THE HEALY CLEAN COAL PROJECT

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Abstract

The Healy Clean Coal Project (HCCP), selected by the U.S. Department of Energy (DOE) under Round III of the Clean Coal Technology Program, is in the demonstration phase. The Project is owned and financed by the Alaska Industrial Development and Export Authority (AIDEA), and is co-funded by the U.S. Department of Energy. Construction was completed in November of 1997, with coal-fired testing starting in January of 1998. Demonstration testing and reporting of the results will take place in 1998, followed by commercial operation of the facility. Formal operational test reports will be provided through June 1999, followed by an additional two years of operational data. The emission levels of oxides of nitrogen (NO_x), sulfur dioxide (SO_2), and particulates from this 50-megawatt plant are expected to be significantly lower than current standards. The project background, a description of the technology to be demonstrated, project status, and the demonstration goals of this project are presented herein.

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Background

In September of 1988, Congress provided $575 million under Round III of the Clean Coal Technology Program (CCT) to conduct cost-shared projects to demonstrate technologies that are capable of retrofitting or repowering existing facilities. To that end, a Program Opportunity Notice (PON) was issued in May of 1989, by the DOE, soliciting proposals to demonstrate innovative energy-efficient technologies that were capable of being commercialized in the 1990s, and were capable of (1) achieving significant reductions in the emissions of sulfur dioxide and/or oxides of nitrogen from existing facilities to minimize environmental impacts such as transboundary and interstate pollution and/or (2) providing for future energy needs in an environmentally acceptable manner.

In response to the PON, DOE received 48 proposals in August of 1989. After evaluation, 13 projects were selected in December of 1989 as best furthering the goals and objectives of the PON. The projects were located in ten states and represented a variety of technologies.

One of the 13 projects selected for funding was the Healy Clean Coal Project (HCCP) proposed by the Alaska Industrial Development and Export Authority (AIDEA). The project will demonstrate the combined removal of SO_2, NO_x, and particulates from a new 50-megawatt electric coal-fired power plant using both innovative combustion and flue gas cleanup technologies. AIDEA owns the Project, performs under the DOE Cooperative Agreement, administers State funds, obtains financing through the sale of bonds, and manages the Project. The architect/engineer for the Project is Stone & Webster Engineering Corporation (SWEC). Fairbanks utility Golden Valley Electric Association (GVEA) will operate the facility and pay for power generated under terms of a Power Sales Agreement. Usibelli Coal Mine, Inc. (UCM) provides coal under the terms of a Coal Sale Agreement. The technology suppliers are TRW (coal feed system and combustors), and Joy-Niro, now the Babcock & Wilcox Company (fabric filter and SO_2 removal systems).

The TRW slagging combustor technology has been developed over many years. During 1990 and 1991, Healy coal was tested by TRW in a 35-MMBtu/hr slagging combustor system at TRW's Cleveland test facility. The slagging combustor scaling and operation were as predicted, both from analytical and operational viewpoints. However, it was recognized that the storage-type coal feed system, used in the Cleveland facility, was not desirable because of safety concerns associated with the high volatile content of the Usibelli coal.

The next development stage was to design and fabricate a non-storage coal feed system and test fire a full size precombustor. To assist in the design, cold-flow modeling was conducted by TRW. A 130-MMBtu/hr precombustor was then built and tested in 1992 and 1993 on Healy coal at TRW's Capistrano facilities. In parallel with the TRW testing, Niro conducted pilot tests in Sweden on the SDA system. In addition, Foster Wheeler built gas-flow modeling facilities and tested combustor gas flows to assist in the furnace design.

The Project site is in Healy, Alaska, near the Denali National Park and Reserve. Extensive air quality and visibility monitoring and modeling were conducted as part of the Environmental Impact Statement (EIS) and the Prevention of Significant Deterioration (PSD) permit documentation. Air quality models of the GVEA coal-fired existing Unit 1 emissions were verified and calibrated with ambient air quality and visibility monitors. Two years of visibility monitoring information was collected. The demonstration technologies are vital to assure air emission levels consistent with environmental permits and the conditions necessary to protect the pristine air quality of Denali National Park and Reserve.

