SB
218

COMMITTEE REPORT

SENATE

FURTHER: None

2/26/81

Date: _____

Mr. President:

The Committee on RESOURCES has had SB 218

use of waste heat produced by certain pipeline facilities

under consideration and (a majority of the committee) (the committee) reports it back with the following recommendations:

[ ] do pass [ ] do not pass

[ ] do pass with attached amendments(s)

[X] replace with CS for SB 218 [ ] same title [X] new title

and ~~recommends~~ WITH INDIVIDUAL Recommendations

[ ] AND attaches a "Letter of Intent" [ ] New Fiscal Note

[ ] reports it back without recommendation

[ ] referred to the _____ Committee

MEMBERS SIGNING
DO PASS

MEMBERS HAVING
OTHER RECOMMENDATIONS:

Glen Ulman (No Rec)

Bettye Fahrenkamp

CHAIRMAN

Alaska State Legislature

BETTYE FAHRENKAMP, CHAIRMAN
VIC FISCHER, VICE-CHAIRMAN
BRAD BRADLEY
DICK ELIASON
DON GILMAN
BOB MULCAHY
ARLISS STURGULEWSKI

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Senate

Committee on Resources

April 27, 1981
1:30 p.m.

Beltz Room
211 - Capitol

MEMBERS PRESENT

Senator Fahrenkamp
Senator Mulcahy
Senator Gilman
Senator Sturgulewski
Senator Eliason
Senator Fischer

HEARING:

SB 218 An Act relating to the use of waste heat produced by certain pipeline facilities.

SB 388 An Act relating to the Commercial Fishing and Agriculture Bank.

Senator Mulcahy put forth the motion to bring CSSB 218 before the Committee.

Senator Mulcahy put forth the motion to move CSSB 218 with individual recommendations.

Rosalee Moore, Chairman, Commercial Fishing and Agriculture Bank, stated that SB 388 contains language which clarifies CFAB's status as a private cooperative. If CFAB is not considered a private cooperative it can not leverage money with the Spokane Bank of Cooperatives.

In response to several questions, Ms. Moore stated that the following information will be provided for the Committee's May 4, 1981 hearing of SB 388;

1. Payback schedule and its relation to members shared dividends;
2. Sections of the banking code that should possibly be a portion of the law relating to CFAB;
3. Cost of converting employees from state benefits to private benefits program;
4. A copy of their policy on affirmative action, and;
5. Correspondence between CFAB and the Spokane Bank of Cooperatives.

Roger Painter, Executive Director, United Fishermen of Alaska, suggested an amendment to SB 388 that would allow CFAB to use limited entry permits as collateral for vessel and gear loans. He stated that he is supportive of SB 388.

The Committee adjourned at 2:55 p.m.

Alaska State Legislature

BETTYE FAHRENKAMP, CHAIRMAN
VIC FISCHER, VICE-CHAIRMAN
BRAD BRADLEY
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Senate

Committee on Resources

April 10, 1981
1:30 p.m.

Beltz Room
Room 211 - Capitol

MEMBERS PRESENT

Senator Fahrenkamp
Senator Fischer
Senator Mulcahy
Senator Sturgulewski

HEARING:

CSHB 173 An Act making appropriations for residential energy programs; and providing for an effective date.

SB 187 An Act making a supplemental appropriation to the Division of Parks, Department of Natural Resources, for the Youth Conservation Corps program; and providing for an effective date.

CSSB 84 An Act relating to the processing of permits by state agencies and to approval of Alaska coastal management programs; establishing the Permit Reform Commission; and providing for an effective date.

SB 218 An Act relating to the use of waste heat produced by certain pipeline facilities; and providing for an effective date.

Clarissa Quinlan (Director, Division of Energy and Power Development, Department of Commerce and Economic Development) spoke in favor of CSHB 173. She reviewed the history of the Residential Energy Conservation Program, stating that it consisted of three parts: (1) residential energy audits, (2) a grants and refunds program and (3) a loan program. Auditors have been trained through a series of one-week intensive courses in the community college system. The Division began contracting for audits in mid-December, and all contractual funds were committed statewide by mid-February. 7,000 audits will be completed in the near future.

Senator Mulcahy put forth the motion to move CSHB 173, with individual recommendations.

