

**REACHING AN AGREEMENT TO BUILD A NEW
COAL-FIRED POWER PLANT NEAR A
NATIONAL PARK BY MITIGATING
POTENTIAL ENVIRONMENTAL IMPACTS**

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ABSTRACT

This paper presents an interesting example of compromise through comprehensive environmental analysis and intensive negotiation to build a coal-fired power plant near an environmentally sensitive area. In December 1993, the U.S. Department of Energy (DOE) completed the final environmental impact statement (EIS) for the Healy Clean Coal Project (HCCP), a proposed demonstration project that would be cost-shared by DOE and the Alaska Industrial Development and Export Authority (AIDEA). The HCCP would be built adjacent to the existing coal-fired Golden Valley Electric Association, Inc. (GVEA) Unit No. 1 in Healy, Alaska, about 4 miles north of Denali National Park and Preserve (DNPP). In response to U.S. Department of the Interior (DOI) concerns about potential air quality related impacts on DNPP, DOE facilitated negotiations among DOI, AIDEA, and GVEA which overcame a "stalemate" situation. A Memorandum of Agreement was signed by all four parties, enabling DOI to withdraw its objections. The cornerstone of the Agreement is the planned retrofit of Unit No. 1 to reduce emissions of sulfur dioxide and oxides of nitrogen. If the demonstration technologies operate as expected, combined emissions from the Healy site would increase by only about 8% but electrical generation would triple. The Agreement is a "win/win" outcome: DOE can demonstrate the new technologies, AIDEA can build a new power plant for GVEA to operate, and DOI can safeguard the pristine environment of DNPP.

INTRODUCTION

Much attention has recently been given to the conflict between industrial development and preservation of the pristine nature of the National Park Service's (NPS's) nationwide park system. A large portion of this dispute focuses on air quality, particularly the clarity of the atmosphere as it affects visibility within the parks. Many visitors to the national parks are unable to fully enjoy some of the beautiful and dramatic views that would prevail in the absence of anthropogenic air pollution [1]. Although Congress in 1977 established a national goal of correcting and preventing pollution-related visibility impairment affecting national parks, little progress has been made to date [1]. As in other areas of environmental concern, this conflict is the result of a value judgment decision between the preservation of scenic beauty and the use of natural resources for economic development [2]. However, by initiating

common understandings through negotiation, many cases need not be "either/or" propositions with irreconcilable differences drawn between the pro-development and pro-environment camps. This paper presents an example of compromise through comprehensive environmental analysis and intensive negotiation to build a coal-fired power plant near an environmentally sensitive national park. The experience reported here may be useful to others faced with difficult siting situations.

BACKGROUND

In September 1988, Congress provided \$575 million for the third solicitation of the Clean Coal Technology (CCT) Program to DOE for cost-shared financial assistance to selected state and industrial participants (Public Law 100-446). The objective of the third solicitation is to demonstrate innovative, energy-efficient, coal-based technologies that would be ready to be commercialized in the 1990s; the technologies must be capable of (1) achieving substantial reductions in the emissions of sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) from existing facilities to minimize environmental impacts such as transboundary and interstate pollution and (2) providing for future energy needs in an environmentally acceptable manner. A Program Opportunity Notice (PON) soliciting proposals was issued by DOE in May 1989. In response to the PON, 48 proposals were received in August 1989. In December 1989, DOE announced the selection of 13 proposals that best further the goals and objectives of the PON. The HCCP proposed by AIDEA, a state agency, was one of the 13 projects selected for funding.

PROJECT DESCRIPTION

The HCCP will demonstrate novel technologies using a new 50-MW coal-fired power generating facility to be built adjacent to the existing 25-MW Healy Unit No. 1, a conventional pulverized-coal unit owned and operated by GVEA, in Healy, Alaska, located approximately 80 miles southwest of Fairbanks and 250 miles north of Anchorage (Fig. 1). The proposed project is intended to demonstrate the combined removal of SO_2 , NO_x , and particulate matter using innovative combustion and flue gas cleanup technologies. The combustion technology is an entrained combustion system with limestone injection to capture SO_2 in the flue gas. The main combustion sections operate at a slight air deficiency to reduce the amount of NO_x produced. The postcombustion technology is a spray dryer absorber for a second stage of SO_2 removal and particulate removal. The technologies are dependent on each other as part of the integrated system. A baghouse provides further capture of particulate matter and SO_2 before the flue gas exits through the stack. The project is expected to generate data sufficient to allow private industry to assess the potential for commercial application of these technologies.