The demonstration project is adjacent to the existing GVEA 25-MW Healy Unit No. 1 pulverized coal-fired power plant. Unit No. 1 has recently been converted with low-NO_x burners, provided by Foster Wheeler, that are guaranteed to meet .30 lb/MMBtu NO_x emission permit conditions with blended coal. The project will demonstrate the ability of slagging combustors to utilize low-quality coals effectively. It is anticipated that HCCP and Unit No. 1 may burn the same fuel blends, allowing comparison of low-NO_x burners and the TRW combustors regarding NO_x emissions.

Technology To Be Demonstrated

Coal provided by the UCM, adjacent to the Project site, is pulverized and burned at the new facility to generate high-pressure steam. The high-pressure steam is supplied to a steam turbine generator to produce electricity. Emissions of SO_2 and NO_x from the plant will be controlled using TRW's Entrained Combustor system with limestone injection in conjunction with a boiler designed by Foster Wheeler Energy Corporation (FWEC). Further SO_2 and particulate removal will be accomplished using the Activated Recycle Spray Dryer Absorber (SDA) System and Fabric Filter (FF) developed by Joy-Niro. A material flow diagram and overall process flow diagram are provided in Figures 1 and 2 depicting the process.

The TRW Entrained Combustor is designed to operate under fuel-rich conditions, utilizing two-staged combustion to minimize NO_x formation. These conditions are obtained using a precombustor for heating the fuel-rich main combustor for partial combustion, with combustion completion occurring in the boiler. The first and second stages of combustion produce a temperature high enough to generate a slag (molten ash) while reducing the fuel-bound nitrogen to molecular nitrogen (N_2). Typically 80% of the ash is expected to be removed as slag. The third and final stage of combustion in the boiler occurs at a combustion temperature maintained below the temperature that will cause thermal NO_x formation. Figure 3 shows the main combustor components configuration. Subbituminous coals from the adjacent UCM will be the fuel. Table 1 shows coal properties for the Run of Mine (ROM) and Waste coals.

The combustor is also used to reduce SO_2 emissions by the injection of pulverized limestone into the hot gases as they leave the combustor and enter the furnace. This technique converts the limestone into lime (flash calcination), or flash calcined material (FCM), which reacts with the sulfur compounds in the exhaust gas to form calcium sulfate. Captured SO_2 is removed in the combustor and boiler as bottom ash. The flue gas, which contains the remaining sulfur compounds, calcium sulfate, ash, unused sorbent, and other solid particles, leaves the boiler and passes through an SDA and FF for further SO_2 and particulate removal prior to exiting the stack.

Table 1.
Coal Analyses

PROXIMATE ANALYSIS	**PERCENT BY WEIGHT (AS RECEIVED)**	**RUN-OF-MINE**	**WASTE COAL**
Moisture	(%)	26.35	23.87
Ash	(%)	8.20	25.00
Volatile	(%)	34.57	27.00
Fixed Carbon	(%)	30.89	24.13
Total	(%)	100.00	100.00
Higher Heating Value	(Btu/#)	7815.0	6105.0
ULTIMATE ANALYSIS	**PERCENT BY WEIGHT (AS RECEIVED)**		
Percent By Weight	(%)		
Moisture	(%)	26.35	23.87
Carbon	(%)	45.55	35.59
Hydrogen	(%)	3.45	2.70
Nitrogen	(%)	0.59	0.46
Sulfur	(%)	0.17	0.13
Ash	(%)	8.20	25.00
Oxygen	(%)	15.66	12.23
Chlorine	(%)	0.03	0.02
Total	(%)	100.00	100.00
ELEMENTAL ASH ANALYSIS	**PERCENT BY WEIGHT – OXIDES (AS RECEIVED)**		
Silicon Dioxide	(%)	38.61	74.58
Aluminum Oxide	(%)	16.97	9.16
Titanium Dioxide	(%)	0.81	0.43
Ferric Oxide	(%)	7.12	4.18
Calcium Oxide	(%)	23.75	6.32
Magnesium Oxide	(%)	3.54	1.32
Potassium Oxide	(%)	1.02	1/21
Sodium Oxide	(%)	0.66	0.65
Sulfur Trioxide	(%)	5.07	1/36
Phosphorus Pentoxide	(%)	0.48	0.24
Strontium Oxide	(%)	0.23	0.07
Barium Oxide	(%)	0.44	0.15
Manganese Oxide	(%)	0.06	0.04
Undetermined	(%)	1.24	0/29
Total	(%)	100.00	100.00
Hardgrove Grindibility	(HgI)	25	35
T250	(°F)	2,450	2,900

