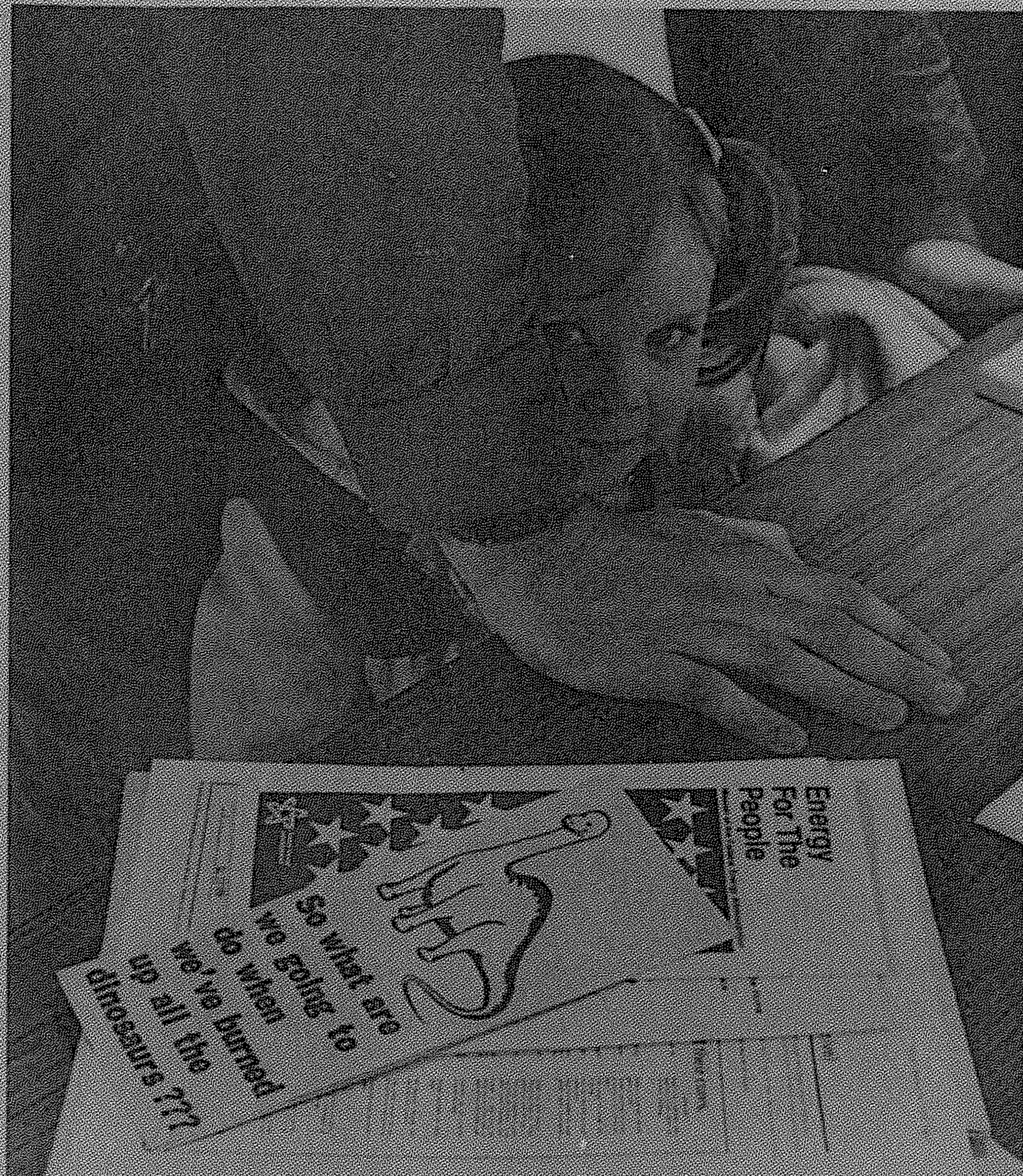
A TOWN MEETING ON ENERGY



A summary in photos and text of a community forum held at Hutchinson Career Development Center, Fairbanks, Alaska, on Saturday, March 26, 1977.

A TOWN MEETING

ON

ENERGY

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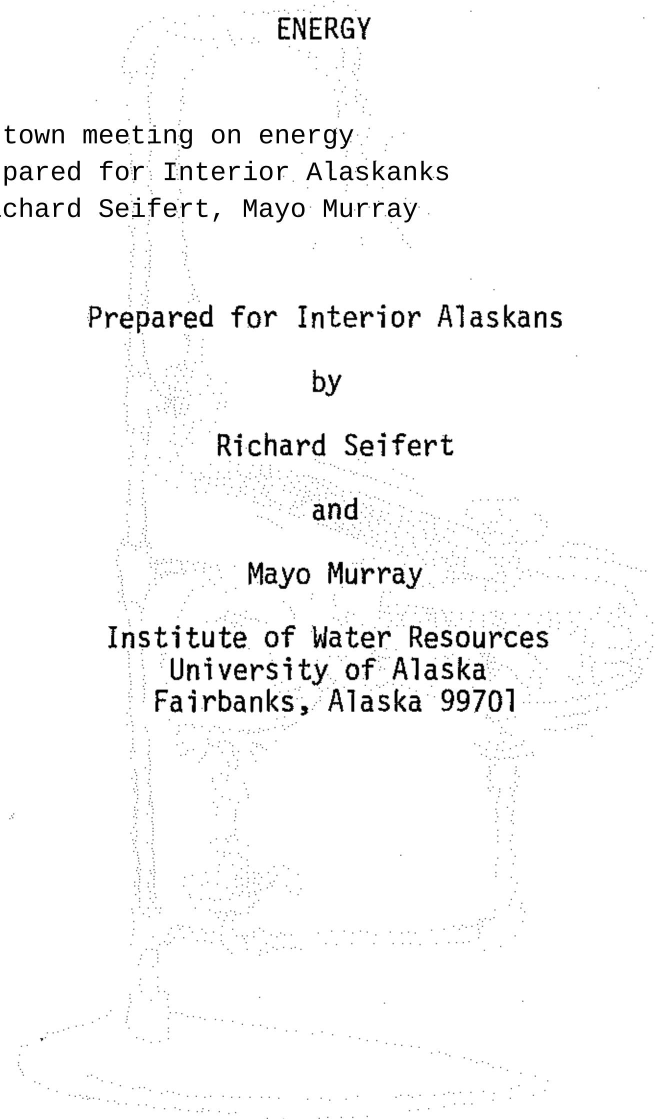
Prpared for Interior Alaskanks
Richard Seifert, Mayo Murray



Prepared for Interior Alaskans

by

Richard Seifert

and

Mayo Murray

Institute of Water Resources
University of Alaska
Fairbanks, Alaska 99701

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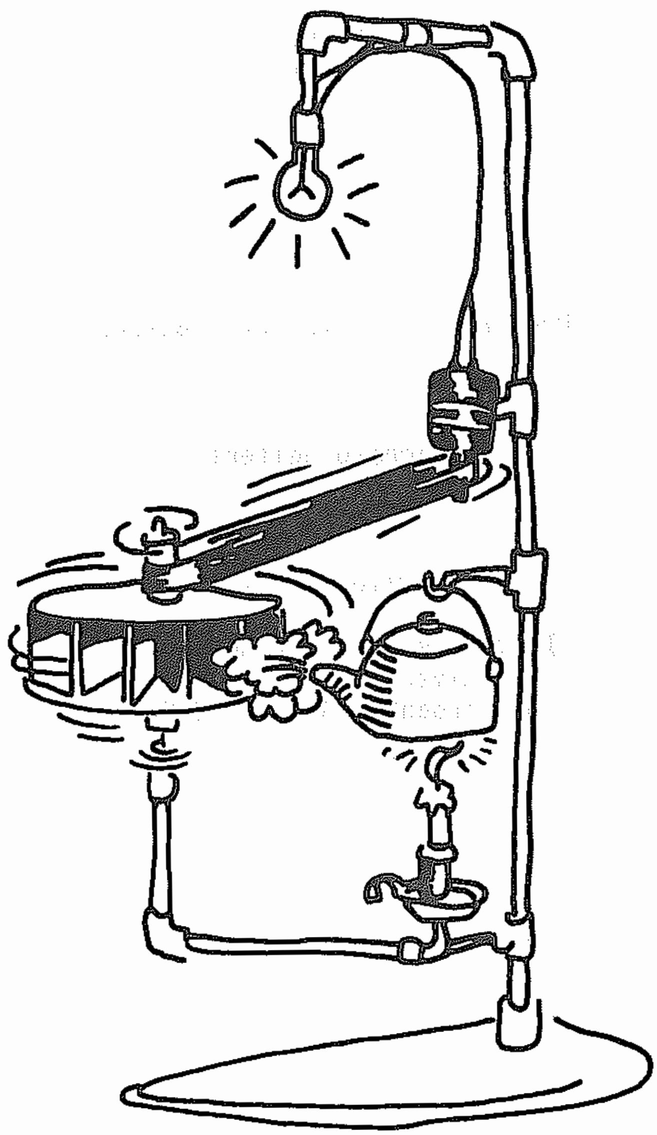

PREFACE

On March 26, 1977, an all-day Town Meeting on Energy was held at the Hutchison Career Development Center on Geist Road in Fairbanks, Alaska. This event was sponsored by the Alaska Humanities Forum in cooperation with the Fairbanks North Star Borough School District; the Institute of Water Resources at the University of Alaska, Fairbanks; and the Fairbanks Town and Village Association. This publication reports the activities during and the information resulting from this town meeting.

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ACKNOWLEDGEMENTS

Many people were instrumental in the planning and success of the Town Meeting on Energy; they contributed to the project in innumerable ways and their positive reactions were welcome and consoling. The efforts of the following people were especially appreciated: Mike Kelly, John Dunker, Ray Morgan, Myron Tisdel, Jerry Smetzer, Larry Holmstrom, Ron Inouye, Morna Seifert, Claus Naske, Frank Mueller, Morris Morgan, Niilo Koponen, Charlotte and Jerry Hok, Phil Deisher, and Ron Howenstein. Special thanks go to Meg Hayes and Tom Weingartner for their extra efforts and encouragement. Axel Carlson took a day out with a computer terminal to be with us at the Town Meeting. The committee also wishes to thank Susan Azzara, Mary Hayes, and Sheila Finch for their secretarial assistance. Sue Fison's and Don Moore's special efforts to produce a consumer price comparison for energy sources in Fairbanks were more than we could have hoped for. Dr. Andrea Helms, a true humanist, was a pleasure to work with! Thanks also to the staff of the Institute of Water Resources, especially Dr. Bob Carlson for the institutional support of this project. The Fairbanks North Star Borough School District and the Fairbanks Town and Village Association for Development also sponsored the program.

The following officials attended the Town Meeting on Energy; and we would like to express our thanks to them for taking the time and effort to be with us: Doug Lowery, DEC, Fairbanks; Carolyn S. Guess and Susan Knowles, Commissioners, Alaska Public Utilities Commision; O. K. Gilbreth, Director of the Division of Minerals and Energy Management; Maj. Leo Laska, Ft. Wainwright, representing the Corps of Engineers; Eric Lee, Director, Division of Community and Rural Development; Bill McConkey, Jim Frederickson, Joan Charles, State Division of Energy and Power Development; Allen Linn, Alaska Division of Agriculture, Department of Natural Resources.

The committee wishes to acknowledge the support and enlightened advice of the Alaska Humanities Forum, an agency of the National Endowment for the Humanities. Because of them, energy use and development is now more clearly recognized as a human problem, not something outside us or beyond our control, but an essential part of our culture, which we have chosen. We have had a chance to ask the right questions. That was one of the major hopes of this project.

Town Meeting photographs are by Paul Helmar. Enid Cutler graciously allowed us to select sketches of the Town Meeting activities, which she made during the events, for inclusion in this publication. The sketch

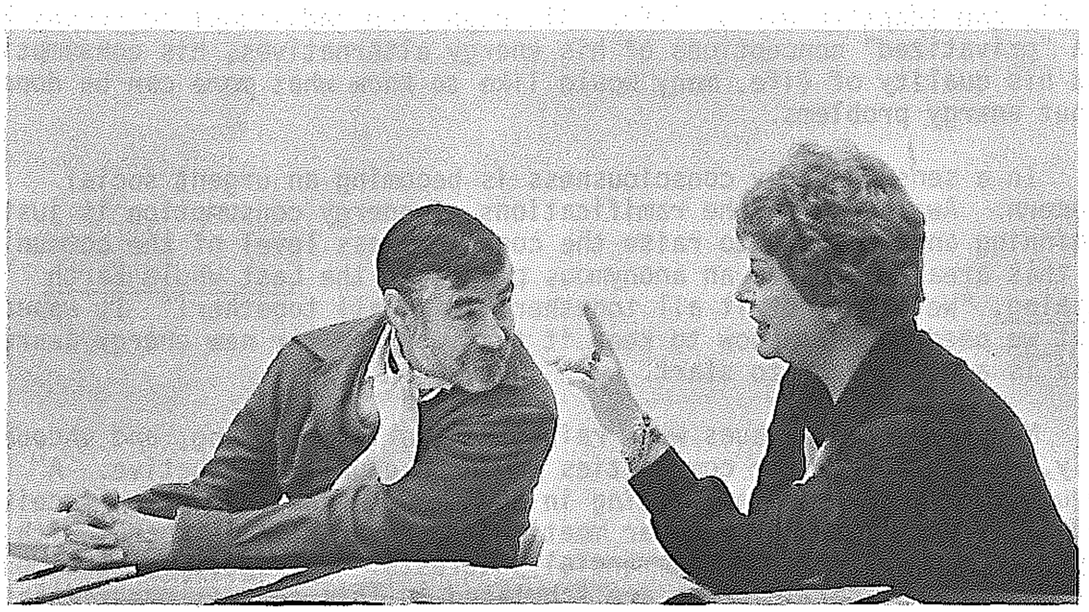
of the "Rube Goldberg" device, which was used through the project as a symbol was drafted by Keith LaChance.

If you have any further questions or comments, please call any of the following people:

Rich Seifert, 479-7987, Institute of Water Resources, University of Alaska

Jerry Smetzer, 452-4761, Fairbanks Town and Village Association, 522 Fifth Avenue, Fairbanks, Alaska 99708

Andrea Helms, 479-7609, Political Science Department, University of Alaska.



FOREWORD

Dear Interior Alaskan:

It is always difficult to commit to paper an adequate record of a public meeting. All the subtleties and levels of communication are lost when the proceedings are in black and white. However, since the consumption of energy is inherent in nearly all modern activities, especially in interior Alaska, we feel a presentation of the proceedings is a necessary part of this educational endeavor. With photos, sketches, text, and commentary, we have tried to relate the atmosphere, attitudes, and social interactions of the 350-400 people who attended the Town Meeting on Energy.

The objective of this town meeting was to provide an opportunity for many people to take a day out to reflect, discuss, and learn with each other what makes an energy-efficient society, community, and home. We tried to determine where we are today in achieving those goals, and how each person might help himself to achieve a more realistic, economical, and adaptive way of life. Although each individual possesses his own "privatized" conceptions of his energy alternatives, his consumption, and his quality of life, many would like to know what more can be done about energy problems.

In a sense, energy consciousness is becoming an urgent social concern. Awareness of the ramifications of energy consumption is just beginning and we hoped to raise the consciousness level of the community in this area. To quote an anonymous phrase in the Last Whole Earth Catalog, "We can't put it all together, it is all together!" It appears that we need to learn how to keep it that way and our new energy awareness is a good place to start.

Many important issues were raised at the Town Meeting, and undoubtedly, meetings in other communities would be equally productive. A request to hold a similar meeting in Anchorage has already been received and it is possible that another meeting may be held in Fairbanks with expanded participation by commercial interests. The specific recommendations made by participants are tabulated in this text as questionnaire responses.

Our climate and our geographic isolation serve to make our resource dependence much more obvious to us than it is to citizens in more temperate climates. We are closer to the margin of existence. The climate naturally exacts a price from the lives of interior Alaskans and we have always responded with diverse, flexible, and creative ways to live within our limitations. Fossil fuels have protected us from environmental pressures somewhat, but because we are not able to depend on any person or utility to come to our rescue, we still have a fundamental independence and self-reliance here in interior Alaska.

Although Alaska has an image Outside of being incredibly energy rich, we are, in fact, energy poor because more than half our refined products come from outside Alaska. We are at the end of a long umbilical cord on which it may not be wise to rely.

So many factors concerning energy in Alaska need to be discussed. Without doubt, much of Alaska's future is inextricably tied to energy resource development and use. Living, transportation, and fuel costs; ice fog; carbon monoxide; wages; unemployment; and political and environmental controversy are all directly tied to energy use and development.

No matter what we have or have not done here with our Town Meeting on Energy, it is only one chapter in an evolving story of Alaska's future, a future in which we each have an enormous interest. The town meeting was expressly designed to involve as many diverse elements of the community as possible. The discussion topics were carefully selected and worded so as to be of maximum relevance to Fairbanks and interior Alaska. It was felt that the participants were best equipped to decide what needed to be discussed so we avoided total planning of the discussion and, rather, made broad suggestions. We wanted only to provide an opportunity for discussion, not to direct it. A brief overview of the discussion follows.

In addition, realizing that not everyone is interested in discussions or is comfortable in a group interaction, a display area in which information on local utilities, home appliance consumption, automobile expenses, and home heating was also organized. The area entitled the Ben Franklin/Rube Goldberg Room was especially designed to appeal to local citizens who are of an inventive and resourceful nature and who have tried to solve some of the problems of energy use in their own ways. All of these events are described further in the brief overview which follows.

Coordinating Committee
The Town Meeting On Energy

INTRODUCTION

Whenever a public forum such as the town meeting is presented, the question "What's it all about?" is often encountered. Here are the goals we sought.

1. First, and most important, we sought a substantial public education effort. There is a wealth of expertise in our resource people and our community which needed an opportunity for expression.

2. The gathering of people to address this critical subject area, energy, is an experience in the democratic process. We regard such public forums as healthy and vital to the "informed citizenry" ideal of our country. This is the reason we chose the name Town Meeting, reminiscent of the traditional New England town meeting, which we felt we could emulate here.

3. There is no substitute for direct person-to-person communication. Since many state and local officials were present at the meeting, the opportunity for otherwise unarticulated needs and aspirants of the public could be described to these officials.

Some questions to which the discussion were addressed included:

A. Electric Utilities and Energy Suppliers

   1. What is the reason for steadily rising electric rates?

   2. Who is to blame?

   3. What is the future outlook?

   4. What are our choices?

B. Energy Conservation and Growth

   1. What is the relationship of energy conservation and employment?

   2. Will we need to sacrifice? If so, what and when?

   3. What are or should be our limits to growth?

   4. How much can conservation help our energy problems?

C. Self-Sufficiency

1. Should we strive to be self-sufficient in energy? If so, at what level? State? Local? National? Individual?

2. How might each of us become more self-sufficient if we choose to?

3. Are there trade-offs?

D. Energy - What's its Value to Us - Social, Fiscal, and Environmental Trade-offs:

1. What social costs do we incur in making certain energy source choices and developments?

2. Should environmental regulations be forfeited for rapid resource development or for any other reason?

3. How much subsidization or public costs are associated with energy use and development?

4. What is energy worth?

E. Transportation and Rural Problems:

1. What can we do to improve transportation and its efficiency?

2. What can we do to improve rural transport and energy problems?

3. Are there changes ahead for the automobile? If so, how will such changes affect automobile purchase prices and operating costs?

4. What's the outlook for air transport and river traffic?

F. Energy and Agriculture:

1. What are the alternatives for agricultural development in interior Alaska?

2. What is the energy intensiveness of various agricultural crops?

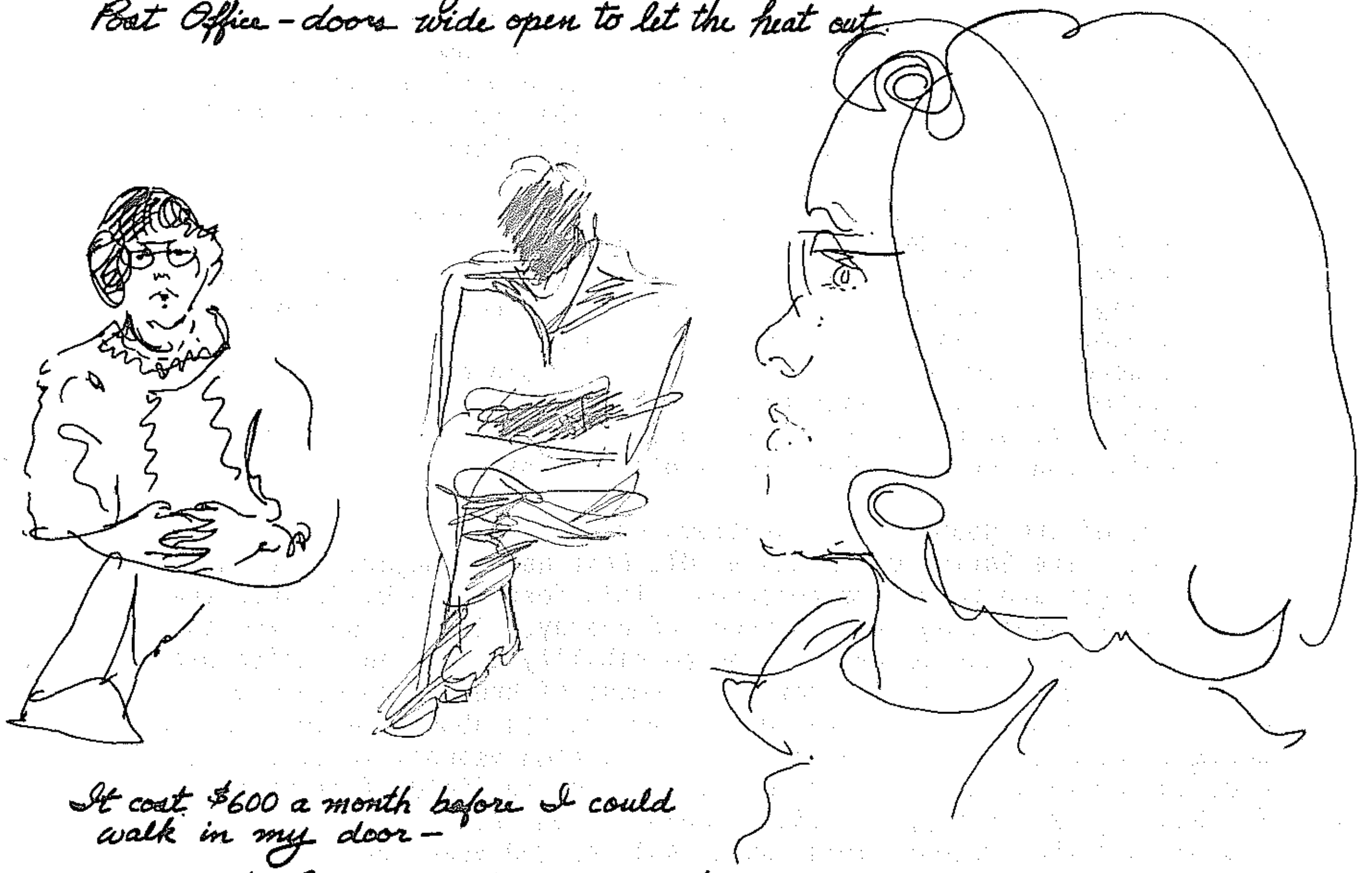
3. Will agricultural development be energy efficient and lower food costs?

Each of the six discussion groups tried to take down and extract from their disucssions the important elements. These abstracts of the discussions follow here. Following each of the discussion group summaries are some of the additional resource packet materials relevant to those discussions.

A. Electric Utilities and Suppliers of

ENERGY

We have to change our whole mentality
But it is not so easy
Post Office - doors wide open to let the heat out



It cost $600 a month before I could
walk in my door -
Now on the Chena - inconvenient for this is shopping
Cost to walk in my door cut 2/3.
Got me to look at the dollar sign.

Moderators: Charles Behlke, Eb Rice.
Resource Persons: Mike Kelly, Bob Burg, Charles Parr, Joe Usibelli, Leo Laska, Herb Melchior, Dan Hawkins, Staples Brown, Norm Sefer.

GROUP DISCUSSION

This first group concentrated on electric utilities and energy suppliers in Fairbanks and their relationships. As the discussion began, many questions were posed regarding what those of us can do who are on electric heat and the efficiency of wood as a heat source. Concerning our options, the discussion centered around the choice between mine-mouth and in-town plants for generating electricity from coal. As a result, some questions were asked and discussion ensued concerning the Susitna River Dam project. This project would result in a large hydroelectric dam on the upper Susitna River.

Two of the suggested future options for Fairbanks were mine-mouth generating plants in the Healy area close to the coal field and the use of heat pumps in town to capture waste heat from the MUS power plant. Interestingly, a statement was made that waste heat from the MUS facility is enough to heat every house in Fairbanks. Also, if the Susitna project were to come on line, electric heat would be a good idea because, for $110,000,000, six billion kilowatt hours of power could be generated. The possibility of using local gas turbines which will be needed even after major coal or hydroelectric plants are installed was also described.

Some of the geopolitical problems of energy use in Alaska were discussed. The Soviet Union and Middle East have a majority of the remaining gas and petroleum reserves. This forces the U. S. into the position of developing other sources of energy. It was suggested that coal is a good place to begin. The possibility of nuclear fusion was also discussed. A plea for the development of breeder reactors was made. It was pointed out that North America has about one third of the world's resources putting us in a fair position geopolitically. The question arose as to how much coal in the Nenana field, from which Fairbanks gets its supply, still remains. Joe Usibelli of Usibelli Coal stated that the present field could last for 250 years or perhaps less. He noted, however, that local coal is not competitive on the international export market and for that reason would probably remain available to the Fairbanks community for an extended period of time.

In the way of alternative sources of energy for electricity, conversion of wood waste to charcoal was suggested. Apparently this is already done economically in the lower 48 states.

Discussion moved on to the subject of conservation of energy, including insulation and specifications for insulation, types of insulation which are advisable, and the ways in which energy conservation might result in decreased pressure on electrical utilities for the production of power. Many of the finer factors in the engineering of homes and commercial facilities were brought out, such as how much humidity we should provide for, how much insulation is correct, whether we should pressurize buildings, or whether we should vent fossil fuel burning furnaces. As to venting of any combustion in a house, many of the resource people suggested strongly that any combustion in a house must be supplied with outside air, preferably with its own source so that air is not sucked into the house through door sills, window sills, or other leaks.

In the afternoon session discussion began with a description of the wave and tidal power possibilities for Alaska. Interior Alaska, of course, has no such possibilities, however, the large tidal amplitudes of Cook Inlet offer a strong possibility for such development; in fact, almost seven percent of the nation's power could come from a Cook Inlet Dam across the forelands of Cook Inlet.

Discussion then proceeded to the subject of solar power. The question of solar power always concerns the problem of storage; if only we had a way to store summer weather for use in the winter. We can do this on a short time scale very easily. However, long periods cf times involve complex problems and large storage areas. Bob Roggasch gave a presentation on his plans for a solar house. His house has an insulating factor of R-63, and he has completed many subtle and interesting engineering projects using lots of reflective aluminized paper. He pressurizes his house and he also uses 10 1/2 inches of urethane foam powder for insulation. It is Mr. Roggasch's plan to make his home totally solar powered over the next year. He feels that he must be able to store 2/3 of a year's supply of heat and in order to provide solar heat to his home. He allows no waste air but rather reconditions it, rehumidifies it, reheats it, and then recirculates it. Roggasch gave the following paraphrase of his philosophy. "A house has to be regarded as a space ship. It must be self-sufficient to the extent possible with no concept of waste, in the same sense it should also not be a liability on you but should provide you with life, rather than extracting from yours." Roggasch feels that the home industry in this country is one of the most backward.

The next phase of discussion centered on the question of "what ought we do to reduce our energy demands." Several suggestions were made such as inverting the rate structures so as not to give any incentive to large-scale users of power, using the cost/price basis for forming a rate structure, and using whatever economic incentives that could be creatively used to limit the consumption of power without necessarily decreasing the standard of living.

Supplemental Information

on

Electrical Energy*

> Civilization in this country,
> according to some,
> would be inconceivable
> if we use only, say,
> half as much electricity as now.
> But that is what
> we did use in 1963,
> when we were at least half
> as civilized as now.
>
> — AMORY LOVINS

*A complete overview of electric utilities in Fairbanks can be found in Chapter 5, pages 41 through 56, Fairbanks North Star Borough Impact Information Center, Special Report Number 5, March, 1977. This publication is available for distribution from the Institute of Water Resources, University of Alaska, Fairbanks, Alaska 99701. There is no charge for these copies.

HYDROELECTRIC POWER DEVELOPMENT--DEVIL CANYON & WATANA

A Potential Power Project of the Army Corps of Engineers

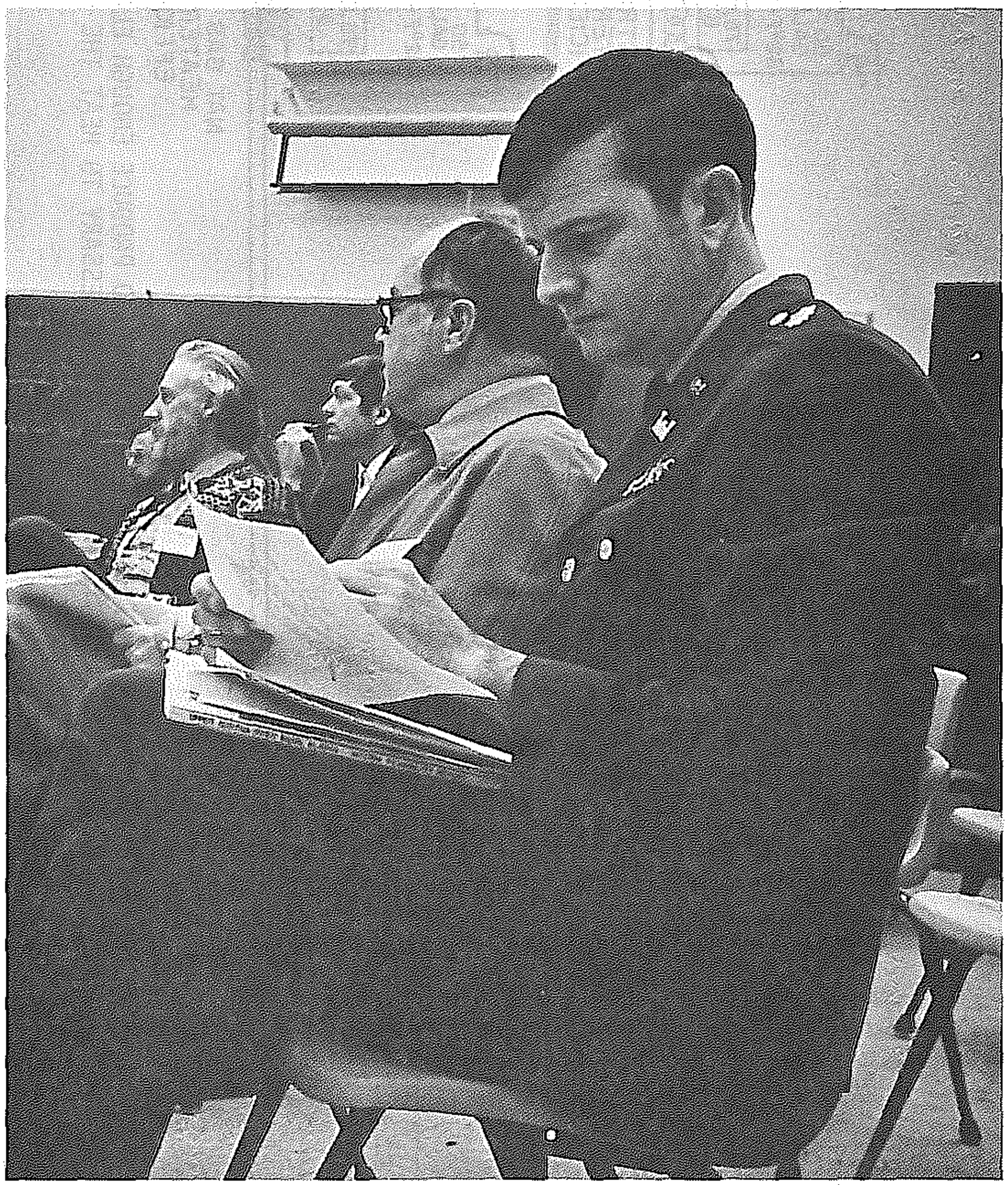
By direction of Congress, the Alaska District of the Corps of Engineers has studied the feasibility of developing the hydroelectric potential of the Upper Susitna River as a means of supplying energy for the rapidly expanding power demand of the Southcentral Railbelt Area of Alaska. This system could provide at least 6.1 billion KWH of energy annually, equivalent to consumption of some 10.7 million barrels of oil per year.

