yr), production could be extended only another 3 years. In actual practice, even with reserves additions continuing at the recent level, production will commence declining by the early 1990's.

The U.S.G.S. estimate of the undiscovered resource was made in 1980, and the 13 Tcf estimate should not have been referenced, in as much as the U.S.G.S. applied only a 5 percent probability to it. The mean estimate is 5.7 Tcf. Assuming that the 5.7 Tcf mean estimate were still realistic, annual reserves additions should not be expected to exceed 200 Bcf per year for the next 20 years (4 Tcf total), with annual additions gradually declining thereafter and spread over the following 20 years. With growing high priority requirements, and assuming growing power generation met by gas, production would have to increase to 250-300 Bcf/yr early in the next century. By then, proven reserves would be down to 2.0-2.5 Tcf and the reserve life index would be down to 10 years or less. Production would in fact be forced into the ultimate decline. Thus, even using the U.S.G.S. estimate, it would be a serious mistake to plan for any new gas-fired power plants.

But the outlook for gas availability is even more serious than this. Reserves additions have been low for the past three years. Drilling since the U.S.G.S. made its estimate has been disappointing and has reduced the expectations. The Alaska Department of Natural Resources made an estimate of the undiscovered resource base in 1983; their estimate was only 2 Tcf. At this magnitude, annual reserves additions could not be expected to exceed an average of 100 Bcf/yr. for the next 10 years -- three times what was added as in the past 3 years -- with the remaining 1 Tcf would be added over at least 20 additional years, on a gradually declining basis. Over the next 10 years, and assuming a constant rate of production of 200 Bcf/yr. instead of the DEIS's expected increase, the trends would be as follows:

	Reserves Additions Bcf	Production Bcf	Reserves2/ Bcf	RLI, yrs.
1983	100	200	3.2	16
1984	100	200	3.1	
1985	100	200	3.0	15
1986	100	200	2.9	
1987	100	200	2.8	14
1988	100	200	2.7	
1989	100	200	2.6	13
1990	100	200	2.5	
1991	100	200	2.4	14
1992	100	200	3.3	
1993	100	200	2.2	11

2/ December 31 of each year.

On this basis, by the mid-1990's if not earlier, Cook Inlet production will commence declining, and this is the basis that should have been used for assessing gas availability for power generation. The conclusion that should have been drawn in the DEIS is that gas from the Cook Inlet cannot be relied on for new power generation.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Natural Gas Price

LOCATION IN DEIS: Vol. 2 Page B-5 Section B.3.3 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Enstar Rate Increase, Market Power

TECHNICAL COMMENT: The Shell and Marathon contracts with Enstar are at a price that is a significant increase for the local market. The base price as of November 1982 was $2.72 per MMBtu versus an average 1982 power plant price of $0.71 per MMBtu.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Gas Price Resources, Natural Gas Price

LOCATION IN DEIS: Vol. 2 Page B-7 Section B.3.3.5 Paragraph 3 of the page

COMMENT IN REFERENCE TO: DEIS Gas Prices and Exploration

TECHNICAL COMMENT: The DEIS's adopted projects show a decline in price for the next decade with prices not rising above the current level until about the year 2000. This price projection does not ensure exploration, but rather will discourage exploration.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Natural Gas Price

LOCATION IN DEIS: Vol. 2 Page B-6 Section B.3.3.3 Paragraph 3 of the page

COMMENT IN REFERENCE TO: LNG, PAC Alaska Project

TECHNICAL COMMENT: As shown in Attachment A to this comment, the price of LNG delivered to Japan essentially equates to the price of crude oil, and was approximately $5 per MMBtu in 1983. With the DEIS's oil price projections, the LNG delivered price in 1990, 1995, and 2000 will be, respectively in 1983 dollars per MMBtu: $3.45, $3.79, and $4.14. At these delivered prices, the price into the liquefaction plant in the Cook Inlet would be about 50 cents to $1 per MMBtu and the netback at the well head for the existing LNG project would be negative to barely positive. For the PAC Alaska project which requires use of U.S. tankers, the wellhead price would be negative in 1990-2000. It would be 2010 or later before the PAC Alaska project could possibly be feasible.

In section B.3.3.1 - B.3.3.4 of the DEIS, FERC staff evaluates the potential for the completion of ANGTS and TAGS and export of Cook Inlet gas, concluding that the outloot is uncertain. But In fact, there is no uncertainty at all. Given the DEIS oil price projections, no export project would be built, until long after the decisions on new power facilities in 1990-2010 were made. The existing LNG contract would not be renewed as the netback prices would be too low to be economic. The only situation prevailing would be a local supply for the local market.

PERTINENT OIL AND GAS PRICES RELATED TO
DEIS ADOPTED CRUDE OIL PRICES
(1983 Dollars)
1983 - 2050

	Marker Crude per Deis		Loser 48 (dollars per MMbtu)			Japan (dollars per MMBtu)
	Dollars per Barrel	Dollars per MMBtu	High Sulfur Fuel Oil	Average Field Price*	City Gate Price+	LNG Delivered
Actual						
1983	$29.00	$ 5.00	$ 4.50	$ 2.92	$ 4.23	$ 5.00
1984	27.62	4.76	4.30	2.75	4.00	4.76
DEIS						
1985	24.00	4.14	3.80	2.25	3.50	4.14
1990	20.00	3.45	3.00	2.00	3.00	3.45
1995	22.00	3.79	3.30	2.30	3.30	3.79
2000	24.00	4.14	3.80	2.80	3.80	4.14
2010	29.00	5.00	4.50	3.50	4.50	5.00
2020	36.00	6.21	5.70	4.70	5.70	6.21
2030	44.00	7.59	7.10	7.00	7.10	7.59
2040	54.00	9.31	8.80	8.50	8.80	9.31
2050	66.00	11.38	10.88	9.30	10.88	11.38

* Interstate.
\+ East North Central (Chicago).

Source: Developed by SHCA.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Coal Price, World Oil Price

LOCATION IN DEIS: Vol. 2 Page B-7 Section B.4 Paragraph 4 of the page

COMMENT IN REFERENCE TO: Coal Price Relationship to Crude Oil Prices - "Coal as an energy source is not linked... to the price of crude oil... [because] coal is not a close substitute for oil."

TECHNICAL COMMENT: This assumption regarding lack of an economic linkage between ol and coal prices in the DEIS is not borne out by hostoric data and is inconsistent with other price assumptions mad in the DEIS. Research has demonstrated a positive cross-price elasticity between the price of oil and the long run demand for coal; i.e., a rise (fall) in the price of oil will cause an increase (decrease) in the demand for coal. The DEIS validates this precise concept (See also Vol. 1 page 1-33).

> The motivating factor for the diversification away from petroleum and into coal...has diminished measurably during the last 18 months as the outlook for real escalation in world prices has moderated and the prospects for falling crude prices have become reality.

A positive cross-price elasticity confirmed by the DEIS logic quoted above indicates that if oil prices resume their upward movement the demand for coal and coal prices will rise as well.

This is confirmed as well in the DEIS in last two sentences, page B-7 and first sentence, page B-8.

> Initiatives...to diversify...reliance on alternative energy sources...represent the major link between coal markets and the price of crude oil. If crude prices climb, then the economic potential for substitution will continue to increase; the market for coal will expand, and there will be upward pressure on the price of coal.

Clearly, the DEIS's assertion regarding the unrelatedness of oil and coal prices is inconsistent with their assertions on the same page about the market relationship. The Susitna Project Feasibility Report, (Acres, 1983) shows that coal and oil prices have correlation coefficients greater than 0.90 since 1950. This is a high value, insofar as a perfect correlation would have a coefficient of 1.0. Although coal is not a substitute for transportation fuels in the long run coal-fired power plants can (and will) be built to replace fuel oil or gas-fired plants if coal's relative abundance acts to lessen the relative rate of advance in coal prices.

SUSITNA HYDROELECTRIC PROJECT
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TECHNICAL COMMENT FORM

TOPIC AREA: Coal Price

LOCATION IN DEIS: Vol. 2 Page B-8 Section B-4 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Production Cost Basis for Coal Value - "Thus, the value of the coal...within the railbelt is likely to be the cost of extracting and transporting it to the generator".

TECHNICAL COMMENT: The logic for this conclusion (See also DEIS Section 1.3.3.3) rests on the DEIS's view of declining real oil prices, hence lack of exapnsion markets for coal. The basic flaw of the oil price outlook is that the DEIS long-term fossil fuel analysis is clouded by its near-term perspective. The oil price growth projection carries into the distant future the existing near-term characteristics of oil markets. These near-term characteristics suggest that coal in the Railbelt market might only be sold at a cost to cover production and transportation. However, the first coal plants would be required in the middle 1990's according to the License Application and by then fossil fuel markets will have changed.

The Applicant's analysis (See Technical Comment NFP104 and Appendix I of this document) shows that by the end of the century, there will be a significant and growing Pacific Rim coal demand that can be met most economically by Alaska exports. An export market will develop, beginning in the early 1990s. Adopting the DEIS logic thus implies that "the export price that coal commands will constitute the real cost of consuming coal locally". (See Vol. 2 App. B page B-8, para. 2).

Studies conducted by the Applicant indicate that the most economical coal generation mix for the thermal alternative would include a mix of coal from the Nenana coal field and the Beluga coal field (for use in mine-mouth plant). This analysis shows that coal from the Usibelli mine or other mines which could be developed in the Nenana field will probably not be competitive with Beluga field coal in the Pacific coal market due to the high rates charged by the Alaska Railroad for shipment (from the Suntrana load-out) to Seward for export.

Therefore, minimum prices of coal from the Nenana coal field would be determined by the cost of production, plus transportation to a suitable power plant site. Maximum prices for both Nenana and Beluga coal would be determined by inside Alaska fuel alternatives and Pacific coal market forces.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Coal Price

LOCATION IN DEIS: Vol. 2 Page B-8 Section B-4 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Export Market Prospects - "The outlook for (export market) expansion is mixed."

TECHNICAL COMMENT: The analysis of export markets conducted by the Applicant indicates, to the contrary, that the outlook for the export market is quite robust.

Coal can be produced from new mines in the Beluga coal field at a cost which will be highly competitive with the cost of production at steam coal export mines in Australia, Canada and the Lower-48 While it is true that real growth in oil prices may be negative for the next few years, this does not imply a dim prognosis for Alaska coal exports. First, the oil price analysis prepared for the License Application (and subsequently updated in Appendix I to this document), indicates that very significant oil price increases (and consequently gas price increases) will occur in this century and into the next. As a result, oil will continue to lose market share in some applications to coal. As the DEIS correctly points out, coal is far from being a perfect substitute for oil. However, oil is still being used in significant quantities for electric power generation and industrial steam raising in the Pacific Rim industrialized countries (Japan, Korea, Taiwan). Eventually many of these oil uses will be replaced with coal, either through direct conversion of existing facilities to coal or through construction of new replacement units.

Second, of even more consequence in terms of potential coal markets, is the continuing economic growth of the Pacific Rim nations. This economic growth, even under regime of high energy prices, will necessitate the use of more electric power and industrial steam. As a result, over the long term that is between 1990 and 2050, a tremendous growth in the coal requirements of Japan, Korea, Taiwan and emerging energy users, such as Hong Kong, Singapore, Malaysia, and the Philippines can be expected.

Analysis conducted by the Applicant shows (1) that Alaska coal will be relatively low cost to produce, and (2) that large and growing market will develop. Thus, there is every reason to believe that Alaska coal from the Beluga field, could be sold in large volumes into the Pacific market. This projection was developed using conservative assumptions on demand growth and on the market penetration of Alaska coal. For example, our projections assume that, due to the low calorific value of Beluga coal, it can be used only in new power plants which would be specifically designed to burn subituminous coal. This is conservative assumption because in addition to this limited use, plant replacements for older plants, blending in existing plants, and use in industrial application would increase the demand for Alaska coal even beyond that projected.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
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TOPIC AREA: Peat

LOCATION IN DEIS: Vol. 2 Page B-8 Section B.5 Paragraph 4 of the page

COMMENT IN REFERENCE TO: Unconventional Sources of Energy

TECHNICAL COMMENT: It is recognized that Alaska in general and the Railbelt region in particular, contain significant resources of peat. However the DEIS is incorrect to suggest that peat could be economically competitive at $2.00 per million Btu. The Applicant's data in support of the license application shows peat to be significantly higher in cost. (Battelle, 1982). The data available suggests that economically useful peat should be available in bogs of 80-320 acres/mi^2, within thirty truck miles of any proposed power plant, and within five miles of a major road (Ekono, 1980). Given the limited rail and road infrastructure in Alaska, the availability of commercially developable peat may be limited. Further the data concerning peat availability in the Anchorage area (e.g. The Susitna Valley) indicate highly variable ash contents ranging from 13.4% to 74.2%, with most values in excess of the threshold 25% ash (Ekono, 1980).

Given the issues of fuel variability, plant sizing, and other related concerns, Battelle (1982) found that power generated from the combustion of peat would cost 40-70% more than power from a 20 MW plant based upon Nenana or Beluga coal.

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TECHNICAL COMMENT FORM

TOPIC AREA: Geothermal

LOCATION IN DEIS: Vol. 2 Page B-8 Section B.6 Paragraph 5 of the page

COMMENT IN REFERENCE TO: Unconventional Sources of Energy

TECHNICAL COMMENT: The Applicant agrees with the apparent conclusion in the DEIS that geothermal energy is not an alternative, or component of an alternative, to the Susitna project.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Tidal Power

LOCATION IN DEIS: Vol. 2 Page B-8 Section B.7 Paragraph 6 of the page

COMMENT IN REFERENCE TO: Unconventional Sources of Energy

TECHNICAL COMMENT: The DEIS identifies the Cook Inlet area as a major potential resource for Tidal power energy. The DEIS incorrectly attempts to present capacity and energy numbers from a tidal facility as if they are comparable to the capacity and energy numbers from a conventional hydroelectric project. They are not comparable for the following reasons:

1. Tidal facilities are cyclical, producing power in relation to tidal action rather than energy demand; and tidal facilities only produce dependable capacity and energy when retiming and storage (e.g. pumped storage) is incorporated into the design; and

2. Tidal facilities have contiuously changing capacities, producing at the peak only when the tides are at their peak.

When these factors are taken into consideration, the total tidal capacity available from the four most attractive sites in the Railbelt appears to be only 4.5 GW. Further, the power costs for tidal power facility are significantly higher than those associated with Susitna, particlarly when storage and retiming are considered (Battelle, 1982).

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TOPIC AREA: Conservation

LOCATION IN DEIS: Vol. 2 Pages C-4 and C-5 Section C.4

COMMENT IN REFERENCE TO: C-4 Rate Design and Load Management

TECHNICAL COMMENT: The "Electric Utility Rate Design Study" conducted by the EPRI summarized the theory and practice of marginal cost pricing of electricity; load research and load management; and numerous issues and related topics such as selecting rating period, surveying customer response to load management and load control equipment. EPRI studies began before PURPA but addressed issues raised by the NEA of 1978. EPRI is a center devoted to the pursuit of research to solve technical problems and issues facing the electric utility industry presently but more importantly in the years ahead. It is a research institute which is financially supported by member electric utilities, primarily investor owned utilities. The "Rate Design Study" was a special project which was sponsored by a wider range of electric utility groups because of the national concern by public and private utilities in the advent of PURPA legislation, with conservation and load management issues in general.

These research studies do not have direct relevance to the Applicant's License Application. However, electric utilities which have adopted time-of-use rates and considered load management and the rate standards of PURPA have factored the information contained in the research reports in their rate design efforts. The use of such studies is voluntary on the part of all electric utilities and the NARUC Resolution recognized a need in the industry for innovative rate design and methods to limit peak demand.

SUSITNA HYDROELECTRIC PROJECT
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TOPIC AREA: Impacts, Alternatives

LOCATION IN DEIS: Vol 1 Page xxvi Summary Section Paragraph 2 of page

COMMENT IN REFERENCE TO: Significant impacts of implementing alternatives

TECHNICAL COMMENT: By failing to provide a complete summary of comparative impacts among all the alternatives, this section significantly understates the combined potential impacts of the alternatives to the Proposed Project.

To assist in making such a direct comparison, the Power Authority has prepared more detailed analyses on the hydroelectric and thermal alternatives to the Proposed Project. These anaylses are described in Appendices II and III of this document. The attached tables provide comparisons of resources and impacts of the Proposed Project to those of the non-Susitna hydro alternatives for the following categories: socioeconomics, land use, cultural, recreation, aesthetics/visual, terrestrial and aquatic. The Applicant recommends that the summary comparisons contained therein be incorporated into the DEIS.

