ENERGY CONSUMPTION AND PRODUCTION IN IOWA

The accompanying tables and graphs show the energy consumption trends in Iowa during the past three years. Total energy consumption dropped 1% in 1974 but rose 1% in 1975, so that 1975 consumption was ~~xxxxx~~ exactly the same as 1973 consumption (within statistical uncertainties). During the two-year period there were some changes in the fuels used. Natural gas consumption decreased 3% while coal and coke consumption declined 8%. Nuclear energy increased over fourfold during this period due to the startup in operations at the Duane Arnold Energy Center and the Cooper Nuclear Station. The four major fuels used in Iowa are (in order of importance) petroleum, natural gas, coal, and nuclear energy.

Almost all Iowa's energy comes from imported fuels. In 1975 less than 2% of the energy consumed in Iowa was produced in Iowa, most of it Iowa coal.

IOWA ENERGY CONSUMPTION
(BTU's in Trillions)

	1975 Preliminary		1974r		1973r	
	#	BTU	#	BTU	#	BTU
. NATURAL GAS[1]	324.3	334.4	337.4	347.9	334.7	345.1
. PETROLEUM[2]	2932.1	361.7	2800.7	347.0	2891.4	359.6
. COAL[3]	6.58	157.9	6.6	158.4	6.9	165.3
. NUCLEAR[4]	5.16	17.6	3.6	12.3	1.25	4.3
. HYDROELECTRIC[4]	0.85	2.9	0.95	3.2	0.90	3.1
. FUELS IMPORTED AS ELECTRICITY[4]	1.96	6.7	1.2	4.2	1.3	4.4
. COKE[3]	0.56	14.0	0.70	17.5	0.87	21.7
TOTALS		895.2		890.6		903.5
. NATURAL GAS:						
1. Northern Natural Gas	202.7	209.0	215.0	221.7	216.6	223.3
2. Natural Gas Pipeline	91.8	94.7	89.9	92.7	86.9	89.6
3. Michigan-Wisconsin	29.8	30.7	32.5	33.5	31.2	32.2
. PETROLEUM:						
1. Motor gasoline	1626.2	203.3	1567.6	196.0	1681.5	210.2
2. Middle distillates:						
a. #1 fuel oil & kerosene	78.5	11.0	79.7	11.2	89.9	12.3
b. #2 fuel oil	316.9	44.4	311.1	43.6	341.0	47.7
c. Diesel	333.4	46.7	321.5	45.0	304.3	42.6
3. LPG	539.0	51.2	481.0	45.7	434.1	41.2
4. Aviation turbine fuel	24.3	3.2	21.3	2.8	20.0	2.7
5. Residual oil	6.7	1.0	11.7	1.8	13.6	2.0
6. Aviation gasoline	7.1	0.9	6.8	0.9	7.0	0.9
COAL:	6.58	157.9	6.6	158.4	6.9	165.3
NUCLEAR:						
1. Duane Arnold	2.30	7.9	1.40	4.8	--	--
2. Cooper Station	1.81	6.2	0.95	3.2	--	--
3. Cordova	1.01	3.4	1.19	4.1	1.25	4.3
4. Genoa #2	0.04	0.1	0.05	0.2	NA	--
HYDROELECTRIC	0.85	2.9	0.95	3.2	0.90	3.1
FUELS IMPORTED AS ELECTRICITY:						
1. Bureau of Reclamation Dams[4]	1.96	6.7	1.2	4.2	1.3	4.4
COKE[3]	0.56	14.0	0.70	17.5	0.87	21.5

[1] in billions of cubic feet
[2] in millions of gallons
[3] in millions of tons
[4] in billions of Kwh
r revised

END-USE DISTRIBUTION - IOWA ENERGY

Trillions of BTU's

Energy Type	Residential	Commercial	Industrial	Utility	Agriculture Construction	Transportation	Other	Totals
Natural Gas	87.7	59.1	127.1	58.4	2.1	--	--	334.4
LPG	19.1	12.7	11.9	0.8	6.2	0.5	--	51.2
Motor Gasoline	--	--	--	--	--	203.3	--	203.3
Aviation Fuels	--	--	--	--	--	4.1	--	4.1
Fuel Oil & Kerosene	21.4	13.4	3.8	4.5	--	9.9	2.4	55.4
Diesel Fuel	--	--	--	--	10.0	36.7	--	46.7
Residual Fuel	0.4	0.3	0.2	0.1	--	--	--	1.0
Coal & Coke	1.4	0.5	42.8	127.2	--	--	--	171.9
Hydroelectric	3.9	2.0	3.5	--	--	--	0.2	9.6
Nuclear Power	7.2	3.7	6.3	--	--	--	0.4	17.6
TOTALS (1975)	145.8	94.9	173.1	191.4	18.3	254.7	3.0	895.2
TOTALS (1974)	137.7	89.4	203.4	190.8	20.1	245.3	2.9	890.6
TOTALS (1973)	131.2	84.8	206.7	195.7	26.1	256.6	2.6	903.5

Columns may not add due to rounding.

LIVING HISTORY FARMS

One of the research proposals funded by the Iowa Energy Policy Council during 1975 was a proposal from Living History Farms, an educational, historical, non-profit organization, to design a Farm Home of Today and Tomorrow to be heated by solar energy from a solar pond. The home is being designed by Ray Crites Associates, Ames, Iowa.

The solar pond will be a pond with water that is very salty at the bottom but very fresh at the top. When sunlight hits the bottom of the pond and warms up the water ~~xxxxxx~~ there, ~~xxxxxx~~ the water will not rise to the surface as it would in an ordinary pond because the salt water is denser than the water above it. The pond will continue heating all summer and the hot water (which may be near boiling) will be available for heating purposes all winter. A solar pond thus acts both as a collector of solar energy and a storage system for the heat. Heat is stored for months and the user does not need to worry about long cloudy periods during the winter as does the owner of an ordinary solar heating system.

On December 5 and 6, 1975, Living History Farms sponsored a seminar and meetings on solar ponds to which the nation's three leading experts on solar ponds came: Professor Carl Nielsen of Ohio State University (Columbus, Ohio), Ari Rabl of Argonne National Laboratory (Argonne, Illinois), and David Styris of Battelle Northwest Laboratories (Richland, Washington).

The solar pond and the Farm Home of Today and Tomorrow will be constructed beginning in 1976. The pond will be designed and its construction supervised by Professor Nielsen and by John Hull, a graduate student in physics at Iowa State University.

APPLIANCE EFFICIENCIES: REFRIGERATORS AND FREEZERS

In 1975 the Association of Home Appliance Manufacturers (AHAM) (20 North Wacker Drive, Chicago, Illinois 60606) released its first directory of certified refrigerators and freezers containing energy consumption as well as volume and shelf area. AHAM sponsors a program to verify the total refrigerated volume, total shelf area, and energy consumption ratings of all household models of participating manufacturers. Certified models in retail outlets carry special AHAM seals of certification. AHAM plans to publish directories of the data about twice a year.

The September 1975 issue of the directory showed wide variations in the energy consumption of existing models. For example, freezers with rated refrigerated volumes of 13.5 to 15.5 cubic feet had energy consumptions of from 85 to 200 kilowatt-hours per month. The less efficient models could draw up to 115 kilowatt-hours per month more than the most efficient models, which would mean an extra $55 a year in operating costs for electricity at 4¢ per kilowatt-hour. Even if an efficient model costs more, its savings in electricity could pay for the extra cost in only a few years (perhaps even the first year).

The results of the AHAM tests show that chest-type freezers typically consume significantly less electric energy than upright-type freezers. In the range around 20 cubic feet freezer volume, chest-type freezers consume about 100 kilowatthours per month and uprights about 175 kilowatthours per month.

Automatic defrosting on upright freezers also requires greater energy consumption. Typically an automatic defrost model will consume about 20 to 30% more electricity than a identical model with manual defrost. This can account for 30 more kilowatthours per month on a typical freezer, or an extra $15 a year at 4¢ per kilowatt-hour.

Some refrigerators and freezers have anti-sweat heater switches. When the heater is on (to avoid condensation of moisture on the outside walls of the appliance) energy consumption is typically about 13% greater than when the heater is off.

Information about appliance energy consumption is available and every consumer contemplating the purchase of a major appliance ought to ask for the information even if it is not prominently posted.

fall into three groups:

-- Under-used mid-term technologies: geothermal power; solar heating and cooling; and waste heat utilization
-- Technologies supporting intensive electrification: electric conversion efficiency; electric power transmission and distribution; electric transport; and energy storage
-- Technologies being explored for the long-term: fuels from biomass and hydrogen in energy systems.

ERDA discusses a number of strategies for energy research, development, and demonstration, only one of which is considered acceptable because all the others lead to unacceptably high levels of imported energy through the year 2000. The acceptable strategy involves pursuing all the possible technologies. The results of this strategy for the year 2000 are estimated as follows.

Table . Resources consumed in the U.S. in 2000. (Units: Quads. 1 Quad = 10^{15} Btu)

		Quads	Fraction
Hydroelectric (at 34% efficiency)		3.65	~~2.69~~ 2.6 %
Geothermal		6.60	~~4.8~~ 4.7
Solar		4.82	3.5
Fusion		0.05	
Light Water Reactor (LWR)		16.50	~~12.0~~ 11.9
Liquid Metal Fast Breeder (LMFBR)		3.90	2.8
High Temperature Gas Reactor (HTGR)		3.90	2.8
Oil Steam Electric		1.88	1.4
Gas Steam Electric		0.00	0.0
Oil, Domestic ~~and Imports~~	15,66	~~19.77~~	~~14.4~~ 11.3
Oil Imports		(4.11)	43.0
Oil Shale		8.00	5.8
Natural Gas, Domestic and Imports		22.80	~~16.6~~ 16.4
Coal (including 1.5 Quads exports)	~~37.11~~	~~39.11~~	~~28.5~~ 28.1
~~Coal (million tons per year)~~		~~1862~~	
Waste Materials		6.50	4.7
Biomass		1.50	1.1
Total Energy Resources (including exports)	138.98	~~137.03~~	100.0
Total Cost in Billions of Dollars per year		328.74	
Average Cost in Dollars per Million Btu of Resources Used		2.46	

THE ERDA NATIONAL PLAN

In mid-1975 the U.S. Energy Research and Development Administration (ERDA) published A National Plan for Energy Research, Development and Demonstration: Creating Energy Choices for the Future.

ERDA listed eight national energy research, development and demonstration goals:

--Expanding the domestic supply of economically recoverable energy producing raw materials, such as the fossil fuels

-- Increasing the utilization of essentially inexhaustible domestic energy resources, such as solar energy

-- Efficiently transforming fuel resources into more desirable forms, such as liquid and gaseous fuels derived from coal

-- Increasing the efficiency and reliability of the processes used in the energy conversion and delivery systems

-- Transforming consumption patterns to improve energy utilization

-- Increasing end-use efficiency

-- Protecting and enhancing the general health, safety, welfare and environment related to energy

-- Performing basic and supporting research and technical services related to energy

As the highest priority technologies with regard to energy supplies, ERDA emphasized:

1. Three near-term energy systems: the direct utilization of coal by electric utilities and industry; the construction of light-water nuclear power reactors; and enhanced recovery of oil and gas.
2. Coal gasification and liquefaction and oild shale as new sources of fluid fuels for the mid-term
3. Breeder reactors, fusion, and solar electric plants as "inexhaustible" sources for the long-term.

