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an evaluation of the ISER electricity demand forecast

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In December 1979, Energy Probe was awarded a contract by The House Power Alternatives Study Committee of The Alaska State Legislature to examine and evaluate an electricity demand forecasting model being developed by The University of Alaska's Institute of Social and Economic Research (ISER).

Energy Probe's work, along with research carried out by several other consultants retained by The Power Alternatives Study Committee was intended to provide a framework within which the proposed Susitna Hydroelectric Power Development could be evaluated. A working paper published in January 1980 presented an initial evaluation of the ISER model, primarily on the basis of ISER's "Detailed Work Plan".

The following is the final report prepared under Energy Probe's contract. It presents an evaluation of the ISER demand forecasting model in its present form; tests the sensitivity of Railbelt electricity demand to changes in various policy and technological factors; and outlines what the authors believe to be the appropriate interpretation and application of the forecast within the broader context of State energy policy development.

The views and conclusions presented herein are those of the authors alone, and do not necessarily reflect the position of The House Power Alternatives Study Committee.

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1. INTRODUCTION

The electricity demand forecasting model developed by the Institute for Social and Economic Research (ISER) is a major step forward for Alaskan energy planning. The ISER model is of a quality which is orders of magnitude ahead of previous forecasting models employed in the State.

This report seeks to accomplish three tasks. The first of these in an introduction to the structure and logic of the ISER model aimed at a non-technical audience. The second is a technical review of the ISER model with a focus on the methods employed and areas for further development. The third is a demonstration of the use of the model in documenting the effects of alternative energy policy assumptions on the model's output.

By far the most important of these is the third. Since Alaska's electricity future is not fixed but rather subject to both fate and policy intervention it is important to appreciate that any forecast depends on assumptions concerning factors which can and cannot be controlled.

On the fate side of the ledger are all those factors which are beyond the control of Alaskans. These include national economic policy to the extent that it sets the tone for state economic and social development and, more importantly, the future of resource discovery and exploitation in Alaska.

Manageable factors include the ways in which Alaskans actually use the energy which is available to them - whether they use is efficiently or inefficiently. A very clear example of the "manageability" of these factors is the recent energy conservation legislation which will undoubtedly influence energy use in the State.

Planning is a process by which those factors which are controllable are identified and managed to bring about a desirable future. In addition, planning seeks to identify items subject to fate to adequately prepare for the realization of a range of possible outcomes. A forecasting model is nothing other than an aid to clear thinking in this complex situation. A good forecasting model should be able to accommodate both controllable and non-controllable factors and progress logically to actual numeric forecasts. On this count the ISER model is exemplary.

In any forecasting environment assumptions are crucial; to the extent that they are hidden there is no clear link between policy and actual outcomes. To the extent that they are open and accessible they are the basis for analysis and action. On this count as well, the ISER model is excellent. Assumptions are clearly stated and readily changed. When the model is ultimately computerized the latter will become even easier and the model even more useful.

But what is most important to realize is that the ISER model is only a tool. Alaskans do to a large extent have control over many aspects of their energy future. In an appropriate planning environment, the ISER model can be utilized to suggest means of making that future more desirable.

2. A USER'S GUIDE TO THE ISER FORECASTING MODEL

2.1 Introduction

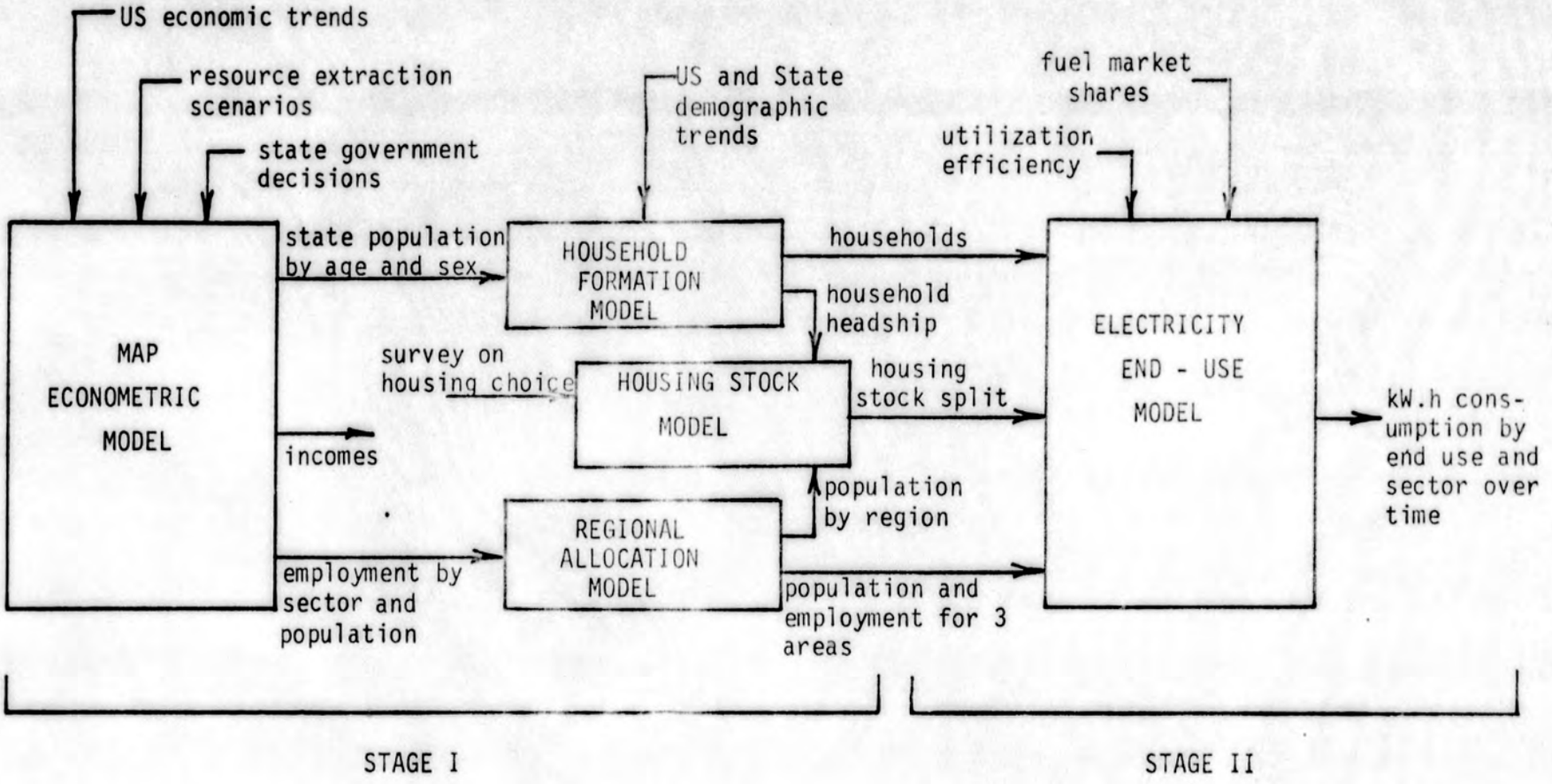
The ISER electricity demand forecasting model, while seemingly complex, has a very straightforward and logical structure and flow of information between components. The output of the model is projected values of electricity consumption for each of the three geographical areas of the Railbelt classified by final use (i.e. heating, lighting, etc.) and consuming sector (commercial, residential, etc.). In its current form the ISER model produces values for the years 1985, 1990, 1995, 2000, 2005 and 2010.

To accomplish this task the model relies on five specialized sub-models linked by key variables and driven by policy and technical assumptions and state and national trends. A flow diagram showing the sub-models and their linking and driving variables is given in Figure 2.1 below. Of the five sub-models, only the MAP econometric model was in existence prior to the Railbelt study; the remaining four were developed by ISER during the course of the study.

2.2 Stage I Components

In our earlier working paper (contained as the appendix to this report) we argued that the electricity demand forecasting process was essentially two-stage. In Stage I, basic

Figure 2.1: A Schematic of the ISER Electricity Demand Forecast



economic and demographic information is developed as input to an electricity demand model which we called Stage II. The final ISER model has this basic structure with the MAP, household formation, housing stock, and regional allocation models performing the Stage I function and the electricity end use models in the Stage II role.

2.2.1 The MAP Econometric Model

The basis of the Stage I function in the ISER model is MAP, a medium size econometric model which translates forecasted or assumed levels of national economic trends, state government activity, and developments in the Alaska resource sector into forecasted levels of statewide population by age and sex, employment by industrial sector, and income. While the MAP model is internally complex, its basic logic is that the State of Alaska will tend to follow national trends in economic development yet will deviate somewhat with resource sector and state government activity. These will cause the state to perform somewhat better or worse than the Outside. In periods of plenty, Alaska will attract immigrants seeking employment opportunities; in periods of relatively poor economic performance, people will tend to leave the State to seek opportunities in the lower-48.

As a result of this basic logic, MAP's output is quite sensitive to the national trends, resource activity, and state government actions assumed as input. Since MAP inputs directly

into the electricity end use model, the final results of the forecasting process are equally sensitive to these crucial assumptions.

MAP's output, while technically quite reasonable, is not appropriate for direct input into the electricity model for two reasons. The first of these is that MAP produces forecasts for the entire state of which the Railbelt and its component areas are only a part, albeit an important one. Secondly, electricity consumption is more closely related to households and the number of housing units than to the number of individuals in the market area; MAP produces only the latter. The household formation, housing stock, and regional allocation models translate MAP output into final Stage I form.

2.2.2 The Household Formation Model

The household formation model groups individuals into household units on the basis of national and state demographic trends. The basic logic of this model is than an individual has a finite chance of being a household head; the probability of headship depends on the individual's age and sex. Applying these probabilities to MAP's output yields the number of households, a critical input into the electricity end use model, and the number of household heads by age and sex, an input into the housing stock model.

2.2.3 The Regional Allocation Model

The purpose of the regional allocation model is to allocate MAP's statewide forecasts of population to the regions of the Railbelt. The inherent logic of this model is that regional population shares are sensitive to employment opportunities in the various regions. These opportunities in turn depend on which industrial sector is predominant in the MAP forecast, and its likely location. The regional allocation model ultimately disaggregates MAP's statewide forecasts of employment and population into regional shares. This information serves as input into both the housing stock model and the electricity end use model.

2.2.4 The Housing Stock Model

Because heating of residences is an important use of electricity in the Railbelt; and because there are a number of different types of housing available (single family, duplex, apartments and mobile homes) it is necessary to forecast the numbers of each type of dwelling unit in each of the Railbelt regions. This task is accomplished in the housing stock model which combines the household headship information from the household formation model, the regional population information from the regional allocation model, and the results of an independent survey on housing choice, to produce the number of housing units by type and region for each of the forecast years.

The logic of the housing stock model is quite similar to that of the household formation model. After combining the household and population information to produce the number of households per region over the forecast period, the information on housing choice is applied to assign each household to a dwelling. The assignment is based on the probability that a household head of a particular age and sex will choose to live in either a single family, duplex, apartment or mobile housing unit. The housing stock model thus produces the last crucial item of Stage I information, namely, the number of housing units by type and region over the forecast period.

2.2.5 Stage I Summary

In summary, the Stage I portion of the electricity demand forecasting process is handled in the ISER model by MAP, the household formation model, the regional allocation model, and the housing stock model. MAP produces forecasts of statewide employment, population and income on the basis of national economic trends, acticity in the Alaska resource sector, and state government policy. The household formation model groups individuals into household units on the basis of state and national demographic trends. The regional allocation model assigns a portion of statewide population and employment to the regions of the Railbelt on the basis of the location of projected economic activity. The housing stock model produces forecasted counts of dwelling units by type on the basis of the output of the household formation model, the regional allocation

model, and a survey of housing choices.

The regionally disaggregated employment, population and housing information is then passed forward to the electricity end use model for translation into projected requirements for electricity in the Railbelt.

Assumptions play a central role in determining the overall output of the Stage I part of ISER's model. While the most important of these are national economic trends, resource sector activities, and state government decisions which drive MAP, there are in addition national and state demographic trends and housing choice information which ultimately influence electricity consumption forecasts for space and water heating, and for other residential uses. Critical among these are the assumptions which lead to projections of household size: should these prove incorrect, or for that matter, should any assumption in the model prove incorrect, then the forecast as a whole becomes somewhat suspect.

2.3 Stage II: The Electricity End Use Model

The ISER electricity end use model translates the Stage I output into estimates of the final demand for electricity for each region and consuming sector in the Railbelt. The basic logic of virtually all components of ISER's Stage II model is that electricity is used in identifiable activities such as cooking, heating a building, etc. Each activity has an observed

electricity "intensity", that is, a quantity of electrical energy required to fuel a single unit of the activity in question. Further, these intensities are subject to change over time. Combining this information with the output of Stage I, which projects the magnitude of specific activities over the forecast period, yields projections of electricity requirements for each activity in each region. These may be summed to give final forecast estimates.

Consider, for example, the activity of refrigeration. In 1980, a "typical" refrigerator in the Railbelt used about 1250 kWh per year. Over time this average intensity changes as older, smaller, manual-defrost models are replaced by newer, larger, forst-free units. Suppose, hypothetically, that a typical refrigerator in service in the year 1995 uses 1800 kWh annually as a result of fifteen years of replacement of worn out units with new large units and purchases of new units by newly formed households. If there are, say, 15,000 households forecasted to the located in the Fairbanks region in 1995 then the total energy requirement for refrigeration in Fairbanks in 1995 is 1800 kWh/household x 15000 households, or 27,000,000 kWh, assuming that each household has a refrigerator.

In actual fact, the ISER method does not work this way mechanically; however, logically and mathematically ISER's model follows this basic procedure for nearly all activities.

2.3.1 The Residential Sector

In the residential sector, ISER has identified seventeen separate activities for analysis. These are:

1. heating a single family home
2. heating a duplex
3. heating a multi-family unit
4. heating a mobile home
5. powering a water heater for general hot water needs
6. powering a water heater for hot water input into a dishwasher
7. powering a water heater for hot water input into a washing machine
8. powering an electric range
9. powering a clothes dryer
10. powering a refrigerator
11. powering a freezer
12. powering a television set
13. powering an air conditioner
14. powering a dishwasher exclusive of hot water needs
15. powering a washing machine exclusive of hot water needs
16. powering lights
17. powering small, unspecified appliances

In the model, activities 5 through 15 are treated similarly as they relate to energy for large appliances. Activities 1 through 4 are also similar as they deal with space heating. Activities 16 and 17 are dealt with as special cases.

In space heating, the basic unit of analysis is the individual heating plant of the dwelling unit. For an electrically heated dwelling unit this means either an electric furnace, a collection of baseboard or ceiling resistance units, or an electric heat pump. ISER has assumed the latter to be insignificant over the forecast period. Heating plants are classified according to their "vintage", that is, their period of installation. There are seven vintages of heating units,

pre-1980, 1981 - 85, 1986 - 90, and so on.

Each vintage of heating plant has its own average electricity requirement which is based on the size, construction, and "retrofit" potential of the dwelling unit into which it was originally installed. For units built in 1980 and before, average consumption is simply the observed consumption of existing units with no conservation or retrofit over time. For new units, average consumption is the product of four terms: a base consumption level, a housing unit size coefficient, a conservation coefficient, and a retrofit coefficient. The base level gives the consumption of a typical electric unit currently being produced. The size coefficient factors this up over time to account for increasing dwelling unit sizes. The conservation coefficient factors the product down to account for improved heating techniques; and the retrofit factor further reduces this product to account for improvements to the dwelling unit's efficiency over the life of the heating plant. The average consumption of an electric heating plant can, therefore, increase or decrease with newer vintages depending on the assumptions made concerning base level consumption and the relative strengths of conservation and retrofit as opposed to increasing unit size.

Heating plants in the ISER model wear out over time, according to an expected lifetime schedule. A heating plant has an explicit probability of "surviving" from one forecast year to the next, which depends on the age of the heating unit.

For example, the probability that a heating plant installed in 1980 will still be in service in 1985 is much higher than the probability that a heating plant installed in 1980 will be in service in the year 2000.

When a heating plant "dies", the model assumes that, in effect, the housing unit dies with it. The heating unit is replaced with either an electric or non-electric heating plant according to specified probabilities of "capture" which run on the order of 9:1 in favour of non-electric units. If an electric heating plant is chosen, it is of the average consumption appropriate to the vintage of the replacement period. This assumes for all intents and purposes that either the dwelling unit itself is replaced with a new unit or that the dwelling undergoes major alterations to increase its size to approximate that of currently produced units.

There is a logic problem in this case which will be discussed in our technical review. Basically, the problem is that the replacement of electric units by non-electric units is likely overstated as is the alleged "growth" of units which switch from one electric heating plant to another in a particular period. In terms of electricity requirements, these tend to offset one another, to an unknown extent. We will assume that they offset one another exactly for the purposes of our subsequent analysis; however, we strongly recommend that the space heating section of the ISER model be reformulated in terms of dwellings rather than heating plants to more accurately

reflect reality.

In operation the ISER electricity end use model accepts as input the number of dwelling units by type from the housing stock model of Stage I and works recursively through the forecast period by vintage. For a given forecast year, the difference between housing units required and those "surviving" from previous periods constitute new housing starts. The number of these which are electric is multiplied by the average consumption of electric units of the new vintage; together with the total consumption of previously built electric units this given electric space heating requirements for the forecast year.

Assumptions again are critical at this stage in the model. The most important are the relative effects of increasing size as compared to conservation and retrofit potential; additionally, the relative "capture" of electric as opposed to oil or gas heating is quite important.

For major appliances, the ISER electricity end use model follows a structure similar to that of the space heating segment. Each appliance is classified according to its vintage; for each vintage the average consumption is computed as the product of base level consumption, a size factor and a conservation factor. The appliances follow a survival schedule similar to that of heating plants; the number of appliances of a particular type in service at a point in time is the number

of households times the probability that a household will own the appliance. In some cases, this probability is close to 1 already; for others it is more modest but is assumed to grow over the forecast period.

General water heating, for purposes other than clothes or dishwashing is adjusted downward to account for diminishing household size. Where alternative fuels exist, an explicit assumption is introduced to determine the electrical share.

Operationally, the model determines required additions to the appliance stock by subtracting required stock in a forecast year from "surviving" units from previous periods. As in the space heating model, the total energy consumption is the sum of the numbers of units of each vintage multiplied by the appropriate energy intensity per unit.

The remaining activities in the residential sector are lighting and powering small appliances. The ISER model assumes a constant electricity requirement of 1000 kWh per unit annually for lighting. This level is assumed constant over the forecast period with increasing lighting requirements arising from increased dwelling size offset by conservation and technical improvements in the efficiency of lighting devices. Small appliances begin with a base requirement (in Anchorage, this is 1010 kWh per year per housing unit), and grow by a constant amount in each five year forecast period to accommodate expanded use of existing small devices as well as the use of

new small appliances which may come into service over the forecast period.

In summary, the residential portion of ISER's electricity end use model operates on seventeen identifiable activities. With the exception of lighting and small appliances, the model works with discrete vintages of consuming devices. It introduces explicit assumptions about the energy intensity and survival characteristics of each device and vintage and calculates the numbers of each vintage in service on the basis of output of the Stage I process, and, where appropriate, explicit assumptions about electricity's share and the proportion of households owning a particular energy using device.

2.3.2 The Commercial-Industrial-Government Sector

Because of data shortages the ISER electricity end use model is rather thin in the CIG sector. While there are certainly as many specific activities using electricity in this sector as in the residential sector, they are unknown at the present time. Consequently, the ISER model takes a "second best" approach to modelling electricity requirements for the CIG sector.

In the CIG portion of the end use model there is effectively only one activity, providing all the electricity required for a CIG employee to carry out his or her job. Included, or

rather subsumed by this classification are lighting, heating, equipment operation, and all of the other activities specific to employment.

The CIG portion of the model employs a structure similar to that of heating and major appliances in the residential sector. Jobs are of one of seven vintages, depending on their creation date which is in turn related to the estimates of employment originating in the MAP model and allocated to regions by the regional allocation model. The basic logic is that the energy intensity of a particular job depends on the technology in place at the time of its creation; the job maintains essentially the same energy intensity over the forecast period although conservation may be factored in over time.

Explicit assumptions about per job energy intensities are a central feature of the CIG portion of the model; in ISER's forecast these are projected to grow nearly three-fold over the forecast period. Jobs created in the 2005 - 2010 period require about 30,000 kWh per year in the Anchorage region as compared to about 10,000 kWh per year for jobs created before 1980.

Operationally, the CIG model is virtually identical to the residential model except that it is driven by employment rather than the number of households. For a given forecast year, employment growth is calculated by subtracting

existing employment from total employment. Energy intensities specific to the respective "vintages" of jobs are applied and the results summed to give overall CIG electricity requirements.

Because of the aggregate nature of CIG activity in the model, it is virtually impossible to identify all the assumptions upon which it is based. The actual parameters used in the forecast indicate that ISER was quite conservative in working with this portion of the model; a large amount of electricity growth per employee is foreseen. However, it is not clear in which of the specific activities of employment the growth is to occur.

2.3.3 Stage II Summary

The Stage II function of the ISER forecast method accepts input from Stage I and translates this information into detailed projections of electricity requirements for each region of the Railbelt. The electricity end use model developed by ISER identified 18 electricity using activities, of which 17 are in the residential sector and 1 in the commercial-industrial-government sector. The model forecasts on the basis of the vintages of consuming devices. Explicit assumptions regarding numbers of devices in operation, energy intensity, and electricity's share of the fuel market are introduced where appropriate.

3. A TECHNICAL REVIEW OF THE ISER FORECASTING METHOD

3.1 Introduction

Prior to the development of ISER's electricity forecasting model, both ISER and Energy Probe agreed that the goal of ISER's research should be the development of an "econometric end-use" (EEU) forecasting model. The name is derived from econometric methods, which employ statistical techniques to estimate the effects of price, income, and other pertinent factors on demand, employment, or population change, and end-use methods, which seek to explain energy use according to its final use.

The EEU approach is rapidly gaining wide acceptance in the electric utility industry as the most sensible approach to the increasingly difficult task of demand forecasting. As mentioned in our working paper, EEU is a means to combine engineering information on final electricity usage with economic information which governs consumer choice.

In an ideal EEU model, not only would basic economic and demographic variables be modelled and forecasted econometrically, so too would information on devices which transform electricity into useful work. The number of appliances, for example, would depend on not only the number of households in a given period,

but also on the current levels of energy and other prices, incomes, and even state fiscal policies.

The disadvantage of pure EEU is that it is extremely data-intensive. This proved most telling for ISER's research; a basic scarcity of data rendered EEU impracticable for Alaska at this time. Consequently, ISER opted for a "next best" strategy which combined an econometric model, MAP, with four new non-econometric models to produce the required forecast.

3.2 MAP

The basis of the ISER electricity forecasting model is MAP, a medium-size econometric model of the State of Alaska. MAP is appropriate for a large role in electricity forecasting because it was designed to deal with different possible events in the resource sector and different possible policies for state finance.

Technically, MAP is quite good, as we argued in our earlier Working Paper. It produces statewide forecasts of employment and population by age and sex on the basis of state and national trends and resource and state government activities. Unfortunately, MAP's output is not directly applicable to electricity forecasting for the Railbelt and we made a number of recommendations on improving this situation, the majority of which have been imple-

mented by ISER in their subsequent work.

3.3 The Household Formation Model

We recommended that the demographic data output of MAP be expanded to include the number of households by age of head to complement MAP's population by age and sex. This was carried out by the addition of the household formation model.

The household formation model is an adequately developed method of accounting for households but relies only on demographic analysis for its aggregation of individuals; no economic activities modelled in MAP affect household formation.

3.4 The Regional Allocation Model

Since MAP produces statewide estimates of economic and demographic variables another required change was to distribute to Greater Anchorage, Fairbanks, and Glenallen-Valdez appropriate shares of statewide activity. The regional allocation model was developed to meet this requirement. This is extremely important because resource development projects used in projections of statewide activity could shift population and economic growth regionally within the state and even within the Railbelt.

The forecasting model must be capable of accommodating the possibility of a remote oil discovery leading to the expansion of communities outside the Railbelt grid, for example. Other scenarios might include projects which have a differential impact on the three Railbelt regions.

The ISER approach to this problem is acceptable. It appears to be a precise statistical allocation of regional activity based on resource sector employment and other factors. However, there has been so little variation in the regional proportions of activity in the years for which data is available that the regional allocation model has not been thoroughly tested.

While likely not as precise as it appears, the regional allocation model is adequate in the context of the present study; much more development would be required to adequately handle unusually-located resource projects or to expand the study area to other regions of Alaska.

3.5 The Housing Stock Model

The housing stock model is the final bridge between MAP and the electricity end use model. The most important aspect of this model is the projection of the relative proportions of single family, duplex, apartment, and mobile units.

Like the household formation model, the housing stock model is based only on demographic factors and not on the economic output of MAP. Beacuse of the lack of year-by-year housing data it is not possible to relate housing stock to construction activity, interest rates, and other influential variables which would clearly be desirable.

While the necessary data is missing it is possible to recreate it in the future on the basis of aerial photography, utility hookups, housing sales, and building permit activity. We strongly recommend this be done in future improvements to the ISER model.

3.6 The Electricity End Use Model - Residential Sector

The residential part of the end use model applies information on heating plant, appliance ownership, housing heating efficiency, and their changes over time to forecasts of households and housing units. The numerous ways in which this allows the analyst to examine the impact of alternative policy options is admirable; the detailed calculation process allows for changes in virtually any aspect of residential electricity consumption patterns.

A major problem in the model is the apparent confusion between housing stock attrition, which is not in the model but should be, and heating plant attrition, which is in the model but overly emphasized. Essentially, the rate of heating plant attrition is

quite high, given that the heating units of concern are electric and consequently last indefinitely given repairs to small components.

The model should allow for a very slow loss of actual dwellings, especially mobile homes, and for a somewhat faster loss of heating plants to newer and more efficient designs. Consequently, the particular numerical values used by ISER which simultaneously understate attrition of buildings and overstate retrofit are open to question.

3.7 The Electricity End Use Model - CIG Sector

The commercial sector end use model is quite undeveloped and sparse in comparison to the residential model. Originally, ISER had intended to build the model on the basis of floor space in commercial, industrial, and government buildings with a very modest breakdown by type of activity. In the final analysis, employment was used as the benchmark for electricity use projections.

This is adequate for the present study but is difficult to interpret as end use analysis as no physical efficiency changes can be directly related per employee energy use. Clearly, a model based on physical attributes of structures, such as floor area, would be easier to relate directly to energy use.

Furthermore, the final results reflect no breakdown of commercial-industrial, government into sectors; and breakdowns published by ISER were generated by across-the-board allocations of final consumption.

The most important problem in the CIG forecast is that the per-employee energy consumption figures are based on 1973-78 changes in consumption per CIG customer, i.e. store, factory, etc. While these two years avoid the highest point in the pipeline boom which might exaggerate energy use, the 1978 figure may have been pushed up by the practices of the boom years (uninsulated buildings, lights on constantly, etc.) This may be an important biasing figure when translated forward into per employee values for future periods.

Alaska's recent energy conservation legislation offers the strong possibility that a significant number of energy audits of residential and CIG customers will be carried out. The audits offer a prime opportunity to build a better data base which includes information on the physical characteristics of buildings. In the mean time, a close scrutiny of actual CIG electricity sales should offer a check on ISER's assumptions and should reveal whether the potential biases suggested above are in operation.

Eventually, more detail of the CIG sector must be built into the model. At the very least, information on principal activity, size of establishment, and region must be included. As we will note in the following section, the actual CIG forecast produced by ISER appears to be based on overly-rapid increases in energy use per employee in an era of growing energy awareness.

3.8 Summary

In summary, the ISER method is a major improvement over any other forecast methods which, to our knowledge, have been used in Alaska. It is a two part process with the Stage I model (MAP plus household formation, regional allocation, and housing stock extensions) feeding information on future households, employment, and housing stock into an electricity end-use model. The latter features an adequately comprehensive residential component but an underdeveloped commercial portion.