Table 4-COMPARISONS OF SOCIOECONOMIC RESOURCES AND IMPACTS AMONG

SUBJECT	A			
	JOHNSON	BROWNE	KEETNA	
1. COMMUNITIES AND AREAS AFFECTED	• Tok, Tanacross, Dot Lake, "The Living Word" at Dry Creek and Delta Junction.	Healy, and Nenana.	• Talkeetna and Trapper Creek.	• Seward, E
2. POPULATION	• During the peak construction period 1,300 persons would in-migrate to the area.	• Peak construction in-migration would total 660 persons. Construction work forces on the roads and railway would add substantially to in-migration and compound other impacts of Browne construction.	• In-migration to Talkeetna and Trapper Creek would total 880 persons.	• Peak const
3. INSTITUTIONAL / QUALITY OF LIFE	• A decrease in the rural, undeveloped nature of the area may occur.with changes in scenic quality. The Native communities of Tanacross and Dot Lake may experience cultural conflicts and subsistence interference.	• The project would interfere with cultural and subsistence activities of Nenana residents.	• Rapid growth impacts would alter residents' quality of life and the rural nature of the area.	• Rapid grov life and th
4. ECONOMY / EMPLOYMENT	• Existing commercial operations might expand and others open. Commercial expansion and recreation opportunities at the impoundment may encourage tourism. Some local residents may fill support jobs.	• Commercial operations may have increased business in local communities and Fairbanks.	• Increased access would create opportunities for commercial development of recreation and tourist facilities.	• Some Sew reduction
5. HOUSING	• About 400 households would require temporary or permanent housing; most in-migrants would settle in Tok and Delta Junction.	• Considerable housing development would be needed to accommodate 300 new households.	• Substantial impacts similar to those from the Susitna Project would occur.	• Up to 300 would be r
6. COMMUNITY SERVICES	• Community services would have to be expanded considerably.	• Schools, sewer and water, police and fire, and health facilities and full-time personnel would need to be added.	• Substantial impacts similar to those from the Susitna Project would occur.	• Sewer, wat needed. Sc students bu
7. FISCAL STATUS	• Delta Junction would finance the costs of community expansion needs. The state would finance the costs of community expansion for Tok.	• Planning, financing and construction of added community services in Nenana would be funded by the town; in Healy such funding would be by the state.	• Improvements would be at expense of the Mat-Su Borough.	• Planning, fi would be f
8. TRANSPORTATION	• The impoundment would inundate portions of the Alaska Highway, a highway maintenance station, 3 gravel pits, 2 stream gaging stations, a pipeline, telephone line, lodge, and two communities (Dot Lake and "The Living Word" at Dry Creek).	• 10 miles of the Parks Highway, Alaska Railroad, and transmission line right-of-way would be inundated.	• Additional roads would be needed to access the site and traffic volumes would likely increase on these and other nearby road.	• Additional and traffic

IMPACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

	ALTERNATIVES			SUSITNA
	SNOW	CHAKACHAMNA	TOTAL NON-SUSITNA HYDRO	
	• Seward, Eastern Peninsula of Kenai Peninsula Borough.	• Tyonek and surrounding small communities.		• Trapper Creek, Cantwell, and Talkeetna.
r Creek would	• Peak construction in-migration would be 900 persons.	• Peak construction in-migration would be approximately 2,000 persons.	• The project would increase populations in a number of small communities; in some cases, the impacts would be substantial. Population impacts are likely to be underestimated because of little or no consideration to construction of ancillary facilities (roads, railroad, transmission lines) in addition, to greater populations due to increased access.	• Communities receiving major in-migration would include Trapper Creek, Cantwell, and Talkeetna Impacts are expected to peak in 1990.
idents' quality of	• Rapid growth impacts would alter residents' quality of life and the rural nature of the area.	• The project would interfere with the Native culture and subsistence activities of Tyonek and surrounding community residents.	• Impacts would be similar to Susitna and dispersed among a larger number of communities. Communities such as Dot Lake and Tyonek would experience potentially severe cultural and subsistence interference.	• The rural lifestyle of Trapper Creek, Cantwell, and (to a lesser degree) Talkeetna would be changed. Cantwell may experience increased cultural conflict.
unities for n and tourist	• Some Seward residents may be hired leading to a reduction in Seward's high umployment.	• Commercial operations would expand and diversify.	• Existing commercial establishments in most communities would experience an increase in business and some would expand. New opportunities related to tourism and recreation would be created in some areas and local residents from a few communities may find project-related employment.	• Some local residents would gain employment, resulting in minor reduction of unemployment. Some tourist, construction, and service-related industries would be created or expanded. Some guiding businesses would be displaced. Periods between peak employment could increase unemployment.
rom the Susitna	• Up to 300 housing units (permanent or temporary) would be needed.	• Considerable housing development would be required to accommodate the in-migration of 2,000 persons since little or no vacant housing is currently available.	• A small number of communities would require considerable housing development for permanent and / or temporary project-related in-migrants.	• Housing demand would require expansion in Talkeetna, Trapper Creek, Cantwell, and unincorporated Mat-Su Borough areas. Demand would be likely to exceed supply in the short-term.
rom the Susitna	• Sewer, water and other community services would be needed. Schools are likely to be able to absorb new students but more teachers would be needed.	• Sewer, water, fire, police and health facilities would have to be added. The Tyonek school would have to be expanded by 50%.	• Most communities would require an expansion of community services including sewer and water, police and fire, health facilities and personnel.	• Services would require expansion in Talkeetna, Trapper Creek, Cantwell, and unincorporated Mat-Su Borough areas. Most notable needs would be in schools, fire departments, police departments and health services.
f the Mat-Su	• Planning, financing, and construction costs for Seward would be funded by the city.	• Construction and planning of services would be funded by the Kenai Peninsula Borough.	• Funding for planning and construction of expanded community services would be required from many towns and cities while the state would incur costs for a number of unincorpoarated places.	• Responsibility for community service expansion would be with the towns, borough, or the state.
access the site ease on these and	• Additional roads would be needed to access the site and traffic volume would increase.	• Additional roads would be needed to access the site and traffic volumes would likely increase on these and other nearby roads.	• A number of new roads would be required to access the 5 hydro sites. Additionally, the inundation of miles of existing highway, railroad, pipeline and rights-of-way would require construction of new routes concurrent with proposed project construction. Generally traffic volumes would increase on all roads in and around impacted communities, several roads would likely reach capacity.	• All transportation modes and routes leading to the project area would be used more heavily. Only the highway junction at Cantwell the site access road junction with the Denali Highway, and the rail access junction and the main rail line could become conjested.

Table 4

COMPARISONS OF SOCIOECONOMIC RESOURCES AND IMPACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

Table 4-COMPARISONS OF SOCIOECONOMIC RESOURCES AND IMPACTS AMONG NO

SUBJECT	ALT			
	JOHNSON	BROWNE	KEETNA	
9. ASSUMPTIONS	• Peak construction work force = 300 Construction period = 7 years	• Peak construction work force = 200 Construction period = 4 years It is assumed that in the worse case only 75% of the construction work force would commute from Fairbanks.	• Construction work force = 200 Construction period = 4 years	• Construction v Construction p
10. COMMENTS	• During construction if there is no camp on-site housing, then severe impacts would occur in the area between Tok and Delta Junction. • The most serious impacts would be the inundation of two communities Dot Lake (population: 67) and "The Living Word" (population: 200). • A lodge may also be inundated. • The rapid growth impacts to Tok and Delta Junction would be exaggerated by road and pipeline work forces.	• Browne's location between Healy and Nenana would lead to construction and operation impacts mainly in those towns. • Due to the project's concurrence with Keetna construction (200 miles away) population impacts may be increased; shortages of supplies exacerbated, and supply routes (highway and railroads) may have difficulty with carrying capacity.	• In-migration would almost double existing population so impacts would be significant.	• Due to this pro construction (would increase supply routes difficulties wit

ALTERNATIVES				SUSITNA
	SNOW	CHAKACHAMNA	TOTAL NON-SUSITNA HYDRO	
	• Construction work force = 200 Construction period = 4 years	• Peak construction work force = 400 Construction period = 5 years		• Peak construction work force in 1990 = 3,500
sting population	• Due to this project's concurrence with Browne's construction (200 miles away) population impacts would increase, shortages of supplies exacerbated, and supply routes (highways and railroads) may have difficulties with carrying capacity.	• Tyonek would experience significant impacts from the in-migrating construction population. • Permits to construct roads to the site may be difficult to obtain from the Tyonek Native Corporation.		• Population impacts used in this comparison are those entitled "Applicant (Rev.)" in the DEIS. In March 1984 the applicant submitted revised projections that decreased the impacts on Talkeetna but increased impacts on Healy and McKinley Park.

Table 4

COMPARISONS OF SOCIOECONOMIC RESOURCES AND IMPACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

Table 5-COMPARISONS OF LAND USE AND IMPACTS AMONG NON-SUSITN

SUBJECT	ALT			
	JOHNSON	BROWNE	KEETNA	
1. LAND USE	• The land in and around the site is primarily forest, wildlife habitat, and recreation land with isolated settlements, mineral and gravel extraction areas, and transportation and utility corridors. These uses would be greatly impacted by the inundation of approximately 84,000 acres of land and by access into new areas opened by project roads, the transmission line corridor, and rerouting of the highway and pipeline. • Portions of the Alaska Highway and an oil pipeline, a highway maintenance station, 3 gravel pits, 2 stream gaging stations, a telephone line and 2 communities (Dot Lake and another at Dry Creek) would be inundated.	• The land at the site is being disposed by the state to private individuals for settlement and agricultural uses. Significant impacts would occur from increased development pressures, increased competition for recreation and wildlife resources and disturbance of the natural, remote setting due to new access by project roads and utility corridors. • Portions of the George Parks Highway and Alaska Railroad would be inundated along with approximately 5,000 acres of the Healy Agricultural Subdivision, other private tracts and at least one mining claim.	• The land in and around the site is state land used primarily for hunting and other recreation purposes. Lands to the west are settlement lands for disposal by the state as homesteads, subdivisions, and remote parcels. Impacts resulting from the project's access road and transmission line corridor would significantly impact these settlement areas by increasing traffic, recreation pressures on state lands, and by reducing the quality of the remote natural setting. • The inundation would remove 4,800 acres from their present uses. Few impacts would result from the dam and impoundment since the land is in state ownership.	• Access due to r would increase and wildlife res the forest land: highway. Appr removed from
2. LAND OWNERSHIP	• Land ownership at the site and through which access would occur includes state forest lands, Native lands, and private lands acquired from state land disposal programs.	• Land in and around the site is owned primarily by private individuals and the state which intends to transfer their lands to private ownership through disposed programs.	• The state owns the land at the dam and impoundment sites. The state and private individuals own the land to the west through which project roads and utilities would run.	• The land at the National Fores the transmissi ownership.
3. MANAGEMENT PLANS	• The inundation could greatly affect the management plans of the various landowners.	• Since the land has been, or is being disposed of, by the state for private use, project uses may be in conflict with those of a variety of private owners.	• The location of the project access roads and transmission corridor over disposal lands may create conflicts with private uses of those lands.	• National forest allowing for sc construction s

AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

	ALTERNATIVES			SUSITNA
	SNOW	CHAKACHAMNA	TOTAL NON-SUSITNA HYDRO	
te land used ation purposes. ls for disposal by , and remote roject's access ould significantly easing traffic, d by reducing ting. acres from their lt from the dam state ownership.	• Access due to new project roads and the reservoir would increase back country use, impacts on vegetation and wildlife resources, and affect the natural setting of the forest lands, particularly in areas closest to the highway. Approximately 2,600 acres of land would be removed from existing uses.	• The rugged terrain surrounding the site is used primarily for recreation including hunting. Increased access with roads and a transmission line corridor would significantly increase such uses of the area. • Since the project calls for a lake tap, a negligible amount of land would be required and overall land use impacts would be minimal.	• Access to recreation lands would be greatly increased leading to increased pressure on vegetation, wildlife resources, and the quality of the remote natural setting. Compared to recreation lands, the effects on settlement and agricultural lands would be significant. Also, a combined total of 115,640 acres would be lost from current uses.	• In the project area where dispersed recreation is the primary land use increased increased pressures from possible residential, commercial, and natural resources development and recreational activities could disturb vegetation and wildlife and fisheries resources. • Approximately 36,000 acres and 6 structures would be inundated with Watana; 7,900 acres with Devil Canyon. • The construction camps for the proposed dams and the temporary village and airstrip would cover approximately 425 acres.
nd impoundment s own the land to s and utilities	• The land at the site is federal land within the Chugach National Forest. However, nearby sites through which the transmission line would run are in private ownership.	• The land at the site is state land. Land to the east through which access roads and the utility lines would run include Native, borough and state lands.	• Land ownership is complex and varied at many sites particularly where access routes and transmission corridors occur. Difficulties could result when negotiating purchases or easements across private land.	• Lands at the dam and impoundment sites are owned by the state and various Native entities including the Cook Inlet Region Native Corporation.
ıds and nds may create nds.	• National forest are usually managed for multiple use allowing for some development which could include construction similar to that of the project.	• Due to the multiple ownership of lands through which the access roads and transmission line corridor would run, conflicts with management plans may occur.	• Where multiple ownership exists, particularly along access and transmission line routes, conflicts may occur with existing or intended management plans.	• Since land management plans for the project area call for multiple use and actual management is essentially passive, the project would not appear to present conflicts.

Table 5
COMPARISONS OF LAND USE AND IMPACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

Table 6-COMPARISONS OF CULTURAL RESOURCES AND IMPACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

SUBJECT	ALTERNATIVES						SUSITNA
	JOHNSON	BROWNE	KEETNA	SNOW	CHAKACHAMNA	TOTAL NON-SUSITNA HYDRO	
1. NUMBER OF KNOWN CULTURAL RESOURCES IN AREA	• None	• 50 +	• None	• Present but not quantified.	• None	• 50 +	• 250 +
2. LIKELIHOOD OF PREVIOUSLY UNKNOWN RESOURCES BEING DISCOVERED	• Very likely; numbers may exceed Susitna Project due to size of project and location near a major river corridor.	• Very likely; not quantifiable at this time.	• Very likely; not quantifiable at this time; probably fewer than Susitna.	• Very likely; not quantifiable at this time; probably fewer than Susitna.	• Possible, but fewer than at other sites.	• Likely to exceed those known at the Susitna site.	• Possible, but not likely.
3. SCOPE OF NEEDED ADDITIONAL IDENTIFICATION STUDIES	• Very large-scale field studies necessary.	• Large-scale field studies necessary.	• Large-scale field studies necessary.	• Large-scale field studies necessary.	• Moderate-scale field studies necessary.	• Major undertaking necessary, exceeding studies done for the Susitna Project.	• Only small-scale additional studies needed.
4. SCOPE OF NECESSARY MITIGATION	• Likely to exceed that required for the Susitna Project.	• Likely to be less than that required for the Susitna Project.	• Likely to be less than that required for the Susitna Project.	• Likely to be less than that required for the Susitna Project.	• Likely to be limited and much less than other sites.	• May exceed that required for the Susitna Project.	• Large-scale data program necessary.

Table 6

COMPARISONS OF CULTURAL RESOURCES AND IMPACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

Table 7 - COMPARISON OF RECREATION RESOURSES AND IMPACTS AMONG N

SUBJECT	A			
	JOHNSON	BROWNE	KEETNA	
RECREATION RESOURCES	• Tanana River heavily used for private and commercial boating. • Charter boat service located at Dot Lake. • Tanana River proposed by the State as a multiple-use river. • Tanana River supports moderate level of sport fishing. • Intensive fishing occurs in number of small lakes in project area. • Significant amounts of hunting in project area. • Numerous multiple-use trails throughout project area. • Alaska Highway (a portion of which within impoundment zone) is major tourist route.	• Nenana River heavily used for river travel and moderately used for recreational boating and fishing. • Parks Highway and Alaska Railroad are major tourist routes. • Developed recreation facilities within impounament area include trails, rest area, and scenic overlooks • Moderate levels of hunting, fishing, and hiking occur in project area. • Impoundment approximately 3 miles from Denali National Park boundary. • Three areas within project area are recommended as State recreation sites and reserve.	• Talkeetna River considered one of the finest white water rafting areas in State. • Talkeetna River used heavily (a portion of which is within impoundment zone) by charter boats. • Heavy fishing occurs in Talkeetna River and its tributaries. • Talkeetna River corridor receives significant amounts of hiking and hunting use. • Talkeetna River recommended as a State Recreation River.	• Project si • Area usec wildernes • Forest sei Lake witl • Seward H miles of c
RECREATION IMPACTS	• 94,500 acres of land used for big and small game hunting, inundated. • Increase demand on hunting and fishing resources due to increase in access to remote areas. • Fishing opportunities lost in Tanana River and lakes within the impoundment zone. • Potential new opportunities in the impoundment for subsistence fishing but not recreational fishery due to turbid water. • Salmon above the site that contribute to downstream fisheries may be lost. • Loss of Tower Bluff rapids and white water boating. • Loss of popular commercial and private boating resource and transportation corridor with charter boats on Tanana River. • Limited reservoir boating opportunities available due to wind, turbid water, and extensive drawdowns. • Loss of land used for dispersed recreational activities. • Tanana River, recommended as state multiple-use river will be inundated. • Inundation of portion of Alaska Highway and loss of related recreation activities such as camping, sightseeing, and wildlife viewing. • Increase in competition for existing facilities and demand for additional facilities due to project induced population.	12,500 acres of moderately used hunting areas, inundated. • Fishing opportunities lost in Nenana River. • Potential new opportunities in the impoundment for subsistence fishing but not recreational fishing due to turbid water. • Salmon above the site that contribute to downstream fisheries may be lost. • Popular intermediate level kayaking course inundated. • Loss of free flowing section of Nenana River which is intensively used for river travel by all boaters. • Limited reservoir boating opportunities available due to wind, turbid water, and extensive drawdowns. • Loss of land used for dispersed recreational activities. • Loss of recommended state recreation areas (June Creek, Bear Creek and Kobe Hill). • Loss of rest area on George Parks Highway. • Relocation of parts of George Parks Highway and Alaska Railroad eliminating existing views and providing views of project. Increase in recreation demand due to loss of existing facilities / areas and increase in project-induced population.	• 5,500 acres of heavily used moose hunting area inundated. • Increased demand on hunting and fishing resources due to increase in access to a remote area. • Fishing opportunities lost for salmon upstream of dam. • Existing fishery in the impoundment zone would be lost; potential replacement by reservoir may occur. • Salmon above the site that contribute to downstream fisheries may be lost. • Dam would block significant white water boating corridor. • Loss of existing popular commercial and private boating opportunities. • New boating opportunities possible on reservoir, but limited due to wind, turbid water, and drawdowns. • Loss of land used heavily for trail-related and dispersed recreational activities. • Inundation of Talkeetna River which is recommended as a State Recreation River. • Inundation of Disappointment Creek which is also recommended for protection. • Potential to substantially increase use of the area via air and road access. • Increased use of area due to increase in project-induced population.	• 3,200 acr inundatec • Increased to increas • Loss of fi no replac turbid wa • Loss of fc • New boat limited di • Intrusion National • Impacts t Railroad. • Potential access.

PACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

ALTERNATIVES				SUSITNA
	SNOW	CHAKACHAMNA	TOTAL NON-SUSITNA HYDRO	
: finest white n of which is r boats. er and its ificant amounts ate Recreation	• Project site located within Chugach National Forest. • Area used for hunting, camping, fishing, and wilderness hiking. • Forest service recreational cabin located on Paradise Lake within impoundment zone. • Seward Highway and Alaska Railroad pass within 3 miles of dam site.	• Project site located within Merrill Pass — a major air corridor to Lake Clark National Park. • Lake Chakachamna used as staging area for access to surrounding area for hiking, fishing, and hunting. • Heavy fishing use in McArthur and Chakachatna Rivers. • Waterfowl hunting in Trading Bay State Game Refuge.	• Heavy boating use on three rivers. • Projects in close proximity to three major highways, railroad, and a major air corridor. • Two rivers, one stream, and three recreation areas within project areas are recommended for State protection. • Projects cover large areas used for hunting and dispersed recreational activities. • One project within a National Forest and two near National Parks.	• Large area with low level of dispersed recreational use (due to remoteness). • Moderate amounts of boating use below Devil Canyon and above Vee Canyon. • Limited white water boating of Devil and Vee Canyon Rapids • Devil Canyon Rapids considered world class white water resource. • Low levels of fishing use in area streams and lakes • Scattered cabins along river corridor used for hunting and trapping. • Area receives moderate amount of use for hunting. • Two lodges within project area used for hunting and fishing.
nting area ing resources area. upstream of dam. zone would be ir may occur. to downstream ater boating nd private n reservoir, but d drawdowns. ted and dispersed is recommended which is also of the area via n project-induced	• 3,200 acres of moderately used moose hunting area inundated. • Increased demand on hunting and fishing resources due to increase in access to remote area. • Loss of fishing opportunities in lower Paradise Lake; no replacement by impoundment expected due to turbid waters. • Loss of forest service cabin located on Paradise Lake. • New boating opportunites possible on reservoir, but limited due to turbid waters, wind and drawdowns. • Intrusion on wilderness hiking experience in Chugach National Forest. • Impacts to views from Seward Highway and Alaska Railroad. • Potential to increase use of the area via increased access.	• Increase in hunting in Trading Bay State Game Refuge. • Increase in competition by hunters due to access to remote areas. • Fishing patterns altered due to changes in existing flow patterns and diversions. • Loss of boating potential in Chakachatna River. • Increased use to Lake Clark National Park by new access into wilderness. • Increased use of area due to increase in project-induced population.	• Loss of over 110,000 acres of hunting land, some heavily used. • New access to three remote areas increasing hunting pressure. • Fishing patterns altered at all sites. Some replacement may be possible by new impoundment; however, turbid reservoirs would reduce the opportunities. • Significant fishing areas lost. • Notable rapids lost on four rivers. Significant loss of white water boating on one river. • Impacts to boating opportunities on five rivers, significant impacts to boating on three rivers. • Loss of large areas of land used for land-based recreation. • Inundation of two rivers and one stream recommended for state protection and numerous small sites recommended for state recreation. • Impacts to sightseeing from three major travel roads, railroad, two National Parks, and one National Forest. • Substantial increase in recreation demand due to five projects in different areas of the state; project-induced population increases and proximity of sites to major travel routes.	• Loss of 46,00 acres of big game hunting area. • Increase in hunting and fishing pressure due to new access to remote area. • Existing fishery in the impoundment zone would be lost; some replacement may be possible; turbid reservoirs may reduce opportunities. • New access could decrease fishery resources by allowing over fishing of area streams and lakes. • Devil Canyon Rapids and Vee Canyon Rapids • inundated—significant white water boating opportunities. • Loss of potential river boating opportunities. • New opportunities possible on reservoir; but limited due to wind, turbid waters, and drawdowns. Loss of land used for dispersed recreational activities. • Increased in recreation demand due to new access and influx of people during construction and operation.

Table 7

COMPARISONS OF RECREATION RESOURCES AND IMPACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

Table 8-COMPARISONS OF AESTHETIC RESOURCES AND IMPACTS AMONG N

SUBJECT	JOHNSON	BROWNE	KEETNA	
AESTHETIC RESOURCES	• Moderate scenic value. • Alaska Highway corridor recommended by state for scenic protection. • High visual sensitivity due to presence of Alaska Highway in project area. • Notable scenic attractions include Tower Bluff Rapids.	• High scenic value. • Very high visual sensitivity due to presence of Parks Highway, Alaska Railroad, river use, and proximity to Denali National Park. • Segments of Parks Highway recommended for scenic highway designation. • Notable scenic attractions are Kobe Hill, a state recommended scenic trail, and numerous overlooks on Parks Highway.	• Moderate to high scenic value. • Moderate visual sensitivity due to use of Talkeetna River corridor and recent land disposals. • Talkeetna River proposed as a State Recreation River. • Notable scenic attractions include Sentinel Rock and Granite George.	• Very h • Modera Alaska of the a • Notabl Gorge,
AESTHETIC IMPACTS	• Project facilities and dam would be highly visible from Alaska Highway. • Transmission lines would be visible from highway and other views from Tanana Valley. • Shoreline erosion could be extensive due to openness and size of reservoir. Large mudflats would be visible from Alaska Highway and to other recreational users. • Ice fogging could reduce visibility in valley. • 210 foot dam and associated facilities would dominate the valley's visual character and strongly contrast with the surrounding landscape. • Crest length of dam would be 6,400 feet and would be highly visible. • Extensive cuts due to relocation of Alaska Highway would be visible. • Alaska highway has been recommended for scenic protection. • Tanana River has been recommended as a multiple-use river corridor that provides for protection of visual resources. • Tower Bluff Rapids, which is of notable scenic quality, would be inundated. • Land in Tanana Valley which has moderate scenic quality, would be inundated.	• Project facilities would be highly visible from Denali National Park, George Parks Highway, and Alaska Railroad. • Transmission lines would be visible from Denali National Park and Nenana Valley. • Extensive mudflats would be visible from Parks Highway and Alaska Railroad. • Additional visual impacts could occur due to relocation of existing transmission line. • 265 foot dam and associated facilities would dominate the valley's visual character and strongly contrast with the surrounding landsacpe. • Crest length of dam which is 3,000 feet would be highly visible. Cuts and fills from relocation of Parks Highway and Alaska Railroad would be visible. Portions of Nenana River have been reommended as a State Recreation River. Portions of George Parks Highway which has been recommended as a scenic highway, would be inundated. Dam abutment would be constructed on Kobe Hill, recommended as a scenic state trail and Public Recreation Reserve.	• Project facilities would be visible to significant numbers of river corridor users and recent land disposal owners in the area. • Transmission line would be visible along Talkeetna River. • Some slumping and beach erosion visible to local users. • 415 foot dam and associated facilities would inundate part of a highly scenic valley. • Talkeetna River and Disappointment Creek, recommended as scenic river corridors, would be inundated. • Notable scenic attractions of Sentinel Rock and Granite Gorge would be inundated.	• Project dam, w Alaska • Minor a • 90 mile highly s • 310 foo part of • Highly s inundat • Snow R • Visual i Wildern

ACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

	ALTERNATIVES			SUSITNA
	SNOW	CHAKACHAMNA	TOTAL NON-SUSITNA HYDRO	
of Talkeetna ls. ecreation River. tinel Rock and	• Very high scenic value. • Moderate visual sensitivity due to Seward Highway and Alaska Railroad passing close by and recreational use of the area. • Notable scenic attractions include the Snow River Gorge, Paradise Lakes, and Paradise Peak.	• High scenic value. • Moderate visual sensitivity due to site being within Merrill Poss air corridor. • Notable scenic attractions include Chakachatna River Canyon, Chakachamna Lake, and surrounding mountains.	• Three sites located in areas of high scenic value, two sites in areas of moderate to high scenic value. • Two sites located in areas of high visual sensitivity and three sites in areas of moderate visual sensitivity. • Project sites include a number of notable scenic attractions.	Moderate to high scenic value. • Moderate to low visual sensitivity due to limited recreational activities in areas accessed via plane, or boat. • Notable scenic attractions include Devil and Vee canyons, Deadman and Devil Creek falls, and Big and Deadman lakes.
gnificant cent land disposal ng Talkeetna ble to local users. would inundate Creek, , would be Rock and	• Project facilities, including transmission lines and the dam, would be visible from Seward Highway and Alaska Railroad. • Minor amount of erosion and mudflats visible to users. • 90 miles of transmission line would be constructed in highly scenic valleys. • 310 foot dam and associated facilities would inundate part of a scenic valley that is predominantly wilderness. • Highly scenic South Fork Snow Valley would be inundated. • Snow River Gorge would be inundated. • Visual impacts would occur in National Forest Wilderness Areas.	• Project facilities and transmission lines would be visible to recreational users and air traffic in a major air traffic corridor. • Some shoreline erosion and mudflats would be visible to users. • 50 miles of transmission line would be constructed in a highly scenic area where no lines currently exist. • A significant reduction in flow through Chakachatna River Canyon, would diminish the scenic appeal of the area.	• Views of project facilities and reservoirs would be extensive due to disturbance of four major travel routes. • 102,000 acres of land would be inundated in areas of moderate to high scenic value. • Approximately 280 miles of transmission corridor routed in areas with high visual sensitivity. • Significant visual impacts would occur due to relocation of existing travel routes and utilities. • Direct and indirect effects would occur to several areas of scenic value located along scenic corridors. • Direct and indirect effects would occur to several state and nationally significant areas.	• Project facilities, except transmission lines, would only be visible from project access road. Mudflats and beach erosion would be visible to users of reservoirs. • 3,800 acres of land would be inundated in areas of moderate scenic value. • Two dams (Devil Canyon – 646 foot high and Watana – 385 foot high) would be visible in a scenic canyon area and would contrast with the surrounding landscape setting. • Devil and Vee canyons would be partially inundated. • Deadmen Creek Falls would be inundated. • Construction of facilities in an area that is predominantly wilderness.

Table 8
COMPARISONS OF AESTHETIC RESOURCES AND IMPACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

Table 9-COMPARISON OF TERRESTRIAL RESOURCES AND IMPACTS AMONG NO

SUBJECT	A l			
	JOHNSON	BROWNE	KEETNA	
1. AREA INUNDATED OR AFFECTED (Acres)	98,160	• 13,090	• 6,140	• 4,110
2. MOOSE	• Approximately 1 moose/mi^2. Important year—round habitat especially winter range and calving area.	• Approximately 1—1.5 moose/mi^2. Important year—round habitat.	• Important year—round habitat.	• Important
3. OTHER BIG GAME	• Little use of the area by caribou except in severe winters. Dall sheep mainly present at higher elevations in surrounding mountains.	• Caribou frequent the foothills near impoundment. Dall sheep mainly present at higher elevations in surrounding mountains.	• Little use of the area by caribou—small localized herds. Dall sheep mainly at higher elevations in surrounding mountains. Increased access may result in long—term impacts on local wildlife populations.	• Caribou nc mainly at l Increased a local wildli
4. BLACK / BROWN BEAR	• Brown bear use in early spring. High use of valley bottoms by black bears.	• Important brown bear habitat in surrounding foothills. Low black bear use of area.	• Black bear use of flood plain area. Brown bear use of high altitude riparian communities. Intensive brown bear use of anadromous fish streams that would be blocked by project.	• Black bear high altitu
5. FURBEARERS	• Important riparian habitat along river and in wetland and forested areas within the flood plain.	• Important riparian habitat along river.	• Important riparian and forested habitats along river.	• Important floodplain.
6. RAPTORS / WATERFOWL	• Important nesting area for bald eagles, golden eagles, and red-tailed hawks. Four peregrine falcon nest locations (three active) along shoreline of impoundment area. Important waterfowl nesting, molting, and resting habitat. Major migration corridor.	• Little raptor or waterfowl data available.	• Bald eagle nesting area. Low waterfowl use.	• Bald eagle area.

›ACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

	ALTERNATIVES			SUSITNA
	SNOW	CHAKACHAMNA	TOTAL NON-SUSITNA HYDRO	
	• 4,110	• 1,870	• 123,370	• 57,620
	• Important spring, fall, and winter range.	• Important winter areas in riparian habitat above lake and in river drainages.	• Important year–round habitat (especially calving and wintering areas). Johnson project would substantially impact local moose population.	• Approximately 1.5 moose/mi ^{2}. Important year–round habitat especially winter range and calving area.
ll localized herds. ; in surrounding lt in long–term	• Caribou not present. Dall sheep and mountain goats mainly at higher elevations in surrounding mountains. Increased access may result in long–term impacts on local wildlife populations.	• Little caribou use of area. Dall sheep mainly at higher elevations north of the Chilligan River.	• Little use of area by caribou. Little use of areas by Dall sheep. Increased access may result in long-term impacts on local wildlife populations.	• Caribou spring and fall migration crossing area. Important site specific area for Dall sheep (ie. lick). Increased access may result in long-term impacts on local wildlife populations.
ɔwn bear use of ıtensive brown hat would be	• Black bear use of flood plain area. Brown bear use of high altitude riparian communities.	• High altitude riparian zones important to brown bear. High black bear use of riparian zone around lake and in river drainages. Brown bear seasonal specific use of drainage during salmon runs.	• No data on denning in areas. Keetna project will impact intensive brown bear use of critical salmon streams (eg. Prairie Creek). Lake Chakachamna project will impact brown bear use of Chilligan and Chakachatna Rivers salmon fisheries. All sites contain important year-round black bear habitat (especially riparian zones).	• Important year–round habitat for black bear including denning. Important spring habitat for brown bear.
ats along river.	• Important riparian habitat along river and on floodplain.	• Important riparian habitat around lake and along river.	• Important riparian habitat along rivers.	• Important riparian and forested habitats along river.
vl use.	• Bald eagle nesting area. Waterfowl nesting and molting area.	• Trumpeter swan nesting areas in drainages. Molting area for Tule white–fronted goose. Drainages in major migration corridor.	• Nesting locations at all sites for raptors (especially bald eagles). Peregrine falcon nest locations at Johnson site. Important waterfowl nesting and resting areas at Johnson and Lake Chakachamna sites. Trumpeter swan nesting areas associated with Lake Chakachamna project.	• Nesting locations for bald eagles, golden eagles, and goshawks. Low waterfowl use.

Table 9
COMPARISON OF TERRESTRIAL RESOURCES AND IMPACTS AMONG NON–SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

Table 10–COMPARISONS OF AQUATIC RESOURCES AND IMPACTS AMONG N

SUBJECT	JOHNSON	BROWNE	KEETNA	
1. ANADROMOUS FISH UPSTREAM OF IMPOUNDMENT / PROJECT SITE	• Chum salmon spawn as far upstream as the Chisana River; escapement figures unknown.	• Coho, chum, and chinook present; coho spawn in Panguingne Creek; escapement figures unknown.	Coho, chum, sockeye, and chinook present, spawning by chinook in Prairie Creek is extensive and supports a significant brown bear population for certain periods of the year. 2/	• No sp
2. ANADROMOUS FISH / IMPOUNDMENT ZONE	• Chum, coho, chinook present; chum spawning observed; escapement figures unknown.	• Coho, chum, and chinook present; escapement figures unknown.	• Chum and chinook spawn in Disappointment Creek and potentially the mainstem.	• Repor Paradi
3. ANADROMOUS FISH / DOWNSTREAM	• All five species utilize either downstream areas or tributaries.	• All five species utilize either downstream areas or tributaries.	• Chum spawn in mainstem immediately downstream of dam site; all five species utilize downstream areas or tributaries.	• Socke specie partic
4. UTILIZATION OF ANADROMOUS FISH	• Extensively and extremely important commercial, subsistence, and sport fisheries in the lower Tanana and Yukon rivers. 4/	• Extensive and extremely important commercial, subsistence, and sport fisheries in the lower Tanana and Yukon rivers. 4/	• Significant and highly important sport and commercial fisheries in the lower Talkeetna and lower Susitna rivers and Cook Inlet.	• Signif fisher
5. POTENTIAL IMPACTS OF PROJECT ON ANADROMOUS FISH	• Loss of spawning and rearing areas by inundation. • Disruption of upstream and downstream passage. • Changes in downstream spawning and rearing habitat. • Loss of chum salmon resource upstream of site.	• Disruption of upstream and downstream passage. • Changes in downstream spawning and rearing habitat. • Loss of chum salmon resource upstream of site.	• Loss of spawning and rearing habitat by inundation. • Disruption of upstream and downstream passage. • Changes in downstream spawning and rearing habitat. • Loss of chum salmon resource upstream of site.	• Tenta passa • Tenta inund • Chan

1/ This matrix only considers anadromous salmon—resident species are discussed in the text. Distributions for the anadromous species are taken from the Alaska Department of Fish and Game's Anadromous Waters Catalogue (1983).
2/ Source : Bentz, Jr., R. W. 1982. Inventory and cataloging of the sport fish and sport fish waters in upper Cook Inlet, Table 8, page 102.
3/ Source : Bechtel Civil and Minerals, Inc. 1983. Chakachamna hydroelectric project interim feasibility assessment report.
4/ Source : Alaska Department of Fish and Game, 1983. Annual Management Report 1983 — Yukon area. Division of Commercial Fisheries.

'ACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT [1]

	ALTERNATIVES			SUSITNA
	SNOW	CHAKACHAMNA	TOTAL NON-SUSITNA HYDRO	
resent, spawning ve and supports a · certain periods	• No spawning above impoundment zone.	• Large numbers of sockeye spawn in tributaries above the site; escapement estimated at 40,000 adults. [3]	• Salmon found upstream of all sites (except Snow). Highly significant numbers are known to exist upstream of Keetna and Chakachamna sites.	• None recorded; passage essentially prevented by Devil Canyon.
intment Creek	• Reports indicate that sockeye are present in lower Paradise Lake (see text for details).	• Some sockeye spawning areas could be within the drawdown zone; juvenile sockeye use Chakachamna for rearing.	• Salmon present in all impoundment zones; Johnson and Keetna impoundments encompass known spawning sites.	• None except for a few chinook; passage to this area is essentially prevented by Devil Canyon.
ly downstream of stream areas or ·	• Sockeye and coho spawn in lower Snow River; all five species utilize either downstream areas or tributaries, particularly in the Kenai River.	• All five salmon species utilize downstream areas in either the Chakachatna or McArthur Rivers. Total number of adults in these rivers are approximately 60,000.	• All sites have significant salmon habitat downstream.	• All species utilize either downstream areas or tributaries.
t and commercial ɔwer Susitna	• Significant and highly important sport and commercial fisheries in the Kenai River and Cook Inlet.	• Believed to be significant and important to sport and commercial fisheries downstream and in Cook Inlet.	• Salmon from all sites potentially contribute to significant and highly important commercial fisheries and in some cases to highly important sport (e.g., Kenai River) and subsistence fisheries.	• Significant and highly important sport and commercial fisheries in lower Susitna and Cook Inlet; no contribution by area upstream of Devil Canyon.
by inundation. ːam passage. l rearing habitat. am of site.	• Tentative disruption of upstream and downstream passage (see text for clarification) • Tentative loss of spawning and rearing habitat by inundation. • Changes in downstream spawning and rearing habitat.	• Loss of spawning and rearing habitat by impoundment level changes. • Disruption on upstream and downstream passage, particularly for diversion from one river system to another. • Extensive changes in downstream spawning and rearing habitat.	• Loss of significant spawning and rearing habitat by inundation. • Disruption of upstream and downstream passage. • Extensive areas of downstream spawning and rearing habitat changed. • Loss of chum salmon resource above Johnson, Browne, and Keetna sites.	• Changes in downstream rearing and spawning habitat.