As the highest priority technologies with regard to energy demand, ERDA emphasized near-term efficiency (energy conservation) technologies including conservation in buildings and consumer products; industrial energy efficiency; transportation efficiency; and the use of waste materials as energy.

Other important technologies in ERDA's national plan

Resource Recovery

THE U.S. SITUATION

In recent years interest has grown in resource recovery -- the recovery of valuable mineral and energy resources from solid wastes that would otherwise be buried in landfills or disposed of in some other manner.

Part of the impetus for resource recoeery came from the 1970 Resource Recovery Act, which provided for federally-funded research into new and improved methods to recover, recycle, and reuse wastes and for financial assistance to the states in the construction of solid waste dispoaal facilities.

Part of the impetus has been the realization that the cost of solid waste disposal can be reduced by resource recovery systems, so that both local governments and private corporations have begun building resource recovery systems for economic reasons.

The systems being built are numerous and varied. The type of solid wastes varies greatly across the United States, as does the markets or uses for the resources in the wastes.

Many of the systems under construction or being planned are aimed at recovering the energy content of wastes. Paper and plastics in the wastes can be burned to produce heat, which can be used directly or to produce electricity. Refuse Energy Systems Co., a private firm, is building a plant at Saugus, Massachusetts, which will handle up to 1200 tons of refuse daily from a population of 500,000; the wastes will be used to produce steam which will be transported across the Saugus River and sold to General Electric Company's River Works in Lynn. Union Electric Company, following a sucessful test begun in 1972, is constructing a solid waste utilization system which will handle all the wastes of the St. Louis metropolitan area, recovering metals for sale and burning the combustible wastes in Union Electric's steam-electric plants. Monsanto Chemical Co. is building a demonstration plant in Baltimore which will pyrolyze (heat in the absence of oxygen) solid wastes and convert them into gaseous and liquid fuels used

to produce steam.

THE AMES SOLID WASTE RECOVERY SYSTEM

One of the most advanced and complete resource recovery systems has been built by the city of Ames, Iowa, which in 1975 began using combustible refuse in the coal-fired boilers at the city-owned electrical power plant. The combustible refuse is produced from the solid wastes of Ames, Iowa State University, and a number of communities in Story County, including Nevada, Story City, Roland, Gilbert, Kelley, Huxley, Cambridge, Slater, Cola, Maxwell, and Zearing.

The solid wastes are delivered to the Ames Solid Waste Recovery System building which is near the municipal power plant. The wastes are shredded in two stages to ½-inch size. Ferrous metals are removed magnetically, Aluminum is separated out by a special separator, and other non-ferrous metals and noncombustibles (glass, sand, grit) are removed. The rest of the wastes are conveyed to the power plant to be burned in place of some of the coal normally used.

The Ames system is expected to produce about 150 tons/day of combustible refuse when full operation begins; by 1985 the total should increase to about 205 tons/day. In the first year it is estimated that operating costs and fixed charges will amount to $15.34/ton, with the fuel worth about $10.00/ton and the recovered materials (mainly metals) worth at least $3.45/ton. The net cost of $2.00/ton will be competitive with the cost of disposing of the wastes in a landfill. Within a few years the plant may be showing an actual profit.

The city of Ames paid the full $5.5 million capital cost of its new facility, obtaining the necessary funds by selling municipal bonds.

Ames is also purchasing a baler which will be installed in a building near the main building. When paper prices are high, paper can then be baled and sold for more than its value as fuel, providing further economic benefits. The baler can also be used with matals.

COAL

A. TRENDS IN THE U.S. AND IOWA COAL INDUSTRIES

Coal production in the U.S. has changed very little over the past few years, but appears to be inching upward.

Production of bituminous coal and lignite decreased 0.6% in 1973 and then rose 1.6% in 1974. During the first eight months of 1975 it rose 0.6% over the first eight months of 1974.

Coal usage in Iowa, which decreased 4.5% in 1974, rose very slightly in 1975 according to preliminary figures. Production of coal in Iowa during the first six months of 1975 was 308,000 tons, up 11% from the 278,000 tons produced in the first six months of 1974. Total coal production in Iowa in the last several years has fluctuated around 900,000 tons/year.

ECONOMIC DISTRIBUTION BY TYPE OF ENERGY
(Iowa)

	1975[p]	1974	1973
NATURAL GAS: (mil.cu.ft.)			
Residential	85.1	88.5	87.8
Commercial	57.3	59.3	58.6
Industrial	123.3	128.3	126.5
Electric Goveration	56.6	59.0	59.4
Agriculture (grain drying)	2.0	2.3	2.4
Totals:	324.3	337.4	334.7
PETROLEUM PRODUCTS:			
LPG & ETHANE: (mil.gal.)			
Residential	200.8	158.9	102.7
Commercial	133.8	105.8	68.5
Industrial	125.0	119.8	110.6
Agricultural	65.0	85.3	144.5
Utility Gas	9.0	7.1	4.6
Transportation	5.2	4.1	3.2
Totals:	539.0	481.0	434.1
MOTOR GASOLINE: (mil.gal.)			
Transportation	1626.2	1567.7	1681.5
AVIATION FUELS: (mil.gal.)			
Transportation:			
Aviation gasoline	7.1	6.8	7.0
Turbine fuel	24.3	21.3	20.0
Totals:	31.4	28.1	27.0
FUEL OIL & KEROSENE: (mil.gal.)			
Residential	152.8	150.7	173.6
Commercial	95.4	94.9	104.6
Industrial	27.2	26.8	38.0
Utility	31.8	31.4	27.6
Transportation	71.0	70.0	70.4
Other (includes military)	17.2	17.0	16.7
Totals:	395.4	390.8	430.9
DIESEL FUEL: (mil.gal.)			
Transportation	262.1	252.7	233.4
Agriculture and Construction	71.3	68.8	70.9
Totals:	333.4	321.5	304.3
RESIDUAL FUEL: (mil.gal.)			
Residential	2.7	5.0	3.7
Commercial	1.9	3.3	2.4
Industrial	1.5	2.5	2.5
Electric Utility	0.5	0.9	5.0
Totals:	6.7	11.7	13.6

p = preliminary

ECONOMIC DISTRIBUTION BY TYPE OF ENERGY (cont'd)
(Iowa)

	1975[p]	1974	1973
COAL: (mil.tons)			
Residential	0.06	0.06	0.05
Commercial	0.02	0.02	0.02
Industrial	1.2	1.3	1.42
Electric Utility	5.3	5.2[r]	5.4
Totals:	6.58	6.58	6.89
HYDROELECTRICITY: (bil.KWH)			
Residential	1.15	0.89	0.91
Commercial	0.58	0.45	0.46
Industrial	1.01	0.77	0.79
Other	0.07	0.06	0.06
Totals:	2.81	2.17	2.22
NUCLEAR POWER: (bil.KWH)			
Residential	2.12	1.48	0.51
Commercial	1.07	0.74	0.26
Industrial	1.84	1.29	0.45
Other	0.13	0.09	0.03
Totals:	5.16	3.60	1.25
COKE (mil.tons)			
Industrial	0.56	0.70	0.87

p = preliminary
r = revised

IOWA RAILROAD ASSISTANCE PROGRAM
FY 1975 and FY 1976 Expenditures

Branch Line	Railroad	Mileage	Total Estimated Project Cost	State Participation
Indianola-Carlisle	R.I.	11.3	$ 600,000	$ 400,000
Creston-Orient	B.N.	12.0	291,000	291,000
Ida Grove-Maple River	C&NW	38.4	176,000	80,000
Spencer-Herndon	Milw.	101.0	2,000,000	807,500
Mona Junction-Minnesota border	I.C.G.	83.2	561,000	190,749
Humboldt-Eagle Grove	C&NW	25.4	1,800,000	800,000
TOTALS		271.3	$5,428,000	$2,569,249
Spencer-Herndon	Milw.	101.0	Supplement	790,357
Palmer-Royal	R.I.	47.1		
Iowa Falls-Estherville	R.I.	109.5		
Estherville-Rake	R.I.	50.6	2,309,400 (1976)	
Dows-Forest City	R.I.	44.3		1,000,000
Orient-Fontanelle*	B.N.	12.0	667,000	222,333
Alden-Eldora*	C&NW	21.0	1,080,000	720,000
Atlantic-Audubon*	R.I.	25.0	830,000	406,700
Cherokee-Rock Rapids*	I.C.G.	71.5	1,270,375	635,000 xx
Ames-Burt*	C&NW	94.2	3,500,000	2,310,000 xxx
Farragut-Griswold*	B.N.	44.4	650,000	217,000
Iowa Falls-Gateway*	R.I.		2,167,830	1,000,000

* pending final negotiations
xx to be adjusted
xxx to be adjusted

"Divorcement" Legislation in Iowa

Due in part to the Federal price and allocation regulations, certain market distortions, already identified, developed during 1974 and 1975. Of particular concern in the state of Iowa was the impact these regulations had on the independent retailer and distributor of motor fuel. Petroleum products are commonly retailed through either "independent" operations, where the proprietor acts as an independent businessman, or ~~through~~ company-owned and operated outlets, where the manager is a salaried employee of thecompany. Much of Iowa's petroleum distribution is undertaken through the independent marketer.

Allegations of discrimination between company-owned or operated stations and independent dealers by producing or refining oil companies ~~lead~~ led to consideration both nationwide and in Iowa of legislation to restrict access to the retail market by petroleum producers or refiners.

In Iowa, a bill to restrict the activities of major petroleum corporations in the retail sale of motor fuel and other petroleum products to the public was introduced and considered by the House and Senate Energy Committees. That legislation proposed to prohibit major petroleum corporations from operating more than one retail service outlet in the State. The scope of this prohibition extended not only to petroleum producers and refiners but also petroleum distributors, including the many small jobbers which operate two, three or four retail outlets in the State.

At its meeting in April, the Council voted to oppose that particular legislation. The petroleum dealers' "divorcement" legislation (so called because it requires certain producers, refiners or distributors petroleum products ~~from~~ to divorcing themselves from all but one of their retail outlets) has been the subject of interim study by a special legislative joint committee.

RECOMMENDATION: The Energy Policy Council recognizes the contributions the independent retail petroleum marketers have made in making motor fuel and agricul-

~~three~~

tural fuels available in every part of the State of Iowa. The Council believes, however, that any proposed legislation which eliminates the producing and refining oil companies and distributors from the retail market, and, thereby, which restricts the operation of and access to the free enterprise system, must clearly promote the general public welfare. Accordingly, the Council will support legislation which restricts access by major petroleum companies to the retail petroleum market in the State of Iowa if it is clearly demonstrated that such major oil companies or larger distributors are actually unjustly discriminating against the smaller independent jobbers and retailers which rely on them for their product in order to increase the market share of the company-owned outlets. To date, no demonstration of such discrimination has been shown.