The innovative concept to be demonstrated in SO_2 removal is the reuse of the unreacted lime, which contains little fly ash, as a result of furnace slag removal, in the SDA. The majority of fly ash is removed in the combustor in the form of slag. A portion of the ash collected from the SDA and the FF are first slurried with water, chemically and physically activated, and then atomized in the SDA vessel for second-stage SO_2 removal. Third-stage SO_2 and particulate removal occurs in the FF as the flue gas passes through the reactive filter cake in the bags.

The dry injection of limestone in the boiler, combined with the fly ash recycle system, replaces the more expensive lime required by commercial SDAs, reduces plant wastes, and increases SO_2 removal efficiency when burning high- sulfur and low-sulfur coals.

The integrated process is expected to achieve SO_2 removal greater than 90 percent, and a reduction in NO_x emissions to 0.2 pounds per million Btu. The integrated process is suited for new facilities or for repowering or retrofitting existing facilities. It provides an alternative technology to conventional pulverized coal-fired boiler flue gas desulfurization (FGD) and NO_x reduction processes, while lowering overall operating costs and reducing the quantity of solid wastes.

Subbituminous coals from the adjacent UCM will be the fuel. The primary fuel to be fired is a blend of ROM and waste coals. ROM coal is a subbituminous coal with a nominal higher heating value (HHV) range of 7,815 Btu/lb, a low average sulfur content of 0.17 percent, and an average ash content of 8.2 percent. ROM coal properties are fairly uniform. The waste coal is either a lower grade seam coal or ROM contaminated with overburden material having a nominal HHV of 6,105 Btu/lb, average sulfur content of 0.13 percent, and average ash content of approximately 25%. However, waste coal properties vary. The coal handling system provides coal to both units. It is capable of providing the same or different coal blends to either unit. The actual properties of the coal blend will vary considerably as a result of the blend and particular waste coal.

Project Status

The Cooperative Agreement project cost is $242 million with $117.3 million being funded under the Agreement by the DOE, and the remainder a combination of State grant, interest earnings, contributions from project participants, bonds sold by AIDEA, and power sales. The projected project cost is about $267 million. Construction of the HCCP began in the spring of 1995, and was completed in November of 1997.

Project construction was undertaken in stages due to the hostile winter conditions at Healy. The objectives of 1995 were primarily to complete all foundation work, the underground circulating water system piping, and primary structural steel. A shutdown of five months was subsequently planned for winter weather. The objectives of 1996 were to complete structural steel erection; install major equipment such as the combustors, turbine-generator, boiler, and SDA system; and to enclose the unit so that the additional mechanical and electrical equipment installation, and electrical and piping work could be accomplished in a controlled environment. The building enclosure was completed in November 1996. The main construction was completed ahead of the contractual schedule, with start-up activities commencing in the fall of

1997. Coal firing commenced in January 1998. Demonstration testing and reporting of the results has started.

Overall Demonstration Program Goals

Emissions control performance of the TRW Entrained Combustion/Joy-Niro Activated SDA System is projected to equal or exceed that of fluid-bed boilers (with advanced SO_2 and NO_x removal processes) or pulverized coal (PC)-fired boilers (also with advanced SO_2 and NO_x control processes). In addition, the emissions control technologies demonstrated by the HCCP are expected to be technically competitive with Integrated Gasification Combined Cycle (IGCC) power plants (also currently undergoing demonstration), but less costly to install and operate.