4. AN ANALYSIS OF THE ISER MODEL OUTPUT

4.1 Introduction

As indicated above, the ISER model forecasts Railbelt electricity consumption in terms of energy (or MWh) by end use and consuming sector, for each of the Railbelt's three divisions, for the years 1985, 1990, 1995, ..., 2010, and for each of three economic scenarios (which attempt to capture a reasonable range of economic development possibilities). Of the three economic scenarios - low, moderate and high economic growth - ISER considers the moderate case to be the "most probable". A summary of aggregate Railbelt electricity growth for each of these three scenarios is presented in Figure 4.1 following:

Figure 4.1: Summary of ISER Electricty Projections

	Low	Moderate	High
1985	2921 (GWh)	3171	3561
1990	3236	3599	4282
1995	3976	4601	5789
2000	5101	5730	7192
2005	5617	6742	9177
2010	6179	7952	11736
Annual Growth (%)			
1980-1990	3.08	4.18	6.00
1990-2000	4.66	4.76	5.32
2000-2010	1.94	3.33	5.02
Average Annual Growth 1980-2010 (%)			
	3.22	4.09	5.45

While ISER has considered and calculated the impacts on electricity demand of various economic scenarios, it has held constant through all its electricity demand projections its electricity end use assumptions, with the exception of the "moderate economic growth/shift to electricity" case. Because forecasts of electricity demand are highly sensitive to these end use assumptions, it is worth noting both the assumptions utilized in the ISER model, and the manner in which they were incorporated into the forecasts.

In summary, the following general assumptions have been utilized in ISER's end use calculations:

1. The electricity market is presently in relative equilibrium, except for space heating in Fairbanks, where a shift away from electric space heating is underway.
2. This equilibrium is expected to remain in effect throughout the forecast period because of relatively constant fuel price ratios.
3. The price of energy relative to other goods and services will continue to rise.
4. Rising real incomes will act to increase the demand for electricity.
5. Federal policies will be effective in the area of appliance energy conservation, but will have a much

smaller impact on building stock efficiencies.

6. No state conservation policies directed exclusively toward electricity will be implemented.
7. No significant state policies designed to alter the price or availability of alternative fuels are implemented.
8. No new electricity technologies will be introduced.
9. In terms of residential appliances:
    (a) saturation rates will track national trends;
    (b) for some appliances, reduced household size will act to reduce average electricity requirements;
    (c) consumption is sensitive to the appliance scrapping rate;
    (d) unspecified appliance consumption grows in order to accommodate the possibility of new domestic electricity applications.
10. In terms of residential space heating:
    (a) a slight trend toward single family homes is projected;
    (b) average housing unit size continues to grow;
    (c) natural gas availability will not significantly increase;
    (d) space heating alternatives such as oil, wood or coal will not greatly affect aggregate space heating demand;

(e) no significant increase in heat pumps occurs.

11. In terms of commercial-industrial-government use:
    (a) employment will grow more rapidly than the population;
    (b) no major conservation measures are anticipated;
    (c) the distribution of electricity end uses will not shift significantly.
12. Miscellaneous utility sales (street lighting and second home use) will grow at rates consistent with overall utility sales.

These assumptions enter the end use model through a series of calculations, as documented in the "User's Guide" section of this report.

Although ISER contends that these end use assumptions are "probable", we argue that in some cases they are unlikely, i.e. they indicate a growth rate in electricity demand which we believe to be too high.

In order to demonstrate the effects of utilizing different end use assumptions within the model, we have taken ISER's moderate economic growth case, and have developed two alternative end use scenarios for the Anchorage sub-region of the Railbelt. The first of these - Case "A" - indicates what we believe will be the result of the recent state conservation bill, combined with national trends in conservation policies and technologies.

Case "B" outlines what we believe would be the product of a conservation program more stringent than that presently contemplated by the State Legislature, but which nonetheless lies well within the realm of the possible.

4.2 Case "A" End Use Scenario

4.2.1 Residential Space Heating Requirements

ISER's calculations for future residential space heating requirements employ a number of specific assumptions. The following figure indicates ISER's assumptions, and where applicable, our modifications for the Case "A" end use scenario.

These modifications seem appropriate given the scope and intent of the recent energy conservation bill. Lower growth in dwelling unit size (assumption 2) is a reflection of a recent stabilization of dwelling unit size in the lower-48, and of smaller expected households.

The impact of the conservation, retrofit and unit size modification assumptions documented in Figure 4.2 is a reduction in Anchorage space heating requirements growth from ISER's expected 3.77% per annum to 1.98% per annum, a 47% reduction.

Figure 4.2: A Comparison of ISER and Case "A" Assumptions

I.S.E.R.	Case "A"
1. Additions to the housing stock will require about 10% more electricity for space heating than the average pre-1980 unit, reflecting larger unit size at the margin	1. no change
2. Average dwelling unit size for all unit types (single family, duplex, multi-family and mobile homes) will increase 5% per 5-yr. period throughout the forecast period	2. Lower growth in unit size is assumed. Single family and mobile units grow 15% larger by 1985 and then stabilize; multu-family and duplex units grow 20% larger by 1990 and then stabilize
3. Pre-1980stock will remain at present levels of efficiency throughout the forecast period (i.e. no retrofits assumed)	3. Retrofit schedules for Pre-1980 stock: (a) single family and duplex: 3% per 5-yr. period efficiency improvement, stabilizing at 15% in 2005 (b) multi-family: 2% per 5-yr. period efficiency improvement, stabilizing at 10% in 2005 (c) mobile homes: no retrofits assumed
4. Post-1980 units will be 5% more efficient per square foot than pre-1980 units for all housing types throughout the forecast period	4. All post-1980 units will be 5% more efficient per square foot per 5-yr. period
5. Once built, new units will remain at constructed levels of efficiency throughout the forecast period, except for single family units, which will improve 2%	5. Once built, units conform to retrofit schedule as in (3) above, effective beginning 5 years after the completion date of the unit

4.2.2 Major Residential Appliance Energy Requirements

ISER's method of dealing with major appliances is similar to their space heating technique, with the exception of the retrofit parameter, which does not exist for appliances. In summary, ISER's appliance assumptions are as follows:

Figure 4.3: ISER's Major Appliance Assumptions

Appliance	kWh Requirements per Unit per Year	Unit Growth per 5-yr. Period	Efficiency Improvement over 1980
water heater	3650	2.5%	14%
stove	1250	0	3%
clothes dryer	1000	0	6%
refrigerator	1560	5.0%	29%
freezer	1550	5.0%	21%
television	400	0	32%
air conditioner	400	0	21%
dishwasher	230	0	0%
dishwasher (water)	740	2.5%	24%
clothes washer	70	0	0%
clothes washer (water)	1050	0	31%

Source: ISER Worksheets

In terms of a moderate conservation effort, these values, and especially the estimated reduction in demand attributable to conservation, seem quite reasonable. While not a function of state policy, appliance efficiencies have been the focus of much federal study; indications are that federal appliance efficiency standards will be realized. Therefore, for our Case

"A" scenario, we accept ISER's major appliance consumption. These assumptions yield a growth rate in major appliance energy demand in the Anchorage district of 3.17% per annum.

4.2.3 Unspecified Residential Appliance Requirements

ISER has disaggregated unspecified appliance energy demand into lighting (1000 kWh/household/year) and assorted appliances (1010 kWh/household/year and growing at 50 kWh/household/year). Because this classification net of lighting contains a very large number of appliances with extremely low utilization rates and energy requirements (i.e. an electric radio at 10 kWh/year), it is necessary to treat it as an aggregate. ISER's allowance of 50 kWh/household annual growth in assorted appliance energy demand, while holding lighting demand constant, seems reasonable given the uncertainty surrounding the actual appliance stock, its potential for efficiency improvements, and the possibility that new small appliances will enter the market in the future.

Thus, for our Case "A" scenario, we have accepted ISER's unspecified appliance assumptions, which yield a growth rate in Anchorage district of 4.9% per annum throughout the forecast period.

4.2.4 Residential Summary

In general, we find ISER's end use assumptions acceptable,

escept for space heating electricity demand, which we believe are unrealistically high. Utilizing our assumptions for space heating while accepting ISER's appliance assumptions, results in a growth forecast for the Anchorage region of 3.36% per annum, compared to USER's 3.75%.

4.2.5 The Commercial-Industrial-Government Sector

ISER's Commercial-Industrial-Government sector (CIG) end use model is, because of serious data limitations, much less detailed than the residential end use model. In general, CIG employment for each of the snapshot years is multiplied by an electricity use per employee parameter, yielding total electricity consumption for that "vintage" of employee. Summing this figure with the electricity consumption of all previous "vintages" of employees yields total consumption for that year. The following values were used in the ISER CIG end use model.

Figure 4.4: ISER CIG Assumptions

Date	Base MWh/Employee	(1 - Cs)	(1 - ret)	Actual MWh/Employee
1980	10.675	1.0	1.0	10.675
1985	15.156	1.0	1.0	15.156
1990	18.180	.95	1.0	17.270
1995	21.200	.90	1.0	19.080
2000	24.220	.90	1.0	21.800
2005	27.240	.90	1.0	24.520
2010	30.26	.90	1.0	27.230

We have serious reservation about accepting the values used in the CIG end use model. It is difficult to imagine that electricity use per employee can nearly triple within the confines of existing CIG electricity applications. Such rapid growth in per employee electricity use seems to suggest that major new applications for electricity will be found. However, ISER's assumption that fuel price ratios will remain nearly constant throughout the forecast period seems to limit the potential for the development of new applications (notwithstanding actual unavailability of alternative fuels).

Secondly, ISER's assumes only a 10% reduction by 1990 in the efficiency with which each CIG employee utilizes electricity (the (1 - Cs) term above). Such a figure seems to underestimate commercial sector savings of 15 - 30% that are already being attained. (Ontario Hydro, for example, inhabits one of the world's most energy efficient commercial structures. Since the building's completion in 1976, Hydro has cut lighting loads by a further 15%).

While the lack of CIG data certainly suggests the need to be conservative, we believe the 10% conservation estimate is far too low.

And thirdly, ISER assumes that no retrofits will be conducted on the buildings inhabited by CIG employees (the (1 - ret) term remains constant at 1.0). Rising electricity prices seem to

imply the incentive for major retrofitting on commercial structures.

For our Case "A" scenario, we will assume data values as follows:

(a) Per employee electricity utilization is allowed to grow, as ISER has forecast, to 1995, but remains stable at the 1995 level throughout the remainder of the forecast period;

(b) All stock is assumed to retrofit, resulting in a 2% savings per employee per 5-year period, effective from five years after the completion of the structure within which the CIG employee is assumed to work;

(c) While we have reservations about the 10% reduction in per employee energy consumption resulting from conservation, we will accept it for Case "A" (but will increase the role of conservation in our Case "B" analysis).

These amendments result in a reduction of the Anchorage district CIG electrical growth rate from ISER's 4.2% per annum to 3.6% per annum over the entire forecast period.

4.2.6 Summary of Case "A" Scenario

The following figure summarizes electrical demand growth in

the Anchorage region according to our suggestions above. The effect of our revisions is to reduce overall growth in the Anchorage area by approximately .5% per year, from ISER's 3.98% to what we believe to be a more realistic 3.49%.

Figure 4.5: Case "A" Summary

Date	Space Heat	Major Appl.	Minor Appl.	C-I-G	Total	ISER Forecast Total
1985	492	464	203	1219	2378	2438
1990	556	523	255	1353	2687	2782
1995	660	628	334	1777	3399	3564
2000	784	753	427	2151	4115	4451
2005	848	858	509	2450	4665	5226
2010	903	975	604	2797	5279	6141

Average Annual Growth 1980 - 2010:

ISER: 3.98%
Energy Probe 3.49%

4.3 Case "B" End Use Scenario

4.3.1 Residential Space Heating Requirements

Figure 4.6 below indicates the residential space heating assumptions utilized in our Case "B" end use scenario (reference should be made to Figure 4.2 for comparison with Case "A" and ISER assumptions).

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Figure 4.6: Case "B" Assumptions (Residential Space Heat)

1. Single Family Dwellings:
   (a) Pre-1980 stock and 1985 stock retrofit so as to achieve improvement in efficiency of 4% per 5-year period compared to base 1980 and base 1985 requirements, stabilizing at 80% of base requirements
   (b) Base heating requirements for 1990 and successive stock vintages decrease as follows:
       1990 - 35000 kWh (based on 1980 house size)
       1995 - 30000 "
       2000 - 25000 "
       2005 - 20000 "
       2010 - 20000 "
   (c) unit size increases to 1.15 x 1980 value by 1995, then remains stable
   (d) 1985 stock has a (1 - Cs) of 0.95 (as per ISER); all other stock has a (1 - Cs) of 1.0 (conservation is accommodated through reductions to base requirements as per (b) above
2. Duplexes:
   (a) retrofit as per single family dwellings
   (b) Base heating requirements for 1990 and successive stock vintages decreases as follows:
       1990 - 23600 kWh (based on 1980 house size)
       1995 - 20600 "
       2000 - 17600 "
       2005 - 14600 "
       2010 - 14600 "
   (c) unit size increases to 1.2 x 1980 value by 2000, then remains stable
   (d) conservation treated as per single family dwellings
3. Multi-Family Dwellings:
   (a) all assumptions as per Case "A"
4. Mobile Homes:
   (a) all assumptions as per Case "A"

These Case "B" modifications to the ISER residential space heat forecast result in a growth reduction from ISER's 3.77% per annum to 1.77% per annum throughout the forecast period, a 53% reduction.

4.3.2 Major Residential Appliance Energy Requirements

Although ISER's model incorporates the effects of federally mandated appliance efficiency improvements, analysis by others has indicated that even greater gains are possible in this area. While the potential improvements in individual appliances vary greatly, it seems reasonable to suggest that on average, improvements in the range of 20% over and above present federal standards are possible. Thus, by using ISER's aggregate major appliance consumption data, and factoring in a 5% improvement by 1985; 10% by 1990; 15% by 1995; and 20% by 2000, a revised estimate of major appliance consumption can be developed. Such improvements would serve to reduce major appliance energy consumption growth from ISER's (and Case "A"'s) 3.17% per annum to 2.41% per annum throughout the entire forecast period.

4.3.3 Unspecified Residential Appliance Requirements

Again; because of the lack of appliance disaggregation in this category, it is impossible to deal explicitly with the effects of increasing saturation and improved unit efficiencies. However, by holding lighting requirements constant at 1000 kWh per year and allowing other appliance use to increase at a compound rate of 2% per annum per household, we believe we can present a reasonable estimate of the combined potential effects of both improved efficiency and growing saturation.

This would yield an annual growth rate in this end use of 4.26% compared to ISER and Case "A" growth of 4.9% per annum.

4.3.4 Residential Summary

The overall effect of the application of Case "B" assumptions to the ISER end use model is to reduce Anchorage residential sector growth from 3.75% per annum to 2.7% per annum throughout the 1980 - 2010 period.

4.3.5 The Commercial-Industrial-Government Sector

For our Case "B" scenario, we have assumed CIG data values as follows:

(a) per employee electricity utilization remains constant after 1985 at the 1985 level of 15.156 MWh. This value can be interpreted in two ways, as either accommodating a growing number of applications at increased efficiency or as accommodating the same number of applications at current levels of efficiency (or, of course, as a combination of these two factors).

(b) retrofitting on all vintages of stock is assumed to proceed at 5% per 5-year period over the base figure.

The effect of these assumptions is to reduce CIG sector consumption growth from ISER's 4.18% to 2.71% per annum.

4.3.6 Summary of Case "B" Scenario

The following diagram summarizes electrical demand growth in the Anchorage district according to Case "B" assumptions. Ovejall growth is forecast at 2.7% per annum compared to ISER's 3.98%.

Figure 4.7: Case "B" Summary

Date	Space Heat	Major Appl.	Minor Appl.	C-I-G	Total	ISER Forecast Total
1985	489	441	191	1190	2311	2438
1990	548	471	230	1267	2516	2782
1995	641	533	291	1558	3023	3564
2000	722	603	363	1798	3486	4451
2005	740	687	427	1967	3821	5226
2010	764	780	503	2152	4199	6141

Average Annual Growth 1980 - 2010

ISER:	3.98%
Energy Probe	2.70%

5. MAJOR CONCLUSIONS AND RECOMMENDATIONS

Although we have outlined many recommendations throughout the text of this report, we believe some are sufficiently important to be restated and explained in greater detail.

5.1 General Commentary

Although the ISER model in its present form is not EEU as both ISER and Energy Probe has desired initially, it nonetheless represents an enormous advance in the quality of electricity demand forecasting in the State of Alaska. ISER is to be commended on the extent to which they have incorporated available data, on the manner in which they have laid out their assumptions, and on their willingness to attempt new procedures and techniques. We believe that, our suggestions notwithstanding, the ISER model represents an excellent vehicle through which to view the State's electricity future.

5.2 Funding for Load Forecasting Research

Although demand forecasting is considered to be the most important element of the planning process; it continues to receive a disproportionately small share of overall research funding. If demand forecasting is to provide a useful guide to energy policy development, and if energy projects are to be evaluated with the highest possible degree of confidence, additional funds must be made available so that data can be

collected and analyzed and the model structure improved.

5.3 ISER Model Automation

While the ISER MAP model is fully automated, the end use model at present consists of several hundred worksheets, changes to which must be made manually. In this form, the end use model is virtually inaccessible to analysts who might wish to test the effects of various end use assumptions: the development of a single alternative scenario for the entire Railbelt would take many days. This serves to limit the potential of the model as a policy analysis tool.

Ideally, the entire forecast model, that is, the MAP, household formation, housing, regional allocation and end use components, would be automated. We believe that such an effort should be made.

5.4 Future Use of the ISER Forecast

Because the ISER model represents such an advance over previous forecast methods, we believe that it should be utilized in the evaluation of future energy projects in the State. In other words, while specific assumptions can, of course, vary over time and among analysts, they should be incorporated, and the results viewed, within the context of the ISER forecast. Efforts should be made to improve the weak points of the forecast, the result of which would

be a forecast structure which forms an excellent basis for project evaluation and policy analysis.

5.5 Data Collection

Data collection methods within the State should be improved, in at least the following ways:

(a) the results of the 1980 Census should be incorporated into the forecast at the earliest opportunity;

(b) air photo interpretation should be employed to reconstruct the building stock for the Railbelt;

(c) information from the energy auditing programs should be used to gain a fuller understanding of the CIG and residential building stocks.

5.6 Statewide Electricity Demand Forecasting

Data should be collected, and the ISER model revised and expanded, so that the model can be used to forecast electricity requirements for the entire State of Alaska. This will require several structural revisions to the model, especially with respect to the regional allocation component.

5.7 Peak Demand Forecasting

A peak demand forecasting method should be developed to be applicable to all Stage I and Stage II scenarios. This analysis

should be conducted by estimating and summing the load characteristics of each individual end use. The potential for load management and the effects of time-of-day pricing should be considered in the research. However, at the present time, we do not believe that it would be worthwhile to develop an integrated energy/demand forecast.

5.8 Additional Stage I Scenario

At present, all three Stage I scenarios developed by ISER assume a steadily increasing level of State economic activity. However, the possibility of a significant slowdown in resource sector activity during the 1990's has been considered by a number of individuals, resulting from the depletion of the most accessible and least expensive natural gas and oil deposits. Given the real possibility and significant consequences of such a scenario, we believe that it would be worthwhile to model this possibility in the same fashion as ISER has modelled the three major scenarios to date.

5.9 Independent Expert Advice on the Load Forecast

It has been argued that an appropriate way to review and evaluate the ISER model results would be to draw together a group of individuals familiar with State economic and energy affairs. This group would evaluate the likelihood and feasibility of the model's assumptions, from which a fuller

appreciation of the range of possible electrical futures could be obtained.

We believe that such an exercise might prove fruitful for two reasons. Firstly, such a group might achieve a consensus with respect to probable electrical futures (or, failing consensus, might better understand the assumptions about which the group cannot agree). Secondly, the logic behind the ISER method could be spread over a wider range of parties, resulting in a deeper appreciation of the factors affecting electricity growth and the role of State policy in these areas.

We should qualify the above, however, by stating that policy intervention can assist in determining the "probability" of a particular electrical future; thus this approach should be seen not as a substitute for, but rather as a complement to, continued energy policy research in the State.

APPENDIX

WORKING PAPER #1: A PRELIMINARY EVALUATION OF THE ISER ELECTRICITY DEMAND FORECAST

January 2, 1980 (amended for inclusion)

Preface

In October 1979, Energy Probe was asked by The House Power Alternatives Study Committee (HPASC) of The Alaska State Legislature to submit a proposal for a study that would evaluate the electricity demand forecasting method developed by The University of Alaska's Institute of Social and Economic Research (ISER). This report presents an initial evaluation of the ISER forecasting model and the Man in the Arctic (MAP) model on which, in part, the electricity demand forecast is based.

The present report draws on information contained within the Detailed Work Plan submitted November 14, 1979, by Dr. Scott Goldsmith of ISER; May 1979 MAP model documentation; various publications relevant to the future social and economic activity in the State of Alaska; and personal discussions with ISER personnel.

A further report will deal with the sensitivity of electricity growth in the Railbelt region of Alaska to policy and market induced changes in the social, economic and physical factors which influence electricity growth; and with an analysis of the appropriate role of electricity demand forecasts within the broader context of State energy policy development.

Because this report is a working document intended only for use by HPASC members and consultants, it is written in relatively technical language. Our final report will detail the three areas mentioned above in less technical terms.

The views expressed herein are those of the authors, and not necessarily The House Power Alternatives Study Committee.

1. Introduction

Electricity demand forecasting, like all quantitative forecasting, is an effort to view the past and present in a systematic way with a view towards making reasonable statements about the future. The basic problem is that the future is not known, and indeed cannot be known, even in a probabilistic sense. As a matter of fact, pretending to forecast the future is an indictable offence under the New York State Criminal Code (1). Similar provisions, we are certain, are in effect elsewhere.

However, analysts often find it necessary to fly in the face of strict legality when the viability of a large project hinges on

the need for it in the future. Hence, forecasting has become an integral part of planning for investments in energy, transportation, housing, and a myriad of other functional service delivery areas. Forecasting the demand for such services comprises a two stage process. In the first stage, aggregate social and economic activity is projected into the future (using, for example, the ISER MAP model); the second stage translates this aggregate activity into a detailed forecast of the demand for the product or service in question.

Stage I models tend to be rather ubiquitous, finding application in a number of functional areas. MAP, for example, has been used in a variety of forecasting environments including energy impact analysis and fiscal forecasting. On the other hand, Stage II models are generally specialized and tailored to the problem at hand. In transportation planning, they are classified under the general heading of travel demand models. In energy demand forecasting, a number of different approaches have been developed, which have met with varying degrees of success. To the extent that a debate over appropriate forecasting methods exists, it is really a debate over the choice of a Stage II approach. In fact as we argue below, the choice of a Stage II approach essentially dictates the output and hence the structure of the Stage I model to be used.

The argument over Stage II models centers on the extent to which the model should deal with two distinct but equally important aspects of the problem. Given an aggregate forecast from Stage I, should a Stage II model focus on the specific activity involved or should it focus on the decision of the consuming unit? In forecasting within a policy environment concerned with housing, for example, the latter dictates that we examine household budgets, prices and so on. However, a dwelling offers service far beyond simple shelter; amenity, proximity and opportunities for social interaction are but a few of these. Hence, the former approach would argue that the demand for housing is really a composite demand for the services offered by a structure. Energy and transportation are similar. Rarely are they required for their own sake: in reality they are crucial inputs into a number of satisfaction-yielding activities.

In electricity demand forecasting it was once possible to do a reasonable job of prediction by looking at a historical growth rate and simply plotting future levels of consumption against time. A draftsman with a French curve (or an engineer with semi-log paper) could make a reasonable guess at future demand by simple curve fitting and extrapolation. However, it is logically clear that the growth in electricity demand has little to do with the passage of time per se. Rather, it is related to individual decisions to engage in a growing number of electricity-using activities over time.

2. Stage II Modelling Approaches

Attempts to deal seriously with this complexity became necessary in the early years of the 1970's when historical rates of elec-

tricity growth ceased to be realized by most electrical utilities in North America. The formation of OPEC and the 1973 Arab oil embargo, with its subsequent increases in petroleum prices, ended the era of cheap energy; and all fuels, including electricity, rose in price rather dramatically. Unfortunately, the econometric demand forecasting models in use at this time (2) were incapable of dealing with such rapid changes and continued to point to historic or near-historic rates of electricity growth. ISER's 1975 electricity demand forecast for the State of Alaska (with which, we might add, ISER itself was not comfortable) is a case in point. The most telling criticism of its strict time-series econometric approach is that potentially ludicrous activity forecasts result. In ISER's 1975 effort, for example, initial results indicated a demand for electricity which implied 100% saturation of electric space heating in Fairbanks in the future. The point to be made here is that because individual activity levels are not explicitly identified in aggregate economic models, such models run the risk of implying physically unrealistic activity levels.

End use forecasting models in their pure form take the opposite approach by relying almost exclusively on activities, independent of the underlying economic conditions. The logic is simple: consuming units engage in various activities requiring energy. Energy growth can result from

(a) engaging in additional energy consuming activities;
(b) engaging in the same activities more intensively;
(c) engaging in the same activities less efficiently;
(d) any combination of the above.

The case of oral hygiene provides a humorous example. A household may switch from "manual" to electric toothbrushing, an additional energy using actitity. Given an electric toothbrush, members of the household may wish to brush more regularly. When the toothbrush wears out it may be replaced with a model which delivers fewer brush strokes per unit of energy input. In any of these cases, electricity use increases. In principle, it is possible to examine all electricity use in this manner, noting that all energy is used in a final form such as heat, light, motion or sound, and that it is transformed from its input form to its final end use form by a "device".

Again, in principle, electricity demand can be projected by forecasting the characteristics of devices and activities. This has become known as the engineering or end use approach to demand forecasting. The most telling criticism of this method in its pure form is that it is not sensitive to changes in prices, incomes and preferences, i.e. the decision aspect of the process modelled in Stage II. This is a generally accurate criticism whose resolution requires an examination of policies affecting the decisions of the individual consuming unit. In further work for HPASC, we will be discussing this problem.

For functional forecasting purposes, an approach is emerging which seeks to overcome the inherent difficulties of both extremes of Stage II modelling methods. The econometric-end use approach (EEU) attempts to deal with electricity use at the level of the activity while recognizing that the decision to own and operate a device, i.e. to engage in an activity at some level of intensity, is inherently a problem of microeconomic choice and is therefore sensitive to prices, incomes and the availability of alternatives (3).

In our opinion, an EEU approach is the only sensible way to forecast electricity demand and to justify a huge expenditure of public funds.

We are pleased that ISER agrees in principle with this general philosophy. The detailed work schedule circulated by ISER lays out a rather impressive work plan. We anticipate problems arising because of the extensive data requirements of EEU, which will be intensified by the basic data problems of Alaska: short time series and small population. However, we fully support ISER's desire to cast the net widely at first, while recognizing that data, and more importantly time and financial constraints will require the net to be drawn in somewhat.

At this point we would like to comment on the allocation of resources for independent demand forecasting relative to the magnitude of potential capital investments. Given the magnitude of the stakes for a project such as Susitna, i.e. a potential investment of billions of dollars, we feel that far too little money is being spent on this crucial element of project feasibility. ISER will likely argue, and justifiably so, that data is simply not available to construct a full scale EEU model. The missing data, however, is not of the variety which is impossible to collect. With additional resources made available, it could be gathered and incorporated into the forecast model, resulting in a forecast method with which all could be reasonably comfortable.

In the following pages we will review the EEU approach to Stage II and the requirements of a Stage I model to provide requisite inputs into EEU. Our goal is twofold: first to analyze and suggest approaches to particular problems for the benefit of ISER, and secondly to lay out the logic of ISER's forecasting proposal for the benefit of all consultants involved in HPASC studies. It is our hope that this will facilitate discussion and understanding of ISER's methods and in the longer term, identify avenues for potential policy intervention.