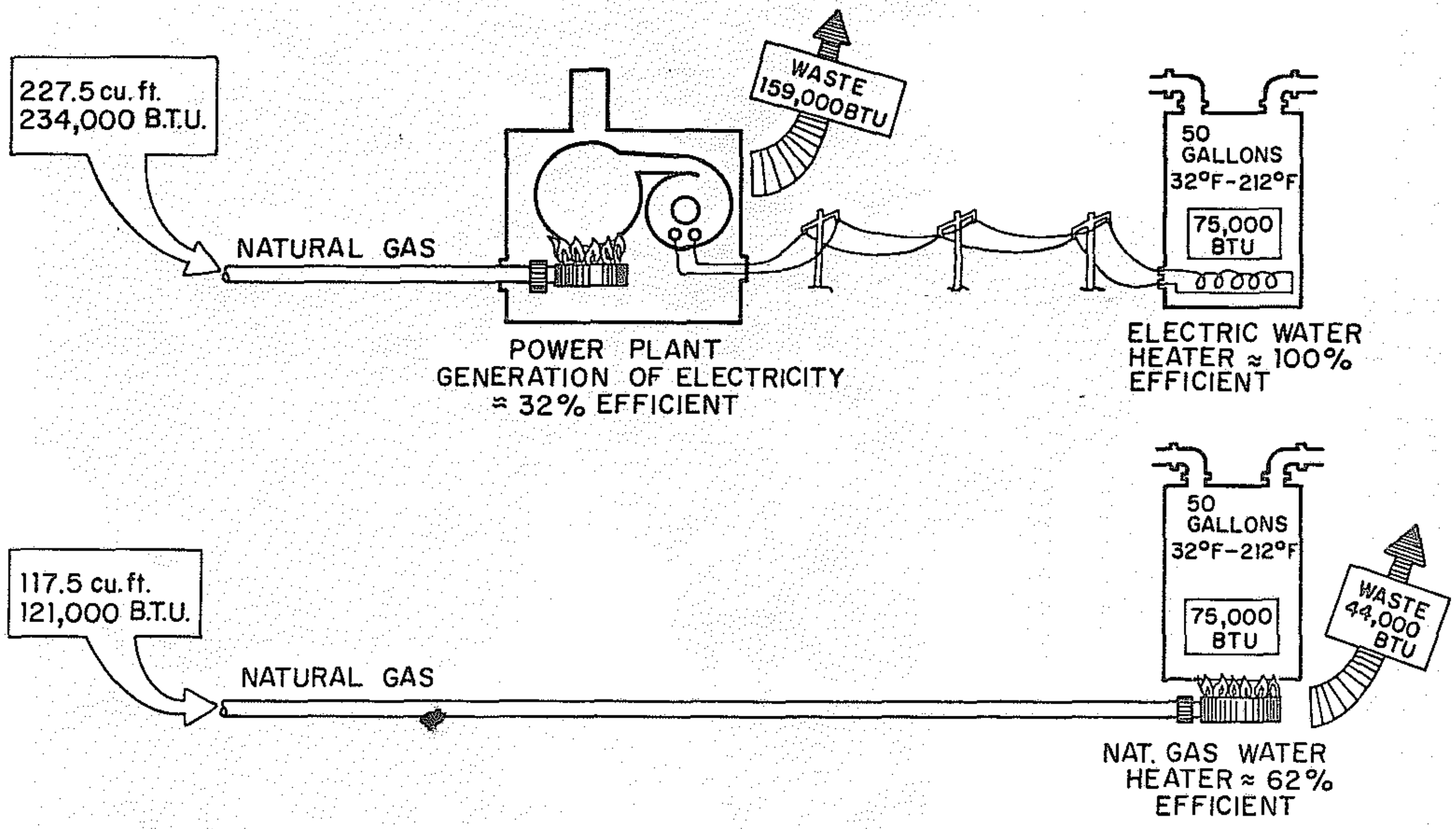
The district's feasibility report, including a recommendation for construction of dams at Devil Canyon and Watana, was sent to the corp's North Pacific Division in late 1975. In January 1976 it was forwarded, with the Division Engineer's concurrence, to the Board of Engineers for Rivers and Harbors in Washington, D. C., for review. At the same time the report was made available for public review and comment. The board closed the comment period in mid-April and, having the public responses on record, completed its evaluation of the proposal. In June the board found the district's report demonstrated the economic justification of development of the hydropower potential of the Upper Susitna Basin, but that more baseline data was needed in order to refine the scope, design, and operating characteristics of the project. Thus Congress authorized $25 million to be spent for Phase I Advanced Engineering and Design of the project. There was also a provision made by Congress that would allow a state-federal joint venture in which the state would provide project funding, and the Corps of Engineers would do the work.

The project is a two-dam system which would inundate some 50,500 acres including an 82-mile reach of the Susitna River upstream from Devil Canyon Dam. The canyon reservoir would have a water surface of about 7,550 acres of normal full-pool elevation. It would extend upstream about 28 miles, confined within the canyon. Reservoir width would vary from about 1/4 to 3/4 mile. Watana Dam, about two miles above the Devil Canyon reservoir, would inundate about 43,000 acres at normal elevation. It would extend some 54 miles upstream from the dam and would average 1 1/4 miles in width.

Power distribution would require a transmission line from Watana to Gold Creek where it would be divided. The Anchorage route would parallel the Susitna River to the Nancy Lakes area, thence due south to Point MacKenzie. The Fairbanks corridor would run north from Gold Creek to Chulitna at which point it would generally follow the Parks Highway and Alaska Railroad to the existing substation at Ester. The transmission corridor would be about 364 miles long, average 200 feet in width, and the total rightof way would be about 8,100 acres.

Significant environmental impacts are generally as follows. Access roads, transmission lines, and dams would impair visual quality of the countryside. Caribou movement may be inhibited and mortality increased as a result of crossing reservoirs. Seasonal construction and maintenance power lines could further inhibit normal caribou movement. Some moose habitat within the reservoir areas would be lost. Public access provided by construction and maintenance roads would impose requirements for intensified game management and fire prevention procedures. Susitna River water now becomes clear during winter months. As a result of the entrapment of sediment during summer, some of the finer material would remain in suspension in the reservoirs, thus increasing downstream turbidity of winter flows.





A COMPARISON BETWEEN THAT AMOUNT OF NATURAL GAS NECESSARY TO PRODUCE ENOUGH ELECTRICITY TO HEAT 50 GALLONS OF WATER AND THAT AMOUNT OF NATURAL GAS NECESSARY TO HEAT THE SAME AMOUNT OF WATER DIRECTLY.

B. Growth and Conserving

ENERGY

Energy Conservation & Growth

Jingle in pocket

sticker on window of car
not on house

Social & Political issues - larger
Afraid of change
Fear of leveling off

Borough - could have preferential mill rate for conservation of energy
Citizens need place where they can get answers to their questions.
ALASKA ENERGY OFFICE
Thermo imagery - infra red - Thermo imagery camera picture

different rates energy
peak loads not peak loads

Energy office official commented had learned a lot in the discussion to take back for his use.

Moderators: David Stone, Larry Sweet.
Resource Persons: Jim Frederickson, Bob Weeden, Monica Thomas, Dick Allison, John Morack.

GROUP DISCUSSION

It is interesting to note that in Washington State, the Seattle Trust and Savings Association provides low cost loans to people who insulate their houses. The interest rate is determined by the amount of anticipated savings due to the improvements. A member of this group discussion suggested that such a program might aid the energy conservation effort in this country, especially in Alaska, to a large extent if it were expanded.

Education is still a major stumbling block to implementing any real savings or conservation. People necessarily respond to a "jingle in the pocket." Consequently the best incentive for getting people to conserve is show them positively how they can see the monetary return. Another major problem in the energy conservation effort seems to be the disparity between the cost of energy, the rate of increase of costs, and the curtailment of the use of valuable fossil fuel resources. This means that when the price goes up, we don't see as great a cutback in utilization as we would like. In other countries apparently the margin is less; when the consumer's pocketbook is hit he responds more quickly. In the United States energy is so inexpensive in comparison to the other basis costs of living that a larger increase in energy costs does not necessarily hit the pocketbook of a consumer as hard.

A suggested local energy conservation incentive was that new cars be required to have a window sticker stating how many miles per gallon the vehicle will get. Another suggestion was for a similar system in purchasing hew houses.

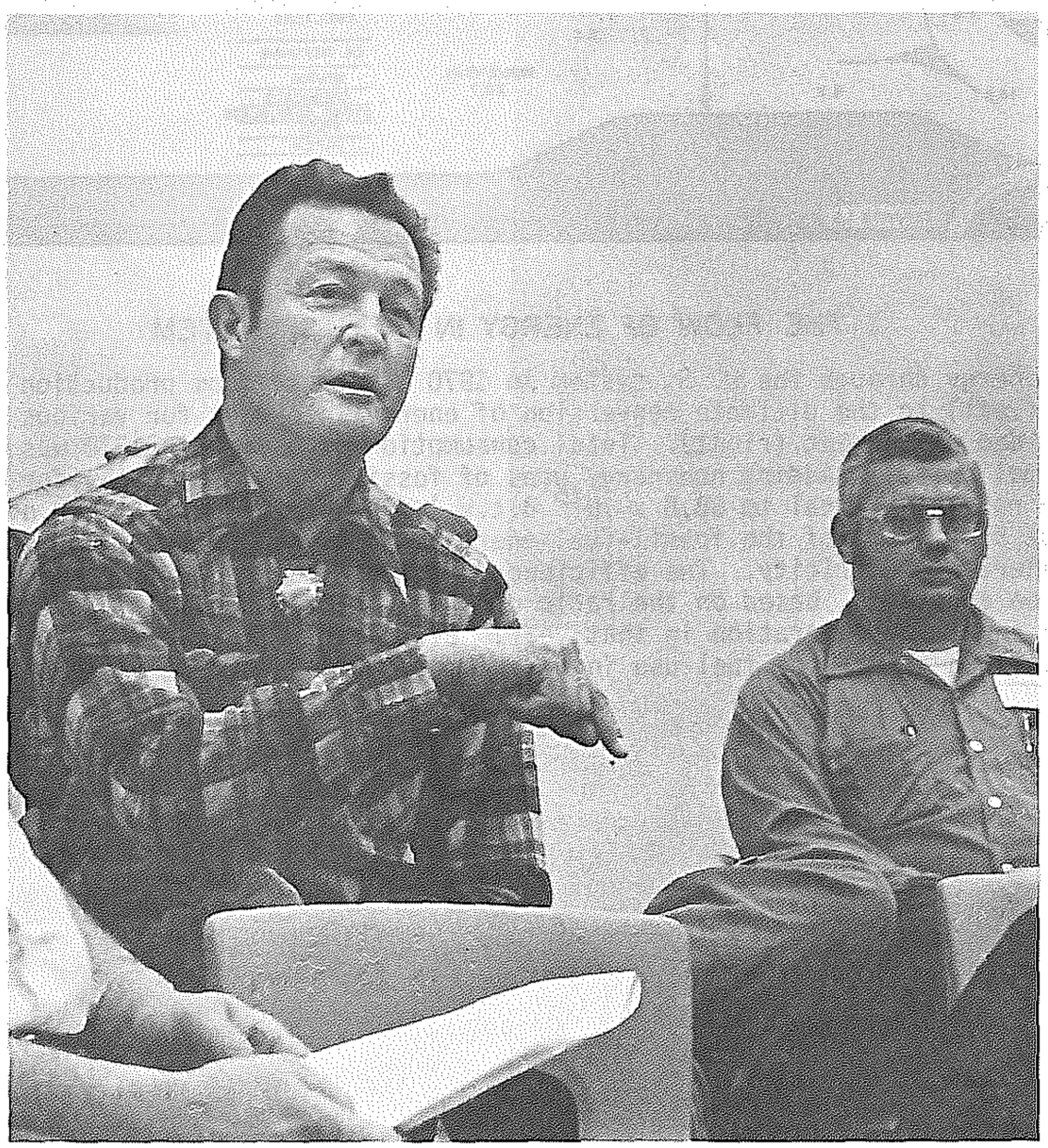
The discussion on energy conservation and growth also delved into social and political issues. Often these seem to be more the controlling factors than conservation considerations per se. We are basically afraid of changing our present life style. This is one of the major impediments to energy conservation--the fear that energy conservation will mean a decrease in our standard of living.

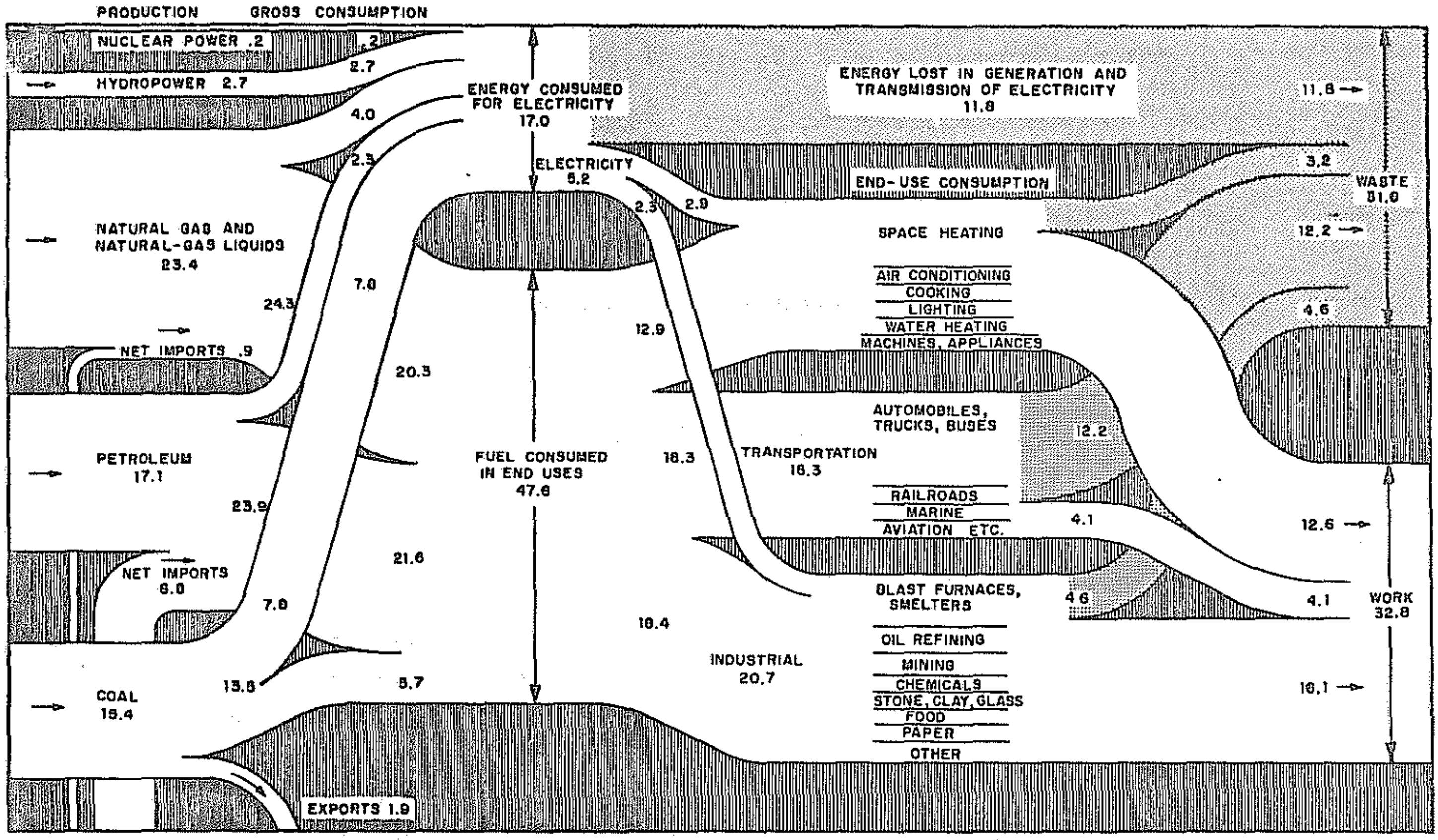
Another local suggestion was that the Fairbanks North Star Borough institute a lower property tax mill rate to home owners who have demonstrated that they have improved the efficiency of their homes by more insulation. This would be an incentive for people to make improvements. A lack of information in the Fairbanks community concerning energy questions was noted. Citizens need a place to have their questions answered. The Alaska Energy Office was mentioned as a possibility, and soon this agency may be in a better position to supply more help to concerned citizens in each area of the state. At present its only office is in Anchorage. What was suggested is a type of cooperative extension service for energy questions and information which would be available at all times for public consultation. Representatives of the Alaska Energy Office who were present mentioned that they had picked up good ideas from the Town Meeting and had lots to take back to their offices to work on. Hopefully they will do so and in the future we may see an "energy office" in Fairbanks.

Supplemental Information

on

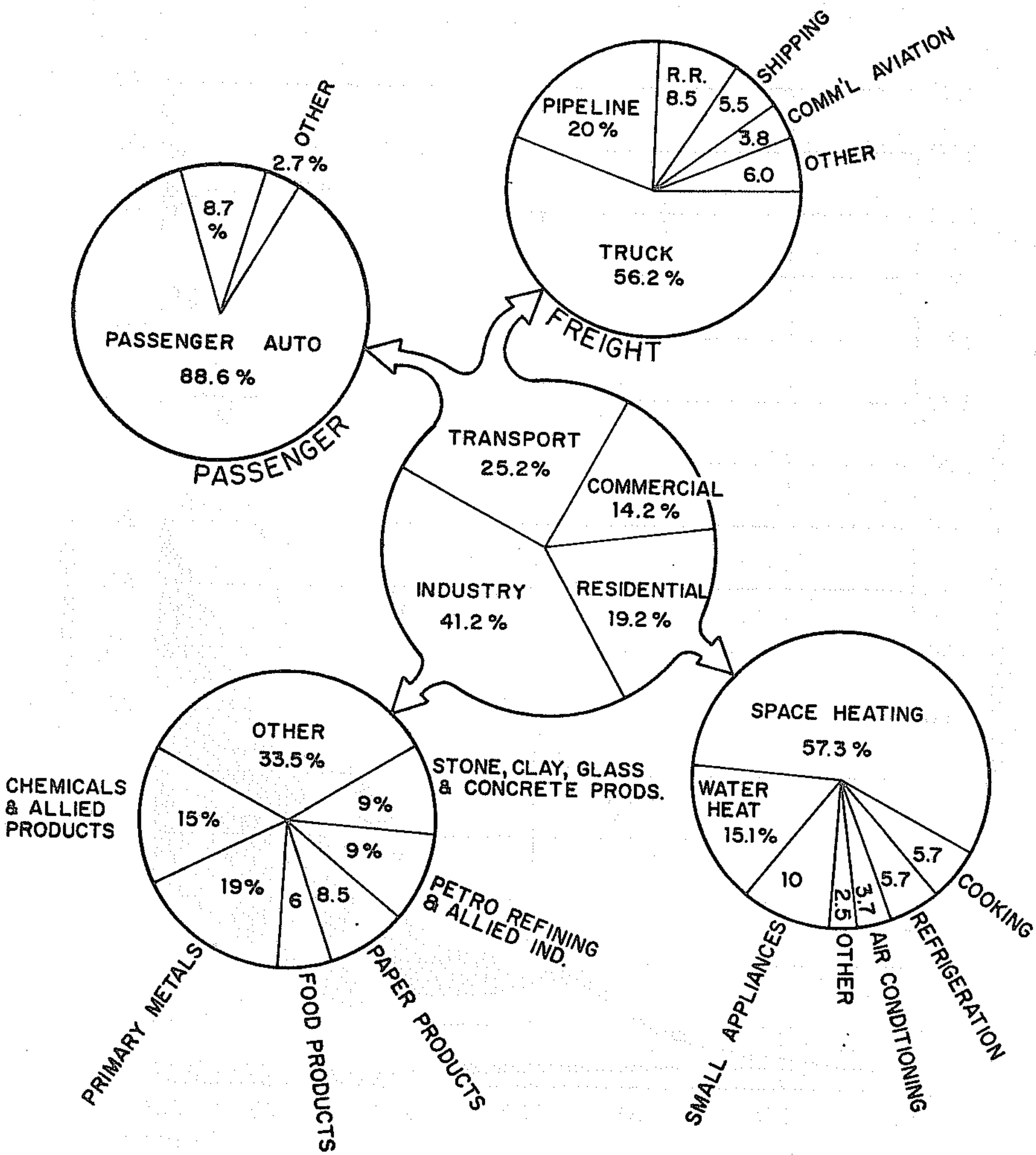
Growth and Conserving Energy



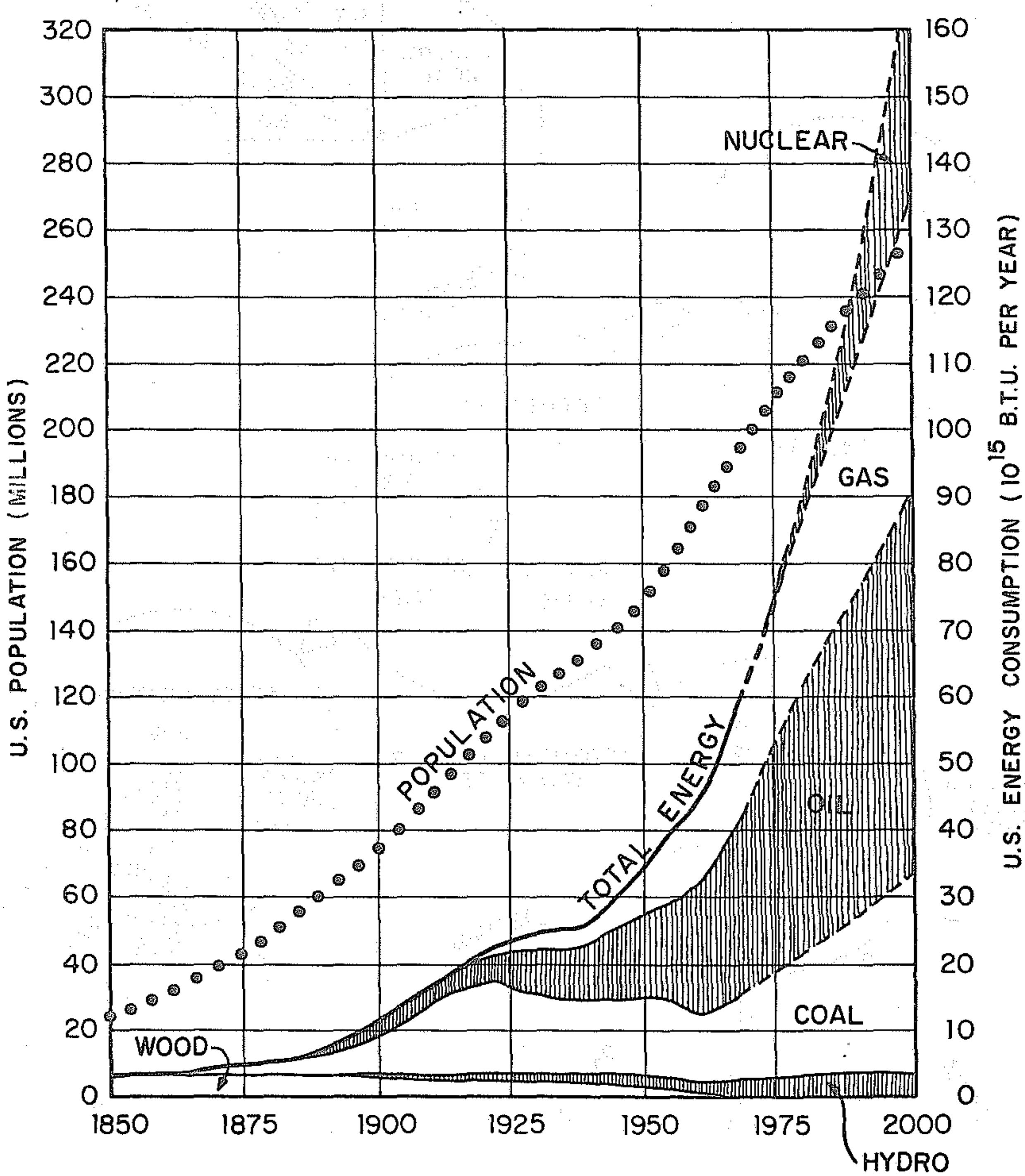


THE FLOW OF ENERGY IN THE U.S. SYSTEM

The flow of energy through the U. S. system in 1970 is traced from production of energy commodities (left) to the ultimate conversion of energy into work for various industrial end products and waste heat (right). Total consumption of energy in 1970 was 64 x 10^{15} British thermal units. (Adding nonenergy uses of fossil fuels, primarily for petrochemicals, would raise the total to 68.8 x 10^{15} B.t.u.) The overall efficiency of the system was about 51%. Some of the fossil-fuel energy is consumed directly and some is converted to generate electricity. The efficiency of electrical generation and transmission is taken to be about 31%, based on the ratio of electricity purchased in 1970 to the gross energy input for generation in that year. Efficiency of direct fuel use in transportation is taken as 25%, of fuel use in other applicatios as 75%. (Kilowatt Counter)



TOTAL ENERGY USE BY SECTOR



U.S. FUEL CONSUMPTION
(from The Flow of Energy in an Industrial Society by Earl Cook, and Energy and Power by Chauncy Starr. 1971. Scientific American.)

TOTAL STATEWIDE POWER REQUIREMENTS, 1972-2000

Type of Load	Actual Requirements 1972 Peak Demand 1000 KW	Actual Requirements 1972 Annual Energy Million KWH	Estimated Future Requirements 1980 Peak Demand 1000 KW	1980 Annual Energy Million KWH	1990 Peak Demand 1000 KW	1990 Annual Energy Million KWH	2000 Peak Demand 1000 KW	2000 Annual Energy Million KWH
			Higher Rate of Growth					
Utility	355	1,620	1,050	4,600	2,490	10,900	5,360	23,500
National Defense	110	594	160	720	190	850	220	960
Industry	104	455	620	4,340	4,290	30,060	4,800	33,630
Total	569	2,669	1,830	9,660	6,970	41,810	10,380	58,090
			Likely Mid-Range Growth Rate					
Utility			940	4,100	1,850	8,100	3,320	14,500
National Defense			160	715	190	850	220	960
Industry			330	2,315	620	4,340	1,720	12,050
Total			1,430	7,130	2,660	13,290	5,260	27,510
			Lower Rate of Growth					
Utility			830	3,600	1,480	6,500	2,190	9,600
National Defense			160	720	190	850	220	960
Industry			210	1,470	330	2,310	620	4,340
Total			1,200	5,790	2,000	9,660	3,030	14,900

Source: U. S. Department of Interior, Alaska Power Administration, Alaska Power Survey, Economic Analysis and Load Projections, 1974, p. 42.

EVALUATION OF ENERGY OPTIONS FOR THE UNITED STATES

Option	Estimated availability*			Estimated net energy	Potential environmental impact†
	Short term (present to 1985)	Intermediate term (1985 to 2000)	Long term (2000 to 2020)		
Conservation	Fair	Good	Good	Very high	Decreases impact of other sources
Natural gas	Good (with imports)	Fair (with imports)	Poor	High but decreasing‡	Low
Oil					
Conventional	Good (with imports)	Fair (with imports)	Poor	High but decreasing‡	Moderate
Shale	Poor	Moderate to good?	Moderate to good?	Probably very low	Serious
Tar sands	Poor	Moderate? (imports only)	Good (imports only)	Probably very low	Moderate
Coal					
Conventional	Good	Good	Good	High but decreasing‡	Very serious
Gasification (conversion to synthetic natural gas)	Poor	Good?	Good?	Moderate to low	Very serious
Liquification (conversion to synthetic oil)	Very Poor	Poor to moderate?	Good?	Moderate to low	Serious
Wastes					
Direct burning	Poor to fair	Fair to poor	Fair	Moderate (space heating) to low (electricity)	Fairly low
Conversion to oil	Poor	Fair to poor	Fair	Moderate to low	Low to moderate
Hydroelectric	Poor	Poor	Very Poor	High	Low to moderate
Tidal	Very poor	Very poor	Very poor	Unknown (moderate?)	Low
Nuclear					
Conventional fission	Poor	Good	Good to Poor	Probably very low	Very serious
Breeder fission	None	None to low	Good?	Probably low	Extremely serious
Fusion	Poor	Moderate to low?	Moderate to low	Unknown (could be low)	Unknown (probably moderate to low)
Geothermal	Poor	Moderate to low?	Moderate to low	Unknown (probably moderate to low)	Moderate to low
Solar	Poor (except for space and water heating)	Low to moderate?	Moderate to high?	Unknown (probably low)	Low
Wind	Poor	Poor to moderate?	Moderate to high?	Unknown (probably moderate to low)	Low
Hydrogen	Negligible	Poor	Unknown§	Unknown (probably moderate to low)	Unknown§
Fuel cells	Negligible	Poor	Unknown§	Unknown (probably moderate to low)	Unknown§

*Based on estimated supply as a fraction of total energy use and on technological and economic feasibility
†If stringent safety and environmental controls are not required and enforced
‡As high grade deposits decrease, more and more energy must be used to mine and process lower grade deposits, thus decreasing net energy.
§Depends on whether an essentially infinite source of electricity (such as solar, fusion, wind, or breeder) is available to convert water to hydrogen and oxygen gas by electrolysis or direct heating. Impact will vary depending on the source of electricity.

C. You and

ENERGY

Self Sufficiency
not self sufficient
need saws and stoves

We should not bring our wants
from Houston.

Water from roofs - not well

turning interest to solar energy

NORWAY DURING WAR more healthful

Must make it known to officials - what we want

Riding together

More agriculture - raise cattle - reindeer
Farmers market

wood an exhaustable resource
10 cords of wood = 20 barrels of

Building codes - more realistic
Education through campaigns

BUT People must have alternatives

Want to - pocket book
not how much I can use -
but what I can get by with

OUR IDEAS - less expensive NEWS LETTER
officials of Gov't. - circulate to Borough office

Moderators: Ev Wenrick, Karen Parr.
Resource Persons: George Matz, Niilo Koponen, Sandra Stringer, Nils Johanson, Joe Meeker, Alan Epps.

GROUP DISCUSSION

Self-sufficiency was discussed at great length and it appears to be an appealing and emotional issue to many interior Alaskans. Some felt that it is an illusion to claim to be self-sufficient because Alaskans depend on outside sources for fundamental tools such as axes and wood stoves. Others relish the thought of trying to "make it on our own," and anticipate the possible failure of outside sources of energy. Water supply and wood appear to be intrinsic to a self-sufficient Alaskan life style. Our notes indicate that many diverse issues were covered.

It was noted that self-sufficiency should be considered on many different levels because we can either be self-sufficient as Alaska and northern Canada together or on a state level or even on a regional level within interior Alaska. However, even if we are self-sufficient we are really dependent on energy because we need such things as saws and stoves which are made by others with associated energy and environmental costs. The fact that the Fairbanks Municipal Utilities System power plant is more efficient than would be the case if each person had their own electrical generating system is testimony to the value of local interdependence. Consequently this should be considered as a trade-off in the value of self-sufficiency.

The definition of self-sufficiency was debated at length. Does it mean getting away from a central system? Does it mean self-discipline? Self-discipline appears to result in a society wherein people tend to be less capital intensive and less resource intensive. Again our life styles limit our ability to be self-sufficient. "There are enough resources for each man's need but not for each man's greed."

In the context of our everyday lives, self-sufficiency was also seen to have some drawbacks. Our houses must be kept warm and we must get to work and to school. We can cut our own wood, but the day will come when it will be hard to get. This is also true with water and consequently it was felt that it was a delusion to think that we are self-sufficient in Alaska.

The possibility of using alternative energy sources to become more self-sufficient was also discussed. Alternatives such as the use of solar energy for part of the year, wind, use of heat pumps--all of these can be used. "If we can't be totally self-sufficient the least we should do is to be energy conscious." It was the general consensus of the group that Alaska does have its own life style and we need to keep it.

One of our main problems according to the self-sufficiency group is the automobile and it was felt we must look to other means of transportation since our cars are our biggest wasters of energy.