Demonstration of SO_2 removal efficiencies, nominally 90 percent with low reagent consumption, will allow the combined TRW/Joy-Niro integrated system to be effectively used in areas where a minimum 90 percent reduction is required and to compete with other high-removal-efficiency processes that are more costly. Waste disposal will be made easier by the production of a vitreous slag waste from the combustors and a dry powdery waste from the SDA system. The combined waste material will make a high-strength, stable waste material that can be easily disposed of in a conventional landfill operation or potentially used in commercial applications such as road base material.

The HCCP combustion system has the capability to limit NO_x emissions in the 0.20 to 0.35 lb/MMBtu range from new and existing boilers. Uncontrolled emissions of SO_2 can be reduced below National Source Performance Standards (NSPS) levels for either existing power plants or new coal-fired power plants with the TRW Entrained Combustion System alone, for some coal/sorbent combinations, or to even lower SO_2 emissions levels, when implemented with the Joy-Niro SDA technology on the back-end flue gas stream.

Project goals include demonstration of the following advantages of the integrated HCCP combustion and air pollution control systems:

- The integrated system will reduce emissions of SO_2, NO_x, and overall particulate matter, typically below 10 microns in size (PM_{10}), to levels below NSPS requirements.

- The process will demonstrate SO_2 reduction by limestone injection into the furnace. The overall use of limestone will be less than that for atmospheric fluidized-bed technologies, thereby reducing problems associated with plant wastes and reducing reagent demand and cost.

- The project will demonstrate activation and utilization of TRW-generated FCM waste for SO_2 removal in the Activated Recycle SDA System. In most SO_2 control processes, the calcium-based product from the particulate collection equipment is sent to disposal. In this innovative process, the product is reused to provide additional SO_2 removal in the SDA system.

- The project will demonstrate performance improvement and applicability of reuse of FCM to other FGD systems. For example, a utility already using FCM at one unit can make effective use of the FCM waste from another nearby site. As part of other HCCP agreements, FCM will be injected into GVEA's adjacent Unit No. 1 to reduce SO_2 emissions.

- The combustor/boiler bottom ash and SDA waste from the HCCP will be less costly to dispose of than waste from a conventional wet scrubber system. The potential for utilization of HCCP combustion process wastes as commercial by-products will also be characterized during the demonstration.

- Low-NO_x emissions will be obtained without the use of ammonia-based compounds and associated ammonia storage and emissions problems common to technologies such as selective catalytic reduction.

- A comparison of slagging combustor performance at the full scale with the Cleveland 35-MMBtu tests and the Capistrano precombustor tests will be made.

- A comparison of HCCP Operation and Maintenance (O&M) costs with those from comparable commercially available technologies will be made.

The key elements of the test program relate to the slagging combustor, the SDA system, and coal blending. The specific goals for each are described below.

TRW Technology Demonstration Program

The test plan for the TRW Coal Combustor Characterization Tests comprises three phases:

1. Initial Performance Characterization Tests
2. Operating Envelope Characterization Tests
3. Steady-State Operation Characterization Tests

Initial Performance Characterization Tests

The objective of the Initial Performance Characterization Tests is to establish the baseline performance of the combustion system while burning Performance coal (50% ROM/50% Waste). Key performance goals are:

- Stack emissions close to predicted values
- No major slag accumulations on internal surfaces
- Continuous slag removal