The HCCP will be fueled with a blend of low-sulfur coal and waste coal (containing an average of 0.15% sulfur and 17% ash) supplied by Usibelli Coal Mine, Inc., from an open-pit coal mine located about 4 miles north of the site. Waste coal is either low-grade coal or overburden- or underburden-contaminated coal of quality that normally is too poor to be used. Due to the proposed project's proximity to DNPP, it has been designed to be one of the cleanest coal-fired power plants in the world, with SO_2 emissions of 0.043 lb/MMBtu, NO_x emissions of 0.2 lb/MMBtu, and particulate emissions of 0.015 lb/MMBtu. GVEA has entered into a power sales agreement for the purchase and distribution of the electricity that will be generated by the HCCP. Construction of the proposed project is expected to begin in April 1995 and be completed in late 1997. After a 1-year demonstration and testing period during 1998, commercial operation of the proposed project is anticipated to begin in 1999.

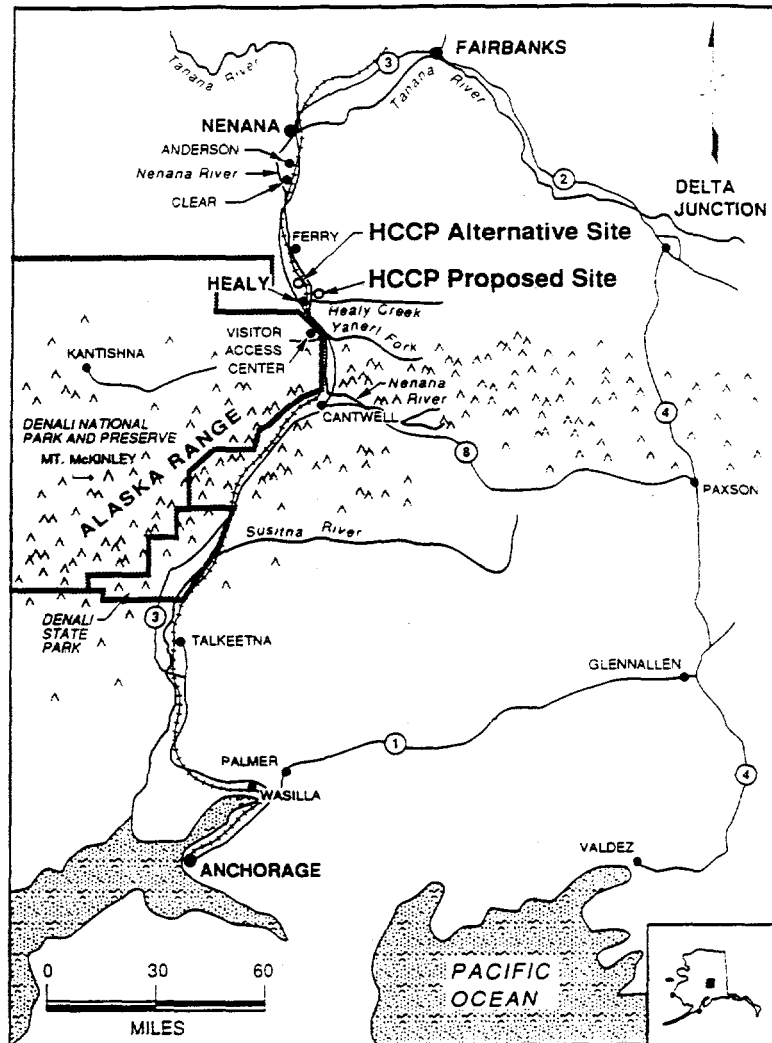


Fig. 1. Regional location map. Source: DOE 1993. *Final Environmental Impact Statement for the Proposed Healy Clean Coal Project*, DOE/EIS-0186, 2 vols., U.S. DOE, Washington, D.C., December.