3. The Econometric-End Use Approach

EEU begins with the simple proposition that all energy is used in capital items or devices, which perform a specific task, i.e. an end use. Each device, by virtue of its design, has a specific energy input requirement for each unit of useful output, a concept similar to "First Law Efficiency". Devices are owned or rented and operated by consuming units. However, not all consuming units own all types of devices, nor do devices operate at all times.

Further, many devices may be powered by more than one fuel. The decisions to own or lease and operate a device are economic decisions made by the consuming unit in light of prices, incomes, preferences and available options. For a given period, say a year, the total energy required by a consuming unit to power a given device is by definition its hours of operation times its power requirement. If the device is electrically powered, this energy demand will contribute to an electricity demand estimate. Any portion of the electric power consumed by the economic unit which it generates itself, does not contribute to this utility forecast.

There are, of course, many consuming units and many devices. We may translate from the device level at the consuming unit by simply summing over devices and consuming units yielding the following expression for utility electric demand over a period of one year:

$$TUD = \sum_{k=1}^{N} \sum_{j=1}^{M} (D_{kj} \times E_{kj} \times I_{kj} \times R_{kj} - S_k) \qquad (1)$$

where

TUD = total utility demand (kW.h)
D_{kj} = 1 (if consuming unit k has device j)
0 (if otherwise)
E_{kj} = 1 (if device j is powered by electricity in consuming unit k)
0 (if otherwise)
I_{kj} = intensity of use of device j by consuming unit k (hours)
R_{kj} = power requirement of device j by consuming unit k (kW)
S_k = amount of self supplied electricity by consuming unit k (kW.h)
N = total number of consuming units
M = number of distinct devices

This is an accounting framework for utility demand (4). To operationalize it for forecasting purposes, each of the components must be related to known of "knowable" variables. Engineering knowledge and economic theory suggest potential relationships. Econometric or other techniques are used to estimate their direction and strength.

For operational purposes it is necessary to group consuming units into classes on the basis of predominant activity within the unit (i.e. residential, commercial, etc.), similarity in patterns of device ownership or energy requirements, or some other appropriate criterion. Clearly, there are losses in precision due to this sort of aggregation. After grouping consuming units into classes, the demand for utility electricity is obtained by the following expression:

$$TUD = \sum_{i=1}^{Q} CUD_i = \sum_{i=1}^{Q} \sum_{j=1}^{M} (N_i \times PD_{ij} \times PE_{ij} \times I_{ij} \times R_{ij} - S_i) \qquad (2)$$

where

CUD_i = the demand for electricity by class i (kWh)
N_i = the number of consuming units in class i
PD_{ij} = the proportion of class i consumers owning device j
PE_{ij} = the proportion of device j in class i that are electrically powered
I_{ij} = the average intensity of use of device j by members of class i (hours)
R_{ij} = the average power requirement of device j owned by members of class i (kW)
S_i = the amount of electricity self supplied by class i members (kWh)
Q = the number of consuming classes

The advantage of examining end use demand in this manner is obvious. Not only is it less data intensive than Equation (1), but also, key parameters become easier to pinpoint. For example, in an analysis of a subclass comprised of mobile homes built before 1970, space heating requirements would be rather similar.

Time, of course, is also a crucial consideration which must enter the model in a forecasting environment. The advantage of an end use model is that the factors developed above exhaust the realm of demand factors, and each will change over time. As time passes, classes of consuming units grow or decline, devices become more or less prevalent and more or less "electrical", self-supplied electricity may become more widely used, devices may be used more or less intensively, and device efficiencies will undoubtedly change. The latter is particularly important since many devices will be replaced over the forecast period and those which are not may be "retrofitted" to improve their performance.

While the passage of time is itself not the reason for change, the argument above suggests that it may prove fruitful to view demand growth in a temporal sense. At a point in time we begin with a "stock" of consuming units equipped with devices. Over the ensuing year the consuming unit may disappear, change or modify its collection of devices or means of powering them. In addition, new consuming units may be formed complete with new devices. Presumably these new devices would have energy consumption characteristics different from "old" devices. At the end of the year we witness a revised stock of existing consuming units and devices comprised of the previous year's units plus net increases. This may be taken a year at a time over the entire forecast period yielding electricity requirements for specific annual points and annual increments in demand.

4. The ISER Model and Suggested Approaches and Revisions

In the context of the Railbelt region, EEU makes a great deal of

sense for the residential and commercial sectors which, taken together, account for about 86% of Alaska's total electricity demand. Because industrial development in Alaska is largely of the major project variety, it is best to examine these in a case by case manner. Further, with the exception of block heating in vehicles, the transportation sector currently uses an insignificant amount of electricity. Again, this is best viewed as a special case.

ISER's EEU model, Figure 1 in their "Detailed Work Plan", incorporates most of the features of an ideal EEU discussed above. It is a stock/flow model which segregates consuming units into "new" and "old" and deals with four residential subclasses, and segregates devices into six categories including an "other" category for minor appliances.

The commercial sector should be divided into at least the following groups:

(a) public/institutional buildings;
(b) large shopping plazas/office buildings (say larger than 100,000 or 250,000 square feet);
(c) other commercial buildings.

This would be fruitful for two reasons: within each group there are similar requirements for electricity; and policies/programs may be specifically tailored, at a later date, to this particular pattern of consumption and occupancy/ownership.

Missing in ISER's proposed model is a term to account for electricity or energy supplied by the consuming unit and hence not required from a central system. This should be added to the model even though it may not greatly affect the magnitude of the final forecast. A number of considerations warrant its inclusion, not the least of which is the possibility of co-generation of electricity and steam for space heating in large commercial establishments, schools, hospitals and the like.

The present ISER formulation allows for the scrapping of dwelling units but not for the replacement of appliances within existing units. A number of appliances ISER intends to consider have useful lives of substantially fewer years than either the forecast period or the structure. In ISER's model, this problem could be solved by adjusting the average consumption of appliances on an annual basis. It is better, however, not to confound the efficiency measure with the effect of new appliance stocks.

Given these structural refinements which we consider necessary, the ISER approach to residential and commercial electricity demand forecasting is methodologically sound. Since residential and commercial consumption in the Railbelt is quite important, it is necessary to examine the components of the EEU model and to suggest possible approaches to modelling each component. In this case we refer initially to our formulation of EEU above, and explicitly to these elements pertaining to Stage II.

In Equation (2), total utility demand was expressed as the sum of class demands. Class demand is a function of the number of

units in the class, the proportion owning various devices, the proportion of these devices powered by electricity, the average intensity of each device's use, the average power requirements of the various devices and the amount of self supplied electricity. The number of consuming units in each class is essentially a modified form of the output of State I which we discuss below. The remaining factors are, however, Stage II concerns which we deal with in turn.

PDij, the proportion of class i units owning device j, is obviously a variable whose value lies between 0 and 1. For certain end uses, i.e. space heating, its value equals unity and will continue to do so over the forecast period. In other cases like clothes drying and refrigeration, its value is a matter of choice, and while perhaps initially close to unity, it is variable over the forecast period. In an ideal world we would hope to estimate this proportion on the basis of income level and distribution within the Railbelt region, bearing in mind that the decision to own a device also commits the owner to operating expenses over its lifetime. Hence the general price level of all competing fuels may be important.

PEij, the proportion of device j owned by class i which are electrically powered is also a variable whose value ranges from 0 to 1. Again, for certain end uses, especially refrigeration, its value is close to unity and will likely remain so over the forecast period. However, a great deal of choice exists in this area. A useful way to look at this problem has been proposed by Fuss who suggests the decision to engage in an activity with a specific fuel is essentially separable. In other words, given a decision to engage in an activity, the choice of fuel is essentially a separate question (5) made on the basis of relative prices.

The question of the treatment of conservation arises in this instance. If conservation is factored into average energy requirements, then no more need be said, However, if we view each or any device as having a "base-line" energy requirement, then any effort to reduce it involves an explicit tradeoff of electricity for conservation. In this sense, conservation is self-supply, and has an average supply price equal to the amortized annual cost of the conservation project divided by the number of kilowatt-hours displaced during a year. Marginal costs may be calculated by assuming, ideally, various levels of conservation and calculating, presumably, a step function for the fuel equivalent value of various conservation schemes. The same logic may be applied to renewable energy projects as well.

We feel it is useful to view conservation and renewables in this way when considering existing activities at a point in time. The major point is that given an existing activity, like space and water heating (the major ones) the consuming unit can choose not only to switch from one conventional fuel to another but can also choose to supply a portion of its requirements with conservation. In an oil heated home, for example, the household may switch to gas, electricity, or conservation for all or part of its heating

on the basis of relative prices. Considering conservation as an explicit fuel represents a useful modification of interfuel substitution analysis.

Rij, the average power requirement of device j in class i, becomes basically an engineering design parameter when conservation is treated as a fuel. Consequently, it is a function mainly of vintage, not confounded by retrofit. One item that should be examined is the trend in device efficiencies over time. This may well be an appropriate area for regulation.

Iij, the average intensity of use of device j by class i members is also a consumer choice variable although to a limited extent in the major consumption categories. Actions like reducing inside temperatures and the like are evidence of the economizing behaviour of households under this category; how much further we can go in this area is certainly questionable. In this case, comfort and convenience bound choice from below. To the extent that there is flexibility it is likely price and income related.

The final term in our formulation is Si, the amount of self-supplied electricity by members of class i. In this instance we suggest that this term be kept pure in the sense that conservation not be viewed as self supply in this term. We include Si in the model for the reasons stated above. There is a price at which self generation or co-generation becomes attractive whether by means of water power, wind or conventional fuel. The model should be sensitive to this possibility.

The above relates to our formulation and also to ISER's model. The remaining terms in ISER's model relate to new household formation which we discuss below and the various "scrapping rates". Scrapping of a device involves not only physical deterioration but also economic considerations, one of which is the device's fuel requirements. Logically, the scrapping rate should increase with decreasing energy requirements for new models of a particular device. This is extraordinarily difficult to measure and project over time; however, it is something to be kept in mind.

Generally speaking, we are impressed with ISER's proposed method for handling the Stage II modelling of the residential and commercial sectors. With the modifications suggested above we can wholeheartedly endorse ISER's approach and we look forward to working with ISER on further questions of approach and sensitivity analysis. With respect to the ISER approach to non-residential and commercial use of electricity, we reserve judgement since the method has not yet been developed. We will, of course, comment at an appropriate time and we are confident that ISER will take a sound approach, based on their work to date.

5. Stage I Approaches

We not turn to the merits of the MAP model of the Alaskan economy as a Stage I model for EEU forecasting. Regional economic forecasting can take a number of forms. Some approaches being

considered in the "Detailed Work Plan" are input-output analysis, the economic base approach, Curtis Harris' locationally efficient model, and the Delphi technique. These all have strong and weak points but none is a serious contendor to a moderately detailed econometric model like MAP.

What is required of the Stage I model? It must provide the number of consuming units in each class for the end use equation. That is, in the number of housing units of several types and the number of firms, employees, square footage or business volume for commercial and institutional units. It must be sensitive to the scenarios of fast, likely and slow growth mentioned in the "Detailed Work Plan". It must respond to changes in oil and gas pricing, energy and other major investment projects, national economic trends, and demographic realities including migration. While the current MAP model incorporates most of the latter functions, the restriction of demographic projections to persons (not households or families), the introduction of housing only through the dollar volume of construction, and the lack of other physical measures of economic activity closely related to the number and type of consuming units are major deficiencies. As noted in the "Detailed Work Plan", data must be gathered and incorporated into new versions of MAP.

What regional techniques must be added? In our opinion, none of the above mentioned techniques merit much effort.

Input-output analysis is appropriate when a region has a large industrial base which relies to a great extent on inter-industry sales. Alaska does not have such an economy yet, and the method's well known data intensity suggests that it need not be considered further. Shortcuts to true regional input-output data gathering - such as the use of technical coefficients borrowed from other studies - are inappropriate for an unusual state economy such as that of Alaska.

The strong points of economic base analysis - a technique which is useful when the regional economy pivots on clearly defined basic industries - are already contained within the MAP model. The simple economic base methods are too elementary; ISER is well beyond them already in its work. The same criticism holds for purely extrapolative methods. Just as ruler and graph paper are inappropriate for load forecasting, they are too simplistic for the economic part of econometric-end use analysis.

Curtis C. Harris developed a regional forecasting model at the detailed industry level based on short time series changes in output by industry and state and incorporating transportation costs estimated by optimization techniques. Alaska clearly is not likely to exhibit consistent locational cost patterns of industrial development necessary to take Harris' approach.

Delphi, a technological and political forecasting technique developed first at the Rand Corporation is unlikely to yield the moderately detailed consuming unit forecasts needed here. However, it may always be considered for developing scenarios for energy projects, general economic growth levels, or energy policy

decisions. Hence it is not a Stage I model but a source of exogenous and policy variable values for any forecasting method.

Among general methods for forecasting regional economic activity, one not yet mentioned is shift-share analysis. This method is based on statistical estimation of the contribution to a state's industrial growth of industry factors and regional factors. It is an excellent basic method which is sufficiently incorporated in a MAP-style econometric approach. While both input-output and shift-share methods are usually performed with a great deal of industry detail, such detail is not needed in our Stage I approach.

What is needed is more detail aimed at household characteristics and building stock characteristics. While data sourc end points for households are well known and trusted, a region such as Alaska can have rapid and crucial post-Censal fluctuations in households and household size. As for buildings, only dwelling units are enumerated in the Census. Building stock estimates for non-residential units are rare above the city level (6). Land use surveys and Civil Defense surveys give spotty data sets, but the building stock is basically an unknown quantity for regions such as states. For the current research, increased information on the building stock is important.

As an expedient is is suggested that housing be looked at in detail (so as to allow better end use forecasts for space and water heating, lighting and appliance loads); that large commercial and institutional uses be examined through enumeration of structures; and that the rest be treated by the use of employment or sales estimates.

Recent efforts by others in energy forecasting suggests two approaches:

(a) macroeconomic econometric models such as MAP;
(b) microeconomic simulations of consuming unit responses to changes in price, income and the availability of alternatives.

The former is necessary to introduce national and major regional trends. The latter is used to discover what the distributional effects of new pricing and supply levels will be.

A study commissioned by a number of New York consumer groups and carried out at Cornell University was used in testimony before the New York State Energy Master Plan Meetings in September 1979 (7). In this approach, Green, Mount and Saltzman utilized a four-sector economic/demographic state econometric model with a partially integrated energy sub-model. The four sectors were residential, industrial, commercial and transportation. All major energy types - electricity, oil, gas and coal - were forecasted simultaneously. This Cornell model as well as another model developed with end use detail by The New York State Energy Office, predicted significantly lower electricity requirements than has previous state plans. It should be noted that while the Cornell model is not extremely complicated (57 economic equations, 150 demographic equations) it contains household formation functions for each age-sex cohort. Unfortunately, the Cornell model does not give explicit place in its structure to self-supply wood space heating or conservation.

Furthermore, in the Cornell approach, a microeconomic simulation was linked to the macro model in order to relate income and price changes and restrictions on fuel supply to consumer demand for the different fuels (8). This, of course, requires an extensive data base of individual households studied by survey research methods. In this case a sample of 7000 households was utilized.

While such microsimulation may be beyond current possibilities in evaluating Susitna (and we are not convinced that such further study should be considered extravagent) it suggests again the need to make the energy forecasting version of MAP more oriented to consuming units, households, and the biggest devices of all, buildings.

Looking in more detail at MAP, based on the may 31 1979 documentation, we note that it has more than enough economic detail, but not enough demographic information because of households not appearing explicitly. Finally, a housing and/or buildings component is lacking; this is a critical shortcoming.

In the "Detailed Work Plan", we support most strongly Items A7 - 9 on electricity consumption; Item 10 on households, houses and appliances. These are more important, in our estimation, than the refinement of the MAP economic model per se. They should receive top priority.

Regional disaggregation (Task B) is important, but less so than getting on to EEU forecasting for the Railbelt region as a whole. Thus the items in "D" are crucial - interfuel substitution plus the addition of conservation.

A general evaluation of the MAP models serves to reveal several strengths in addition to the above shortcomings. First despite the limited length of the Alaska data series, the resulting equations are adequate by conventional statistical benchmarks, at least for forecasting use. The detailed fiscal and native/non-native/military results, needed for earlier applications, are well developed, but may not be particularly helpful in the current application.

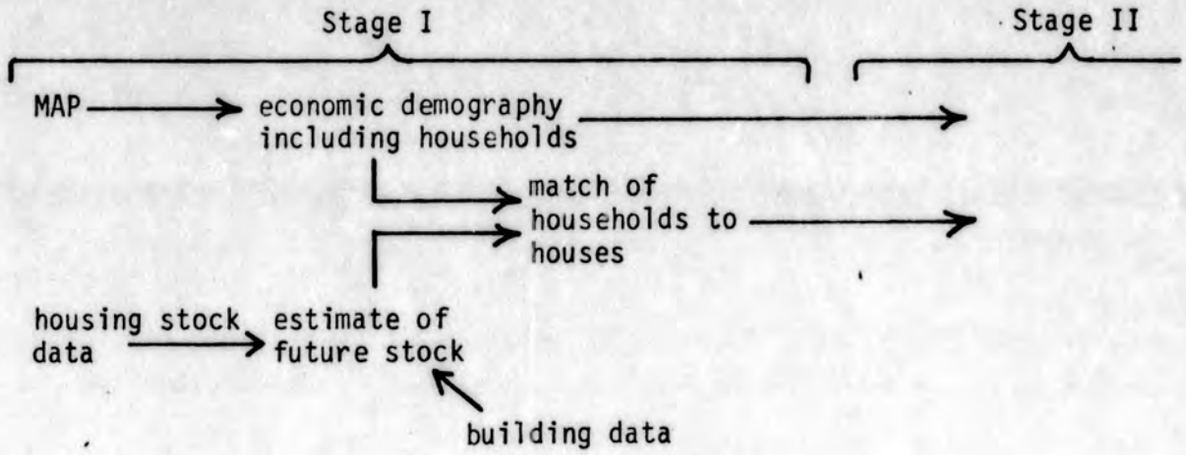
What is needed, more than any other modification, is a housing sub-model. Whether the data can be gathered for such an addition remains to be seen. Lacking a formal housing model, some intermediate step is required based on the housing stock data from the decennial censuses. A brief outline of each alternative is in order.

A full-blown econometric sub model for housing would flow from the following modifications to MAP:

(a) inclusion of household formation equations in the demographic sub-model;
(b) a set of equations for the housing stock (or alternatively changes to that stock) by age and type of unit.

Some of the crucial right hand variables would be from the construction and investment functions of the economic model as well as the household formation results.

If the time series data are lacking for the housing modifications to MAP, then the available census benchmarks - number of dwelling units by age and type - should be combined with recent data on housing starts, mobile home sales, building permits, etc., to update the distribution of the housing stock. This results in the following structure:



6. Conclusions

Energy demand forecasting, the most crucial element of energy policy development, is difficult in the face of growing uncertainties. In order to maintain confidence in forecasting procedures, the analyst is faced with the need to develop what amount to relatively more sophisticated models and forecasts than has traditionally been the case.

Pure econometric and pure end use forecasts suffer inadequacies; hence, a blended approach combining the best elements of each is necessary. This blended EEU approach is difficult because of its data requirements and because modifications must be made to the structure of the underlying econometric and end use models on which it is based.

In the long run, an EEU forecasting system for Alaska can be developed with MAP, suitably modified, at its heart. Its data requirements are not yet attainable in a small region such as Alaska with a short data history. Therefore, in the short term, ad hoc forecasting must be carried out with the outputs of the current version of MAP. These outputs must be obtained by using a very wide range of input scenarios.

The most crucial shortcoming of the current version of MAP is the lack of a housing sector and this must be bridged by some reasonable, if imperfect method of estimating Alaskan housing stock and characteristics in recent years.

7. Footnotes

1. Joan Robinson, "What are the Questions?", Journal of Economic Literature 15, December 1977, p. 1322.
2. These are extremely expensive and sophisticated versions of semi-log paper. See Herman Daly, "Energy Demand Forecasting: Prediction or Planning?", Journal of The American Institute of Planners, January 1976.
3. Robert W. Shaw Jr., "New Factors in Utility Load Forecasting", Public Utilities Fortnightly, July 19, 1979, pp. 19 - 23.
4. Much as Dr. Goldsmith's is a stock/flow approach to accounting for demand.
5. M. A. Fuss, "The Demand for Energy in Canadian Manufacturing: An Example of the Estimation of Production Structures with Many Inputs", Journal of Econometrics 5, January 1977, pp. 89 - 116.
6. B. Jones, D. Manson, J. Mulford, M. Chain, The Estimation of Building Stocks and their Characteristics in Urban Areas, Program in Urban and Regional Studies, Cornell University, 1976.
7. W. Greene, T. Mount, and S. Saltzman, "Forecast of the Demand for Major Fuels in New York State 1980 - 1994", Technical Report, September 4, 1979.
8. S. Caldwell, W. Greene, T. Mount and S. Saltzman, "Forecasting Regional Energy Demand with Linked Macro/Micro Models", Working Paper in Planning #1, Department of City and Regional Planning, Cornell University, January 1979, forthcoming in Papers of the Regional Science Association 45.

A PRELIMINARY EVALUATION

OF

THE I.S.E.R. ELECTRICITY DEMAND FORECAST

(Working Paper #1)

Robert E. Crow
Dr. James H. Mars
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DRAFT

ENERGY CONSERVATION POTENTIAL FOR ALASKA'S RAILBELT

Prepared for

Alaska Center for Policy Studies

Note: This report was sponsored by Power Alternatives Study Committee of the Alaska House of Representatives. The Committee is charged with assessing alternative strategies for meeting demand for power in the Alaska Railbelt.

March 1980
By Mark Baumgartner and
Samuel Skaggs
Produced by the Alaska
Federation for Community
Self-Reliance, Inc.

ALASKA STATE LEGISLATURE
HOUSE OF REPRESENTATIVES
RESEARCH AGENCY

Pouch Y, State Capitol
Juneau, Alaska 99811
(907) 465-3991

MEMORANDUM May 26, 1980

TO: Representative Hugh Malone
Representative Brian Rogers

FROM: Susan Brody (SEB) and Jack Fargnoli (JF)

RE: Fiscal Note--Legislative Oversight of Susitna Hydroelectric Project Feasibility Study (Acres American, Inc.) (Research Request No. 144)

The cost of providing legislative oversight of tasks 1 and 11 of the Susitna Hydroelectric Project feasibility study has been estimated at $135,000, and is depicted on two copies of a fiscal note, attached. This estimate represents the cost of monitoring portions of the Acres American, Inc. study through May of 1981, including the power studies (Task 1), and the study's initial financing feasibility phase (Task 11).

The assumptions upon which the estimated cost is based are as follows:

- Oversight monitoring will be coordinated by the House Research Agency (no additional funding required), including ongoing monitoring of the contractual activities described below.

- A single contractor or several contractors, as necessary, will be engaged by the House Research Agency to assess the progress of the feasibility study at identified benchmark stages (coinciding with completion of specified subtasks). Contractor reports to the Agency, and through it to the Legislature, will assess progress to date, identify any potential problem areas, and discuss the implications of the subtask findings for ensuing stages of the feasibility study.

- Contractor costs will be approximately $500 per day, based on current billing rates estimated at $50-$75 per hour.

Based on these assumptions, and the time period for the study, oversight of the subtasks has been costed out as follows:

Subtask	Activity Involved	Estimated Time (@ $500 per day)
1.01	ISER Power Demand Report	30 days (full-time equiv.)
1.02	Peak Load Forecasting	20
1.03	Power Alternatives	40
1.04	Viable Expansion Sequences	20
1.05	Expansion Sequence Impact Assessment	20
1.06	Power Alternatives Study Report	10
	Subtotal:	140 days ($70,000)
11.03	Alternative Power Sources/ Risk Analysis	40
11.04	Base Plan/Initial Risk Analysis	40
11.07	Tax Exempt Bond Issuance	30[a]
11.08	Parties in Interest	20
11.10	Liason/Bond Underwriters	-0-[b]
	Subtotal:	130 days ($65,000)
	TOTAL:	270 days ($135,000)

[a] Estimate is high due to possible need for specialized bond counsel, at higher hourly/daily rate.

[b] As this subtask is a continuous study activity and results in no monitorable product, costs for its oversight have been subsumed under Subtask II.07.

If we may be of further assistance, or if you would like any additional explanation of these estimates, please don't hesitate to contact us.

SB:JF/dp

Kuilbelt Utilities gross sales - 100m/yr.

Time to do something on the Susitna Dam

By BOB PENNY

compass

points of view from our community

What would you think about having "free" electricity for the rest of your life? Only one-third of the state's surplus income in 1981 would build and pay for the Watana Dam on the Susitna River. This one dam would provide all the electrical energy presently used by 75 percent of our state's population — and do it for the next 100-plus years.

What about an inflation-free investment of state funds? Capital investment by our state, such as roads, buildings, etc. become a liability to the annual budget as their yearly maintenance expense is 6 to 12 percent of the project's original cost. The Susitna project could earn money while providing us all with clean, non-polluting electrical energy.

What better use could we make of our surplus dollars than to provide long-term energy for ourselves? The legislature should consider creating a "Permanent Power Fund" that would provide capital to develop long-term, energy-producing sources of electricity around the state. Income from these energy sources could then be returned to the fund as a payment for the use of that energy by each one of us. What better heritage could we leave for future generations of Alaskans?

The dam feasibility study by the Acres American company won't be complete until April 1, 1982. But in the meantime, as part of its research, why doesn't the legislature appoint a committee to explore:

- What is involved in acquiring title to the sites?
- How best to fund the project — over 10 years?
- What federal and state permits will be needed?
- What impediments are there?

When and if the final decision is made to build the project, all of this preliminary relatively inexpensive research could be done, saving us 18 months of valuable time.

The continual quoting in the media of misleading statements by environmental sources of late dictates some answers.

For example:

"We should have more studies because Watana and Devil's Canyon will be harmful to the fisheries and their habitat." Unmentioned is the fact that no anadromous fish or salmon spawn upstream above the Devil's Canyon site. The river there is almost sterile. The reservoirs would help provide more fish habitat.

Much has been said about the fact that "we should have smaller hydroelectric projects and not a big one like the Susitna Dams," as if smaller is better. Statistics prove that the kilowatt cost for small hydroelectric projects is almost without exception higher than the cost of a single, large efficient source.

The comment that "Devil's Canyon, one of the two massive dams that will be built, is known worldwide as the ultimate white water challenge," is certainly true — only three or four people have ever navigated the river downstream and lived — none have upstream. The river in this portion is classified as non-navigable and has been for 100 years. What a tremendous recreational facility it will be when the reservoirs are complete; they will be a attraction for our state.

The biggest argument we hear against the Susitna Project is that it will produce too much electricity. The statement that "Susitna Dams, when built, will provide enough electricity for the population of 2 million people" is not only misleading, it is a fabrication.

One of the dams will equal the energy requirements of what is needed today by the communities of Fairbanks, Healy, Anchorage, the Mat-Su Valley, Seward, Soldotna, Kenai, and Homer.

It is a safe bet that the energy produced by the second dam, when completed 12 years from now, will be needed then by the population of the area. This clean energy would allow Fairbanks citizens to heat their homes with electricity; make electric automobiles feasible; and do a lot to eliminate their ice fog.

Try to tell the people in Fairbanks, who are relying on coal and oil-fired energy sources, that there will be "too much electricity," while they pay 2½ times as much for residential electricity as do the people within the Anchorage area.

While utilization of wind, solar, and other forms of energy is important, the governor's new $1.2 million "Alternative Energy Study" can only sum up with one conclusion: The basic energy needs for these communities over the long term will be provided by hydroelectric, coal generation, or nuclear power. Period. Take your pick.

The cost for the Susitna is quoted as: Watana Dam, $1.46 billion; Devil's Canyon Dam, $823 million; transmission grid, $306 million; total, $2.588 billion.

Each dam would produce 750 megawatts of power per year. Even though the reservoirs would help clear up the Big Su below the dams, the recreational lake behind the Watana would only lose 6 percent of its reservoir to sedementation in the first 100 years.