CONSUMPTION OF ENERGY BY ECONOMIC SECTOR
Iowa

	1975	1974	1973
I. TRANSPORTATION:			
LPG (mil.gal.)	5.2	4.1	3.2
Motor gasoline (mil.gal.)	1626.2	1567.6	1681.5
Aviation fuels (mil.gal.)	31.4	28.1	27.0
Fuel oil & kerosene (mil.gal.)	71.0	70.0	70.4
Diesel fuel (mil.gal.)	262.1	252.7	233.4
II. ELECTRIC UTILITIES:			
Natural gas (mil.cu.ft.)	56.6	59.0	59.4
LPG (mil.gal.)	9.0	7.1	4.6
Fuel oil & kerosene (mil.gal.)	31.8	31.4	27.6
Residual fuels (mil.gal.)	0.5	0.9	5.0
Coal (mil.ton)	5.3	5.2	5.4
III. INDUSTRY:			
Natural gas (mil.cu.ft.)	123.3	128.3	126.5
LPG (mil.gal.)	125.0	119.8	110.6
Fuel oil & kerosene (mil.gal.)	27.2	26.8	38.0
Residual fuels (mil.gal.)	1.5	2.5	2.5
Coal (mil.ton)	1.2	1.3	1.4
Coke (mil.ton)	0.56	0.70	0.87
Hydroelectricity (bil.Kwh)	1.01	0.77	0.79
Nuclear power (bil. Kwh)	1.84	1.29	0.45
IV. RESIDENTIAL:			
Natural gas (mil.cu.ft.)	85.1	88.5	87.8
LPG (mil.gal.)	200.8	158.9	102.7
Fuel oil & kerosene (mil.gal.)	152.8	150.7	173.6
Residual fuels (mil.gal.)	2.8	5.0	3.7
Coal (mil.ton)	0.06	0.06	0.05
Hydroelectricity (bil.Kwh)	1.15	0.89	0.91
Nuclear power (bil.Kwh)	2.12	1.48	0.51
V. COMMERCIAL:			
Natural gas (mil.cu.ft.)	57.3	59.3	58.6
LPG (mil.gal.)	133.8	105.8	68.5
Fuel oil & kerosene (mil.gal.)	95.4	94.1	104.6
Residual fuels (mil.gal.)	1.9	3.3	2.4
Coal (mil.ton)	0.02	0.02	0.02
Hydroelectricity (bil.Kwh)	0.58	0.45	0.46
Nuclear power (bil.Kwh)	1.07	0.74	0.26
VI. AGRICULTURE:			
Natural gas (mil.cu.ft.)	2.0	2.3	2.4
LPG (mil.gal.)	65.0	85.3	144.5
Diesel fuel[1]	71.3	68.8	70.9

1 Includes Construction and Mining

Fuels do not add to totals due to ""Other" sector being excluded.

RECOMMENDATION:

The Iowa Energy Policy Council recognizes Iowa's coal resources as a valuable energy resource to the State and the nation. As the use of other fossil fuels, such as natural gas and petroleum, becomes less feasible, economically and politically, the Council believes it is important that the development and utilization of coal be actively sought and encouraged.

The Council maintains however that this development must not be done in a way which compromises sensible environmental standards and goals.

~~Greater emphasis must be given to developing an economically feasible technology for the gasification and liquifaction of coal.~~

Iowa has already done a great deal to encourage the sensible development of this valuable resource. While undertaking measures to encourage the development of Iowa coal, such as the Iowa Geological Survey's Coal Resource Survey and the Iowa State Coal Research Project, the State has passed a surface mining law and proposed revised air ~~quality standards~~ pollution emission regulations to permit greater utilization of Iowa coal without compromising reasonable standards for a clean atmosphere.

To continue these efforts greater emphasis must be given to developing an economically feasible technology for gasifying and liquifying coal, especially in situ. Coal slurry pipelines must be carefully studied and evaluated for their energy efficiencies and water consumptive properties and, if appropriate, be given right of eminent domain. Finally, the state should consider the institution of a coal severance tax, the revenues from which would be dedicated to reclaiming Iowa's valuable farm land and contributing to Iowa's energy research and development fund.

RECOMMENDATIONS

I. Conservation - General

IOWANS NEED TO MAKE RIGOROUS EFFORTS TO CONSERVE ENERGY IN EVERY WAY THIS REASONABLY CAN BE DONE.

Iowans face intensifying energy supply problems which can only be met satisfactorily with the more efficient use of the energy we consume and the development of both existing and new energy sources.

The state receives about three-fourths of its energy from petroleum products and natural gas. The future supply of both of these fuels is clouded. The natural gas available to Iowans is projected to decline by as much as 20 percent during the 1970s. Crude oil production from domestic wells has declined each year since 1970 and the national government is considering various measures to reduce or place a lid on petroleum imports.

The outlook for coal production is brighter, but the coal industry faces pollution control, land reclamation, transportation and expansion obstacles and competition for coal, particularly low-sulfur western coal, will be intense. Additional nuclear power is another possibile alternative, but no new nuclear plant can be completed in Iowa before 1983.

The situation isn't uniform throughout the state. The projected natural gas shortage is most severe in the northern two-thirds of the state. The electric utility industry is planning a major expansion of its generating capacity, which will rely upon the availability of primary fuels - coal, uranium and oil.

Firm conclusions are difficult because of the uncertain impact of federal legislation and energy industry decisions, but a purdent evaluation of Iowa's energy outlook suggests our future economic well-being will depend importantly on our using the energy we have more efficiently.

II. Conservation - Attitude

THE NEED TO CONSERVE ENERGY OFFERS OPPORTUNITIES TO INDIVIDUALS AND INDUSTRIES AS WELL AS PROBLEMS.

The projected restrictions in some energy supplies does not require that individuals abandon their search for the "good life". It doesn't portend economic stagnation.

There is greater elasticity between economic growth and energy consumption than commonly is realized. By increasing the efficiency with which we use energy, we can achieve a steady rise in economic activity even if total available energy supplies do not increase significantly for the next several years.

This is true for individuals as well as corporations. There are satisfactions to be gained from "making it do" and "wearing it out" which are at least as rewarding as the rapid acquisition and scrapping of a steady stream of different material goods.

The energy shortage will require changes, but change is not new in American history. Change offers opportunities as well as hardships. The opportunities are greatest and the hardships shortest for those who recognize early that changes must be made.

III. Conservation - Methods

CONSERVATION EFFORTS SHOULD INCLUDE, BUT NOT BE LIMITED TO:

-Support programs that increase the insulation of homes, businesses and other structures.

-Imposition of a tax on automobiles that creates a strong economic incentive for the purchase of more energy-efficient automobiles.

-Encourage the use of energy-efficient modes of transportation such as railroads and mass transportation systems.

-Require that air conditioning units meet energy efficiency standards before they can be sold in the state.

-Support utility rates that require users who contribute most to peak demands to pay the cost of building the generating facilities required to provide these peak loads.

-Support the adoption and revision of building codes to include energy efficiency requirements in the design and construction of new buildings.

-Encourage energy-efficiency consideration in land-use planning.

IV. Natural Gas

V Petroleum Supplies

VI. Electricity Generation

BECAUSE OF UNCERTAINTY ABOUT FUTURE DEMAND AND UNRESOLVED CONTROVERSIES OVER THE TYPE OF GENERATION PLANT TO BUILD, UTILITY INDUSTRIES SHOULD EXERCISE CAUTION IN INITIATING THE CONSTRUCTION OF NEW GENERATING FACILITIES.

The electric utilities have a statutory responsibility more burdensome than other energy industries. The electric industry is by law required to meet the needs of its customers. Since the planning, approval and construction of a new generating plant may take eight to ten years, utilities are under pressure now to initiate building projects to meet the anticipated demands of the mid-1980's.

Planning now for 1985 is fraught with difficulties. If a utility builds a new plant and conservation "catches hold," it may end up with a costly plant that is not needed. If it doesn't build and conservation doesn't "catch hold," it may be unable to meet its customers' needs.

Public policies will influence the rate of growth in demand for electricity. Demand will be subdued if these policies involve effective conservation measures. The EPC plans to pursue energy-saving policies and asks that the utilities take this into consideration as they develop their plant.

VII. Nuclear Power

THE ENERGY POLICY COUNCIL OPPOSES THE IDEA OF A NUCLEAR MORATORIUM IN IOWA.

THE ENERGY POLICY COUNCIL BELIEVES THE NUCLEAR POWER QUESTION IS ONE PART OF A LARGER ELECTRIC POWER QUESTION WHICH SHOULD BE THE SUBJECT OF ONGOING STATE RESEARCH AND ANALYSIS.

DECISIONS MADE REGARDING ANY MAJOR NEW ENERGY FACILITIES HAVE A SIGNIFICANT IMPACT ON THE PUBLIC INTEREST AND THE ENERGY POLICY COUNCIL AND ANY SUCCESSOR ENERGY POLICY AGENCY SHOULD TAKE AN ACTIVE PART IN SUCH DECISIONS.

THE POWERS OF THE IOWA STATE COMMERCE COMMISSION SHOULD BE EXPANDED TO REQUIRE THE APPROVAL OF THE COMMISSION FOR THE ESTABLISHMENT AND ERECTION OF MAJOR NEW ELECTRIC GENERATING FACILITIES.

THE ENERGY POLICY COUNCIL BELIEVES THAT THE NUCLEAR POWER PLANT QUESTION ALSO INVOLVES THE HANDLING, TRANSPORTATION, STORAGE AND DISPOSAL OF NUCLEAR WASTES WHICH POSE PROBLEMS WHICH SHOULD BE ADDRESSED THROUGH THE APPROPRIATE FUNDING OF THE AUTHORITY GRANTED TO THE DEPARTMENT OF ENVIRONMENTAL QUALITY UNDER CHAPTER 455B, DIVISION IV, PART 2, OF THE CODE OF IOWA.

"During the next five years, new supplies of uranium may be discovered, the emergency core cooling system may be tested successfully, a reprocessing plant may come on line, there may be progress toward the fast-breeder reactor, the reliability of nuclear plants might be improved, radioactive wastes may be transmited into harmless substances. Or none of these things might occur and new problems may develop. No one knows. At a time which research and development and operating experience are accumulating rapidly, the state should not place itself in a position where it cannot consider and use this new evidence. . .

"If the responsibilities given to the EPC as the energy advisor to the Governor and the Legislature are to have any real influence, there must be some mechanism established for implementing these policies. . .The logical agency to exercise this review authority is the ISCC (Iowa State Commerce Commission). . .The EPC does not intend to relinquish its energy policy responsibilities to the state regulatory commission. . .There may be times when the Council will intervene as a party in an energy facility case. But the Council does not believe it would be wise, expendient or necessary for it to try to duplicate the ISCC's regulatory function."

(These comments are excerpted from a longer commentary contained in the EPC's separate nuclear power report.)

VIII. Energy Research and Development

THE STATE OF IOWA SHOULD PROVIDE A FUND FOR RESEARCH AND DEVELOPMENT INTO METHODS OF IMPROVING IOWA'S ENERGY SITUATION.

There are several promising areas in which careful spending of public funds would accrue benefits to Iowans. The State has already provided $3 million for a three-year coal research project aimed at finding ways to mine Iowa's coal resources with minimum environmental impact and to remove part of the high sulfur content of Iowa coal to make it an acceptable fuel. The State has also provided $3 million for a railroad assistance program to upgrade branch lines in the state and thereby improve the usefulness of an energy-efficient transportation mode.