Table 10
COMPARISONS OF AQUATIC RESOURCES AND IMPACTS AMONG NON-SUSITNA HYDRO ALTERNATIVES AND THE SUSITNA PROJECT

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric

LOCATION IN DEIS: Vol 1 Page 1-30 Section 1.3.2 Paragraphs 2 and 3 of page

COMMENT IN REFERENCE TO: Selection of non-Susitna hydro alternatives

TECHNICAL COMMENT: The justification for including the Johnson Project in the alternative hydro scenario is not apparent. The DEIS states that it is "appropriate to consider the 18 sites that remained after the Applicant's fourth iteration." DEIS Table 1-16, which summarizes the results of the screening process, indicates that only 10 sites passed the screening (not 18) and that the Johnson site was not included in these 10 sites. Johnson was eliminated in the fourth iteration.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric

LOCATION IN DEIS: Vol 1 Page 1-30 Section 1.3.2 Paragraph 3 of page

COMMENT IN REFERENCE TO: Construction costs used for the non-Susitna hydroelectric alternatives

TECHNICAL COMMENT: Referring to DEIS Table 1-18, the estimated costs in the table are those developed by Acres in 1980 (updated to 1982 costs), during the screening process. These costs are comparable to those on DEIS Table 1-14 (i.e. Watana at a cost of $1860 million) and should not be compared to Watana at $4062 million (see Table 1-15) as FERC Staff has done in their analysis. Also, the cost for Chakachamna of $905 million is lower than previously reported. These costs would increase by a factor of 2 or 3 if the same unit prices used by the Applicant for the Proposed Project were used to estimate the costs of the alternative hydro developments. In addition, the installed capacity and average annual energy values shown in DEIS Table 1-18 differ from those shown in Table E.10.13 and Table D.18 of the License Application.

See Appendix II of this document for further discussion of the cost comparison.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Hydroelectric, Alternatives, Construction Cost, Energy Production

LOCATION IN DEIS: Vol 1 Page 1-30 Section 1.3.2 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Estimated total cost, installed capacity, and average annual energy of hydroelectric alternatives

TECHNICAL COMMENT: There is no apparent basis for the 1982 costs presented in the DEIS; all are considered to be unrealistically low, giving the false impression that the non-Susitna hydro alternatives considered in the DEIS may have an economic advantage over Susitna. A reasonable 1982 level cost evaluation, based on a common escalation of 1981 prices evaluated in the Development Selection Report (Acres 1981), is presented in Appendix II of this document. This cost evaluation (Table 10) shows the alternative hydro projects to be much more expensive than Susitna.

The installed capacities and energy production of the hydro alternatives presented in Table 1-18 are incorrect. The installed capacities of Chakachamna and Snow are 33 MW and 37 MW less, respectively, than shown in DEIS Table 1-18.

The energy production and seasonal regulation of flows by the alternative hydro projects will be limited by the low summer demand coupled with high minimum flow requirements. When the five alternative hydro projects are considered as a system, their average annual energy production is 21% less than that estimated by HEC-5 in the DEIS. The following table should be used to revise Table 1-18 of the DEIS.

Alternative Investigated	Total Installed Capacity of Alternative (MW)	Average Annual Energy of Alternative (GWh)
Johnson	210	423
Chakachamna 1_/	300	1,152
Snow	63	266
Keetna	100	429
Browne	100	444

1_/ Alternative D (Bechtel 1983)

The dependable capacity of the alternative hydro projects will also be severely hampered by the high minimum summer flow requirements. For example, the Chakachamna dependable capacity, as estimated by the Applicant, is only about 110 MW.

Documentation of the foregoing is presented in Chapter 9 of Appendix II of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 2-13 Section 2.1.9 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Air quality permits required for the proposed project.

TECHNICAL COMMENT: The list of required air quality permits described in the DEIS is not correct. The EPS no longer conducts air quality permitting in Alaska. All air quality permitting in the state is conducted by the Alaska Dept. of Environmental Conservation, under the Alaska Administrative Code, Title 18, Chapter 50. Construction of the Watana dam would require compliance with the following.

- Permit to Operate, in accordance with 18 AAC.50.300 (a) (1);
- Prevention of Significant Deterioration (PSD) review, in accordance with 18 AAC.50.300 (a) (6).

The list of permits on page 2-13 of the DEIS should be revised to reflect these changes.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Coal Plants

LOCATION IN DEIS: Vol 1 Page 2-39 Section 2.4.1 Paragraph 8 of page

COMMENT IN REFERENCE TO: Specifications for coal-thermal units are not complete.

TECHNICAL COMMENT: The DEIS does not describe the proposed coal-fired power plants in enough detail to allow the reader to assess the technical, environmental and economic feasibility of this alternative. The following engineering data should be provided in the FEIS. These engineering issues are discussed in Appendix III of this document.

1. How the coal will be transported from the mines to the power plants.

2. For fugitive dust calculations, how large the coal stockpiles will be.

3. The quantity of fly ash/bottom ash that will be produced, and where it will be disposed of.

4. What the quality of the coal to be used is. Whether or not the coal quality will be constant for the life of the project.

5. The quantity of lime/limestone to be used in the SO_2 scrubber, its source and how it will be transported, stored, and processed.

6. The quantity of spent limestone/sulfur sludge that will be generated, and how it will be diposed of.

7. How NOx emissions will be controlled.

8. For prevention of ice fog formation, how the water vapor from the cooling towers and boiler emissions will be controlled.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Coal Plants, Natural Gas Plants

LOCATION IN DEIS: Vol 1 Page 2-39 Section 2.4.1 Paragraph 8 of the page

COMMENT IN REFERENCE TO: Coal unit parameters and costs

TECHNICAL COMMENT: The FEIS should provide a much more detailed description of the thermal power plants. Many of the environmental impacts of the plants will depend on the specific units and operations used. A detailed description of the gas-fired and coal-fired plants is provided in Appendix III of this document. The expanded project descriptions in the FEIS should address the key points noted in Technical Comment ALT006.

As discussed in Technical Comment ALT015, it is possible that the SO_2 control efficiency that would be required to meet BACT will require use of a wet limestone SO_2 scrubber instead of the dry scrubber assumed in the DEIS. The FEIS should therefore describe both the dry SO_2 scrubber and the wet limestone scrubber. The FEIS should also provide a cost comparison of the two SO_2 scrubber types.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Coal Plants, Natural Gas Plants

LOCATION IN DEIS: Vol 1 Page 2-39 Section 2.4.1 Paragraph 8 of the page (Table 2-5)

COMMENT IN REFERENCE TO: Additional input data required to interpret Table 2-5

TECHNICAL COMMENT: The FEIS should discuss the engineering assumptions that are needed to interpret the economic data in Table 2-5 and Appendix Table G-8. The economic analyses and the environmental impacts of the coal-fired power plant alternatives depend very strongly on the engineering assumptions used. The final FEIS should discuss the topics listed below, many of which are addressed in detail in Appendix III of this document.

1. The cost and environmental impacts of the coal-fired power plants will depend on the long-term coal quality. The FEIS should present data comparing the coal quality of the major coal fields in the central Alaskan region. The following coal properties should be discussed: coal reserves; heat content; ash content and sulfur content (See Technical Comment ALT079). See Appendix III of this document for a description of coal quality.

2. The SO_2 and NOx control equipment used in the economic analyses are based only on meeting the Federal New Source Performance Standards (NSPS) for those pollutants. The NSPS are in fact the minimum allowable levels of control. The required levels of emission control would actually be specified by the Alaska Department of Environmental Conservation (ADEC) during the Best Available Control Technology (BACT) analysis that is required for the PSD permit for the plants. The BACT

requirement for SO_2 control efficiency has not yet been established by ADEC (MacClarence, 1984). It will not be established until a PSD permit applicant submits a detailed cost effectiveness analysis for various pollution control equipment. It could require more than the 70% controls assumed in the DEIS (See Technical Comment ALT015). The SO_2 control equipment needed to comply with a more stringent BACT requirement may well be more complex and expensive than would the dry SO_2 scrubbers specified in the DEIS. ADEC would decide whether the reduction in SO_2 emissions attained by switching to wet limestone scrubbers would justify their higher cost. The engineering and economic aspects of more stringent SO_2 and NOx control requirements should be addressed in the FEIS. See Appendix III of this document for a technical description of wet limestone SO_2 scrubbers.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric

LOCATION IN DEIS: Vol 1 Page 2-41 Section 2.5.1 Paragraph 1 of the page

COMMENT IN REFERENCE TO: Site descriptions and available information on alternative hydro sites.

TECHNICAL COMMENT: Although the information that is available for the Browne, Johnson, Keetna and Snow sites is less detailed than for the Chakachamna (and Susitna) site, there is sufficient information to reject these sites compared to the Proposed Project site. The Power Authority has detailed this information in Appendix II of this document. This Appendix provides the rationale for the rejection by the Power Authority of the non-Susitna hydro alternatives proposed by the DEIS and establishes that they should not be preferred alternatives to the Proposed Project.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Hydroelectric, Alternatives

LOCATION IN DEIS: Vol 1 Page 2-41 Section 2.5.1 Paragraph 3 of the page (Figure 2-20)

COMMENT IN REFERENCE TO: Project layout for Chakachamna

TECHNICAL COMMENT: The recommended project layout (Bechtel 1983, Recommended Layout E) is not reflected in the DEIS figure. A significantly higher total construction cost and cost per kilowatt will be realized by the recommended plan because of the inclusion of both an embankment dam and fish transfer facilities involving a 930-ft long approach channel and a 3,000-ft long transfer tunnel between Lake Chakachamna and the Chakachatna River. In addition, regulation of minimum discharge to the Chakachatna River will result in a lower installed capacity than originally intended, from 500 MW to 330 MW. This recommended design was a part of the License Application, and is discussed further in Appendix II of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Transmission Lines and Corridors, Impacts

LOCATION IN DEIS: Vol 1 Page 2-45 Section 2.5.3

COMMENT IN REFERENCE TO: Discussion of transmission lines for alternative plant sites.

TECHNICAL COMMENT: In general, the alternatives discussion lacks detail regarding the siting and construction of the transmission lines. Such lack of detail makes it difficult to adequately evaluate and compare impacts of the alternatives to the Proposed Project.

Refer to maps and text of Appendix II of this document for more information.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Hydroelectric, Alternatives, Transmission Lines and Corridors

LOCATION IN DEIS: Vol 1 Page 2-45 Section 2.5.3 All Paragraphs

COMMENT IN REFERENCE TO: Required transmission for non-Susitna hydroelectric alternatives

TECHNICAL COMMENT: The section discusses transmission alternatives for the non-Susitna hydro sites to existing substations in the vicinity of either Anchorage or Fairbanks, or to the "Intertie". The DEIS does not discuss in detail (or include in the construction costs) the Intertie upgrading needs for handling the alternative hydro generation. Examination of the issue by the Applicant indicates that Intertie upgrading needs are comparable to those required for Susitna both in extent and construction cost. Inclusion of transmission costs and Intertie upgrading costs, which are omitted in the DEIS, would have a significant effect on the economics of the non-Susitna hydroelectric alternatves. See Appendix II of this document for a discussion of the non-Susitna hydro transmission requirements.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Transmission Lines and Corridors, Alternatives, Hydroelectric

LOCATION IN DEIS: Vol 1 Page 2-45 Section 2.5.3 Paragraph 6 of page

COMMENT IN REFERENCE TO: Transmission line distance of Browne and Keetna sites.

TECHNICAL COMMENT: The distances given in the DEIS (5 and 20 miles) for connecting the Browne and Keetna transmission lines to the Intertie are reversed. The FEIS should state that Browne is 20 miles and Keetna is 5 miles from the Intertie.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Transmission Lines and Corridors, Alternatives

LOCATION IN DEIS: Vol 1 Page 2-46 Section 2.5.3 Paragraph 2 of page

COMMENT IN REFERENCE TO: Transmission lines related to gas-fired combined-cycle and combustion turbine units.

TECHNICAL COMMENT: Applicant's studies assumed that gas-fired combustion turbine units would be located in metropolitan areas and, thus, would utilize existing transmission and distribution facilities. However, such is not the case for combined-cycle plants. These plants are larger, would be located in remote areas, and would require new transmission lines of varying lengths. The impacts of the lines, regardless of their lengths, could be significant relative to social/cultural resources. These lines would present visual impacts and potential land use and ownership conflicts. New access created by the lines could also lead to resource degradation through overuse.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Coal Plants

LOCATION IN THE DEIS: Vol 1 Page 2-46 Section 2.7.2 Paragraph 7 of page

COMMENT IN REFERENCE TO: "No air quality mitigations would be required..."

TECHNICAL COMMENT: The DEIS states that no additional SO_2 or NOx controls would be required for coal-fired power plants of up to two units. The DEIS has assumed that the required SO_2 and NOx controls would be established by the Alaska Department of Environmental Conservation (ADEC) after a detailed Best Available Control Technology (BACT) analysis. The BACT analysis is part of the PSD permit application, and is a site-specific cost-effectiveness evaluation. The PSD applicant would provide ADEC with detailed cost estimates for various levels of pollutant control. For each permit application, ADEC would decide what level of control is technically and economically feasible.

There have been no PSD permits in Alaska for coal-fired power plants, so no BACT requirements for SO_2 control at power plants have been established (MacClarence, 1984). However, it is likely that BACT would require more than the 70% SO_2 control (the NSPS level) that was assumed in the DEIS.

ADEC has recently demonstrated that BACT can be much more stringent than NSPS. ADEC reviewed a BACT analysis for SO_2 control at the Tesoro oil refinery at Nikinski. Tesoro proposed installing SO_2 equipment for 98.5% SO_2 control. At that control level the NSPS limits would be met, and the ambient SO_2 would consume roughly 25% of the available PSD Class II increment. However, ADEC ruled that the 25% incremental consumption was unacceptable. Based on the BACT analysis, ADEC ruled that the proposed 98.5% SO_2 control (the NSPS level) was unacceptable and imposed a 99.90% SO_2 control requirement.

Based on the example of the Tesoro refinery, it is clear that ADEC could impose a BACT SO_2 control requirement that would be more stringent than the 70% controls that were assumed in the DEIS. The FEIS should therefore discuss the SO_2 control techniques that would be used to meet a more stringent BACT requirement. Appendix III of this document discusses the engineering aspects of wet limestone SO_2 scrubbers.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Coal Plants

LOCATION IN DEIS: Vol 1 Page 2-46 Section 2.7.2 Paragraph 8 of the page

COMMENT IN REFERENCE TO: The high NOx and SO_2 mitigation costs are not presented.

TECHNICAL COMMENT: The DEIS indicates that the very significant air quality and visibility degradation impacts caused by SO_2 and NOx emissions can be mitigated by installing more efficient scrubbers on the power plants. The DEIS should therefore also address the technical, economic and environmental problems associated with air pollution control on coal-fired power plants operating in severe northern climates (see Comment ALT007).

Specifically, the FEIS should discuss the following topics to allow a thorough comparison of alternatives.

1. Reducing SO_2 emissions below the levels specified in the DEIS would probably require use of more complex and more expensive wet limestone type scrubbers, rather than the dry scrubbers assumed in the DEIS.

2. The wet limestone scrubbers would generate a calcium sulfate sludge that would be expensive and difficult to dispose of during the winter.

3. Disposal of the fly ash and scrubber sludge would create possible environmental problems.

4. The high-efficiency particle control devices and SO_2 scrubbers would consume a significant fraction of the power plant electrical capacity, and would add to the scheduled and forced outages.

5. A detailed comparison of the capital and operating expenses associated with increased SO_2 and NOx control should be presented. The costs of SO_2 scrubber sludge disposal must be addressed.

6. The proposed methods for reducing NOx emissions to below the NSPS levels must be described.

These issues are discussed in Appendix III of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Hydroelectric, Alternatives, Flow Regime

LOCATION IN DEIS: Vol 1 Page 2-47 Section 2.7.3 All paragraphs

COMMENT IN REFERENCE TO: Minimum flows for the alternative hydro sites

TECHNICAL COMMENT: The specified minimum flow requirements will severely impact the economics and operation of the non-Susitna hydro alternatives. Refer to Appendix II of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Flow Regime

LOCATION IN DEIS: Vol 1 Page 2-47 Section 2.73 Paragraph 3 of page (Table 2-7)

COMMENT IN REFERENCE TO: Inconsistency between flows proposed in the economic model versus those presented in Table 2-7.

TECHNICAL COMMENT: The DEIS should clarify which flow regimes were used for the economic analysis for the Susitna and non-Susitna hydro alternatives. On page 1-22, Paragraph 7, the DEIS indicates that Case C (Exhibit B, Table B.54) minimum flows were used in the analysis of the Proposed Project output. However, on page 1-30, paragraph 3, the DEIS indicates that the average annual energy of the alternative sites was based on historic streamflow data for each river basin, along with "appropriate minimum flow criteria for fishery habitat maintenance". These "appropriate minimum" flows are not presented nor are they referenced on DEIS page 1-30. However, the minimum flows are presented in Table 2-7 and the text on page 2-47 paragraph 3 states that these values were used in the economic analysis.

The difficulty arises in that the values presented in Table 2-7 for minimum flow for Susitna for the summer (18,000 cfs) and other months (2,700 cfs) are not the Case C scenario values. The Case C flows are lower in summer (12,000 cfs) and higher in other months (5,000 cfs) than the flows in Table 2-7. Therefore, it is unclear whether the DEIS used the Case C scenario or the values on Table 2-7 for its economic analysis of the Proposed Project.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Mitigation, Salmon, Alternatives, Hydroelectric

LOCATION IN DEIS: Vol 1 Page 2-47 Section 2.7.4 Paragraph 5 of page

COMMENT IN REFERENCE TO: Mitigation for alternative hydro sites

TECHNICAL COMMENT: Mitigation for impacts to fisheries resources will most likely be required for all of the non-Susitna hydro alternatives, not only for the Keetna and Chakachamna sites as stated in this section. The details of the Applicant's evaluation of impacts and potential mitigation for those resources at all sites are provided in Appendix II of this document and summarized below.

1. The Johnson project would inundate chum salmon spawning areas and would block upstream migrations for chum, chinook, and coho salmon (ADF&G 1983i). Mitigation for impacts to these species are generally required. This requirement would most likely be that a fish passage facility be incorporated into the dam design. The effectiveness of such a facility is uncertain, especially for chum salmon. On a worst-case basis, all of these fish would be lost. If fish passage were not required, it would only be because that loss would be mitigated by some other means. Resident fish habitat in rivers and lakes within the impoundment zone would also be lost and mitigation would probably be required.