Generating electricity by burning natural gas provides Anchorage with 85 percent of its energy; but this method of generating electricity is only a 30 percent effective use of gas. Electrical generation fueled by natural gas in our area is already buring 1½ times the amount of energy that would be provided if both Susitna Dams are constructed. Once the gas is burned, it is gone — and those reserves are being depleted.

Probably the single largest deterrent to early construction of the Susitna Dams is the price of electricity within the Anchorage area. Its cost isn't high enough yet to get our attention — but it is going to be.

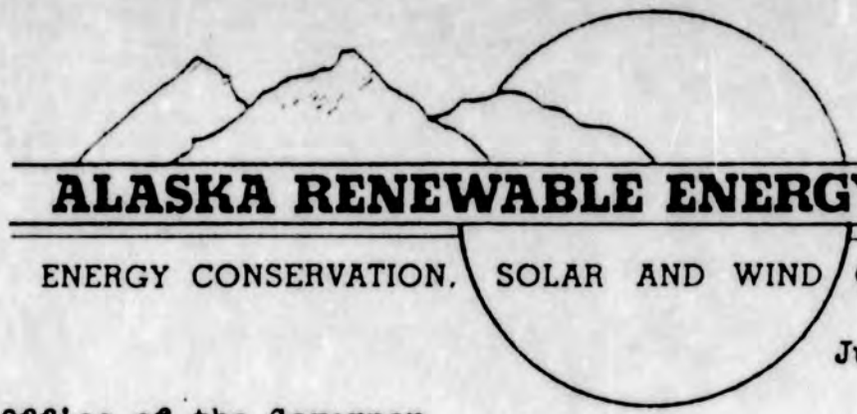
The 23 percent increase recently asked for by Municipal Light and Power is only the first step. The fixed price in the city's contract lapses in January of 1986. It is very probably that the cost for gas-fired electricity in our communities will double, triple, quadruple, or go even higher than what it is today. Even Arlon Tussing, in a report for the state legislature, stated, "...prices for new gas supplied, whether from Cook Inlet or the North Slope, will be at least 10 times as costly as the utilities current supplies."

Just remember, if we start today with a sincere effort to construct Watana Dam, it will be eight years before it is generating electricity. Each year delay will cost consumers in Anchorage millions and millions of dollars more per year for electricity.

How fortunate we are to have the best probably site in our nation for a hydroelectric project. How incredibly fortunate we are to have the surplus funds necessary to build and pay for it. How unfortunate we are that it is not being built.

Bob Penney is the co-chairman of Susitna Power, Now! and president of the Anchorage Chamber of Commerce.

STEVEN B. SMILEY ENERGY CONSULTANT



ALASKA RENEWABLE ENERGY ASSOCIATES

ENERGY CONSERVATION, SOLAR AND WIND CONSULTING SERVICES

July 29, 1980

Office of the Governor
Pouch A
Juneau, AK 99811

Re: Alaska Railbelt Power Alternatives Study

Dear Governor:

I have been following the various electric power supply and demand studies (Goldsmith/Huskey, Tussing, etc.) and feel compelled to express my interest particularly as it relates to the Kenai Peninsula. As a result of my building, economic, and energy related work I have become fairly familiar with the energy supply and demand picture on the peninsula and I feel that up to this point no one has appropriately dealt with this significant part of the railbelt.

The Kenai Peninsula represents an area as much different from Anchorage as Fairbanks. For example:

* Prices vary significantly for energy compared to Anchorage and are recently changing for electricity, bringing about a per capita shift away from electric use.

* Historical use on the Kenai Peninsula is of little value for projecting future growth.

* Significant potential for waste heat utilization and cogeneration exists for existing and new industry.

* Energy conservation and solar potential are high in this region due to population characteristics, a different economic base, higher energy prices as well as recent legislation.

The Peninsula contains about ten percent of the railbelt population and perhaps a much greater percentage of energy demand. Any energy study of the railbelt should have Kenai Peninsula specific data included to ensure consideration of the best options for railbelt energy needs.

(page 1 of 2)

S.R.A. Box 41-C HOMER, ALASKA 99603 (907) 235-7349

I would like to express my interest and willingness to become involved in the studies when you office begins to look seriously at the power alternatives for the railbelt.

Regards,

Steven B. Smiley
S.R.A. Box 41-C
Homer, AK 99603

(907) 235-7349

cc Rep. Hugh Malone
Rep. Brian Rogers

THE NORTHERN LINE

VOLUME II ISSUE III

MAY 1980

"Behind is a forest that goes to the Arctic ...
And here we must draw our line."
-Gary Snyder

The APA and Our Energy Future

The Great Alaska Power Grab

by Jeff Weltzin and John Adams

The Susitna River rises in the glaciated peaks of the Alaska Range and flows south some 275 miles into Cook Inlet, near Anchorage. The upper Susitna basin is home to the most heavily-hunted caribou herd in Alaska and has historically contributed 20% to 25% of the moose harvest in the state. The "Big Su" sustains major commercial and sport fisheries. And Devil's Canyon, where one of the two massive dams may be built, is known world-wide as the ultimate whitewater challenge. Even by Alaskan standards, the Susitna is truly a unique wild river.

But the proposed Susitna hydro-electric project would affect much more than just the river and its resources. It raises some very basic questions: What sort of energy future do Alaskans want? And who will control that future?

The $4.2 to $6 billion Susitna project could lock Alaskans into patterns of power development and consumption which make us more and more dependent on large-scale, centralized production, controlled by big government and bureaucracy.

Locking up Susitna - locking into megapower
Gretchen Walker

Boosters of the Susitna project claim energy consumption in the "railbelt" area of Alaska will increase 4 to 10 times by 1995. They also assume Alaska's population will at least double and per-customer use of electricity will double to triple in the next fifteen years. The Susitna project would generate an average of 6.9 billion kilowatt-hours (kwh) of power annually. This is about three times the power presently needed by railbelt utility consumers. Based on these questionable assumptions, proponents of the project argue that a state-wide network, with Susitna as the first step, must be developed.

A project the size of Susitna could be just the beginning of an energy future for Alaska similar to that of the rest of the U.S.

Washington State is a good case-study. In just 40 years, under the Bonneville Power Administration (BPA), all the major hydro-power sites in that state have been developed. This has seriously depleted what once were the world's most productive fisheries.

The demand is still increasing and the public now faces the grim prospect of large-scale coal and nuclear plants. Why is this?

Believing in the myth of cheap, abundant, clean power. Washingtonians have become the biggest wasters of electricity in the nation. Rather than increase the efficiency of their energy use, they have chosen a path of total-electric, poorly insulated homes and ever-increasing production. If Alaska chooses Susitna hydro, what comes next?

The past decades have seen powerful bureaucracies like BPA and the Tennessee Valley Authority (TVA) control the course of energy development throughout the lower 48.

In 1976, the Legislature created the Alaska Power Authority (APA), to control State involvement in design, financing, construction and operation of the Susitna and other hydro projects.

The APA has recently proposed to connect Anchorage and Fairbanks with high-voltage transmission lines. This would be the first link in the Susitna project.

The APA is also overseeing feasibility studies of Susitna. Many people feel these studies are highly slanted toward a decision to build the project, without real consideration of the alternatives. (See "How to Short-Circuit A Study" - back page.)

Preliminary designs have already been completed for a transmission system connecting the major communities in Southeast Alaska. The next step would be to connect this regional power grid with British Columbia and energy-hungry states in the lower 48. The Railbelt network could also be connected with the Yukon Territory and British Columbia, setting the state for wholesale power export.

cont. on page 9

Poor Ole Alaska

The State of Alaska is embarrassingly wealthy. Decontrol of Prudhoe Bay oil has given the State a projected budget surplus of some $4 billion, this year. Alaska's assets may soon be in the same class as the Federal deficit! One State consultant conservatively forecasts a surplus of $18 billion by 1985. It's no wonder the rest of the world is calling us "the blue-eyed Arabs".

There's a bit of irony in all this. Alaska's runaway affluence is out of keeping with the image the State has tried to cultivate in its campaign against a strong National Interest Lands bill. Somehow the story about the poor, under-developed state being bullied around by the Federal government isn't very convincing anymore.

The State has escalated its propaganda efforts, spending millions of its petro-dollars on Madison Avenue advertising and "the best lobbyists money can buy".

The goal is to convince Congress and people in the lower 48 that protection of the most outstanding remnants of America's natural heritage is a shameful "lock-up". Meanwhile, Alaskan Jaycees are gearing up for a tour of the nation in their gas-guzzling Winnebagos, presumably to prophesy energy disaster unless Alaska's wilderness is open to development.

We hear loud protests from those who claim Alaska is treated like a colony and Alaskans are "second-class citizens". Yet these same people persist in trying to push the North Slope Haul Road open as an unrestricted highway, despite almost unanimous opposition from Alaskan citizens who live north of the Yukon River.

Some complain about "excessive" Federal ownership of land and say the State can manage things better. But they ignore Alaska's generous statehood entitlement of 104 million acres - an area the size of California - which the State is subdividing and selling at the rate of 100,000 acres each year.

The State speaks out against certain Federal offshore oil sales, while quietly pursuing its own very ambitious OCS lease schedule. The State rushed ahead with its sale in the sensitive Beaufort Sea, above the protests of the North Slope Borough and villages. While professing concern for the marine environment, the State opposed the Borough's plan to balance oil development with fish, wildlife and subsistence values in the Beaufort.

The Governor recently met behind closed doors with Big Oil to plot d(2) strategy, undoubtedly with an eye to opening the Arctic Wildlife Range calving grounds of the Porcupine caribou herd to oil development.

The State has joined hands with Anaconda Copper Corporation in a lawsuit to force large-scale mining into several National Monuments. The Alaska Power Authority continues to roll ahead toward State construction of the $4.2 to $6 billion Susitna hydro-project, the most expensive dam project in U.S. history.

The Legislature is laying plans to build an artificial-climate, Teflon-domed city at the base of Mt. McKinley. A major natural gas pipeline is on the horizon. Development is expanding in the State-owned Kuparuk oil field, west of Prudhoe Bay. And there's constant talk of such things as a World's Fair, winter Olympics and a major petro-chemical industry in Alaska.

Poor ole Alaska! It's rough being the richest state in the union.

But sarcasm aside, it's not a question of whether the State or the Feds are the "good guys" or the "bad guys". Things aren't that simple.

To trust one government more than another is to lose sight of the real issues confronting us and to forfeit control of our own future.

We must make our choices issue by issue, based on what we feel is best for Alaska's land, resources and people.

Speaking of our new wealth, State Senator Clem Tillion has said. "It will change the face of Alaska, in time". The difficult question we must answer for ourselves is this: "What do we want Alaska to become?".

John Adams

THE NORTHERN LINE is published by the Fairbanks Environmental Center in cooperation with Students for Friends of the Earth at the University of Alaska at College, Alaska.

The FEC is a non-profit, educational organization dedicated to the preservationof the environment of Arctic and Interior Alaska and the wise management of our natural resources.

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Letters should bear the writer 's signature, but names may be withheld upon request. We reserve the right to edit letters to fit space requirements.

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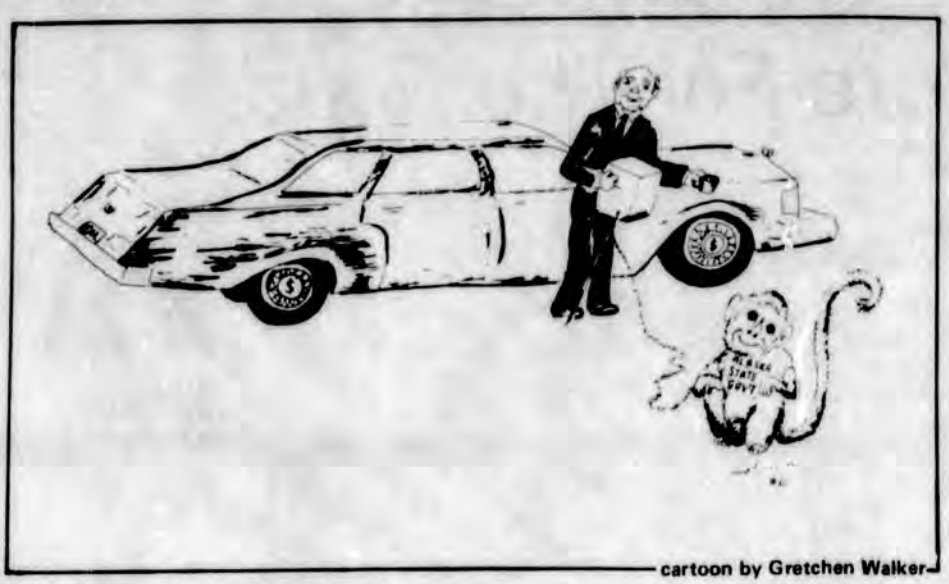


cartoon by Gretchen Walker

Tokositna: Rustic Lodge or Teflon City?

Mt. McKinley National Park has been a major destination for Alaska visitors over the years, beginning with a small, locally-owned concession in the early 20's. The Park was created in 1917, but was seldom visited prior to construction of the Alaska Railroad. Once the railroad was in operation, tourists began arriving, often as a stop on the old Golden Belt tours, which used the Alaska Steamship to Valdez and Seward, then one way to Fairbanks via railroad, return to Valdez by the Richardson Highway bus.

Traveling in Alaska in those early days was an adventure in itself, for the railroad trip took two days, with an overnight stop at the old Curry Hotel, just across Curry Ridge from the Denali State Park. In Mt. McKinley National Park, no facilities existed at the railroad stop, and guests were transported by horse-drawn wagons or buses to a large tent-camp situated at the Savage River, where the public campground is located today.

Gradually facilities were extended out into the Park, first a camp at Igloo where horseback parties could overnight, then eventually a tent-camp with kitchen and dining room at the present site of the Eielson Visitor Center. The road was finally pushed through to Wonder Lake and the Kantishna mining community in 1938.

The trickle of Park visitors of these early days has expanded into a flood, and virtually no trip to Alaska is complete without a stay in the Park. This people-pressure has generated demands for additional tourist facilities and housing, which could be satisfied along the present Park road only at the expense of sacrificing both wildlife habitat (viewing wildlife is a major Park attraction) and scenic integrity in a land largely above treeline.

In response to the need for additional visitor accommodations, Park planners began looking over possible sites south of Mt. McKinley, first choosing one above Byers Lake on Curry Ridge, which commanded a sweeping view of the mountain and its southerly glaciers. This site is now within Denali State Park. Later, Brad Washburn suggested a site looking up the Tokositna Glacier, a spectacular view spot chosen by Sydney Laurence for his famous painting of McKinley. Washburn visualized a hostelry along European lines, with architecture blending into the surroundings, enhancing the wilderness experience of those who used it. Access could be afforded by upgrading the existing Petersville mining road, and adding a few miles to reach the lodge site.

Today, the admirable concept of a southern McKinley visitor enter is lost in swirling controversy over the style and the magitude of development desired. Senator Mike Gravel has interected his own version, described as "Denali Recreational Comunity", a grandiose vision of a world-class downhill ski resort as a focus for a high-density urban complex featuring commercial exhibition and convention centers, a golf and tennis center, and cultural and research institutes.

Since the cold and darkness of the sub-arctic location offer serious limitations to public acceptance of his scheme, Senator Gravel proposed to cover the entire city with a teflon dome, under which the climate would be controlled: buildings would thus require no insulation, the merrymakers could stroll in coatless comfort, and nature would be defeated.

Worse still, the Commission would eliminate the State Division of Parks and Recreation from any jurisdiction over the project, putting all authority in the hands of a group dedicated to promoting it.

As a result, Gravel's choice of contractor to design the project would prevail - he prefers The Architectural Collaborative, Inc., a world-wide firm with headquarters in Kuwait and Massachusetts, which specialized in designing luxury hotels for Arab billionaires.

Such pipedreams can be forgiven, especially during an election year, but this fantasy has mesmerized the lawmakers convened in Juneau, and is about to be immortalized in legislation - SB 481 and SB 482 passed the Senate with only one dissenting vote (and no debate) and are headed through the House Committees.

SB 481 creates a "Denali Recreation Community Commission" of five people, to direct studies and development of Gravel's proposal. Included among the commissioners would be (1) member of Alaska's Congressional delegation; (1) representative of the Alaska Visitor's Association (Gravel's campaign manager, Bill Sheffield, is currently director of AVA); (1) representative of the State Dept. of Commerce and Economic Development, and two unassigned positions.

. . .this fantasy has mesmerized the lawmakers convened in Juneau, and is about to be immortalized in legislation . . .

The mandate for this Commission is to study the "economic feasibility" of the proposed cluster of centers for the "Denali Recreational Community" - no questions raised concerning environmental impacts or the suitability of this type of development in this wilderness setting. SB 482 would appropriate $1 million to fund the Commission's work.

In ordinary times, a wild and irresponsible proposal on this scale would be no threat, simply because Alaska couldn't afford it. In these days, with legislators euphoric under the spell of windfall oil riches, fiscal responsibility can't be depended upon. It can happen here. Alaskans need to take the threat seriously, and make sure their legislators know how they feel.

One More For The Road!

Once again, Interior Alaskans have turned out in numbers to voice their opposition to opening the North Slope Haul Road to unrestricted traffic. In mid-April, at a teleconference hearing held in Fairbanks by the House Commerce Committee, the majority of those who testified spoke against opening the road.

The Committee was considering two bills. House Bill 552 would immediately open the road as a public highway all the way to Deitrich Camp in the Brooks Range, during the summer months. HB 965 would open the road to Coldfoot, (about 35 miles south of Dietrich), five years after completion of the Alaska natural gas pipeline. This bill would also prohibit State land disposals, off-road vehicles (except for access to mining claims) and hunting (except for subsistence) within ten miles either side of the road. HB 965 would also establish a special Commission which would conduct a review of the impacts of opening the Haul Road and make recommendations to the Legislature.

Supporters of HB 552 were allowed to testify first. William Woods, Mayor of Fairbanks and Executive Vice-President of the Fairbanks Development Corporation, claimed to represent "more than three-fifths of the voters in the area". He opposed HB 965, supported opening the road immediately and said he wants no restrictions whatsoever.

Tom Owen of the Fairbanks Chamber of Commerce spoke in favor of opening the Haul Road. He said the Chamber strongly opposes HB 965 and supports HB 552, although they feel there should be no seasonal restrictions on travel. Owen reminded the Committee of official Chamber resolutions to this effect which had already been submitted.

In testimony for the Fairbanks Environmental Center, Executive Director John Adams supported HB 965, but suggested some specific amendments. "It is our feeling that making a determination to open the road to any point whether Coldfoot or Deitrich or Prudhoe - is premature until the Commission (established in HB 965) has made its recommendations to the Legislature," said Adams. "We support the Commission idea, but feel the scope of its job must be broadened.

Rather than evaluate the effects of a pre-determined opening to Coldfoot, the Commission should fully investigate all options for management of the Haul Road and the social, economic, cultural and environmental costs of each", Adams said. He suggested that in the meantime the road remain open to industrial travel.

Adams also suggested the Legislature seriously consider the option of charging tolls on the road. "Tolls would remove the cost of maintaining the Haul Road from taxpayers and place it squarely on the shoulders of those who use the road", Adams said. "We could still allow for public use by tour buses, while minimizing the adverse effects".

Adams testified in support of a ban on all hunting in a zone five miles either side of the road. "The attempt to define subsistence (in HB 965) is well beyond the scope of Haul Road legislation", said Adams. " Native groups and local villages have publicly supported a blanket ban on hunting in the corridor".

Adams continued, "We view off-road vehicles as one of the most crucial points of the Haul Road issue. In order to minimize damage to the land and reduce pressure on hunting, fishing and trapping areas which are vital to villages in the region, a ban on recreational ORV's is absolutely essential".

cont. on page 8

drawing by Ingrid Lustig

Alaska Conservation Abstracts

BY FLORENCE COLLINS

"Possibly the most widely held fear of the Inupiat (Eskimos) toward Arctic oil and gas development is the slow 'destruction through insignificant increments' of Arctic wildlife habitat: cumulative impact." Previous environmental studies have dealt with catastrophic or single events and changes, but much wildlife "cannot cope effectively with long-term displacement."

"The relationship of the species with their environment---and the delicate timing involving ice movements, weather, nesting, moulting, calving, feeding, and migrating---have been balanced genetically over thousands of years and cannot be suddenly unlearned. Many wildlife species are endangered because of the fact that, genetically, 'they have nowhere else to go' ".

"Also ignored has been the cumulative impact of 'industrial presence', which includes the chronic pollution of the environment through industrial discharge, small continuous oil spills from equipment and fuel transfer, and industrial air and noise pollution."

The Army Corps of Engineers plans to use the Prudhoe Bay waterflood project as a benchmark to calculate cumulative habitat impact from oil and gas operations on the Arctic Coast; this will be difficult, however, because original habitat values have not been quantified. Arctic Coastal Management Newsletter, April, 1980, p. 13.

GLACIER BAY HUMPBACK WHALES may be affected more by pleasure boats than by cruise ships; boat noises may disorient the whales in the rocky fjord, according to the National Marine Fisheries Service. Alaska Magazine, March 1980, p. A14.

Fourteen EXPLORATORY WELLS for oil and gas were drilled in Alaska in 1979, ten onshore and four offshore; all were dry. Alaska Construction and Oil, February, 1980, p. 38.

HAZE OVER THE ARCTIC OCEAN in recent springs is probably air pollution from Russia and Europe. Alaska Magazine, March 1980, p. 83.

BIRCH CREEK RAPIDS – Muddied water can be a direct result of placer mining, making river travel more difficult because of hidden rocks.

photo courtesy of BLM

(EDITOR'S NOTE: In the April edition of THE NORTHERN LINE, The Birch Creek Experience, Part I, was published. It addressed the water quality problems created by placer mining on Birch Creek. In Part II, we will learn the answers to questions such as who controls stream quality? aren't certain protections afforded a candidate wild river? and what rights do placer miners have?)

The Birch Creek Experience, Part II

ORV's Tear Up Proposed Wild River

by Steve Cook

Since Birch Creek has a long history of mining activity (since 1893), don't miners have "grandfather" rights to continue mining in the same manner as before? It appears the answer is no.

Public Law 92-500, the Federal Pollution Control Act Amendments of 1972, has set the standards by which to judge placer mining discharge. The intent is not only to stop new pollution but also to reduce existing pollution.

The Bureau of Land Management (the agency having jurisdiction over Birch Creek) has not demonstrated a willingness to take the lead in controversial matters of this type in the past, and is unlikely to do so here. This very lack of enlightened management by a multiple-use agency is contrary to its mission. By failing to monitor and reasonably control the placer mining activities within its jurisdiction, it appears BLM has become essentially a single-use agency - at least within the Birch Creek drainage.

The proposed wild river status requires BLM to manage the area in such a way that the river corridor is not impaired or degraded. Since the withdrawal is essentially to maintain the wild character of the river and adjacent lands, it would seem that random cross-country dozer travel and widespread ORV use (including four-wheel drive vehicles traveling the banks of Birch Creek) are degrading the resource.

These violations are well documented, yet they've been ignored. Emergency ORV closures, requiring permits for off-road travel, have been proposed but have gone nowhere. Surface mining regulations have been drawn up several times but have never been approved at the Washington D.C. level due to political pressure.

Of all the agencies involved in water quality, the Alaska Department of Environmental Conservation (ADEC) is the one with the most direct mandate to monitor and decide on applicable standards for placer mining. Except for very few instances, the State of Alaska owns the streambed of all navigable waters up to the normal, high water mark. Navigable used here is in the broadest definition, probably anything that will float a canoe.

The water quality standards set by ADEC are even used by EPA on permits issued for water discharge into streams. The permits presently state that the water discharge from a placer mine must meet Alaska state standards for water quality.

Eventually ADEC will probably take over issuance of these permits, as has been done in other states. There is a possibility, as with BLM, that if ADEC proves itself incapable of administering a viable water quality program, EPA will step in and enforce the federal laws on a much stricter basis. And the miners will be the big losers.

Recreational use of streams has increased phenominally, and based upon public interest, is a valid non-consumptive use of a resource. We are no longer living in times when a single resource use like placer mining can wash entire mountains away with no consideration given to its effect on other aspects of the natural environment.

Many placer miners are beginning to recognize this fact and are willing to comply with reasonable environmental regulations. But they need direction and guidance from ADEC. If ADEC lets the miners down, we may see ourselves with a situation similar to California, where surface mining permits state "the direct discharge of wastes to surface waters or surface water drainage courses is prohibited".

Historically, California and Alaska have experienced many parallel developments, with California being fifty years ahead of Alaska. Placer mining can have a place in Alaska's future, if approached from a multiple use point of view and not demanding to be the only valid use of streams.

There are few clear water streams in Alaska which are readily accessible for recreation or placer mining. On some sections of Birch Creek and the Fortymile perhaps the emphasis should be placed on placer mining, calling for a lower water quality standard, while in other areas like the Chena, Salcha and Chatanika river basins the emphasis should be placed on recreation, with a higher water quality standard applied.

The management and regulatory agencies need input from miners, fishermen, hunters, floaters and other interested parties to decide which stream use to emphasize in a given area.

The Kitchen Sink

Trash and Treasure Sale

The FEC will be sponsoring a Trash and Treasure Sale on Saturday, June 14, from 10 am to 6 pm at the Center, 218 Driveway. All members are encouraged to bring their used items to recycle at our yard sale. Clothing should be clean, sized and on hangers (if needed). Suggested pricing will be appreciated on all items. If you would like to donate, drop your items by the Center beginning June 2nd, or call 452-5021 to have someone pick them up. Any larger items such as TV's, recreational items, furniture, etc. will bring the most to the Center, so please give generously.

If you do have an item you would like to donate, and you know it will bring prospective buyers, please let us know by late May so we can include these items in our advertising.

Retrofitting the Center

A committee was formed at the Annual meeting to retrofit the Center. This committee intends to paint the house and trim, rebuild and paint the fence, landscape the yard and plant a vegie garden, insulate the roof and basement, paint the inside walls, tear up the carpet and sand and varnish the beautiful wood floor underneath, build some stationary shelves in the library and fix our small plumbing problems.

Are you interested in volunteering some time? We need plumbers, electricians and carpenters! You don't have to be a professional. . . .just call Cindy at 452-5021 to show your interest and talent!

We Need New Sign

The Center needs an artist to make us a new FEC sign to hang on our humble abode. If you have an interest in redesigning our nameplate, please contact Cindy.

Typesetting, Anyone?

Interested in learning the ropes of putting together a newsletter? Or if you already know the ropes, elevating it to the pinnacles of perfection?

We need a typesetter! If you are a very good to excellent typist and want to learn how to use a composer (typesetting machine), give us a call and try it out. It's a handy skill!

FEC Annual Meeting Held

Kowalsky Honored/Committees Set

The FEC's 1980 Annual Meeting and Earth Day activities were highlighted by an award given to Jim Kowalsky for Conservationist of the Decade. Jim was honored with a short presentation by Celia Hunter, and several tokens of appreciation from the Center. Jim was one of the founders of the Center in 1971, and worked as its Director for most of the 70's. He was also the Alaska Representative for Friends of the Earth from 1971 - 1978.

The annual meeting culminated the Earth Day '80 activities sponsored by the Center and the Student Senate at the University of Alaska, Fairbanks. Activities included an Environmental Film Festival and exhibits from different environmentally concerned organizations and agencies. Hundreds of people filed through the exhibits and attended the films.

Over 50 FEC members attended the annual meeting held at Souvlaki's restaurant in downtown Fairbanks. A thirteen member board of directors was elected.

Molly McCammon received the Conservationist of the Year Award and Glynn Hoener received the Volunteer of the Year Award.

The main discussion of the evening centered on the FEC committees. Several new committees were set up, and established committees discussed. If you would like to serve on one of the following committees, please call Cindy at the Center, 452-5021.

There have been rumors around town that a little greenery placed in strategic places would go far to make Fairbanks a more beautiful place. The GREENING OF FAIRBANKS COMMITTEE is committed to encouraging the City to plant trees and shrubs downtown.

Wolverines, foxes, walrus, voles, wolves, mountain goats. . . . .all these and more in our WILDLIFE COMMITTEE.