Chip Dennerlein (Director, Division of Parks, Department of Natural Resources) spoke in favor of SB 187. He stated that the Youth Conservation Corps program in Alaska has been effective, and required funding to continue. SB 187 would provide state matching funds for federal funding for FY 1981 and 1982.

Senator Sturgulewski put forth the motion to move SB 187, with individual recommendations.

Deming Cowles (Deputy Director, Department of Environmental Conservation) testified on behalf of the Administration against CSSB 84. He stated that the administration had identified some of the problems with the permitting process, but that CSSB 84 was not the solution. The Administration opposes the bill for several reasons, including the basis of the class identification of permits, the elimination of the requirement to exhaust administrative remedies, shifting of the burden of proof to the agencies, application to other than resource permits, automatic approval upon expiration of the processing time limits and the possible violation of the single-subject rule by the reference to Coastal Zone Management.

Mr. Cowles stated that the Administration has developed new permit regulations to resolve some of the problems. The regulations will be in effect before the end of the fiscal year. There are other efforts in the Adiministration to expedite the permit process, including improving the information flow to permittees, a master application process, single permits by industry, general permits for DNR and DEC and increased agency coordination.

Senator Sturgulewski commented that SB 84 was similar to legislation passed by the House last session, and suggested making amendments to the original bill (SB 84) to match that legislation and eliminate the problems under the single subject rule. The Senator pointed out that substantive problems with CSSB 84 could lead to extensive litigation if enacted.

Senator Strugulewski put forth the motion to bring SB 84 before the committee for the purpose of amendment. The Senator put forth the motion to move amendments to SB 84 eliminating references to Coastal Zone Management and the Permit Reform Commission.

Senator Bennett testified that he had no objections to the amendments at that time.

The Committee recessed.

After recess, the Committee took up SB 218.

Senator Kerttula spoke in favor of the concept of SB 218. He cited a University of Alaska study that determined that the waste heat from one of the trans-Alaska oil pipeline could have heated 200 acres of land for agricultural production. He stated that he had sponsored similar legislation in the past, and that SB 218 made sense as a vehicle for the utilization of waste heat on future projects. It would be wasteful to require all facilities to be constructed to allow the utilization of waste heat. On the trans-Alaska pipeline, for example, only two or three sites were feasible for the utilization of waste heat.

The Committee took up SB 84.

Senator Sturgulewski put forth the motion to rescind the Committee's action on SB 84.

CSSB 84 was before the Committee.

Senator Mulcahy put orth the motion to move CSSB 84 with individual recommendations.

The Committee was adjourned at 3:17 p.m.

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Dave Harbour
Regional Director

April 10, 1981

The Honorable Bettye Fahrenkamp
Alaska State Senate
Resources Committee Chair
Pouch V
Juneau, Alaska 99811

Dear Senator Fahrenkamp:

We at Atlantic Richfield Company wish to submit these prepared comments on Senate Bill 218, relating to recovery of waste heat generated by pipeline facilities. We hope these comments will be useful to you and the committee.

Sincerely,

Beverly Ward

Beverly Ward
Associate Director

Atlantic Richfield Company Position

Senate Bill 218

Senate Bill 218 expands the powers of the Alaska Pipeline Commission by requiring that all pump stations or compressor stations for oil or natural gas pipelines on leased State land be designed and constructed so that waste heat produced by the pump or compressor stations could be used for agricultural production and for the generation of electricity. The additional cost of design and construction could be passed on to the users of the waste heat.

We support the concept of recovering waste heat, but we do not believe passage of Senate Bill 218 is in the best interests of the consumer, the citizens of Alaska, or Atlantic Richfield Company.

Currently less than 1% of the land in Alaska is being used for agricultural purposes. To require that pump or compressor stations be designed to sell waste heat for agricultural purposes would be an unnecessary and cost-prohibitive requirement. The agricultural potential of the North Slope is not presently recognized.

The same argument is true with the need for electrical generation. Most pump and compressor stations are in very isolated locations where there is no demand for electrical generation. It would be a waste of time and energy to require these facilities when there is no current nor anticipated demand.

Designing and constructing pump and compressor stations to these specifications would be very expensive, the cost of which could not practicably be charged to the users of waste heat. The additional cost would be borne by the shippers.

That in turn, would affect the well head price, thus reducing revenue to the State.

This bill would have an adverse effect for Atlantic Richfield Company on the development of the Kuparuk field requiring additional outlay of millions of dollars, where a new pump station is planned for 1984 and for all later development.