CONCERNS OF THE NATIONAL PARK SERVICE

Because the site proposed for the HCCP is only 4 miles north of the nearest border of DNPP, a "crown jewel" of the NPS system with pristine air quality, the potential for the proposed project's emissions to degrade visibility within the park was of great concern to NPS from the project's inception. DNPP is designated a federal Prevention of Significant Deterioration (PSD) Class I area where stringent standards apply to severely limit any degradation of air quality. Although there have been no known visibility impacts associated with the existing Healy Unit No. 1, NPS was concerned that the simultaneous operation of the HCCP and Unit No. 1 might result in emissions above a threshold that would trigger perceptible effects. Visibility impairment, if it were to occur, would probably take the form of a yellowish-brown plume resulting from light absorption by nitrogen dioxide (NO_2) that would reduce visibility or be noticeable when contrasted against relatively clean air either above or below the plume. Visibility impairment resulting from light scattering by particles in the plume, including sulfate particles formed from SO_2 , would be even less likely. In fact, the light scattering could counteract and diminish the visual effects of an NO_2 plume. In addition, NPS was

concerned about the formation of regional haze, a reduction in visibility associated with air masses containing pollutants from emissions that have mixed in the atmosphere so that distinct plumes are not visible.

NPS used two principal avenues to express its concerns. First, as the Federal Land Manager for DNPP, NPS has a responsibility to protect the park's air quality related values through consultation with the Alaska Department of Environmental Conservation (ADEC), the permitting agency, during the permitting process. NPS exercised this responsibility through its parent department, DOI, by concluding that the new facility's emissions would have an adverse impact on the air quality related values of the park. DOI recommended that ADEC deny the proposed PSD permit to construct and operate the facility (which was based on the permit application prepared by AIDEA). Subsequently, ADEC determined that DOI had not demonstrated that the new facility's emissions would have an adverse impact and issued the permit in March 1993. In April 1993, NPS appealed the issuance of the permit to the Commissioner of ADEC.

The second avenue NPS followed was to challenge portions of the analyses and findings from the draft EIS prepared by DOE with assistance from Oak Ridge National Laboratory. The EIS evaluated environmental issues associated with the proposed project, in compliance with the National Environmental Policy Act (NEPA) of 1969, which was triggered because of the cost-shared funding being provided by DOE. DOE determined that an EIS was the appropriate level of NEPA documentation because the proposed project constituted a major federal action that might significantly affect the quality of the human environment. NPS was granted cooperating agency status by DOE for the preparation of the EIS because of its special expertise with respect to air quality and visibility [other cooperating agencies included the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture's Rural Electrification Administration, and the U.S. Department of the Army's Corps of Engineers]. As a cooperating agency, NPS reviewed and commented on the draft EIS, but declined DOE's invitation to assist in the preparation of the document.

The NPS concerns were the major issues that required resolution in siting the proposed project near the park. These issues are described in detail because they illustrate the extensive analysis required to comply with the spirit of NEPA and successfully execute a sensitive EIS. Because of extensive coordination between AIDEA and DOE during the preparation of the PSD permit application and the EIS, which resulted in similar analyses for their respective documents, NPS concerns regarding the two documents were nearly identical. Therefore, although the following discussion focuses on NPS issues related to the EIS, those issues are also relevant to the permit.