Have a special yearning for the bright lights of media? Well, then join our OUTREACH COMMITTEE! You too can bring the FEC into the limelight, let all those secret sympathizers out there know about the Center's activities and philosophy and bring them into the fold.

If you're an alternative energy aficionado, then the ENERGY COMMITTEE is

If you're an alternative energy aficionado, then the ENERGY COMMITTEE is land of a thousand dreams. Exploring energy alternatives for Alaska and keeping abreast of energy bills in the Legislature are the committee's two priorities.

Because of the complexities of FEC's three top priority issues, the HAUL ROAD, the SUSITNA HYDRO-PROJECT and STATE LAND DISPOSALS, special committees were set up to do research, send direct mailings and assist in any way possible. If any of these three issues especially concern you, join its committee!

If grassroots fund-raising, organizing events like the Shrimp & Crab Feed and our upcoming Trash & Treasure Sale, and even grant-writing are your cup of tea, then join the FUND-RAISING COMMITTEE. The FEC needs you!

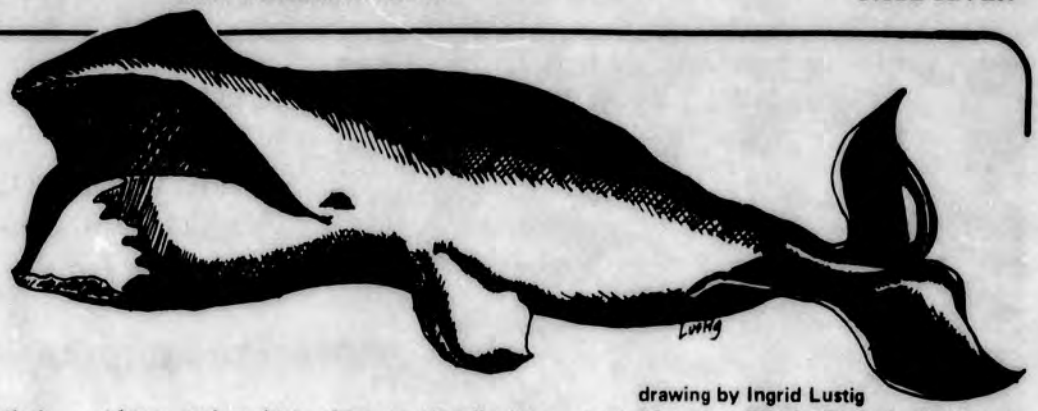
The FEC would like to thank and extend our congratulations to Jim Kowalsky, Molly McCammon and Glynn Hoener for all the work they have put into keeping Alaska alive and well.

suit of clothing? During the winter there were a few heat leaks and a good padding of insulation would do the trick. Work on the CENTER RETROFITTING COMMITTEE and you can also mend the fence, work in the garden, paint the inside of the Center and indulge in a veritable cornucopia of repairing and carpentry.

Calendar of Events

May 27	Public hearing on State Power Development Plan, Alaska Court Building, 303 K Street, Anchorage, at 7 PM.
May 28	Public hearing on State Power Development Plan, Alaska Court Building, North Star Borough, Fairbanks, at 7 PM.
June 5	Public hearing on South Fairbanks Expressway, Ryan Jr. High School in Multi-purpose Room, at 7:30 PM.
June 14	Trash & Treasure Sale at the FEC, 218 Driveway, Fairbanks. Lemonade and lots of items! Great prices! Stop by and bring your family. 10am - 6pm.
June 17	Deadline for comments on Draft Environmental Impact Statement on Int'l Caribou Treaty (available from U.S. Fish & Wildlife Service or the FEC).
June 19	THE NORTHERN LINE newsletter deadline.

OCS Schedule Draws Fire



drawing by Ingrid Lustig

The Interior Department has unveiled its new schedule for oil and gas leasing on the Outer Continental Shelf (OCS). Under the plan, 36 OCS areas around the nation will be leased, by 1985.

Ten of the offerings will be in Alaska (see map). Eight of these ten sales will be in frontier areas which have never before been leased. The plan has been severely criticized by environmentalists and several states, including Alaska.

In the Alaskan areas, severe storms, sea ice and earthquakes present serious hazards, greatly increasing the chance of accidents and making clean-up vitually impossible in the event of well blowouts or other spills.

These areas also sustain large numbers of marine mammals, fish and birds, including endangered species. Many Alaskans depend on these resources for their cash income and subsistence. Scientific knowledge of most of the Alaskan areas is incomplete and technology for contending with the hazards is unproven.

For these reasons, the FEC and other environmental groups urged ommission of the Chukchi Sea, St. George Basin, Navarin Basin, Norton Basin and Northern Aleutian Shelf (Bristol Bay) sales from the schedule. The State of Alaska also requested indefinite postponement of the North Aleutian, St. George Basin and Chukchi sales.

But the OCS schedule has been approved by President Carter and passed on to Congress for final approval. The State of California is preparing a lawsuit to challenge the plan and national environmental groups are also investigating legal options.

Meanwhile, Alaskan environmentalists are gearing up for a long series of struggles around Alaska's entire coast.

OCS Lease Areas and Dates of Sales

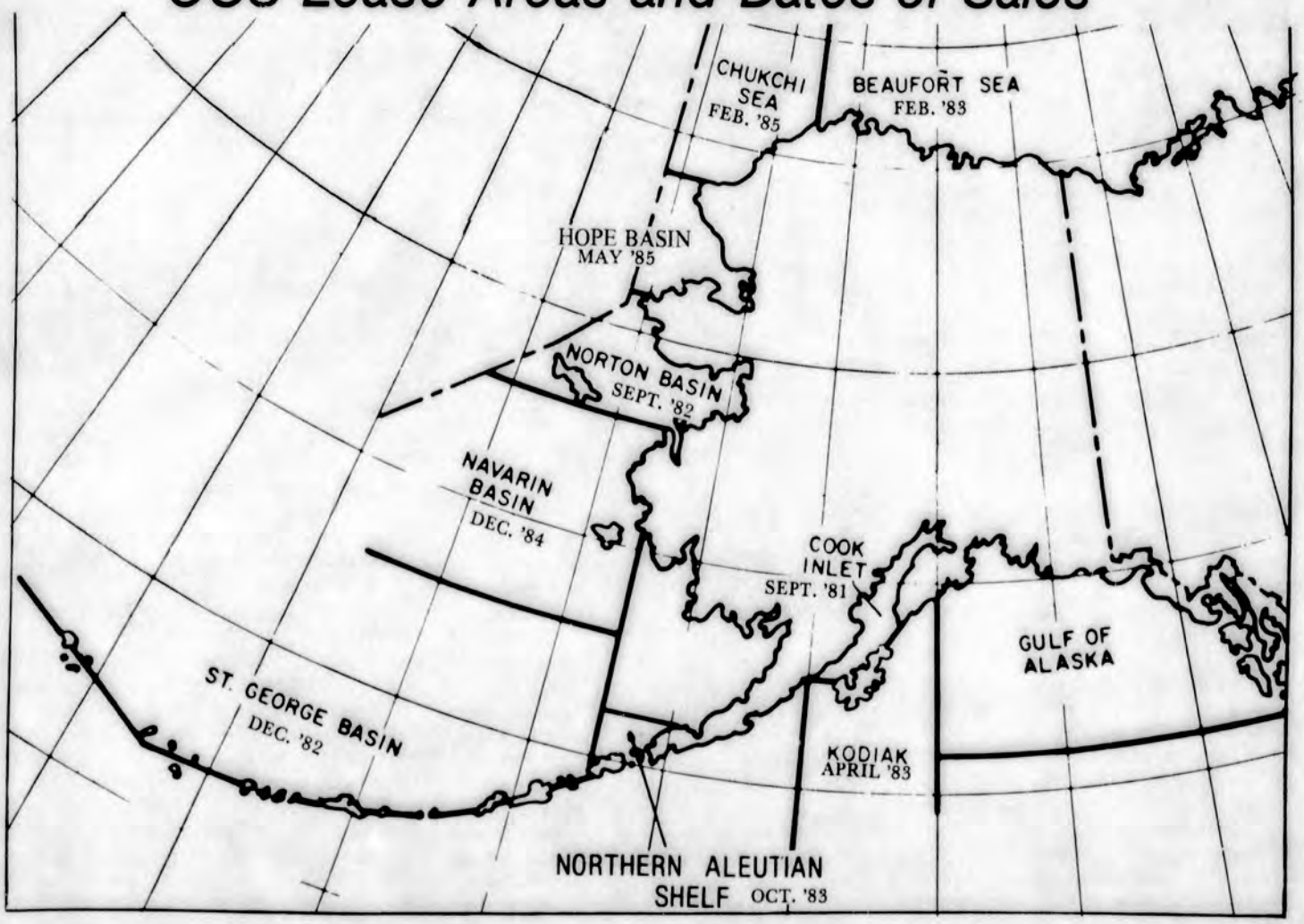


photo by John Adams

Give your approval to all you
cannot understand.
Praise ignorance, for what man
has not encountered
he has not destroyed.
Ask the questions that have
no answers.
Invest in the millennium.

---Wendell Berry

State Lands Bills Stalled

Two bills currently pending in the Legislature would make several major changes to the State land disposal program.

House Bill 946 would, among other things, repeal the 100,000-acre annual disposal quota, include agricultural land in the "land bank", limit the density of parcels in remote disposal areas and reinstate local government planning and zoning authority.

HB 855 would establish local citizen advisory committees to make recommendations on land disposals to the Department of Natural Resources.

The Fairbanks Environmental Center is supporting both these bills. In recent comments to the House Resources Committee, the FEC stated, "The 100,000 acre disposal quota. . .has been the root of many problems."

"This arbitrary figure has no relation to the real need for land. With such a large amount of land to be disposed of each year, the Division of Lands simply cannot perform adequate planning and public involvement. In our opinion, repeal of the quota is the most significant and positive feature of HB 946".

The FEC has frequently spoken out concerning the need for more localized decision-making on land disposals. Last December, the Center sponsored a meeting of Interior Citizen leaders to discuss the disposal program and its problems.

One of the recommendations from that meeting called for local advisory committees to be established.

Although HB 946 and 855 have received the support of Native groups and municipalities, these bills appear to be stalled in committee. Alaskans should let their legislators know their feelings about these bills before this session ends.

One More . . .

cont. from page 4

Concluding the Center's comments, Adams said, "I would like to reiterate our support of HB 965, but emphasize our opposition to any measure which would open the Haul Road even partially before a full evaluation of management options is completed".

Gretchen Walker, President of the Center, pointed out the problems with unrestricted traffic and caribou movement. Fred Brown, Chairman of the Commerce Committee, responded by discussing his early experiences in McKinley Park. Brown said he didn't think their car bothered the abundant caribou herd.

Ms. Walker pointed out the herd he referred to is now on the verge of extinction.

Eddie Bergman, a Native Alaskan from Allakaket, expressed his concern about increased hunting and fishing pressure.

Spud Williams, President of the Tanana Chiefs Conference, supported Bergman's testimony and went on record opposing any opening of the road.

However, Williams said a compromise was reflected in HB 965.

Williams also explained that the State does not recognize the present need for money to improve airports and roads in the rural areas, and that money spent on the Haul Road would probably be interpreted as being spent on rural Alaskans, even though they don't want the road opened.

Throughout the 3-hour hearing, people pointed to the effects on fish and game, hazards to public safety, opposition of local residents and waste of fuel as reasons not to open the Haul Road.

The need for control of hunting and off-road vehicles in the Corridor was repeatedly emphasized.

Despite this strong public input to the contrary, several days later the Commerce Committee passed HB 552. That bill has moved on to the House Finance Committee.

Non-Game Program On Horizon

by Marilyn Sigman

"Nongame" has not exactly become a common household word this year, but it is on its way to a place in the management scheme of the Alaska Department of Fish and, uh,. . . .Game. For those who came in late, "game" legally, in the State of Alaska, includes all animals except those currently domesticated.

Thus, the escaped pheasant or feral ferret are legally game animals, as well as the MacNeil River bear and the gray-crowned rosy finch. The term "nongame" has been coined to describe those wild vertebrate species (birds, mammals and amphibians) not traditionally harvested by humans, many of which are valued for ecological or aesthetic reasons.

Game management has been traditionally funded by the fees and special excise taxes paid by hunters, trappers and fishermen. The so-called nongame species, some 90% of all fish and wildlife species, often receive little management attention unless they are endangered. The major emphasis of nongame legislation has been to provide an alternate source of funds for the management of nongame species especially to make more funds available to the state agencies to provide opportunities for the public to observe, photograph, or study wild animals and to learn about natural history.

drawing by Gretchen Walker

A bill which would fund conservation planning for nongame passed the U.S. House in July, 1979. A similar bill which would fund planning and implementation of projects was, at last report, still in the Senate Environment and Public Works Committee.

Meanwhile, local legislators have worked to appropriate general fund monies for three nongame positions within ADFG. These positions appear in the House version of the budget, but not in the Senate version.

The outcome of the free conference committee hearings will determine whether this year will see the beginning of a nongame program.

Right now, support is needed to get the Senate bill (S 2181) moving. Please write Senator Gravel, who supported the bill in subcommittee hearings, to voice your support and urge its passage.

As for the state legislature, there's always another session and game management is likely to continue to receive a lot of attention.

An Alaskan nongame management program still has several legislative hurdles to clear, but it appears within the realm of possibility.

Another 4-Lane For Fairbanks?

The Department of Transportation recently released a draft Environmental Impact Statement on the proposed four-lane highway through south Fairbanks.

The proposed highway would connect the Parks highway to the Richardson highway. Alternatives being considered include: doing nothing; constructing one of four routes being considered; postponement; phase development, and development of other modes of transportation.

Two issues which have generated controversy are air quality and strip development along the proposed route.

A public hearing for this project is scheduled for June 5, at 7:30 PM in Ryan Jr. High School, Multi-purpose room.

Written comments should be sent to: Alaska Department of Transportation, 2301 Peger Road, Fairbanks, AK 99701, by July 7, 1980.

A copy of the draft EIS is available for review at the Center.

Power Grab . . .

cont. from page 1

This could lead to damming more major rivers such as the Stiking, the Copper and Yukon to ship power Outside. Besides the obvious environmental losses, this would make most Alaskans dependent on a centralized, "master-circuit" controlled by a single government agency - the Alaska Power Authority.

Underlying this energy future is the worn-out assumption that we must have ever-increasing energy consumption to have a rising standard of living. This assumption is at the root of our present national energy problems. We Alaskans pride ourselves on our independence and doing things differently. Do we really want to repeat the same old mistakes?

Most Alaskans want to see more efficient use of electricity. But they also know that we now use oil and gas for 85% of our electrical generation. Clearly, we've got to find a way to kick this expensive habit. Hydro power can play a major role in a transition to an energy future based on renewable resources.

Construction of smaller-scale local and regional projects would make Alaskan communities more self-sufficient and encourage more efficient energy use.

Regional hydro projects cost less, are less environmentally destructive and can be brought on line quickly. We could build these projects to fit our real needs, rather than building enormous projects to fit inflated projections. A real commitment to making our homes and buildings more efficient would go a long way toward keeping our consumption at reasonable levels.

Since 1975, Fairbanksans have shown individual conservation efforts can dramatically reduce energy use. For the last four years, the per-customer rate of consumption at the State's second largest utility, Golden Valley Electric Association (GVEA), has decreased by an average of 12% a year.

As a result, GVEA used less than 40% of its installed generating capacity in 1979. This has eliminated the need for new generating capacity until sometime after 1990.

In the same period, the number of insulation businesses in Fairbanks has dramatically increased. Alaskans are learning a kilowatt-hour saved is as useful and cheaper than a kilowatt-hour produced.

We have a choice. We can assume rapid growth in Alaska's population and consumption, build on Susitna hydro and put our energy future in the hands of the APA. If we choose this path, it could lead to damming most of our major rivers and eventually to large-scale coal and nuclear power plants.

We could also choose a path based on smaller-scale, decentralized hydro projects, generation from waste-heat and other locally appropriate technologies and increased efficiency. This path could lead to a future where our major rivers still run free and Alaskans continue to enjoy lifestyles of self-sufficiency and independence.

The Acres Plan

How To Short-Circuit A Study

Last year, the Alaska Power Authority (APA) hired Acres American, a New York based engineering firm, to conduct feasibility studies of the proposed Susitna River hydro-electric project. Since then, the APA has repeatedly assured the Alaskan public that the Acres studies will take an in-depth look at the many economic and environmental questions surrounding the Susitna project and seriously consider all possible alternatives.

But an independent consultant hired by the State Legislature disagrees. In a recently released report, ("Susitna Hydro-Power: A Review of the Issues"), economist Arlon R. Tussing strongly criticizes the Acres plan of study. Tussing points out fundamental biases and numerous inadequacies which confirm what environmentalists and others have suspected all along: The Acres plan virtually guarantees a decision to build the Susitna project.

The Tussing report concludes that: "The substance and sequence of work tasks. . .strongly imply that Acres and possibly the Power Authority have already decided. . .that the project should go ahead."

Evaluation of the real need for Susitna power and possible alternative power sources will only be given lip service. The 2½-year study schedule is designed in a way that precludes serious evaluation of these crucial questions.

Most of the $30 million Acres budget will be spent on detailed technical and engineering studies of the Susitna project. Only about 1% of the total will be spent on electrical demand and alternative studies.

The real decision on whether to build the Susitna project will be based on incomplete information. At the heart of the Acres plan is a "Go - No Go" decision to be made early next year. Officially the Power Authority says this will only be a decision on whether to proceed with the studies. But Eric Yould, Executive Director of the APA, has publicly said that this decision will in fact be interpreted as the final decision on whether to proceed with the project, (Anchorage Daily News, "Dambackers speak out").

A "Go" decision at this point will guarantee increased political momentum to fund construction of the Susitna project, before the studies are even half-completed.

Almost all the studies after the "Go - No Go" decision will be geared toward meeting the requirements of a Federal license needed to build Susitna. Yet this decision will be made before the environmental and economic studies are complete. Clearly, the real purpose of the Acres studies is to get a license to build the Susitna project.

The 90-page Tussing report highlights many other problems in the Acres/APA plan and makes specific recommendations for revising the studies. Most significant is the recommendation that an additional $1.2 million be spent for expanded studies of electrical demand and alternative energy sources. This must be done before a rational decision can be made about the Susitna project.

Based on Tussing's findings, the FEC is urging the "Go - No Go" decision be rescheduled for June 1982. An earlier decision would be based on incomplete information and could commit Alaska to the Susitna project without a full evaluation of the real need, environmental impacts and alternatives.

The Center also supports continued oversight of the studies by the House Power Alternatives Study Committee. This committee, which contracted the Tussing report, serves as an independent perspective to balance that of Acres and the APA.

The Susitna studies are really a "de-facto" energy policy. The choice we make now will largely shape the energy future of Alaska. It is essential to base our choice on a thorough, objective evaluation of all possible energy futures, not on a pre-determined decision to build the Susitna project.

Chena Rec Area Endangered

The authority of the Alaska Division of Parks to regulate off-road vehicle use within the Chena River Recreation Area would be severely limited by two bills which have passed the Senate.

SB 537 would forbid Parks to restrict or prohibit the use of any motorized vehicles, either on or off-trail, within 5,200 acres between Colorado Creek and Four Mile Creek.

A more general bill, SB 536 would forbid regulations prohibiting or restricting traditional use, including motorized use, of roads and trails which existed before an area was established as a state recreation area.

If this legislation becomes law, it could not only open up the Chena River Recreation Area to serious environmental degradation, but also could make it difficult if not impossible to zone for mechanized and non-mechanized use.

Closing out future use options in this manner would be inadvisable in light of an active master planning effort presently ongoing for this area.

SB 536 defines traditional use as one which occurred regularly before establishment of the recreation area. However experience has shown the Division of Parks that ambiguous terms like "regular use" and "occurring regularly" will be interpreted in an all-too-liberal way by off-road vehicle advocates.

Under SB 536, even the most obscure remnant of a trail could in reality be open to motorized vehicle use.

Gretchen Walker

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energy & society

Editors: GEORGE H. DANIELS and MARK H. ROSE, *both of the University Program in Science, Technology, and Society, Michigan Technological University*

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energy & society

ABOUT THE EDITORS

GEORGE H. DANIELS, Jr. is Associate Professor of Science, Technology, and Society at Michigan Technological University. Former Director of the Center for the Interdisciplinary Study of Science and Technology, Northwestern University, he is editor of two books, **Darwinism Comes to America,** and **Nineteenth Century American Science: A Reappraisal.** He is author of **American Science in the Age of Jackson** and **Science in American Society: A Social History.** Professor Daniels is currently working on **U.S.A. 1981: Essays Toward an Understanding of the Present,** and **Science and Technology: An Externalist's View,** a book of essays developing a theoretical approach to the history of science and technology, and a rationale for their social control. He received his Ph.D. in History from the University of Iowa.

MARK H. ROSE is Associate Professor of Technology, Science, and Society at Michigan Technological University. The current editor of *Energy History Report* (a publication of the U.S. Department of Energy), he has done extensive research on urban energy, and on energy choices and the economic and social patterns of five U.S. cities. He is the author of **Interstate: Express Highway Politics, 1941-1956,** and of a number of articles dealing with urban producers and users of light, heat and power; highway politics; and America's first energy crisis. He received his Ph.D. in History from The Ohio State University.

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A B C D E F G H J M

JOBS:

How Many, What Kind, For Whom?

When a new shopping center is proposed or an industry plans to relocate in your area, it is usually promoted by "pro-growth" advocates as being good for the community because it will boost the local economy by supplying more jobs. But developers are often reluctant to say that those new jobs will be taken by outside professionals transferred from other branches of the company; rather than providing jobs for local residents they may just be promoting undesirable expansion.

The number of jobs to be created directly by the project and other information can be obtained from the project's promoters. Secondary sources include the Censuses of Manufacturing, Retail Trade and Population, Bureau of Census and other Department of Commerce publications. The Department of Labor publishes employment data with industry and county breakdowns.

Similar publications might be available from state and local government agencies, trade associations, labor unions and the Chamber of Commerce. Local government planning documents usually are supported by statistical compendiums, and local colleges or universities often have studies with unique local data which can be used for the Employment Impact Statement (EmIS).

Do not overlook the importance of "hunch" estimates, so long as there is logic behind them. The fancy "models" used by economists are nothing more than hunch anyway, although they are dressed up in language and symbols designed to make us think they must be scientific because we don't understand them. Some answers will have to be judgmental by their natures. The important thing is to be consistent in reason and method.

The sample questionnaire presented here goes beyond assessing a project by the number of jobs created; it addresses the qualitative aspects of employment as well. Consequently, the EmIS does not have a built-in judgment about what sorts of impacts are "good."

Some projects or programs, for example, might produce more jobs than others—a quantitative measurement—but may be unacceptable on qualitative grounds. Evaluation of EmIS findings is a matter for local debate based on local values and objectives. The purpose of the EmIS is to provide a consistent and meaningful informational basis for discussion and for rational choosing among options.

Avrom Bendavid-Val

RESOURCES

Several publications of the Center for Advanced Computation, University of Illinois, Urbana, Il. 61801, provide interesting data on the shifts in numbers and kinds of employment as well as energy use resulting from reallocation of funds from one kind of priority, such as highway construction, to other uses:

"Job Impacts of Alternatives to Corps of Engineers Projects" by Hannon and Brezdek, ENGINEERING ISSUES, Oct. 1973, pp. 521-31, American Society of Civil Engineers, 345 E. 47th Street, New York, NY 10017.
Shows that transfer of funds from ACE projects to national health insurance, social security payments, mass transit development, construction of sewage plants or general tax relief would provide significant increases in employment, and shows that specific Corps projects may not even benefit nearby local communities.

"Options for Energy Conservation," Bruce Hannon, TECHNOLOGY REVIEW, February 1974.
Provides information on energy and employment intensity per dollar of product for many industries, for different food products providing equal protein and for household expenditures.

Also:

MANPOWER REQUIREMENTS FOR NUCLEAR AND COAL POWER PLANTS, free from CRITICAL MASS, 133 C Street S.E., Washington, DC 20003.
Comparison of employment impacts over the lifetime of alternative processes for producing an identical product indicate that coal power will result in 40% more employment than nuclear power, while costing less.

The higher costs to a community resulting from any kind of economic growth is described in several publications:

"Santa Barbara—The Impacts of Growth," reprinted in the SECOND ALTERNATIVE PUBLIC POLICY READER, Shearer and Webb, ed., $7.50 from the Institute for Policy Studies, 1901 Q Street N.W., Washington DC 20009.
A solid and straightforward discussion and analysis of the questions people have about growth and growth management in a community.

THE COST OF URBAN GROWTH: OBSERVATIONS AND JUDGMENTS, Richard Bradley, 1973, $2.32 from Pikes Peak Area Council of Governments, 27 East Vermijo, Colorado Springs, CO 80903.
Demonstrates that larger cities and faster growing cities cost more to live in and have fewer amenities.

The economics and community benefit of smaller scale, locally-owned business and industry is nicely explained in:

SIZE, EFFICIENCY AND COMMUNITY ENTERPRISE, Barry Stein, 1974, $5 from the Center for Community Economic Development, 639 Massachusetts Ave., Suite 316, Cambridge, MA 02139.

Recent studies by the Institute for Local Self-Reliance analyze the economic impact on a specific neighborhood of different size businesses, outside ownership of enterprises, and the role of banks in directing deposited money out of the neighborhood into other investments:

"The Adams-Morgan Business Sector: Paying for Other People's Development," $1 from the Institute for Local Self-Reliance, 1717 18th Street N.W., Washington, DC 20009.

EMPLOYMENT IMPACT STATEMENT

JOBS CREATED

1. How many new local jobs will be *directly* associated with the proposed new facility (program, project, etc.)?
2. How many new local jobs will be created indirectly by local purchases of supplies and services by the new facility?
   (This can be roughly calculated by: (a) obtaining estimates of the new facility's annual local purchases of supplies; (b) figuring the proportion that will go to pay the wages of new workers that local suppliers will have to hire to handle the increased business; (c) and then dividing by local average wage, to convert the dollar figure to a jobs equivalent. Consistent and reasonable "guestimates" are OK.)
3. How many *induced* local jobs will the new facility generate?
   (This can be roughly calculated by: (a) estimating the percentage of new direct and indirect payrolls that will ultimately become local personal expenditures by workers; (b) figuring the proportion that will go for wages of new workers that local retailers will have to hire to handle the increased business; (c) and dividing by the average local wage to convert the dollars to job estimates.)
4. Total number of jobs created:
   (direct + indirect + induced = total)
5. How many jobs will the new facility eliminate—directly or indirectly—in other local businesses?
6. NET number of jobs created:
   (number of jobs created minus number of jobs eliminated)

Proposed Project	Alternative Processes	Alternative Investment

ALTERNATIVES

1. What are the employment impacts of alternative means of providing the same services?
   (These alternatives can be different production processes—such as employing bank tellers instead of computers to process checks—or different institutional arrangements. Small, locally-owned shops keep business profits within a community, where they provide indirect and induced jobs, while large, outside-owned franchises remove profits—and induced jobs—from the community and frequently purchase supplies from outside suppliers they own, reducing indirect jobs in a community.)
2. What are the employment impacts of alternative uses of the same investment resources? (particularly if public funds)
   Almost any expenditure of money creates jobs, but using that money for different purposes may have very different results while providing the same amount of jobs. Building new power plants provides jobs and insulating homes provides jobs, but only the latter eliminates need for unnecessary future expenditures of work, dollars and energy. Expenditure of tax money provides jobs but raises our taxes, giving us each less to spend, which would have provided jobs anyhow. And expenditures for different purposes provides very different numbers of jobs and use of resources. Hospital services provide three times as many jobs per dollar spent as highway construction. Expenditure of funds for waste treatment construction, social security benefits or national health insurance instead of present Army Corps of Engineers projects would provide 30 to almost 60% increases in employment.