The penal[illegible]mposed for failure to comply seems unduly harsh, since waste heat recovery has previously been ignored.

We, at Atlantic Richfield, are supportive of waste heat recovery and other alternative energy sources, and are working to make those tec[illegible]ologies economically feasible. We do not believe that designing and constructing all pump and compressor stations to recover waste heat is logical or economically feasible in Alaska for either the producer or the consumer.

SB 218

Pertinent Questions and Answers on Subject of Waste Heat

Q. What is waste heat?

A. Waste heat is the term commonly used for energy that is rejected from various industrial sources. It usually results from the burning or other consumption of fossil fuels; however, it may also result from nuclear power plants or represent the unused heat from geothermal sources. The waste heat rejected from a process using fossil fuel usually exceeds the amount of the energy that is put to useful work such as the production of electricity. For example, most electrical power generation facilities that operate with fossil fuels have only a 30 per cent efficiency and the remainder is rejected as hot water or hot air.

Q. What is the extent of unused heat in Alaska?

A. The quantity is enormous at the present time and it will increase greatly as the pipelines, refinery and other power plants are placed into operation. It is estimated that each pumping station along the Trans-Alaska Pipeline could heat 2000 homes. The estimate for the North Pole Petroleum refinery is that 10,000 homes could be heated. Canadian sources estimate that each pumping station associated with their Mackenzie Valley Pipeline will produce enough clean waste heat to meet the requirements for 15 to 20 acres of greenhouse vegetable production. However, there has not been an inventory made of the present and future status of the waste heat that will be rejected and that could be used in the state.

Q. What are some proposed uses?

A. Agriculture, fisheries and aquaculture, forestry, processing and district heating in commercial and domestic areas. High temperature waste heat also may be useful in some cases for the generation of electricity where uses can be found for the remaining lower temperature heat so that vapor and thermal pollution is not a problem. For example, it would be technically possible to generate electricity from the high temperature waste from the North Pole Petroleum refinery. However, if this is done the reject energy would be in a form that could not be injected into the upper atmosphere and would create a vapor or ice fog problem during winter months. Agriculture and district heating could provide a use for this remaining low temperature reject energy.

Agriculture

The high temperature reject heat could be useful for forage and grain drying and may provide the necessary component that would make potato processing feasible in the state and therefore, expand potato production.

Heat energy consisting of hot air, hot water or steam and at temperatures ranging from 80°F to 300°F would be useful for greenhouse

production and vegetable and plant production in areas that would support horticulture crop production resulting from soil warming. The use of the heat in greenhouses and then during the summer months in the soil for crop production is necessary to all wise proposals that suggest a near total use for the energy. This crop use is probably necessary because it can utilize the low temperature energy and would utilize the heat as less is needed for other uses. It appears to be an important part of every systems approach to utilizing this resource because the near total use of the resource will make the collection and distribution more economical for each use.

Aquaculture, Forestry Processing and District Heating

The use of heat to improve production of fisheries through hatchery rearing and in fish production ponds is suggested. The heat requirement for forestry, processing industries and in district heating of homes and businesses is obvious if the heat can be collected and distributed. The more complete use that would result by greenhouse and soil heat use would provide a better economic picture for the above uses.

Q. Is our environment suitable for the types of intensive crop production that is suggested?

A. During the four summer months it is superior to most other areas of the nation. The northern latitudes are recognized to have the highest photosynthetic production rate in the world during these four summer months. If the season can be lengthened and/or the soil warmed, the productive capacity can be further increased, and this photosynthetic advantage further exploited.

Q. Why hasn't the greenhouse industry developed without the waste heat use?

A. It is one of Alaska's major agricultural industries at the present time, but it has been developed through the use of fossil fuels which are even higher in cost than they are in the rest of the nation.

Q. There are indications that hundreds of acres of greenhouse and soil heated vegetable production is possible. Could all of these products be marketed in Alaska?

A. No. Besides providing Alaskans with vegetables and ornamental plants, it would be necessary to market cut flowers such as roses, carnations, chrysanthemums and etc. on national and world markets. It is proposed that this could be done competively during 5-6 months of the year because of Alaska's superior environment for greenhouse production and through the use of waste energy.