During this first phase of the test series, the combustor performance will be evaluated at the nominal "design" operating conditions specified for Performance Coal. It is anticipated that variations will be made in the key combustor operating conditions, including slagging stage stoichiometry, precombustor stoichiometry, slagging combustor/precombustor coal split, and slagging combustor inlet velocity. The operating range will be limited to that required to achieve reasonable performance of the combustor in terms of gaseous emissions at the stack, slagging behavior, and slag recovery. During this phase of testing, an "on-line" method for observing slagging behavior will be evaluated. Specifically, the coal flow will be shutoff after several hours at steady-state conditions and the slag coverage will be observed under oil-only firing conditions by looking through the aspirating doors located in the slag tap, tangential inlet and slagging combustor headend, as well as the furnace doors. If this method of observing slagging behavior is successful, then the number of full shut-downs required to observe slagging behavior can be reduced and the test frequency can be increased.

This initial phase of the test series will be deemed complete when the combustor can operate for extended periods of time with continuous slag removal, without any major slag accumulations on the internal surfaces, and stack emissions are reasonably close to predicted values. At this stage, the combustion system will be ready to support SDA and coal blend characterization testing.

Operating Envelope Characterization Tests

The objective of the second phase of the test series is two fold: (1) characterize the performance of the combustor over a broad operating envelope and (2) optimize the performance of the combustor for the integrated plant system at Healy. Key performance goals to be achieved during these tests are:

NO_x:	0.2 to 0.35 lb/MMBtu
Carbon Losses:	<1%
Slag Recovery:	>80%
Slagging Behavior:	No major growths or fouling

The proposed test matrix is shown in Table 2. This test series will focus on evaluating the combustion system performance over a wide range of operating conditions to determine the operating envelope in terms of stoichiometry (both precombustor and slagging combustor), precombustor exit conditions (temperature, stoichoimetry, and velocity), coal feed characteristics (coal carrier flowrates, coal grind), limestone Calcium/Sulfur (Ca/S) ratio, furnace stoichiometry, and plant load.

In order to map the combustor and boiler operating envelope, each of the operating variables will be varied independently during this characterization test series. The data from this phase of the test series will be used to (1) determine the boundaries for each operating parameter, (2) provide a basis for comparison of the HCCP combustor performance to that of the TRW Cleveland 35 MMBtu/hr combustor tests to verify scaling methodology, as well as extrapolation to other coal types and process conditions, and (3) determine the optimal operating conditions for long-term commercial operation at Healy.

Table 2.

Combustion System Operating Envelope Characterization Test Matrix

Operating Parameter	Operating Range	Performance Parameter
Slagging Combustor Stoichiometry	0.85 to 0.91	Gaseous Emissions Slagging Behavior Slag Recovery Heat Load
Precombustor Stoichiometry	0.87 to 0.99	Gaseous Emissions Precombustor Slagging Behavior Precombustor Heat Flux Gas Temp at Inlet to Slagging Combustor
Slagging Combustor/Precombustor Coal Split	36 to 42%	Same as above
Slagging Combustor Inlet Velocity	250 to 340 ft/sec	Pressure Losses Slagging Behavior Slag Recovery Heat Load
Limestone Ca/S ratio	2 to 3	Feed System Stability SO_2
Coal Blend and Grind	Performance Blend, Max Waste Coal Blend, Two Bull Ridge 50% to 70% through 200 mesh	Slag Recovery Carbon Content inSlag Carbon Content in Fly Ash CO and Smoke Limits Coal Feed Stability Heat Load Slagging Behavior
Coal Carrier/Mill Air Split	To Be Determined	Coal Feed Stability Slagging Behavior Slag Recovery Carbon Content In Slag
NO_x Post/Precombustor Air Split	Nominal + 15%, -15%	NO_x
Furnace Excess Air	Max. to Min.	CO and smoke limits Furnace-Deposits Boiler Efficiency
Load Range	50 to 100%	Stoichiometry and Air Flow Rate of Change of Load Steam Control Slagging Behavior Slag Recovery

The test matrix comprises individual variable “tests.” In general, each operating parameter identified will be varied individually. The specific order in which the tests are performed will be dependent on the baseline performance determined during the first phase of the characterization tests. In general, the following test guidelines will be followed:

- If initial stack emissions and slag recovery are close to predicted levels (i.e., NO_x <0.35 lb/MMBtu and Slag Recovery >70%), then the test matrix will be set up to evaluate and optimize performance with a coarser coal grind. In this case, the coal grind will be changed to a coarser grind first and then the stoichiometry, inlet velocity, coal split and carrier air split will be optimized for the coarser coal.