COMMUNITY IMPACTS

1. What special conditions will be required to sustain the activity being planned? (Do the product produced and the proposed rate of resource use indicate sustainable operation? Are special markets, government subsidies, local resources, abnormally low local wages necessary?)
2. Are the activity and the jobs it creates seasonal or cyclical over a longer period of time?
3. How many of the new jobs created will be permanent?
4. How many of the new jobs will be temporary? (e.g., associated only with construction or initial operation)
5. What will happen to workers in temporary jobs when their work ends?
6. What will be the distribution of new jobs among types and wage levels?

Type of job	Wage	Number	Percent of Total
7. Will the income distribution of the jobs provided increase inequality of wealth in the community?
8. How many of the new jobs are likely to be filled by local unemployed people?
9. How many of the new jobs are likely to be filled by workers whose employment has been terminated, directly or indirectly, because of the new facility?
10. How many of the new jobs are likely to be filled by local residents? How many by newcomers?
11. How many of the new jobs are likely to be filled by men? women? minorities?
12. Will the new facility make it harder for people without special education or training to get jobs in the community?
13. Will the new facility make local employment more dependent on outside decisions that don't incorporate the needs of the community?
14. Will the financial base of the new project make it comparatively harder for small local industry to compete fairly for loans?

Prepared by RAIN Magazine from an earlier version by Avrom Bendavid-Val, Center for Growth Alternatives

TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
500A Chestnut Street Tower II

November 24, 1980

Mr. Mark Wittow
Study Coordinator
Power Alternatives Study Committee
1024 West 6th Avenue
Anchorage, Alaska 99501

Dear Mr. Wittow:

Thank you for your letter of October 14, 1980. The Tennessee Valley Authority has had the opportunity to review the reports and studies which were sponsored by the Power Alternatives Study Committee of the Eleventh Alaska Legislature. It is readily apparent that a very comprehensive analysis has been performed by the study committee. The final report clearly demonstrates that the major issues have been identified and addressed. A satellite issue which may have some impact on your decision is the potential future value of coal exports to such countries as Japan. Hydroelectric development could free coal resources for export.

Once again, we commend the quality of your study and appreciate the information which you have provided us.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J L Crom for

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Manager of Power

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October 29, 1980

Mr. Arlon R. Tussing
Arlon R. Tussing & Associates
2720 Ranier Bank Tower
Seattle, Washington 98101

Dear Arlon:

Thank you kindly for your thoughtful letter of October 13 along with your analytical report on Susitna Dam.

Isn't a shame that hearsay evidence is used so badly. Frankly, Arlon, I have no recollection of even discussing your report on Susitna Dam with anybody, let alone allegedly denouncing it (vehemently too!) to anybody.

In the course of the A.N.D. litigation, I have perceived a personal and most favorable intellectual dimension of you I was heretofore completely unaware of.

I've carefully read your report. If I can summarize it with one concise thought, I can honestly say you've convinced me, at the very least, that the "ACRES" study lacks much credibility. When the makeup of that study group and circumstances under which it was awarded to them are considered, one can understand why.

You're to be particularly commended for printing the critique of your own report by Eric Yould as an exhibit to yours. This is professional class and manifests self-confidence and objectivity.

As you know, I am expressing these reactions with some degree of knowledge of the subject matter; as you know Ernest Gruening appointed me to the 1965 Rampart Dam advisory group and in that process, I did become familiar with studies of hydro projects.

Knowing that Chugach Electric is not at all enthused about the Susitna matter basically because of Beluga and natural gas and the general conservativeness of their management, I am, like you, also concerned about Susitna's market; however, I hope that somehow, someway Susitna will be built as a prudent use of our non-renewable resource money for future generations.

Again, Arlon, thank you for your kindness in writing.

Sincerely,

Edward A. Merdes

EAM/lw

02-001B (Rev. 10/76)

STATE of ALASKA

MEMORANDUM

TO: Jessie Dodson

DATE: June 9, 1980

FILE NO:

TELEPHONE NO:

SUBJECT: Susitna Plan of Study Management Options

FROM: Tom Singer
Policy and Program Specialist
Division of Policy Development and Planning

There are two basic decisions before us:

1. Who should perform the power market and alternative supply studies, serving as prime contractor for and integrator of load forecast, supply alternative, and system optimization analyses. Acres is no longer considered a viable alternative as prime contractor for Task I studies due to legislative intent, Tussing recommendations, etc.

   A related question is who should perform the non-Task I related Tussing recommendations (see Tussing p. 101 recommendations #6 and #9).

2. Who should manage the performance of these studies.

Options

1. Task Performance

a. Woodward-Clyde becomes prime contractor for power market and alternative supply studies, utilizing input developed by ACRES (underway) and other subcontractors such as ISER;

b. Competitive bid via RFP process;

c. Sole source negotiated contract with firm chosen following joint APA/Governor's office nation-wide search;

d. ACRES/APA continues work with some portion of funds appropriated to Governor's office. Balance used by Governor's office to perform second "alternative" alternatives studies (i.e., competition); or

e. Other

2. Contract management

a. Governor's Office staff manages contracts (i.e., Jessie, Bob etc.).

b. DPDP manages contracts

c. Budget and Management manages contracts.

d. Special Projects Office manages contracts.

e. Governor's Office RSA's funds to APA to manage contracts.

f. Governor's Office RSA's funds to another entity of state government to manage contracts.

g. Governor's Office hires personnel (or contracts for project manager) to manage contracts.

h. Other

Attached please find:

1. Arlon Tussing's list of POS revisions, for which $1,365,000 was appropriated in FCCS HB556.

2. ACRES POS description of Task 1 and funding levels.

3. Budget allocation to Governor's Office for Susitna planning.

cc: Fran Ulmer
John Halterman

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ALASKA STATE LEGISLATURE
HOUSE OF REPRESENTATIVES

POWER ALTERNATIVES STUDY COMMITTEE

Representatives Hugh Malone and Brian Rogers, Co-Chairmen

October 14, 1980

Enclosed are several reports sponsored by the Power Alternatives Study Committee of the Eleventh Alaska Legislature. (A short summary of the work is provided in the committee's final report, also enclosed.) The reports discuss and analyze energy issues in Alaska, focusing on future energy demand in the Railbelt area of Alaska and possible alternatives to the proposed Susitna Hydroelectric Project. Although the committee formally disbanded in June 1980, the analysis of electric power alternatives is being continued by Batelle Northwest, under a contract with the Office of the Governor. Continuing oversight of the Susitna project is being conducted by the House Research Agency.

One report sponsored by the committee has not yet been completed: a paper evaluating the potential for coal and natural gas-based power generation in the Railbelt area, by economist Gregg Erickson. Those of you wishing to receive this report should write directly to Mr. Erickson at 316 Coleman Dr., Juneau, Alaska 99801 (907-586-1954). His report should be distributed in early November.

I would appreciate receiving any comments you have on the reports or the work of the committee, at the address given below. Additional copies of the reports are available from Lynn Strauss or Debi Smith at the Juneau Legislative Information Office, Pouch Y - State Capitol Bldg., Juneau, Alaska 99811. (Some of you may have already received one or more of the enclosed reports. If so, please pass the extras on to a local library or some other person who can use them.)

Sincerely,

Mark Wittow

Mark Wittow
Study Coordinator
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Copies of the following committee reports are available from Debi Smith at the Juneau Legislative Information Office, Pouch Y, 99811 (465-4648)

1. ELECTRIC POWER CONSUMPTION FOR THE RAILBELT: A PROJECTION OF REQUIREMENTS (By Scott Goldsmith and Lee Huskey, Institute of Social and Economic Research, Univ. of Alaska, June 1980, 71 pp.) A 400 page set of technical appendices for this report is also available.

2. AN EVALUATION OF THE I.S.E.R. ELECTRICITY DEMAND FORECAST
(By Crow, Mars and Conway, Energy Probe, Canada, July 1980 , 62 pp.)

3. A REVIEW OF ELECTRIC POWER DEMAND FORECASTS AND SUGGESTIONS FOR IMPROVING FUTURE FORECASTS
(By Bradford Tuck, Univ. of Alaska, May 1980, 73 pp.)

4. INTRODUCTION TO ELECTRIC POWER SUPPLY PLANNING; WITH SPECIAL ATTENTION TO ALASKA"S RAILBELT REGION AND THE PROPOSED SUSITNA HYDROELECTRIC PROJECT
(By Arlon R. Tussing and Assoc., May 1980, 103 pp.)

5. ENERGY ALTERNATIVES FOR THE RAILBELT: A STUDY OF END-USE STRUCTURE, ENERGY CONSERVATION POTENTIAL, ALTERNATIVE ENERGY RESOURCES AND RELATED PUBLIC POLICY ISSUES
(by the Alaska Center for POlicy Studies. Anchorage, August 1980, 479 pp.)

6. ALASKA COAL: ALTERNATIVES FOR THE RAILBELT
(By Gregg Erickson and Fred Boness) (with)
ALASKA NATURAL GAS: ALTERNATIVES FOR THE RAILBELT
(By Gregg Erickson, October 1980, app. 70 pp.)

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ANALYSIS OF

POLICIES AND RECOMMENDATIONS

BY THE STATE ENERGY POLICY

COMMITTEE

JANUARY 31, 1979

Alaska State Legislature

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STATE ENERGY POLICY COMMITTEE

January 31, 1979

TO: The Honorable Jay S. Hammond
Governor

The Honorable George Hohman
Chairman, Legislative Council

FROM: Bill Miles, Chairman
State Energy Policy Committee

Pursuant to the guidelines established in HCR 67 passed during the first session of the 10th Legislature, I present for your consideration the final report of the State Energy Policy Committee.

TABLE OF CONTENTS

SECTION I INTRODUCTION

The State Energy Policy Committee was created during the first session of the 10th Legislature through HCR 67. The Committee consists of three members of the Senate appointed by the President, three members of the House appointed by the Speaker, the Commissioner of the Department of Natural Resources, the Commissioner of the Department of Commerce and Economic Development plus four members appointed by the Governor.

HCR 67 was introduced in recognition of Alaska's need to begin developing a coordinated policy concerning in-state energy needs, and the development of energy resources which will augument national energy supplies. The mandate of the resolution charges the Committee to "identify the problems and initiate solutions with respect to the development of a viable overall energy policy."

The work done to date represents the first step in developing an overall energy policy. Given the depth and complexity of the subject and the changing state and federal needs, this report and the recommendations made by the Committee must be viewed as only the first step in the direction of formulating an "overall policy." It would be a mistake to evaluate this report and its suggestions as the final word on an in-state energy polciy. However, many of the policies and suggestions should be studied and evaluated in light of current needs and future expectations. The

report provides a useful starting point in coming to terms with some of the problems the state now faces regarding its energy resources and its energy needs.

SECTION II STUDY APPROACH

The publication and dissemination of "Alaska's Energy Policy: Issues and Options", outlined, in brief, the issues which the State must deal with in order to begin developing a State energy policy. The report points out that energy policy needs be aimed at two areas: 1) How should the state deal with in-state energy needs? 2) How should the state develop energy resources which are surplus to in-state needs? The overall purpose of "Issues and Options" was to inform the public and urge public participation.

For in-state use, "Issues and Options" outlined two approaches. These were referred to as the "Hard Path" and the "Soft Path." The Hard Path places continued reliance on large centralized power grids. Fuel sources would continue to be fossil and large hydroelectric with a future shift to nuclear. This path is consistent with industrial expansion and growth in energy demand. The Soft Path would promote energy conservation and the development of appropriate technology. In the future the state would shift to renewable fuels like solar, wind and small hydro-

electric, with a lessening dependence on the large power grid networks.

For policies related to the development of energy resources which are surplus to in-state needs, "Issues and Options" points out that the state has two paths here as well. Policies can reflect a laissez faire attitude with minimal state participation, leaving the responsibility for a development of energy resources with the private sector. Or the state can take a more active role, share some of the risk and maintain a more responsible, regulatory position. The key is maximization of net benefits. That is, what balance between these two options will benefit the greatest number of people?

The next step was to develop a framework for the formation of policy guidelines, taking into account comments received from citizen input pursuant to Issues and Options. The framework deveоднoped was broken into four primary areas. These corresponded to the two broad areas of in-state use and development of additional energy resources. These primary areas are:

Title I	Policy Guidelines Related to Development and Management
Title II	Policy Guidelines Related to Disposition of State Royalties
Title III	Policy Guidelines Related to Energy Conservation

Title IV Policy Guidelines Related to Planning for In-State Power Development and Use

Title I and II deal primarily with developing energy resources. Policies reflect positions concerning leasing, regulation and use of royalties. However, pursuant to these development-orientated policies there is recognition of the need for development of renewable resources and protection of the environment. Titles III and IV deal with in-state energy needs and planning. The emphasis in these sections is that of encouraging energy conservation, and the development of renewable energy resources for in-state demand.

With a framework developed, the Committee formulated policies in each of these areas. The policies were adopted and approved at a public meeting in Anchorage on November 29, 1978. After adoption of policies staff made recommendations to the Committee on suggested methods to implement the policies. These were in the form of suggested legislation and proposed studies. The implementation measures were presented and adopted in a Juneau meeting on December 6, 1978. Notes of these meetings are included in the appendix.

SECTION III EXECUTIVE SUMMARY

Below is a brief statement on the policies and proposals which

were recommended by the State Energy Policy Committee:

Title I: Policy Guidelines Related to Development and Management

1. "to distribute the risk of development between the State of Alaska and developers of energy resources"

* The Committee proposed that the state study the cost vs. benefits of contracting for exploratory drilling for oil and gas, and of obtaining the necessary geological and geophysical data.

2. "to encourage the development of economically viable renewable energy resources for in-state use"

* Allow the expensing of intangible drilling expenses and cost depletion for geothermal wells. This was recently allowed by Congress in the Energy Tax Act - 1978, part of the National Energy Plan.

3. "to insure the orderly and timely development of energy resources, taking into consideration resource marketability"

* Consider enacting a uranium leasing law. Currently uranium is not leased, but treated as a locatable mineral.

4. "to insure a fair return to the people of the state for conveyance of state owned energy resources"

* Consider increasing coal royalties. Currently royalties for coal may not be less than 5 cents a ton. See AS 38.05.150.

5. "to protect the environment when this is consistent with other provisions of the State Energy Policy"

* The Committee urges that the state oversee implementation of coal mining regulations under the Federal Surface Mining Control and Reclamation Act 1977, to assure that mining be allowed to continue in an environmentally acceptable way.

* The Committee also suggested that appropriate state agencies be responsible for preparation of social, environmental and economic analysis for energy projects which "significantly affect the human environment." This requirement would not apply to any energy project which would have a similar document prepared pursuant to another local, state or federal law.

Title II <u>Policy Guidelines Related to Disposition of State Royalties</u>

The Committee reviewed and adopted the Royalty Oil and Gas

Advisory Board's policy guidelines with some minor amendments. No recommendations were made by the Committee as to how to implement these policies. The policies were:

1. "maximize net benefits; these benefits include but are not limited to price, employment, local training, local hire and ownership, tax base and includes other economic, social and environmental ramifications"

2. "the baseline price for any royalty sale shall not be less than the price that would be received for that royalty if taken "in-value"

3. "to give preference first to existing in-state facilities, second to those expanding existing in-state facilities and third to those who will construct new in-state facilities"

4. "to withhold a portion of any royalties from long-term commitment to supply anticipated demands"

5. "with the exception of small sales to public utilities, sales will be for specified volumes of proportions or production, constant throughout the year, rather than for flexible volume options to be called for by the purchaser"

6. "products derived from royalties refined or processed in-state and subsequently used in-state will be priced at the lowest possible price"

7. "royalties or products from royalties exported from the state must be surplus to anticipated in-state needs for those royalties of products"

8. "in general royalties will be disposed of in long-term contracts rather than in "piece lots" as may be done by a private sector, trader or dealer"

Title III Policy Guidelines Related to Energy Conservation and Suggestion for Implementation

1. "to encourage and facilitate the implementation of energy conservation measures, for all in-state energy uses"

* The Committee chose to evaluate the fiscal impact of replacing AS 43.30.039 the Residential Conservation Credit with the Residential Energy Credit sections of the Energy Tax Act - 1978, recently passed by Congress. The Federal Energy Tax Credit is more generous than the current state tax credit and has a broader allowable application.

* The Committee also recommended expanding the authority of the Alternative Power Resource Revolving Loan Fund AS. 45.88.010 to allow loans for energy conservation improvements. The fund currently only has the authority to loan for alternate energy power projects.

2. "to maximize, when possible, federal monies and other resources available for energy conservation improvements"

* Consider supplementing federal weatherization programs with state money if needed. In the past, problems have arisen because of spending guidelines laid out for use of federal weatherization grant money.

* Establish a fund which provides state matching money for research and development projects supported in part by federal government grants or any other money available.

3. "to provide for the implementation of appropriate regional lighting and thermal efficiency standards in newly constructed residential and commercial buildings, and for retrofitting of existing buildings, while maintaining local autonomy"

* The Committee recommended adoption of appropriate lighting and

thermal efficiency standards in compliance with federal law.

4. "to encourage the structuring of energy utility rates which promote energy conservation"

* The Committee recommended to comply with appropriate provisions of "Public Utility Regulatory Policies Act of 1978", part of the recently enacted National Energy Legislation. This Federal Act requires consideration of alternative rate designs by regulatory agencies for larger utilities.

5. "to encourage the optimal use of exhaust heat"

* The Committee elected to require the efficient utilization of waste heat by any major industrial facility as a condition of using state royalties for fuel.

Title IV: Policy Guidelines Related to Planning for In-state Power Development and Use

1. "to assure for coordination of state and federal responsibility in planning for in-state energy needs and the development"

* The Committee recommended amending AS 44.56.224, "Long Term

Plan," to require the Division of Energy and Power Development to give equal consideration to all types of power generation which are economically feasible. This plan must be developed in conjunction with the Alaska Power Authority and must be approved by the Governor and submitted to the Legislature.

2. "encourage the availability of energy to all people of the state at the lowest possible rates consistent with good management techniques"

* The Committee, pursuant to a recommendation by a liaison group to the Energy Policy Committee chaired by Rep. Leo Rhode, recommended to use the Reserve for Energy Development Account to provide bonding leverage for small hydroelectric projects. (See attached subcommittee report).

SECTION IV PROPOSED POLICY GUIDELINES AND THEIR APPLICATION

This section reviews the proposed guidelines, the amendments and deletions to the guidelines and provides comments on their implications. The guidelines on Title I, III and IV were reviewed in Anchorage at the November 29 meeting. The guidelines for Title II were reviewed in Juneau at the December 6 meeting.

Title I Policy Guidelines Related to the Development and Management of Alaska's Energy Resources

1. "to reduce the risk of development of oil and gas resources"

This policy was adopted by the Committee but amended to read;

"to distribute the risk of development between the State of Alaska and developers of energy resources"

The original policy guideline was intended to deal primarily with oil and gas leasing policy. The amendment adopted by the Committee expands the policy's application to include all types of energy resources. The discussion, however, will deal with only oil and gas.

There are four major sources of risk involved for a firm in leasing oil and gas land. These are: (1) the amount of recoverable resource located in the tract; (2) the cost of exploration; (3) the cost of developing the tract; (4) the future price of the resource. Under the traditional cash bonus fixed royalty bid the lessor shares in little or none of these four risks. The cash bonus is paid to the lessor prior to development of the tract. The bonus represents a sunk cost to the lessee and is paid to the lessor whether the tract is productive or not. This represents a relatively risk free situation for the lessor.

The State of Alaska, as a lessor, has taken steps which reflect

the policy of sharing the risk of development of oil and gas resources. The vehicle for this shift in policy was HB 854, "An Act relating to the leasing and exploration of state land for oil and gas development." (See AS 38.05.180). This Act, among other things, increases the number of bidding options available to the Commissioner for leasing oil and gas lands. With passage of HB 854, the Commissioner has basically three options: (1) cash bonus fixed royalty; (2) fixed bonus royalty bid; (3) fixed bonus percent of net profits.

Cash Bonus Fixed Royalty

Of the three bidding methods, the cash bonus fixed royalty option represents the least risk to the lessor. When a lease tract is offered, a firm will calculate a bonus based on its expected present value of the resource. In calculating a bonus a firm includes many subjective elements. Risk averse firms will tend to discount the bonus offered because of the high level of uncertainty over the lease tract's potential. The high levels of uncertainty may also increase the cost of capital over what might be required for more secure investments. Both of these factors tend to decrease the expected present value of the resource and will be reflected in lower bonus bids. The bonus is basically a residual; that is, the bonus is what is left over after subtracting developmental costs and an expected rate of return from the expected present value of the resource.

There are several advantages to the cash bonus method of bidding. Indeed some may argue that a "no risk" situation may in itself be considered an advantage. Other advantages include:

(1) The bonus represents a large commitment by the lessee.

(2) There are no disincentives placed on marginal production other than the fixed royalty which may be reduced by the Commissioner if this extends the productive life of the field.

(3) The state receives its money up front.*

(4) Major corporations have access to market funds at low interest rates, and this will normally be reflected in higher bonuses.

(5) Bonus bidding requires minimal state regulation and policing.

(6) The state may make up revenues from low bonuses on productive acreage by increasing the severance tax.

For its simplicity, cash bonus bidding has problems associated with it. The bonus represents a high capital barrier to entry for smaller firms. This may lead to less competition in the bidding process and tend to depress the bonus below the true expected present value. Disadvantages of the bonus system are:

*Note: This may or may not be an advantage depending on the state's financial condition.

(1) A high capital barrier to entry. Because of the high up front costs of the bonus, small firms are at a disadvantage because of the difficulty of raising the necessary money. This may tend to reduce competition.

(2) The payment of cash bonus is made at the same time that capital must be secured for exploratory drilling. The further exacerbates the money crunch for smaller firms.

(3) It is questionable whether the state is in need of large amounts of front money at a time when they are looking for outlets for the Permanent Fund.

(4) Selling land under the bonus system is tantamount to the state divesting itself of planning and resource management responsibility. The state applies the rule of caveat emptor as there is a high degree of uncertainity as to the real potential of the lease tracts.

(5) As low as the industry's internal costs of capital may be, the state's effective rate is probably lower. This presents a conflict between the state and companies over the time value preference of money. This may result in a misallocation of the resource in terms of production, and may correspondingly result in lower bonuses offered by companies.

Many of these points were raised in a report to the Legislature

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entitled "Oil and Gas Leasing Policy: Alternatives for Alaska in 1977" prepared by Mason Gaffney as an economic policy analysis. It was partly in response to criticisms of the bonus system that the Legislature amended the state's leasing law.

Fixed Bonus with Royalty Bid

Under provisions of the new leasing law, the Commissioner now has available royalty bidding with a fixed cash bonus. The royalty, as a bid variable, is a percent of the production removed or sold from a property and may either be taken "in-kind" or "in-value." The royalty bidding provision in HB 854 may only be applied to sales where acreage is subject to drainage from offsetting wells. (See AS 38.05.180 (f)(3).)

Of the four sources of risk involved in leasing, royalty bidding shifts only the risk attendant with the future price of the resource to the lessor. Royalty bidding does not shift any of the risk involved with discovery, exploration costs or production costs from the lessee.

The primary advantage of Royalty bidding is that it transfers a portion of the firm's risk to the lessor. If the tract is economically "dry" then both the petroleum firm and the lessor share the loss. An increase in risk sharing would help enable

small firms to enter the field and increase competition, help increase government revenues and help insure an optimal allocation of resources.

However, royalty bidding can cause some additional problems due to excessive speculation. If the fixed bonus is set too low firms have little to lose by bidding high royalties and the higher the royalty the greater the problem of early shutdown and unrecovered resources. Theoretically, the lower the fixed bonus the higher will be the winning royalty bid.

In addition some of the advantages of royalty bidding are:

(1) Payment for the lease tract is deferred. This allows entry by smaller firms and conserves capital for actual drilling and equipping the lease tract. This should increase competition in bidding.

(2) Rent collected by the lessor is contingent on the finding of petroleum and is in proportion to volume. This is more consistent with a sovereign's responsibility of assuring a "fair market" value.

(3) Royalty bidding reduces the premium now placed on prior knowledge of resource potential, thus reducing the advantage of large firms who can afford extensive pre-leasing surveys.

(4) Royalty bidding allows a steady flow of income to the state over the productive life of the field.

(5) Income gain to the state results in part from a reduction in that portion allocated to the federal government via income tax.

Some of the disadvantages of royalty bidding are:

(1) the commitment made by the lessee is considerably less than with the cash bonus. A lessee may tie up land at little cost, deferring the risk of exploration and development of a tract to a neighbor. This may also encourage entrance by firms unable to commit adequate resources to assure proper development.

(2) Royalty bidding decreases incentives on marginal production.

(3) High royalties on low-value deposits are uncollectable as a lessee will not develop the tract, whereas low royalties on low-cost deposits are irretrievable.

(4) The lessee's incentive to defer production is exaggerated. It may be worthwhile to defer production on a field in anticipation of higher prices. In the meantime, the company may take advantage of unrealized capital gains, due to an increase in company worth based on the discovery.

(5) The price paid for the royalty requires careful policing.

(6) Royalty bidding may screen out small finds.

Many of the problems associated with royalty bidding are centered on a relatively high royalty bid. Some of these problems could be overcome by use of a sliding scale or step royalty. This would help alleviate some of the problems with discentives on marginal production. However, even a sliding scale royalty does not solve the entire problem, because it is hard to adjust the royalty scale to activities such as work overs, pressure maintenances and secondary recovery. The royalty provisions in HB 854 does not provide for a sliding scale, but the Commissioner may reduce the royalty if it will enhance ultimate recovery.

Fixed Bonus with Net Profit Bidding

This bidding method allows the risks associated with leasing to be shared between the lessor and the lessee. In contrast to cash bonus bidding, the lessor shares in the risks associated with exploration costs, resource potential, development costs and future market price.

This bidding option requires that the bid variable be a percent of the net profit from a tract. This option, in many ways, is a refinement of royalty bidding. It allows payment of rent to be deferred until production begins as a royalty bonus, but eliminates many of the problems associated with the royalty, namely early shutdown and discentives on marginal tracts.

Net profit bidding also goes much farther in terms of risk sharing than royalty bidding. Some advantages of the profit sharing approach are:

(1) Net profit bidding binds the interest of the lessor and the lessee in much more common interest. They both share in a per cent of the net profits.

(2) Income received by the state with respect to leases is now proportional to profit. This allows the share/barrel to be large when the field is flush and decreases as the field becomes marginal.

Some disadvantages include:

(1) Formidable administrative problems in determining allowable deductions. These problems will resemble and approximate those involved in the corporate income tax. These may lead to considerable litigation.

(2) There will be considerable padding of costs. The term used here is "gold plating." This has been a problem with the "East Wilmington" field off Long Beach, particularly with those costs related to environmental expenses.

The preceding discussion has centered around risk distribution and leasing alternatives. It has attempted to show how the lessor can share some of the risk and what some of the advantages and

disadvantages are. While the lessor, in this case, the State of Alaska, now has the opportunity to share some of the leasing risk via royalty bidding or net profit bidding, the state does not share in any of the pre-leasing risk. The risks consist primarily of collection and analyses of geological and geophysical information. This type of information is needed to make an estimate, albeit somewhat subjective, of the expected present value of the resource.

The Committee has asked an elemental question concerning leasing policy: What are the cost vs. benefits of obtaining pre-leasing data? In other words, what would be the advantages to contracting for exploratory drilling and of obtaining geophysical data prior to leasing? This approach would lead to the total separation of exploration and development. The firm eventually developing the tract would share some of the risks associated with the amount of the recoverable resources, but this would be substantially reduced. The firm would bear the risk of developing the tract, and the future price of oil. This proposal is developed further in Section V of the report "Summary of Legislation and Studies."

2. "to encourage the development of alternative energy resources for power generation and space heating"

This guideline was adopted by the Committee but amended to read:

2. "to encourage the development of economically viable renewable energy resources for in-state use"

This policy, as originally worded, could have easily been interpreted to be a subsidy policy related to alternate energy power projects. Alternative energy porjects were not defined, but were intended to mean solar, wind, geothermal, and biomass conversion projects. With the amendments, the meaning and applicability of the policy guideline has changed. By inserting the words "economically viable," the policy may have changed. It is questionable whether economically viable energy projects need a subsidy. However, it may be argued that by encouraging energy projects via subsidy they become economically viable, and this guideline may still apply as a subsidy policy. Also in replacing alternative energy resources with renewable energy resources, the Committee may have inadvertently excluded geothermal energy.