Q. Why do you feel that it is important to examine national and world markets for cutflowers?

A. Because it appears to be necessary at the present time in order to make more complete use of our unused resource. It also would add to the stability of our economy to have a renewable resource such as this contributing to the state's economy. It would also decrease the nation's consumption of fossil fuels now used for this purpose in the present greenhouse growing areas.

Q. What will be the <u>temperature of the Waste Heat</u>?

A. The temperature of the reject heat energy will vary with the type of industry and will range from about 80°F to above 800°F. It will be exhausted as hot air, hot water or steam.

It is expected that not all reject energy could be utilized at this time because of accessibility problems, the lack of adjacent growing areas and the lack of technology. A systems approach with agriculture as a major user appears to give the best potential.

Q. What is the <u>urgency in the legislation</u> now in process?

A. We must promote the use or it will not happen. The potential for use must be designed into the system in the beginning in order to develop the most economical recovery system. For example the oil pipeline pumping stations were not designed with reject heat use in mind, and, therefore, it will cost more to recover the heat.

Although the technology appears to be available at the present time to make economical use of the energy, it is necessary to demonstrate this and to improve this technology.

SB 218

THE FEASIBILITY OF UTILIZING WASTE HEAT FROM THE TRANS-ALASKA PIPELINE FOR GRAIN AND FORAGE DRYING

BACKGROUND

Much emphasis has been placed in recent years on energy utilization and it's impact on economic growth. In the face of an increasing world population, heavy demands are being made on energy supply sources, particularly as related to food production. It has become exceedingly important to conserve and improve the efficiency of energy available from both fossil and non-fossil fuels. This is very evident in the agricultural industry, particularly in small grain and forage production. As an example, natural gas forms the energy base for over 80 percent of the energy used in irrigation pumps, grain drying and anhydrous ammonia fertilizer production in Kansas. Decreasing supplies of natural gas can be expected with continuously rising prices.(1) This will be true in all agricultural areas of the United States. It is important to utilize the maximum energy available from any fuel source.

Alaska, in particular, is placed in a unique position in the scenario of total energy use in food production. Over 17 million acres of tillable land and 10 million acres of rangeland have been identified.(2) One area, the Delta-Clearwater region, in the interior is considered most attractive for future agricultural development for the following three major reasons:

1. The area contains approximately 10,000 cleared acres and over 100,000 acres of uncleared land with high agricultural potential. Portions of this acreage are currently in use for the production of grain and forage crops.

2. Pump Station #9 of the trans-Alaska pipeline is located centrally within the area. During beginning phases of oil flow, an average of 800,000 BTU per minute of low pressure turbine exhaust will be released at temperatures of 475° F at an ambient temperature of 0° F. At maximum oil flow, this will increase to an average of 1,000,000 BTU per minute at temperatures of 535° F.(3) These temperatures are considered within the range necessary to operate grain and forage dryers, which have an energy requirement in the neighborhood of 1/10 that available from Pump Station #9, if the grain and forage is harvested at moisture levels as high as 40 to 60 percent.(4,5)

3. The beginnings of a production and marketing infrastructure are present in the Delta-Clearwater area. A major road system serves as a connector to Fairbanks and Anchorage. Farm equipment and supply outlets are located within a 100 mile radius. Small grains and hay produced within the area are marketed within the state through established channels. In addition, Delta Junction is the headquarters of the Alaska Farmers Cooperative, Inc..

The potential for growth in agricultural production, processing and marketing in the Delta-Clearwater area will not be realized until several specific questions are resolved. These are:

1. Can waste heat be used for grain and forage drying? Although the heat generated by pump station turbine exhausts is extremely high, it is not in a form immediately usable in any agricultural application. Investigations show that systems can be designed within specifications of the turbines to use the heat generated.(6) The various methods of transfering the heat to the drying area must be investigated to determine that which is the most efficient. Use of waste heat for grain and forage drying may make production of these crops within Alaska economically attractive.

2. Will use of turbine exhaust gases for drying damage grains and forages? Indications are that there will be no damage and that there may be an advantage to using waste gases. Grains and forages should be analyzed both before and after a storage period to determine the effect of the exhaust gases, if any.

3. Will grains and forages produced meet international quality standards? Data from the Agricultural Experiment Station at Fairbanks indicate approximately 80 percent of barley produced in the Delta-Clearwater area can meet international standards. Again, analysis of grain and forage quality before and after a storage period will substantiate this data.