Iowa could benefit by research and development in such areas as energy conservation methods applicable to Iowa and in the use of the state's abundant renewable resources such as solar and wind energy and agricultural wastes.

Federal funding is available in certain areas and is being used in several energy research programs in Iowa. State funding could be directed at methods specifically suited for use in Iowa, with application for supplemental federal funding being encouraged. A solar energy project developed in Arizona or New England will not provide as much useful information for Iowans as a project carried out within the state.

We recommend that an energy research and development fund be provided to the Energy Policy Council for use in projects chosen by the Council with the advise of knowledgeable people.

IX. Environmental Protection

IOWA'S ENERGY POLICIES SHOULD BE DESIGNED TO COMPLY WITH FEDERAL AND STATE ENVIRONMENTAL PROTECTION STANDARDS. THE ENVIRONMENTAL STANDARDS FOR AIR AND WATER QUALITY AND WASTE DISPOSAL SHOULD NOT BE ELIMINATED OR RELAXED IN FAVOR OF SUPPOSED SHORT-TERM GAINS IN GREATER FUEL USE AND SUPPLIES.

Energy and the environment are intimately connected. The combustion of fossil fuels in motor vehicles and furnaces is responsible for most air pollution emissions. The production of energy imposes heavy burdens on air, water and land. Pollution control facilities require energy. No environmental improvement program can ignore energy.

Knowledge of the environment and of the effects of human activities upon the environment is increasing rapidly. While many questions are still unanswered, it is recognized today that environmental degradation is imposing a heavy financial burden on people through increased medical care for illness, accelerated deterioration of metals and stone and fabrics, lower crop yields, and adverse effects on the health of farm animals. Environmental pollution also has adverse effects on the psychological well-being of persons.

Environmental standards will require continuous reevaluation and occasional changes as new data becomes available and as technology progresses.

However, relaxation of these standards in order to increase the supply or the demand of energy is not a wise policy. The Energy Policy Council recommends that Iowa's energy policies take into account the environmental protection standards and that the state resist pressure to change the standards just to permit the institution of different energy policies.

X. Energy Policy Strategies

THE COUNCIL BELIEVES THE SOLUTIONS TO THE STATE'S AND NATION'S ENERGY PROBLEMS SHOULD BE SOUGHT THROUGH POLICIES WHICH RESPECT INDIVIDUAL, GROUP AND CORPORATE FREEDOMS AND USE MANDATORY MEASURES ONLY WHEN OTHER EFFORTS ARE UNSUCCESSFUL.

A wide range of methods may be used to achieve energy policy objectives. These range from information and education programs, to calls for voluntary actions, to the use of economic incentives, to the imposition of mandatory laws and regulations, to the use of litigation and penalties. Each step up this ladder imposes additional constraints on the exercise of free choice by individuals, groups and corporations.

To the greatest degree possible, these constraints should be kept to a minimum. Reliance should be placed on informational, educational and voluntary programs. Iowans have shown a great willingness to respond to these measures when they are consistently and believably invoked.

When economic and mandatory measures are required, they should be carefully drafted and the need for them fully explained so that cooperation and acceptance are maximized.

12/18/75

IOWA STATE ENERGY ORIENTATION FILM SERIES

This is NOT a formal proposal; rather it represents the later stage of a working document which will provide the conceptual nucleus of a proposal. It does not contain at this stage any information concerning the project investigators, a description of the facilities and capabilities which the university can bring to bear upon the project, nor a budget.

This document is presented for your preliminary evaluation and comments, which we feel is important in determining the validity and direction of our approach toward the development of a modern energy ethic by the people of Iowa and the nation.

The Iowa State Energy Orientation Film Series

INTRODUCTION

In an address to the regional conference of the Interstate Energy Conservation Leadership, held in Des Moines, Iowa, on the 4th of December 1975, Mr. Edward Koenig, Director of Community Relations for the Public Education Division of the Federal Energy Administration spoke of the realities of energy. The gist of his statements was: The energy crisis IS real; it may ebb and flow with economic developments, but it will continue and there will be no easy solutions. It will increasingly affect the life style of our entire population.

Sooner or later (and we are beginning to see some effects in this direction) the citizens of the United States will have to modify their attitudes and actions toward energy production and consumption, willingly or unwillingly, and we will see the development of a new energy ethic in this nation.

While some success may be realized with the adult population, the primary effort for the development of an ethic compatible with the continuing energy situation will, in the long run, have to be carried out in the American school systems. Such an effort must be more than the presentation of facts and figures; while these form the cognitive base upon which some decisions can be based, they must be related to socioeconomic and humanitarian considerations. Thus the concept of a new energy ethic, and a stress on the development of educational materials which meaningfully combine both factual and additudinal considerations of the total energy situation. This proposal represents an approach toward the development of such an ethic by attempting to provide an ORIENTATION to the many variables which must be included in any consideration of energy use and conservation.

PURPOSE

To present basic facts and problems related to both the short-term and long-term energy situations existing in the United States, and to stimulate discussions of alternatives and possible solutions.

AUDIENCE

1. school classes, 9th or 10th science, as part of a module or minicourse on energy;

2. television viewers (film would need to be supplemented by a panel or several discussants, with or without viewer question input).

3. extension study programs, conducted either in conjunction with the television presentation or as discussion group stimulators as a part of organized meetings in the field.

SPECIFICATIONS

16mm, sound, color, approximately 15 to 20 minutes, each film dealing with a relatively specific aspect of the energy situation, but the entire series of 10 to 15 films developed to provide a progressing integrated overview of the basic energy situation, problems, and possible rationales for alternative actions.

RATIONALE

Examination of a number of current energy films reveals that many of them are relatively self-contained overviews, often heavily packed with material, and frequently overwhelming in the amount of information they convey. A special effort has been made in planning this series so that its use within existing curricula could relate to, but not significantly duplicate, existing film materials. The primary function of the series is threefold: 1) to dissect the consideration of the total energy situation into a related sequence of topics, permitting step-by-step examination of the factors which collectively contribute to the complexity of the national problem, 2) to permit free and flexible discussion and exploration of each topic as it is developed and related to the previous ones, and 3) to develop a sense of the constant interplay of technology and human factors as it affects our attitudes toward energy usage and conservation.

The series should be designed so that each succeeding film builds upon the previous one, starting with the background of our traditional energy ethic and progressing through specific considerations of energy economics, conversion, options, alternatives, and trade-offs in such a manner that the ideas developed in each film can be applied in the consideration of those concepts explored in the film which follows. Supplemental materials of various types, including current magazine and news articles, can be used to illustrate and augment the basic concepts developed by the topic films; however, it may be advisable in some cases to prepare several short didactic films to present relevant cognitive material, e.g., the nature of specific systems such as solar or organic-derived energy sources.

Advocacy should be minimized, the intent of the series being primarily to provide guidelines for the viewer's subsequent collection of information and for discussion of the ramifications of the various topics.* At the conclusion of the use of the full sequence of films, the student (or adult audience) should be able to more meaningfully manipulate the multiple variables of the energy situation in making realistic decisions. (This is another reason for the last film in the series to explore the energy situation as it relates to the individual state or region, in this case the State of Iowa.)

*The discussion guides can suggest related materials.

The ninth grade year is recommended as a target year for the energy film series for the following reasons:

The ninth grade year in school is usually the last year where typically all students take the same core of courses. If curriculum planners want to incorporate an idea into the curriculum for exposure to all students, they must do it during the freshman year or earlier. With the exception of some language arts and social studies courses all other senior high courses are on an elective basis.

Wise energy utilization is a multi-faceted problem which requires attention simultaneously to several variables. Piagetian learning theory fixes the age of approximately 12 years before youngsters begin to attend to multiple variables. By ninth grade, ages 14 and 15, most youngsters should be able to attend to multiple variables.

Much of the reported research on attitude development indicates that many attitudes are formed during the preschool years and that by the conclusion of sixth grade, the attitudes possessed by a student are relatively stable. The intent is to select a target age where intellectual development is sufficient to handle the nature of energy use decisions, but an age young enough to permit modification of already developed attitudes.

Excellent cognitive print materials are available at the ninth grade year to provide related source materials for the film series. Four exemplary curriculum projects widely used across the nation are: Interaction of Matter and Energy, Rand McNally; Introductory Physical Science, Prentice Hall; Investigating the Earth, Houghton-Mifflin; and Probing The Natural World, Silver Burdett.

Curriculum materials developed for the ninth grade level are sophisticated enough to permit them to be used at any level above the ninth grade including post high school usage with adults. The level at which discussions are developed can be geared to the type and level of the group involved.

DESCRIPTION

The following individual topic film descriptions are at present only tentative--considerable work is yet to be done to incorporate balance and film-to-film relationships and to define concept development and flow throughout the series. Some of the present film topics may be further separated for clarity, others may be combined as closer examination of the concepts and sequence occurs.

However, even these tentative descriptions should provide a reasonable idea of the style and intent of our present thinking toward a comprehensive energy orientation series:

#1 THERE'S PLENTY WHERE THAT CAME FROM.

This film examines the utilization of energy resources in the United States from an historical point of view, tracing the transitions from extensive to intensive energy sources with the development of technology, the expansion of the variety of needs of an expanding society, and the natural development of the ethic of unlimited resources and energy through the middle of the twentieth century.

(1) What is the traditional American energy ethic?
(2) What is the historical matrix, both technological and social, out of which this ethic developed, and why did (does) this ethic seem completely natural and appropriate?
(3) To what extent is the American energy ethic different from that of, say, European countries? To what extent was the American energy ethic a reaction to that of European countries?
(4) What factors/developments are impingent upon and in conflict with the continuation of this ethic, and alternatively, what factors support the continuance of this ethic?

#2 THE ULTIMATE CURRENCY

This film examines energy use as a non-recycling expenditure of a valuable asset in contrast to the recirculating nature of our common currency; suggests situations where our economic goals and our energy-oriented goals may be in conflict; and compares the fossil fuels and energy mineral deposits to an "energy savings account" which we are in danger of depleting, as compared with the short-turnover extensive energy sources such as wind, water, and photosynthetically-derived fuel sources in common use before the development of our complex technology.

#3 (conservation)

Predicated on the ultimate currency concept, this film emphasizes the concept that the practice of energy conservation follows logically and inevitable from the recognition that most of our traditional energy sources are finite

and diminishing, that a significant amount of our energy is being wasted, and that technology exists to improve the efficiency of energy use and material recovery.

(1) What is energy waste, at what levels does it occur, and how can it be minimized?
(2) What determinator would be used to define necessary vs unnecessary energy consumption?

#4 GETTING IT FROM HERE TO THERE

This film explores aspects of the conversion of energy from one form to another, compares the means by which energy can be "shipped" from its point of origin to point of use, and investigates factors to be considered in making choices for the location of energy production facilities.

What price is paid for energy conversion, both in terms of dollars and in terms of the "ultimate currency"? What tradeoffs exist in energy transport, e.g., the shipping of coal from a remote mine site vs the establishment of a generating facility at the mine and the movement of the energy in the form of electrical power?