The changes made by the Committee tend to make the policy apply more to large hydroelectric projects rather than "alternate energy" development. Generally large hydroelectric projects are more economically viable. In spite of this, the Committee retained the suggestion to allow cost depletion and expensing of intangible drilling expense for geothermal wells under this guideline. This is basically a tax subsidy and was included in the Energy Tax Act of 1978 recently passed by Congress as part of the National Energy Plan.

3. "to insure the orderly and timely development of non-renewable energy resources, taking into consideration resource marketability"

The Committee adopted the guideline, but amended it to read;

"to insure the orderly and timely development of energy resources, taking into consideration resource marketability"

This policy guideline deals primarily with leasing of energy minerals on state lands. Two apparent problems have arisen inconsistent with the stated policy. These are 1) state management of uranium, 2) the glut of Alaskan oil on the West Coast.

Currently the mining of uranium is carried out pursuant to Title 27 of the mining statutes. Title 27 lays out the procedure for staking a claim. A person who discovers, locates, and files a claim upon a uranium deposit acquires the irrevocable right to mine it, subject to various limitations or duties that may be imposed to continue such right.

Currently the Alaska Constitution limits the method of establishing the right to mine uranium and other fissionable material to discovery and appropriation under Title 27. However, the constitution does not preclude the leasing of land comprising a

fissionable or any other locatable mineral claim. The only constitutional requirement is that the discoverer have first right to such a lease. The problem is that there is no uranium leasing law.

The second problem deals with the timing of oil and gas leases.

Under current state management it is virtually impossible to time a lease consistent with the market demand. This is due primarily to the fact that the state has very limited knowledge about oil and gas resource potential prior to leasing. The Department of Natural Resources has considered implementing Miscellaneous Land Use Permit (MLUP) regulations which would allow the state to have access to non-interpreted seismic data shot on state land.

With proper staffing, the state could use the data to make resource estimates on potential lease tracts. The Department of Natural Resources has not yet implemented these regulations.

4. "to insure a fair market value for energy resources to the people of the state"

The Committee adopted this policy but amended it to read;

"to assure a fair return to the people of the state for conveyance of state owned energy resources"

This policy places responsibility on the state to assure that the citizens of the state are adequately compensated for transference of publicly owned energy resources. This is accomplished via leasing. The policy applies to oil and gas, uranium, coal and geothermal. The discussion provided here will deal only with oil and gas and coal.

This policy is closely related to policy 1 - "to distribute the risk of development between the State of Alaska and developers of energy resources". Both policies if developed to their furthest extent could lead to the separation of exploration from production for oil and gas development.

Under the present bidding system, the firm interested in bidding is faced with major uncertainties about three basic factors: 1) the actual level of resources that will be found in the tracts; 2) the cost of finding and producing those resources; 3) the price of which those resources can be sold. Exploration prior to leasing can be expected to reduce uncertainty about 1 and 2, but may have no effect on 3.

The level of uncertainty should affect the return to the public by affecting the amount that firms bid on available lease tracts. Three key areas which would be affected are: (1) improvement of a firm's expected present value of the resource; (2) reduction of any discount resulting from risk aversion; (3) increase in

competition. The latter two effects would clearly tend to move a firm's bid upward toward the estimates of the expected true value. However, the "net" change upward or downward would be determined by (1) namely the expected improvement in the bidder's evaluation of the resource.

In considering the net change in return, if current tract evaluations are generally overly optimistic, better information prior to leasing could lead to a net reduction in the average level of bids. This would occur if increases due to risk reduction and increased competition are more than offset by declines in the expected present value of the tracts. On the other hand, if current procedures do not lead to overly optimistic bids, the net change on return to the public would be upward. In either case, the reduction of uncertainty would be consistent with assuring a fair return.

The Committee made no recommendation pursuant to this policy concerning oil and gas. The recommendation concerning assuring a fair return is covered under policy 1. This recommendation was to evaluate cost vs. benefits of contracting for exploratory drilling and obtaining necessary seismic and geological information.

The policy guideline also applies to coal which is leased by the state. Currently AS 38.05.185 states that royalties paid on coal may not be less than 5 cents/ton. Using a cents per ton method

makes the royalty payment more like a severance tax than a royalty. Normally royalties are figured as a percent of production removed or sold from a property. The state usually receives either one-eighth or one-sixth of the production from oil and gas leases. For geothermal leases royalties amount to one-tenth of the production.

Normally coal is sold on a dollar/BTU basis. This unit price is equivalent to approximately $15 - $17/ton. Recent prospecting permits issued by the State have set the coal royalty at 35 cents/ton. Royalties on coal leases which date back to 1959 vary from 5 cents/ton to 15 cents/ton.

The Committee acknowledged that the royalty for coal is low but made some additional observations. Most of the coal mined in-state is burned as utility fuel. By increasing the coal royalty the cost will be directly passed on to the consumer via the Public Utilities Commission. This increase must also be viewed in light of the recently enacted Surface Mining and Reclamation Act of 1977. This act provides a 35 cents/ton charge for reclamation, and a 25 cents/ton charge which goes into an accident fund. The net affect of these charges will be an increase in utility rates.

The Committee chose to evaluate other state's coal royalties before making any specific recommendation.

5. "to maximize recovery of energy resources when this is consistent with maximization of net benefits"

This policy was not adopted by the Committee. The implications of this policy relate to the Oil and Gas Conservation Statutes, Title 31. This chapter governs the regulation of oil and gas production. The Alaska statutes are modeled after the Interstate Oil Compact Commission (IOCC) model legislation.

As the need for state regulation became apparent, states employed different means to regulate production of oil and gas. Most of the regulation methods were designed to prevent physical waste. One of the earliest and most widely accepted methods of regulation has been to control the spacing of wells. Every state which has conservation statutes authorizes the control of well spacing.

A second method of regulation has been to control directly the quantity of oil and gas produced. This type of regulation has taken two distinct forms: (1) Market demand prorationing; (2) Maximum Efficent Rate. Other types of regulation include voluntary or compulsory unitization and requiring use of secondary recovery techniques.

Market demand prorationing was used by Oklahoma and Texas in early years of the industry to restrict production to meet demand. This type of regulation was designed to increase the price of oil during times of excessive production. The intent of market demand

prorationing was not so much geared to conservation, but rather avoidance of economic waste. Maximum Efficient Rate (MER), on the other hand, dealt primarily with conservation. The MER for a reservoir is the rate of production which will maximize total recovery. The MER for a field is determined primarily by reservoir engineering factors. For example, a rate of production which needlessly dissipates reservoir pressure and affects ultimate recovery would be in excess of MER and would not be allowed.

Although the MER for a reservoir is determined typically by engineering considerations, the MER is partly an economic concept. The MER is officially defined as:

> "the approved maximum sustainable daily oil and gas withdrawal rate from a reservoir which will permit economic development and depletion of the reservoir without detriment to ultimate recovery." (quoted in a statement by Jack W. Carlson, Assistant Secretary, Energy and Minerals, Dept. of Interior, 1975).

The State of Alaska regulates production on the basis of MER. The question of whether to regulate based on DCF or MER gets down to a basic conflict between the State of Alaska and oil producers. When a company sits down to determine its optimal MER, a number of economic factors are considered. A company will have to determine how a production rate might affect

recovery of oil vs. gas. The company will have to assign expected future values to each and adjust the MER to maximize present value. The MER will also be dependent on capital investments required to produce the field. Once investment decisions on use of capital enter the picture the companies will calculate their MER using time discount factors. It is often in determining appropriate time discount factors to maximize present value where the conflict between the state and the producers sometime arises.

6. "to protect the environment"

This policy was adopted by the Committee but amended to read:

> "to protect the environment when this is consistent with other provisions of the State Energy Policy"

With the amendment, the Committee has changed the application of the proposed guideline. This ties protecting the environment into two other policies: (1) "to maximize net benefits, these benefits include but are not limited to price, employment, local training, local hire and ownership, tax base and includes other economic, social and environmental ramifications;" (2) "to encourage the availability of energy to all people of the state at the lowest possible rates consistent with good management techniques."

In terms of "maximizing net benefits" environmental ramifications might be considered a cost to some communities and would have to be weighed against the benefits associated with certain types of development, most notably petrochemical development. How this would be accomplished is uncertain. For some environmental costs such as damage to a fishery, it may be possible to assign some cost, but for other effects of environmental degradation values are not so easily assignable. How does one assign a value to air quality? Is the measure here hospital costs for lung disease? The measure of these benefits vs. costs would be difficult, if not impossible.

Protecting the environment when related to encouraging the availability of energy to all people of the state puts protection of the environment in a subordinate position. Protecting the environment in this case must be consistent with encouraging the availability of energy to all people of the state. Conversely, one would conclude if it were not consistent with encouraging the availability of energy to people of the state one could ignore the guideline. As with the relation to royalties the real key here should be maximization of net benefits.

Two recommendations arose from this guideline. The first was to oversee the regulations being promulgated by the Federal Government pursuant to the Surface Mining Reclamation Act of 1977. This is currently being done by DMEM within the Department of Natural Resources. The second suggestion was to require Social Economic

Environmental Assessment for energy related projects. These will be discussed in more depth in the next section of the report.

7. "to promote competition"

This policy was not adopted by the Committee. Even so, it is a policy of the state in regard to oil and gas. AS 38.05.180 (a)(1) states, "the people of Alaska have an interest in the development of the state's oil and gas resource to", (b) "maximize competition among parties seeking to explore and develop the resources."

Oil and gas leasing is a high risk venture and the current leasing system appears to reduce competition in two ways. First, the high level of uncertainty about the amounts of oil and gas present make it difficult for a small firm to obtain the necessary capital to bid on lease tracts. Second, the capital requirements are so high that even large firms must participate in joint bidding ventures. This may lead to pre-emptive bidding by larger firms.

The first problem, i.e. uncertainty, can affect bids in the following way. Risk averse firms, as mentioned earlier, will discount bids because of uncertainty. If there is competition the firms that discount below the true value will probably lose the tract. However, if a tract receives only one or two bids, the likelihood of selling the acreage below its true value is increased.

The second problem is joint bidding. The only evidence concerning the competitive impact of joint ventures concerns joint bidding and gas leases in Alaska and the Gulf of Mexico. Professor Mead, an economist at the University of California, Santa Barbara, examined data from Alaska sales between 1959 and 1966 in order to identify the impact of joint bidding on bidding participants against each other or against former participants. Mead's results indicate that in a two-year period following a break up of a joint bidding agreement, the bidding patterns indicate a clear tendency of restrained bidding among former partners. Over a longer period of time the results indicate that cooperation between former partners tends to dissipate. The study yielded similiar results in the Gulf of Mexico.

Concerning the possible decline in competition for bids, the Federal government made three suggestions. These were (1) banning joint bidding by producers; (2) speeding up publication of basic geological and geophysical information in order to facilitate participation by smaller oil and gas companies; and (3) improving the bid rejection system. All three of these suggestions have been incorporated to varying degrees by the Federal government on OCS acreage. The State of Alaska has asked for an exemption from (1) for the Beaufort Lease Sale. The State of Alaska plans to lease the Beaufort jointly with the Federal government in December 1979.

Title II <u>Policy Guidelines Related to Disposition of State Royalties</u>

The policies stated here are policies of the Royalty Oil and Gas Advisory Board's which were adopted by the State Energy Policy Committee.

1. "to maximize net benefits; these benefits include but are not limited to price, employment, local training, local hire and ownership, tax base and include other economic, social and environmental ramifications"

This policy is intended as a backdrop or measure of the desirability of competing proposals for disposition of state royalties. Royalties may be taken "in-kind" or "in-value" at the discretion of the Commissioner. The cost of choosing a specific proposal is the cost of sacrificing other alternatives. In simplest terms, this guideline requires the optimal allocation of labor, capital, natural and other resources.

While the idea of maximization of net benefits is easy to grasp in concept, it is difficult in evaluation. Basically if a change in any resource combination requires a sacrifice that is smaller than the incremental increase in benefits, then the change is seen as desirable. How you measure this incremental change is the difficulty. The difficulty is exacerbated by changes in intangible costs and benefits such as environmental and aesthetic affects.

However, if this evaluation is effectuated, some note should be taken of present vs. future benefits. The state should calculate

present vs. future benefits based on its discount rate or time value preference of money. This would result in maximization of present value. Some of the effects of this are included under policy (4) of Title 1, a policy which was not adopted by the Committee.

> 2. "to allow flexibility in the taking of royalties either "in-kind" or "in-value" so that the net benefits and the long term revenues from the refining, processing and/or sale of the resource are at least equal to the in-value revenues and benefits."

This was the policy recommended to the Committee by the chairman. The Committee, however, voted to amend the policy back to the original guideline as proposed by the Royalty Oil and Gas Advisory Board:

> "the baseline price for any royalty sale shall not be less than the price that would be received for that royalty if taken "in-value"

The recommendation would have allowed an initial subsidy of feedstock to encourage industrial development. This subsidy would have to be made up in subsequent years by the purchaser so that the net effect in revenue could not be less than what would have been received by the "in-value" price. The Committee rejected the proposed guideline because it could not be shown that repayment

of the subsidy could be guaranteed.

The original Royalty Board s guideline required that no royalties be sold at less than the "in-value" price. Calculation of the "in-value" price requires two steps. Step (1) calculates each producers weighted average value per barrel at Point of Delivery for all oil sold by each producer during the month; Step (2) the weighted average of each producer's value is compared to the average weighted price received by all other producers. The higher of these two is chosen. These higher values are then weighted and the average is the price to the buyer.

The Committee chose to keep the "in-value" price calculation as the floor.

3. "to give preference first, to existing in-state facilities, second, to those expanding in-state facilities and third, to those who will construct new in-state facilities"

This policy is self explanatory. The guideline establishes priorities for the sale of royalties in-state. The guideline simply states that facilties already providing services and products from the use of certain natural resources be allowed first crack at buying royalties. The most obvious application would be for the sale of royalties to in-state utilities and refineries.

4. "to withhold a portion of any royalties from long-

term commitment to supply anticipated demands"

This policy related to Federal jurisdiction over the sale of crude oil and natural gas. The appropriate Federal laws are the Mandatory Petroleum Allocation Act (oil) and the new Natural Gas Act of 1978.

OIL

In terms of royalty oil the question of access revolves around interpretation of the Mandatory Petroleum Allocation Regulations. The crux of the allocation program is 10. CFR 211.63 entitled "Domestic Crude Oil Supplier/Purchaser Relationships." This essentially requires that the distribution scheme of crude oil which was in effect as of Jan. 1, 1976, remain intact. The rationale is to insure that small refiners retain access to the necessary feedstocks of crude oil. This Act was influenced by the Arab Oil Embargo. The regulations further require that once the "first sale," (See 10. CFR 212.72), of domestic crude oil is made from a property where domestic crude oil was not produced and sold prior to Jan. 1, 1976 a supplier/purchaser is established as though it had been in effect on Jan. 1, 1976. To terminate a "supplier/purchaser" agreement requires written consent of a purchaser and all subsequent purchasers, and is fairly difficult to effectuate.

The State of Alaska's first encounter with the Mandatory Petroleum Allocation Program concerned disposition of Prudhoe Bay

Royalty oil. There was a fear on the state's part that if they initially took their royalty share "in-value", could they then choose to take their royalty share "in-kind" at some future date? The basic question was, did the taking of royalty oil "in-value" constitute a "first sale" and was the state subsequently locked into a "supplier/purchaser" relationship?

The FEA responded to a request by the State of Alaska for an interpretation of 10. CFR 211.63 in terms of Prudhoe Bay Royalty oil. The FEA ruling was extremely favorable to the state in terms of Prudhoe Bay. The FEA noted that a major purpose of the Energy Policy and Conversation Act (EPCA) was to preserve a crude oil distribution scheme in effect on Dec. 1, 1973. To freeze Alaskan Royalty Oil would not serve that purpose. In fact the FEA ruled that use of royalty oil within the state would actually further the distribution purpose of EPCA. This was the basis for allowing the state to take its royalty "in-kind" after first taking it "in-value."

However, the FEA in the interpretation also ruled that the taking of crude oil "in-value" did constitute a "first sale" and created a "supplier/purchaser" relationship. This was in spite of an advance termination clause included in the lease. The advance termination clause in the lease allowed the state the option to take royalty "in-kind" after receiving it "in-value" with six months notice to the producers.

The purpose of this discussion is to illustrate that royalty oil once "sold" will be difficult if not impossible to retrieve.

Although the state fared well in terms of Prudhoe Bay and their "in-value" vs. "in-kind" taking problem this would not apply if the state sells royalties to a refinery. Once the oil is sold, it is committed under the terms of the Mandatory Petroleum Allocation Act.

GAS

The situation over Federal control of natural gas sales is unclear at this time, because of passage of the Natural Gas Act of 1978. Under provisions of the old Natural Gas Act of 1938 the Federal Energy Regulatory Commission (FERC) has "abandonment authority". This required that a producer, in this case the State of Alaska, could not retrieve gas dedicated into interstate commerce without FERC's approval.

Under the new Natural Gas Policy Act of 1978, FERC continues to have this type of jurisdication over gas which was dedicated to interstate commerce as of the day before the enactment of the NGPA of 1978. However, under the new Act, FERC does not have "abandonment authority" over gas sold into interstate commerce after that date. FERC does retain some "non-price" jurisdiction over gas sales. The NGPA of 1978 allows FERC to set a minimum contract periods of up to 15 years for sales of new onshore natural gas.

It is unclear how the NGPA of 1978 will affect the future sales of royalty gas. Care should be exercised by the State to insure long-term access to adequate supplies. This is consistent with Policy 3 adopted by the Committee.

5. "with the exception of small sales, to public utilities, sales will be for specified volumes or proportions of production, constant throughout the year, rather than for flexible volume options to be called for by the purchaser"

This policy simply requires a purchaser to enter into a contract for a specific amount based on anticipated demand. It may cause some problems for a purchaser who may subsequently find feedstock at a lower price, but it eases the administrative burden.

6. "products derived from royalties refined or processed in-state and subsequently used in-state will be priced at the lowest possible price"

Although the state generally has no control over the price of products that a refiner sells, the Committee felt that one of the principle benefits of in-state usage would be lower product pricing for Alaskans.

7. "royalties or products from royalties exported from

the state must be surplus to anticipated in-state needs for those royalties or products"

This policy is in line with policy #4. It simply restates the need for in-state use of royalties or products. This type of policy is consistent with the provision in the ALPETCO Contract requiring processing of 30,000 bbl/day for in-state use.

8. "in general royalties will be disposed of in long-term contracts rather than in "piece lots" as may be done by a private sector, trader or dealer"

There are agents or brokers operating in the industry that specialize in selling odd lots of crude stock and refined products to buyers throughout the world. Out of necessity, they operate in a way to maximize volume with little emphasis on price. Often a producer will have to sell at a discount to get rid of these products through a broker. The guideline is simply a statement that this is not the way the state should conduct its business in terms of disposing royalties.

Title III <u>Policy Guidelines Related to Energy Conservation</u>

1. "to encourage and facilitate the implementation of energy conservation measures"

This policy was adopted by the Energy Policy Committee but amended to read:

> "to encourage and facilitate the implementation of energy conservation measures, for all in-state energy use"

The policy as stated is self-explanatory. The Committee has recommended that the state begin actively pursuing programs which promote energy conservation. This policy represents a shift from current policy stated in AS 44.33.030 which directs the Section of Power Development to "promote and extend the use of electric power and energy in the state." The word conserve is included in this section but the context of "making an abundant supply of electric power available at the lowest possible rates."*

The State has two directions it can take in terms of encouraging energy conservation. These are primarily a policy of taxation which is basically a penalty policy for inefficient use, or a policy of subsidy. The subsidy policy is allowing tax credits for energy conservation measures or providing low interest loans.

*Note: Conservation in this section does not deal with the Petroleum Conservation Statute, AS 31.05. This Section is aimed at "use" and not development.

The National Energy Plan also includes penalty policies for excessive use. Title II - Transportation of the Energy Tax Act requires the imposition of a gas guzzler tax on automobiles. The bill provides that by 1980 a car which get 15 miles/gallon will not be taxed. However, if the mileage falls to 13 the tax is $550. By 1985 a car must get at least 21 miles/gallon, not to be taxed. If the mileage falls below 13 miles/gallon in 1985, the tax is $2,650. Tax schedules have been developed for 1980 - 1986.

The recommendations made by the State Energy Policy Committee reflect a policy subsidy. The recommendations were to analyze the fiscal impact of expanding AS 43.20.039 to more closely resemble the Federal Residential Credit. The Committee also recommended expanding the authority of the Alternate Power Resource Revolving Loan Fund to allow loans for energy conservation improvement. The fund exists but there is no money in it at present.

2. "to maximize, when possible, federal monies available for energy conservation measures, and renewable energy resource measures"

This policy was adopted by the Committee but amended to read:

The recently enacted National Energy Plan includes subsidy provisions for energy conservation and renewable energy development.

Title I - The Residential Energy Tax Credit of the Energy Tax Act of 1978, allows energy conservation credits for "qualified expenditures" of 15 per cent for the first $2,000. The renewable energy source portion of the credit allows a 30 per cent credit for qualified expenditures which do not exceed $2,000 plus a credit of 20 per cent for qualified expenditures which exceed $2,000 but do not exceed $10,000.

Maximum credit for energy conservation:

(.15 x $2,000) = $ 300

Maximum credit for renewable energy sources:

(.30 x $2,000) = $ 600
(.20 x $8,000) = $1,600
$2,200

The State of Alaska has a similar law, AS 43.30.049, Residential Fuel Conservation Credit. This credit allows a 10 per cent credit for expenditures up to $2,000. The credit applies to energy conservation improvements and to alternate sources of power generation. The maximum credit is $200.

"to maximize, when possible, Federal monies and all other resources available for energy conservation measures, and renewable energy resource measures"

To date, the most conspicuous use of Federal grant money in Alaska has been for weatherization of houses in rural Alaska. There are numerous Federal grant programs in existence at this time. These include:

* Community Service Administration; funding for this program is provided under Section 222 (a)(12) of the Community Services Act.

* Special Crisis Intervention; funding for this program was provided by a special appropriation to aid low income families in meeting their utility bills as a result of the severe winter of 1976 - 1977. Funds not expended under this program by September 30, 1977 were re-programmed by CSA for home weatherization.

* DOE Low Income Home Weatherization Program; funding for this program is provided pursuant to section 440 of Public Law 94-385.

* Farmers Home Administration Home Weatherization Program; funding for this program is through local utilities. Funds are provided for low interest loans which are repaid through customers utility bill. The program also provides grants to low-income households.

The program has not been implemented to date.

* Health Education and Welfare Home Weatherization Program; this program is made available through the Bureau of Indian Affairs. It has not been used in Alaska to date.

The two main programs in use are the DOE programs and the CSA program. Money from the Special Crisis Intervention Program is included in the CSA program. The DOE program is not designed to be operated independently. The DOE program does not allow expenditures to be made for "repairs" on a house. Many of the homes need repairs before they can be properly weatherized. The other limitation of the DOE program is that labor must be supplied by CETA. Many of the problems have arisen because of CETA. These involve misplacement of funds and the prohibition of a supplemental wage payment for Alaskan labor.

These problems surrounding use of DOE money have been surmounted by using CSA funds to supplement the DOE program. However, CSA funding ends in September 1979 and it remains to be seen if this funding will continue. The Committee has recommended supplementing the DOE program if the need arises.

Besides weatherization, the Federal Government has many other grant programs available. It has been indicated by the State Division of Energy and Power Development that "seed" money is

needed to utilize some of these funds. They are currently working on a proposal related to capturing some of these R & D grants. This will be submitted to the Committee.

3. "to provide the adoption and enforcement of standards to promote the efficient heating, cooling, lighting and ventilating in newly constructed buildings while maintaining local autonomy"

The Committee adopted this policy but amended it to read:

"to provide for the implementation of appropriate regional lighting and thermal efficiency standards in newly constructed residential and commercial buildings, and for retrofitting of existing buildings, while maintaining local autonomy"

This policy is directly related to two Federal Laws. These are P.L. 94-163 Energy Policy and Conservation Act (EPCA), and P.L. 94-385 Energy Conservation and Production Act (ECPA).

Part C of Title III of the Energy Policy and Conservation Act (EPCA) entitled, "State Energy Conservation Programs," authorizes the Federal Energy Administration, now the Department of Energy, to establish guidelines for the development and implementation of state energy conservation programs and to provide federal financial and technical assistance in support of such programs. To be el-

igible for federal grants, state plans must include:

a) mandatory lighting efficiency standards for public buildings;
b) programs to promote carpools and public transportation;
c) mandatory energy efficiency standards and policies to govern local procurement;
d) mandatory thermal efficiency standards and insulation requirments for new renovated buildings;
e) traffic laws or regulations allowing motor vehicles to make right turns at red lights

Optional elements of the state plan include:

a) restriction of hours of operation of public buildings;
b) restrictions on use of decorative lighting;
c) transportation controls;
d) energy conservation public education programs

Based on reports submitted and other available information the DOE is to set energy conservation goals for each state by 1980.

Pursuant to EPCA and in regards to the policy guideline the State Division of Energy and Power Development organized the Lighting and Thermal Efficiency Standards Committee. The Committee ad-

opted the ASHRAE 90-75 standards. DEPD has submitted appropriate legislation to the Committee.

Title III of the Energy Conservation and Production Act requires HUD in conjunction with GSA to promulgate energy conservation standards for new buildings which states and local entities will be encouraged to adopt. These federally - developed standards will not be mandatory unless both Houses of Congress pass a resolution approving implementation of financial sanctions against non-complying jurisdictions. These sanctions would be a prohibition of direct or indirect federal assistance for construction of new buildings and a prohibition of federally insured regulated or supervised banking institutions from making loans for construction of new buildings.

The ASHRAE 90-75R standards have been implemented within the City of Anchorage. The cost increase for initial construction is approximately 5%. The initial cost is amortized after about 2 years.

4. "to encourage the structuring of electric utility rates to promote energy conservation rates which reflect the cost of providing service to each customer class"

The Committee adopted this guideline but amended it to read:

"to encourage the structuring of electric utility rates to promote energy conservation"

Traditionally, utilities have utilized declining block values in determining how to allocate costs to each customer class. This results in the smallest users paying the highest unit price. The common principle behind declining block rates is "value of service." This is a value under which consumers who place a higher value on goods or services are charged more than those who value it less. In general, the residential customer class values utility service more than, for example, an industrial plant which may be able to generate its own power if the cost of service becomes too high.

Most large utilities are regulated by state public utility commissions. Earnings of a regulated utility are held to a "fair and reasonable" rate of return on investment. Simply stated, revenue may not exceed costs... this is the so-called "revenue constraint" in utility rate making. By eliminating a profit incentive, the industry has devised means of expanding their rate base to compensate.

"Value of service" has tended to accomplish this. By charging residential customers a high per unit amount, the utility is able to cross subsidize some larger users. This encourages the larger users to buy more power and keep them from switching

to other sources. It also discourages efficient and conservative use.

The Committee adopted the guideline "to encourage the structuring of utility rates which promote energy conservation." This guideline is consistent with practices which tend away from declining block rates but in not such a direct and immediate manner as alternative proposals. This guideline could lead to "flat rates" where everybody is charged the same amount per unit of power. The guideline could also lead to peak-load pricing whereby rates for power are less during off-peak periods. The Committee made no suggestion as to how to implement the guideline, choosing instead to await the results of the standards implemented under Title I - Retail Regulatory Policies for Electric Utilities which is part of the recently enacted National Energy Plan.

5. "to encourage and require the optimal use of facilities and fuel resources for power generation"

The Committee adopted this guideline but amended it to read;

"to encourage the optimal use of exhaust heat"

This guideline was aimed at encouraging efficient fuel use by utilities and other large industrial power users. With fuel

costs increasing at such a rapid rate, economics are becoming such that it is more attractive to utilize waste heat. Utilities are switching to combined cycle units; institutional barriers are trying to be worked out so industry has the incentive for cogeneration. The Committee wholeheartedly approved this recommendation.