The conversion and use of gas turbine exhausts as an energy source for drying grains and forages is a key to large scale production of an animal feed product within Alaska.

PROJECT OBJECTIVES

The objective of this project is to show the feasibility for utilizing waste heat for drying grains and forages. This will accomplish:

1. The provision of a waste heat recovery system design for Pump Station #9 of the trans-Alaska pipeline or for similarly designed exhausting systems.

2. The provision of a method for more efficient use of fossil fuel in a multi-purpose system (pump station operation and crop drying).

3. A means to use high moisture grains and forages as a year-round feed base in Alaska and as a marketable product to areas outside the state.

All of the above will combine to provide the opportunity for growth of an agricultural industry which will include as major components production, processing and marketing of grains and forages. The industry will serve the immediate area and the state and provide consumer benefits including dollar savings per unit of energy expended.

PROJECT AREA

The Delta-Clearwater area is largely agricultural. It is serviced by a major highway system providing access to Fairbanks (90 miles west-northwest), Anchorage (300 miles southwest) and the Canadian border (200 miles southeast). The nearest railhead is in Fairbanks; the nearest port, Anchorage. Only charter airlines service the area with Fairbanks the nearest international airport. The area cannot be considered a bedroom community of fairbanks, although Fairbanks is considered the primary trade center. It was, previous to the trans-Alaska pipeline influx, a trading center for area farmers, most of whom had begun as homesteaders. In fact, Fairbanks, ninety miles west of the Delta-Clearwater area, from the turn of the century to the 1930's, was considered the center of Alaska's agriculture. Cattle and hogs were raised. Market vegetable production, hay production and grain production were under way.

In 1968, legislative action made additional land available to persons actively engaged in farming. Several area farms have grown because of this action but have not expanded substantially. As examples, a 1,000 hog production facility was established in 1970, but did not remain in operation because of lack of a consistent feed supply and lack of an existing market infrastructure.(7) A dairy operation involving more than one hundred head with a complete processing, packing and distributing facility exists in the area. In addition, a beef cattle feeding operation involving one hundred head was recently established. There is an on-going egg production operation of over 10,000 laying hens, as well as a sheepherder with a one hundred head flock. Agriculture in the area is not limited by climactic or biological factors, but by factors of a developmental and economic nature.

The transportation access in the Delta-Clearwater area provides a means for import and export of products. The same system makes distribution to inter and intra-state destinations possible, and provides access to shipping ports making available possibilities for international trade. Japan, in particular, imports 90 percent of its vital grains. Alaska, with a high quality grain product, could be in a good position to compete in the international livestock feed market. As the market is expanded, the Delta-Clearwater area could conceivably provide up to 100,000 acres of high quality agricultural land for production of grains and forages.

An ad hoc committee on agriculture has prepared an assessment of large scale barley production in the Delta-Clearwater area. The assessment indicates that farms approximately 3,000 acres in size, using fallow management systems are viable and that sufficient quantities of grain can be produced on 50,000 acres to warrent a 1 million bushel put-through elevator-dryer system.(9) Investigation of the potential of drying grains and forages with waste heat is, therefore, of high interest in terms of contribution to a renewable resource economic base for the state. The conclusion which may be reached is that waste heat utilization may well be the impetus needed for the revival and future development of agriculture in Alaska.

RELATED STUDIES AND PROJECTS

The following is a listing of projects, with references, of on-going and future research by the University of Alaska, Agricultural Experiment Station.

Grain and forage production:
For the past four years, a cereal grain research program has been conducted in the Clearwater-Big Delta region. Emphasis has been placed on evaluation of barley, oat and wheat varieties as feed grain crops. Oat varieties have also been evaluated as a forage and straw crop. Other areas of research include fertilizer response, comparison of production systems (continuous grain vs. summer fallow-grain), tillage practices, seeding rates, and weed control.

Burton, W. E., D. H. Dinkel, and F. J. Wooding, "So Many Questions-So Few Answers", Agroborealis, Vol. 3, No. 1, pp. 21-24, 1971.

Wooding, F. J., G. M. Paulsen, and L. S. Murphy, "Sulfer Composition of Soybeans as Affected by Macronutrient Deficiencies", Soil Science and Plant Analysis, 3:151-159, 1972.