VISIBILITY ANALYSIS ISSUES

In performing the analysis of the potential for visibility impacts at the park, DOE consulted extensively with EPA and NPS. Initially, NPS questioned the appropriateness of modifications that were made to the PLUVUE I visibility model [3], which DOE used to predict visibility impacts within the park from emissions of the proposed project and the existing Healy Unit No. 1. NPS expressed concern that the modifications resulted in an underprediction of the potential effects. NPS identified the PLUVUE II model as the preferred and more appropriate model for this application. Later, EPA provided a technical evaluation which stated that the PLUVUE II model could not be relied upon to produce technically credible results for the EIS because the model contained an error in its computer code that lacked a confirmed and fully understood correction. Eventually, consensus was reached on the appropriate model to

use for the EIS analysis: participants representing AIDEA, DOE, EPA, and NPS agreed at a workshop held in September agreed that the PLUVUE I model, as modified by DOE, provided a reasonable tool for predicting the visibility impacts of the HCCP.

Disagreements persisted, however, concerning some of the assumptions required to conduct the modeling, as well as the manner in which the results should be interpreted. In particular, NPS and EPA urged DOE to use recommended EPA regulatory guidelines, which tend to be conservative (i.e., form an upper bound of expected results), in view of the importance of protecting the park and the uncertainties inherent with visibility modeling as an analytical technique. DOE agreed that a conservative approach to modeling should be taken, but maintained that the assumptions it used were sufficiently conservative. DOE believed that its assumptions were most appropriate because the predictions for the existing Healy Unit No. 1 alone using those assumptions most nearly matched the experience of camera monitoring equipment operating from January 1992 through April 1993. During this monitoring period, the cameras did not detect any visible pollutant plumes within the park from the existing Unit No. 1 (the camera monitoring program was established by AIDEA as part of the PSD permit application for the purpose of determining if plumes from Unit No. 1 are visible). Using the DOE assumptions, the model predicted 6 daytime hours per year that a plume would be perceptible from Unit No. 1 emissions alone.

Nevertheless, in response to the discussions over model assumptions, DOE tested the sensitivity of the model results to using the more conservative NPS and EPA assumptions. Specifically, the effects of changing two assumptions were tested: (1) the threshold for perception of a visible plume and (2) the length of the sight path of a visible plume. The modeling was found to be more sensitive to decreasing the perceptibility threshold than to extending the sight path beyond the park boundary so that its length equals the distance to the background terrain. The modeling was extremely sensitive to changing both parameters simultaneously and increased the predicted number of hours for a visible plume beyond credible amounts. For emissions from the existing Unit No. 1 alone (in which the base case predicted 6 daytime hours per year that a plume would be perceptible), 17 daytime hours per year were predicted by extending the sight path; 42 daytime hours per year were predicted by decreasing the threshold; and 145 daytime hours per year were predicted by changing both parameters simultaneously. For emissions from the HCCP alone, the base case predicted 2 daytime hours per year that a plume would be perceptible; 4 daytime hours per year were predicted by extending the sight path; 14 daytime hours per year were predicted by decreasing the threshold; and 78 daytime hours per year were predicted by changing both parameters simultaneously.

NPS disagreed with DOE's assumptions and was opposed to trying to correlate the observations with the modeled results. NPS indicated that based on past experience, photographic monitoring alone has not always been reliable for detecting plumes. NPS noted that there could be subtle visibility impairment detected by human observers that would not be detected by camera monitoring systems due to insufficient film resolution and sensitivity. To date, however, no visible plumes within DNPP from the existing Unit No. 1 are known to have been sighted by human observers.

REGIONAL HAZE ANALYSIS ISSUES

As with the plume visibility analysis, there were elements of the regional haze analysis on which DOE, NPS, and EPA reached consensus, but the three agencies still disagreed on other issues which primarily involved modeling assumptions. Therefore, DOE tested the sensitivity

of the modeling results to using the more conservative NPS and EPA assumptions. Specifically, the effects of changing two assumptions were tested: (1) the percentage change in the light extinction coefficient necessary to perceive regional haze and (2) oxidation rates of SO₂ to sulfate. The modeling was found to be more sensitive to increasing the oxidation rates than lowering the percentage change in the light extinction coefficient. The modeling was very sensitive to changing both parameters simultaneously. For example, for emissions from Unit No. 1 alone, the base case predicted from 0 to 2 haze episodes per year (depending on the location); lowering the percentage change in the light extinction coefficient resulted in a prediction of 2 to 7 events per year; increasing the oxidation rates yielded 5 to 19 events per year; and from 30 to 38 events per year were predicted by changing both parameters simultaneously.