2. Adult coho, chum, and chinook salmon migrate upstream of the Browne damsite (ADF&G, 1983i) and would be blocked by the Browne dam. Therefore, fish passage facilities may be required as part of the mitigation plans for this project. The success of such facilities is uncertain. On a worst-case basis, all anadromous species upstream of the site would be eliminated. Existing resident fish habitat in rivers and lakes within the impoundment zone would be lost.

3. There is some uncertainty whether or not salmon migrate upstream of the Snow River site. The uncertainty arises primarily because of a potential blockage caused by a velocity barrier which may exist just downstream from the damsite (McHenry 1984). On a reasonable worst-case basis, fish passage facilities would be needed.

   Existing fish habitat for grayling and rainbow trout in Lower Paradise Lake, which lies within the inundation zone, would be eliminated.

4. The Keetna reservoir would inundate chum and chinook spawning habitat and block the passage of chinook, chum, coho and sockeye salmon to and from upstream spawning areas. The anadromous fish resources above the dam are significant not only to the downstream fisheries but also for the extensive utilization (particularly of chinook salmon) in Prairie Creek by brown bears. The success of fish passage facilities for this high-head dam is uncertain. On a worst-case basis, none of the fish would successfully pass through these facilities.

5. At the Chakachamna site, the potential loss of 40,000 adult sockeye upstream of the damsite is highly significant. Fish occurring downstream of the damsite and in the McArthur River could also be impacted, particularly by the diversion of water from one river system to another. The population estimate for these fish is approximately 64,000 (see attached tables). Overall, the number of adult spawning salmon that could be directly affected by this project is over 100,000.

1982 SUMMARY

Estimated Chakachamna Salmon Escapement by Waterbody and Drainage

	Chakachatna River		McArthur River	
Species	Upstream of Damsite	Downstream of Damsite	River Drainage	Total
Sockeye	41,357	2,280	34,933	78,570
Chinook	---	---	2,107	2,107
Pink	---		19,777	19,777
Chum	---		29	29
Coho	---		4,729	4,729
Overall Total	41,357	2,280	61,575	105,212

Source: Bechtel 1983

Summary of estimated salmon escapement by waterbody and drainage for 1982.

	CHAKACHATNA RIVER DRAINAGE								
Species	Straight Creek Mouth	Chakachatna Bridge Side Channels and Sloughs	Chakachatna Canyon Sloughs	Chakachatna Tributary (C1)	Igitna River	Chilligan River	Straight Creek	Straight Creek Clearwater Tributary	Drainage Total
Sockeye Salmon	203	1,193	392	238	2,781	38,576	0	254	43,637
Chinook Salmon	0	0	0	0	0	0	0	1,422	1,422
Pink Salmon	0	59	279	0	0	0	0	7,925	8,263
Chum Salmon	152	1,482	121	165	0	0	0	0	1,920
Coho Salmon	76	1,560	608	183	0	0	0	172	2,599

	MCARTHUR RIVER DRAINAGE			Streams					
Species	McArthur Canyon	Stream 13X	Stream 13U	12.1	12.2	12.3	12.4	12.5	Drainage Total
Sockeye Salmon	666	5,416	1,213	16,711	6,085	2,512	2,328	0	34,933
Chinook Salmon	0	452	1,633	0	22	0	0	0	2,107
Pink Salmon	60	4,225	5,402	8,499	1,566	4	18	3	19,777
Chum Salmon	1	0	23	4	0	0	1	0	29
Coho Salmon	1,182	1,378	32	2,000	46	89	0	0	4,729

Source: Bechtel 1980

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Thermal, Alternatives, Visual Impacts

LOCATION IN THE DEIS: Vol 1 Page 2-48 Section 2.7.8 Paragraph 5 of the page

COMMENT IN REFERENCE TO: Power plant plume mitigations

TECHNICAL COMMENT: The DEIS states that potential degradation of visual resources caused by the visible plumes from the thermal power plants will be controlled by using "state of the art" emission control devices. Such devices would have the following impact on the thermal power alternatives:

1. Sophisticated emission controls could add significantly to both the capital costs and operating costs of the thermal power alternatives.

2. The emission control devices could reduce the net generating capacity of the power plants and can add to the scheduled and non-scheduled downtime of the plants.

3. The dry SO_2 scrubbers that were assumed in the DEIS would only provide approximately 70% SO_2 removal, which probably would not be an acceptable level for ADEC. Additional SO_2 reduction beyond the 70% control assumed in the DEIS might require switching to wet limestone scrubbers. These wet scrubbers would generate sludges that would have to be disposed of in an environmentally acceptable manner.

The engineering and environmental problems associated with sophisticated pollution control equipment are discussed further in Appendix III of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Climate

LOCATION IN THE DEIS: Vol 1 Page 3-4 Section 3.1.2.1 Paragraphs 5 and 6 of the page

COMMENT IN REFERENCE TO: Lack of data on seasonal variations to support conclusions

TECHNICAL COMMENT: The information presented in this section should support the conclusions of Chapter 4, Environmental Impacts. Although some information is presented in Appendix G, no reference is made in the text. It is unclear whether the DEIS included data on extreme and normal meteorological parameters, the occurrence of extreme inversions, the representativeness of available data, and the effects of the surrounding topography. Additional data on wind speed and direction are also required to evaluate the power plant impacts. The required meteorological data are given in Appendix III of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Impacts

LOCATION IN DEIS: Vol 1 Page 3-53 Section 3.2.2 Paragraph 8 of the page

COMMENT IN REFERENCE TO: Microclimatic differences in the data are not addressed. Onsite data are not utilized.

TECHNICAL COMMENT: Although the distances between the alternative sites are small, microclimatic differences in wind speed, wind direction and air pollution potential could be significant. The DEIS should consider the differences in site-specific data available in the Processed Climatic Data for the Watana and Devil Canyon stations (R&M 1982j-1982m).

Pre-operational related impacts will vary by construction level-of-effort. The DEIS should consider impacts from site-specific construction activities.

Site specific climatic factors have been used by the Applicant to estimate the air quality impacts of the thermal power plants. See Appendix III of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 3-58 Section 3.3.2.2 Paragraph 4

COMMENT IN REFERENCE TO: Additional data on background air quality are needed.

TECHNICAL COMMENT: The DEIS does not sufficiently describe the existing background concentrations of key pollutants (e.g. SO_2 and NO_2) that are important in evaluating the air quality impacts of the thermal electrical generating alternatives. The following data should be addressed in the FEIS:

1. The average values and seasonal variations of background NO_2 and SO_2 near the proposed power plant sites.

2. The seasonal fluctuations in the background concentrations related to climate (e.g. inversions).

3. For those pollutants for which no onsite background concentrations have been measured, the "typical" referenced background values applicable for pristine areas.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Climate

LOCATION IN DEIS: Vol 1 Page 3-62 Section 3.4.2.1 Last paragraph of the page

COMMENT IN REFERENCE TO: "These locations...should have similar climatic features as the proposed Susitna project area."

TECHNICAL COMMENT: This statement is questionable. Although the range of temperatures between the Proposed Project and the alternative locations is similar, the climate at Willow and Nenana can be expected to be quite different from the climate at the Susitna site, primarily because of topographic considerations. Both Nenana and Willow are in flat north-south floodplains. The Susitna sites are in a narrow east-west confining valley. The DEIS should consider patterns of precipitation, wind, and potential for air quality impact that are a consequence of site specific climatology.

The section on air quality should include values of background data. These data will be useful for the air quality impact analysis.

Meteorological data for various locations along the Railbelt are given in Appendix III of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric

LOCATION IN DEIS: Vol 1 Page 3-65 Section 3.5.1.1 Paragraph 1 of the page

COMMENT IN REFERENCE TO: Johnson alternative description

TECHNICAL COMMENT: There are inconsistencies in the text regarding the Johnson site location description. The DEIS states that the site is on the Johnson River. This is incorrect. The damsite is located on the Tanana River just downstream from the confluence of the Tanana and Johnson Rivers as it is correctly presented on page xxiv of the DEIS Summary. The description on page xxiv should be used throughout the DEIS to avoid confusion.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 3-66 Section 3.5.2 Paragraph 1 of the page

COMMENT IN REFERENCE TO: "...should have similar climate, air quality, and noise features as the Susitna project area."

TECHNICAL COMMENT: The locations of the alternative hydro and thermal sites range from the Kenai Peninsula to over 300 miles inland. The sites are located in two different climatic regimes, and in numerous topographical settings. The final EIS should address climatic differences between the possible hydroelectric sites and power plant sites.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Water Quantity, Alternatives

LOCATION IN DEIS: Vol 1 Page 3-66 Section 3.5.3 Paragraph 2 of the page (Table 3-11)

COMMENT IN REFERENCE TO: Inconsistency in numbers presented for flow

TECHNICAL COMMENT: The flow data presented in Table 3-11 is inconsistent with that of Table 2-7. On Table 2-7, minimum flows for the various alternatives were presented based on a historical Q90 value for summer and 30% of the mean annual flow for other months. The same Q90 values are presented for Table 3-1. However, the flows are not always the same for each site as those presented in Table 2-7. For example, for the Browne site Table 2-7 shows 9,300 cfs while for Table 3-11, the value given is 9,100 cfs. The rationale for this difference in values should be presented or the correct value presented in all sections.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIIC AREA: Water Quality, Alternatives

LOCATION IN DEIS: Vol 1 Page 3-66 Section 3.5.3 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Water quality for Snow River site

TECHNICAL COMMENT: Although water quality data are not available for the Snow River, the system is extensively influenced by meltwater from glaciers in the basin as well as snowmelt. Therefore, the water to be impounded would be expected to be highly turbid throughout most of the year. This high turbidity would limit productivity in the reservoir area.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Subsistence

LOCATION IN DEIS: Vol 1 Page 3-66 Section 3.5.4 Paragraph 5 of the page

COMMEENT IN REFERENCE TO: Johnson site fish resource

TECHNICAL COMMENT: In addition to the sport fish harvest that occurs downstream of the Johnson site (and Browne), highly significant commercial and subsistence fisheries for these species also exist (ADF&G 1983j). Subsistence fishing for salmon is particularly important to the Eskimo and Indian people that live in villages dispersed along the coast and major river systems of the Yukon. The contribution of fish potentially impacted by the Jonson and Browne sites to these fisheries is unknown at this time. Areas within the Johnson impoundment are extensively used for subsistence fishing, mainly for whitefish by the local residents.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Salmon

LOCATION IN DEIS: Vol 1 Page 3-66 Section 3.5.4 Paragraph 5 of the page

COMMENT IN REFERENCE TO: Johnson site fish resource

TECHNICAL COMMENT: Spawning by anadromous fish occurs both downstream and upstream of the Johnson site. Chum salmon spawning has been documented within the impoundment zone and in areas as far upstream as the Chisana River. Chinook and coho salmon have been documented as occurring within the impoundment zone (ADF&G, 1983i). No information is available as to the numbers of fish present. A typographical error exists in this paragraph; "sheepfish" should be sheefish.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Salmon

LOCATION IN DEIS: Vol 1 Page 3-67 Section 3.5.4 Paragraph 6 of the page

COMMENT IN REFERENCE TO: Fish resources of the Keetna site.

TECHNICAL COMMENT: At the Keetna site, spawning areas for chinook and chum spawning occur within the impoundment zone in Disappointment Creek and possibly for chinook, chum, and sockeye within the mainstem (ADF&G 1983i). Actual numbers of adults present are not known. However, spawning ground counts in index areas for chinook salmon in Prairie Creek are the highest of any east side Susitna tributary (Bentz 1983).

The salmon resources upstream of the site are considered highly significant, particularly considering the utilization by the commercial and sport fisheries downstream, (Watsjold 1984), and by the brown bear populations in Prairie Creek (Miller 1983). The mouth of Disappointment Creek also supports a known recreational fishery for rainbow trout and Dolly Varden. Access to this location is made by river boat from the town of Talkeetna.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Salmon

LOCATION IN DEIS: Vol 1 Page 3-68 Section 3.5.4 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Fish resources of the Snow River

TECHNICAL COMMENT: The statement that no anadromous fish are known to occur in the Snow River is incorrect. Both coho and sockeye spawning and rearing are documented to occur in the South Fork and below the confluence of the North and South Forks (ADF&G 1983i). No information is available on numbers of fish present. Resident species of interest for this site are the grayling and rainbow that are known to occur in Lower Paradise Lake which would be within the inundation zone. Also, grayling are found in Upper Paradise Lake which is just upstream of the inundation zone.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Salmon

LOCATION IN DEIS: Vol 1 Page 3-68 Section 3.5.4 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Fish resources of the Nenana River at the Browne site.

TECHNICAL COMMENT: The statement that no anadromous fish occur at the Browne site is in error. ADF&G (1983i) has documented that chinook, coho, and chum salmon migrate upstream past this project site. No information is available on the numbers of fish present.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Transmission Lines and Corridors

LOCATION IN DEIS: Vol 1 Page 4-4 Section 4. 1.1.2 Paragraphs 2 of the page

COMMENT IN REFERENCE TO: Recreational and residential land values decreasing due to proximity of the transmission line.

TECHNICAL COMMENT: While land values in proximity to transmission lines may decrease in more populated areas, this may not be the case for the proposed transmission line which traverses mostly unpopulated regions. In these locations the transmission corridor could be viewed as access to remote parcels and subdivisions, and as utilities enabling development, thus increasing land values.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Transmission Lines and Corridors, Impacts

LOCATION IN DEIS: Vol 1 Page 4-4 Section 4.1.1.2 Paragraph 6 of the page

COMMENT IN REFERENCE TO: Transmission line could impact military training, maneuvers, security, flight activities, and communications.

TECHNICAL COMMENT: Transmission line impacts of concern to the military will be avoided or significantly reduced because the proposed transmission line will parallel an existing transmission line across military land. Impacts from an additional line, therefore, would be expected to be incremental at most.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 4-5 Section 4.1.2 Paragraphs 3 and 4 of the page

COMMENT IN REFERENCE TO: "fugitive emissions might be transported outside the site boundary...".

TECHNICAL COMMENT: The DEIS text implies that fugitive dust impacts during the Watana Dam construction would be widespread, and would extend beyond the "site boundary". In fact, the updated fugitive dust analyses (APA 1984) indicate that the concentrations of fugitive dust beyond the site boundary upriver from the Watana damsite should be well below the allowable limits established in the Alaska Ambient Air Quality Standards (18 AAC 50. 020). The fugitive dust emission rates were estimated using EPA-approved emission factors. For the revised calculations, the wind was assumed to flow upriver, under conservatively poor atmospheric conditions. The "site boundary" was assumed to be the "Project Boundary" shown in Exhibit G of the February 1983 FERC License Applicaton. See Technical Comment ALT037 for a detailed description of the revised fugitive dust analyses.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 4-5 Section 4.1.2 Paragraph 4

COMMENT IN REFERENCE TO: Fugitive dust impacts during Watana construction

TECHNICAL COMMENT: The DEIS indicates that windblown fugitive dust during the Watana dam construction will cause exceedences of the ambient air quality standards. This conclusion is not supported by refined analyses. The worst-case fugitive dust analysis described in the DEIS was of a very preliminary nature, and it utilized unrealistic assumptions that resulted in very conservatively high estimates of ambient dust impacts. A more sophisticated fugitive dust analysis will be prepared by the Alaska Power Authority for its submittal of a Prevention of Significant Deterioration (PSD) permit application to the Alaska Dept. of Environmental Conservation (ADEC).

Emission Estimates: The fugitive dust emission rates presented in the DEIS were based on worst-case estimates of gravel excavation rates, gravel silt content, gravel storage pile configuration, and haul truck speeds. The required future estimates for the PSD application will utilize updated design data for these parameters. The revised calculations will probably show a lower fugitive dust emission rate than did the preliminary calculations used for the DEIS.

Fugitive Dust Mitigations: The calculated emission rates used for the DEIS analysis were based on very limited control of windblown dust. The future estimates for the PSD application will reflect possible mitigations to reduce windblown dust from haul roads and gravel storage piles. These mitigations will include the following: reduced haul truck speed; placement of gravel storage piles in a configuration that will minimize windblowm dust; and application of dust suppressants on long-term storage piles.

<u>Dispersion Modeling Techniques:</u> The dispersion modeling techniques described in the DEIS assumed that the winds blew directly across the Susitna River valley. This assumption is commonly used as an extreme worst-case screening technique, which is not generally meant to approximate actual impacts. It is clearly unrealistic to assume the presence of persistent cross valley winds in the narrow Susitna River valley. The calculated fugitive dust impacts at the project boundary are much lower if the prevailing winds are assumed to blow either upriver or downriver. If required for submittal of the upcoming permit application, onsite wind data at the valley floor will be measured. These measured wind data will then be used to support more sophisticated dispersion models, which will probably show much lower fugitive dust impacts than were reported in the DEIS.

<u>Results of Preliminary Revised Analyses:</u> Preliminary revisions of the fugitive dust analyses have been presented to the Alaska Dept. of Environmental Conservation (APA 1984). The conservatively high fugitive dust emission rates used for the DEIS analysis were also used in the revised analysis. However, the revised analysis assumed that the wind blew upriver instead of across the valley. The revised analysis showed a maximum fugitive dust impact of only 55 ug/m^3, as compared to the 627 ug/m^3 impact described in the DEIS. The calculated 55 ug/m^3 impact is well below the allowable 150 ug/m^3 ambient limit specified by ADEC, but is above the 37 ug/m^3 PSD Class II increment. Hence, the more realistic analysis demonstrates less impact.

Based on the results of the revised fugitive dust analysis, the detailed PSD analysis that will be required in the future will demonstrate that the fugitive dust impacts will be below all applicable air quality limits.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 4-5 Section 4.1.2 Paragraphs 6-8 of the page

COMMENT IN REFERENCE TO: Diesel generators emissions

TECHNICAL COMMENT: The air quality analyses for the diesel generators and other point sources have been revised and presented to the Alaska Dept. of Environmental Conservation (APA 1984). The key point emission sources considered were the diesel generators, the Watana refuse incinerator, the oil heaters at the campsites, the concrete batch plants and the aggregate screening plant. The estimated emission rate from the diesel generators are as follows:

Particulates	900 tons/yr
SO_2	207 tons/yr
NO_2	2,193 tons/yr
Carbon Monoxide	626 tons/yr
Hydrocarbons	232 tons/yr

The worst-case ambient impacts caused by the point source emissions were estimated using the simplified VALLEY model calculations prescribed by the EPA (EPA 1977). The worst-case impacts for all pollutants were all well below the applicable air quality limits for both ambient concentrations and PSD Class II increments. These revised emission rates and ambient impacts should be incorporated into the FEIS.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Nitrogen Supersaturation, Watana

LOCATION IN DEIS: Vol. 1 Pages 4-18 and 19 Section 4.1.3.2.1 Paragraph 7 of page 4-18 and Paragraph 1 of page 4-19

COMMENT IN REFERENCE TO: Term "emergency spillways" used incorrectly

TECHNICAL COMMENT: The term "emergency" spillways as used in the DEIS text should be "main service" spillways. This is an important distinction.