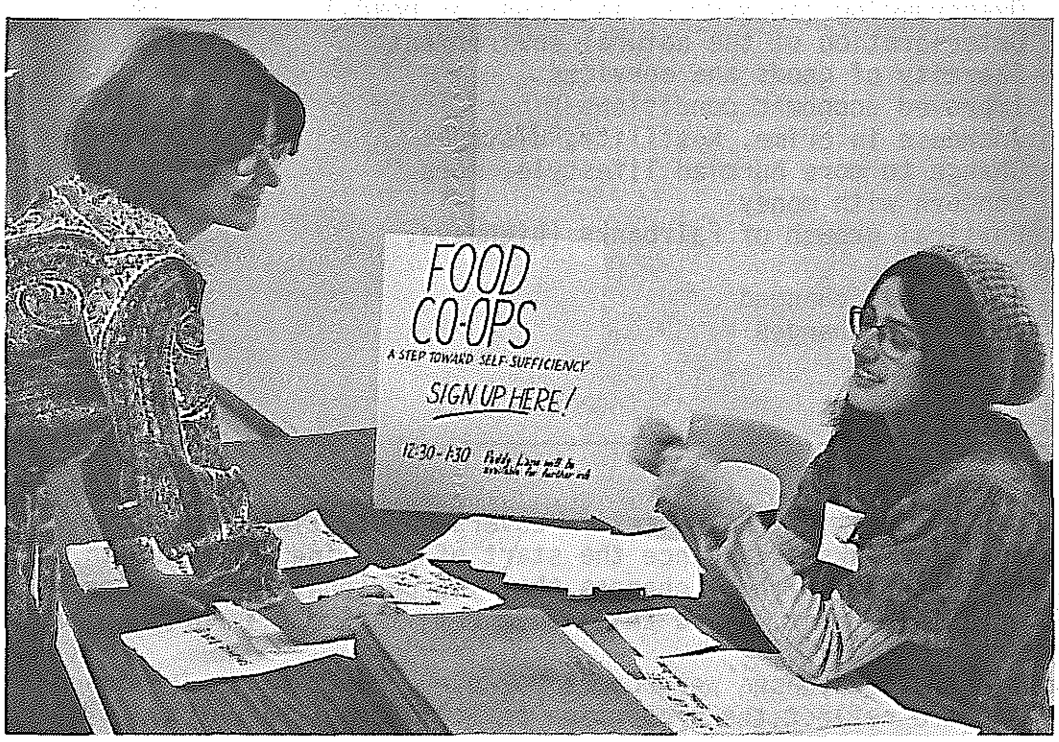
One person posed a theme question in the self-sufficiency discussion. That is, what would Fairbanks do if we suddenly were cut off from the outside sources of energy on which we are presently dependent? It was felt that on an individual level we could make do. The example of Norway during the war was brought up when, during the siege, people were healthier with less energy use. It was felt that because of our large amount of resources in Alaska we could probably do quite well. More options exist in Alaska than do in Manhattan, for instance. If one were to compare the two possibilities, one can see that more options do in fact exist, but because Alaska has changed to an energy-intensive way of life, the change would not be easy. In addition, people don't want to admit that they are wasteful. In lieu of this it was felt that education on the aspects of personal energy consumption would be valuable. The impediment to self-sufficiency created by current laws was also brought out. We may not be allowed to use wood, even if we chose to. We, in fact, won't have a choice.

The group became a bit introspective and realized that, as a small group, they already felt that self-sufficiency was quite important but they wondered about the other 99 percent who weren't at the meeting and who apparently aren't interested in self-sufficiency. They would like to advocate the social unacceptability of wasting energy. Again, what was stressed was the need for education, that the public be made aware of the problem and to try to make energy conservation a more general attribute of the population. As in the discussion on energy conservation and growth, it was felt that the best way to get the public's attention is to hit people in the pocketbook. As a statement of ethics it was felt that what we should stress is not how much can we use but how little can we get by with. This was felt to be the ethic necessary for the twentieth century in order to bring change to an energy-conservative system. The exchange of ideas would be a very valuable way to share the problem in Fairbanks. And it was suggested that the Borough Impact Information Office or some other similar agency be enlisted in this regard. This idea was presented directly to Assemblywoman Karen Parr who was a moderator for the Town Meeting discussions on energy self-sufficiency.

Supplemental Information

on

You and Energy*



*Further resource materials for groups C and D are found in the FNS Borough Impact Information Center Report #32, pages 1-25. These pages discuss the impact of the pipeline on incomes in Fairbanks, on low-income persons, and Fairbanks cost of living.

Many of the resource materials for Groups C and D are similar. The following is obtained mostly from the December, 1976, Alaska Review of Business and Economic Conditions which reports on a community survey of interior Alaska and Fairbanks conducted in 1975-76 by Jack Kruse and his staff at the Institute of Social and Economic Research of the University of Alaska, Fairbanks.

PERCEPTIONS OF THE MOST IMPORTANT COMMUNITY CHANGES*

Categories of Community Change	Percentage of total mentions**
1. Increase in the cost of living	30
2. Overcrowding (in stores, in lines, on roads)	19
3. Deterioration of the natural environment	12
4. Scarcity of goods and services	9
5. Improved economic conditions	8
6. Increase in crime, hostility, distrust	8
7. Change to more hurried lifestyle, more concern with money	5
8. Physical growth of Fairbanks (highways, buildings	2
9. Little has changed	2
10. All other changes	5
	100

*The question read,
"The first part of the interview covers changes in living conditions in the Fairbanks area since the start of pipeline construction. We are interested in those changes that you personally have experienced. First of all, what do you think have been the most important changes?"

**Up to three responses were coded for each respondent. The percentages given here reflect the proportion for all responses which fell into each category.

DEGREES OF SELF-RELIANCE AMONG FAIRBANKSANS

How much of your own food would you say you and your family grow, hunt, fish or gather for yourselves:

	Percent
Most to all of it	2
About half of it	5
Some of it	40
Not any of it	53
	100

Which of these activities have you or your family participated in during the time you lived in Fairbanks?

	Percent
Build or help build your own house	38
Cut and gather your own firewood	39
Sew many of your own clothes	48
Repair your own automobile, television, or other appliances	73
Use something besides a car or motorcycle to get to work or shopping	43

REASONS FOR COMING TO FAIRBANKS

		Percent Responding Extremely or Very Important*	Average (Mean) Score**
1.	A chance to be independent, to start something new	50	2.9
2.	To get close to a wilderness environment	46	2.9
3.	Curiosity about Alaska	45	2.9
4.	A challenging or exciting job	41	3.1
5.	Long-term economic opportunity	39	3.1
6.	Immediate income gains	35	3.2
7.	To become part of a small community	30	3.5
8.	To get away from urban problems	24	3.7
9.	To be with family and friends	22	4.0
10.	To live a pioneer's life, be self-reliant	20	4.8
11.	School or military	19	4.1

Number of respondents - 400

*Respondents assessed the importance of each reason on a rating scale range from 1 to 5, where 1 is extremely important, 2 is very important, 3 is moderately important, 4 is not very important, and 5 is not at all important.

**Average (mean) scores are the average of all the responses on the same scale as described above. Thus, a lower mean score indicates that a reason is more important.

ESTIMATED ULTIMATE FUEL EFFICIENCY

Fuel and use	Delivered efficiency	x	Utilization efficiency	=	Ultimate efficiency
Coal (bituminous):					
Central heating, hand fired	93.0*	x	45.0	=	41.8
Central heating, stoker fired	93.0	x	55.0	=	51.1
Water heating, pot stove	93.0	x	14.5	=	13.5
Oil:					
Central heating	81.0	x	63.0	=	51.0
Water heating, 100 gpd**	81.0	x	50.4	=	40.8
Natural gas:					
Central heating	93.0	x	75.0	=	69.7
Water heating, 100 gpd	93.0	x	63.7	=	59.2
Electricity:					
Central heating, resistance	17.0	x	95.0	=	16.1
Central heating, heat pump	17.0	x	226.0	=	38.4
Water heating, 100 gpd	17.0	x	92.2	=	15.6

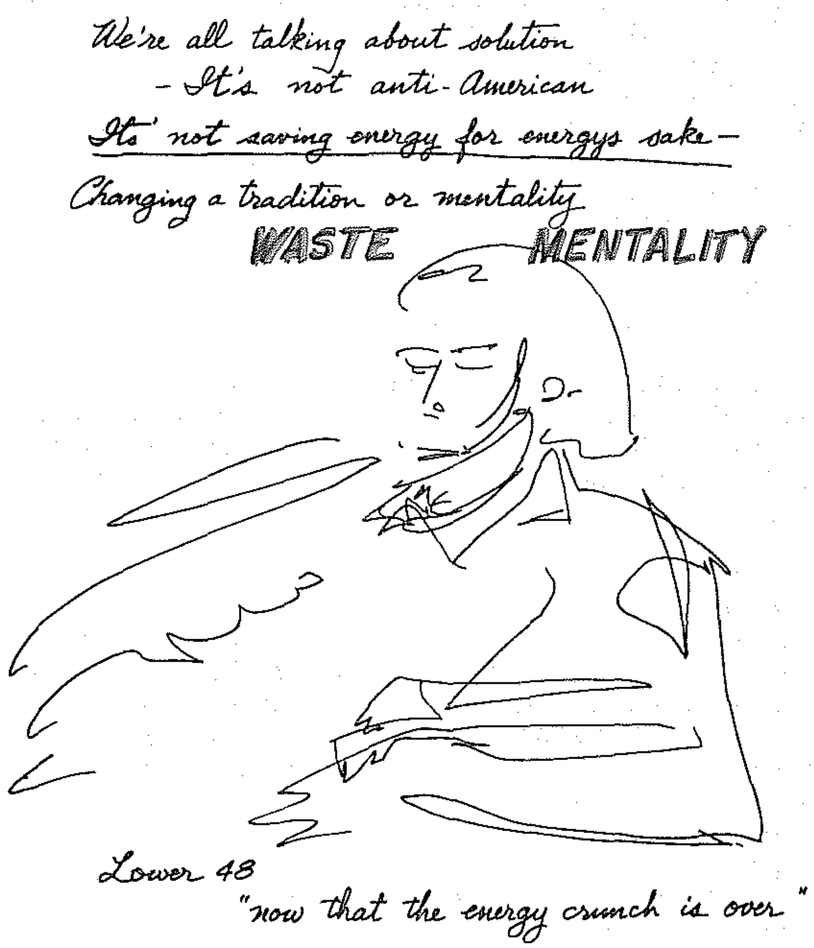
*all figures are percent
**gallons per day
Source: Kilowatt Counter, Alternative Sources of Energy Magazine, 1975.

UNIT FUEL PRICE FOR EQUIVALENT SPACE HEATING OUTPUT

cost per million btu	electricity kwh	#2 fuel oil gallon	natural gas mcf
$ 2.93	$ .01	$ .26	$ 2.20
4.40	.015	.40	3.31
5.86	.02	.53	4.41
6.59	.0225	.59	4.95
7.33	.025	.66	5.51
8.06	.0275	.73	6.06
8.79	.03	.79	6.61
11.72	.04	1.05	8.81
14.65	.05	1.32	11.02
17.58	.06	1.58	13.22

D. Evaluating

ENERGY



Moderator: Don Triplehorn.
Resource Persons: Sue Fison, Don Moore, Bill McConkey, Jeff Cook, John Kruse, Vern Carlson.

GROUP DISCUSSION

Energy, its value to us and the social, fiscal, and environmental trade-offs involved in its evaluation are of major current concern. President Carter's energy policy changes have served to make this even more clear to us than ever before. Energy use and development involves social, economic, and environmental costs which must be weighed and measured as a reflection of our own values in order to choose energy sources for ourselves and our community. Each of us does this each day in our own lives and the intent of including this discussion was to provide an opportunity for the community to make its values known. Fairbanks' pipeline impact experience qualifies us well for making decisions as to the choice of trade-offs.

This discussion addressed many questions--some rhetorical, some easily answered. The first question is: Exactly what is energy worth? The answer is, simply, "a lot." Next, the posed question was how should energy be valued? Again the answer was fairly straightforward, "highly," but not to the point of being overly restrictive. It was also noted that our values are time dependent. The short-term interests are usually private and full of self-interest or may be mandated by the government and are centered around issues of the pocketbook. The long-term values are more ones of aesthetics and it is very difficult to put a price tag on them. However, a listing was made on the blackboard in the discussion room as to which elements of the value of energy were positive and which were negative in a dollar sense. Under the positive were listed: convenience, communiciations, security, aesthetics, and health. Under the negative dollar values were: pollution, vulnerability to nature and the elements, aesthetics, and health. Each of these obviously relates to different aspects of energy use and development and how it affects the community. Aesthetics can be positive and aesthetics can be negative. Damage to the aesthetic sensibilities of the community can occur through coal, ash, air pollution, and impact of some sort, or they can be positive because the capital flow into the city can provide for aesthetic achievements in the community which would not otherwise be possible. It was noted also, that the whole concept of standard of living has been the baseline for evaluating the tradeoffs.

The next question that was posed was, "How does the government set energy policy?" Apparently, it responds somewhat to constituency pressure but also we have to realize that the bulk of society has not accepted the reality of the "energy crisis." This creates a problem of credibility which has not yet been solved in any viable way. In other ways, the government controls the energy policy situation. That is, it can regulate, it can initiate research and development and construction by spending public dollars, and it can also motivate commercialization of energy, concentration systems, and tools.

One of the resource persons pointed out that energy developers and producers appear to have a united front in the debate on the energy value question; conservationists and consumers, however, do not. The need was seen for a basic consensus upon which debate could occur. However, this remains an unresolved problem whose value lay in the fact that it was raised. Another problem was noted: the democratic system is based on, generally, immediate personal goals and is not well adjusted to planning ahead. This also leads to the possibility that full social costs are not incorporated because an unbridled free market will distort costs in that the environmental or social costs involved in energy use and development are not heeded. In order to overcome these short-term goals and the short-sightedness of government, it was suggested that consumers must take an insistent stand because government will respond only to organized pressure.

The general awareness of the energy problem appeared to have reached a peak in 1973. However, it has been difficult to generalize behavior and attitude changes which resulted from that awareness. Concerning the role of government, it was felt that its role should be and is assumed to be one of regulation, education and, in the executive branch, subsidization of certain good judgments. It was also felt that the government exercises better judgment than an individual could in any given decision, both in theory and in practice. However, in practice, it is very cautious and has limited vision. Often the political role of government is simply to wait for a very, very clear message, thereby rendering it unable to exercise a strong leadership role. Hence, government lacks an effective mechanism for determining and allocating total economic, social, and environmental costs.

There is also apparently a tendency to focus on relative issues, on relativism in general. However, it was pointed out that there are some absolutes in the issue of economic and environmental tradeoffs, the first of which is wilderness. There is definitely a finite amount of wilderness and, once it is destroyed, it can no longer return. It is a nonrenewable resource, so in that sense wilderness is certainly finite and it is an absolute. The same is true of the finite quantitites of coal and oil. We all know or can accept the fact that coal and oil are of limited quantity and that one day we will run out.

An interesting observation was that economy and ecology stem from the same root and it is impossible to maintain one without the other. On the local side, the question of how to plan for total environmental costs was also brought up. But in order to plan there must be an increase of information. The lack of knowledge about total environmental costs was one shortcoming that was noted in assessing any ability to plan. It is possible to generalize from past experiences in order to show what the total environmental cost of certain processes and technical developments has been. With our pipeline experience it might also be possible to discuss what the community-borne expenses have been. A democracy can plan but it needs to avoid the dilemma of the "squeaky wheels" in which loud vocal minorities tend to override the general well-being and end up being the major voices reflecting public opinion and, consequently, the planning.

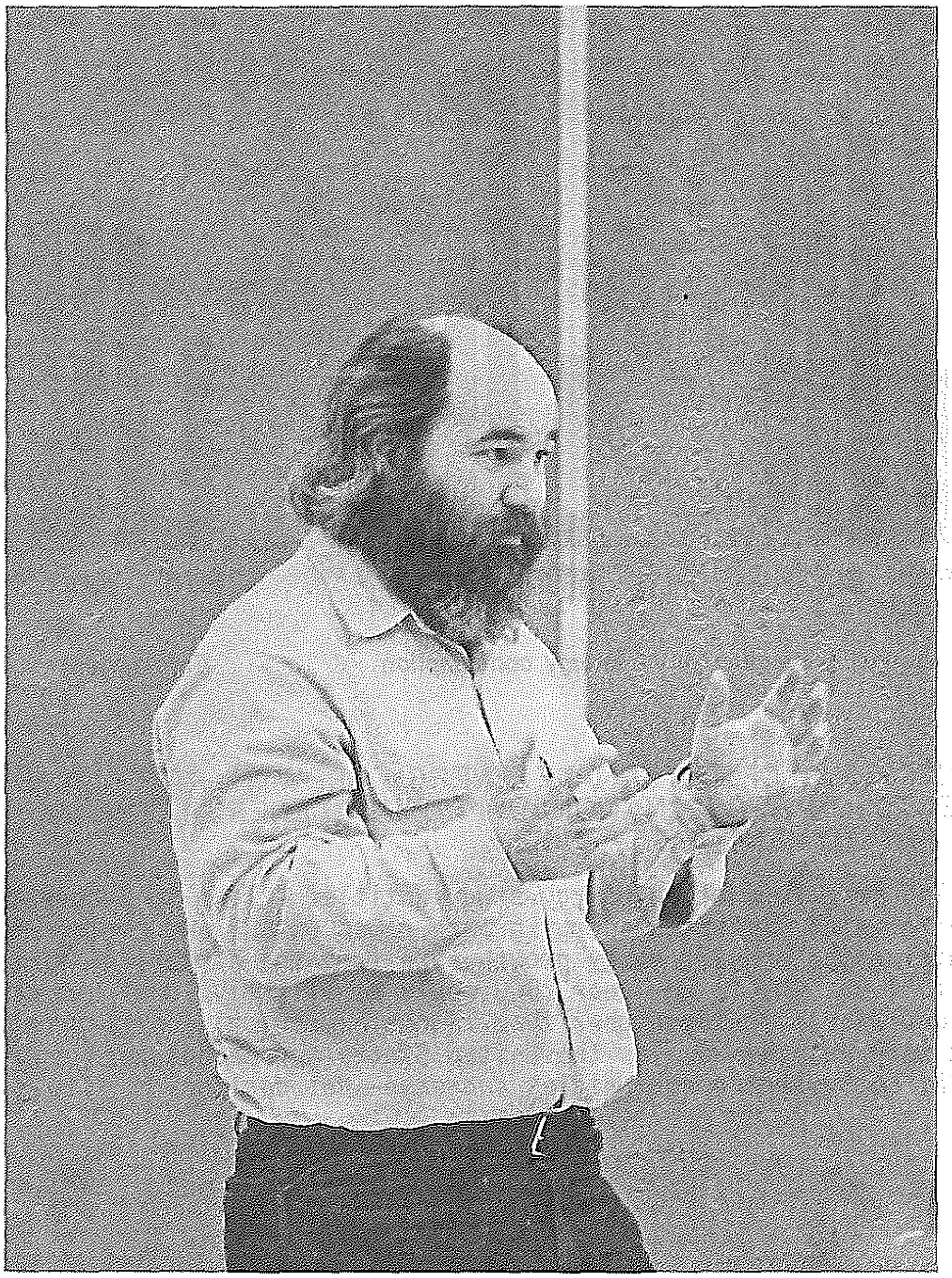
The social and the environmental costs of solid waste disposal was another area that was discussed. Fairbanksans are in a bad position now because of our solid waste disposal problems, and we can no longer afford the luxury of passing on to our children the problems of our own profligate abuses of resources, although some of our past errors were often unavoidable. Now is the time to reflect and plan in light of those errors. Methods whereby social costs could be evaluated were suggested. One is to charge for pollution. That idea works for point sources but doesn't work very well for continuous sources such as transportation systems. It might also be possible to devise an index of marginal utility which creates an evaluation scheme rather than to assign a dollar amount for damages. This integrates the idea of social costs and shows them to be more than dollar amounts that are incurred. Some costs may, in fact, not be reimbursable but have more value than dollars can buy.

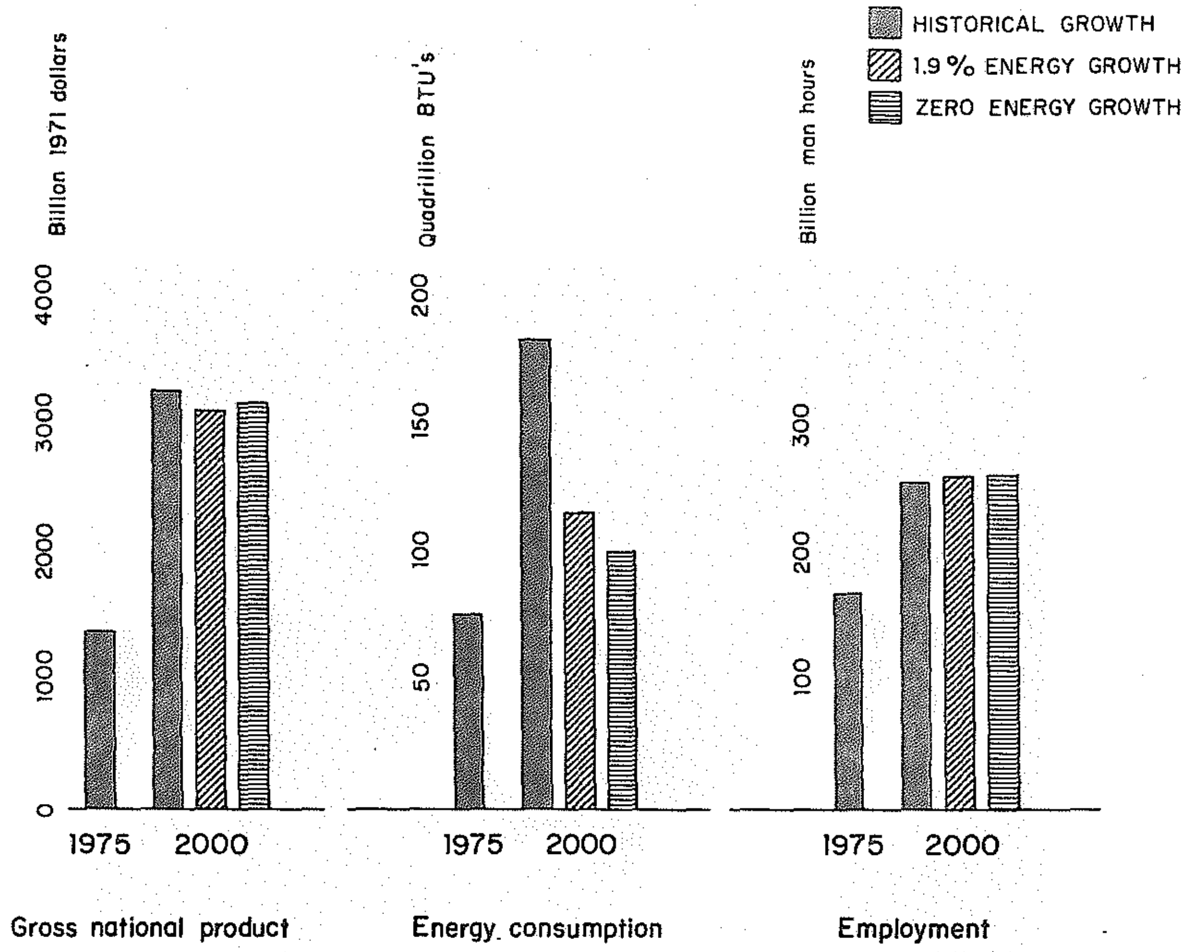
Two major statements were made about the actual value of energy. One regarded the short-term basis and, here, it was simply a pocketbook issue. For the long-term, the values of energy have to become moral and aesthetic choices based on moral and aesthetic judgements. It was also pointed out that our awareness of environmental and energy crises is very recent and we need more time than perhaps we have to really reflect and evaluate energy with respect to its real value and with respect to our social system. Lastly, one of the major points made was that we need to plan to enhance the choices and improve the options for future generations.

Supplemental Information

on

Evaluating Energy





PROJECTIONS OF ALTERNATE ENERGY GROWTH RATES AND THE EFFECTS ON GROSS NATIONAL PRODUCT, ENERGY CONSUMPTION, AND EMPLOYMENT 1975-2000.

The Ford Foundation energy study entitled A Time to Choose tested the effects of differing energy growth rates on GNP and employment. By cutting the annual energy growth rate from the historical figure of 3.4% to 1.9%, GNP in the year 2000 would be slightly lower but employment would be slightly higher than if the historical energy growth rates were maintained. As the United States approaches zero energy growth, employment opportunities increase--not decline

THE ENERGY AND LABOR INTENSITIES OF THE LARGEST SELECTED (DOLLARWISE) PERSONAL CONSUMPTION ACTIVITIES, RANKED BY ENERGY INTENSITY, FOR 1971

Personal Consumption Expediture Sector Description	Energy Intensity (BTU/$)	Labor Intensity (Job/$)
Electricity	502,473	.04363
Gasoline and Oil	480,672	.07296
Kitchen and Household Appliances	58,724	.09551
New and Used Cars	55,603	.07754
Food Purchases	41,100	.08528
Women and Children's Clothing	33,065	.10008
Religious and Welfare Activity	27,791	.086365
Privately Controlled Hospitals	26,121	.17189

NOTE: The above table demonstrates that energy and raw materials have low labor intensities and high energy intensities. Manufacturing is toward the middle while services are labor intensive but not energy intensive. If money originally spent on energy to operate an air conditioner is instead spent on better materials and labor, this will result in a more carefully constructed, efficient air conditioner. Since manufacturing is generally more labor intensive than electric utilities, the switch to a more efficient model of air conditioner would decrease the electrical demand while raising the total labor demand as measured per dollar spent by the consumer.

SOME STATISTICS FROM ELECTRIC UTILITIES

	Output 10^{12} kwh	Revenues 10^6 $	Employment 000's
1961	.8	$12,200	343
1973	1.85	$31,700	415

NOTE: Employment in utilities, in particular, has failed to keep pace with growth in the utility system, as shown in a variety of ways in the above table. Electrical output increased 230%, revenues earned increased 260%, while employment, including construction, increased only 120%.

Source: Above tables are excerpted from "Energy Conservation: Its Nature, Hidden Barriers and Hidden Benefits," by Lee Schipper, Energy and Environment Division, Lawrence Berkely Laboratory, California.

RELATIONSHIP BETWEEN ENERGY AND EMPLOYMENT

"Conservation of energy means doing better, not doing without... In 1974, three Western European countries-Sweden, Denmark, and Switzerland--had per capita GNP's higher than that of the United States, despite energy use per person in those countries around half that in the U. S. or less.

"The energy-producing industries comprise the most capital-intensive and least labor-intensive sector of the U. S. economy. Accordingly, each dollar of investment capital taken out of energy production and invested in something else, and each personal-consumption dollar saved by reduced energy use and spent elsewhere in the economy, is likely to benefit employment."

-- from testimony of John P. Holdren, Ph.D., at hearings before the Subcommittee to Review the National Breeder Reactor Program, JCAE, June 10, 1975.

The effects of energy conservation upon employment are particularly well-discussed by the Ford Foundation's Energy Policy Project. A report entitled "Economic Analysis of Alternative Energy Growth Patterns 1975-2000" (by Data Resources, Inc.; found as Appendix F in the book A Time to Choose) concluded, in part:

1. Substantial economies in the U. S. energy input are possible within the existing structure of the economy without having to sacrifice continued growth of real income.

2. Under a 2% annual growth rate (energy) or under a zero energy growth rate, the real income for the nation would be approximately twice as large as it is today, although it would be about 4% less than under the historical growth rate of 3.5% per year.

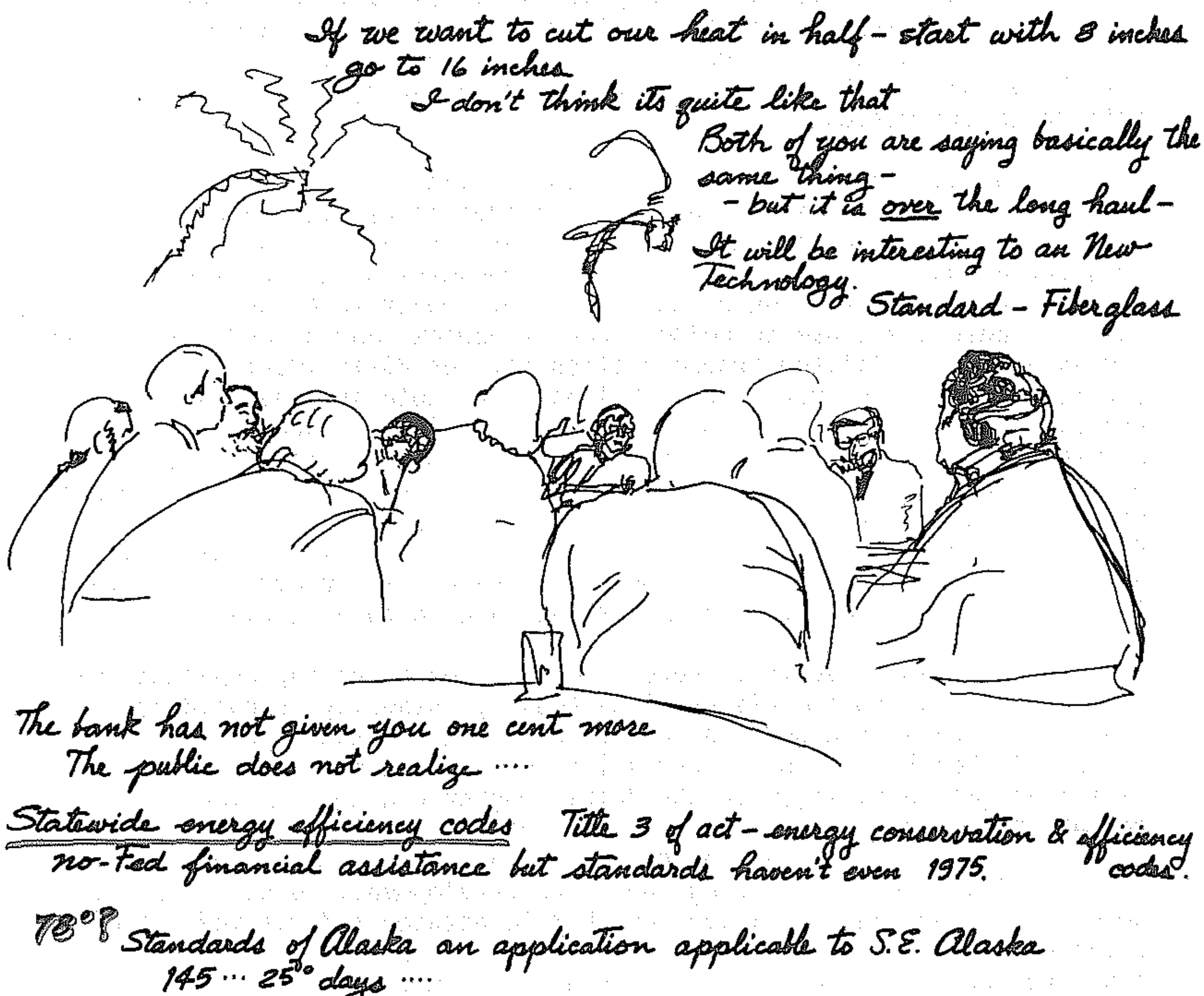
3. Adaptation to a less energy intensive economy will result in a slight increase in employment over the existing use levels of energy consumption.

4. Capital requirments will be slightly less under a less intensive energy economy.

Example: in comparing a 2% growth rate to the historical 3.5% energy growth rate, in the year 2000 the U. S. will use 37.7% less energy but jobs will be up 1.5%. Comparing a zero energy growth rate to the historical rate, the figures would be 46% less energy with a 3.3% increase in jobs.

E. Transporation, Rural Problems, and

ENERGY



Moderators: Don Lynch, Rocky Rhoads.
Resource Persons: Morris Morgan, Ann Swift, Bob Thomas, Joan Charles, Jim Kowalsky, Jack Hakkila.

GROUP DISCUSSION

Rural interior Alaska has many problems relating to energy. Many of these are transport problems that are geographically determined. The topics of net energy efficiency, storage problems, economics of village life, and the possibilities of alternative technologies were explored in this group discussion.

Discussion began with presentations on the current status of energy in rural Alaska. The fact that many villages today lack water or electricity was stressed, and those villages are extremely sensitive to transportation failures and are heavily dependent upon wood for fuel. The present transportation network does not appear to be used adequately. Many villages are close to being a barter economy and do not really have a cash economy. Village trappers often make an 80-to 100-mile run by dog team to service trap lines. Villages are totally dependent on air and barge traffic and, in many areas, air service is unreliable because of weather, lack of air-to-ground communications facilities, and absence of instrument flight capabilities. Many villages along the Yukon experience average temperatures 20 to 30 degrees lower than does Fairbanks. Basic fuel for heating is wood in barrel stoves. Fuel oil costs about $1500 per year to heat a small cabin excluding the $20 per barrel deposit. There is also a shortage of bulk fuel storage in rural areas.

It was also noted that there is revolution of rising expectations in rural Alaska and the Alaska State Housing Authority is building large houses with oil-fired heat which increases requirements for fossil fuels. In March of 1976, thirty villages ran out of gasoline. Air-delivered gas in villages in the Bethel region can cost as much as $110 per 55-gallon drum. The Department of Transportation restrictions on aircraft carrying fuel have been very serious. Government policies, i.e. the Department of Housing and Urban Development, refuse to accept wood stoves and there is a constant battle between federal and state agencies over Alaskan conditions and the need for exceptions for rules mandated for the lower 48. There is a false impression in Washington D. C. that Alaska is wealthy and, therefore, no longer needs special exceptions from regulations.