#5 THERE IS NO FREE LUNCH

This film explores the concept of "tradeoffs", in that the establishment of energy production facilities exacts costs in terms of environmental disturbances and/or socio-economic adjustments, and that all of these factors must be weighed against one another.

(1) (Continuing with question 2 from film #4,) What other tradeoffs would be involved in determining whether or not a generating plant might be constructed at a mine site rather than at the point of energy use?
(2) Assuming that we were to double the hydroelectric power generating capacity of the western United States, what tradeoffs would be involved?

#6 HOW MUCH IS LEFT?

This film explores the concept of energy reserves and how they are determined on the basis of known technology; it would also examine the need for more effective methods of recovery of these resources.

(1) What is meant by estimated reserves? proven reserves? recoverable reserves?

#7 THE GREAT AMERICAN RESOURCE

This film features the conflict between our throwaway society and the loss of energy and material resources which it represents; examines possible alternatives for (e.g.,) the landfill concept of disposal.

(1) What is recycling? What is its role in conserving energy? maintaining environment?

#8 (energy efficiencies)

This film deals with the adaptability of certain energy sources for various uses, e.g., a comparison of which energy sources may be most suitable for the production of intense heat vs extensive heating, and how the design of facilities can minimize conversion and other losses.

(1) What is the relative efficiency in using a fossil fuel to generate electrical energy which is then converted into heat, as opposed to direct combustion of that fuel to furnish the same amount of heat? What economic and environmental factors would be involved?

#9 BUSINESS AS USUAL

This film explores the effects on our industrial production of the implementation of certain major efforts for energy conservation, using the concept of "the chain reaction" to show the interdependence of the various facets of the American economy.

(1) In the light of the need for energy conservation, are there certain aspects of our life style which will need to change? If so, to what degree can we expect it to change?
(2) What are the economic implications of a marked decrease in energy usage, e.g., a switch to mass transit from private vehicle transportation, or the switch to one-car families?

#10 STRETCHING THE RUBBER BAND

This film explores the relationship between growth rate and energy source development or substitution, and the suitability of various sources for certain types of energy consuming activities.

(1) What effect is our present growth rate (population, industrial, economic) going to have on the use of various types of energy?
(2) To what extent can this growth rate be maintained or even augmented through the application of energy conservation procedures? through the development of alternative sources?
(3) Are there certain energy sources which cannot be efficiently used for some types of industrial processes?

#11 TIME AND TIME AGAIN

This film deals with the present "energy crisis" as only the beginning of a long-range problem, and should precipitate discussions of future energy source developments.

(1) What indicators exist to permit us to evaluate the types and degrees of energy deficiencies we may expect on both a short term (10-15 year) basis and on a long-term (50-150+ year) basis?
(2) What are reasonable time scales for the implementation of alternative energy sources to replace presently diminishing energy resources?

#12 THE BIG CLUTCH

This film deals with the fallacies of only stop-gap energy conservation measures, and explores some possible political/economic effects if consumption continues to outstrip production in the intermediate and long-range time span ahead.

(1) To what degree, if the energy crisis cannot be abated satisfactorily, can political units be expected to intervene in the allocation of energy resources?

#13 (Iowa's situation)

Based on the background provided by the use of the preceding films, this film examines Iowa's energy situation--in-state fossil fuel reserves and extraction feasibilities, dependence upon imported materials, possibilities for further application of present technology or the application of new technology, and environmental and economic factors influencing the balance of energy use.

PROCEDURES

Initial efforts, under some type of development grant, will be directed toward clarifying the concepts to be considered, and categorization of these into applicable film topics. This will be done with the assistance and cooperation of selected university staff members, representatives of the Department of Public Instruction and the Iowa Energy Policy Council, and a selected advisory/steering committee of nationally recognized consultants who have expertise and commitment in the interpretation of the broad technological, environmental, and philosophical relationships of the energy situation throughout the United States.

With their guidance, film writers, curriculum consultants, and appropriate technical advisors will define and develop specific objectives and film treatments for each of the topic films, and define the scope of the entire series on the basis of these film treatments. As funds permit, one or more of the topic films will be fully scripted as more definite examples of how content will be handled in a typical topic film. Also from the preliminary content research, one or more preliminary discussion guides will be developed.

A detailed proposal for the production of the series will be prepared, incorporating sections on rationale, content, procedures (including descriptions of advisory committee input and control), budget, and a discussion of facilities and capabilities. With the concurrence of the advisory committee and Iowa State University authorities, this proposal will then be submitted to an appropriate public or private agency for funding.

SUMMARY

We feel that this film series can fill an important need for material which deals with both the cognitive and affective aspects of the energy situation. The sequenced, segmented structure of the series should assist the step-by step understandings of the factors involved in energy use and conservation, and their relationship to and influence upon one another. The intent of the films as instigators of discussion permits their use at several different levels and also allows the teacher or discussion leader to use other existing films or print material in close conjunction with the series.

We feel the choice of primary audience is valid; the development of a new energy ethic in this state and nation will become more imperative with the passage of time, and our best prospects of success will be with the remarkable perceptiveness of our young people. Energy cannot be Iowa's problem alone, for the solution of our energy problems, now and in the future, must be a joint and national effort.

COLLABORATORS

W. Emmett Dreeszen, Manager, Information and Security, Ames Laboratory, Energy Research and Development Administration

Dr. Lynn W. Glass, Assistant Professor of Secondary Education (Science), Iowa State University

Richard H. Kraemer, Manager, Film Production Unit, Iowa State University

Marvin Ross, Director of the Mines and Minerals Division, Iowa State Department of Soil Conservation

William H. Smith, Assistant Manager, Information Section, Ames Laboratory, Energy Research and Development Administration

PRELIMINARY LIST OF CURRENT ENERGY FILMS.

A Question of Balance" color 28 min

Challenges of the electric industry, meeting energy needs of the future.

Aluminum-An Investment in Energy" 1973 color 14 min.

Shows how the use of aluminum, although energy is intensive in its manufacture, can help save energy in the long run through its special physical properties.

An American Asset" color 28 1/2 m.

Documentation of vital roles of coal in our economy.

'Changing Energy Resources" ? color 18 min.

Discusses the development of energy resources in Japan and related problems. From the Land and Industry of Japan Series.

'Choices" color 27 min.

Our options in valancing growth with environmental responsibility.

'Conserving Energy Through Telecommunications" 1974 color 6 min.

Shows various forms of telecommunications and explains how they can be used to conserve energy.

'Douglas Point Nuclear Power Station, Design and Construction" 1969 color 35 min.

Shows the technical background of the development of a Canadian nuclear power station, using animation to explain the station's working parts and the basic Canadian system of heavywater plants.

'Energetics of Life" ? color 23 min.

Shows where the energy inside us comes from. Begins with concepts in energy transfer like free energy and entropy to show why some molecules have potential energy, particularly the atp molecule. Shows how energy transfer starts with energy from the sun, which is converted with the help of ATP into potential energy in molecules like glucose.

'Energy" 1970 color 12 min.

A visual demonstration of power systems and the transformations of energy. Highlights the power systems of the past, present and future.

'Energy - A Conversation" 1972 color 27 min.

Presents a conversation on the nature of energy between Dr. Linus Pauling, Dr. George Wald and Dr. Philip Morrison. Discusses the definition of energy, different forms of energy and sources of energy.

'Energy Challenge, The " 1973 color 26 min.

Discusses the causes and effects of the energy shortage, problems and opportunities and various plans and proposals.

'Energy Crisis, The " 1973 color 52 min.

Details basic facts about nuclear power generation, telling what it is, how it works, and how it can help to close America's energy gap. Sheds light on the controversy among experts about the safety of nuclear plants.

'Energy: Critical Choices Ahead (two versions) 1975 color 27 min.
18 min.

Analyzes the nature and the order of magnitude of our energy problem. Analyzes how energy is used in the United States, citing the problems involved in extending the same use patterns into the future. Both films give a clear description of the dimensions of the energy problem we face in America today.

'Energy - Less is More" 1973 color 20 min.

Investigates the need for slowing the growth of energy consumption and shows ways in which this can be done.

'Energy - New Sources" 1974 color 20 min.

Examines the potential and limits of new technologies, including solar, fusion and geothermal. Presents an argument for developing a variety of options. Stresses societies' need to develop ways of using less energy.

nergy Sources - A New Beginning
. series of 9 films (U. Colorado) 1975 C 28 1/2 min. each

Energy Sources - A Matter of Policy
Geothermal Power - The Great Furnace
Solar Power - The Giver of Life
The Sleeping Giant - Coal
Wind Power - The Great Revival
Oil Shale - The Rock That Burns
Nuclear Energy - The Great Controversy
Nuclear Gas Stimulation - Tapping Our National Heritage
Tar Sands - Future Fuel

nergy - The Dilemma 1974 color 20 min.

Discusses past, present and future energy growth patterns. Explores problems of supply and demand, depletion of fossil fuesl, our dependency and economic and social problems. Streses societies' need to develop ways of using less energy.

Energy - The Nuclear Alternative" 1974 color 20 min.

Explores fission power, how it works and the controversies over safety and radioactive waste. Stresses societies' need to develop ways of using less energy.

Energy - Towards the Age of Abundance" 1971 color 22 min.

Explains that one-fifth of the world's population, in Japan, Europe and North America, consumer over 60 per cent of all the power on earth, 10 times as much per capita as the other four-fifths. Predicts that in the next 10 years North America will consume more energy than it has in all its history. Suggest as possible energy sources the nuclear fission plant, nuclear hi-jacking, eventual harnessing of the fusion reaction and the use of tidal power and solar energy.

nergy Crisis Series - Future Fuels ? color 17 min.

Contrasts the need for new available energy sources with the fact that nobody seems to be looking very hard.

nergy Game" 1972 color 52 min.

Shows scientists discussing the energy shortage in the United States, and the role atomic power plants have played in the problem.

nergy in Life" ? color 20 min.

Concentrates on the basic physical laws of energy conversion from one species to another. Contrasts less industrialized nations with more industrialized nations and shows how they face the food-fule crisis. Questions what the atomic age's conversion of energy will bring.

nergy vs Ecology - The Great Debate" 1973 color 28 min.

Describes the role that coal plays in meeting the ever-increasing demands for electrical energy in the United States.

vidence of Progress 1975 color 28 1/2 min.

Encourages with respect to environmental problems, shows how these can be solved.

odern Engines and Energy Conversaion" 1969 color 11 min.

Explains the difference between potential and mechanical energy. Shows energy conversion in combustion, jet, rocket and nuclear powered engines.

atural Gas: Supply and Demand 1975 color 28 mins.

Where we must seek our future supply, the problems involved, why shortages, history of development and use.

atural Gas and You" ? color 16 min.

Presents the role of natural gas in modern living, showing some of the reasons why the industry has grown to where it supplies nearly one-third of the nation's energy requirements. Portrays some of the operations involved in producing, transporting and delivering natural gas instantly on demand to millions of customers.

ower From the Atom" ? color 11 min.

Uses animation to show how power is obtained from the atom. Illustrates atomic fission, fusion and radioisotopes. Shows how a reactor converts atomic energy into electrical energy.

utting the Sun to Work" 1974 color 5 min.