Title IV Policy Guidelines Related to Planning for In-State Power Development

1. "to allow for coordination of state responsibility in planning for in-state power needs and the development of in-state power projects"

This policy was adopted by the Committee, but amended to read;

"to assure for coordination of state and federal responsibility in planning for in-state energy needs and the development of in-state energy projects, and to avoid duplicative and overlapping effort"

The three agencies responsible for state energy planning and regulation are the Alaska Power Authority (APA), the Division of Energy and Power Development (DEPD), and Alaska Public Utilities Commission (APUC). There is also one Federal agency, the Alaska

Power Administration (APA).

The guideline represents recognition of the fact that there should be a coordinated effort between these agencies. The legislature has passed legislation which should help coordinate activities between the APA and DEPD (see HB 442). The Power Authority is a public corporation within the Department of Commerce and Economic Development but with a separate legal existence. The authority can acquire money through the sale of revenue bonds, direct appropriation of state revenues, return of interest on its investment, and by borrowing. The purpose of the authority as stated in AS 44.56.070 is "to promote, develop and advance the general prosperity and economic welfare of the people of Alaska by providing a means of constructing, acquiring, financing and operating power production facilities..."

The Division of Energy and Power Development is basically a planning agency. Its responsibility, as stated under AS 44.33.040 (4), is to "prepare, after public hearings and reasonable consultation with government and other agencies, private companies and associations having a primary interest in it, a plan for orderly and timely development of the state's power resources..."

HB 442 included a provision which relates to the Long Term Power Plan. AS 44.56.224 requires that the Department of Commerce and Economic Development prepare a long-term electrical plan in conjunction with the Authority. The plan, and any revision of it,

must be submitted to the governor for his approval and shall be reviewed by all appropriate state agencies. The plan is then submitted to the legislature.

The Committee acknowledges, with adoption of the guideline, the need for a coordinated effort as is provided under AS 44.56.224. The Committee however, feels that this should be carried out with no duplication and overlap. The Alaska Power Administration (APA) is also involved in a similar effort and annually prepares a power plan. The Committee has also recommended with the guideline that their efforts be coordinated with the APA and DEPD.

One amendment related to the long-term plan that the Committee recommended was an evaluation of power production facilities except nuclear which are economically feasible.

2. "to provide power to all people of the state at reasonable costs"

The Committee adopted this guideline but amended it to read;

"to encourage the availability of energy to all people of the state at the lowest possible rates consistent with good management practices"

This guideline adopted by the Committee was in recognition of

the problem of power availability and cost in rural Alaska. Power for much of rural Alaska is supplied by the Alaska Village Electric Co-Operative (AVEC). Cost to residential customers serviced by AVEC is as high as 37 cents/KWH. Besides the cost, many villages are simply without electricity. Both problems require considerably more work than can be given in this paper.

The recommendation made by the liaison committee to the Energy Policy Committee concerns the use of the Reserve for Energy Development Account. (See AS 37.05.158 plus the attached liaison committee report). The recommendation by the Committee deals with establishing guidelines for use of the account. The legislation presently directs the executive branch to isolate 5% of mineral lease income. The legislation does not provide for the specific use of the funds. The liaison committee has recommended use of the money for expansion of the obligations of the Alaska Power Authority. (See attached subcommittee report).

SECTION V SUMMARY OF LEGISLATION AND STUDIES

This section provides brief summaries and explanations of proposals recommended by the State Energy Policy Committee. The author retains the same format as used earlier.

Title I Policy Guidelines Related to Development and Management

1. "to distribute the risk of development between the State of Alaska and developers of energy resources"

The Committee's recommendation under this guideline was to study the costs and benefits of contracting for exploratory drilling to obtain necessary geological and geophysical data. The Committee expressed the desire that this analysis be done for different levels of pre-leasing work. The following discussion will attempt to formulate a framework for this study.

The effect of the state contracting for oil and gas drilling and seismic data gathering is to separate exploration activities from production. Exploration simply defined involves two major phases: (1) geophysical surveys; and (2) exploratory drilling. More broadly, exploration for oil and gas is the entire process of broad and specific surveys and collection of basic data for an area, followed by detailed geophysical delineation of geologic features and by drilling of holes into potentially productive traps. There is a high degree of economic risk involved in exploration. The Committee's proposal would shift a substantial amount of the risk to the State.

Under current state administration exploration is not separated from production. The first phase of exploration, geophysical surveying is carried on after a firm obtains a miscellaneous

land use permit issued by the Dept. of Natural Resources. These are relatively easy to obtain. Geophysical exploration is a method of mapping subbottom geological forms and features, structures and interfaces to locate potential traps. The principal method used is a seismic or acoustic survey.

Exploratory drilling, the second phase of an exploration program, cannot be carried out on state land until after a lease. This requires a large risk in that it cannot be effectuated until after the bidding process. Under cash bonus bidding the large amounts of capital are expended in obtaining the lease and large amounts of capital are expended on exploratory drilling. The Committee's proposal would obviate most of the risk.

The Committee's request was for a cost benefit analysis for contracting for exploration work of different levels. A similar request was made by Congress to the Office of Technology Assessment. Although similar, the major question addressed in that study was: Is it feasible to separate exploration from production on OCS lands? In OTA's evaluation monetary costs for exploration for different areas were figured, including Alaska, and this was related to effects on present leasing policy.

The major issues looked at in OTA's assessment were:

(1) Public availability of resource information

(2) Public control of resource development

(3) Return to the public

(4) Efficiency of exploration

The study evaluated each of these issues in terms of (1) limited exploration; (2) intermediate exploration; (3) full exploration. A limited exploration program was intended to find all traps with a potential of over 500 million BBL's. The intermediate program was intended to find and delineate both large traps (500 million barrels or greater), and intermediate size traps (over 50 million BBL's). The full exploration program would locate all the traps in a given area.

The study concluded that it was feasible to separate exploration from production, and that more complete information about the extent and location of reserves than is typically available under present leasing policy would:

(1) Afford better estimates of total reserves essential to sound energy policy planning;

(2) Ensure a fair return to the owner of the leased land.

It is the author's recommendation that a more complete analysis of this study and other literature on the subject be made prior to a final recommendation by the Committee. This would allow

the Committee to formulate a more definitive framework for the proposal with specific goals and objectives.

2. "to encourage the development of economically viable renewable energy resources for in-state use"

The proposal under this guideline was to allow expensing of intangible drilling expenses and cost depletion for geothermal wells. This was passed as a provision of the recently passed Energy Tax Act - 1978, as part of the National Energy Plan. The Committee recommended adopting this provision into the state income tax code. However, this proposal needs no committee recommendation or approval as it will be adopted automatically in the state tax code unless the Legislature dictates otherwise. Cost depletion and expensing of intangible drilling costs are tax subsidies.

3. "to insure the orderly and timely development of energy resources, taking into consideration resource marketability"

The suggestion here was to enact a uranium leasing law if this was constitutional. A letter from Committee counsel indicated there would be no constitutional problems if first priority was given on the lease to the person holding a claim.

4. "to insure a fair return to the people of the state for conveyance of state owned energy resources"

The Committee chose to evaluate other states' coal royalty provisions in comparison with the State of Alaska's. Consideration should include the amount of royalty as well as whether the cents/ton method should become a percentage of production. Most royalty payments are figured as a percent of production.

5. "to protect the environment when this is consistent with other provisions of the State Energy Policy"

The Committee recommendation pursuant to this policy was to require Social Economic Environmental Analysis (SEEA) documents to be prepared for all energy related projects which "significantly affect the human environment." A provision similar to this was included in the proposed oil and gas leasing regulations. This proposal will directly affect the Alaska Power Authority (APA), in future construction of their projects, particularly those funded with only state money. It will probably affect Community and Regional Affairs as well. The Committee's proposal would not include projects which have a similar document prepared pursuant to another local, state or federal law. Currently, projects funded by Federal money require Environmental Impact Statements under provisions of the National Environmental Policy Act.

The other recommendation was to oversee drafting of regulations

to implement the Surface Mining and Reclamation Act of 1977.

Some of the proposed regulations demand practices which are totally unsuitable for Alaskan terrain. Some of these are removal of overburden and topsoil which destroys permafrost and water quality standards regarding turgidity and PH. The standards exceed the naturally flowing waters used as mine input. Currently the Division of Minerals and Energy Management (DMEM) is working with the Federal Government on the regulations. Once the problems are overcome DMEM will administer the regulations and Divison of Geologic Survey will be responsible for inspection.

TITLE II Policy Guidelines Related to the Disposition of State Royalties

The Committee made no recommendation under this title.

TITLE III Policy Guidelines Related to Energy Conservation

1. "to encourage and facilitate the implementation of energy conservation measures, for all in-state energy uses"

TAX CREDITS

The first committee recommendation pursuant to this guideline was to consider the impact of replacing AS 43.30.039, Residential Fuel Conservation Credit with the Federal Residential Energy Tax Credit. The state credits allow a 10% credit for expenditures

which do not exceed $2,000. The maximum credit is $200. The credit may apply for energy conservation improvements and alternate energy power development projects.

The Federal Credit is broken into two parts. The conservation credit allows a 15 per cent credit for expenditures up to $2,000. The maximum renewable energy allows a 30% credit for "qualified expenditures" which do not exceed $2,000 plus a credit of 20% for expenditures which exceed $2,000 but do not exceed $10,000. The total credit allowable is $2,200.

In 1977 the Residential Fuel Conservation Credit was claimed on 10,837 returns by Alaskan taxpayers. The total amount of credit received was $796,841. The average credit for each taxpayer who applied was $73.83. This means that the average cost of improvements claimed was approximately $750. 1977 is the only year for which data is available.

With only this data available the staff from the Dept. of Revenue did not think a good estimate could be made in terms of replacing AS 43.30.039 with the Federal Credit. It is unclear whether the state credit was allowed for energy conservation improvements or for alternative energy projects. Also, a single year's return does not provide adequate historical data.

LOAN FUND

The second recommendation was to expand the authority of AS 45.88.010

the Alternative Power Resource Revolving Loan Fund. The fund currently may only loan for alternate energy power projects. Energy conservation measures include insulation, furnace replacement burners, storm thermal windows, caulking, weatherstripping or double glazing of exterior doors, electrical ignition systems which replace gas pilot lights, and other improvements which the Commissioner of Commerce specifies increase the energy efficiency of a dwelling.

One problem has arisen concerning this fund. No money has been appropriated to it. Until an appropriation, the amendments and the balance of AS 45.88.010 are ineffective. The fund is authorized to provide loans up to $10,000 at 8% interest.

2. "to maximize when possible, federal monies and other resources available for energy conservation improvements"

Under this guideline, the Committee recommended supplementing the DOE weatherization program with state money if needed. At present, it is not needed because funds from the Communtiy Services Administration program are being used.

The Committee also endorsed a recommendation to allow the use of state funds as seed money for obtaining federal grants for research and development of alternative energy projects. The Division of

Energy and Power Development is currently working on a proposal for this recommendation. The proposal is to include the amount of seed money needed and to explain what Federal projects this applies.

3. "to provide the appropriate regional lighting and thermal efficiency standards and for retrofitting of existing buildings, while maintaining local autonomy"

The Committee adopted, under this guideline, a proposal to require energy performance standards for new residential and commercial buildings. These performance standards would be promulgated under regulations adopted by the Commissioner of Commerce. They would not specify actual methods of construction and types of material which would be required, but would include statements of requirements, criteria and evaluation methods. No state financial assistance would be approved with respect to any construction which did not meet the standards. These standards could be waived in areas of the state where it can be shown that the cost of implementation is too high.

4. "to encourage the structuring of energy utility rates which promote energy conservation"

The Committee made no recommendation under this guideline except to comply with appropriate provisions of the Public Utilities Regulatory Policy Act of 1978. Title I - Retail Regulatory Policies

for Electric Utilities includes certain ratemaking standards for utilities having annual retail sales in excess of 500 millon KWH. The only utility which this Act applies to in Alaska is Chugach Electric. The ratemaking standards are:

1. Cost of Service. Rates charged by an electric utility for electric service to each class of consumers should be designed to reflect the cost of providing such services to that class. The costs of providing service should be on the basis of methods prescribed by the state regulatory authority (or the utility in the case of a nonregulated utility)* and should permit identification of differences in cost-incurrence for each class of consumers attributable to daily and seasonal time of use of service. The cost determination should also permit identification of differences in cost-incurrence attributable to differences in customer, demand and energy components of cost. The methods of cost determination should take into account the extent to which total costs to a utility will change if capacity is increased to meet peak demand relative to base demand and if additional kilowatt hours of energy are delivered to consumers.

2. Declining Block Rates. The energy component of a rate (or the amount attributable to the energy component) charged by a utility for service to a class of consumers should not decrease as kilowatt hour consumption by that class increases, except to the extent that such a decrease is

justified by a decrease in costs.

3. Time-of-day and Seasonal Rates. Rates charged by a utility for electric service to each class of consumers should, to the extent they are cost-effective, be on a time-of-day and seasonal basis which reflects the costs of providing service to each class at different times of the day and in different seasons of the year, respectively. A time-of-day rate should be considered cost effective if the long-run benefits of such a rate are likely to exceed costs associated with such rates.

4. Interruptible Rates. Each utility should offer its industrial and commercial electric consumers an interruptible rate which reflects the cost of providing interruptible service.

5. Load Management Techniques. Each utility should offer its electric consumers such load management techniques as the state regulatory authority (or the utility in the case of a nonregulated utility) determines will be practical, cost effective, reliable and provide useful energy or capacity management advantages to the utility. A technique should be considered cost effective if it is likely to reduce maximum kilowatt hour demand on the utility and if, in the long-run, the costs saved by the demand reduction exceed the costs of implementing the technique.

6. Lifeline Rates. Title I does not prohibit the adoption of a rate for electric service, lower than the cost of such service, for essential needs as defined by the state regulatory authority (or the utility in the case of a nonregulated utility), or residential consumers.

These ratemaking standards do not supplement or override state utility law or regulation. Nothing in this Title prohibits a state regulatory body from making a determination that a standard is not appropriate for implementation.

5. "to encourage the optimal use of exhaust heat"

The Committee recommended under this proposal that each power generation facility utilize waste heat to as great an extent as feasible as; 1) a condition of obtaining a lease on state land; 2) as a condition of using state royalty oil or gas taken "in-kind"; 3) for pipeline right of way over state land. The degree to which utilization of waste heat is feasible shall be determined by regulation adopted by the Commissioner of Commerce and Economic Development.

Title IV <u>Policy Guideline Related to Planning for In-State Power Development and Use</u>

The Committee recommended amending AS 44.56.224 (Long-Term Plan) to require that equal consideration be given to all types of power generation production facilities (except those based on nuclear fuels) which are technologically feasible. The plan must promote efficient use of facilities and fuels consistent with energy conservation goals. This plan is prepared by DPDP in conjunction with the APA.

2. "to encourage the availability of energy to all people of the state at the lowest reasonable rates consistent with good management practices"

The recommendation under this guideline is presented in the Appendix as a report from a liaison committee to the State Energy Policy Committee.

THE RESERVE FOR ENERGY FACILITIES DEVELOPMENT ACCOUNT

A Report to the State Energy Policy Committee

From the Liaison Group
Rep. Jim Duncan
Rep. Ernie Haugen
Rep. Leo Rhode, Chairman
Senator Bill Ray
Senator Ed Willis

Prepared under contract with the Legislative Affairs Agency

By Mike Doogan

INTRODUCTION

The Liason Group was formed during the interim to recommend to the State Energy Policy Committee uses of the Reserve for Energy Facilities Development Account (REFDA).

At its November 29 meeting, the Liason Group reached the decision to recommend that the REFDA proceeds be appropriated to the Alaska Power Authority's Power Project Revolving Fund, where they could be used to assist in the construction of power projects.

This decision was based on three considerations.

First, the Alaska Power Authority is the agency created to give direct state assistance to power project development in Alaska. As such, it is most appropriate agency to receive REFDA proceeds. Of the financing tools available to the power authority, the Power Project Revolving Fund is the most flexible because loans can be made through it.

Second, most of the testimony presented to the Liason Group favored this approach.

Third, this decision is consistent with energy policy guidelines approved by the State Energy Policy Committee, particularly:

TITLE I Policy Guidelines Related to Development and Management

1. "to distribute the risk of development between the State of Alaska and developers of energy resources"

2. "to encourage the development of economically viable renewable energy resources for in-state use"

and:

TITLE IV Policy Guidelines Related to Planning for In-State Power Development and Use

2. "to encourage the availability of energy to all people of the state at the lowest possible rates consistent with good management practices"

The Liason Group determined that additional legislation was necessary to implement its decision. On December 19, the Liason Group, through the Legislative Affairs Agency, entered into a contract with Mike Doogan to oversee the preparation of the legislation and to write this report to the State Energy Policy Committee.

THE RESERVE FOR ENERGY FACILITIES DEVELOPMENT ACCOUNT: STRUCTURE AND PURPOSE

In passing legislation (FCCS SCSHB 222) revising the procedures for planning and funding of capital projects, the second session of the 10th Alaska Leg-

islature created the Reserve for Energy Facilities Development Account.

The pertinent section of the law is sufficiently brief to be set forth in its entirety. It reads:

> Sec. 37.05.158 GENERAL FUND: "RESERVE FOR ENERGY FACILITIES DEVELOPMENT" ACCOUNT. (a) There is created within the general fund the "reserve for energy facilities development" account.
>
> (b) Five per cent of the annual receipts paid the state from mineral lease bonuses and rentals for state land and royalties derived from minerals produced on state land shall be allocated to the reserve for energy facilities development account.
>
> (c) The proceeds of the reserve for energy facilities development account shall be subject to annual appropriation by the legislature. Plans for expenditures from the account shall be submitted by the governor in accordance with the Executive Budget Act (AS 37.07) as part of his annual budget presentation.

Several facets of the REFDA are noteworthy.

First, the REFDA is an account, not a special or dedicated fund. As such, it should be isolated as an accounting line in the general fund and its proceeds should remain in the general fund until appropriated.

Second, the REFDA proceeds come not from taxes and licenses but from mineral lease income. Dedicated funds, such as the Alaska Permanent Fund and the Renewable Resources Development Fund, have the same funding source. In fact, the REFDA and the Renewable Resources Development Fund receive similar shares (five per cent) of this mineral lease income.

Third, the REFDA proceeds are subject to the same

annual allocation and appropriation procedures as other general fund money.

Fourth, no language exists --- other than the title of the account --- directing the REFDA proceeds to a particular project or type of project.

THE RESERVE FOR ENERGY FACILITIES DEVELOPMENT ACCOUNT: STATUS AND SIZE

There is currently, in one sense, no REFDA.

The law directs two actions by the executive branch involving the REFDA: the isolation of five per cent of state mineral lease income within the general fund and the inclusion in the governor's budget of plans for the use of these REFDA proceeds. As of this writing, there is no REFDA isolated within the general fund and the governor's FY 1980 budget contains no plans for the use of REFDA proceeds.

Since the REFDA has not been isolated, no figure is available for it. But, since the REFDA and the Renewable Resources Development Fund have similar revenue sources and shares, the figure projected for the Renewable Resources Development Fund should equal the projected REFDA proceeds.

Based on figures found in Revenue Sources FY 77-79 (September Update), projected FY 1980 REFDA proceeds are $15,275,000.

In addition, there may be more REFDA proceeds

available for appropriation this year. The REFDA's effective date was July 1, 1978, the first day of fiscal year 1979. Since the REFDA proceeds should therefore have been isolated for FY 1979, and since no appropriation of those proceeds was made in the FY 1979 budget, it may well be that they are available for appropriation this year. This would mean, according to the same figures as those cited above, an additional $13,660,000, for a total of $28,935,000.

THE ALASKA POWER AUTHORITY: STRUCTURE, PURPOSE AND POWERS

Before detailing the Liason Group's recommended legislation, its is necessary to take a brief look at the current status of the Alaska Power Authority and its Power Project Revolving Fund.

The Alaska Power Authority (defined in AS 44.56) is a public corporation in the Department of Commerce and Economic Development but with a separate and independent legal existence. It is governed by a five-member board consisting of the Commissioner of Commerce and Economic Development and four at-large members appointed by the governor and confirmed by the legislature.

Amendments passed during the second session of the 10th Alaska Legislature (SCS CSHB 442) broadened the scope of the power authority. Its purpose, as amended, is:

> Sec. 44.56.070 PURPOSE OF THE AUTHORITY. The purpose of the authority is to pro-

> mote, develop and advance the general prosperity and economic welfare of the people of Alaska by providing a means of constructing, acquiring, financing and operating power production facilities limited to fossil fuel, wind power, tidal, geothermal, hydroelectric or solar energy production and waste energy conservation facilities.

To achieve this purpose, the authority is given a wide range of corporate powers, including the power to select or reject projects to receive assistance according to regulations it promulgates.

If the authority chooses to assist a project, it has a wide range of financial options to work with.

The authority can acquire money through: the sale of revenue bonds, direct appropriation of state funds by the legislature, return of interest on its investments, borrowing, and receipt of funds under contractural agreement.

In return, the authority can give financial assistance through: performing services, purchasing project bonds, selling its own bonds for a project, and making loans to a project through the Power Project Revolving Fund.

There are, however, constraints on these powers of the authority. Its operating and capital budgets are subject to the Executive Budget Act. Issuance of revenue bonds and promulgation of regulations are subject to approval by legislative resolution. The authority is

subject to annual audit and it must, before March 1 of each year, submit an annual report to the governor and legislature. Finally, it is subject to Alaska's public records and open meetings laws.

THE POWER PROJECT REVOLVING FUND: STRUCTURE, PURPOSE AND SIZE

The Power Project Revolving Fund (AS 44.56.170, as amended by SCS CSHB 442) is a separate fund managed as a trust by the power authority. It is designed to allow the authority to offer loans to projects. Money in the fund comes from legislative appropriation and the return of principal of and interest on previous loans.

By law, the authority can make loans from the fund to electric utilities, regional electric authorities, cities, boroughs, regional and village corporations, village councils and nonprofit marketing cooperatives. Loans may be made for everything from feasibility studies (some of which may be forgiven) on to construction of small-scale power production or conservation facilities and potable water supplies.

The authority may establish loan rates and terms by regulation, with the exception of loans made to projects carrying loans from the Water Resources Revolving Loan Fund (AS 44.56.170(f) contains terms for these loans). A copy of regulations adopted by the authority but not

yet in force is attached to this report.

To date, the Power Project Revolving Fund has received and loaned slightly more than $1 million. An account of these transactions, prepared by the power authority, also is attached.

PROPOSED LEGISLATION: AN EXPLANATION

The Liason Group found three types of legislation necessary to implement its decision to appropriate the REFDA proceeds to the Alaska Power Authority's Power Project Revolving Fund.

Amendments to the REFDA

First are two versions of an amendment to the Reserve for Energy Facilities Development Account (AS 37.05.158), designed to strengthen the intent of the previous legislature that the REFDA proceeds be used for the development of energy facilities. As was pointed out previously, only the title of the REFDA now expresses this intent.

The first version (attached as Section 1 of WO #5992) requires that the REFDA proceeds be appropriated only for the construction of power projects.

The second version (attached as Section 1 of WO #5986) requires that the REFDA proceeds be used for the construction of power projects unless those proceeds are otherwise appropriated by the legislature.

Neither of these amendments is thought to be binding on future legislatures (see attached memorandum from Donna Spragg Pegues). Indeed, the constitutional prohibition against dedicating funds may make it impossible to impose such a constraint on the REFDA. Ms. Pegues' memorandum offers a third amendment option for consideration.

Amendments to the Power Project Revolving Fund

Second are two amendments to the Alaska Power Authority's Power Project Revolving Fund (AS 44.56.170). These are attached as Section 2 of both WO #5986 and WO #5992.

The first amendment adds a subsection (g) which requires a finding that the applicant's only financing option is a loan from the fund. It also requires that if a subsidy of loan payments is necessary, such a loan cannot be made unless the amount of the subsidy is available to the authority.

The second amendment adds a subsection (h) which allows the authority to set up an account for the purchase of revenue bonds in the Power Project Revolving Fund. Under the amendment, the authority may purchase such bonds secured by a subordinate pledge of revenues from the project being financed. (Please note changes made in the draft legislation by this writer.)

Additional Definitions

Third are two definitions added to the Alaska Power Authority Act (AS 44.56.230). These are attached as Section 3 of both WO #5986 and WO #5992.

The first definition, added as (8), is of "small-scale", a term used in the current statute but not defined. This definition would allow the authority to finance currently feasible hydroelectric projects of a moderate size.

The second definition, added as (9), is of "construction costs", a term used throughout the new subsection (g) added to AS 44.56.170.

Appropriations Bill

Fourth is a draft appropriations bill (attached as WO #5991). This is presented merely as a model, since there are a variety of methods for appropriating all or part of the REFDA proceeds to the Power Project Revolving Fund. It is included simply to point out the necessity of an appropriations vehicle to transfer the proceeds.

Original sponsor: State Affairs Committee

Offered: 5/28/77
Referred: Rules

IN THE HOUSE BY THE RESOURCES COMMITTEE

SENATE CS FOR CS FOR HOUSE CONCURRENT RESOLUTION NO. 67

IN THE LEGISLATURE OF THE STATE OF ALASKA

TENTH LEGISLATURE - FIRST SESSION

Relating to the development of a comprehensive state energy policy.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS the President of the United States has recently directed attention to the critical problems involving the conservation, production and development of energy resources of the nation, offering for the consideration of Congress and the American people a Comprehensive National Energy Policy Plan; and

WHEREAS, with its reserves of oil, gas and coal, abundant tidal and hydroelectric sources, and unique opportunity to utilize other renewable energy factors such as wind, solar, and geothermal power, the State of Alaska enjoys a preeminent position as a supplier of a major portion of the nation's energy resources through the next decades and an unparalleled opportunity similarly to develop and implement a realistic state energy program to meet future residential, commercial, transportation and other demands; and

WHEREAS increasing domestic energy demands, coupled with rising production and processing costs and transportation requirements and expenses, severely burden Alaskans and hence require the development of a comprehensive energy policy to meet the needs of the people of the state; and

WHEREAS the development of a comprehensive state energy policy should involve the executive and legislative branches of government on a cooperative basis, with opportunity for public participation and comment, in a forum which will examine alternative courses and lay the groundwork for subsequent action;

BE IT RESOLVED by the Alaska State Legislature that there is established

a temporary State Energy Policy Committee composed of the following members to identify the problems and initiate solutions with respect to the development of a viable state energy policy:

(1) three members of the Senate appointed by the president;

(2) three members of the House appointed by the speaker;

(3) the commissioner of commerce and economic development or his designee;

(4) the commissioner of natural resources or his designee;

(5) four members appointed by the governor, one of whom shall represent each of the following public interests: consumer concerns, conservation interests, public utilities, and the state's nonrenewable energy resource industry; and be it

FURTHER RESOLVED that the committee established by this resolution shall through a process which examines in detail the individual efforts to develop Alaska's domestic energy resources, including the protection and development of the state's nonrenewable resource reserves, and only after opportunity for public participation, make a preliminary report not later than January 1, 1978, and a final report not later than January 1, 1979, to the governor and the Legislative Council on its recommendations with respect to development of a comprehensive state energy policy, including but not limited to, coordination of state plans and programs with the national effort, the timely and proper development of additional nonrenewable resources and their transportation and delivery to the markets of the state and nation, the effects of state and federal energy regulatory functions and pricing, and the development of alternative renewable energy resources on a regional or community basis especially in rural areas of Alaska, and that the committee's report formulate guidelines and suggest the means by which to marshal additional resources to maintain a continuing energy planning and development program; and be it

FURTHER RESOLVED that the committee may proceed in its work through the establishment of one or more subcommittees; that, with the consent of the governor, it may apply for federal, state and private financial assistance to undertake and complete its work; and that the committee may extend an invitation to representatives of any agency of the federal government concerned with energy planning and development to serve as ex officio members of the committee.

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