Wooding, F. J. and C. W. Knight, "High Protein Grain from Interior Alaska", Agroborealis, Vol. 4, No. 1, pp. 12-13, 1972.

Martin, G. C., R. F. Barnes, A. B. Sim[illegible], and F. J. Wooding, "Alkaloids and Palatability of Phalaris arundinacea L. Grown in Diverse Environments", Agronomy Journal, 65:199-201, 1973.

Wooding, F. J. and A. C. Epps, "Grain Varieties for the Golden Valley", Cooperative Extension Service Publication No. 46, University of Alaska, 1973.

Wooding, F. J. and C. W. Knight, "Barley Yields on Summer Fallowed and Stubble Land", Agroborealis, Vol. 5, No. 1, p. 22, 1973.

Wooding, F. J., D. H. Hassinger, and G. Willis, "Grains in Seward's Icebox", Agroborealis, Vol. 6, No. 1, pp. 4-6, 1974.

Wooding, F. J., J. L. Brossia, S. D. Sparrow and D. H. Hassinger, "Small Grains on Agricultural Land in Remote Areas of Alaska", Agroborealis, Vol. 7, No. 1, pp. 28-30, 1975.

On-going research concerns grain production in the Tanana Valley of interior Alaska. The objectives are to increase production of barley, oats, and wheat through a broad, intergrated, research program of variety testing and cultural practices. Triticale is to be evaluated as a potential new grain crop. Grains produced in a subarctic environment are to be evaluated for quality and suitability. In addition, grain adaptation tests are being conducted for remote areas of Alaska.

Wooding, F. J., "Small Grain Production in the Tanana Valley of Interior Alaska", Hatch Project, March 1, 1974.

Wooding, F. J., "Grain Adaptation Tests for Remote Areas of Alaska", Special Appropriation of Hatch Funds, 1974.

Since May, 1970, research on peas, barley and oat mixtures has been conducted to determine in-combination and independent response to harvest date and crop mix. The parameters of interest are protein, digestibility and yield.

Brundage, A. L., R. L. Taylor and V. L. Burton, "Barley, Oats and Peas, Alone and in Combination, for Forage", presentation at the Annual Meeting of the American Dairy Science Association, June, 1976.

Markets:

Past work on markets for agricultural commodities produced in Alaska has been largely confined to only statewide markets. The topics covered have included pork, beef, vegetables, dairy, and feed production. Although only limited local markets were identified, production within the state is small enough to allow market expansion in most areas.

Burton, W. E., "Alaska's Agriculture", Institute of Social, Economic and Government Research, University of Alaska, 1971.

Flynn, E. and W. Thomas, "Assessment of Markets for Fresh Vegetables in Anchorage", G. E. - TEMPO, Research Publication, 1973.

Thomas, W., and P. Linn, "Economic Factors in Alaskan Milk Marketing", Agroborealis, 1972.

Stephens, C., W. Thomas and V. Burke, "Supplying Alaska's Red Meat and Poultry Products, Institute of Agricultural Sciences, University of Alaska, 1975.

Research just beginning at the University of Alaska will analyze the export market for feed barley, malt barley, and grain and/or feed pellets. Identification will be made of possible markets and problems and opportunities associated with these markets. Included will be an analysis of price conditions, trade arrangements, transportation system requirements and appropriate domestic and foreign government regulations.

Thomas, W., "Agriculture in Alaska; 1976 - 2000 A.D.", Alaska Review of Business and Economic Conditions, Institute of Social, Economic and Government Research, University of Alaska, June, 1976.

Thomas, W., "International Markets and Marketing for Alaska Produced Farm Products", Research Project, Agricultural Experiment Station, University of Alaska, 1976. Sections of this marketing research will be carried on as in-kind contributions to the waste energy project proposed here.

Agricultural potential:
There are three agricultural potential studies which are on-going within the Agricultural Experiment Station. The major concern is economic and social impact on the state and on available markets for products from the state.

Eaton, W. E., "Creating a Northern Agriculture, I, II, III, IV, V", University of Alaska, Agricultural Experiment Station Bulletin No. 42 through 46, 1975, 1976.

Faris, J. E. and R. J. Hildreth, "Considerations for Development - Alaska's Agricultural Potential", for the Federal Land Use Planning Commission of the University of Alaska, Agricultural Experiment Station, April, 1976.