Discusses current research on the development of ways to produce electrical energy from the sun.

efinery" 1975 color 14 min.

Explains the process, inaccessible to the eye of turning crude oil into fules; uses animation to show interior systems.

alk Was of Energy" 1971 color 29 min.

Demonstrates the need to acquire energy from natural sources but at the same time preserve the environment.

'There's Always A Question" 1974 color 8 min.

Tells a story about two unseen beings who observe the function of the Earth, the development of life forms there, and man's evolution to the present-day energy crisis. Designed to raise questions about alternative energy sources.

'To Bottle the Sun" 1973 color 6 min.

Explores the possiblity of fusion power reactors as an alternative way of satifsying our future expanding energy needs with coal, gas and oil in limited supply.

'To Imitate the Sun" 1971 color 33 min.

Covers controlled thermonuclear research over two decades. Includes the philosophy of two-X-two, scyllac, astron, stellerators and tokamaks.

"Twenty-Three/Twenty-Eight" 1975 color 46 mins.

To increase pride and productivity, a young factory worker points out the importance of our material and energy resources.

"When The Circuit Breaks ? color 29 min.

Americas need to develop resources of coal, oil, and natural gas.

"Why Lignite" 1975 color 19 1/2 mir

Shows the process of mining lignite in Texas; designed to promote it as a power source.

"World of Energy" 1974 color 29 min.

Reviews man's use of energy from primitive times to the present. Discusses the future of energy and the challenges it presents in meeting the economic and environmental requirements of the future.

IOWA ENERGY POLICY COUNCIL

300 - 4TH STREET - DES MOINES, IOWA 50319 - 515-281-3428

December 3, 1975

GOVERNOR ROBERT D. RAY

Subcommittee on Nuclear and Radiation Safety
House Committee on Energy
State Capitol
Des Moines, Iowa

Dear Subcommittee Members:

Enclosed is the report of the ad hoc radiation study committee authorized by House Resolution 46.

In accordance with the resolution, the Energy Policy Council and the named agencies established an ad hoc committee of 18 state agencies and other organizations, each with full voting privileges. The members of the ad hoc committee are listed on the enclosed sheet.

The report consists of three sections. The introduction contains some background information: the resolution, the reports of the state agencies concerning their current radiation safety authority and programs, and an AEC background statement on the AEC (now NRC) program for transfer of regulatory authority to states. With respect to seeking agreement state status through such a transfer program, the ad hoc committee took no position, apparently feeling consideration of such a status was premature at this time.

The second section of the report contains the main recommendation of the committee, together with the name of committee members supporting this recommendation. It recommends establishment of an Interagency Coordinating Council on Radiation Safety.

The third section contains minority reports. Part A contains the minority report signed by several members of the ad hoc committee. The main point of disagreement is the membership of the Coordinating Council and its policy-making functions. Part B is a separate minority report disagreeing with the main recommendation with regard to the memberships of the Coordinating Council. Part C is an addendum by a signatory to the minority report in Part A. Part D lists abstentions.

Very truly yours,

Laurent Hodges

Dr. Laurent Hodges
Research Director

MEMBERS OF AD HOC RADIATION

SAFETY STUDY COMMITTEE

1. Department of Environmental Quality
Pete Hamlin
3920 Delaware
Des Moines, Iowa 50313

2. State Hygienic Laboratory
William J. Hausler
Medical Lab Building
The University of Iowa
Iowa City, Iowa 52240

3. Department of Transportation
Dennis Ehlert
5238 Northwest 2nd Avenue
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4. Department of Health
Ken Choquette
Lucas State Office Building
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5. Midwest Nuclear Compact
William Twaler
311 Grand
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6. Civil Defense Division
Donald C. Hinman
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7. Department of Agriculture
Carlos Creamer
East 7th and Court
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8. Iowa Conservation Commission
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Des Moines, Iowa 50319

9. Iowa Geological Survey
Bill Bunker
123 North Capitol
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10. Energy Policy Council
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11. Iowa Medical Society
D. C. Young
1001 Grand Avenue
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12. Iowa Society of Osteopathic Physicians and Surgeons
John C. Agnew
817 Insurance Exchange Bldg.
Des Moines, Iowa 50309

13. Citizens United for Responsible Energy
Gail Gamm
500 East 6th
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14. Iowa Radiological Society
Ralph E. Hines
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15. Iowa Society of Radiologic Technologists
Thomas J. Hewitt
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16. Iowa Chiropractic Society
Daniel A. Keat
621 Euclid Avenue
Des Moines, Iowa 50313

17. Department of Public Safety
Lyle Dickinson
Lucas State Office Building
Des Moines, Iowa 50319

18. Bureau of Labor
Jerry Addy
East 7th and Court
Des Moines, Iowa 50319

DRAFT

REPORT OF AD HOC RADIATION STUDY COMMITTEE--NOVEMBER, 1975

1. INTRODUCTION

The ad hoc radiation safety study committee was convened by the Iowa Energy Policy Council in accordance with House Resolution 46 of the 1975 Iowa legislature. The text of the resolution was as follows:

HOUSE RESOLUTION 46

WHEREAS, the standing committees on energy in the House of Representatives and the Senate are deeply concerned about the lack of coordination among state agencies in the area of radiation safety; and

WHEREAS, the Iowa energy policy council has offered to establish an ad hoc committee, as proposed by the house committee on energy, for consideration during the 1975 interim of radiation safety legislation and of funding and staffing required to implement the committee's recommendations; and

WHEREAS, a radiation safety study committee should, in addition to providing an opportunity for input and participation by private and consumer interests, represent state agencies administering existing laws; NOW THEREFORE,

BE IT RESOLVED BY THE HOUSE OF REPRESENTATIVES, That the department of environmental quality, the state department of health, the state hygienic laboratory, the department of public safety, the state department of transportation, the Iowa bureau of labor and the midwest nuclear board cooperate with the energy policy council in the establishment of an ad hoc committee to conduct during the 1975 interim a study of radiation safety which would consider the effects on the environment and health of Iowans of the use and transportation of radioactive materials; and

BE IT FURTHER RESOLVED, That the Legislative Council authorize the standing subcommittee on nuclear and radiation safety of the House Committee on Energy to meet for the purpose of reviewing and making recommendations on a preliminary report to be submitted by the ad hoc committee not later than November 15, 1975; and

BE IT FURTHER RESOLVED, That a final report, together with the recommendations of the subcommittee, be submitted for consideration by the Standing Committees on Energy and members of the Sixty-sixth General Assembly meeting in regular session in 1976.

Iowa Department of Environmental Quality

The Department of Environmental Quality has the statutory authority to establish policy for the transportation, storage, handling and disposal of radioactive material in Division IV, Part 2, Chapter 455B, of the Code of Iowa. The Solid Waste Disposal Commission is to provide by rule for the proper method of transporting, storage, and handling of radioactive material. Licensed physicians and surgeons, licensed osteopathic physicians and surgeons or qualified employess of licensed hospitals within the scope of their duties are exempted from this law.

This authority enables the Department to license persons transporting, handling, or storing any radioactive material, require maintenance of records, and require the submission of plans and specifications for design construction, maintenance, and monitoring of nuclear waste disposal sites.

Activities in the Radiation Program of the Department this past year have included radiological incidents response, radiation response plan, staff training, and drafting of rules. A brief description of these activities follows.

DEQ has primary responsibility for radiological monitoring of incidents involving radiological materials. In FY75, there were three incidents or releases into the environment of radioactivity in excess of technical specifications from the five nuclear power plants in or near the border of Iowa. In addition to the incidents at nuclear power plants, the Department has responded to two incidents involving transportation of radiological materials.

The Department prepared the final draft of the Radiological Response Plan which will enable it to undertake the responsibilities delegated by Part D of the Iowa Emergency Plan. In addition, the staff has worked with the Civil Defense Division of the Department of Public Defense in coordinating response activities with nuclear power plants, adjacent states, and local counties.

Other aspects of the radiation program include: staff training and rule preparation. A staff member was sent to a Health Physics and Radiation Protection course at Oak Ridge Associated Universities in Oak Ridge, Tennessee, for 10 weeks for additional training. The preparation of rules/regulations to regulate transportation, storage, and disposal has been initiated. A letter of agreement is being prepared between the Department of Transportation, the Department of Public Safety and DEQ for the regulation of transportation of radiological materials.

Iowa State Department of Health

1. We have no statutory authority relative to control of radiation.
2. The Department receives no appropriations for a radiation program.
3. There is no staff directly involved in a radiation program.
4. There are no rules and regulations.
5. Activities within the last year - writing proposed legislation for control of X-rays, etc., and time involved preparing a radiation incident preparedness plan.
6. No expected changes until legislation and appropriation are obtained.

The only possible exception to the above is that the Department contracts with the State Hygienic Laboratory to survey X-ray equipment, etc. of hospitals relative to Medicare programs.

Iowa Geological Survey

1. The legal responsibilities of the Iowa Geological Survey are set forth in the Iowa Code, Chapters 305 and 84.
2. Budget askings for the Iowa Geological Survey are reviewed and recommended by the General Assembly Committee on Natural Resources Appropriations.
3. In 1972, two members of the Iowa Geological Survey and four members of the U.S. Geological Survey received twenty-four hours of training in the use, handling and storage of radioactive material. The training was conducted by the Radiation Protection Office on the University of Iowa campus and taught by the Health Physicist, William Twaler.
4. All rules and regulations are those of the AEC, as administered by the Radiation Protection Office. Current storage of radioactive sources is with their office. The Survey utilizes three radioative sources:

    1. Americium - 241 Beryllium -- 3 curie
    2. Americium - 241 Beryllium -- 250 millicurie
    3. Cobalt 60 -- 10 millicurie

5. Actual activities involve lowering these radioactive sources into Iowa Geological Survey test drill holes in an attempt to define certain hydrologic parameters.
6. There are at present no plans to change any of the above.