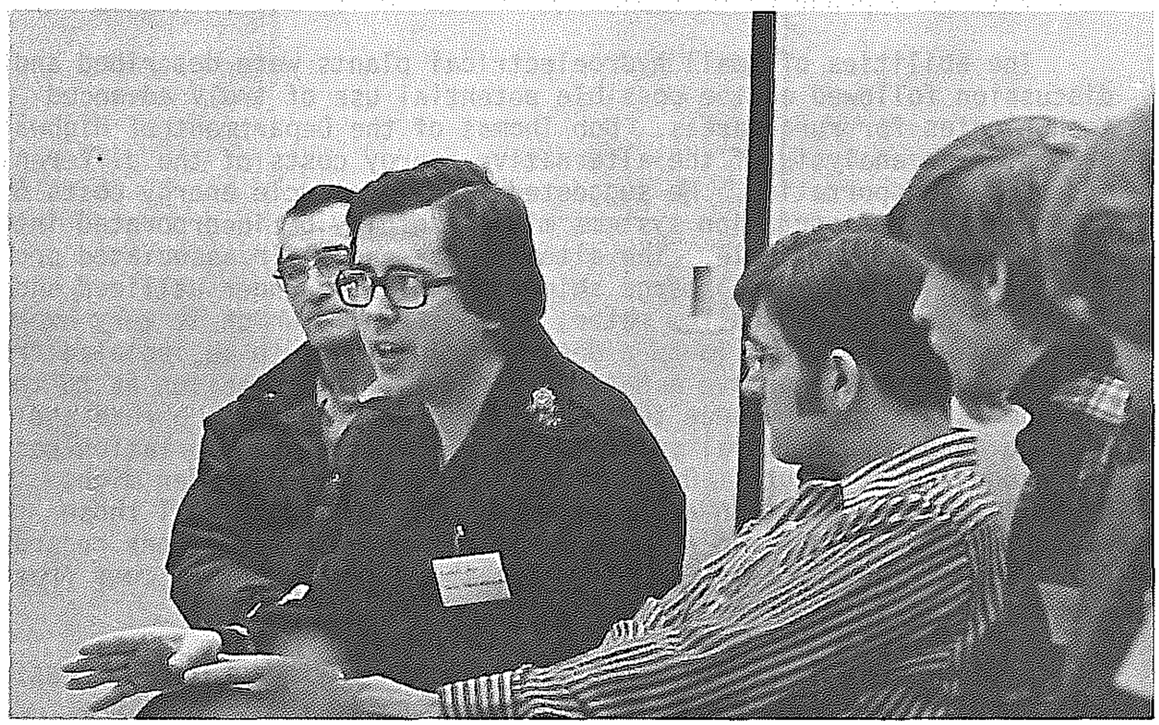
Discussion of the lack of adequate transportation for the village of Birch Creek also was discussed specifically. A resource person commented on his experiences in trying to run a bush air service in an area that is basically a subsistence economy region. Some participants commented on the fact that an effort was being made to get people to go back to wood which is a problem since the villages only recently began enjoying the advantages of fossil fuels and because of inadequate wood stoves. There is the problem of the trade-off between the energy consumed in hauling wood and the amount of wood available in the vicinity of the villages. An energy conservation training program for the rural areas has begun and stresses the use of locally available insulation materials and the possible use of wind power in some areas was discussed. It was felt that none of these is sufficiently funded by the Energy Research and Development Administration (ERDA).

A comparison was made between the merits of dog teams versus snow machines. A dog team consumes more food in a year than a family so that the decline in dog teams reduces the need to fish. On the other hand, it creates a dependence on expensive fossil fuels.

The abilities of small hydroelectrical plants were described and discussion followed on the possible potential use of truly advanced technologies for rural areas. Bob Thomas of the Department of Highways presented an analysis of the alternative energy costs of the different modes of transportation. He suggested that life cycle energy costs of alternative transportation systems might usefully be incorporated into the decision-making cycle. The alternatives and their associated problems were as follows: 1) barge shipping, which is under utilized and faces the problem of shallow water, 2) hovercraft, which is very expensive, 3) highways-there seems to be a desire for villages to be isolated from roads in order to preserve a Native lifestyle. A discussion as to the optimum barrier or distance that might be created between a road and a village to ensure cultural security while lowering transportation costs was discussed at length. One thought was that such a buffer might usefully be sought within a distance of 18 to 20 miles. All those present felt considerable reluctance in making recommendations regarding rural areas, feeling very strongly that these should really come from the people in rural areas themselves.

A short film on hovercraft was also shown followed by a discussion on the possible use of these and lighter-than-air vehicles. Tony Gasbarro presented some ball-park estimates of wood consumption rates. There is considerable variation in terms of area regarding wood production and consumption rates. In one area it is estimated that a village of 60 families consumes 45 acres of wood fuel per year, requiring about 3,000 acres dedicated to wood to support the village on a sustained-yield basis. Estimates of wood consumption rates per family varied between 10 and 16 cords per year. The need for improved wood stoves and improved insulation was pointed out.

The panel was given a copy of the 1976-1977 rural energy survey compiled and prepared by the Department of Commerce and Economic Development, Division of Energy and Power Development. In summary, the panel felt that the existing air and barge services in rural areas were quite inadequate and that technological improvements should be made in energy utilization and also that attention should in some areas be given to optimizing the use of local resources including alternative power sources, insulation, and combustion devices. Some factors which should be used in judging the relative merits of transportation systems were the subsidization of air carriers on the same basis as ferries, the possible future significance of railroads, and the need to consider total life cycle energy costs in selecting among transportation system alternatives. A critical point to keep in mind about rural Alaska is the relationship between energy, transportation, and food production and distribution.



Supplemental Information

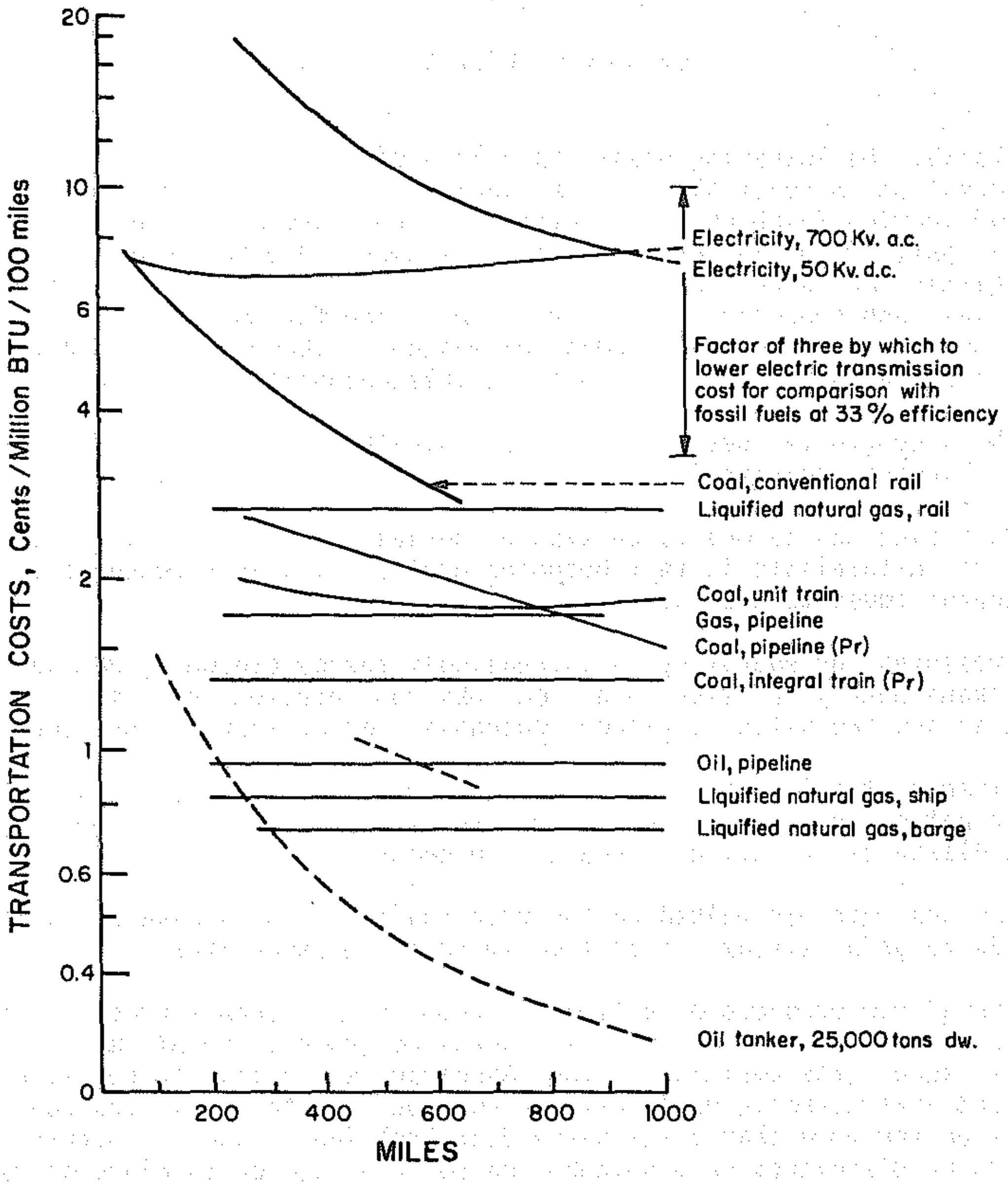
on

Transportation, Rural Problems, and Energy

EFFICIENCY OF MODES OF PASSENGER TRANSPORT

Mode	Cruise Power (H.P.)	Speed (mph)	Seat Capacity (no.)	Occupancy Assumed (%)	Transportation Efficiency (Pass. mile per gal.)	Transportation Efficiency (BTUs per pass. mile)*
Rail						
Fast train**	2,400	100	360	55	133	980
Commuter train†	4,000	40	1,000	50	100	1,300
Cross-country train	2,400	60	360	55	80	1,600
10-car subway train††	4,000	30	1,000	50	75	1,700
Road						
Large bus	200	50	43	58	125	1,000
Automobile (sedan)	50	67	4	25-50	16-32	8,100-4,100
Bicycle		6-10				180
Walking		3.5				800
Air						
747-jet	60,000	500	350	55	22	5,900
707-jet	28,000	500	136	62	21	6,200
STOL‡ plane (4-prop)	10,000	200	99	55	18	7,200
SST (US)	240,000	1,500	250	60	13.7	9,500
Helicopter (3 engine)	12,000	150	78	58	7.5	17,300

*Conversion obtained with 130,000 BTUs per gallon
**3-car, self-propelled, bi-directional double-deck, 67 tons per car
†10-car train with 2 diesel locomotives, 950 tons gross weight
††New N. Y. subway train at heavy, non-rush hour traffic
‡Short-take-off-and-landing (see "Aircraft in the Balance," Enviornment, December, 1971)
Source: Rice, R. A., ASME, 70 WA/ENER-8, November 1970, Table 12



TRANSPORTATION COSTS OF ENERGY BY DIFFERENT MODES

Though the chart above proposes to show comparative costs of transporting fuel and energy in different forms and by different means, it is so simple as to be only vaguely correct. The actual transportation cost depends critically on the efficiency of the particular facility being considered as well as on the particular time and place when it is being used. For these reasons--and because parallel data are difficult or impossible to acquire--a critical issue in developing our energy strategies is only vaguely suggested by this presentation. (Technology Review, Energy Technology to the Year 2000, A Special Symposium, MIT, Cambridge, Mass., 1971)

ALASKA: THE NATION'S POWERHOUSE

A Paper for a Town Meeting on Energy
March 26, 1977

By Jack O. Hakkila*

Alaska, the Awakening Giant, is a land of complex unreality. Transportation in rural Alaska is an indication of this complexity. An airplane leaving Fairbanks International Airport bound for the North Slope is part of the largest airlift in history. Another plane leaving on a charter for Hughes may be the only plane arriving in days. On it is the mail and groceries; it is the supply line for the village. And it may or may not arrive, depending on weather. There is no weather report from Hughes, because there is no telecommunication to the village.

The incongruity does exist. Untold wealth is being untapped by the world's largest industrial concerns next to awakening villages.

What once was termed as untamed wilderness, inaccessible, a last refuge for naturalists is fast becoming another available resource as development comes to Alaska.

Pressures for energy by an increasingly energy consuming nation and by Alaskans hungry for ever more good jobs has resulted in a view of Alaska as now the nation's energy powerhouse rather than a storehouse.

Close to two (2) decades ago a young President Kennedy set goals for the nation to place a man on the moon by the late 1960's. He also viewed Alaska as the nation's energy storehouse.

Now that man has walked on the moon and the first Alaska pipeline is ready to go on stream, it is time to review perspectives.

Energy now preoccupies national thought rather than a race to the planets and the stars. For without energy no group of people need consider such lofty ambitions. That Americans would like to consider space and intergalactic exploration should be an alternative for consideration for more than a few hardy Star Trek fans. What resources await to be discovered on a neighboring solar system or as close as Mars or Jupiter or even on the moon? The alternatives should be available for consideration by the adventurers in society. But such projects require vast expenditures in energy; not only for the actual expeditions, but for the men working at the laboratories who travel back and forth to work and for all people involved in design, construction and allied fields related to aerospace industries. As Alaskans contemplate a petrochemical industry, they may recall that 15% of the aerospace budget is for the petrochemicals, for example.(1)

That man should expend less on energy is a false sense of hope, for expending less on energy implies in part doing less. If an individual or a society is to look for accomplishment it must rely on those individuals or groups in motion for achievement. Newton's law of physics transfers to economic activity. A body at rest tends to stay at rest, one in motion tends to stay in motion.

As Alaska begins economic growth as an alternative, a very real consideration of alternative life styles and values becomes apparent. Alaskans consist of three distinct groups, Natives who have not participated by and large in the process of economic development or growth, who have only begun to do so since the settlement of the Native Land Claims. There are the Alaskans who came here for a new lifestyle, to be freed of a competitive economy, not necessarily to subsist but to be allowed to subsist and create their own world free of the system of entanglements or commitments in a modern economic society. A third group today consists of the newcomer, interested only in development and growth as he has learned to do in the boom town atmosphere of pipeline and town alike over the last several years. In between them lies a small group of Alaskans, born here, who resent the imposition of an outside set of values on their traditional conservative way of doing things. They are willing to commit to change, however, and are an important and integral part of the development process, in many cases in control of it from a political and economic standpoint.

That Alaska has a vast economic future is dictated by the fact that within her boundaries lie the resources for which the science of economics was defined; i.e., scarce resources. Those resources most important to our nation's growth are those resources directly related to the production of energy. Oil in Alaska is more plentiful both on shore and offshore than anywhere on or off the contiguous states. Alaska's coal reserves suffice for 500 years of usage. And the last great hydroelectric projects in North American exist in Alaska where the rivers and mountains offer the same opportunities that the Western states once did for hydroelectric projects. Another alternative not generally discussed is the feasability of building nuclear power plants in Alaska's mountains, away from the threats to life that exist in more populated areas.

Why the energy in such an unpopulated state? It is not of course, unrealistic to imagine that the nation's most alert, enthusiastic and imaginative people, Alaskans, may be the first to travel to Mars or to other solar systems. But they may need help from the lower states and people in the contiguous 48 should be given the opportunity to compete in a race to the stars. They will need energy and Alaska may supply it.

Transportation of energy is a critical cost item. The first oil and gas will be transported along pipelines and in ships. An alternative mentioned above is to generate the electricty in Alaska to transmit rather than the raw product.

One system which is likely to become feasible in the next few years for electrical transmission is the use of superconducting transmission lines. McDonald and Hassenzahl (2) conclude that "studies indicate that there are no major technical difficulties in the design, integration and operation of the dc superconducting transmission line and magnetic energy storage device. At present the systems would have higher capital costs than conventional alternatives; however, environmental and operating advantages of the systems may affect these costs." Work is presently underway to determine more economical design. (2) The most promising feature is the conservation of energy in transmission estimated at 99.8% over the distance of 800 kilometers. (2) By way of comparison, an estimated eight to thirteen percent of the natural gas transmitted via the El Paso proposal will be used in liquifying the gas for transport on cryogenic tankers.

One alternative for an energy conscious nation to consider, then, is to tie Alaska into the nation's grid system via superconducting electrical transmission lines.

If the mix of Alaskans decides to move ahead with growth and development, power projects as well as resource development, then Alaskans can transmit energy outside. If the conservationists, environmentalists, and stagnationalists win out, such a transmission line could serve to bring power to Alaska when the lights go out.

In any event it is time to consider Alaska as the nation's powerhouse!!

As the giant awakens, a group of children are contemplating: Should they tickle his toes?

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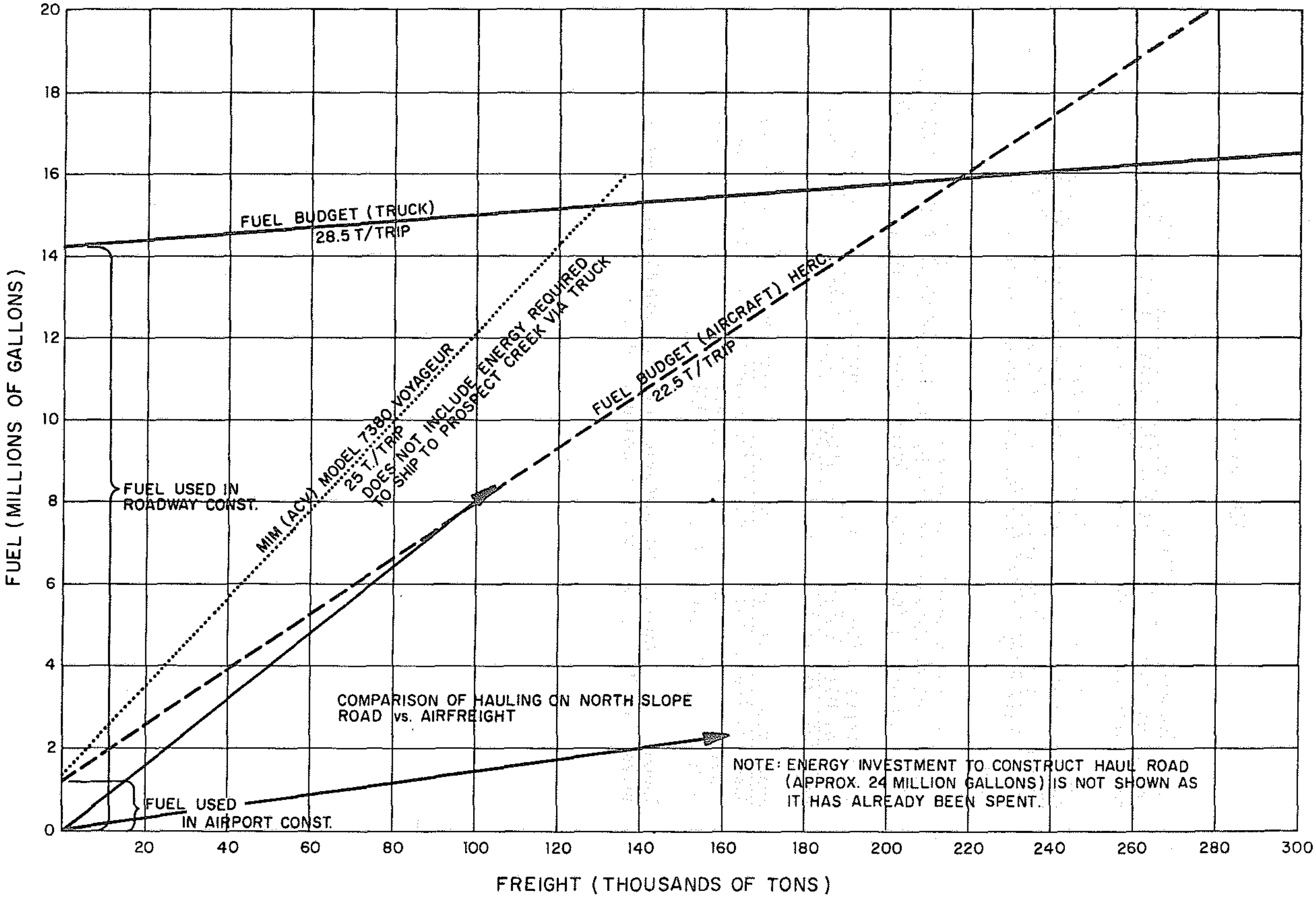
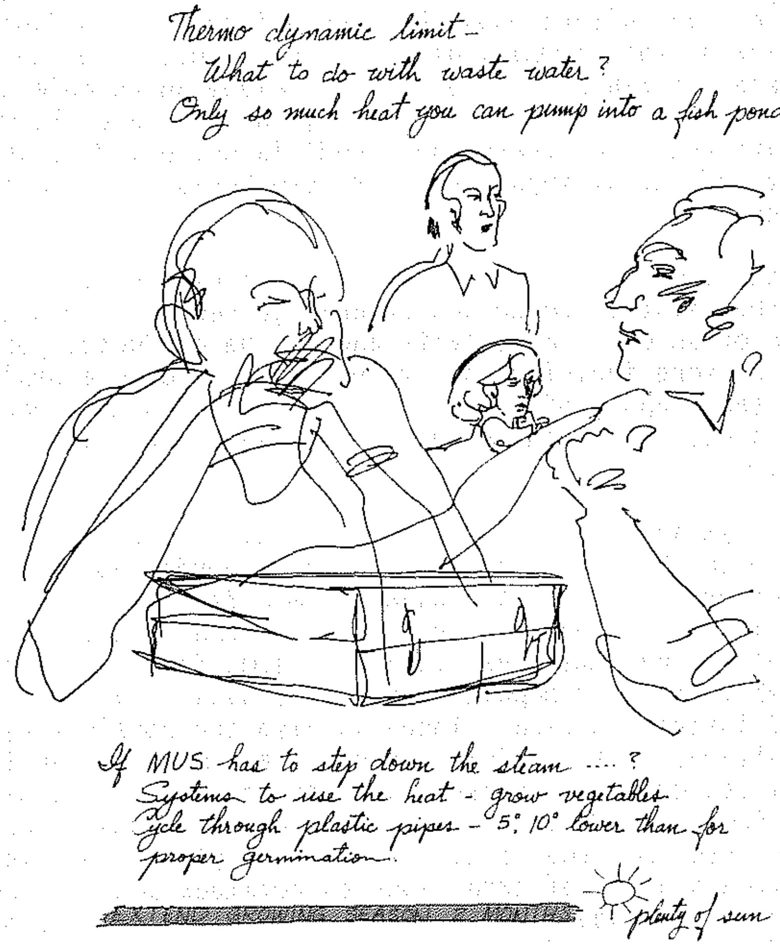


FUEL BUDGET COMPARISON (HAULING BETWEEN FAIRBANKS & KOBUK, ROUND TRIP)
AIRCRAFT / TRUCK / ACV

F. Agriculture and

ENERGY



Moderators: Tom George, Ray Morgan.
Resource Persons: Wayne Thomas, James Drew, Bill Workman, Allen Linn, Bonnie Snarski, Ann Dolney.

GROUP DISCUSSION

Both energy and agriculture are presently key topics of discussion in interior Alaska. With the Delta area agricultural development project now pending, it was felt that a discussion of the relationship between energy and agriculture would be appropriate for the Town Meeting on Energy. Following this summary of the discussions, an extensive amount of resource materials is added which include an example of the energy efficiency of one state's agriculture, in this case, Vermont. In addition, a report entitled "Energy and Food" is quoted, describing the different amounts of energy input on a per-acre basis for foodstuffs in the United States.

In the discussion group, four levels of agriculture were described and discussed, the first of which was organic gardening. This can be either an indoor or an outdoor activity and can be conducted year around with one or more individuals involved in providing a small but potentially constant supply of produce. It is based on the concept of recycling of resources and elimination of the use of artificial pesticides or fertilizer.

The second element discussed was that of family gardening. Most of us are familiar with this as it consists of home gardening with a wide variety of groups grown in a plot ranging from a few square feet up to an acre or more in size. Normally this is a seasonal activity and is generally accompanied by home preservation of some food for winter use. It is also probably the most popular type of gardening in the Fairbanks area and most of interior Alaska. There is also the possibility of community agriculture. This activity involves a number of families working in a unified effort to raise a variety of crops in volumes larger than the family gardener is able to produce. In this case garden size could range into the tens of acres. Community buildings may be involved for common storage of crops such as potatoes and the individual community equipment that would be involved would allow grain production on up to hundreds of acres. This type of gardening is also done in interior Alaska but fewer examples of it are known than that of family gardening.

Last there is the possibility of commercial agriculture. This is large-scale farming with parcels in the 1,000-acre class and with a total area of tens of thousands of acres in production to achieve economic feasibility. Generally, a single crop is produced, large capital investments are required to start the operations, and cooperatives are often involved in the distribution and marketing of those agricultural products.

After a lengthy discussion of these types of agriculture, the discussion group considered that, from a standpoint of energy, it appears that less energy per unit area is required for the large-scale operations. It is recognized that when considerations other than energy are involved, community and family gardening activities may have high values to society. The range of agricultural activities has corresponding implications for land use. Where a family or community garden involves a uniform distribution of population, large-scale farming causes relatively low density of population but supports a higher density elsewhere. In summary, the decisions concerning the type of agriculture desirable for interior Alaska will involve a range of factors, only one of which is energy efficiency.

Supplemental Information

on

Agriculture and Energy

ENERGY AND FOOD
A SUMMARY

The report, "Energy and Food"*, seeks to make a comprehensive examination of the sources and inputs of energy used in bringing to our homes the food items we use. Thus, a listing is made of common food items and the amounts of energy needed to produce, transport, process and market these food items. A summary chart of energy in BTU's per pound is provided.

Of greatest value is a quantification of the amount of energy needed to produce and deliver meat products. Special efforts were made to draw distinctions between the sources of these meat products, i.e., whether from forage-fed or grain-fed sources and the type of livestock.

Among some new findings it was found that a considerable portion of the energy expended in food production occurs in the packaging. High energy users included such processed food items as aerosolized cooking oil, flavorings and spreads, TV dinners, frozen prepared foods, and canned beverages.

Several practices seem to emerge for reducing energy consumption while preserving nutrition standards at current levels or with anticipated improvement in this country:

a. Increased home gardening and fruit growing;
b. shift to vegetable from animal protein, especially from grain-fed cattle;
c. reduced use of over-processed foods, especially frozen specialties;
d. avoidance of non-returnable beverage containers;
e. increased purchase of bulk and unpackaged foods.

This report indicates that good energy conservation practices in the food section of our economy are compatible with good nutrition andgood consumer buying practices. Many foods are available for eco-nutritious diets.

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*This summary and data are from a report entitled ENERGY AND FOOD: Energy used in production, processing, delivery, and marketing of selected food items, by A. J. Fritsch, Ph.D., Linda W. Dujak, and Douglas A. Jimerson, Center for Science in the Public Interest, 1779 Church Street NW, Washington, D. C. 20036.

INTRODUCTION

The world is in the midst of a food and an energy crisis. Only with much effort have concerned citizen groups been able to alert the general public that there is a link between these two crises, noting especially that most of the vital nitrogen fertilizer is made from scarce natural gas. The "Green Revolution" has compounded the problem, since it substituted chemical fertilizer-intensive grain types for more hardy but less productive varieties. Furthermore, many of the developing countries depend on fuel-driven pumps to bring water to their irrigated areas. When gasoline and other fuels quadrupled in price after the Arab embargo, these nations could no longer afford their recently acquired dependence on fuel-driven tractors and engines. Now their growing human populations are all the more threatened.

In America, lower-income citizens are being squeezed by spiraling food prices, which result, in large part, from industrial processing and over-packageing. While in the past energy never amounted to more than a cent or so of each food dollar, the picture is changing due to rising energy cost. Good economics and good nutrition go hand-in-hand with good conservation.

Americans use about 12% of their massive total energy budget on food production and preparation. Granted about 15% of agricultural output is exported, we also import energy intensive foods such as fish and meat products. It takes sizeable portions (about 2.5% of our total national energy) to fuel our tractors, electric dynamos, water pumps, milking machines, and other labor-saving devices to bring food from the field to the home. Food costs take up 25% of the American budget and are second only to housing (26.5%). It takes 2,000 trillion* calories of fuel to operate the total food system (production, processing, delivery, sales and home preparation) while we receive only 252 trillion calories of food. These inefficiencies are subject to critical examination in an energy-short world.

The emphasis on lower priced and more nutritious foods can be complemented by better energy conservation through proper food choices. To do this a comprehensive calculation of energy use in various food production, processing and marketing areas is required. This report begins with the agricultural inputs in the production sector, calculating the electricity, fuels, pesticides, commercial fertilizers, irrigation, agricultural machinery, commerce and farm building and maintenance costs.

In Chapter 2 we consider certain crops and by-products which are used partly in direct human consumption and partly in livestock production. The energy consumption of ecah class of livestock is calculated and then apportioned according to final utilization of the animal, whether meat, milk, eggs, etc.

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*Kilocalories by physical scientific nomenclature.

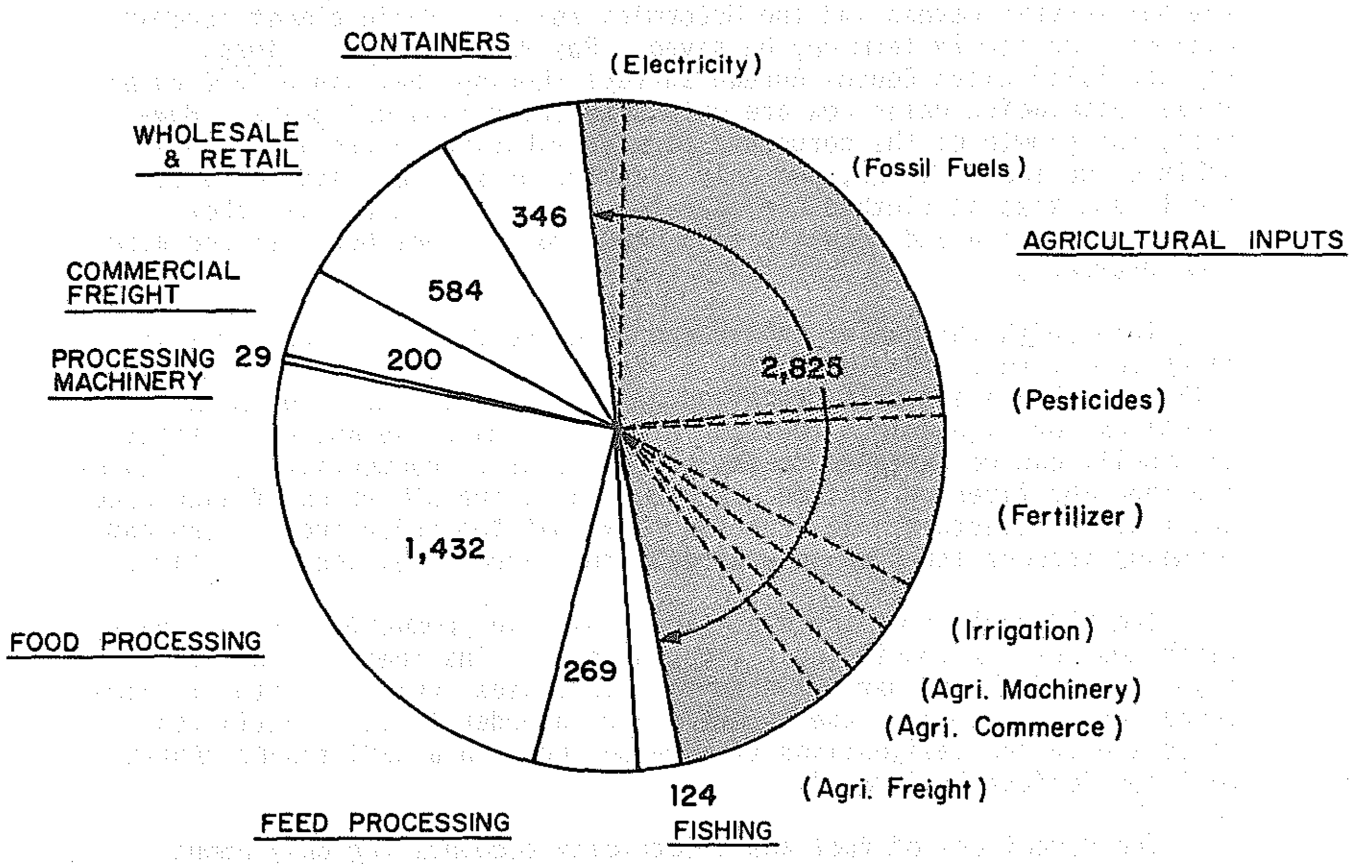
In Chapter 3 the food-processing energy contribution is developed. This is the summation of fossil fuels and electricity used in nine subdivided categories of the food processing industry: meat-packaging, dairy products, canned, cured and frozen foods, grain mill products, bakery products, sugar confectionery products, beverages and miscellaneous products To this is added the processing machinery and steel used in making food industrial equipment. The railroad and motor freight is included but food additives and purification cf process water have been excluded.

Chapter 4 considers the commerce of food. The marketing of food items, especially frozen foods demand considerable energy. Also included here are the container materials used to package the foods we buy in the store. Various minor inputs such as advertising and promotion have been omitted.

The final chapter deals with a comprehensive food chart listing the commonly purchased food items in the American diet with amounts of energy per unit. From this listing the citizen is able to construct a nutritious diet to his or her liking which also permits sould ecological practices.

This report is meant to be a scientific analysis cf energy intensity of food products which enter the home. It does not consider the 2,000 trillion BTU's of energy required to preserve and prepare foods in the home. Thus the final results are computed for commercial items, not prepared servings.

This report is a refinement of Chapter 2 of Lifestyle Index and uses the same basic methodology found in that report. From the data presented here we hope that the conscientious consumer will be better equipped to make some practical judgments about constructing his or her econutritious diet.