- If initial stack emissions are at reasonable levels, but the slag recovery is low (<50%), the coal grind will be changed to a finer size (typically, a finer size will improve slag recovery). The stoichiometry, coal split, and inlet velocity will then be optimized for the new coal grind.

- If initial stack emissions for NO_x are higher than predicted values, then the emphasis of the test matrix will be placed on stoichoimetry, coal split, and air split variations.

<u>Steady-State Operation Characterization Tests</u>

The objective for the third phase of the test series is to evaluate the “optimized” combustion system operating conditions during longer term, steady-state operation.

After determination of the “best” operating conditions for the combustor system based on the results of the second phase of the test series, two steady-state tests will be conducted, one at part-load and one at full-load. The specific operating conditions will be determined based on the second phase of the characterization test results.

Representative slag samples will be analyzed to confirm environmental characteristics (i.e., non-leachable, non-hazardous). This analysis will provide useful information regarding potential commercial applications, as well as meeting environmental requirements for disposal. Although there currently are no commercial uses for the slag generated at the Healy site, potential uses at other locations include recycling as a construction material additive (e.g., concrete mix aggregate, asphalt road paving material, etc.), abrasives, and architectural media (e.g., ceramic roofing tiles). The viability of these potential applications are all site specific.

At the end of the part-load and full-load operational tests, the system will be shutdown to allow a full inspection of the slag coverage on the internal combustor walls.

B&W/JOY-NIRO SDA Demonstration Program

SDA Technology system characterization refers to the tests recommended for study of how the SDA system responds to incremental change in process conditions. The SDA technology characterization test program assumes that the parameters given in Table 3 are achievable and that the equipment and control system can accommodate these variables. The characterization test matrix is subject to changes at anytime within the given outlines pending the evaluation of the previous test results and their agreement with the project goals. Additionally, characterization test parameters may need to be adjusted once data from combustor optimization are available.

Initial Performance SDA System

A brief series of tests will be conducted on the SDA/Fabric Filter (FF) system for preliminary adjustment of operating parameters. This initial performance tuning is required to ready these systems for compliance testing.

SDA/FF Characterization Testing

Table 3 summarizes the characterization testing matrix.

The following information is required for SDA/FF Technology Characterization testing:

- Coal feed rate, coal analysis, limestone feed rate, and limestone composition.
- Air heater hoppers drop out solids analysis.
- Ash analysis for alkaline components.
- FF recycle stream analysis.
- FCM – Sample at inlet to SDA for available calcium oxide.
- Recycle slurry for available calcium oxide/calcium hydroxide and reactivity.

The testing will explore SDA operation with different SO_2 inlet concentrations to the SDA based upon various levels of sulfur removal achieved in the TRW combustors, coal quality, and plant load.

Table 3.

HCCP SDA Technology Characterization Test Matrix

Inlet SO_2 Concentration	Reagent Ratio (Ca/S)	Approach to Saturation (°F)	Recycle Grind	Recycle
Low	1.95 1.75	33 18	Design	No Supplemental Heat Activation With Supplemental Heat Activated
Medium	1.95 1.75	33 18	Design	No Supplemental Heat Activation With Supplemental Heat Activated
High	1.95 1.75	33 18	Design	No Supplemental Heat Activation With Supplemental Heat Activated

These tests will be conducted at various plant loads. Sulfur capture will be characterized throughout the system including the combustors, SDA, and fabric filter.