Thomas, W. C., C. E. Lewis and F. J. Wooding, "The Potential for Production of Barley in the Delta-Clearwater Area of Interior Alaska", Univ. of Ak., Ag. Exp. Station, February, 1977, draft.

Waste heat utilization:
The utilization of waste heat in agricultural systems has been addressed within the Agricultural Experiment Station.

Dinkel, D. H., "Potential for Production of Intensively Cultured Crops in Alaska Using Geothermal or Waste Heat Sources", presented at the Second Int. Symp. on Cold Regions Engineering, Univ. of Ak., Aug. 13, 1976.

Lewis, C. E., "The Utilization of Waste Heat in Agribusiness Development ", presented at the Second Int. Symp. on Cold Regions Engineering, Univ. of Ak. Aug. 13, 1976.

PROJECT PROCEDURES

Method of Approach

A three part study will be conducted over a two year period to provide answers to those questions raised in the background discussion. The parts of this study are:

Part 1. Provision of an efficient design for the conversion of low pressure turbine exhaust to usable form.

Part 2. Determination of the effect of turbine exhaust gases on quality of grains and forages.

Part 3. Determination of grain and forage quality after drying with exhaust gas and after a period of storage at varying moisture levels.

Discussion of Part 1.

The exhausted heat available is in the form of a low pressure, high BTU per minute flow at high temperatures. Requirements of low back pressure for efficient turbine operation limit the design specifications for recovery of the heat. Both a fin tube and a tube/ambient air system have been suggested. Alternate possibilities will be considered. The possibility of a water jacket surrounding the recovery tube will be investigated, assuming a future need for heated water. Cost of the system and operation and maintenance requirements will be a primary consideration.

In FY 78, a small dryer (200 bushel per hour) will be purchased and equipped with heat conversion and transport systems which will allow utilization of turbine exhausts. If it is not possible, due to conflict with pipeline start-up operations, to use the Pump Station #9 site, an alternative source will be used. Several are available in the Fairbanks area. The dryer system is scheduled to be operational in FY 79.

After completion of drying of the FY 79 crops, an analysis of operating efficiency, cost of operation and conversion and installation costs will be prepared. The waste heat system will be compared to conventional drying systems using this cost data.

Discussion of Part 2.

During FY 78, grain and forage samples harvested either in Fairbanks or in the Delta-Clearwater area will be dried to moisture levels varying from 30 to 12 percent. The drying will be done at the Agricultural Experiment Station at Fairbanks using conventional drying methods. The objective of the FY 78 sampling is to establish a data base for Alaskan grains and forages dried using conventional methods. This data base will be used as a comparison when turbine exhaust is used for drying.

Before storage, contractural services will be used to analyze grain and forage quality. Particular attention will be given to carbohydrate content (sugars and starches), protein content, and amino acid composition of proteins.

The grain and forage samples will be stored in outdoor bins. After a nine month storage period, an analysis will again be conducted of carbohydrate content and proteins. Additionally, a determination will be made of the type and amount of fungal organisms and amounts or presence of micro-toxins in the stored grains and forages.

Discussion of Part 3.

During FY 79, the grain and forage drying procedure of Part 2. will be repeated. However, the drying will be accomplished using a waste heat source and a drying system described in Part 1.. Contractural services will again be used to perform the analysis described in Part 2. on the dried samples and on samples taken from grains and forages which have been stored for nine months.

After sample analysis is completed, carbohydrate content, protein levels, amino acid composition of proteins, and fungal types and micro-toxins present will be compared to those in the grain and forage samples in the control group of Part 2..

Summary of Data to be Collected

After completion of the three part study (July 1, 1979), sufficient data will have been collected to complete a report addressing the questions:

1. Can waste heat be used to dry grains and forages?

2. Will use of gas turbine exhaust for drying effect grains and forages?

3. Will grains and forages produced in Alaska meet internation quality standards both before and after storage?

The following data catagories will be used in the report.

1. Technology of waste heat recovery systems for use in grain drying.

2. Efficiency of waste heat recovery systems considering all energy uses within a system. An example would be the use of fossil fuel for pump station operation and a use of the exhaust heat from the turbines for crop drying.

3. Investment cost of the waste heat recovery system.

4. Operating cost of the recovery system.

5. Efficiency, investment cost and operating cost of conventional drying systems.

6. Quality characteristics of grains and forages stored at varying moisture contents for one season after drying by either conventional or waste heat methods.