Iowa State Hygienic Laboratory

1. Statutory Authority
   The State Hygienic Laboratory operates under 263.7 and 263.8 of the Code of Iowa.

FIGURE 17
NATURAL RADIOACTIVITY ANALYSES OF
AIR SPECIMENS FROM NINE CITIES

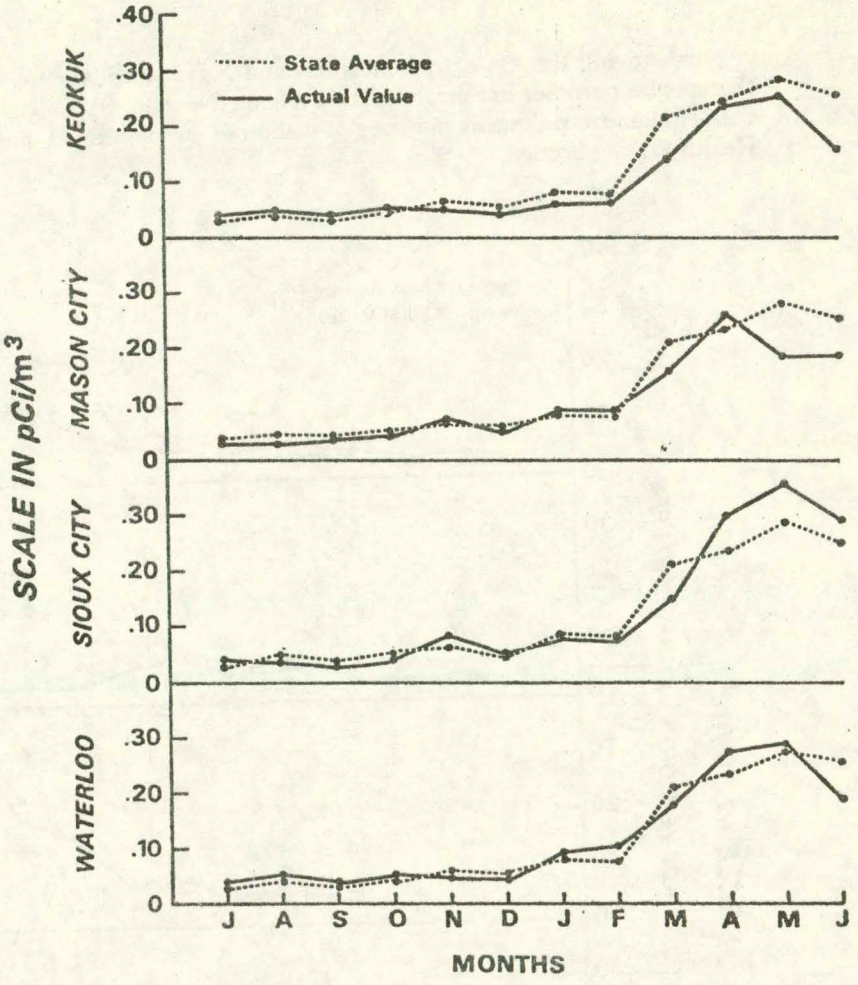

TABLE 52
RADIOCHEMISTRY SECTION SPECIMEN STATISTICS

	Specimens	*Examinations*
Air	731	707
Water	196	384
Tritium		
Strontium	28	28
Precipitation		
Milk	58	295

Radiochemistry Section

Air Surveillance. Samples were collected from 26 monitoring sites throughout the state by the Air Pollution Division of the State Hygienic Laboratory, in support of the Iowa Air Quality Monitoring Network. In Figure 17 a comparison is made between the levels of gross beta activity in nine Iowa communities and the average state level. Normal seasonal fluctuations are observed, with the highest levels occurring in late spring and summer. Some of the increase can be attributed to recent atmospheric nuclear weapons testing.

Water Surveillance. Drinking water in Iowa comes from ground water, both treated and non-treated, and from treated surface waters. All drinking water is subject to the quality standards of the U.S. Public Health Service (1962). In Fiscal Year 1974, 938 water samples were analyzed for both gross alpha and gross beta activity. The USPHS standards limit the ^{90}Sr and ^{226}Ra concentrations in water to 10 picocuries per liter (pCi/l) and 3 pCi/l, respectively. Water samples that exceeded 10 pCi/l of gross beta activity and/or 3 pci/l of gross alpha activity were subsequently analyzed for the specific radionuclides ^{90}Sr and ^{226}Ra. Thirty-six of 286 specimens had ^{226}Ra concentrations exceeding 3 pCi/l; 28 analyses for ^{90}Sr were performed, but none of the samples had a concentration exceeding 10 pCi/l.

Surface water surveillance is accomplished by sampling at 11 locations on rivers within and bordering on Iowa. Several sites have been selected upstream and downstream from nuclear power plants to monitor any possible radioactive releases to the surface waters. Radioactivity in water released by these nuclear facilities has not been a major problem, but it is a growing concern, since the Duane Arnold Energy Center at Palo, near Cedar Rapids, and other nuclear power plants on Iowa's borders either began operation or increased their power output during this fiscal year. Analyses for gross alpha and gross beta activity and for ^{3}H (tritium), ^{226}Ra, and ^{90}Sr radioactivity are performed on water samples obtained at all 11 sites. High and low values for gross beta activity at each of the 11 sites are shown in Figure 18.

Milk Surveillance. The milk surveillance program continued at the same level as in Fiscal Year 1973. Milk samples collected from Des Moines, Iowa City, Le Mars, and the Little Cedar River are routinely analyzed for radioactivity from

TABLE 53

ON-SITE X-RAY SURVEYS PERFORMED BY THE HEALTH PHYSICS SECTION

Medicare Surveys	
Hospital Facilities	44
Extended Care Facilities	2
Medical Surveys	
Physicians' Offices	1
Hospitals	5
Dental Surveys	
Dental Offices	17
Industrial Surveys	
Industries	2
TOTAL	71

There were 155 radiographic and 46 fluoroscopic X-ray units surveyed in Fiscal Year 1974. A total of 108 deficiencies were found while surveying these 201 units. All deficiencies noted were items of non-compliance with the recommendations of the National Council on Radiation Protection and Measurements. These deficiencies are detailed in Table 54.

Radionuclide surveys at hospitals and clinics continued on a reduced level in Fiscal Year 1974. The use of radionuclides for diagnostic and therapeutic applications has, however, continued to expand. As a result, the safety of the patients and technicians has necessitated surveys of those facilities using radioactive materials to determine compliance with Title 10 of the Code of Federal Regulations and with applicable recommendations of the National Council on Radiation Protection and Measurements.

Surveys of microwave ovens have continued in support of the compliance program of the U.S. Public Health Service Bureau of Radiological Health, as promulgated in Public Law 90-602.

During Fiscal Year 1974 the Radiological Health Division was asked to provide the technical expertise and equipment for the nucleus of a state radiological emergency response team. This team has been supplemented by other qualified personnel from the State Hygienic Laboratory and from the Radiation Protection Offices of The University of Iowa and Iowa State University. The team is set up to respond to radiation incidents at nuclear power plants or to transportation ac-

Iowa Department of Agriculture

General area of work	Radiation related activity	Applicable State law (Code of Iowa)
Protection of foods and agricultural products; adulteration of foods	Participation in the Iowa Civil Defense Plan; Radiation Response Plan	Ch. 189.17 190.3 190.4
Inspection of food establishments	Voluntary surveillance of microwave ovens in cooperation with FDA	Ch. 170
Licensing of veterinarians	Use of x-ray machines for veterinary diagnoses by Iowa veterinarians	Ch. 169
Environmental radiation surveillance	No program at present	
Laboratory food analysis	NRS byproduct material license	

Chapters in the Code of Iowa mentioned above do not specifically refer to radiation (except 190.4) but it is implied in their content.

The Department does not receive any specific appropriations or assign full-time personnel for these activities. No rules or regulations have been promulgated on these areas of work and we plan to continue these activities in the future.

One important question addressed by the committee was the question of whether or not Iowa should develop a radiation control program that would eventually lead to its becoming an agreement state and assume some of the regulatory authority of the Federal Nuclear Regulatory Commission. The program for transfer of authority to the states is described in the following statement by the U.S. Atomic Energy Commission (the predecessor agency to the Nuclear Regulatory Commission).

The mechanism for the transfer of the Commission's regulatory authority is by an agreement between the Governor of a state and the Commission. Before entering into an agreement the Commission is required to make a finding that the State's radiation control program is compatible with the Commission's, and that the state's program is adequate to protect health and safety against radiation.

Thus far, 25 states have entered into such agreements and have taken over the regulatory authority described above.[1/] A copy of the agreement with the State of New Mexico, the most recent state to assume regulatory authority from AEC, is enclosed. This agreement is typical of those entered into with other Agreement States. As of December 31, 1973, the 25 Agreement States administered some 9300 licenses for radioactive materials under the authority transferred from AEC.

It is necessary that a state have enabling legislation authorizing its Governor to enter into such an agreement. In addition to the 25 states that have agreements with AEC, 19 others and the Commonwealth of Puerto Rico have enacted such enabling legislation.[2/]

The Commission's staff is available to consult with a state which is interested in entering into a regulatory agreement with AEC. This includes consultation in the drafting of enabling legislation and radiation control and licensing regulations, as well as other aspects of the state's program. The Commission also provides training assistance in radiation safety and regulatory procedures for personnel in Agreement States and states negotiating for agreements.

The question has frequently been raised as to the nature of the advantages that accrue to a state by taking over the Commission's regulatory authority as described above. The principal advantages are the following:

(a) AEC's authority does not include regulation of x-ray machines, accelerator-produced radioactive materials, and radium. These sources of radiation are, and always have been, the responsibility

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1/ Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Idaho, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Oregon, South Carolina, Tennessee, Texas and Washington.

2/ Alaska, Connecticut, Delaware, Hawaii, Illinois, Indiana, Maine, Michigan, Montana, New Jersey, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Dakota, Utah, Vermont, Virginia and Wisconsin.

state inspectors by AEC staff on selected inspections of state licensees; exchange of information on a current basis covering regulations, licensing, inspection and enforcement data; consultation on special licensing and regulatory problems; and an annual meeting of all Agreement States to consider regulatory matters of common interest or concern.

Enclosures:
1. Cpy of Section 274 of the Act
2. Cpy of Agreement with the State of New Mexico

order should, because of the hazards or potential hazards thereof, not be so disposed of without a license from the Commission. Notwithstanding any agreement between the Commission and any State pursuant to subsection b., the Commission is authorized by rule, regulation, or order to require that the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing source, byproduct, or special nuclear material shall not transfer possession or control of such product except pursuant to a license issued by the Commission.

Conditions.

"d. The Commission shall enter into an agreement under subsection b. of this section with any State if—

"(1) The Governor of that State certifies that the State has a program for the control of radiation hazards adequate to protect the public health and safety with respect to the materials within the State covered by the proposed agreement, and that the State desires to assume regulatory responsiblity for such materials; and

"(2) the Commission finds that the State program is compatible with the Commission's program for the regulation of such materials, and that the State program is adequate to protect the public health and safety with respect to the materials covered by the proposed agreement.

Publication in F. R.

"e. (1) Before any agreement under subsection b. is signed by the Commission, the terms of the proposed agreement and of proposed exemptions pursuant to subsection f. shall be published once each week for four consecutive weeks in the Federal Register; and such opportunity for comment by interested persons on the proposed agreement and exemptions shall be allowed as the Commission determines by regulation or order to be appropriate.

73 STAT. 689.

73 STAT. 690.

"(2) Each proposed agreement shall include the proposed effective date of such proposed agreement or exemptions. The agreement and exemptions shall be published in the Federal Register within thirty days after signature by the Commission and the Governor.

Licensing requirements. Exemptions.

"f. The Commission is authorized and directed, by regulation or order, to grant such exemptions from the licensing requirements contained in chapters 6, 7, and 8, and from its regulations applicable to licensees as the Commission finds necessary or appropriate to carry out any agreement entered into pursuant to subsection b. of this section.

"g. The Commission is authorized and directed to cooperate with the States in the formulation of standards for protection against hazards of radiation to assure that State and Commission programs for protection against hazards of radiation will be coordinated and compatible.

Federal Radiation Council.

"h. There is hereby established a Federal Radiation Council, consisting of the Secretary of Health, Education, and Welfare, the Chairman of the Atomic Energy Commission, the Secretary of Defense, the Secretary of Commerce, the Secretary of Labor, or their designees, and such other members as shall be appointed by the President. The Council shall consult qualified scientists and experts in radiation matters, including the President of the National Academy of Sciences, the Chairman of the National Committee on Radiation Protection and Measurement, and qualified experts in the field

Definition.