The main service spillways are designed to pass floods larger than the 50-year event, up to the 10,000-year event. These spillways would be used to safely pass the majority of floods experienced throughout the life of the project. The emergency spillways provide incremental discharge capacity so that, under the extreme Probable Maximum Flood (PMF) event, the structural integrity of the project will be maintained. Refer to the License Application, Exhibit B for further discussion.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 4-70 Section 4.2.2 Paragraph 5 of the page

COMMENT IN REFERENCE TO: Inconsistency in air quality impacts from Susitna basin alternatives.

TECHNICAL COMMENT: On page 4-69, in the last paragraph, it is stated that "The smaller Watana I dam would require less borrow material, thereby reducing impacts related to borrow sites...". However, on page 4-70 it is stated that the air quality impacts from the alternative Susitna developments "would be very similar to those described...for the proposed project." These two statements are not consistent. The air quality impacts of the dam construction will depend on many factors, one of which may be the amount of borrow material. In the absence of analysis, the FEIS should simply state that the impacts have not been evaluated for the alternative hydroelectric sites.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 4-77 Section 4.3.2 Paragraphs 4 and 5 of the page

COMMENT IN REFERENCE TO: Water-vapor plume from the power plants.

TECHNICAL COMMENT: The FEIS should discuss the water vapor plumes and potential ice fog formation in more detail. The following items should be addressed:

1. The seasonal relative humidity patterns in the Cook Inlet and Railbelt areas.

2. The basis for estimating the visible water-plume length to be 0-350 feet.

See also Technical Comment ALT076.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 4-77 Section 4.3.2 Paragraph 7 of the page

COMMENT IN REFERENCE TO: NOx emissions from gas-fired plants

TECHNICAL COMMENT: The FEIS should address the possible ambient visibility degradation caused by NOx emissions from the proposed gas-fired combined-cycle power plants.

Also, emissions from proposed simple-cycle combustion turbines should be quantified, rather than being dismissed as "very small".

A detailed analysis has been provided in Appendix III of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 4-81 Section 4.4.2 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Assumptions used to model power plant impacts.

TECHNICAL COMMENT: The air quality screening computer model PTPLU used for the DEIS yields maximum predicted one-hour ground level concentrations. It is unclear how the 3-hour and 24-hour values were developed. If standard adjustment factors were used, then their validity in Alaska should be discussed.

It is not clear whether the DEIS considered fugitive dust impacts related to the coal-fired units. Fugitive emissions can be generated by mining activities, coal-trains, construction of the coal-fired units, as well as operation of coal handling facilities at the coal-fired units. The relative duration of the air quality impacts of the Proposed Project and the coal plants should be addressed.

It is not clear what assumptions and meteorological data FERC staff utilized for the air quality impact analysis for the coal-fired units. Did the analysis consider strong winter inversions? Did the analysis consider fumigation?

These issues are addressed in further in Appendix III of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 4-81 Section 4.4.2 Paragraph 5 of the page

COMMENT IN REFERENCE TO: The implications of violating air quality standards should be discussed.

TECHNICAL COMMENT: The DEIS fails to emphasize the significance of the fact that several of the coal-fired power plant scenarios could cause exceedences of the PSD Class I and Class II air quality increments. The very brief discussion in the DEIS might imply to some readers that air quality violations can be negotiated. This is not true. A Prevention of Significant Deterioration (PSD) permit would be required for each of the thermal power plants proposed. Each PSD applicant must demonstrate that the project will not cause exceedences of the allowable pollutant concentrations. If air quality models predict an exceedence of any air quality standard, then the PSD permit must be denied. Denial of the PSD permit specifically forbids the project from being constructed.

The Final EIS should therefore emphasize that failure to demonstrate future compliance with air quality standards would prevent the power plant involved from being constructed.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Visual Impacts

LOCATION IN DEIS: Vol 1 Page 4-81 Section 4.4.2 Paragraph 8 of the page

COMMENT IN REFERENCE TO: Discussion on visibility is insufficient.

TECHNICAL COMMENT: The DEIS has misinterpreted the role of the National Park Service (NPS) and the general public regarding evaluation of visibility impairment in the Denali National Park Class I Area. The DEIS used the simplified Level I visibility screening analysis (EPA 1980) to evaluate the impacts.

The DEIS mistakenly implies that any of the coal-fired scenarios that pass the Level I screening test are environmentally acceptable. That conclusion is not correct. The FEIS should discuss the complex issues involved with visibility protection in Class I areas. Some of those issues are described below:

Limitations of the Level I Analysis

This screening procedure was developed by the EPA for use as a preliminary test of visibility impairment caused by a single emission source (EPA 1980). It has general, built-in assumptions regarding topography, meteorology and plume chemistry that might not always be valid. The model is based on viewing of a discreet emission plume at a 90° angle during an assumed atmospheric dispersion condition. The model cannot account for the extended inversions and calm periods that are prevalent in Alaska (see Comment ALT078). The model does not consider any important viewsheds, sun angle, etc. Finally, the actual evaluation criteria for the Level I model are three coefficients: C_1, which indicates the plume/sky contrast caused by particles and NO_2; C_2, which indicates decreased sky/terrain contrast based on black terrain; and C_3, which indicates reduced visible range or "haziness" caused by particles.

Level I analysis is not always appropriate in that a given emission source is assumed to "pass" the screening test if all three coefficients are less than 0.1, signifying less than a 10% contrast change. In reality, a 10% contrast can be noticeable to most people and could therefore be unacceptable. In a location such as Denali Park, where visitors expect pristine conditions, the Level I screening analysis is probably not a valid test for judging whether emission sources would cause unacceptable visibility impairment.

Role of the NPS in Visibility Permitting

The Clean Air Act specifically mandates that the states must protect visibility in Class I areas. Visibility evaluations are included as part of the Alaska PSD permit process, under 18 AAC 50.021(c) and 18 AAC 50.300(c). The regulatory mechanisms for visibility evaluations are described in the Federal Register (45 FR, No. 233, 80084, Dec. 12, 1980). The National Park Service (NPS) would designate the Federal Land Manager, who would have a major role in the PSD process. The Federal Land Manager can recommend denial of the PSD permit based solely on predicted visibility impairment, even if the permit shows that no other air quality standards would be exceeded (40 CFR 52.21 (p) (3)). Recognizing the importance of protecting visibility in the National Parks, the NPS has funded research to develop standard procedures to predict visibility impairment caused by industrial emission sources. The proposed methods are expected to be distributed for comment within several months (Malm 1984). The proposed methods are described in the following section.

Proposed Methods to Evaluate Visibility Impairment Prediction of the perceived visibility degradation caused by any given proposed emission source generally will consist of three interrelated steps (Middleton et al. 1983):

1. Prediction of downwind plume physical/chemical properties;
2. Identification of how people will physically perceive the plume; and
3. Applying a psychological judgment on how much visibility impairment will be allowed. These three steps are described below.

Extensive research regarding physical/chemical plume modeling has been conducted to predict the concentrations of NO_2 and submicron particles formed by NOx and SO_2 emissions. Unfortunately, it is generally recognized that no available models are very accurate (Malm 1984). In particular, few models can predict regional haze formed during inversions.

The physical perception of air pollution has been studied by having people numerically rate photographs of key vistas with varying degrees of air pollution (Malm 1980, Malm 1981, Latimer et al. 1981). The developed Index of Perceived Visual Air Quality was found to be related to air pollutant concentrations, sun angle, cloud cover, and the coloration of the scenery.

The psychological and regulatory judgment on how much visibility degradation will be allowed in the park would be based on NPS inspection of photographs of key vistas. The proposed NPS methods to evaluate allowable visibility degradation caused by emissions from a proposed industrial facility will consist of a three step process: (Malm 1984)

1. A series of baseline photographs with concurrent baseline air quality data would be taken, to document how existing variations in air quality influence existing visibility.

2. Based on those photographs, the NPS would establish what levels of visibility impairment are acceptable. The allowable pollutant concentrations corresponding to that acceptable visibility impairment would therefore be known based on the correlations in Step 1.

3. Physical/chemical plume models would then be used to determine the maximum allowable SO_2 and NOx emissions to ensure that the ambient pollutant concentrations in the park would not exceed the allowable levels established in Step 2.

Implications of Visibility Evaluations There are numerous cases where visual resource analysis has played a key role in the design and permitting of major industrial projects. The Final EIS should address some of these cases. Two applicable examples are given below:

- Visual resource analysis was incorporated directly into the engineering design of the Anchorage-Fairbanks Transmission Intertie (Gilbert Commonwealth 1983). Appropriate design steps were taken to ensure that visual impacts of the intertie would be minimized.

- Potential visibility impacts were, unfortunately, not considered during the design of the proposed Greene County Nuclear Power Plant in New York. The Nuclear Regulatory Commission recommended denial of that plant's construction permit, based primarily on unacceptable visual impacts (Petrich 1979).

Conclusion

It is apparent that the proposed NPS procedures for evaluating future visibility impairment are far more complex than is indicated in the DEIS. The FEIS should therefore make it clear that visual resource impairment could be a major constraint on constructing coal-fired power plants near Denali National Park.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Land Use

LOCATION IN DEIS: Vol 1 Page 4-86 Section 4.5.1 All Paragraphs

COMMENT IN REFERENCE TO: Cited size of alternative hydro reservoirs, consequences of foundation conditions.

TECHNICAL COMMENT: Subsequent to the DEIS, project and reservoir layouts were prepared by the Applicant for use in site evauations. From these layouts, reservoir inundation areas were measured by planimeter. Johnson was found to inundate not 84,000 acres, but 94,500 acres. Also, Snow would inundate 3,200 acres instead of 2,600 acres; Browne 12,500 acres instead of 10,640 acres; and Keetna 5,500 acres for a total combined inundated area of 115,700 acres instead of 102,000 acres.

The 50-year sediment deposition at Johnson, Browne, and Keetna would be approximately 400,000 acre-feet, 150,000 acre-feet, and 65,000 acre-feet, respectively, resulting in decreased storage capacity and mud flats at the upstream end of the reservoirs.

Deep (in excess of 75 feet) foundation excavations would likely be required at Johnson and Keetna damsites. Excavations in the neighborhood of 50-feet deep would be required for Chakachamna, Snow, and Browne dams to remove pervious, frozen, loose or unconsolidated materials from the foundations. In addition to massive relocations and scheduling implications associated with the Johnson and Browne projects, the total combined additional land requisition required for access and individual stub transmission systems would be 6,800 acres for the alternatives as compared with only 2,400 acres for Susitna.

All of the above increases could significantly increase the cost of the non-Sustina alternatives. Refer to Appendix II of this document for project descriptions and layouts by the Applicant.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Water Quality, Impacts

LOCATION IN DEIS: Vol 1 Page 4-87 Section 4.5.3 All paragraphs

COMMENT IN REFERENCE TO: Potential impact of the hydro alternatives on surface water quality

TECHNICAL COMMENT: The statements made regarding the impacts to surface water resources from the five non-Susitna hydro projects are speculative and based on a virtually non-existent data base. While some of the statements made could be logically argued, the majority of statements would require additional information before conclusions on the severity of impacts could be made. Unsupported conclusions include the following:

1. The dewatering of 8 miles (13 kilometers) of the Snow River represents a minor water quality and quantity impact.

2. "Although the magnitude of such changes [in suspended solid concentrations] cannot be estimated without information on the predicted reservoir hydrology and on water quality in the existing environment, adverse impacts on water quality from changes in the concentration of suspended solids would not be anticipated for any of the hydropower alternatives". This is speculative.

3. "Relative to thermal conditions, the Snow project would not impound any water and, therefore, upstream of the diversion point the Snow River would maintain preproject conditions." Snow reservoir would actually have a total storage of 179,000 acre-feet. This corresponds to an average retention time of four months. It thus seems permature to state that the Snow reservoir would maintain preproject thermal conditions without conducting thermal studies.

4. "No significant groundwater impacts would be anticipated from any of the non-Susitna hydropower projects."

5. The DEIS acknowledges that the Johnson, Browne, and Keetna hydro facilities could produce changes in ice processes in the Tanana, Nenana, and Talkeetna rivers, but because of a lack of data no qualitative or quantitative assessment was undertaken. Changes in ice processes could have significant effects on the downstream fisheries or could potentially cause flooding at downstream communities. However, these effects could only be determined through additional analysis.

The speculative statements suggesting no significant impacts, and the minimal treatment of impacts through absence of analyses to determine these impacts, imply that the non-Susitna hydroelectric alternatives have less impact on water quality and quantity than Susitna. If a comparable data base were obtained for the non-Susitna hydro alternatives and a comparable level of analysis undertaken, the analyses could lead to the conclusion that the Susitna project has a lesser effect on water quality and quantity than the cumulative effects of the non-Susitna hydro alternatives.

See Appendix II for a more detailed discussion of water quality impacts of the alternative hydro sites.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric

LOCATION IN DEIS: Vol 1 Page 4-87 Section 4.5.3 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Snow alternative description

TECHNICAL COMMENT: The text describes the location of the Snow project powerhouse as being on Kenai Lake. This is incorrect. The powerhouse would be located on the Snow River approximately 4 miles downstream of the dam and approximately 4 miles upstream from Kenai Lake. See Appendix II for Applicant's description of hydro alternatives.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Salmon

LOCATION IN DEIS: Vol 1 Page 4-88 Section 4.5.4 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Aquatic resources of alternative hydro sites

TECHNICAL COMMENT: Although there is little quantitative information available on fish resources for the Snow, Browne, and Johnson sites, there is a strong potential that significant resources could be affected. For both the Browne and Johnson sites, ADF&G (1983i) has documented that anadromous salmon either spawn within the proposed impoundment zone (Johnson) or pass upstream (both sites). These fish contribute to highly significant commerical and subsistence fisheries downstream (ADF&G 1983j). In addition, resident fisheries would be impacted. The resident fish at the Johnson site support a significant subsistence fishery for local residents.

The Snow site is in the upper Kenai River drainage. The Kenai River has extensive recreational development and supports the largest sport fishery for anadromous fish in the state (Mills 1983). Therefore, any proposed development in the upper reaches would receive extensive scrutiny and review from a diverse group of people including sport fishermen, commercial fishermen, and fisheries biologists. All sites except the Snow site would block upstream migrations by anadromous fish and cause potential difficulties for downstream passage. All mitigation measures (e.g. fishways for upstream passage, screening for outmigrants, and other bypass facilities) incur a certain risk for success. In the original screening of sites, the Power Authority incorporated as one of their major criteria, whether or not anadromous fish pass the site. A site at which anadromous fish are known to utilize upstream areas was ranked below other sites.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Land Use

LOCATION IN DEIS: Vol 1 Page 4-91 Section 4.7.1.1 Paragraph 5 of the page

COMMENT IN REFERENCE TO: Comparison of the Proposed project to the combined hydro-thermal generation scenario

TECHNICAL COMMENT: This paragraph compares the advantages and disadvantages of the proposed project with the individual hydro projects of the combined hydro-thermal generation scenario. The comparison should be made using worst case assumptions with the entire group of 5 proposed hydro projects. Statements like the following can be made:

If inundation is the basis of comparison, the alternative reservoirs alone will impact or inundate 2.5 times as much land as the proposed project. Impacts due to access roads and transmission lines are not included because the scarcity of information. The alternative reservoirs will inundate valuable agricultural land whereas the Proposed Project will not. Areas subject to slope failure will be greater for the alternatives than the Proposed Project, principally because of the greater periphery involved and the more rapid flucations in the reservoir levels.

By virtue of the increase in impacted area and more severe climatic condition in some of the projects, permafrost-thaw impacts are expected to be greater with the alternatives than the Proposed Project. Coal reserves in the Nenana coal field will be inundated by the alternatives, whereas, no mineral deposits will be impacted by the Proposed Project.

See Appendix II of this document for further discussion.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Coal Plants

LOCATION IN DEIS: Vol 1 Page 4-92 Section 4.7.2 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Feasibility of mitigative measures.

TECHNICAL COMMENT: The DEIS states that the adverse impacts caused by SO_2 emissions could be mitigated by additional SO_2 scrubbing. The FEIS should emphasize that further SO_2 reductions could require switching to a wet limestone type scrubber. Such a change in SO_2 control equipment would have the following implications:

- Increased capital and operating costs;
- Slight reductions in net generating capacity for the plant;
- Possible increased plant outages caused by problems with the SO_2 scrubber;
- Production of large quantities of calcium sulfate sludge, which must be dewatered and disposed of.

The FEIS should discuss these implications. A detailed descriptions of both the dry SO_2 scrubbers and the wet limestone SO_2 scrubbers are given in Appendix III of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Impacts, Coal Plants

LOCATION IN DEIS: Vol 1 Page 4-92 Section 4.7.2 Paragraph 7 of the page

COMMENT IN REFERENCE TO: Acceptability of the coal-fired scenarios

TECHNICAL COMMENT: The DEIS implies that those coal-fired thermal alternatives that do not cause exceedences of the air quality standards would be acceptable to the state and federal air quality agencies, and would also be acceptable to the National Park Service. That conclusion is not necessarily true. The National Park Service could recommend denial of any plant's Prevention of Significance Deterioration (PSD) air quality permit if it ruled that emissions from the plant would cause unacceptable visibility degradation in Denali National Park, even if that plant's emissions were modeled to pass the simplified visibility screening test (EPA 1980).

See Technical Comment ALT045 for a detailed discussion of the complex issues regarding the role of the National Park Service in air quality/visibility permitting.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Impacts

LOCATION IN DEIS: Vol 1 Page 4-92 Section 4.7.3 Last paragraph of the page

COMMENT IN REFERENCE TO: Water quality and quantity impacts of alternatives

TECHNICAL COMMENT: The relative comparisons made that: 1) the Chakachamna site would have greater impacts than the Susitna Project; 2) the Johnson, Browne, and Keetna sites would have similar impacts; and 3) the Snow site fewer impacts; are misleading because the FERC has not presented the scale by which these relative statements were made. The impacts would be highly dependent on project location, design and operation, energy produced, and existing water resources. Also, impacts are relative to each site. For example, depending on final operational flow schedules, the percentage change in flow at any one site from existing flows could be quite similar between projects. Therefore, the impacts on water quantity among the projects would be similar.