TOTAL AGRICULTURAL AND COMMERCIAL FOOD ENERGY INPUTS
(IN TRILLIONS OF BTU's)

CHAPTER 1

Agricultural Inputs

American agriculture has undergone a revolution since the time of the horse-drawn wagons and the McCormick reaper. While almost becoming extinct, the family farm may be saved. Roy Reed (New York Times, May 18, 1975) cites Census Bureau surveys showing that since 1970 rural areas' population gains now are outpacing urban regions' gains. However, the growth of the corporate farm (agribusiness) has almost overwhelmed the small farmer, who only a decade or so ago tried to raise a family and keep it clothed and educated by the fruits of his labor. Commercialization and mechanization have brought some benefits and also some drawbacks.

Today with the use of the tractor and the demise of the horse it takes fossil fuel and electricity to keep a farm humming. Corn driers, milking machines and self-propelled grain harvesters have enormous appetites for high-priced fuels. This use of gasoline and electricity eventually can be assigned to the end products of commercial agriculture--the food and fiber we consume. Table 1 shows the BTU value of each crop and type of livestock. It is noteworthy that two major crops, corn and soybeans account for over one-third of the direct fuel used on a farm.

The BTU content of the electricity used in production is only one-tenth that of the fossil fuels (see Table 2). Ths does not include a major part of the farmer's electricity purchases, which go into his home operation. That energy use is neglected in order to be strictly consistent with the designations of end-use found in a CSPI sister report entitled "Lifestyle Index."

The direct use of fuel and electricity accounts for only about forty percent of the total agricultural input of energy. It takes energy to produce the pesticides which are sprayed on our cropland and livestock (see Table 3). Commercial fertilizers have greatly increased the crop yields of our land, but these require energy to produce (see Table 4). In fact, this is the major non-direct energy input in the agricultural sector. The major portion of this is the natural gas required to produce nitrogen fertilizer. When one remembers that nitrogen can be replaced in the soil by legume crops one wonders why all the need for energy-intensive urea and ammonia. Farmers are beginning to turn to earlier methods of fertilizing as their profits dwindle through rising fertilizer costs. Non-farmers use about fifteen percent of the total fertilizer either in their gardens or lawns.

Another hidden energy input in the agriculture-sector is that required to pump water for irrigation (see Table 5). This applies to that part of irrigation which is not performed by pumping on the farm and thus included in Tables 1 and 2. The major irrigated crops are

TABLE 1: FUELS

	A	B	C	D	E	F
Crops & Lifestock	Acres or Number x 10⁶	Fuel/acre (gallons)	Total fuel (million gal)	Corrected T fuel (mil gal)	% Total fuel	Btu Value x 10^9
Corn grain	61.8	23.0	1,419	1,613	17.8	221,303
Sorghum	15.9	13.3	211	240	2.6	32,894
Other corn & sorghum	12.3	16.7	206	234	2.6	32,105
Wheat	53.9	11.1	596	677	7.5	9,295
Other grains	29.6	12.7	375	426	4.7	58,482
Soybeans	56.4	22.8	1,288	1,464	16.1	200,861
Peanuts	1.5	29.3	44	50	0.55	6,860
Cotton	12.0	26.7	320	364	4.0	49,907
Tobacco	0.9	386.0	344	391	4.3	53,645
Alfalfa hay	27.5	13.4	368	418	4.6	57,384
Other hay	34.7	3.5	121	138	1.5	18,865
Silage, grass	2.1	36.4	77	88	0.97	12,005
Selected pastures	46.5	3.1	146	166	1.8	22,775
Irish potatoes	1.3	57.8	75	85	0.94	11,696
Other vegetables	3.3	36.0	119	135	1.5	18,556
Fruits	3.2	41.8	166	189	2.0	25,897
Other crops	8.6	44.1	380	432	4.8	59,236
Total crops	371.5	Fuel/head	6,255	7,110		891,766
Milk cows	11.7	38.1	444	505	5.6	69,217
Other cows	41.1	8.3	341	388	4.3	53,165
Other cattle	69.2	7.4	515	585	6.4	80,296
Hogs	85.7	3.0	256	291	3.2	39,925
Sheep	12.7	2.1	27	31	0.34	4,219
Broilers	2,923.5	0.03	88	100	1.1	13,720
Chickens	250.3	0.2	43	49	0.54	6,689
Turkeys	132.2	0.2	24	27	0.3	3,739
Total livestock	3,526.4		1,738	1,976		270,970
Total crops & livestock	3,897.9		7,992	9,086	100.0	1,162,736

SOURCES: U.S. Food & Fiber Sector, page 18, Economic Research Service, "Handbook of Agricultural Charts, page 15.
Column A, B,C, from page 18, U.S. Food & Fiber Sector.
Column D includes fuel processing losses C/88 X 100.

Column E is a percentage of column D.
Column F is expressed in Btu's.
Fuels included are: gasoline, diesel and LP gas.

TABLE 2: ELECTRICITY

Crops & Livestock	A Million Acres	B Btu X 10^9
Corn, grain	61.8	4,368
Sorghum, grain	15.9	1,113
Other corn & sorghum	12.3	861
Wheat	53.9	3,801
Other grains	29.6	1,951
Soybeans	56.4	3,990
Peanuts	1.5	105
Cotton	12.0	84
Tobacco	.9	63
Alfalfa hay	27.5	1,932
Other hay	34.7	2,457
Silage, grass	2.1	147
Selected pasture	46.5	3,276
Irish potatoes	1.3	84
Other vegetables	3.3	231
Fruits	3.2	231
Other crops	8.6	737
All crops & pasture	371.5	25,431
	(1,000)	
Beef & veal cattle	131,833	13,967
Dairy cattle	21,932	50,400
Hogs	94,480	5,911
Sheep & lambs	16,545	223
Poultry & eggs	3,719,760	8,585
Turkeys	132,153	714
Others	4,450	
All livestock	4,121,153	79,800
Total crop & livestock	-	105,231

SOURCES: U.S. Food & Fiber Sector, page XIV and Dr. Lasley (personal communication). Complete set of references found at end of this report.

TABLE 3: PESTICIDES

Crops	A Pesticides (1000 lbs)	B Btu x 10^9	C Sulfur (1000 lbs)	D Btu x 10^9	E Petroleum (1000 lbs)	F Btu x 10^9	G Total Btu x 10^9
Peanuts	14,798	647	25,966	311	-	-	958
Cotton	111,916	4,891	15,078	181	49	1	5,073
Corn	127,851	5,587	192	2	13,527	311	5,900
Wheat	14,549	636	135	2	708	16	654
Sorghum	12,128	530	59	1	17	-	531
Rice	8,373	366	39	-	-	-	366
Tobacco	14,167	619	46	1	144	3	623
Soybeans	44,758	1,956	262	3	201	5	1,964
Alfalfa	2,930	128	3	-	41	1	129
Sugar beets	3,108	136	13	-	13	-	136
Oats	213	9	21	-	-	-	9
Barley	253	11	25	-	-	-	11
Rye	13	0.56	1	-	-	-	-
Other hay & forage	-	-	-	-	22	-	-
Pasture & Rangeland	8,336	364	-	-	32,659	751	1,115
Irish potatoes	9,269	405	-	-	4,226	97	502
Other vegetables	27,613	1,207	5,261	63	6,877	158	1,428
Citrus	14,255	623	24,500	294	106,442	2,448	3,365
Apples	12,783	559	1,095	13	5,696	131	703
Other deciduous fruits	3,822	167	8,169	98	-	-	265
All other fruits & nuts	12,645	552	31,221	375	32,533	748	1,675
Summer fallow	1,437	63	-	-	140	3	66
Nursery & Greenhouse crops	1,040	45	-	-	362	8	53
Livestock	15,154	662	872	10	13,126	302	974
Total	461,411	20,163	112,958	1,355	216,783	4,986	26,504

SOURCES: U.S. Food & Fiber Sector, page 87. Economic Research Service, "Farmers' Use of Pesticides in 1971."
Sulfur = 12,070 Btu/lb.

Pesticides = 43,670 Btu/lb - including feedstock and losses.
Column A X 43,670 Btu/lb = column B.
Column C X 12,070 Btu/lb = column D.
Column E X 22,867 Btu/lb = F.
Column G = column B + D + F.

TABLE 4: COMMERCIAL FERTILIZERS

Crops	Tons of Fertilizer	Percent	Btu x 10^9
Corn	9,558,348	34.44	191,385
Sorghum	1,061, 694	3.83	21,283
Wheat (includes winter wheat)	3,530,138	12.72	70,686
Oats	675,185	2.43	13,504
Barley	456,567	1.64	9,113
Rye	47,684	0.17	945
Soybeans	1,103,715	3.98	22,117
Peanuts	260,074	0.94	5,224
Cotton	1,551,625	5.59	31,064
Irish Potatoes	676,543	2.44	13,559
Tobacco	765,217	2.76	15,337
Hay crops	1,184,779	4.27	23,729
Field seeds	134,866	0.49	2,723
Vegetables	1,223,264	4.41	24,507
Orchards	1,357,681	4.89	27,174
Subtotal	23,587,380	85	472,351
Other - nonfarm	4,162,000	15	83,356
Total	27,749,380	100	555,707

SOURCES: Agricultural Statistics 1974, Census of Agriculture and Economic Research Service, "Changes in Farm Production and Efficiency." From U.S. Food & Fiber Sector, page XV, total Btu = 555,707 X 10^9. Tonnage obtained from Census of Agriculture.

TABLE 5: TOTAL AGRICULTURAL INPUT

Crops & Livestock	Electricity	Fossil Fuels	Pesticides	Fertilizer	Irrigation	Machinery	Commerce	Freight	Total BTU x 10^9
	←			Btu X 10^9				→	
Cropland pasture	3,276	22,775	1,115	-	11,100	3,024	2,592	-	43,882
Silage:									
Grass	147	12,005	-	-	365	1,630	1,397	-	15,544
Sorghum	202	7,535	-	-	361	1,025	878	-	10,001
Corn	659	24,570	-	-	3,690	3,343	2,880	-	35,142
Alfalfa hay	1,932	57,384	129	100	19,000	7,728	6,624	135	93,032
Alfalfa seed	-	-	-	-	790	-	-	-	790
Other hay	2,457	18,865	66	23,729	10,300	2,520	2,160	7,184	67,281
Grains:									
Wheat	3,801	9,295	654	70,680	7,900	12,600	10,800	22,726	138,462
Rice	874	26,186	366	1,423	12,153	3,528	3,024	6,524	54,078
Rye	29	873	-	945	405	118	101	222	2,693
Corn	4,368	221,303	5,900	191,385	12,700	29,904	25,632	32,999	524,191
Oats	481	14,402	9	13,504	1,030	2,016	1,728	3,662	36,832
Sorghum	1,113	32,894	531	21,283	13,500	4,368	3,744	10,119	87,552
Barley	567	17,021	11	9,113	6,000	2,352	2,016	4,327	41,407
Oil-Bearing:									
Soybeans	3,990	200,861	1,964	22,117	2,780	27,048	23,184	25,716	307,660
Peanuts	105	6,860	958	5,224	790	924	792	8,099	23,752
Nursery & Greenhouse	-	-	53	-	560	-	-	-	613
Sugarbeets	294	23,647	136	479	4,092	3,219	2,765	19,509	54,141
Sugarcane	168	13,580	-	275	2,350	1,849	1,584	11,203	31,009
Syrups	6	468	-	9	-	64	58	386	991
Vegetables	231	18,556	1,428	24,507	6,400	2,520	2,160	57,459	113,261
Irish potatoes	84	11,696	502	13,559	2,780	1,579	1,354	39,929	71,483
Fruits	231	25,897	5,805	27,174	9,100	3,360	2,880	32,452	106,899
Nuts	269	21,540	203	436	-	2,932	2,506		27,886
Cotton	84	49,907	5,073	31,064	12,300	6,720	5,760	10,301	121,209
Tobacco	63	53,645	623	15,337	397	7,224	6,192	7,541	91,022
Lawns & shrubs	-	-	-	83,356	-	-	-	-	83,356
Beef & veal cattle	13,967	116,828	430	-	-	10,752	9,216	49,932	201,125
Dairy cattle	50,400	85,850	196	-	-	16,632	14,256	102,620	269,954
Hogs	5,911	39,925	182	-	-	5,376	4,608	18,596	74,598
Sheep & lambs	223	4,219	7	-	-	571	490	698	6,208
Poultry & eggs	8,585	20,409	136	-	-	2,755	2,362	49,056	83,303
Turkeys	714	3,739	22	-	-	504	432		5,411
Total	105,231	1,162,736	26,504	555,707	140,843	168,000	144,000	515,396	2,824,768

alfalfa hay and sorghum though smaller amounts of water are used for almost every type of crop grown. A larger hidden input is the energy required to make the steel and machinery used on the farm (see Table 4). The total 168 trillion BTU's has been determined from calculations found in a revised version of Lifestyle Index which will be released later this year. It is assumed that the agricultural machinery will be used in direct proportion to fuel used by various crops and categories of livestock.

Mechanized farms require certain purchases from the commercial sector of the economy. It takes energy to operate seed stores, livestock markets, and machinery service centers. Also included in the 144 trillion BTU's in the category is the energy required for agricultural containers such as fruit crates and grain sacks.

The second largest indirect agricultural energy expediture is the transportation. This has been extensively analyzed by the U. S. Department of Agriculture in the report entitled "U. S. Food and Fiber Sector." It is worth noting that milk and vegetables require the greater expenditures of energy in this sector.

The sum of agricultural inputs from Tables I through VIII is given in Table IX.* Some twenty-nine crops and seven livestock categories are indicated. Not all the energy was divided into these categories and some adjustment is residual "other" classes is made in various inputs. A ninth major agricultural input, fee, is deferred until the next chapter. It will become apparent why this is so when one reflects on the complicated problem of allotting crops to feed, food and exports, and the diverting of crop by-products to animals.

This report neglects energy exerted by the farmer himself-which is diminishing per quantity of output with each passing year. Human work does require energy, but each worker must live and eat, whether on a farm or not. Out interest is primarily in non-renewable energy resources such as fossil fuels, and so the neglect of this is consistent with assumptions found in "Lifestyle Index." Seed crop production and breeding stock are counted in energy use but will be excluded in total production. Thus the energy used in producing seed is ultimately apportioned according to useful endpoint consumption (domestic food, feed, fiber and exports). Crop loss and shrinkage of harvested crops are computed in a similar fashion.

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*See complete report.

ENERGY UTILIZATION IN VERMONT AGRICULTURE

Energy consumption in the United States has been increasing at the rate of about 5 percent a year over the last two decades, four times faster than cur population growth. Our national energy budget now consumes 35 percent of the world's energy. Such statistics, in themselves significant as indicators of our dominant role as energy consumers, become even more disquieting when our use of this energy is more closely examined.

The food production, processing, and marketing system is today a major energy consumer in the U. S. economy, using 15% to 18% of our total energy budget. This system, marked by the growth of agribusiness and specialization, is dependent on decreasing supplies of fossil fuels. Food production and distribution no longer rests on labor intensive agriculture and traditional storage techniques. The development of highly processed foods and the extensive use of internal combustion engines and electrical power, along with the increase in meat consumption since 1945, have drastically changed food production. These developments have at least one outcome which affects all consumers: the overall energy efficiency of our food system from field to table has fallen.

We are at an end of the era of cheap energy, at least until technological advances lead us to use of other energy sources. Meanwhile, the energy crisis has clearly shown us that production and distribution systems for all goods--including agricultural items--are based on obsolete assumptions concerning the finite nature of natural resources. Contrary to conventional wisdom, the United States and the global community are moving into a new era of production constraints on both our limited, non-renewable and our renewable resources.

This change in focus requires a more critical understanding of how, where and to what ends we use resources, as well as examination of alternative patterns of resource use. Before we can effectively deal with this present and long-lasting problem, however, current energy use patterns must be analyzed and discussed. Such study of the agricultural system can move us toward more efficiency in the use of raw fuels. It may also help us to put environmental, social and economic considerations into the energy equation.

Long-term improvements in agricultural productivity and stability are bound to our definition of agricultural efficiency. In the past and even today most societies define efficiency as an economic concept, related to profit maximization. Fuel or electrical energy are, thus, efficient if their use results in higher profits, and are inefficient when they are no longer profitable. This definition does not take other questions into account. What are the amounts and purposes of cultural energy used, items such as human labor, fuel, tractors, fertilizers and other energy subsidies? What is valuable to the quality of life and the ongoing operation of our monetary system? What are, in short, the total costs of production? These considerations require a full energy accounting system for agricultural production, one which describes the real costs of goods and services and guides us toward energy conservation measures.

FULL ENERGY ACCOUNTING

Process analysis is one method which can be used to obtain more complete energy accountings. It involves the detailed accounting of the energy inputs involved at all stages of the production process for a particular product, separating cultural from non-cultural energy. This method, one of several ways to gather and analyze data, was used in our study of Vermont Agriculture to determine net energy. This concept generally refers to the amount of energy remaining after all energy costs of finding, producing, upgrading, transporting, and all energy used in labor, material and other social inputs have been subtracted. Although net energy does not consider the quality of energy, it can determine the desirability or appropriateness of a particular energy form for a specific use. "High quality" energy like electricity, for example, is less efficient for space heating than solar or wood.

This total accounting uses the kilocalories (kcal) as a unit of measurement. A calorie is the amount of heat required at a pressure of one atmosphere to raise the temperature of one gram of water one degree centigrade. This approach allows us to make energy and non-cultural energy dimensions, converting available information and data obtained directly from manufacturers and farmers into a uniform analysis.

According to United States Department of Agriculture figures, 95.2% of Vermont's agricultural cash receipts for 1973 fell into four production output categories. Dairy accounted for 88%, apples for 1.9%, eggs and poultry products for 4%, and maple sugar for 1.3%. These categories were exapnded to include, in our study, both direct and indirect outputs. In apple production, for example, apples are the foot output, but vegetative growth such as wood, leaves and hay, as well as chemical residues, heat and oxygen are also outputs.

Vermont's agricultural sytem in 1970 produced over 225 million gallons of milk, 17,000 tons of apples, 11 million dozen eggs, and, as of 1974, 321,000 gallons of maple syrup. We have developed summary energy budgets for these four production categories, including inputs and outputs measured in kilocalories (see table at the end of this report).

Our analysis of the energy inputs required for this productive output also considered direct (on-site) and indirect items. A process which appears less energy-intensive on-site can, in fact, be more energy-intensive when total inputs are included in the calculation. In our study of maple production, for example, it was critical not only to include energy calculations for direct inputs such as horse labor or fuel used by tractors, but to look at the energy costs for indirect inputs such as tractor production.

Here is a brief summary of the way we looked at horse labor, fuel for tractors, and tractor production in our study of the maple industry in Vermont. Similar calculations were completed for all inputs in the four major agricultural sectors.

Horse Labor: Input was derived first by multiplying the estimate for horse-gathered taps in Vermont by the average of 0.25 hours of horse labor per tap. That gives 61,000 horse-hours per season. We used feed consumption figures of 0.58 pounds oats per hour and 0.73 pounds hay per hour to derive totals of 17.1 tons of oats and 22.3 tons of hay consumed each season by maple horses. The energy input yearly attributable to horses in this industry was then determined, using figures of 2122.4 gross kcal per pound of oats and 2045.4 gross kcal per pound of hay.

Fossil Fuel for Tractors: Fuel consumption was computed by multiplying the total estimated number of gas-powered tractors in use on maple operations by the average use of 87.34 hours per tractor each season. This total was multiplied by the average consumption of 4.2 gallons of gas per hour, giving a total of 121,787 gallons of gasoline attributed to gas-powered tractors. Assuming that 50¢ of tractors were deisel, at 87.34 hours per season, we multiplied this figure by 2.9 gallons of fuel per hour for a total of 70,177 gallons of diesel fuel for tractors. Adding total gas and diesel figures gives the total tractor fuel consumption for the season.

Tractor Fabrication: The energy required to manufacture a tractor, an indirect input for maple production, were first determined by calculating the estimated total tractor horsepower based on an average of 43.74 h.p. per tractor, multiplied by the estimated total tractors in use. When taken times the estimated 2.65×10^6 kcals per tractor horsepower, this figure gives a total input of 6.43×10^{11} kcals. We assumed that maple accounts for 1/6, or 2 months of the tractor's yearly use, and depreciated it over 20 years at 5%.

Tractor Materials: Each tractor also has an energy cost for raw materials, that is, the energy needed to produce and transport its constituent materials. These costs were calculated by assuming that steel comprised 99% of tractor weight, at 3.15 tons per 45 h.p. tractor. The total weight of 554 maple tractors is about 1728 tons. At 108×10^7 kcals per ton for steel production, kilocalorie input was determined and depreciated for a yearly figure. Transportation was taken at an estimated 4.43×10^5 kcal per ton of agricultural machinery. After depreciation, this produced the value for transport input.

VERMONT AGRICULTURE

THE QUESTION OF SIZE

What scale is appropriate or most efficient? Such a question is critical in almost any political, social or economic discussion today. It is also relevant to the discussion of Vermont's productive units in agriculture. In the dairy industry, for example, the average acreage of farms and the number of cows per farm have both significantly increased. In order understand the effect of different size operations on overall energy efficiency, we compared economy of scale models for each item.

In two sectors, the maple and apple industries, we found relatively little efficiency advantage at any size. The energy efficiency advantage of a 4000-tap maple operation over a 1000-tap operation is less than 10%. The situation in the apple industry is similar, and, given the current approach of ground or air crop spraying, there is little chance that less energy use can be achieved by increasing the size of apple operations. At the moment a 218-acre apple orchard, with 158 producing acres, is not much more efficient than a 35-acre operation.

Commerical egg operations are currently more efficient than homestead operations utilizing purchased feed. Most efficiency differences, we found, depended upon the amount of feed expended to produce each egg. Increased mechanization reduces the waste of feed. Aside from this difference, however, there seems to be no real energy advantage of a large commercial operation over a small one.

In the dairy industry, the smallest farms are the most energy efficient. A dairy farm with between 25 and 42 cows, especially if they use a high proportion of feeds from hay and pasture, is both most efficient and produces a greater total food output per cow. Indirect inputs, such as energy needed to produce seed, fertilizers and herbicides, and food consumed in providing needed human labor, are lower for a larger dairy operation than for a small farm. Direct inputs, however, are generally higher for larger farms.

CONCLUSION

The energy efficiency of Vermont's four major agricultural sectors is low. As we indicated earlier, the relatively high place of these items on the food chain and the high energy inputs normally required have contributed to this situation. Vermont's agriculture, which does not use primary production of plants directly, is currently skewed by the dependence of dairy producers on imported feeds. They account for over 60% of the overall energy input for agriculture. Farmers are also vulnerable to rising energy costs and fossil-fuel dependent products which are sometimes in short supply.

The State's low agricultural efficiency and fuel dependency are compounded by an economic system which discourages and prevents farmers from adopting more energy efficient or ecologically sound practices. As things stand, profit and short-term solutions to problems tend to support one another. If short-term profit is the criteria and the problem is a need to reduce the use of natural gas, for example, then the solution may be increased use of electricity generated by fossil fuel.

Erik Eckholm of Worldwatch Institute has exemplified the situation. The problem of surging world grain prices, he notes, led farmers to convert pastures, woodlands and idle fields to crops in the mid-1970s even though much of the land had inadequate conservation treatment. As a result, the average loss of topsoil to water and wind on those lands rose to double the tolerable level, according to government soil conservation officials. In this case, short-term profit led to soil depletion.

If the criteria, on the other hand, include resource availability and sustained productivity, then the current problems must be matched by long-term solutions. At the moment, these solutions aren't supported by immediate profit. The choice of extending our current economic policies into the future, however, will tend to incrase the hardships for most farmers.

Another choice is available, redefinition of the concepts of efficiency, profit and resource exploitation. Our process analysis approach is a tool for such a change in thinking. It acknowledges that food production is dependent on raw fuels and the quality of the water, air and soil. For future generations, we believe, efficiency will mean the protection rather than the depletion of these resources.

The concept of nutrition must also be redefined, with a view of the overall market structure and quality of life. We must begin to consider more than the calorie or protein accounting which currently characterize our nutritional concerns.

In the near future, additional comparative analysis will be needed concerning various modes and sizes of agricultural production. These might include the individual operation which has mixed output, such as meat and forage, fruit and vegetable; the monocultural production unit; cooperative associations which produce a variety of items; and intermediate levels of production on specific items from the individual farm up to the national level.

Such study must place agriculture in a social, biological, and political framework. We have taken a bioregional approach to analysis which considers the state an important political level. The state level provides a perspective for public policy decision-making and individual farmers. On this level, a bioregional view considers the direction of technological development, the environmental costs, short and long run natural resource demands, and the economic impact of changes in energy use or availability. It might be possible, nonetheless, to extend this approach to a multi-state region, for instance, New England or a part of this region and New York.

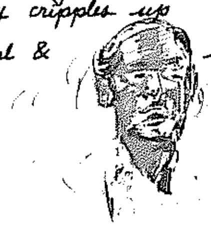
When farmers consider the installation of production processes that require a large, on-going energy subsidy, the type of energy demanded and the nature of the benefits derived should be carefully reviewed. We recommend a long-term view, especialy if alternatives are feasible and available. State and national researchers must look for production options that are economically, socially and environmentally adequate.

Agricultural policy is also made at the local level. Such policy, we concluded from the research summarized previously, will prove most effective if it indicates an awareness of the needed long-term energy resources for a fully efficient agricultural system.

NOON PANEL DISCUSSION:

The Day the Lights Went Out

External energy sources are not dependable
our convenience gets served but
technology cripples up
internal & external life



FAIRBANKS *is by nature a disaster area*

If you can't depend upon God and if you can't depend on your own mind then surely THERMO DYNAMICS

Energy crises is to 20th Century what death of God is to 19th Century

Breakdown of humans image of relationships between outside and inner world

What in the external world can be trusted to be sure our needs will be met.

must be from within us not fragile energy system

At 12:45 p.m. the town meeting reassembled for a panel discussion entitled "The Day the Lights Went Out." Panel members gave brief discussions of what they felt would occur in Fairbanks if one January morning with the temperature at -40°F the town received word that all outside sources of energy would be cut off. This scenario was designed to stress the great importance energy supply has to this community and every element of our lives, by showing us what would happen <u>without</u> it. Panel speakers were Dr. William Catton, Professor of Sociology, Washington State University, Dr. Joseph Meeker, Visiting Professor of Environmental Studies, Pitzer College, and Dr. William Hunt, Professor of History, University of Alaska, Fairbanks. The text of their discussion is given here.

Some Comments in Response to the Question What Would Happen to Fairbanks if...an Unforeseen Crisis Cut Off Outside Energy?

by

William R. Catton, Jr.
Professor of Sociology
Washington State University

To anticipate what might happen to Fairbanks if outside energy sources were cut off, I propose to look at some other human populations that either have faced or will face a chronic shortage of one or more essential resources.

Eleven years ago, in his presidential address to the British Association for the Advancement of Science, a professor of agriculture at Cambridge University, Sir Joseph Hutchinson, said he believed Britain was already over-populated and would become even more so in the future whatever his countrymen might decide to do about it. By overpopulation he meant simply "too many people for the resources in land that are available to them."

By that definition, it ought to be easy to see that a condition of overpopulation can come about either by continued increase of human numbers <u>or</u>, just as truly, by depletion of some essential resource. Thus, examples of populations that increased too much can be instructive for understanding the plight of populations deprived of access to a vital resource.

Closely connected with the concept of overpopulation is the concept of "critical population density," which professor Hutchinson borrowed from a book by William Allan, called <u>The African Husbandman</u>. The critical population density is the maximum ratio of people to land that can be supported by a given agricultural system before the land begins progressively deteriorating. In other words, it is the same idea as the range-manager's concept of "carrying capacity"--the maximum number of animals of a given species that an area can support on a permanent basis, i.e., without degradation from over-use.

As Professor Hutchinson said, "It is a characteristic of our biological environment that we can for a limited period exploit it in excess of its real productive capacity, and only after a lapse of time is it apparent that we have initiated in it a progressive decline." That is, population growth can sometimes temporarily overshoot carrying capacity. When it does, then the population living in the period after sustainable carrying capacity has been exceeded finds itself faced with a chronic shortage of one or more essential resources. What happens in that kind of situation is precisely what we want to know about Fairbanks. The question before us could have been stated differently: "How excessive would the present population of Fairbanks turn out to be, or how extravagant would the present Fairbanks way of life turn out to be, if people here had to make do with local resources only?" That is really the same question, in a different form.

What makes the question about a sudden cut-off of outside energy sources timely and realistic is not just the experience of energy shortfalls that hit the eastern part of the lower 48 this January. It is realistic and timely because we are all now living in an era in which we have begun to sense that our lives, or at least our ways of life, have come to depend heavily upon the continued availability of resources which aren't going to continue to be dependably available.

That's the kind of trap the Irish fell into. Their history can be instructive to Fairbanks in 1977. The big fact of life in all modern communities is our extraordinary dependence on enormous per capita inputs of energy, and we have only begun to recognize the vulnerability of these essential inputs. The people of Ireland allowed their lives to become similarly vulnerable when they developed a way of existing that made 9/10 of them almost totally dependent on a single food crop, the potato. Just as modern energy-consuming technology has seemed desirable to us, the potato seemed a great blessing to the Irish when introduced just before 1700, for it yielded more calories of food per acre than other crops, it required less cultivation, and growing underground, potatoes were less subject to easy destruction by British armies. Irish population increased accordingly. By 1821, the Irish census counted over twice as many people as there are in Ireland today. They were increasing at a rate that would have twice doubled even that excessive number between then and now, had growth not been rudely interrupted. By the 1841 census there were 8,175,124, and the country was manifestly overpopulated, as reflected in the deaths of many thousands from starvation following localized crop failures in 1822, 1831, and in 1835, '36, and '37.

By 1845, more than 60,000 people annually were emigrating. That year, a fungus from America infected potatoes in Ireland, destroying about half the crop. More potatoes than ever were planted in 1846, but the blight struck again and the crop was almost totally lost. Emigration increased 73 percent in one year. The horrors that followed this interruption of vital resource exceeded any disaster in Europe since the Black Death of 1348. Typhus, dysentary, and cholera compounded the agonies of starvation. People died faster than the living could bury them; bodies lay on the roadsides. The number of emigrants who fled Ireland in each of the next five years was almost three times the annual exodus in prefamine years. The number of extra emigrants was matched by the number of deaths in excess of normal. Deepening misery and poverty made delay of marriage a permanent custom and increased the percentage of both sexes who never married at all. Net result: instead of doubling and doubling again, the Irish population has since declined to about 25 percent of its peak figure about five generations ago.

The citizens of Fairbanks, like the citizens of any other modern city, and like all the citizens of many whole nations, depend to a considerable extent upon certain resources that come from elsewhere. Energy is by no means the only example. How much of your clothing is locally manufactured? How much of the natural or synthetic fiber from which it is made comes from the immediate vicinity of Fairbanks? How much of your food is grown in your own back yard? How much of the equipment you use in your daily lives, to earn your living, to enjoy your evenings, or to appreciate your portion of The Great Land on your weekends--how much of it is made here from local materials?

Before Fairbanks existed as a modern city, there were native people living in this area who did get along without "outside sources of energy" in the sense in which we now understand that phrase. But there were many fewer of them, and they had to live a far more arduous and austere life than modern Alaskans or other Americans would regard as our birthright. Modern residents of Fairbanks could not revert overnight to that low-energy mode of living.

Suppose the interruption of availability of a vital resource were only temporary. You'd make adjustments. Some form of rationing of supplies on hand might be quickly devised. Long-established social norms would be invoked with new significance, and various ways of sharing with each other would spontaneously develop. Mutual aid mechanisms would emerge. You'd all cut back on consumption in whatever ways you could, to get through a difficult time. As long as you were sure the deprivation was temporary and most people were cooperatively and decently doing their best to cope and help, you might well find the experience socially and emotionally positive. Like a muscle being exercised, community solidarity might be strengthened by such testing.

But assume the unavailability was permanent; no relief in sight, even in the distant future. It is doubtful if the same positive community spirit would manifest itself. It would be especially unlikely, I think, if people started adjusting initially under the supposition that their collective deprivation was only temporary and then found their frustrations deepening when prolonged far beyond both expectation and understanding. Resentful cries of "Why didn't they tell us?" would be heard.

Culprits would be sought upon whom our woes could be blamed. Perhaps officials of local government would first be singled out for criticism, humiliation, and retaliation. If imported resources were no longer available, remote suppliers would be of no use as culprits upon whom to vent expectable rage; so there would be an urge to impute culpability to the more accessible local people who happened to be cast in the role of agents of our frustration. Service station operators with no more gasoline to sell might incur the wrath of their former customers. With the exhaustion of local stockpiles of heating fuel, and with the shutting down of local electric utilities, it might be the doors of the oil dealer or the power company executive that would first be battered down and chopped up for firewood. One can imagine mounting resentment being reciprocated, and frenzies of frustration leading to orgies of mutual destruction--all in the name of justice and self-preservation.

Do people who are only deprived and not depraved really behave that way? Well of course not everyone in a community like Fairbanks would turn beastly, but as frustration deepened some would.