7. Quality characteristics of grains and forages immediately after drying either by conventional or waste heat methods.

FOLLOW-UP

This project has been proposed to aid those persons already producing grains and forages within Alaska and those who may be considering a beginning enterprise. At present, there is no data base which the farmer can use to determine to what moisture level grains and forages should be dried to maintain quality after storage under interior Alaska climactic conditions. Moreover, much interest has been generated concerning the use of waste heat for grain and forage drying. It is

reasonable to assume an operating cost savings would be effected by waste heat utilization. When the cost of wasted energy is compared to investment cost of recovery systems, the qualitative savings of valuable fuels is also large. Cost savings may be even larger if the use of turbine exhaust proves beneficial in storage of grains and forages at higher than normal moisture levels. However, if gas turbine exhausts damage the crop, there will be no need for further consideration of waste heat for grain and forage drying. The completion of the much needed data base for drying of grains and forages utilizing waste heat.

FOOTNOTES

1. R. J. Robel, "There May be Energy Tomorrow but at a Frightful Cost", address to the Kansas Cooperative Council, 1976.

2. Alaska Rural Development Council, "Alaska's Agricultural Potential", prepared by the Agricultural Potential Committee ARDC Pub. No. 1, Fairbanks, Alaska, March, 1974.

3. Communication: Alyeska Pipeline Service Company, Anchorage, Alaska, April 28, 1976.

4. Operating and Parts List, Behlen Model K Grain Dryer, Behlen Manufacturing Company, Columbus, Nebreska.

5. Correspondence: MEC Company, Neodesha, Kansas, 1976.

6. Communication: Ekodyne, Inc., Santa Barbara, California, April 16, 1976.

7. Communication: F. J. Wooding, May, 1976.

8. A. Tussing, et. al., "Alaska Pipeline Report", Institute of Social Economic and Government Research, Univ. of Ak., Sept., 1971.

9. Thomas, W. C., C. E. Lewis, and F. J. Wooding, "The Potential for Production of Barley in the Delta-Clearwater Area of Interior Alaska", Univ. of Ak., Ag. Exp. Station, February, 1977, draft.

CERTIFIED: Irene Cashen
Irene Cashen, Chief Clerk

A M E N D M E N T S

IN THE HOUSE BY ROGERS

TO: HCS CS FOR SENATE BILL NO. 438 (Finance)

Amendment No. 1

Page 2, line 20 -- delete "with the"

Page 3, line 4 -- delete "except if" replace with "unless"

Page 4, line 7 -- delete "persons" replace with "person"

Page 6, line 10 -- delete "of" replace with "and"

Page 10, line 6 and 28 -- insert "municipalities" after regional electric authorities"

Page 12, line 23 -- delete "of" replace with "which is"

Page 14, line 27 -- insert "estimates of" between "limited to" and "total"

Page 15, line 5 -- insert "to be" between "money" and "used"

Page 16, line 14 -- insert "to be" between "bonds" and "issued"

Page 19, line 25 -- delete "44.56.183" replace with "44.56.185"

Page 20, line 5 -- insert "and section 44.56.187" between "section" and "a new project"

Page 37, line 21 -- delete "loan" replace with "load"

Page 42, line 16 -- insert "audited" between "the commission the" and "financial"

Page 43, lines 17-19 -- delete sentence beginning "On the effective date" and replace with "All projects authorized in Section 48 of this Act are exempt from the provisions of AS 44.56.177-185. For all other projects, unless a proposed project is exempt under AS 44.56.187 added by section 24 of this Act,

Amendment No. 2. BY MALONE

Page 27, lines 13-16 -- delete subsection"(L)"

CERTIFIED: Irene Cashen
Irene Cashen, Chief Clerk

HCSSB 438(Finance) am H

Amendment No. 3. BY MILES

Page 45, line 21 -- insert new subsection (d) to read: "(d) The Alaska Power Authority is authorized to proceed with design and acquisition of right-of-way of the Anchorage-Fairbanks transmission intertie. This project may be financed by revenue bonds issued by the authority, appropriations from the general fund, or other funding sources approved by the legislature."

Amendment No. 4. BY MALONE

Page 30, line 29 -- insert after "(a)" "After December 31, 1980,

Page 31, line 4 -- insert after "(b)" "After December 31, 1980,