One way to examine relative impacts is to look at the amount of area impacted compared to the power produced. The attached Table 1 presents such comparisons. These comparisons are an estimate because they do not examine quality of habitat nor the resources that are associated with those habitats. These are examined in more detail by the Applicant in Appendix II of this document. However, the calculations do illustrate that, for the power produced, the Proposed Project affects substantially smaller surface areas for the impoundment and far fewer miles of river upstream and downstream than do the other projects when combined.

Even when taken singly, the ratio of installed capacity to both stream miles impacted and to impoundment area is less for Susitna than for almost all the other sites. Therefore, based on these comparisons, the relative impacts of each alternative hydro site are greater than Susitna. The only exception is the ratio of reservoir acreage to power production for the Chakachamna project. The reason for this is that the impoundment is essentially the existing lake. However, the project would impact Chakachamna Lake in that there would be a significant increase in the frequency and severity of water-level fluctuations of the lake surface. In the case of the Browne and Johnson sites, impacts to water quantity and quality of the individual sites and the combination of both sites must also be considered.

Table 1. Relative Comparison of power production versus impacted area for the Susitna and non-Susitna hydro projects.

	A Installed Capacity (MW)	B Approximate Impacted Stream Miles 1/	Ratio of B/A	C Impound-ment Surface area (acres)	Ratio of C/A
Snow Site	63	14	0.22	3,200	32
Keetna Site	100	29	0.29	5,500	55
Browne Site	100	41	0.41	12,500	125
Johnson Site	210	229	1.09	94,500	450
Chakachamna Site	330	50	0.15	0	-
Summary					
With Chakachamna	803	363	0.45	115,700	144
Without Chakachamna	473	313	0.66	115,700	245
Susitna	1,620	110	0.07	45,800	28

1. Impact areas of most significance are assumed as follows:

   Snow site to impact approx. 14 mi. (from dam to Kenai Lake plus length of reservoir)

   Keetna site to impact approx. 29 mi. (dam to Susitna River plus length of reservoir)

   Browne site to impact approx. 41 mi. (dam to Tanana River plus length of reservoir)

   Johnson site to impact approx. 229 mi. (dam to Nenana River plus length of reservoir)

   Susitna site to impact approx. 110 mi. (dam to Chulitna/Susitna confluence plus length of reservoir)

   Chakachamna site (Alt. E) to impact approx. 50 mi., the distance that flow changes would be expected in both the Chakachatna and McArthur Rivers.

   In general, the impacted reach was considered to be the distance from the proposed project to nearest major downstream tributary or body of water, below which potential project impacts would be expected to be attenuated by the tributary input. Extensive studies might be required to clearly define these distances. However, the distances assumed for this illustration are believed to be appropriate.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Impacts

LOCATION IN DEIS: Vol 1 Page 4-93 Section 4.7.4 Paragraph 6 of the page

COMMENT IN REFERENCE TO: Impacts of alternative non-Susitna hydro sites on fisheries resources

TECHNICAL COMMENT: The Power Authority disagrees with the statement that "the non-Susitna hydro alternatives [with the exception of the Keetna and Chakachamna sites] would likely have smaller aquatic impacts than the Susitna basin development alternatives." The Power Authority does agree with the portion of the statement that the Keetna and Chakachamna sites could potentially have significantly greater impacts. However, the Power Authority also believes that the impacts to fisheries resources of the Browne and Johnson sites, either individually or in combination, would have relative impacts at least as great or greater than the Proposed Project. The reasons for this are:

1. Anadromous fish utilize areas upstream of the Browne and Johnson sites and anadromous fish have been documented as spawning in the proposed impoundment area of the Johnson site (ADF&G, 1983i). In comparison, almost no anadromous fish are found above Devil Canyon on the Susitna.

2. Both the Browne and Johnson sites may require passage facilities for both upstream and downstream migrants with some risk associated with success of the passage. These fish contribute to downstream commercial and subsistence fisheries. No such facilities are needed for the Susitna project.

3. Areas of resident fish habitat would be altered by inundation, particularly for the Johnson site.

Although the Snow project would be relatively small compared to the other projects, the relative impact to fisheries resources of this drainage also would be significant. For example, Lower Paradise Lake, presently a clear lake that has an existing recreational fishery for grayling and some rainbow trout, would be completely inundated and lost. Also, the Kenai River downstream of Kenai Lake (to which Snow River is a tributary) supports the largest sport fishery in Alaska. As such, any alterations of flow, water temperature, or water quality within the Kenai watershed would require very careful scrutiny as this project could potentially affect an extremely economically (via the monies generated by both commercial and sport fishing) and environmentally sensitive area.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Impacts

LOCATION IN DEIS: Vol 1 Page 4-100 Section 4.9.1 Paragraph 4 of the page

COMMENT IN REFERENCE TO: Summary of unavoidable adverse impacts of alternative non-Susitna hydro sites on fisheries resources

TECHNICAL COMMENT: The Applicant's evaluation of these impacts (Technical Comment ALT019) should be included in the FEIS.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Impacts

LOCATION IN DEIS: Vol 1, Pages 4-100 & 4-101 Sections 4.9.1 and 4.10.1

COMMENT IN REFERENCE TO: Project comparisons in the two sections

TECHNICAL COMMENT: The DEIS has selected five alternative hydro projects to compare with the Proposed Project. The DEIS fails to compare each alternative on the same bases as that which has been used for the Proposed Project. The DEIS compares a project that has been studied at grat length to alternatives that have been developed on paper, based largely on topographic maps and limited information.

For example, the noise and fugitive dust levels for the Proposed Project are compared to the impacts of the alternatives which have not been sited. Therefore, a worst-case scenario should be assumed, i.e. assume a siting in a noise-sensitive area. Impacts to cultural resources, and archeological and historic sites are largely unknown for the alternatives and without a survey no comparison of the impacts should be considered.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Proposed Project, Impacts

LOCATION IN DEIS: Vol 1 Page 4-101 Section 4.11

COMMENT IN REFERENCE TO: Short term uses and long-term productivity with the Proposed Project.

TECHNICAL COMMENT: This section improperly implies that if the Proposed Project were not constructed there would be no short- and long-term changes to the environment due to resource use. The conditions 50 years from now cannot be the same as now.

The statement that "stream hydraulic patterns below the dams would adversely affect fish and possibly wildlife populations in downstream reaches of the river" is inaccurate if not quantitified to indicate the relative importance in the ecosystems. Information presented in response to FERC's requests for supplemental information and Agency comments on the License Application, as well as ongoing field studies, indicate that the preceding statement is an exaggeration.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Proposed Project, Impacts

LOCATION IN DEIS: Vol 1 Pages 4-101 and 4-102 Sections 4.11.1 and 4.11.2

COMMENT IN REFERENCE TO: Abandonment of Proposed Project

TECHNICAL COMMENT: The Applicant disagrees with FERC Staff's contention that it is unlikely the Proposed Project would or could be removed after its useful life, but that such is possible with the alternative hydro developments. After abandonment it is unlikely that any of the hydro sites will undergo remedial work to assure that conditions will be the same as pre-project conditions.

There are a number of small hydroelectric developments that have been abandoned with no effort to restore the site to pre-project conditions. In many cases they have been classified as "historical sites." There is no record of large projects being retired after their useful life, principally because projects of this magnitude were only constructed in the 1930's. The economic input into large projects and the power and energy output will justify further expenditures to their utilization well beyond the 50-year life used in economic evaluations.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Proposed Project, Impacts, Alternatives

LOCATION IN DEIS: Vol 1 Page 4-102 Section 4.11.2 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Proposed Project liftime versus thermal plant lifetimes.

TECHNICAL COMMENT: The life of the thermal facilities are not equivalent to those of the hydroelectric. The economic life of thermal plants ranges from 20 to 30 years, whereas, hydroelectric project lifetimes are commonly 50 to 100 years. Therefore, thermal plants will be retired and reconstructed several times during the life of a hydroelectric plant. Both the economic and environmental impacts of this repeated construction activity should be considered in the comparison of thermal scenarios to the Proposed Project.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 5-1 Section 5.1.1.2 Paragraph 3 of page

COMMENT IN REFERENCE TO: Comparison of air quality impacts is misleading. Fugitive dust analyses have been updated.

TECHNICAL COMMENT: The information presented in Section 5.1 is misleading. The impacts of all alternatives are listed without considering the severity, significance, duration or areal extent of the impacts. The impacts would be more clearly expressed by ranking the significance of each environmental issue for all of the alternatives. This would allow an objective comparison of the significance of each alternative.

The FEIS should emphasize that the air quality impacts of the coal-fired plants would be long-term and would affect a large area.

The analyses of fugitive dust from Watana construction described in the DEIS were of a very preliminary nature. Extreme worst-case assumptions were used to estimate fugitive dust emission rates and ambient dust impacts. Based on these worst-case assumptions, the DEIS analysis indicated probable exceedences of the ambient air quality standards and PSD Class II increments. However, revised analyses have shown that the fugitive dust impacts will be much lower than described in the DEIS. See Technical Comment ALT037 for a detailed description of the revised analyses.

The FEIS should emphasize that the mitigated fugitive dust impacts of the Proposed Project would be temporary and of very limited areal extent.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Thermal

LOCATION IN DEIS: Vol 1 Page 5-4 Section 5.1.2.1.1 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Conclusions on geology and soils relative to the combined hydrothermal generation scenario.

TECHNICAL COMMENT: For the combined hydrothermal generation scenario, the following have not been included in the conclusions:

o No assessment of the reservoir-induced seismic events has been made

o No assessment has been made of the following; (of which it is evident from the layouts and climatic and terrestrial information presented would be significant).

a) Increased erosion and permafrost impacts related to clearing of vegetation from reservoir areas and development of borrow areas, access routes, transmission lines, and construction facilities.

b) Soil compaction, erosion, and disturbances along access routes, transmission lines and at construction camps, as well as in areas subject to off-road vehicle traffic.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Land Use

LOCATION IN DEIS: Vol 1 Page 5-4 Section 5.1.2.1.2 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Conclusions regarding land use and ownership relative to the combined hydro-thermal generation scenario

TECHNICAL COMMENT: For the combined hydro-thermal generation scenario, the quantity of land affected would be in excess of 120,000 acres, more than twice the amount affected by the Proposed Project. The Browne and Johnson sites would significantly impact transportation and utility corridors by inundating portions of the Parks and Alaska Highways and a petroleum products pipeline. These are important factors in the consideration of the alternative scenarios.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Water Quantity and Quality

LOCATION IN DEIS: Vol 1 Page 5-5 Section 5.1.2.3 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Non-Susitna hydropower alternatives and the assessment of the modifications of the rivers

TECHNICAL COMMENT: The rivers on which the Browne, Keetna, Snow, Chakachamna, and Johnson projects have been sited are glacier fed. Therefore, the following observations may be made about the impacts to water quantity and quality of the rivers downstream of the projects.

a) The rivers will be altered from an uncontrolled glacial river to a controlled flow.

b) Turbidity levels would be reduced in the summer and increased in the winter.

c) Water temperatures in the mainstem would be reduced in the summer and increased in the winter.

d) The river channel downstream of the dams may be narrowed and stabilized.

e) Onset of ice cover would be delayed in the autumn and ice breakup would be slowed in the spring downstream of the dams.

f) The Snow Project is subject to breakout floods every two to three years. Chakachamna would experience the same phenomena, but at longer intervals.

See Technical Comment ALT019 concerning assessment of fisheries impacts.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Impacts

LOCATION IN DEIS: Vol 1 Page 5-5 Section 5.1.2.3 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Water quality and quantity impacts of alternatives

TECHNICAL COMMENT: The Power Authority disagrees with FERC Staff conclusions regarding the water quality and quantity impacts of hydro alternatives to the Proposed Project. FERC Staff should consider the points raised in Technical Comemnt ALT053 and revise their conclusions accordingly.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Alternatives, Hydroelectric, Impacts

LOCATION IN DEIS: Vol 1 Page 5-5 Section 5.1.2.4 Paragraph 4 of the page

COMMENT IN REFERENCE TO: Conclusions regarding impacts of alternatives on fish resources.

TECHNICAL COMMENT: Based upon the material presented in Appendix II of this document, the following additional conclusions should be included in the FEIS:

1. Adoption of the Browne Project would result in major impacts on anadromous fish runs upstream and downstream of the site.

2. Adoption of the Johnson site would inundate existing salmon spawning areas and would have a major impact on anadromous fish runs upstream and downstream of the site.

3. The Snow River Project would inundate Lower Paradise Lake, a lake that has an important existing recreational fishery for grayling and rainbow trout. The site would also potentially have a major impact on anadromous fish runs downstream of the site.

4. Cumulatively, the impacts of all alternative non-Susitna hydroelectric facilities on fisheries resources would be significantly greater than those of the Proposed Project.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Proposed Project, Alternatives

LOCATION IN DEIS: Vol 1 Page 5-7 Section 5.2.1 Paragraph 1 of the page

COMMENT IN REFERENCE TO: FERC staff's approach to assess the "... economic, engineering and environmental costs, feasibility and effects of a range of representative generation scenarios ..."

TECHNICAL COMMENT: The main text and the supporting appendices do not support the above statement.

For example, the non-Susitna hydroelectric developments in general (with the exception of Chakachamna) have a bare minimum of basic data available. No geological or soils exploration specific to the sites has been presented. Therefore, foundation conditions, and material availability and quality, cannot be ascertained. The data on water resources is limited and is not presented in DEIS Appendix H, Water Resources. The basic data relative to the non-Susitna hydroelectric developments for fisheries and aquatic resources, terrestrial botanical resources, terrestrial wildlife resources, recreation resources, visual resources, socioeconomics and cultural resources have not been covered in the supporting DEIS Appendices. Therefore it is not understood how the FERC Staff can determine the feasibility of this scenario. The engineering and environmental costs which enter into the determination of economic viability cannot be evaluate from the data presented. Because of the lack of data concerning alternatives, the DEIS discussion of alternatives is seriously deficient. Further, impacts of individuals projects of the alternatives should be assessed on a "worst-case basis".

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Proposed Project, Alternatives

LOCATION IN DEIS: Vol 1 Page 5-7 Section 5.2.1 Paragraph 2 of the page

COMMENT IN REFERENCE TO: "Based on considerations of engineering feasibility, and environmental effects, the FERC staff finds that a mixed thermal-based generation scenario, supplemented with selected non-Susitna basin hydropower facilities would be the most effective approach to meeting the projected generation requirements of the Railbelt area."

TECHNICAL COMMENT: The data which has been presented in the Main Text and Appendices of the DEIS does not support this determination. As is required by NEPA, the DEIS has not evaluated the alternatives on the basis of worst-case assumptions. Until such an analysis is performed, a reasoned choice among alternatives cannot be made.

See Technical Comment ALT066 for examples of DEIS data shortcomings.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Access Roads, Impacts

LOCATION IN DEIS: Vol 1 Page 5-8 Section 5.2.3 Paragraphs 3 to 5 of the page

COMMENT IN REFERENCE TO: Access from the Denali Highway would have severe impacts on the wildlife resources etc., and that staff recommends adoption of a rail-only access from Gold Creek.

TECHNICAL COMMENT: The issues surrounding the selection of a preferred access route are complex from economic, environmental, and engineering perspectives. The preferred plan described in the License Application was selected after a thorough study of the 18 alternate plans. The Applicant performed a detailed analysis of the costs, schedules, and various environmental advantages and disadvantages of 18 different alternate access routes and modes (Acres 1983). The preferred plan shown in the License Application has been designated Plan 18 (Denali). The plan suggested by the FERC Staff in the DEIS is designated Plan 8 (Gold Creek).

While the rail-only access (Plan 8) would have less overall environmental impact than the proposed Denali access route, rail-only was considered unacceptable from an engineering perspective for reasons of logistics, delivery flexibility, cost, and construction scheduling. The primary purpose of access is to provide and maintain an uninterrupted flow of materials and personnel to the damsites throughout the life of the project. A rail-only access would jeopardize this fundamental objective by not providing the flexibility to maintain costs and schedule control or to ensure operation for emergency or other situations when rail access is not possible.

An additional concern of the rail-only access is the need to construct a major bridge across the Susitna River near the Devil Canyon damsite. This is a major engineering disadvantage of that plan from a construction scheduling perspective. The need to build this major bridge adds at least two years to the construction period when compared with the proposed access route. Total time to construct initial access to Watana under the rail-only plan is estimated at 3 to 4 years. In comparison, the route for the proposed access road traverses comparatively flat terrain with no major stream crossings or engineering obstacles. It has been estimated that initial access to Watana for the proposed route could be achieved in one year or less (Acres 1983). A delay in access will negatively impact economics of the Proposed Project. Also, a longer construction period for access would worsen construction impacts.

It is recognized that the proposed access route traverses an area that is presently relatively inaccessible and considered to be valuable for wildlife. With active management and use restrictions, however, it will be possible to reduce nonconstruction-related secondary impacts. Current plans call for restricted access from the Denali Highway to the dam site during construction. Eliminating public access during construction is also preferred from a construction management viewpoint. Such a policy prevents safety-related problems which would arise if the public were allowed to travel freely to the construction site. A restricted-to-construction access policy also provides environmental benefits by minimizing impacts to all species and by preventing habitat loss. The Power Authority will work with agencies to develop access policies both to control access during construction and for road use following the completion of the Proposed Project.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 1 Page 5-9 Section 5.3.2 Paragraphs 4 & 5 of the page

COMMENT IN REFERENCE TO: Required mitigative measures for fugitive dust.

TECHNICAL COMMENT: The fugitive dust analyses that were presented in the DEIS were based on very preliminary estimates of the excavation quantities, haul road configurations and gravel handling practices. A much more detailed description of the construction practices will be submitted to the Alaska Dept. of Environmental Conseration (ADEC) as part of the Prevention of Significant Deterioration (PSD) permit application. The PSD application will include detailed estimates of the fugitive dust emission rates, ambient dust impacts, and the methods that will be used to minimize the generation of windblown dust. The fugitive dust control measures that could be used include the following:

- Watering of haul roads;
- Surfacing of haul roads;
- Limiting vehicle speed on haul roads;
- Configuration of gravel storage piles to minimize windblown dust;
- Application of stabilizing agents to long-term storage piles.

Use of a combination of these mitigations would reduce fugitive dust emissions enough to ensure compliance with all air quality standards.

See Technical Comment ALT037.

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SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Hydroelectric, Alternatives

LOCATION IN DEIS: Vol 3 Page E-55 Section E.2.3.3.1 All Paragraphs

COMMENT IN REFERENCE TO: Impact of permafrost in Tanana riverbed and siesmic potential on foundation of Johnson dam.