Pitirim Sorokin, a Harvard sociologist who had been born in Russia, had lived through the Bolshevik revolution and suffered through the famine that hit that country during its period of severe disorganization after World War I, published a book during World War II on Man and Society in Calamity. In considerable detail, he compared the responses of many populations in many times and places to four major kinds of calamity: war, revolution, famine, and pestilence. He showed how, in many eras and in many countries, strong tendencies toward moral degeneracy were evoked by each of these. But he also showed that there was a pattern he called "the law of polarization of effects." The same calamity that brings out the beastly side of some of its victims may deepen the nobler nature of others who suffer its effects. He estimated, for example, that in cases of severe famine the percentages who typically succumb to its pressures might run about as follows: less than 1 percent would resort to cannibalism; perhaps 2 to 5 percent might engage in wanton killing; not more than 5 to 10 percent would inflict bodily and other injuries on members of their own social group; something like 7 to 10 percent might engage in criminal acts against property, such as theft, larceny, forgery, etc.; anywhere from 20 to 99 percent would sooner or later resort to violation of rules of strict honesty and fair play such as misuse of ration cards, hoarding, taking unfair advantage of others; from 50 to 99 percent would begin bending other moral scruples; and from 50 to 99 percent would weaken or abandon their adherence to esthetic standards ordinarily associated with food.

But side by side with these processes of desocialization, Sorokin insisted, there would appear "conspicuous deeds of altruism, heroism, and religious devotion."

Paraphrasing some of the conclusions from Sorokin's final chapter, entitled "A Glance into the Future," I think I can tell you how he might have answered the question about Fairbanks. He thought the following trends could be expected to escalate in all contemporary societies involved in the catastrophes of our time:

1. Increasing fractions of the people in the community would become more emotionally unstable, irritable, or depressed.

2. Most of the social institutions and organizations of a modern community would be pressed toward increasing control of the activities of members and clients; regimentation and regulation by the state would increase; privacy and individual autonomy would be inevitably eroded.

3. Contrasts between rich and poor would diminish, not by elevation of the poor in accordance with the time-honored American dream, but rather by the collapse of privilege and "the impoverishment of the whole society,"

4. An atmosphere of calamity would pervade all compartments of culture; science, pholosphy, art, music, theater, literature, law and ethics will be increasingly preoccupied with themes or projects pertaining to calamitous conditions and to supposed means of coping with such conditions.

5. Uncertainty and insecurity, combined with an apocalyptic mentality, will become part of everyday life. People will be increasingly receptive to "various portents and omens, from astrological soothsaying to the queerest fantasmagorias," said Sorokin.

6. The population will be increasingly polarized into categories of saints and sinners, cynics and stoics, profligates and ascetics, criminals and altruists, libertines and martyrs.

Now I would remind you that it was only a generation ago that the world had the experience of having a whole nation that had suffered severe deprivation (Germany after defeat in World War I) turn against a subgroup within it whom it declared to be superfluous. The Nazi attempt at genocide may not have been merely the product of Hilter's twisted mind, but may be an omen of what we can expect when human redundacy is severely felt in the face of a carrying capacity deficit.

One human community which suddenly had the resource rug pulled out from under it was the Ik, of east Africa, studied by an anthropologist, Colin Turnbull. His book, The Mountain People, is relevant to our attempt to guess how the people in Fairbanks might behave if cut off from a vital resource. It describes what happened to these hunters and gatherers when their major source of game, the Kidepo Valley, was designated a national park. The Ik suddenly were required to become farmers, but they had no cultural preparation for so drastic a change in their way of life, nor was the land on which they lived suitable for agriculture. Moreover, several successive years of drought made the transition impossible. They were reduced to chronic starvation, which they alleviated slightly by game-poaching in the national park, purchasing some tolerance from the police with bribes of meat.

Despite Turnbull's background and previous field experience as a trained anthropologist, he was profoundly shocked by the completeness of the social degradation he observed during his first few weeks among these mountain people. They seemed to him to have shed their human qualities even more completely than did the ruthless supervisors of Nazi concentration camps--a fairly harsh standard of comparison.

Turnbull reported that almost no acts of kindness could be observed among the Ik, and they seemed to derive the nearest thing to joy from witnessing or inflicting misfortune upon others. Many adults with whom he conversed had lost all memory of a time when people had treated each other kindly, when children were fondly cared for by parents, or when grown children appreciatively looked after superannuated parents. Family ties seemed to have lost all value; children were as unwanted a burden as were aged parents.

Living as close to starvation as these people did, expressions of emotion were an expenditure of energy they could ill afford, so emotion was hard to detect. The food they had so little of had become their highest value. When any became available it was consumed immediately; deferment of gratification was simply not considered. Turnbull found them altogether devoid of a sense of belonging to one another or wanting or needing each other, and altogether devoid of a sense of moral responsibility. Their utter thoughtlessness of each other was exemplified by the nonchalance with which they might defecate on each other's very doorsteps. There seemed to be no religion, no ritual, and little activity even. These people sometimes just sat for long periods, utterly ignoring each other. Social bonds seemed to have been reduced to nothing but inescapable relationships of material and exchange and mutual exploitation. Even the parents or the sibling of a starving child, or the adult some of a feeble old person, could be seen taking unswallowed food from the weaker individual's mouth and consuming it.

Turnbull saw an ominous parallel between the Ik and our own industrial society. He suggested that among us, too, "the very mainstays of a society based on a truly social sense of mutuality are breaking down." Perhaps that is less apparent here in Alaska than in some parts of the lower 48, or elsewhere on this crowded planet--Northern Ireland, Uganda, Argentina, the Middle East. But all of us would be well-advised to heed the warning implicit in Turnbull's study of the Ik. Those people who found themselves trying to live without visible means of support seemed to Turnbull to have deteriorated beyond the possibility of salvage. As a group they were dying, but as emotionless and competitive individuals they were existing temporarily by utterly self-service actions.

Knowing about the Ik enables us to see an allegorical meaning in the question about Fairbanks on a frigid January morning. What it really asks is whether their dehumanized existence may be the future fate of major segments of energy-dependent civilization when energy is no longer cheaply and abundantly available.

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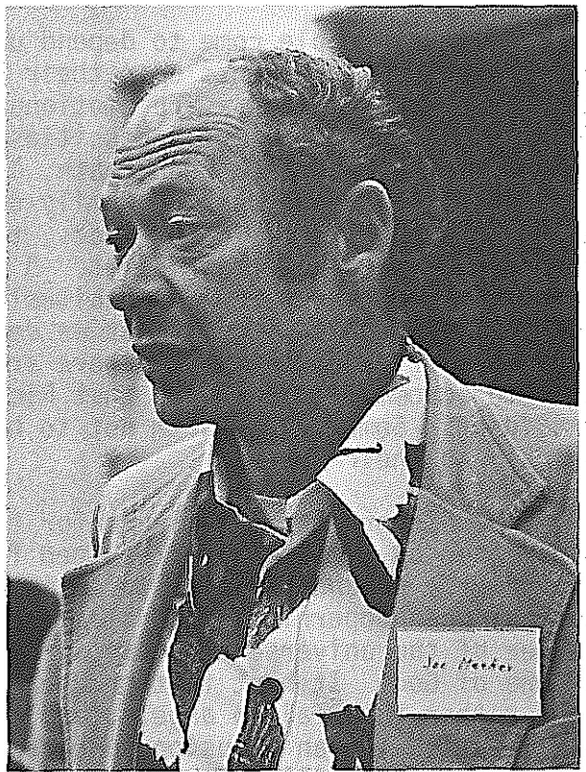


Learning to Undepend

by

Joseph W. Meeker
Visiting Professor of
Environmental Studies
Pitzer College

A woman I know in Southern California told me the other day with a sigh that she had finally decided to have the furnace in her home repaired, even though the cost was ridiculously high. I asked how long it has been since the furnace had worked? "Oh, about a year and a half," she answered. She could obviously afford a low-energy response to her domestic energy problem. She didn't have a crisis, but merely an inconvenience. On chilly mornings, she compensated for the useless furnace by wearing sweater.

In Fairbanks, when the external energy source goes off, the internal energies of everyone must be ready to take over immediately, for there's no comfy cushion to give anyone time to decide whether or not they can afford to make repairs. Repairs may not even be possible at any price, and no amount of screaming at GVEA or the mayor or the Corps of Engineers will help. That's when the energy inside each person will have to compensate for undependable external energy sources.

External energy sources never were very dependable, but they have a way of persuading us that they are fixed parts of reality that we can rely upon. Whenever something is done for us, we seem to forget how to do it for ourselves. Whatever we once knew about mathematics disappears shortly after buying a calculator, we forget how to walk once we've bought a car, and we forget how to keep warm by merely paying our utility bills. While serving our convenience, technology thus sometimes has the side effect of crippling us.

Whatever people come to depend upon as a certainty of their external lives has its effects upon their inner states--their emotions, thoughts, and feelings. The emotional and practical securities of family life become almost necessities for many people, with a disastrous crash in store for them when death, divorce, or the normal dissolutions of time break the pattern of family dependability. People also depend upon their jobs, their governments, their friends, and their religions to meet the needs of their lives. A serious change in any of these important structures that we habitually depend upon will disrupt us internally and will demand that we develop internal resources to compensate for our external loss. There are people who still have not been able to accommodate the idea that Richard Nixon was not a dependable president. Some people seem not to have it within themselves to adapt quickly to their losses.

The history of our culture for the past few centuries has been punctuated by crises which resulted from the disappearance or weakening of formerly dependable structures in the world around us. It was a blow to many when Copernicus demonstrated that the earth was not at the center of the universe and that our sun was a modest star, not the throne of God. It hurt further when Darwin alleged that we were risen apes rather than fallen angels, and that our secure position as Lords of All Creation was an illusion. Nietzsche pulled the rug from under many people who are still off balance when he announced that God was dead. And Freud capped it when he showed us that we weren't even masters of our own minds, but were animated instead by subconscious forces over which we could have but little influence. It's been a bad time for dependable things during the past few centuries, and for the people who were unlucky enough to be dependent upon them.

As dependable parts of our cultural beliefs have increasingly proved undependable, a growing technology has filled the void for many people. If you can't depend upon God or even upon your own mind, at least the laws of thermodynamics are reliable, as are the engineers who apply them to produce fast cars, warm rooms, and supermarkets full of tasty food. But now we're entering a time when the systems of technology that we have come to depend upon, and the resources that they in turn depend upon, will become shakier and shakier, and some of them will come abruptly to a halt. We might as well get used to it--in fact, if we hope to persist and thrive and keep our internal lives in order, we must get used to it. Energy crisis will become a way of life in the near future, and our choices are either to be ready for it or to be ruined by it.

A philosopher named Sam Keen has said that "Energy crisis is to the 20th century what the death of God was to the 19th century: a breakdown of the human being's image of the relationship between his inner and outer worlds." (Keen, in Rackstraw, "Promethean Energy," p. 6) If technology and the energy that drives it is our anchor in the world around us, then we had better be prepared to be set adrift once again, for it cannot hold for long. And as energy falters, we will have to find it within ourselves to generate our own new kinds of dependability.

The central question, whether we're discussing religion or energy technology, is "What in our external world can be trusted to assure that our human needs will be met?" Confident answers to that question are harder and harder to find as we see the systems around us subject to increasing stresses and breakdowns. The answers will have to come from within us, not from the fragile systems of energy technology.

An energy shutdown in interior Alaska would of course be a catastrophe for the people here, but it is also true that few people are more accustomed to catastrophe than those of interior Alaska. If we must have an energy crisis-and it appears that we must-then Fairbanks should be the ideal place for it. The slim margin that makes living here possible has always been slim, with the result that errors, shortages, and breakdowns must always be taken very seriously and responded to at once. In some ways it seems a little silly to hold a conference asking "what would happen if the energy were shut off at 40 below?--simply because most of the people in this room can answer that question from their personal experience. There's no need to imagine the scenarios that would be played out, for you've played them out already in response to power failures, automotive breakdowns, disrupted services, frozen plumbing, and the thousand natural shocks that all flesh in Fairbanks is heir to. Fairbanks is by nature a disaster area, so it is probably the best possible place to plan for a disaster.

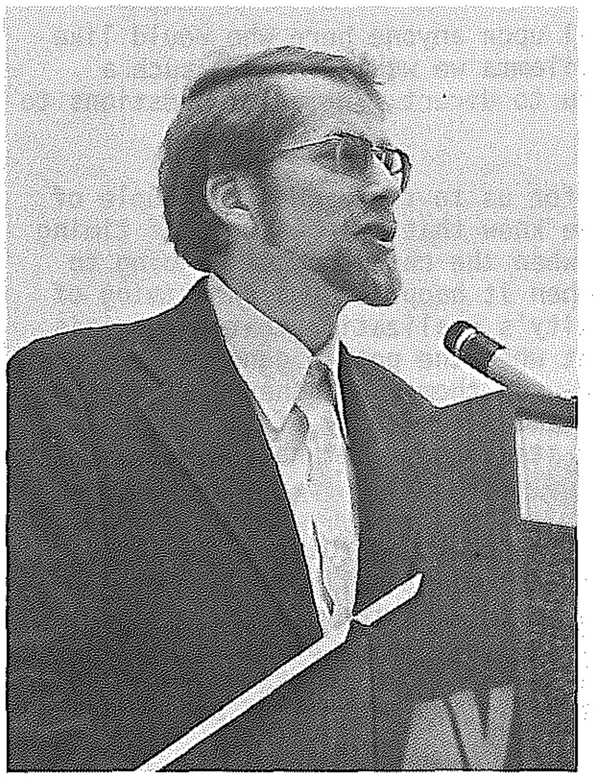
Others don't know how to do it so well. In Southern California, there is much talk these days about the coming earthquake that many geologists say is inevitable. Last wekk I heard Dr. Hans Richter from Cal Tech (inventor of the Richter scale) describing how science and technology are responding to the earthquake threat. Research and planning funds are being heavily applied in two areas: how to predict earthquakes, and how to prevent them. That's ridiculous, says Richter, for the real and imminent problem is how to maintain life when the earthquake comes, and very little effort is being devoted to that problem. Southern Californians have so little experience of disasters that they can't seriously prepare for them. Their imaginations simply don't work that way.

Alaskans at least understand the precariousness of life in this environment, and they are wise enough to plan for living even when a crisis comes to tip the odds against them. That's what brings us together here today, and it doesn't seem especially odd to see a group like this contemplating its coming catastrophes. Every normal Alaskan winter is a catastrophe that calls upon strong inner resources from everyone who lives here. The technological devices like furnaces and automobiles which make life easy in temperate places can do the same here, but they also become burdens which must be worried about and assiduously maintained because of the heavy demands made upon them. Only fools and cheechakos take them for granted and fail to prepare for alternatives when they inevitably break down.

Interior Alaskans already know what the rest of the world will have to learn over the next few years: how not to depend upon gadgets, machines, and the energy that powers them. The rest of the world has been trying hard to persuade Alaskans to depend upon these things so that they can sell them here. To the extent that they have been successful, Alaskans have trusted the machines, and have thus begun to forget how to take care of themselves. The next crisis will catch these people, and will surely teach them an Alaskan reality lesson.

When the crisis comes, it will quickly distinguish between the Alaskans who understand their land and themselves as part of it, and those itinerants from elsewhere who are strangers to this place, and who want to live here only as long as their comfort systems are in good working order. The crisis will also demonstrate promptly which people in the community possess strong inner resources which can be counted upon when the external resources fail.

Just as winter has the dual effect upon Alaskans of forcing them to recognize their essential aloneness and their essential need for others, so will the energy crisis. Crises isolate us from one another as each person takes responsibility for his or her own survival, but they also unite us when we realize that no one can survive alone. That strange Alaskan combination of personal isolation together with closeness to others was born of natural crises, and it is the right combination to survive the coming times of crisis. It means that you love your land, but that you don't expect it to be good to you, and that you love your friends without depending upon them for your welfare. You may even love your car, your furnace, or GVEA, but you'd better learn how not to depend upon them.



Town Meeting

by

William R. Hunt
Professor of History
University of Alaska, Fairbanks

Two different points of view seem to be reflected by the speakers who have preceeded me. A consideration of the overall social implications of a local energy crisis presents us with some cause for concern--great concern. The other view is more optimistic, focusing as it does on qualities of individual resource presumed to exist in individuals here.

Does the history of peoples' behavior in conditions of catastrophe provide us with any light on how we are likely to react to an energy crisis in Fairbanks? I have looked at the behavior of people impacted by all kinds of disasters: fires, bombings, shipwrecks, storms, floods, invasions, droughts, earthquakes and other natural and man-made blows without finding circumstances which show some similarity to the hypothetical situation under consideration.

What emerges from the historical record is that people reacted to particular stresses in diverse ways, sometimes showing their self interest and cowardice, a tendency to panic; and on other occasions showing heroic behavior. Even humor has not been absent. The best anecdote I found concerned fire, a terrible fire, where a man barely escaped with his life from a burning building and then went back to recover his piano from the sixth floor, got it down safely and then sat down and played "There'll be a hot time in the old town tonight."

What I was supposed to do is call upon anyone here who would like to contribute their solution to the dilemma we would face in such a situation, and also leave time for you to direct particular questions to any of the other speakers.

I thought that it would be best for us to think about a couple of problems which would be important. We know that the question of timing would be very important, not so much when the catastrophe is going to happen, and the conditions existing when it happens, but the timing of realization, the moment of the community's realization that the crisis is going to go on for a long time; but when the people generally understand that the horror is indisputably upon them. How they react to that and what form the defensive measures take seem worthy of discussion. What form will panic take? Will they steal their neighbor's wood pile or what?

I've been intrigued by the idea of the exodus that may be involved and the conditions of the exodus. At what point will people start running? What conditions will people be in when they start to go, and where are they going to go? What will be the effect along the highways as the runners try to recover their losses from residents in their path? It would be a wonderful thing to write a social history of but certainly something unpleasant to experience.

Other problems concern communications. I also went back to the 1967 Fairbanks flood and listed to the tapes Paul McCarthy and I made after the events. These were interviews with authorities here, Civil Defense authorities, and the Chief of Police and others. I wanted to see whether or not the flood here, or for that matter, the earthquake in Anchorage, provided any kind of precedent that would be useful. It seems to me it was quite a different thing, but certainly the general problems are suggested by any kind of catastrophe: how do you communicate, how do those who are charged with keeping order and spreading the word deal with the eruption of rumors, either false rumors that cause more hysteria or false rumors that create an optimism that is unfounded--that rescue is on the way, for example? Of course, this relates to the general matter of police control, what can police do to prevent the worsening of the situation?

But, of course, the problem of health would be so accute. I would assume that unless everyone was able to gather in the same few places where fuel sources could be utilized there would be a tremendous health problem. Consider just the frostbite problem. How would a community this size deal with something like that? It seems to me it would be almost impossible to handle it among a dispersed populace. The question of food distribution is another frightening prospect. And beyond all particular concerns there would be the permanent loss of property as well as lives that would follow such a catastrophe.

I don't really believe that we are prepared for any of this at all, but I suppose the value of this kind of consideration is supposed to make us think generally, about the overall dependence on energy sources that are now proving to be uncertain and fallible.

Anyway, how about that, would anyone here care to direct a particular question on the Irish Potato Famine or the movement of the sun and earth? Are any of the speakers here offering suggestions you would wish to have them enlarge upon?

FAMILY ENERGY ECONOMICS

Self sufficiency is even a myth
interior Alaska is probably a sterile eco-system
-some way

we should set up a pattern
for use of fossil fuels

It is only by the initial input in a structure that you can get it out.

A house is a structure that has to be in tune with the environment.

We are still in the 18th in our housing building structure

I will be able to heat my house with 500 cu. ft. of salt brine.

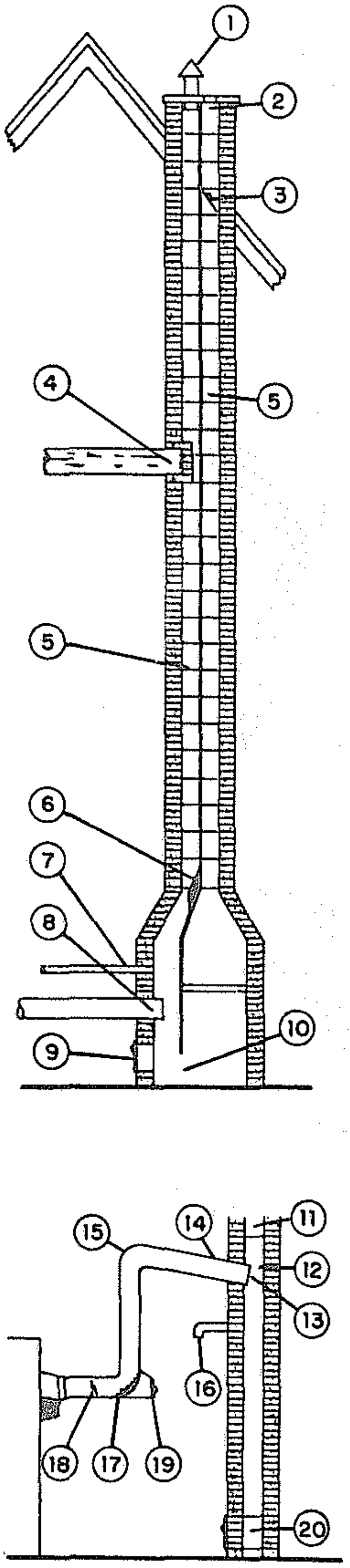
we're overbuilt &

BTU
British Thermal Units
calories

THE COST OF OPERATION OF APPLIANCES IN FAIRBANKS, ALASKA FOR ONE YEAR
1977 RATES (BASED ON AVERAGE FAMILY USE)

Appliance	Avg. Annual Use (KWH)	Approx. Annual MUS Cost†	Approx. Annual GVEA Cost	
			In City†	Outside City†
Std. Water heater*	15,520	$667.07	$634.72	$622.20
Quick Recovery*	17,700	758.63	720.56	705.58
Microwave Oven	190	15.64	16.64	16.63
Microwave Oven*	700	43.05	47.25	48.96
Electric Range	1,175	64.57	69.69	73.19
Electric Range*	4,320	196.66	193.73	193.80
Self-Cleaning Oven	1,205	65.84	71.07	74.65
Dishwasher*	1,340	71.51	76.39	79.81
Trash Compactor*	180	15.01	15.96	15.91
Trash Compactor	50	4.99	5.25	5.10
Freezer (15-21) Manual	1,320	70.66	75.60	79.05
Freezer (15-21) Auto Def	1,985	98.59	101.78	104.49
Freezer (15) Manual *	4,400	200.02	196.88	196.86
Freezer (15) Auto Def*	6,480	287.39	278.78	276.42
Humidifier*	1,390	73.61	78.36	81.73
Auto Washer*	380	27.62	29.61	30.19
Auto Washer	103	10.16	10.70	10.41
Dryer	993	56.89	61.09	63.90
Dryer*	2,770	131.57	132.69	134.51
T.V. (Color)**	540	35.49	39.69	40.80
T.V. (B&W)**	400	28.88	30.98	31.62
Ref (16-18) Auto**	1,795	90.61	94.30	97.22
Ref (10-15) Manual	700	43.05	47.25	48.96
Ref (19.1) Save	1,860	93.34	96.86	99.70
Ref (19.1) Use	2,184	106.95	109.62	112.10
Hand Iron*	530	35.02	39.22	40.29
Hand Iron**	150	13.13	13.91	13.77
Frying Pan**	240	18.80	20.06	20.20
Frying Pan*	680	42.11	46.30	47.94
Toaster*	140	12.50	13.23	13.06

* From Lifestyle Index 1976 - Center for Science in the Public Interest
** "People & Energy" 10/76 p. 9
† Rates quoted in FNSB Impact Info Center Rept. 31, 11/17/76
(Includes Sales Tax)
Other Appliances Quotes from Edison Electric Institute.



No.	Fault	Examination	Correction
1.	Pipe extension not of same area as chimney opening, and extension below opening of cap.	This is ascertained by measurement.	Pipe to be extended and opening to be same as chimney opening.
	Chimney below gable of roof.	Determined by actual observation.	Extended chimney above gable of roof.
2.	Chimney opening smaller than inside dimension.	Ascertained by measurement.	Widen opening to same dimensions as chimney area.
3.	Obstructions in chimney.	Found by lowering weight on a line.	Use weight to break and dislodge.
4.	Projection into the chimney.	Lower a weight or light on extension cord.	Must be handled by brick contractor.
5.	Break in chimney linings.	Build smudge fire blocking off other chimney opening, watching for smoke escape.	Must be handled by competent brick contractor.
6.	Collection of soot at narrow space in the opening.	Lower light on long extension cord.	Clean out with weighted brush or bag of loose gravel on end of line.
7.	Two or more openings into same chimney.	This is found by inspection from basement.	The least important opening must be closed, using some other chimney flue.
8.	Smoke pipe projects into flue but beyond surface on the wall.	Measurement of the pipe from within or observation of pipe by means of lowered light.	Length of pipe must be reduced to allow end of pipe to be flush with wall.
9.	Air leak at base of clean-out door.	Build small fire, watching for smoke or flame through the cracks.	Cement up all cracks around the base.
10.	Failure to extend the length of flue partition down to floor level.	This is found by inspection.	Extend partition to floor level.
11.	Broken clay tiles.	Can be found by light and mirror reflecting condition of walls.	All breaks should be patched with cement.
12.	Clay lining fails to come below opening of smoke pipe.	Found by observation through the flue opening into chimney.	Clay tiling should be extended below flue opening.
13.	Partial projection of smoke pipe into flue area.	Found by measurement after pipe is withdrawn or by sight from chimney opening, using light on a cord.	Projection must be eliminated.
14.	Loose seated pipe in flue opening.	Air leaks can be determined by smoke test or examination of chimney while fire burns below location.	Leaks should be eliminated by cementing all pipe openings.
15.	Smoke pipe enters chimney in declining position.	This is observed by measurement.	Correct the pipe to permit smoke to enter in an ascending pipe.
16.	Second flue opening below that for smoke pipe.	This is found by observation from within basement.	Change to allow only one opening in each chimney.
17.	Accumulation of soot narrows cross sectional area of pipe.	Examine pipe from clean-out opening.	Remove soot.
18.	Hand damper in a full closed position.	If handle does not give true position of plate remove section of pipe to ascertain position.	Allow sufficient opening of plate for needed escape of gases.
19.	Clean-out opening on pipe leaks air.	Flames visible when furnace is under fire.	Tighten or cement to eliminate leak.
20.	Clean-out pan not tightly seated in base of chimney.	This air leak can be determined by watching action of small fire built in bottom of chimney shaft.	Cement to eliminate all leaks.

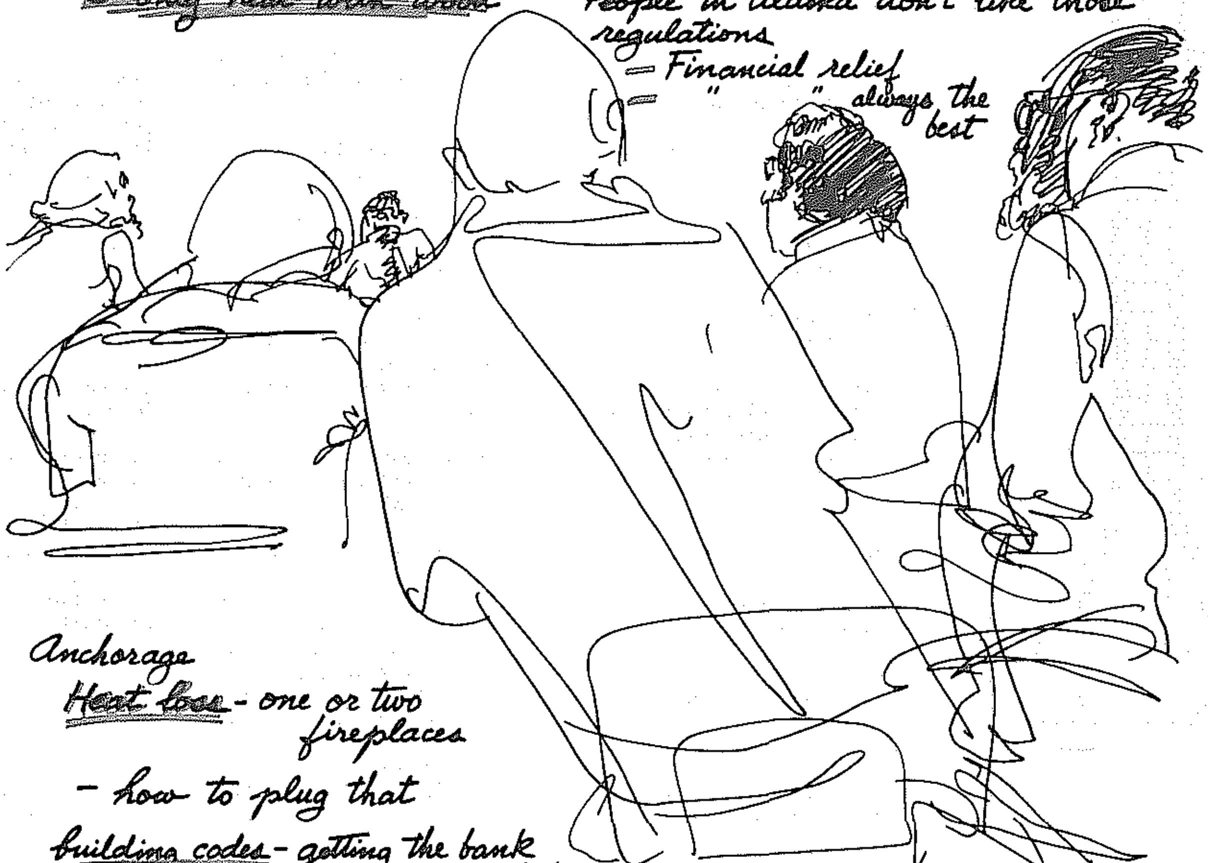
TWENTY CAUSES OF CHIMNEY TROUBLES AND THEIR CURES.

Building codes windows 8° 11° 16° window areas

I only heat with wood

People in Alaska don't like those regulations

- Financial relief
- " " always the best



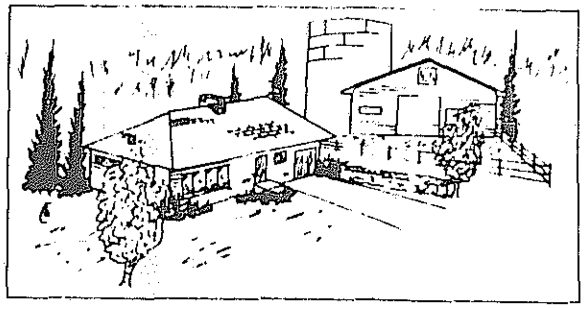
Anchorage

Heat loss - one or two fireplaces

- how to plug that

building codes - getting the bank rebates

COOPERATIVE EXTENSION SERVICE
University of Alaska



Building in Alaska

P-4-451

WILL INSULATION PAY FOR ITSELF IN FAIRBANKS?

AXEL R. CARLSON
EXTENSION ENGINEER

Yes, additional insulation will pay for itself under normal Fairbanks construction, labor and material prices. The annual net savings depends upon initial building costs, annual mortgage payments and annual heating costs, as shown in Table 1.

Initial building costs depend upon labor and material costs, the contractor's overhead and profit and the effect of local demand on price of houses. Annual mortgage payments depend on local costs of financing a home. Annual heating costs depend upon thermal coefficients of various exposed surfaces, the cost and type of fuel, the average (base interior temperature, and the outdoor annual mean temperature for each geographical location).

The cost factors in this table were based on a 24-0 X 48-0 one story house set on a concrete slab masonry basement with the concrete located four feet below grade. Construction costs were based on 1976 Fairbanks prices for labor and materials and standard overhead and profit charges. Costs do not include land, site improvements and speculative price increases.

If speculative prices of the oil pipeline boom were added to the cost of additional insulation, it would seemingly not pay for itself, other than conserving on national energy supplies. The economic benefits of insulation should not include the present speculative mark up in housing.

The annual building costs were amortized over a 30 year period based on 9.5 percent interest charges. The heating costs were based on a fuel oil cost of 54 cents per gallon, and an electric energy cost of 3.55 cents per kilowatt hour (KWH). The pay back year was obtained by dividing the added cost of insulation by the annual reduction in fuel costs.

8/76/417/ARC/2M

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Dr. James W. Matthews, Director, Cooperative Extension Service, University of Alaska

COOPERATIVE EXTENSION SERVICE
University of Alaska
and U.S. Department of Agriculture cooperating

October 27, 1976

TABLE 1. EFFECT OF INSULATION ON HEATING AND BUILDING COSTS - FAIRBANKS, ALASKA.