After extensive coordination and consultation with NPS, DOE believed that the regional haze analysis using its assumptions was both reasonable and conservative. Regional haze has been detected at DNPP, but that haze has not been attributed to any specific source because of limitations in the monitoring data to identify the sources. Studies have indicated that the long-range transport of sulfur species from Eurasia is an important source of existing Arctic regional haze [4,5]. DOE believed that the analyses indicated that HCCP emissions would rarely make a perceptible contribution to any regional haze in the park.

MEMORANDUM OF AGREEMENT

In spite of ADEC's issuance of the permit and DOE's findings in the draft EIS, the NPS's unwavering position (including its pending appeal of the issuance of the permit to the Commissioner of ADEC) made it unclear as to whether DOE's decision-makers would provide cost-shared funding for the proposed project (following issuance of the final EIS). Because of this uncertainty, AIDEA and GVEA agreed, at DOE's urging, to participate in negotiations that would include discussions of measures to mitigate potential adverse effects to the park. AIDEA's and GVEA's participation was an acknowledgment that an agreement between all parties would maximize the probability of a decision to proceed with the project in an expedient manner.

Consequently, DOE facilitated negotiations among AIDEA, GVEA, and DOI, beginning in May 1993. Although the negotiations stalled during the early stages, they became intense by September 1993. The negotiations were successfully concluded and a Memorandum of Agreement was signed by DOI, DOE, AIDEA, and GVEA on November 9, 1993, to ensure the protection of the park's resources from potential adverse air pollution impacts attributable to the proposed project and Unit No. 1. The Agreement has rendered the disagreements over the previously discussed modeling assumptions to be largely academic.

The cornerstone of the Memorandum of Agreement is the planned retrofit of Healy Unit No. 1 to reduce emissions of NO_x and SO₂. This Agreement is unusual, if not precedent setting, because current emissions from Unit No. 1 are well within permitted limits and there has been no evidence that Unit No. 1 is causing any deleterious effects. For NO_x control, the Agreement calls for Unit No. 1 to be retrofitted with low-NO_x burners with overfire air (if technologically feasible) after the start-up of the proposed project. GVEA has agreed to reduce Unit No. 1 NO_x emissions by approximately 50%, from 848 tons per year to 429 tons per year. The Agreement also requires that SO₂ emissions from Unit No. 1 be reduced by 25%, from 630 tons per year to 472 tons per year, using duct injection of sorbent (e.g., flash-calcined material or lime). In addition, GVEA has agreed to implement administrative controls (reduce Unit No. 1 output) to protect the park from observed plume or haze impacts.

Furthermore, the Agreement may be renegotiated if visibility impacts occur more than 10 times during any 6-month period. In addition, 2 years after start-up of the proposed project and as otherwise agreed, GVEA and the DNPP superintendent will meet to evaluate these procedures and discuss additional reasonable measures, if necessary, to protect air quality related values of the park, including measures applicable to any plumes of water droplets or ice crystals emanating from the proposed project.

If the HCCP demonstration technology operates as expected, combined NO_x and SO₂ emissions from the Healy site would increase by only about 8%, from 1478 tons per year to 1602 tons per year (Fig. 2), even though electrical generation will increase from the existing 25 MW to 75 MW for the two units. If the HCCP demonstration fails to meet project objectives for air emissions but attains levels allowed by the permit issued by ADEC which had been challenged by DOI, then the combined emissions from the Healy site would be capped under the Agreement at 2160 tons per year (i.e., 1439 and 721 tons per year of NO_x and SO₂, respectively), about 46% over the emissions for the existing Healy site (Fig. 2). This is 576 tons per year less than the combined maximum allowable emissions for the site under the permit which DOI had challenged without mitigation of Unit No. 1 (Fig. 2).