Coal Blend Tests

A series of coal blend tests will also be conducted at the HCCP. These tests will be conducted once the SDA characterization tests are complete. The purpose of these tests is to demonstrate unit performance with a range of ROM and waste coal mixtures.

Three coal ratios will be evaluated:

1) 100% ROM coal;
2) Blend (1) to be determined;
3) Blend (2) 65% waste coal and 35% ROM coal.

The first is ROM coal, which will provide unit performance information without a waste coal fraction. Blend (1) will be determined during the tests. It may be Performance coal or other blend. AIDEA is evaluating using a blend similar to the Two Bull Ridge blend, which will be used in future operation of this plant. Blend (2) is the HCCP coal used for design (65% waste/35% ROM).

Operational Experience And Commercialization

Training of GVEA operators has been ongoing for several months. This has included on-the-job training, classroom instruction by the AIDEA team including vendors, and participation and witnessing of construction tests. GVEA is providing operators for start-up and the current coal firing and will gradually assume day-to-day operational control of HCCP during 1998. Training is complicated by the need to provide skilled operators for HCCP without hindering Unit No. 1 operation. Temporary operators have been employed by GVEA for use on Unit No. 1. Prior to commercial operation which is scheduled for January 1, 1999, a 90-day commercial operating test will be witnessed to assure compliance with the AIDEA/GVEA Power Sales Agreement. This test will be witnessed by a third party consultant to assure compliance with the AIDEA/GVEA Power Sales Agreement and performance and reliability consistent with prudent utility practice.

During the first two years of operation, visibility monitors will be operated at two locations near the site. These monitors will be linked to the HCCP control room so that the HCCP operators may observe the stack plume and local air quality at all times. Ambient monitors will be installed after demonstration testing at selected sites. In addition, the National Park Service is conducting monitoring and biological impact studies.

Operational experience on oil has been good. The combustor oil ignition and burner systems for the combustors have operated well with minimal problems. Oil-and coal-firing- related control and safety systems have been checked out and functioned without problems. At the time of preparation of this paper, each combustor had been fired on coal successfully. Both combustors have also been operated in parallel at loads up to 30 MW. The bottom ash system has been operational and the combustors appear to be slagging as expected, with no ash buildups.

Commercialization of the systems is highly dependent upon the success of the demonstration program. TRW and UCM have jointly had preliminary discussions with potential utility users in the Pacific Rim. An engineer from an overseas utility plans to participate in the technology tests. These discussions have advanced interest in the technology. TRW and UCM have determined that business development activities should continue and are actively urging potential technology users to observe the demonstration testing.

Summary

The demonstration program described in this paper is the current plan. Actual testing will vary depending upon performance of the equipment, available schedule, frequency of outages, and funding and support from the technology suppliers. Since the HCCP is a large unit in the GVEA system, the demonstration test program must be carefully coordinated with GVEA operational and spinning reserve requirements. The project participants are committed to attaining the demonstration test program goals. The technologies to be demonstrated have performed successfully to date.

Sources of Information

1. Alaska Industrial Development and Export Authority, November 1996, The Healy Clean Coal Project – An Overview.

2. Department of Energy, December 1997, Healy Clean Coal Project Status Report.

3. TRW, December 1997, TRW ECS Technology Characterization.

4. Babcock & Wilcox Company, December 1997, B&W/Joy SDA Technology Characterization.

5. Stone & Webster Engineering Corporation, December 1997, HCCP Demonstration Test Program Final Draft.

6. TRW, August 1991, Healy Clean Coal Project, Healy Clean Coal Firing at TRW Cleveland Test Facility.

Biographical Sketches Of Authors

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Mr. McCrohan has Bachelor of Engineering (1965) and Master of Science (1966) degrees from Cornell University. He has been a member of the American Society of Mechanical Engineers for many years and served on local and national committees. He is currently a Professional Engineer in Florida and Alaska.