Axel R. Carlson
Extension Engineer

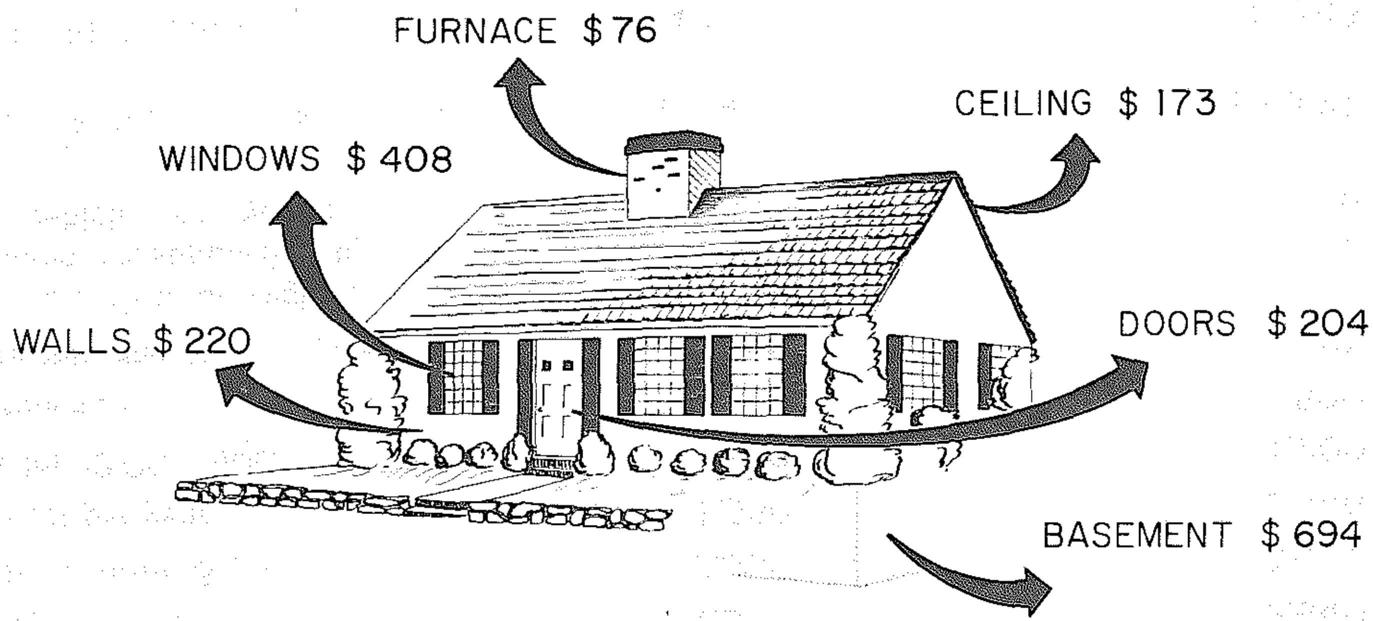
EXPOSED SURFACES	INSULATION THICKNESS	BUILDING COSTS				ANNUAL HEATING COSTS				ANNUAL NET SAVINGS & YEARS PAY BACK			
		TOTAL	DIFFERENCE	MORTGAGE		FUEL OIL		ELECTRIC		FUEL OIL		ELECTRIC	
				ANNUAL	DIFFERENCE	ANNUAL	DIFFERENCE	ANNUAL	DIFFERENCE	SAVINGS	PAY BACK YEARS	SAVINGS	PAY BACK YEARS
BASEMENT, MAS	0"	8986	base	906	base	694	base	1170	base	base	base	base	base
" , MAS	2"	9355	+ 369	944	+ 38	214	-480	386	-784	-442	- .8	- 746	.5
" , MAS	3½"	10985	+1909	1109	+203	190	-504	343	-827	-301	3.8	- 624	2.3
" , TRT WD	3½"	5997	-2989	605	-301	204	-490	368	-802	-791	none	-1103	none
WALL, 2X4	3½"	3063	base	309	base	220	base	397	base	base	base	base	base
WALL, 2X6	6"	3787	+ 724	382	+73	125	- 95	225	-172	- 22	7.6	- 99	4.2
ROOF, TRUSS	6"	7692	base	776	base	173	base	312	base	base	base	base	base
" , TRUSS	9½"	8179	+ 487	825	+ 49	105	- 68	189	-123	- 19	7.2	- 75	4.0
" , TRUSS	12"	8655	+ 963	873	+ 97	86	- 87	155	-157	+ 10	11.1	- 60	6.1
WALLS/WINDOW	AREA, SQ FT (FLOOR %)												
1st, DOUBLE	127 (11%)	6687	base	674	base	408	base	735	base	base	base	base	base
, DOUBLE	207 (18%)	8286	1608	837	+163	487	+ 79	878	+143	+242	never	+ 306	never
, DOUBLE	92 (8%)	5974	- 704	603	- 71	373	- 35	672	- 63	-106	none	- 134	none
, TRIPLE	127 (11%)	7382	+ 704	745	+ 71	363	- 45	654	- 81	+ 26	15.6	- 10	8.7

AUTOMOBILE COSTS

COST ITEM	Compact Sedan	4-Wheel drive pickup
Initial purchase price	$ 5,000	$ 8,000
Interest for 3 years	1,650	2,640
Trade-in after 3 years	- 2,000	3,000
Net cost per year	1,550	2,546
Fuel for 12,000 miles	640	1,200
Insurance	400	500
Lubricants and Maintenance	265	395
State and Federal Highway Maintenance supported by Taxes (per vehicle / per year)	536	536
TOTAL EXPENSE PER YEAR	$ 3,421	$ 5,177
COST PER MILE	$ 0.29	$ 0.43
COST PER DAY	$ 9.48	$ 14.18

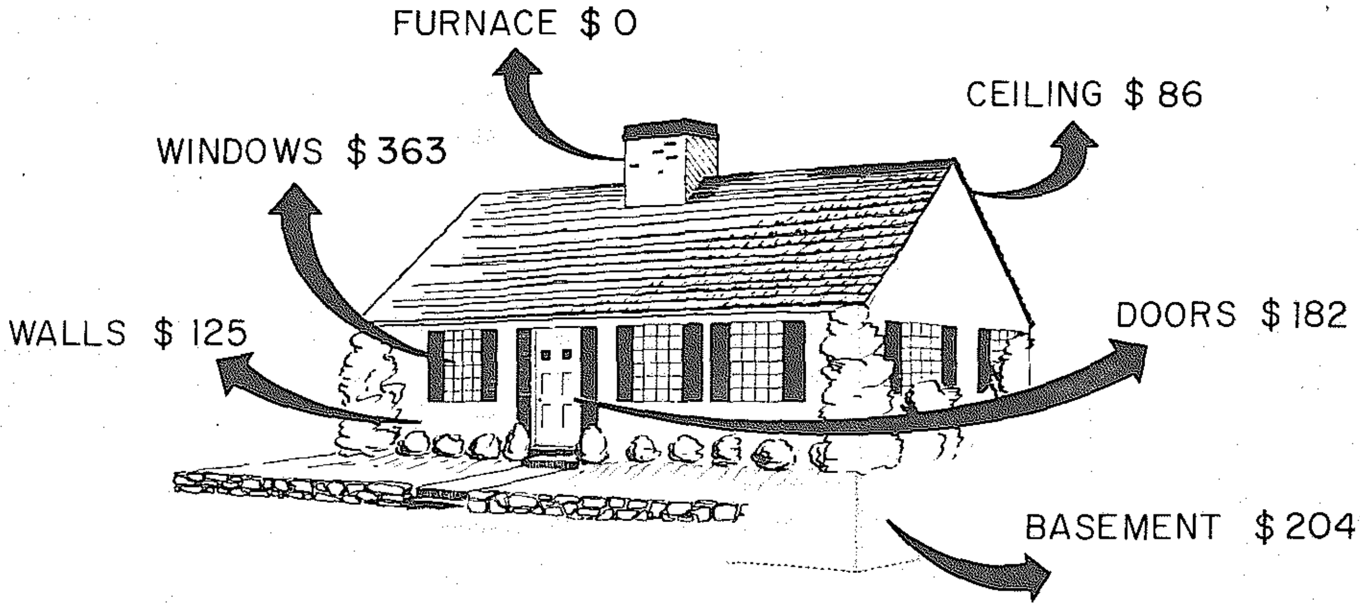
UNINSULATED

$ 1775
PER YEAR



HEAT COST PER YEAR FOR TYPICAL 1150 sq.ft. SINGLE-STORY HOUSE. BASED ON FUEL OIL COST OF 54¢ PER GALLON IN FAIRBANKS. DOLLAR FIGURES FOR INDIVIDUAL PARTS OF HOUSE ARE AVOIDABLE LOSSES. FOR ELECTRIC HEAT, ALL FIGURES ARE ABOUT DOUBLE.

INSULATED
$ 960
PER YEAR



HEATING COST PER YEAR FOR TYPICAL 1150 sq. ft. SINGLE-STORY HOUSE. BASED ON FUEL OIL COST OF 54¢ PER GALLON IN FAIRBANKS. DOLLAR FIGURES FOR INDIVIDUAL PARTS OF HOUSE ARE AVOIDABLE LOSSES. FOR ELECTRIC HEAT ALL FIGURES ARE ABOUT DOUBLE.

EFFECT OF INSULATION ON HEATING AND BUILDING COSTS
FAIRBANKS, ALASKA

EXPOSED SURFACES	INSULATION THICKNESS	BUILDING COSTS				ANNUAL HEATING COSTS				ANNUAL NET SAVINGS & YEARS PAY BACK			
				MORTGAGE		FUEL OIL		ELECTRIC		FUEL OIL		ELECTRIC	
		TOTAL	DIFF.	ANNUAL	DIFF.	ANNUAL	DIFF.	ANNUAL	DIFF.	SAVINGS	PAY BACK (YEARS)	SAVINGS	PAY BACK (YEARS)
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" " , MAS	3 1/2"	10985	+1909	1109	+203	190	-504	343	-827	-301	3.8	-624	2.3
" " , TRTWD	3 1/2"	5997	-2989	605	-301	204	-490	368	-802	-791	NONE	-1103	NONE
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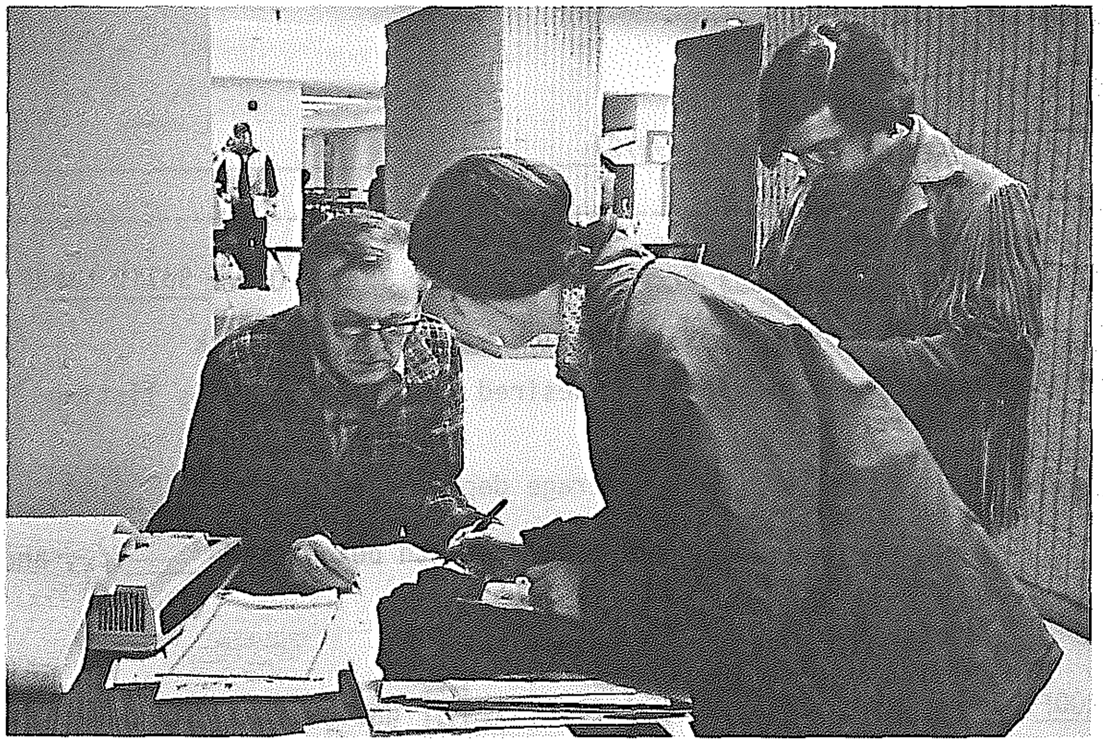
AXEL R CARLSON
Extension Engineer

AXEL CARLSON'S DAZZLING COMPUTER TERMINAL

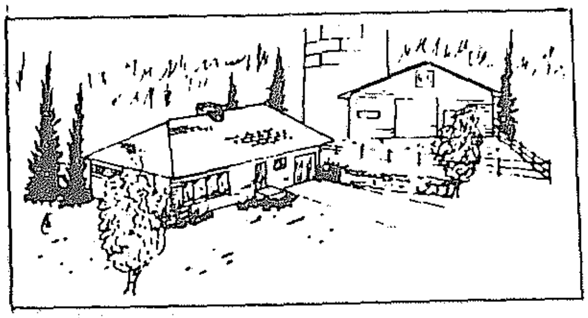


Axel Carlson, Cooperative Extension Service Engineer, provided questionnairs to interested Town Meeting participants, enabling them to provide information regarding the construction components of their own homes. This information was entered on the computer terminal and a printed analysis of the building's heat losses was later mailed to each individual. An example of the questionnaire and its specific analysis print out is attached.

COOPERATIVE EXTENSION SERVICE
University of Alaska

and U.S. Department of Agriculture Cooperating

Building in Alaska



INSULATION SURVEY

Axel R. Carlson, Extension Engineer

DATE: March 26, 1977

NAME: John Doe

ADDRESS: Any Street, Fairbanks, AK 99701

A. TYPE HOUSE (check one) 1. [X] Frame, 2. [ ] Log, 3. [ ] Other Split Level

B. SHAPE & SIZE: (Floor plan, elevation and dimensions) See Back
Sketch on separate sheet of paper if desired and attach to this listing.

C. TYPE FOUNDATION: 1. [X] Basement (average depth below grade 4 ft.),
2. [ ] Closed crawl space (depth below grade ____ ft., and depth above grade ____ ft.),
3. [ ] Open crawl space.

D. TYPE ROOF: 1. [ ] Cathedral, 2. [ ] flat, 3. [X] gable, flat ceiling, 4. [ ] 1½ story

E. INSULATION: (Mark one for existing and two for proposed.)

1. Floor, basement or crawl space, (a) [X] none, (b) [ ] 2" styrofoam below grade ____ ft.

2. Wall, basement or crawl space, (a) [ ] none, (b) [X] 2" styrofoam (c) [ ] 3½" fiberglass, (d) [ ] 6" fiberglass

3. Windows, ~~basement~~ garage, (a) 0 sq. ft. or 6% of floor, (b) [ ] single, (c) [ ] double, (d) [ ] triple, (e) [ ] quadruple, (f) [ ] shutters

3/77/417/ARC/2C

4. Door, basement: (a) area 126 sq. ft. or 20 sq. ft., (b) ☐ single, (c) ☐ storm (d) ☒ insulated.

5. Floor, 1st: (a) ☒ none, (b) ☐ 3½" fiberglass, (c) ☐ 6" fiberglass, (d) 12" fiberglass.

6. Wall, 1st: (a) ☒ stud spacing 16 inches, (b) ☐ none, (c) ☐ 3½" fiberglass (2X4 stud), (d) ☐ 3½" fiberglass & 1½" nailers, (e) ☒ 6" fiberglass (2X6 studs) (f) ☐ 7" fiberglass (2-2X4's), (g) ☐ 6" 3-sq. log, (h) ☐ 10" log, (i) ☐ 12" log, (j) ☐ other ________

7. Windows, 1st: (a) ☒ 67 sq. ft. or 17% of floor, (b) ☐ single, (c) ☒ double, (d) ☐ triple, (e) ☐ quadruple, (f) ☐ shutters ____ % floor

8. Doors, 1st: (a) ☒ area 40 sq. ft. or 20 sq. ft., (b) ☐ single, (c) ☐ storm, (d) ☒ insulated.

9. Ceiling or roof, 1st (a) ☐ none, (b) ☐ 3½" fiberglass, (c) ☐ 6" fiberglass, (d) ☐ 9½" fiberglass, (e) ☒ 12" fiberglass.

*IF YOUR HOUSE IS ONLY ONE STORY, SKIP TO QUESTION F.

10. Wall, 2nd, (a) ☐ ____ sq. ft., (b) ☐ none, (c) ☐ 3½" fiberglass, (d) ☒ 6" fiberglass, (e) ☐ 7" fiberglass, (f) ☐ 6" 3-sq. log, (g) ☐ 10" log, (h) ☐ 12" log, (i) other ________

11. Window, 2nd, (a) ☒ 123 sq. ft. or 6% of floor, (b) ☐ single, (c) ☒ double, (d) ☐ triple, (e) ☐ quadruple.

12. Doors, 2nd: (a) 20 sq. ft., (b) ☐ none.

13. Roof or ceiling, 2nd: (a) 1440 sq. ft., or 1.41 X's floor area. 12" F.G.

TABLE 1. STRUCTURAL AND INFILTRATION HEAT LOSSES,

HOUSE, 1 STORY, 30X48 & 2X20, ON GRADE

EXPOSED SURFACES	AREA SF	R-VALUE	TEMP DEGF	HEAT LOSSES BTUHF	BTUH
1.FLOOR CRW 48 0	840.	32.30	45.0	26.	505.
2.FND CRW 48 2	288.	16.70	45.0	17.	335.
3.FND CRW 2	72.	8.30	45.0	9.	168.
4.FLOOR GAR	640.	6.70	45.0	96.	1853.
5.DOOR GAR INSL	126.	8.30	45.0	15.	295.
6.WINDOW GAR					
7.FLOOR 1ST	1440.	0.	0.	0.	0.
8.WINDOW 1ST DBLE	67.	1.84	70.0	36.	1617.
9.DOOR 1ST INSL	40.	8.30	70.0	5.	214.
10.WALL GAR 6	466.	16.80	55.0	28.	816.
11.WALL 1ST 6	704.	16.80	70.0	42.	1861.
12.CEILING GAR	640.	0.	0.	0.	0.
13.CEILING 1ST 12	40.	37.90	73.0	1.	50.
14.CEILING 1ST	840.	0.	0.	0.	0.
15.FLOOR 2ND	1440.	0.	0.	0.	0.
16.WINDOW 2ND DBLE	123.	1.84	70.0	67.	2968.
17.DOOR 2ND INSL	20.	8.30	70.0	2.	107.
18.ROOF 2ND 12	1440.	37.90	73.0	38.	1801.
19.INFILTRATION	78. CFM	0.92	70.0	85.	3758.
	4866.	12.74	60.6	466.	16346.

TABLE 2. FUEL REQUIREMENTS AND HEATING COSTS,

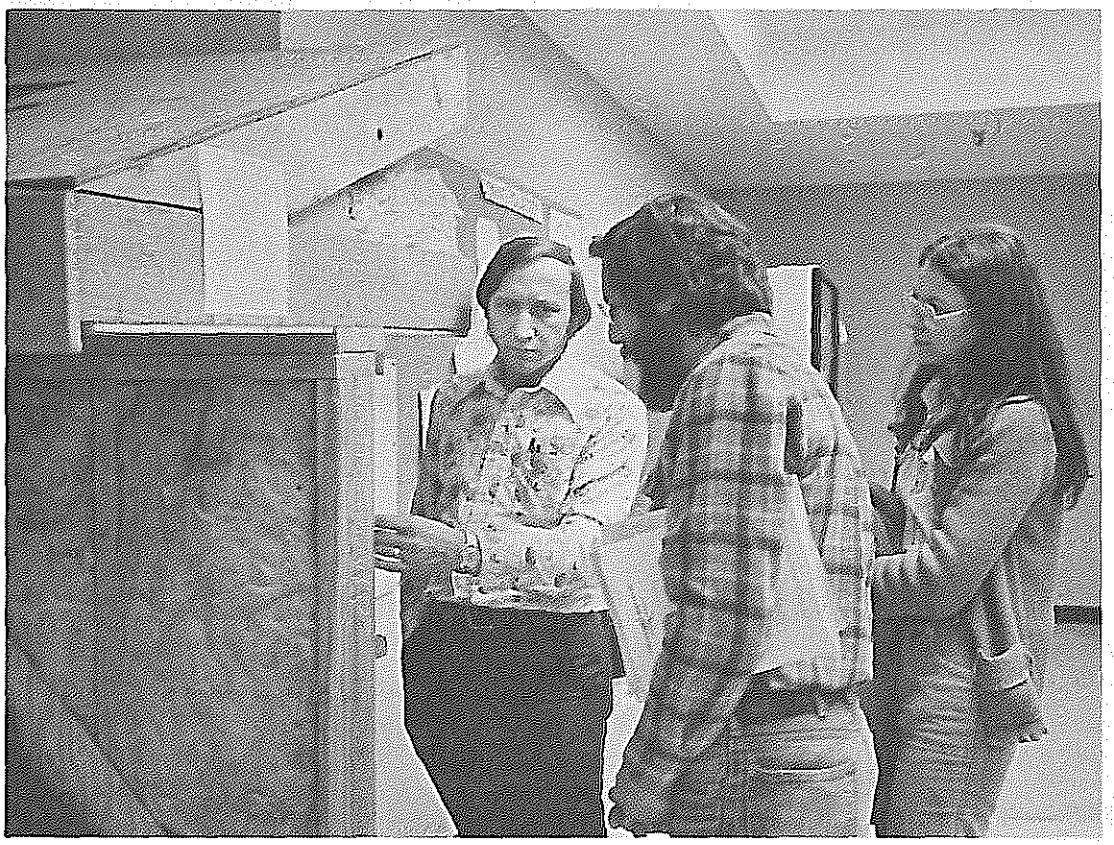
HOUSE, 1 STORY, 30X48 & 2X20, ON GRADE

FUEL TYPE	UNIT	OUTPUT BTU	EFFIC-IENCY	QUANT-ITY	HEATING COSTS($) UNIT	TOTAL
BIT COAL	TON	17000000.	0.55	15.	50.0000	766.
ELECTRIC	KWH	3413.	1.00	41954.	0.0377	1582.
FUEL OIL	GAL	138000.	0.65	1596.	0.6000	958.
PROPANE	GAL	91800.	0.70	2228.	0.9000	2005.
SPR WOOD	CRD	12500000.	0.50	23.	50.0000	1146.

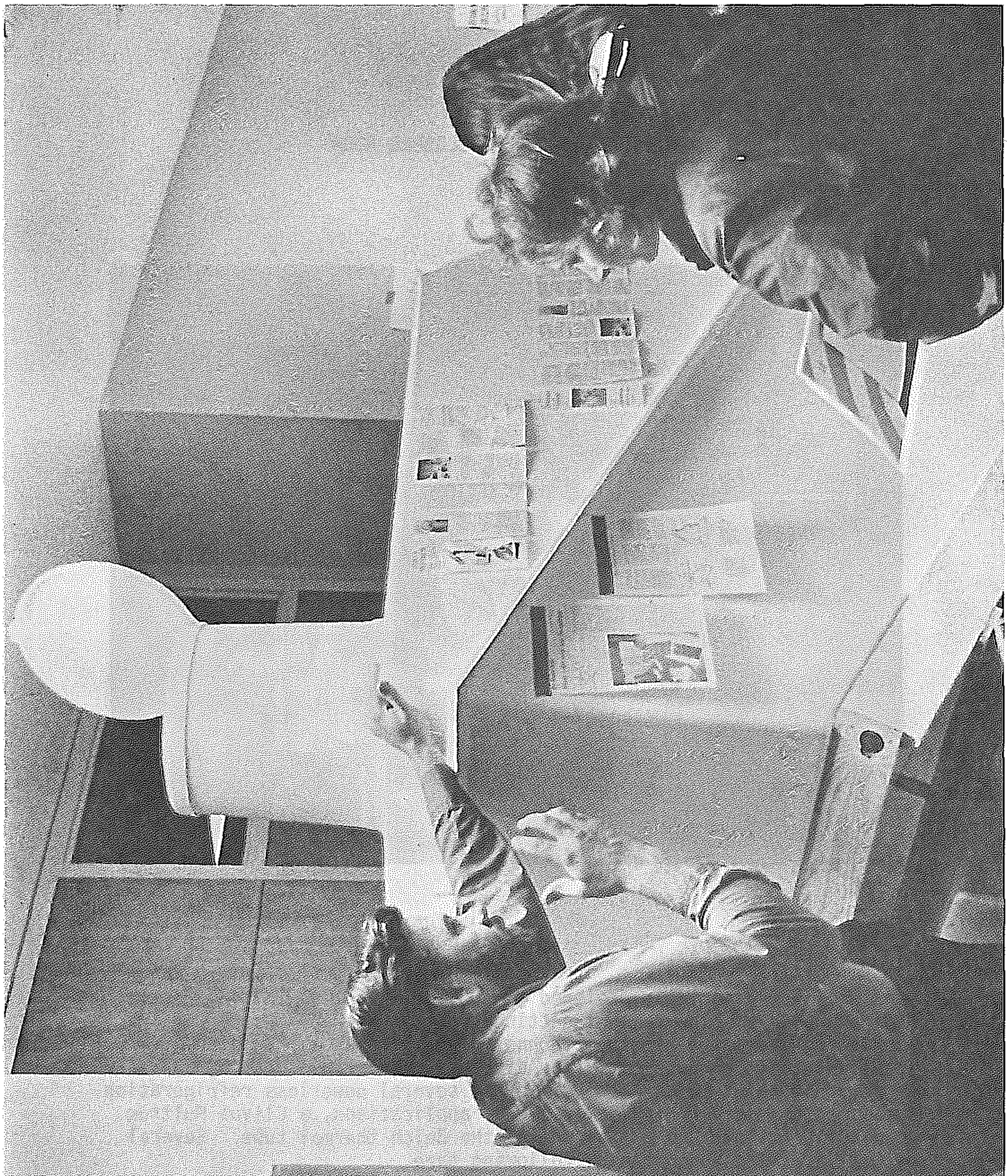
NOTES
1.LOCATION: FAIRBANKS, AK
2.ANNUAL MEAN TEMPERATURE 25.60 DEG-F
3.AIR CHANGES PER HOUR 0.20

AXEL R. CARLSON
EXTENSION ENGINEER
COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF ALASKA
FAIRBANKS, AK 99701

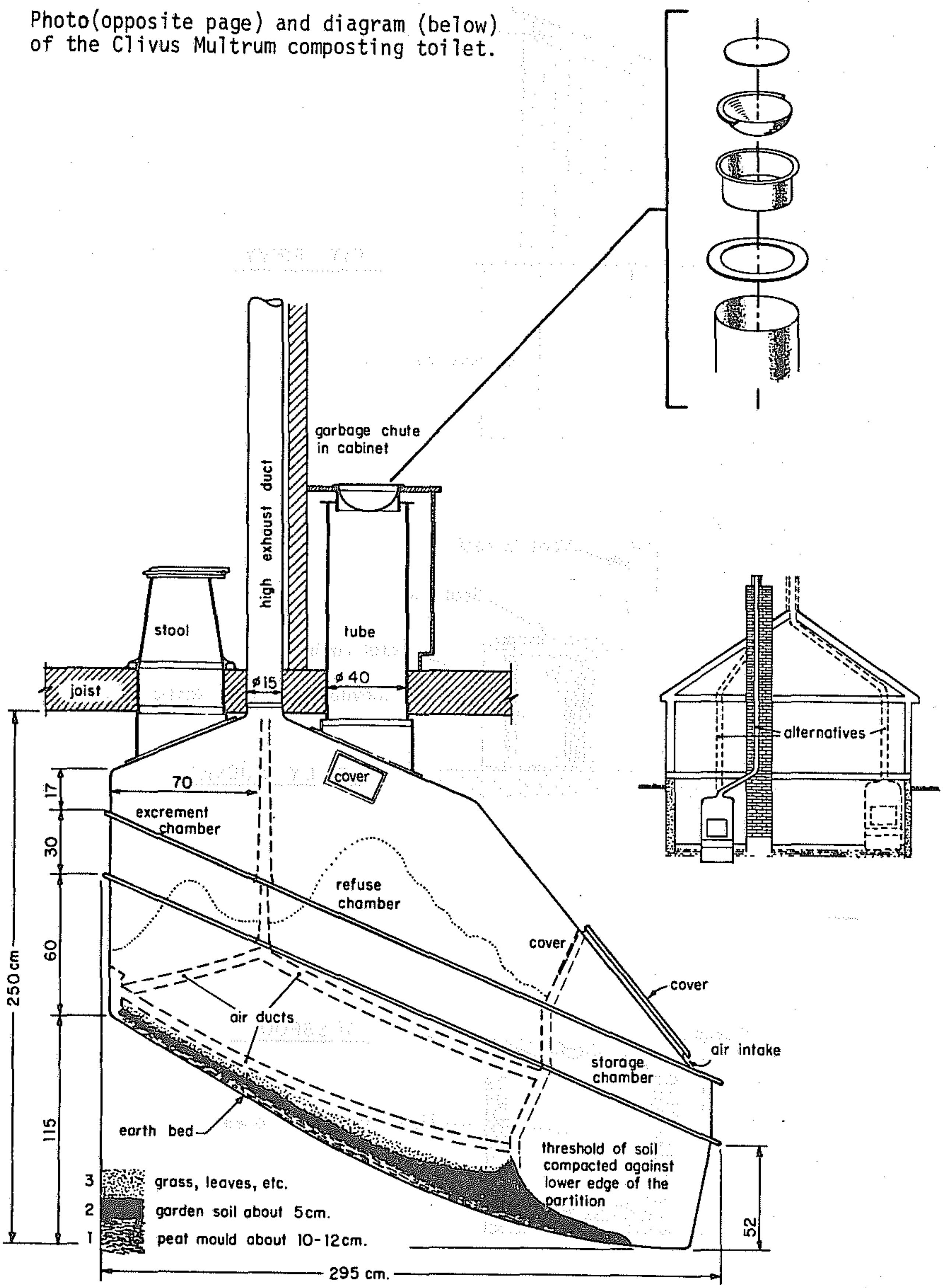
BEN FRANKLIN-RUBE GOLDBERG ROOM

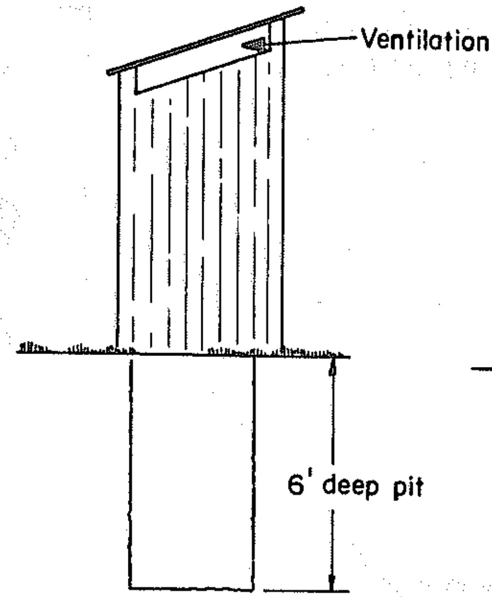


This room was especially designed to provide inventive and interested citizens with simple means of getting together for the purpose of exchanging ideas and homespun technologies, with an emphasis on local solutions to local problems. The displays consisted of photographs of many different types of wood stoves, several powerless refrigeration ideas, posters describing solar energy applications, a Clivus Multrum composting toilet, and an example of the Balch thermal tube. Several of the ideas are shown on the following page.

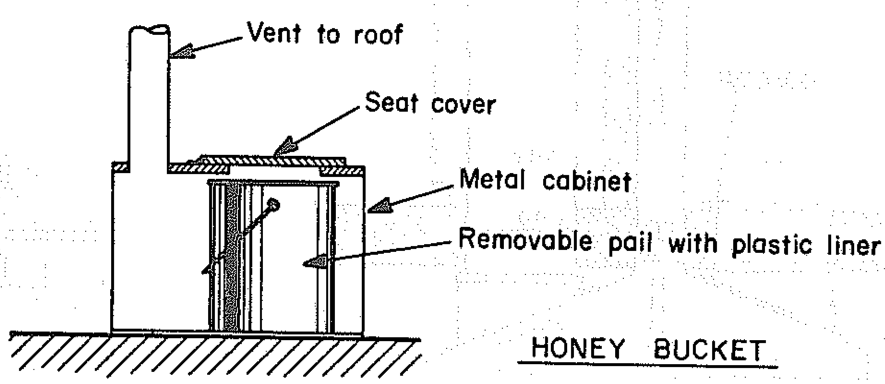


Photo(opposite page) and diagram (below) of the Clivus Multrum composting toilet.