The Agreement requires that the PSD permit issued by ADEC reflect the new reductions in emissions from Unit No. 1. Furthermore, the Agreement establishes that if the proposed project successfully attains the low level of emissions expected, then GVEA would request that ADEC reduce NO_x and SO₂ emission limits in the permit to match achieved emission levels. The Agreement also requires GVEA to reduce combined emissions from the site to the level of existing Unit No. 1 emissions, immediately upon notification by either NPS or ADEC that a NO_x or other pollutant plume, or a sulfate or other pollutant haze, is visible inside the park. Furthermore, if sightings persist, NPS may reopen the Agreement so that additional measures can be taken. The Agreement states that DOI withdraw its request to ADEC to reconsider the issuance of the permit, and that the mitigation terms and conditions of the Agreement be incorporated into and become enforceable requirements in the permit.

As a consequence of the Agreement, DOI withdrew its appeal of the issuance of the permit on November 11, 1993. DOE issued the final EIS in December 1993, including a detailed discussion of the provisions of the Agreement [6]. On March 10, 1994, DOE issued a Record of Decision to provide cost-shared funding for the HCCP, contingent on the incorporation of the terms of the Agreement into the permit. In January 1994, AIDEA and GVEA requested a revision to the permit which would incorporate the provisions of the Agreement. The amended PSD permit was issued by ADEC in May 1994.¹

IMPLICATIONS

The Agreement is a "win-win" outcome for DOE, AIDEA, GVEA, and DOI. DOE can demonstrate the innovative combustion and flue gas cleanup technologies as part of the CCT Program. AIDEA can provide economic development for Alaska by building a new power plant with an investment that achieves the "biggest bang for its buck." In addition, AIDEA believes the demonstration will improve the attractiveness of Alaskan coal in the international marketplace. GVEA can operate the plant to generate electricity economically and meet its

¹On June 2, 1994, an agreement was reached between the Trustees for Alaska, GVEA, and AIDEA that likely will allow construction of the proposed project.

growing regional demands for electricity for many years (the expected operating life of the proposed project is in excess of 40 years). Finally, DOI has helped to safeguard the pristine environment of the park by minimizing the allowable increases in emissions.

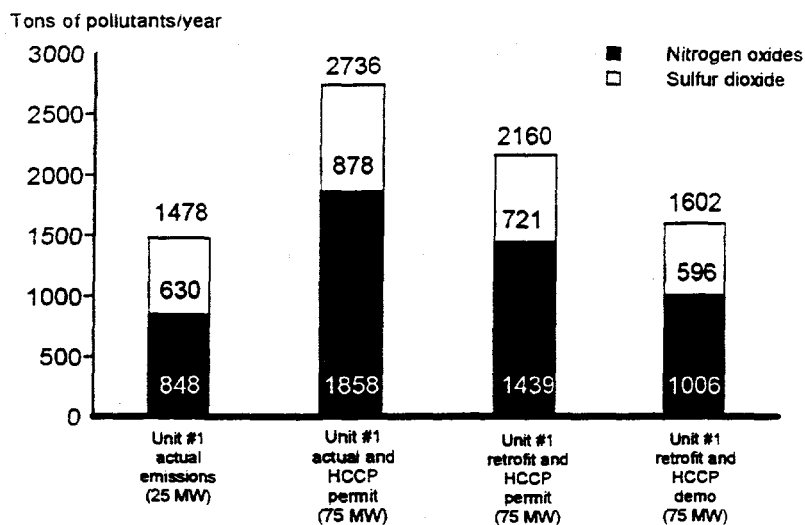


Fig. 2. Total site NO_x and SO_2 emissions for the Healy Unit No. 1 (actual and retrofit) and Healy Clean Coal Project facilities. Emission levels are for a 100% capacity factor.

From a broader perspective, the successful outcome of these negotiations provides the public with hope that federal agencies and other involved organizations can come to the table and negotiate in good faith to resolve their differences. With so many examples of irreconcilable disputes within the federal government, it is refreshing to point to the HCCP negotiations as a case of "good government." The consequences of this landmark case should be followed closely during operation of the new facility to document the actual performance of the Memorandum of Agreement in mitigating the NPS concerns related to visibility impairment at DNPP.

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