TECHNICAL COMMENT: The Tanana River valley is known to contain deep, permeable, unconsolidated sediments which could contain permafrost. To insure seismic stability, these deposits would have to be removed so the embankment could be founded on bedrock. The extent of this excavation could greatly affect the Johnson Project construction cost. Refer to Appendix II of this document for a discussion of the Johnson Project.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Hydroelectric, Alternatives, Filling

LOCATION IN DEIS: Vol 3 Page E-55 Section E.2.3.3.3 All Paragraphs

COMMENT IN REFERENCE TO: Impact of glacier-dammed lake at Snow project, stability of reservoir rim

TECHNICAL COMMENT: Slopes surrounding the reservoir are rock, which could be susceptible to block slides and slope instability during reservoir filling. In addition, a thin layer of overburden mantles portions of the upper left abutment. The overburden could be susceptible to instability upon reservoir filling due to increased pore-water pressure and reduced sliding resistance.

Release of water from an ice-dammed lake above the Snow River valley has produced flood flows of approximately the same magnitude as storms (the 1967 outburst flood was estimated at 20,000 cfs). Historical records indicate that these glacial outburst floods have occurred every 2-3 years in the Snow River valley. Should outburst flooding occur simultaneously with a non-outburst flood, a combined flow of 40,000 cfs could be realized.

Special provisions would have to be incorporated into the Snow project design to allow for these possibilities and the resulting reservoir surcharge levels. These provisions would have a significant impact on the Snow project construction cost, and could complicate the operation and intensify the maintenance requirements of the project. The Snow project is discussed in more detail in Appendix II of this document.

SUSITNA HYDROELECTRIC PROJECT
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TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 3 Page G-3 Section G.1.1.1 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Rainfall data.

TECHNICAL COMMENT: More detail on rainfall/snowfall profiles is needed to evaluate fugitive dust at the Susitna project site. The available onsite meteorological data for the Watana site should be described. The following information is available (R&M 1982j - 1982m), and should be included in the FEIS:

- Monthly precipitation profiles;
- Monthly number of days with no precipitation;
- Monthly snow acccumulation.

SUSITNA HYDROELECTRIC PROJECT
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TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 3 Page G-3 Section G.1.1.2 Last paragraph of the page

COMMENT IN REFERENCE TO: Need for atmospheric stability data. Need for presentation of onsite data.

TECHNICAL COMMENT: Onsite data are critical to a discussion of air quality, especially for a region where meteorology conditions are severe. The FEIS should:

1. Present available onsite data.

2. Consider severe meteorological conditions in the air quality impact analysis.
3. Consider local topographic effects such as channeling and valley breezes.

4. Discuss how strong winter inversions will affect the proposed project.

5. Ensure that the estimated ambient air quality values, presented in the second paragraph of page G-5, are realistic.

6. State the assumptions that were the basis of the calculations.

7. Verify that those assumptions are applicable to the Alaskan interior.

The meteorological conditions at various locations along the Railbelt are described in Appendix III of this document.

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TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 3 Page G-14 Section G.2.1.2.1 Paragraph 2 of the page

COMMENT IN REFERENCE TO: Dispersion modeling procedures have been revised

TECHNICAL COMMENT: A more realistic fugitive dust impact analysis has been performed. See Technical Comment ALT037.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 3 Page G-15 Section G.2.1.2.1 Paragraph 2 of the page (Table G-4)

COMMENT IN REFERENCE TO: Diesel generator emissions have been revised

TECHNICAL COMMENT: The impacts of emissions from the proposed temporary diesel generators, residential heaters and the refuse incinerator located at the Watana Camp have been re-evaluated (APA 1984). The revised emission rates from the diesel generators were based on the same assumptions regarding fuel usage as were used in the DEIS analysis. The impacts of the point source emissions on the elevated terrain surrounding the Watana site were estimated using the simplified VALLEY calculation procedures (EPA 1977). The estimated maximum 24-hour impacts caused by the diesel generator emissions are as follows:

Particulates	11.8 ug/m^3
SO_2	11.1 ug/m^3
NO_2	166 ug/m^3
CO	36.2 ug/m^3
Hydrocarbons	13.3 ug/m^3

These worst-case impacts are all well below the allowable air quality limits and the PSD Class II increments. These calculated air quality impacts should be incorporated into the FEIS.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION: Vol 3 Page G-17 Section 6.2.3 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Ground-level fogging and icing unlikely from towers.

TECHNICAL COMMENT: Since ice fog is considered to be a significant problem in many parts of Alaska, are meteorological conditions in the Cook Inlet area well enough established to support the statement on page G-17 of the DEIS, "Ground level fogging and icing would be very unlikely with this type of tower."?

The FEIS should emphasize that ice fog formation is a complex phenonmenon and provide more information on how ice fog will be avoided at the power plants.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 3 Page G-17 Section G.2.3 Paragraphs 7 to 9 of the page

COMMENT IN REFERENCE TO: Computer models are not appropriate.

TECHNICAL COMMENT: The PTPLU and VALLEY models used by FERC Staff to estimate the ground level pollutant impacts may not be appropriate for these analyses. These models are not well suited for modeling pollutant dispersion during severe inversion and extended calm periods, both of which are prevalent in Alaska (see Technical Comment ALT078). A more detailed air quality analysis is presented in Appendix III of this document. This detailed analysis includes discussions on inversions and calm periods. The EPA-approved ISCST and COMPLEX computer models have been used for the revised analyses. The wind data for these models have been adjusted to account for calm periods.

The results of this detailed analysis indicate the following:

The final paragraph of page G-17 gives a false sense of the validity of the screening calculations. This paragraph should be revised to stress the need to evaluate site-specific meteorological conditions prior to using the screening models.

- o Coal mine expansion would create long-term fugitive dust impacts; however, the dust concentrations would generally be below ambient limits.

- Fugitive dust from the coal-fired power plants might exceed the PSD Class II increments and would create long-term impacts near the power plants.

- Stack emissions from power plants would cause long-term impacts in a large area around each plant. SO_2 emissions would create the most significant impact. However, the calculated worst case impacts in Denali National Park would not exceed the allowable PSD Class I increments.

- The visibility degradation caused by the power plant plumes would be long term and would affect many key vistas that are considered a valuable cultural resource in Alaska.

- Ice fog and steam plume formation from gas-fired power plants could be a significant siting constraint. The plants near Anchorage could have a significant impact on carbon monoxide, nitrogen dioxide, and ozone concentrations in the urban area.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 3 Page G-20 Section G.2.4 Paragraph 3 of the page

COMMENT IN REFERENCE TO: Modeling methods are inappropriate considering the earlier discussions on "severe" inversions.

TECHNICAL COMMENT: The DEIS used the EPA-approved PTPLU and VALLEY dispersion models to estimate the air quality impacts caused by the coal-fired power plant emissions. Neither of those models are appropriate for calculating impacts during calm periods and severe inversions that are common during the winter in central Alaska. It is therefore probable that the coal-fired power plants would cause much greater air quality impacts than are presented in the DEIS.

The limited available data indicate that surface inversions are extremely common during the winter months, in both the Interior and Coastal regions of Alaska (Bilello, 1966). Based on 9 years of data, the average frequency of occurrence and average inversion thickness measured during the winter at Fairbanks (Interior Alaska) and Yakutat (Coastal Alaska) are as follows:

	Fairbanks		Yukatat	
Month	Frequency of Occurrence (%)	Inversion Thickness (m)	Frequency of Occurrence (%)	Inversion Thickness (m)
Jan	81	690	62	210
Feb	56	480	40	210
March	30	190	15	160
Oct	28	230	26	180
Nov	66	440	44	180

Because these data show that inversions are common in both the Interior and coastal regions, it is likely that inversions would be common at the thermal power plant sites.

Much of Alaska also experiences extended periods of calm winds, especially during the winter. The monthly occurrence of calm periods at various locations is shown in the following table:

Comparison of Wind Data for
Locations in the Alaska Railbelt

	Fairbanks [1]		Anchorage [1]		Nenana [2]		Talkeetna [3]	
Month	Wind Speed (mph)	Calms (%)	Wind Speed (mph)	Calms (%)	Wind Speed (mph)	Calms (%)	Wind Speed (mph)	Calms (%)
January	2.5	48.2	6.1	34.1	6.5	29.2	6.2	12.9
February	4.1	28.9	5.4	33.7	6.0	33.4	6.1	11.0
March	5.4	21.3	6.0	29.6	5.8	30.1	6.7	8.5
April	7.1	10.3	6.7	20.5	4.9	34.6	7.2	4.9
May	8.3	5.9	6.7	20.5	4.9	33.3	8.2	4.4
June	7.6	3.9	7.0	23.4	4.7	28.8	8.5	3.9
July	6.9	4.8	5.3	26.9	4.5	33.6	7.1	6.5
August	6.7	6.4	8.5	28.9	3.6	42.5	6.8	8.0
September	6.4	7.7	10.4	25.0	3.4	44.9	6.1	12.3
October	5.5	14.0	10.6	25.8	4.2	39.2	6.6	8.6
November	4.1	28.6	5.5	33.5	5.6	31.8	6.1	8.2
December	3.6	35.6	4.9	40.4	5.6	35.3	5.9	12.3
Annual Average	5.6	18.0	5.8	28.5	4.9	34.8	6.8	8.5

1. Source: NOAA 1979a
2. Source: U.S. Air Force 1983
3. Source: Batelle 1966

The combined inverions and calm periods would result in the poorest dispersion potential during the winter months, when the total electrical output (and hence pollutant emissions) from the power plants would be the highest. Exactly the opposite situation would occur at the Proposed Project. The highest fugitive dust emissions during the dam construction would occur during the summer months, during which time the occurrence of inversions is at a minimum.

The severe inversions and extended calm periods must be carefully considered during the impacts analysis. The following topics must be addressed:

- How would the occurrence of extended calm periods influence the ground level SO_2 concentrations around the power plants?

- How would the reduced mixing heights that occur during inversions influence the ground level SO_2 concentrations around the plants and in Denali National Park?

- How would the occurrences of inversions affect the formation of regional haze in Denali National Park?

- How would plume fumigation caused during inversion breakups affect short-term (1-hr and 3-hr) pollutant concentrations around the plant?

These major topics are discussed in detail in Appendix III of this document.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality, Coal Plants, Coal Resources

LOCATION IN DEIS: Vol 3 Page G-20 Section G.2.4. Paragraph 4 of the page (Table G-8)

COMMENT IN REFERENCE TO: Coal composition should to be documented.

TECHNICAL COMMENT: The SO_2 emission rates that were used for the DEIS air quality analyses were based on continuous burning of coal with the following properties:

Heating Value	(BTU/lb)	- 8,000
Sulfur Content	(%)	- 0.3
Ash Content	(%)	- 9.9

These values are apparently the average of measured coal quality for the major coal fields in central Alaska. The DEIS assumed that the coal properties at all of the proposed power plants would remain constant for the life of the project. Site-specific coal properties, and changes over time, should be considered in the FEIS.

The DEIS should have evaluated the potential impacts caused by variations in coal quality. It is reasonable to expect that roughly half of the coal burned in the power plants would be of lower quality than the "average coal" assumed for the DEIS. Since the DEIS indicated potential air quality problems caused by burning the "average coal", extended use of a lower quality coal could cause even more unacceptable problems.

A compilation of coal quality data for the three major coal fields is shown in the attached Table 1. The coal data is based on analyses conducted by the Alaska Department of Natural Resources (ADNR 1984). As is expected, there is a wide range in the measured coal properties within all of the fields. To evaluate the impacts of potential coal degradation, two key coal-quality scenarios are shown in the table; the "representative scenario" that represents ADNR's best judgment on the average coal quality in each coal field, and the "worst-case scenario" that represents ADNR's judgment on the worst coal quality that could reasonably be expected for at least a one-year period.

There are two major implications to these variations in coal quality. First, the coal mine owner would have to conduct extensive coal blending to meet the minimum coal-quality standards that will be set by the power companies. Second, even with coal blending it is possible that some lower quality coal would have to be burned for an extended period, which would cause increased pollutant emissions during that period. These two major implications are discussed below.

Coal blending at the mine site would be needed to produce a continuous supply of coal with consistent properties (heating value, ash, sulfur content, etc). It would be difficult for the power plants to operate using a coal supply that frequently varied in quality. The individual power companies that purchase the coal would therefore specify an allowable range of coal quality. The mine owner would be responsible for ensuring that the coal that was delivered to the plants consistently met those standards. If the coal that was mined from a particular seam did not meet those standards, then it would have to be temporarily stockpiled and later blended with coal that was better than the minimum standards. These coal blending operations would add to the cost and environmental impacts of the mine. The blending operations would require additional equipment and manpower, so they would increase the coal cost. The active coal stockpiles and coal transfer operations would be major fugitive dust sources. Surface runoff from the active coal stockpiles could also increase the water quality impacts of the mine.

Increased SO_2 emissions caused by burning low quality coal could add to the air quality impacts near the power plants. The estimated SO_2 emissions and total ash production that would result from burning coal from the three fields are shown in the attached Table 2. The assumed plant parameters are the same as those used in the DEIS: 200 MWe, 10,000 BTU/kWh heating rate, and 13.7% total outages. As shown in that table, the SO_2 emission rate that was assumed in the DEIS does indeed represent the average rate that is calculated for the three major coal fields. However, the table also shows that the SO_2 emission rate when burning lower quality coal could be much higher than the value assumed in the DEIS. These major SO_2 emission increases would cause higher ambient SO_2 concentrations near the power plants.

The FEIS should address the implications of variations in coal quality at the Nenana coal field. It should present data on the varying coal quality. The necessity for coal blending and its economic and environmental impacts should be discussed. The revised air quality analyses in the FEIS should discuss SO_2 impacts caused by burning of low quality coal. All of these topics are addressed in Appendix III of this document.

Table 1

Comparison of Coal Quality
from Alternative Coal Fields [1], [2]

Coal Source	Parameter	Representative Range	Representative Scenario	Worst-Case Scenario[3]
Susitna Lowlands, incl. Beluga Field (66 samples)	BTU/lb	6,500 - 9,500	8,200	7,800
	Sulfur (%)	0.1 - 0.7	0.3	0.5
	Moisture (%)	10 - 30	15	20
	Ash (%)	3 - 30	15	20
Nenana Basin, incl. Nenana Field (70 samples)	BTU/lb	6,500 - 9,800	7,900	7,700
	Sulfur (%)	0.2 - 0.7	0.3	0.5
	Moisture (%)	10 - 30	20	23
	Ash (%)	3 - 30	12	20
Matanuska Field (58 samples)	BTU/lb	10,400 - 14,300	10,700	10,000
	Sulfur (%)	0.3 - 0.7	0.5	0.7
	Moisture (%)	3 - 9	6	15
	Ash (%)	4 - 25	20	22

(1) Source: Alaska Dept. of Natural Resources, 1984.

(2) All values use on as-received basis.

(3) "Worst-Case Scenario" is the ADNR judgment on the worst coal properties that would be encountered for extended periods.

Table 2

Comparison of SO_2 and Ash Emissions
for Alternative Coal Sources(1)

Coal Source	SO_2 Emissions, g/sec Uncontrolled	SO_2 Emissions, g/sec 70% Control	Total Ash Production, tons/yr
Assumed Values in DEIS	188	56.5	75,000
Nenana Field			
a. Representative Scenario	167	50.2	115,000
b. Worst-case Scenario (2)	287	86.0	196,000
Beluga Field			
a. Representative Scenario	162	48.6	138,000
b. Worst-case Scenario	283	84.9	194,000
Matanuska Field			
a. Representative Scenario	206	61.9	141,000
b. Worst-case Scenario	309	92.7	166,000

(1) Based on 200 MWe plant; 13.7% outages; coal properties from Alaska Dept. of Natural Resources (ADNR 1984).

(2) "Worst-case Scenario" is the ADNR judgment on the worst coal properties that would be encountered for extended periods.

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TECHNICAL COMMENT FORM

TOPIC AREA: Air Quality

LOCATION IN DEIS: Vol 3 Page G-27 Section G.2.4 Paragraph 4 of the page

COMMENT IN REFERENCE TO: Visibility analyses are inadequate.

TECHNICAL COMMENT: The analyses of visibility impairment caused by the coal-fired power plants will be much more complex than is indicated in the DEIS. See Technical Comment ALT045.

SUSITNA HYDROELECTRIC PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TECHNICAL COMMENT FORM

TOPIC AREA: Transmission Lines and Corridors

LOCATION IN DEIS: Vol 6 Page M-53 Section M.3.1.4.2 Paragraph 5 of the page

COMMENT IN REFERENCE TO: Proposed transmission line from Healy to Fairbanks terminus would be new right-of-way.

TECHNICAL COMMENT: The proposed transmission line between Healy and Fairbanks will parallel the existing Golden Valley Electric Association's line for approximately 25 miles of the 94-mile length, and would not be considered new right-of-way. Therefore, impacts in these areas would be only incremental.

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Alaska Power Authority
Comments on the Federal Energy Regulatory Commission
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of May 1984

This Bibliography is organized according to the five categories of the Technical Comments. Within each category, the references are listed alphabetically by author. For brevity, the following acronyms are used in the citations.

Acronym	Affiliation
Acres	Acres American, Inc.
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AEIDC	Arctic Environmental Information and Data Center
AIEE	American Institute of Electrical Engineers
AK	State of Alaska (General)
ALUC	Alaska Land Use Council
APA	Alaska Power Authority
ASL	Alaska State Legislature
Battelle	Battelle Pacific Northwest Laboratories
BLM	Bureau of Land Management
BP	British Petroleum
COE	Corps of Engineers
DCED	Alaska Department of Commerce and Economic Development
DOE	U.S. Department of Energy
EBASCO	Ebasco Services, Inc.
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission

Acronym	Affiliation
FNSB	Fairbanks - North Star Borough
FOA	Frank Orth and Associates
HE	Harza-Ebasco Susitna Joint Venture
IEA	International Energy Agency
IEEE	Institute of Electrical and Electronics Engineers, Inc.
ISER	Institute of Social and Economic Research
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
O&GCC	Oil and Gas Conservation Commission
PND	Peratrovich, Nottingham & Drage, Inc.
R&M	R&M Associates
SHCA	Sherman H. Clark Associates
SHP	Susitna Hydroelectric Project
TES	Terrestrial Environmental Specialists
UAM	University of Alaska - Museum
USBR	U.S. Bureau of Reclamation
USDASCS	U.S. Department of Agriculture, Soil Conservation Service
USGS	U.S. Geological Survey

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