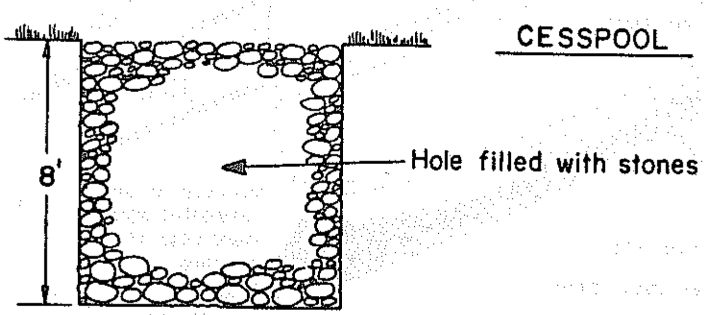




PIT PRIVY



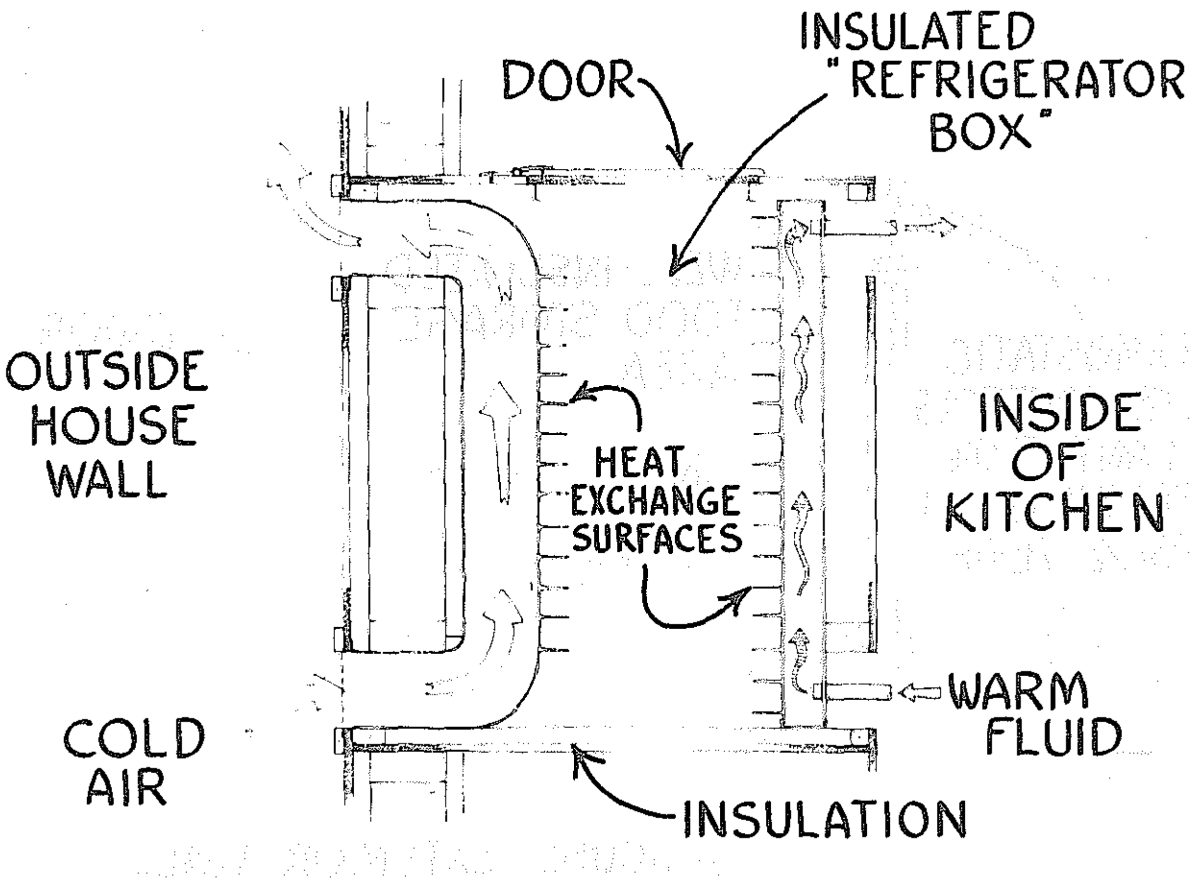
HONEY BUCKET



CESSPOOL

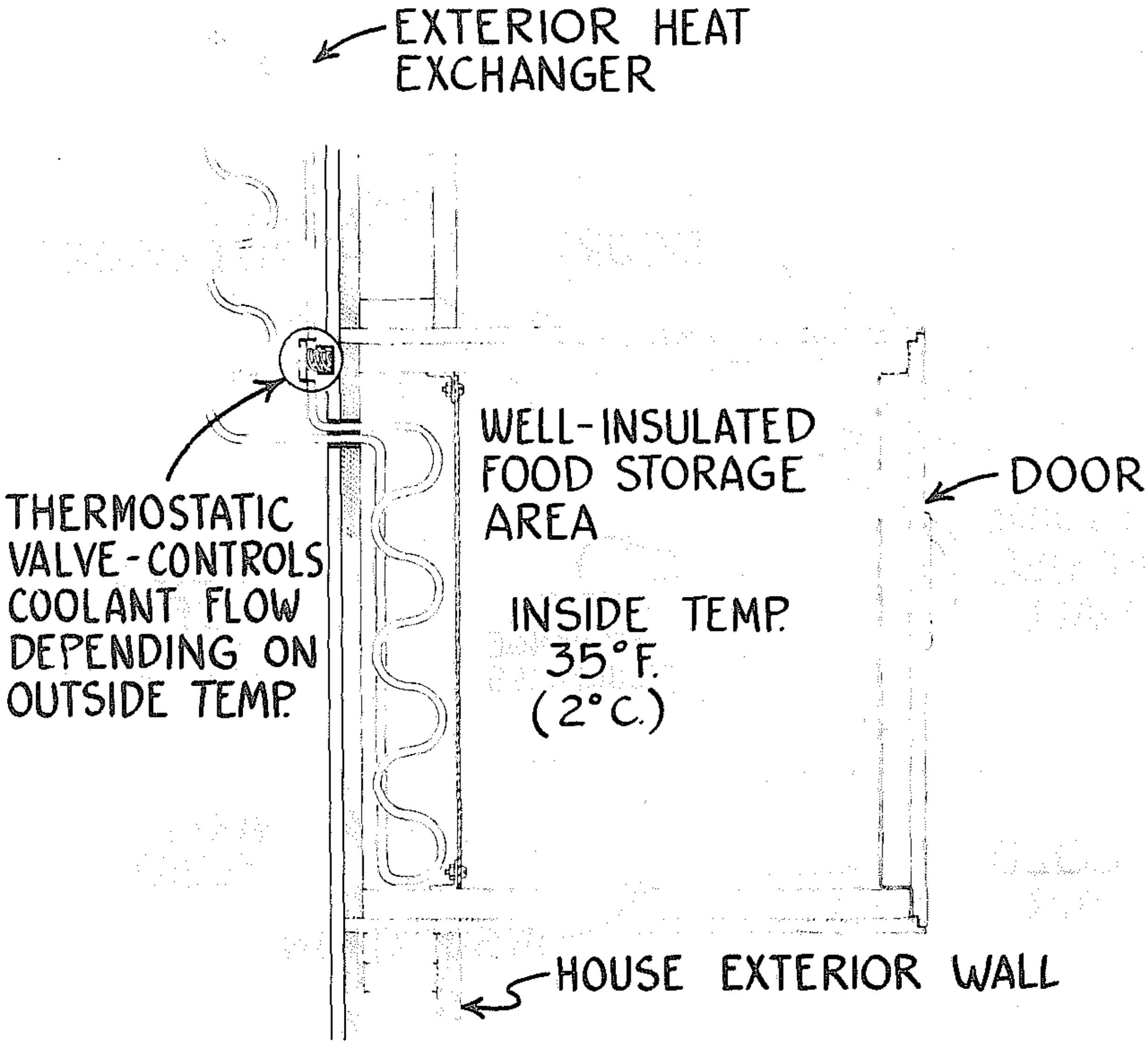
PRIMITIVE WASTE DISPOSAL FACILITIES

THE POWER-FREE REFRIGERATOR



Original Sketch by
COERT OLMSTEAD

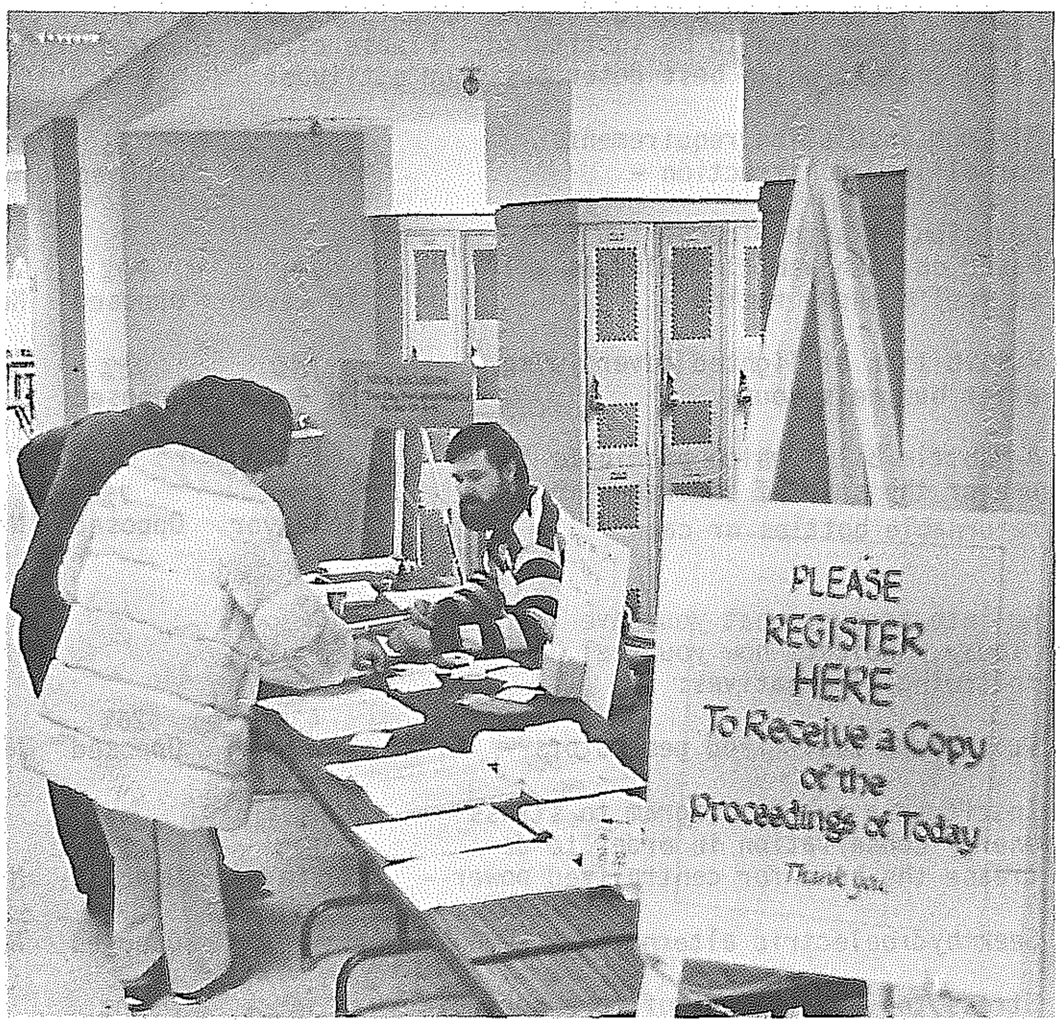
ANOTHER REFRIGERATOR IDEA SPECIFICALLY FOR FAIRBANKS WINTERS



THIS REFRIGERATOR WOULD REQUIRE NO POWER BECAUSE THE COOLANT IN THE HEAT EXCHANGERS WOULD NATURALLY REMOVE THE HEAT TO THE COOLER OUTSIDE WHENEVER THE OUTSIDE TEMPERATURE IS BELOW 35°F.

sketch by
RICH SEIFERT

WHO CAME TO THE TOWN MEETING?



Following are the results of a questionnaire provided the Town Meeting participants. Reflected in these results are the opinions, collective and individual, of those in attendance regarding matters of interest to consumers of energy.

Count Results

FAIRBANKS TOWN MEETING

ENERGY CONSUMER SURVEY

MAR. 26, 1977

Please circle the answer of your choice.

1. If energy consumption continues to increase at a rate faster than that at which that energy can be provided, some mandatory and/or voluntary conservation measures may have to be instituted. Please circle the response in the following choices which best describes your attitude:

A. Minimum insulation requirements for all new construction -	82% In Favor	3% Opposed	5% No Opinion
B. Revision of auto license tab fees based on both vehicle value as well as fuel economy rating -	71% In Favor	20% Opposed	9% No Opinion
C. Prohibition of lighted advertising after business hours -	76% In Favor	12% Opposed	12% No Opinion
D. A "bottle bill" which prohibits the use or the sale of beverages in non-returnable bottles or cans -	90% In Favor	7% Opposed	3% No Opinion

2. Taking into account what you have learned here today, indicate how you feel about the following alternatives:

A. Build more coal-fired generators -	43% In Favor	26% Opposed	31% No Opinion
B. Institute a public program to stress energy conservation in order to decrease the need for centralized power -	81% In Favor	2% Opposed	17% No Opinion
C. Seek hydroelectric alternatives -	46% In Favor	25% Opposed	29% No Opinion
D. Stress the development of more centralized power development -	30% In Favor	30% Opposed	40% No Opinion

3. Could you reduce your energy consumption without being significantly inconvenienced? Yes 71% No 22% Undecided 7%

4. Do you believe that solar energy can be practically developed and utilized in this area? Yes 62% No 16% Undecided 22%

5. What kind of energy source is primarily used to heat your residence?
   Coal 2% Wood 34% Oil 50%
   Other electric 11% Don't Know 0
   gas 2%

6. Would you consider changing your source of home heating if you felt there were a more economiacal, as well as a more "energy conscious", alternative available to you? Yes 95% No 2% Undecided 3%

7. If you are now considering such a change, what does it entail? From ________ to ________

8. What is your age 32 (mode)? Are you male X (mode) or female __?

9. Does your present residence have removable storm windows or thermopane-type glazing? Yes 83% No 17%

10. Please number the energy sources listed below in the order in which you feel the Federal government should either develop them or for which you feel the Federal government should provide development incentive to private industry?

3 Coal	6 Oil and Gas	4 Hydroelectric
5 Synthetic Fuels	1 Solar Power	2 Geothermal

11. Do you favor state and Federal tax incentives in order to encourage home-owners to insulate their homes to a high performance standard? Yes 85% No 7% Undecided 8%

12. Federal efficiency labelling of appliances will soon be a reality. Please comment on how you would like to see this accomplished so that valid comparisons may be made between like appliances of different brand names.

____

____

____

13. Please feel free to make any additional comments you wish - either on today's meeting or on the subject of energy use/conservation as a whole.

____

____

____

____

Question 12. Federal efficiency labelling of appliances will soon be a reality. Please comment on how you would like to see this accomplished so that valid comparisons may be made between like appliances of different brand names.

Answers Provided:

1. Already appliances are labelled with their power consumption in watts. How is federal labelling going to do any better than that?
2. Use of standardized units of measure - which can not be changed to sway customer opinion.
3. How many kilowatts/hr. an electrical appliance can use or amount of gas/unit time a gas appliance uses at a standard setting, etc.
4. Amount of energy required - efficiency of appliance.
5. Big motors are overused, inefficient and vice versa. Standards need changing.
6. Use consumer report type ratings.
7. a.) KWH used. b.) Life expectancy rating to combat planned obsolescence built in by manufacturers.
8. State the amount of energy required to perform task.
9. Main question would be the use of a clear and consistent power factor as wattage, from which cross comparisons can be made.
10. Would need a time to effect listing.
11. Be sure each company uses same way of designating energy efficiency. Use some common example so there is a valid and easy comparison.
12. I'd like to know when I buy an appliance exactly how much electricity it draws.
13. Have some sort of testing bureau set up along the lines of consumers union, and require appliances to display these ratings like autos are required to show their gas mileage.
14. Energy required per unit of product or preference. Eg. cars miles/gal. Furnace BTU output/BTU input.
15. Clearly.
16. Energy consumed, efficiency.
17. Power consumption vs. output. Total power, i.e., from raw resource on.
18. In a very simplified manner - perhaps a relative value scale 1-10 as well as in energy units/units of time or other more accurate but technical language.

19. -Required with all advertising
-Need to also indicate energy required to make the product being sold.

20. The simplest way.

21. Efficiency.

22. Create an expense related identification system all people can understand - in calories or BTUs or ? Hopefully decimal - easily programmed in schools as is our monetary system.

23. No appliances are good appliances. However a watts per time unit rating would be helpful.

24. On a number system i.e.: 1-10. With one being more efficient and 10 being least.

25. I'd like consumer union to develop those standards.

26. Appliances should be labeled in the same manner EPA required auto mileage figures, with regard as to energy consumption. The buyer should shop comparatively.

27. Measure output - same things rated against each other, numerically.

28. Don't know. But seems like a good idea.

29. Appliances now list time for cooking various dishes, foods, etc. Have them also list cost in watts or units of energy for these chores - food, vacuum cleaners, fans, etc.

30. I feel that using a "consumers guide" - already available - should be required at every store - available for people to read. This rates efficiency and quality.

31. Appliance departments could post the information in descending order which would be an incentive to manufacturers to be at the top.

32. Set up reliable tests.

33. A readily available and easy to understand equivalency scale to interpret power/cost/efficiency (high, low, normal).

34. Both BTU input and BTU output listed as on many oil burning furnaces.

35. Develop a common unit of wasted heat possibility (a coefficient) and the higher the coefficient the less desirable the appliance.

36. Same as food as to protein, fat, mineral, etc.

37. In simple language.

38. KW consumption per hour of running time/and energy consumed to produce it.

39. Energy req. under normal load for normal life of the product - Also what the normal load and life expectancy are.

40. Maximum use of power when operating at full capacity.

41. Energy consumption per unit of useful work done - this could be expressed as a number on a scale.

Question 13. Please feel free to make any additional comments you wish - either on today's meeting or on the subject of energy use/conservation as a whole.

Answers Provided:

1. Establish recycle center for deposit of clean cardboard and paper to be picked up for use by those who heat with wood.

2. Excellent opportunity to educate and be educated.

3. Too much dependence on government, especially in the questions of this questionnaire. Develop private energy awareness centers.

4. The "hurdles" of recycling - (such as waste oil and aluminum) must have federal help to overcome, to create the missing links (markets, incentives reclaiming values).

5. Let's cut out the subsidies to energy-intensive industries and products. That's much of the problem. Without those subsidies, they would never have a chance to dominate.

6. We need the natural gas pipeline through Fairbanks! Hydroelectric must be developed within next 10 years. Coal supplies need to be explored.

7. Spendid meeting this was. Do it again soon!

8. Feel a need for an economical windplant for rural sites.

9. We feel solar energy should be emphasized in energy saving - there are many applications - Please put a stop to activities that prevent individuals from economical solar usage - such as making economical solar cells available.

10. Cardboard paper recycles for heat. More insulation best energy saving possibility. Rate wood stoves as to efficiency. Many claims are made - very confusing. i.e. is Riteway better than Fisher - etc. Like to see some rating system established in this area.

11. The scientists in one discussion group talked of the finite limit of resources, our society's consumption philosophy and such; the people wallowed in "my wood-burning heater," "my log house" and never seemed to get above the individual level. Too bad they couldn't get together.

12. I think the booklet from this meeting should be distributed as widely as economically possible to all agencies involved and to our politicians. We know why we came. Others should know what was said.

13. Program was excellent - I would like to see more of the community involved - through education and public awareness programs.

14. Hope you can recycle the left over forms, etc.

15. I feel that the meeting was worthwhile.

16. With people using less energy, etc. as of this date, oil, gas and electric companies have raised costs to offset incentives for economies. Is this fuel crunch a variety of Watergate or have we really gone around the bend of no return? With a business running government, can the public get a fair shake?

17. Education; conservation starts at home and at work; government should lead the way by setting an example; de-emphasize energy intensive industries (i.e. agriculture, as now practiced by agri-biz). Strive toward an intermediate technology, where people are more important than machines.

18. Very useful forum for helping me form my feelings and obtain a concensus feeling toward energy problems from others in the community.

19. I oppose government's hand in anything - private hands should control, not the government. What power we give them!

20. We need more initiative on every level, to develop, to produce and use alternate sources of energy, and a general abandonment of the use of fossil fuels as energy sources.

21. Note that the Brazilians are pushing alcohol as auto fuel - this kind of determination to develop - after investigating all possibilities - alternate energies is imperative.

22. This is the kind of project needed to stimulate interest in fuel conservation before economics force us all to do so.

23. Insurance companies are set up to discourage use of wood stoves. Insurance co-ops of 50 families each could be established so that premiums would be paid only when a member family claims a loss. The members would screen one another.

24. The more "professional" - in many cases - the testimony is - the more it grasps our obsolete conventions when what is needed is a complete revolution in transport and shelter - always considering esthetics. The manually illiterate intellectual community has failed to recognize the artists of innovation.

25. I hope more meetings are held in the future to catch many who missed this one.

26. Thank you.

27. Great organizational ability indicated by those who put it together. Excellent!

28. Make solar.

29. 1) U. S. government should study hydroelectric projects where electricity is used 10 times for generation in a single system - these are in operation in Switzerland where over 90% of electricity is hydro-generated.

30. Conservation should precede development of additional energy resources.

31. Great. We need to push this in all public media - and schools - our students are the consumers of tomorrow.

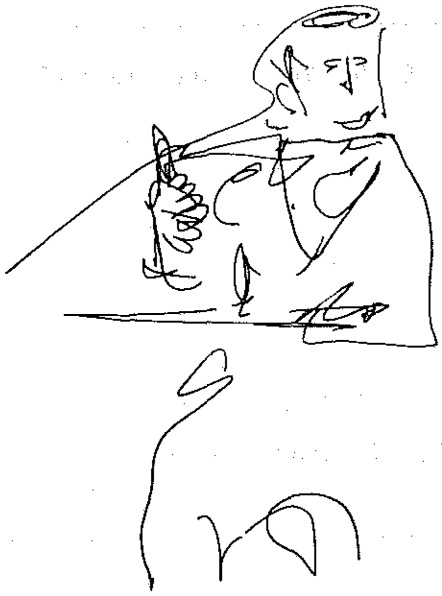
32. Remove price controls on fossil fuels; prohibit O & G exploration and development on public lands - half the whole fossil fuel/private industry unconscionable rip-off. No more flooding of land for dams. Prohibit energy-eating appliances, signs, vehicles, etc. BY LAW.

33. Already the increased cost of energy has started a lot of people thinking about ways to cut down on energy use and further cost increase will increase efforts to cut down on use. Government may end up proving itself less than competent to legislate or regulate away the use of energy.

PARTICIPANT REACTIONS TO THE

TOWN MEETING ON ENERGY

We're afraid of Stability
"People kind" are used to stability
I don't think its such a terrible thing



The following questionnaire was filled out by some of the participants of the Town Meeting on Energy in order to document its effectiveness and to gauge public reaction to this event.

Count Results

QUESTIONNAIRE

"A Town Meeting on Energy"
Saturday, March 26, 1977

The organizers of this meeting would like to know how well we have met your expectations. Would you please fill out this questionnaire and hand it to your moderator?

1. Which discussion group(s) did you attend?

   morning ______________________________

   afternoon ______________________________

2. What were some of the energy questions that you brought to the meeting?

   A. ______________________________

   B. ______________________________

   C. ______________________________

3. Were you able to get answers to the questions you had?

   morning session . . . . yes 27 no 10

   afternoon session . . . . yes 25 no 6

4. Did you learn something new about the energy issues discussed?

   morning session . . . . yes 37 no 7

   afternoon session . . . . yes 27 no 9

5. If so, what new information is of chief use or interest to you.

   ____

   ____

6. In the discussion groups you attended, do you feel you had a chance to state your side of the issue?

   morning session . . . . yes 45 no 0

   afternoon session . . . . yes 32 no 1

   please comment ______________________________

7. Were the moderators effective? That is, did they offer issues for discussion, give everyone a chance to speak, and help the group to work out answers or to reach a consensus?

morning session . . . . yes 40 no 1

comments ______

afternoon session . . . . yes 31 no 3

comments ______

8. Did your group decide to do anything anything specific after the meeting, either as a group or as individuals?

morning session . . . . yes 2 no 34

if yes, please comment ______

afternoon session . . . . yes 10 no 33

if yes, please comment Self-sufficiency wanted FNSB Impact Information Center retained, and have it distribute a monthly newsletter on alternative energy

9. Did you tour the display area? yes 58 no 2

comments Generally should have been larger with more information

10. Did you meet and share ideas with people you did not know before the meeting - or people with whom you did not know you shared such interests?

morning session . . . . yes 40 no 4

afternoon session . . . . yes 29 no 7

display area . . . . yes 34 no 5

comments ______

11. Do you feel the panel discussion was worthwhile? yes 45 no 5

comments ______

12. How important do you feel energy use and development is to interior Alaska?

crucial 40 important 18 marginally important 0 unimportant 0

comments ______

13. Do you feel that people in Interior Alaska can play a decisive role in determining its future in terms of energy issues and related economics?

yes 44 no 6 don't know 9 comments ______

14. In general, do you feel that you can make a better, more informed, choice in your own situation because of your participation here today?

yes 46 no 10 comments ______________________________

____

15. Please tell us your reaction to the town meeting on energy - what we did right, and what we did wrong.

____

____

____

____

____

____

____

____

____

____

16. And last, please tell us a little about yourself:

age ____________ own your own home? ____________

number in household ______ planning to stay in Fairbanks? ______

occupation ____________ number of years here? ____________

your name (only if you wish) ______________________________

Please feel free to use the back of this sheet for any comments you might wish to make.

QUESTIONNAIRE RESPONSES

Question #2: What were some of the energy questions that you brought to the meeting?

Responses:

"Who is expected to pay for the cost of rural electrification? Should the state and federal governments subsidize rural energy needs?"

"Are current solutions to the problems efficient enough?"

"How will new DOT manage to integrate transportation facilities?"

"What sort of commitments in terms of land resources are we willing to make for energy?"

"Why so little investigation on making our environment work for us?"

"What economic possibility for solar use has Alaska?"

"What is the general attitude of the Fairbanks people as to conserving energy?"

"What about government control through dollar incentives? We really don't need any new laws."

"How best to deal with the growing high cost of fuel and all energy."

"What is going to make the people realize how fast we are using up the natural resources?"

"What can be done to reduce demands on energy that came about as a response to social vs. real needs?"

"How at the present cost can I build the most economical leisure home with capital costs running so high?"

"What are some of the economical energy saving devices?"

"What specifically can be done to make energy more available and less expensive to the bush residents?"

"Self generating energy sources on a small scale other than fuel generators?"

"How to make people more aware."

"What I can do as an individual in my own home?"

Question #5: What new information is of chief use or interest to you?

Responses:

"Attitudes of outlying community residents towards their transportation needs."

"The general public information."

"GVEA's plans for future State Energy Office."

"The use of insulation vs. heating supply."

"The regard of bank interest on improvement loans to discourage energy usage."

"Feeling the borough should educate the public to conserve before setting bureaucrat regulations."

"There is nothing here on wind power, which is a surprise to me because it is much better for Alaskans than solar power."

"I'm convinced that meetings such as these between experts and amateurs provide a valuable forum."

"Heat and waste disposal in homes, this is where most of energy consumption is used. There should be solar or wind energy recirculating waste."

"Financial incentives to build energy efficient homes."

Question #8: Did your group decide to do anything specific after the meeting, either as a group or as individuals?

Responses:

"Small inexpensive newsletter to share individuals ideas."

"Information center concept."

"Urged to attend as many city and borough meetings as possible."

"Fairbanks North Star Borough Impact Office to continue."

Question #9: Did you tour the display area?

Responses:

"Good, wish there were more."

"Yes, they should have been larger."

"Need more information booklets with display."

Question #11: Do you feel the panel discussion was worthwhile?

Responses:

"Too general in nature."

"Was sufficient and refreshing in contrast to other discussions but public knowledge was too vague to understand."

"Thoughts of disaster planning seemed very limited."

Question #12: How important do you feel energy use and development is to interior Alaska?

Responses:

"It is crucial if we are to have development, otherwise important to the growth of the Interior."

"Development should be done in such a way as not to use up or demolish all our known and unknown resources."

"If we are to survive or should I say if our children are to survive we must develop the knowledge and the usage of all our resources in the interior."

"The development is necessary in order for us to cut down the cost which we are all now feeling."

Question #13: Do you feel that people in interior Alaska can play a decisive role in determining its future in terms of energy issues and related economics?

Responses:

"We're a small area so there is opportunity for input."

"With in-state legislation can Fairbanks be relied on?"

"I believe the people can if the big businesses don't legislate them out of existence."

"We will have to consider our role, population-wise we are a small percent, however, interior Alaska or Alaska in general is playing a role for greater justification."

Question #14: In general, do you feel that you can make a better more informed choice in your situation because of your participation here today?

Responses:

"When I build my dream home, I'll know where to get the information about all the how-to's."

"I am more aware of potential alternative energy measures for individual day-to-day living."

"I appreciate the chance to be exposed to a variety of ideas for my home under construction."

Question #15: Please tell us your reaction to the Town Meeting on Energy--what we did right and what we did wrong.

Reponses:

"Separate between city problems and rural problems."

"Not enough personal participation in displays."

"I'm pleased with it--also feel that the short time I spent here will save me some money in the long run. I was able to get answers to my questions easily."

"Too many people wandered to different groups and then talked about points already made."

"Was a really good idea and was well publicized. Too bad more weren't in attendance."

"I think the opening general session should have set the tone and left more people feeling less adrift. Alaska living never seemed to get above the individual levels to realize we are part of a bigger world. Too bad they didn't get together."

"Overall I think it was fine and executed fairly well. I have a few areas I think need more covering.

a) Let people know beforehand what the discussion will be on
b) Combine some groups
c) Energy saving devices
d) More and larger displays

The series of statements were well organized."

"Lack of coffee."

"There is a need to educate oneself in all areas of energy and economics. We need booklets to keep everyone informed on all meetings and discussions."

"Very useful--I hope the information gathered here today will go far beyond this group and will spread to the entire community and reflect in the future development of this town."

"I would definitely like to see a newsletter come out; we could call it The Day the Lights Went Out. What do you say?"

"We came and saw; we learned and shared; now I will act. Will you?"

"Our moderator suggested that these problems are too important to leave to the experts--I suggest their solution depends on our all becoming experts."

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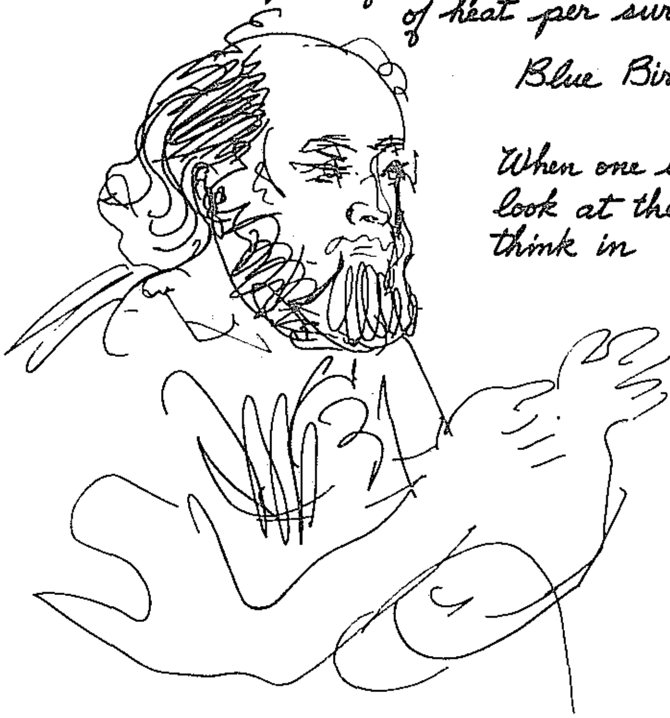
In order to be self sufficient
How little can I get by with and be comfortable -
rocker arm device .39 amp per hour - turns complete blower system in a house -
devices - that maintains NOT REBUILDS
we have to go to the space industries
Thinking small - smaller car - eating less
we have to start with Ratio of Exterior Surface to interior surface -
4,000 surface square feet in smallest containment 1.5 BTU's of loss of heat per surface area.

Blue Bird Subdivision



When one is looking at heat you must look at the flow of heat TERMS we must think in

RETENTION

walls of a house is a storage system

FLOW

HEAT

Recycling

Criminal insult to have an outside vent

Champion Mobile Home
solar energy

A selected list of some reading materials on energy conservation, economics, and alternatives.

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WOOD HEAT INFORMATION

(There are also many commercial dealers locally doing business in wood stoves. Because of shipping costs, it is always best to inquire about a stove you're interested in from local dealers).

<u>Wood Burning Fireplace, Heater and Stove Manufacturers</u>

Autocrat Corporation, New Athens, IL 63364

Enamel and Heating Products Ltd., Suite 1002, 1107 Broadway, New York, NY 10010

The Firebox Company, P. O. Box 1, Richmond, MA 02154.

Washington Stove Works, P. O. Box 687, Everett, WA 98201

Malm Fireplaces, 368 Yolanda Avenue, Santa Rosa, CA 95404

Atlanta Stove Works, Inc., Atlanta, GA 30307

The Majestic Company, Huntington, IN 46750

Vega Industries, Inc., Mt. Pleasant, IA 54641

King Stove and Range Co., P. O. Box 730, Sheffield, AL 35660

United States Stove Co., South Pittsburg, TN 37380

West Coast Fire-View Distributors, P. O. Box 370, Rogue River, OR 97537