"n. As used in this section, the term 'State' means any State, Territory, or possession of the United States, the Canal Zone, Puerto Rico, and the District of Columbia."

42 USC 2138.

SEC. 2. Section 108 of the Atomic Energy Act of 1954 is amended by deleting the phrase "distributed under the provisions of subsection 53a.," from the second sentence.

Approved September 23, 1959.

GPO 34139

2. RECOMMENDATIONS

In order to provide for the protection of the citizens and their environment in Iowa, the 1975 Ad Hoc Committee on Radiation Safety recommends that legislation be drafted to establish a comprehensive radiation program. The committee further recommends that the comprehensive radiation program be adequately staffed and funded and include:

1. Provision for the control of ionizing and non-ionizing radiation.
2. Provision for inspection/registration of radiation - producing machines in the healing arts and non-healing arts.
3. Establishment of minimum training standards for users of sources of radiation.
4. Provision for safe handling, storage, disposal and transportation of sources of radiation, (amendment to existing statute).
5. Provision for registration and/or inspection on non-NRC regulated radioactive materials. (Authority split between healing arts and non-healing arts).
6. Provision for an environmental radiation surveillance program.

Coordination

The Committee recommends the establishment of an Interagency Coordinating Council on Radiation Safety (ICCRS) to be composed of the chief executive (or his designee) of each of the following state agencies: Department of Environmental Quality, State Department of Health, Department of Transportation, Department of Agriculture, Department of Public Defense, Department of Public Safety, Conservation Commission, and Bureau of Labor; also the Iowa representative to the Midwest Nuclear Board, ex officio, non-voting.

It is recommended that if the chief executive of a given agency desires not to participate but provide a designee, that designee must be the only one continuously attending meetings and through his vote provide appropriate representation from the member agency. This does not deny the chief executive the opportunity and right to attend meetings and vote.

It is also recommended that the ICCRS have the responsibility for the development of a state radiation safety program plan, evaluate and coordinate radiation related regulatory activities of each member agency, review proposed radiation safety regulations and compile participating agencies' radiation budgets for incorporation into the state plan for submission to the General Assembly for the accomplishment of objectives.

Pete Hamlin
Department of Environmental Quality

William J. Hausler, Jr.
State Hygienic Laboratory

William Twaler
Midwest Nuclear Compact

Donald C. Hinman
Civil Defense Division

Thatcher Johnson
Department of Agriculture

Allen Farris
Iowa Conservation Commission

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Energy Policy Council

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Iowa Chiropractic Society

Jerry Addy
Bureau of Labor

Dennis Ehlert
Department of Transportation

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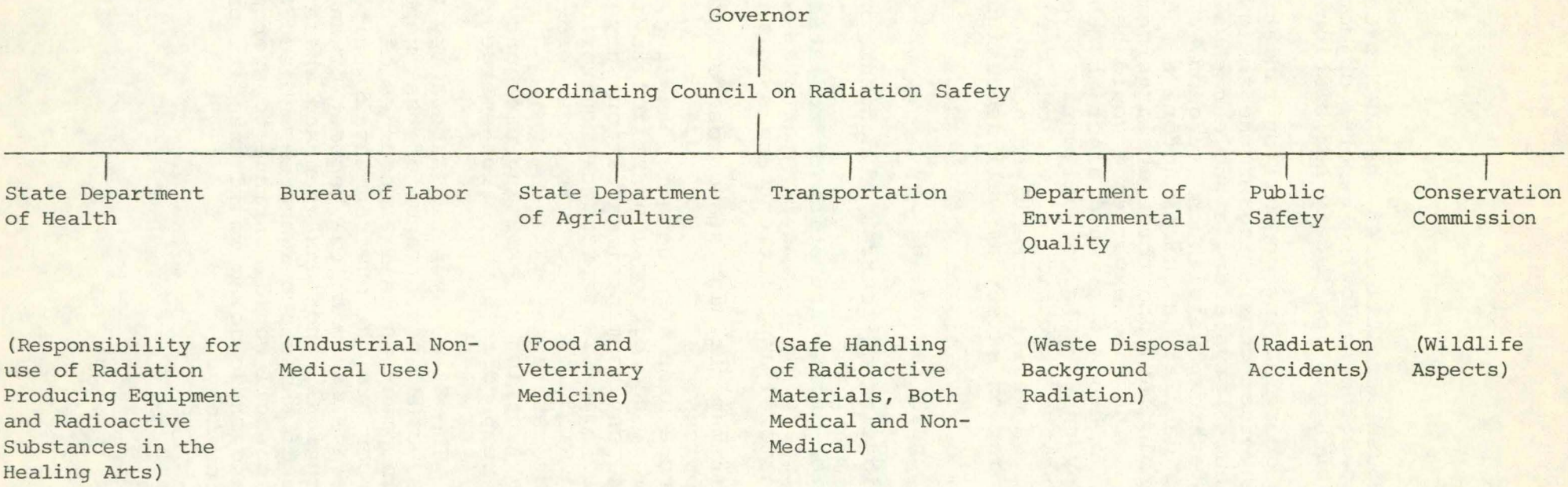
John C. Agnew
Iowa Society of Osteopathic
Physicians and Surgeons

Ralph E. Hines
Iowa Radiological Society

Thomas J. Hewitt
Iowa Society of Radiologic
Technologists

Gail Gamm
Citizens United for
Responsible Energy

ORGANIZATION CHART ON RADIATION SAFETY



Discussion: This proposal specifically responds to House Resolution 46 with the development of a coordinating council. The Council which would have specific authority to designate areas of agency responsibility and at the same time implement a radiation safety program in Iowa. Membership of the coordinating council is broad enough to permit it to function as an interagency coordinating group as well as the technical advisory group at the same time protecting the public interest.

C. Minority Addendum by Citizens United for Responsible Energy

CURE supports the basic intent and reasoning of the minority report which emphasizes that (1) concerned users have equal representation on the Coordinating Council and (2) that the Council should be a policy-making organization.

These are the areas of basic disagreement that could not be reconciled in the ad hoc committee.

But we would like to emphasize that there was very little disagreement among committee members about the ultimate concerns and problems to be solved in radiation safety and the specific proposals submitted concerning them.

We therefore express hope that the areas of agreement will be considered the foundation for legislative action.

Gail Gamm
Citizens United for
Responsible Energy

2-18-75

Because of changes and advancements of our energy knowledge, the Council may want to consider the proposed deletions and additions to the 1975 recommendation III.

Delete	-Support programs that increase the insulation of homes, businesses and other structures.
	-Imposition of a tax on automobiles that creates a strong economic incentive for the purchase of more energy-efficient automobiles.
	-Encourage the use of energy-efficient modes of transportation such as railroads and mass transportation systems.
~~Delete~~	-Require that air conditioning units meet energy efficiency standards before they can be sold in the state.
Delete	-Support utility rates that require users who contribute most to peak demands to pay the cost of building the generating facilities required to provide these peak loads.
Delete	-Support the adoption and revision of building codes to include energy efficiency requirements in the design and construction of new buildings.
	-Encourage energy-efficiency consideration in land-use planning.

Proposed additions:

-Support the adoption and revision of building codes to include performance rather than prescriptive energy efficiency requirements in the design and construction of new buildings.

~~Burn~~ -Restrictive methods of labeling, prohibition and taxing of certain consumer goods by implemented consistent with national trends, so that Iowa retail and manufacturing outlets are not placed at an economic disadvantage in relation to outlets of other states.

-Support utility rates that provide incentives for consumers to lower their energy consumption during peak load periods.

-Support energy conservation programs that will involve analysis of long-term economic and conservation repersusions.

MONTH OF November 1975

PRIORITY CATAGORIES SHIPPED-MIDDLE DISTILLATES

GORY	# OF LOADS	% OF TOTAL	REMARKS
ulture	38	33 %	Down 47 Loads from Oct.
ing	37	32 %	Up 31 Loads over Oct.
County Fed	4	3 %	Up 2 Loads over Oct.
cks	34	29 %	Down 9 Loads from Oct.
ractors ercial	4	3 %	Up 1 Load over Oct.
	117	100 %	

PRIORITY CATAGORIES SHIPPED-GASOLINE

GORY	# OF LOADS	% OF TOTAL	REMARKS
e Stations ercial	74	57 %	Down 8 Loads from Oct.
ulture	33	26 %	Down 76 Loads from Oct.
County. - Fed.	8	6 %	Up 4 Loads over Oct.
Ks	11	9 %	Up 7 Loads over Oct.
ractors	3	2 %	Up 2 Loads over Oct.
er	0	0	Same as oct.
	129	100 %	

PRIORITY CATAGORIES SHIPPED-PROPANE

GORY	# OF LOADS	% OF TOTAL	REMARKS
ing & king	2	40 %	Up 2 Loads over Oct.
ercial ting	0	0	Same as Oct.
ulture	3	60 %	Down 20 Loads from oct.
	5	100 %	

ENERGY: 1976

THE SECOND ANNUAL REPORT OF THE IOWA ENERGY POLICY COUNCIL

TABLE OF CONTENTS

FORWARD

~~MY PARAGRAPHS FOR E.P.C. ANNUAL REPORT~~

Eighteen months after it was created by the General Assembly, Iowa's Energy Policy Council has fulfilled the hopes of all those who envisioned it and made it a reality.

Although state government in Iowa had responded rather successfully to the energy crises of the winters of 1972-73 and 1973-74, Governor Robert Ray and his energy advisers determined the interests of Iowans would be better served in the future if energy responsibilities were clearly assigned to a single agency. ~~The agency,~~ It was concluded that policy for that agency should be formulated by a group which included public members, legislators, and the heads of those existing departments of state government that had a clear involvement in or statutory responsibility for energy activities in Iowa.

The goal was broadly-based energy policy, developed by people who would take the time to familiarize themselves with the way energy was distributed to and used by Iowans. The implementation of those policies would be carried out by a small, dedicated and professional staff in a manner that would not duplicate functions being performed by other agencies. The energy agency would work closely with the Governor's Office.

Those aspirations were reflected in the legislation creating the Energy Policy Council and in the way the Council has conducted itself in the 18 months it has existed. As now constituted, it has the vision, the knowledge, the flexibility, and the professionalism it will take to cope with the energy problems which are certain to emerge in the months and years ahead.

The Energy Policy Council has earned the respect of Iowa citizens, Iowa legislators, Iowa energy industries, the Iowa Congressional Delegation, and energy officials of the other states and the federal government. It does, indeed, have that respect.

Maurie Van Nostrand

ENERGY: 1976

THE SECOND
ANNUAL REPORT OF
THE
IOWA ENERGY POLICY COUNCIL

JANUARY 15, 1976

ENERGY CONSUMPTION AND PRODUCTION IN IOWA

(Paragraph introducing table on "Iowa's Energy Consumption" and summarizing trends from 1973 to 1975.)

(Pie graph showing 1975 consumption by fuels and by users, similar to Fig. 5 of First Annual Report.)

(Paragraph summarizing trends in energy consumption by user in second table.)

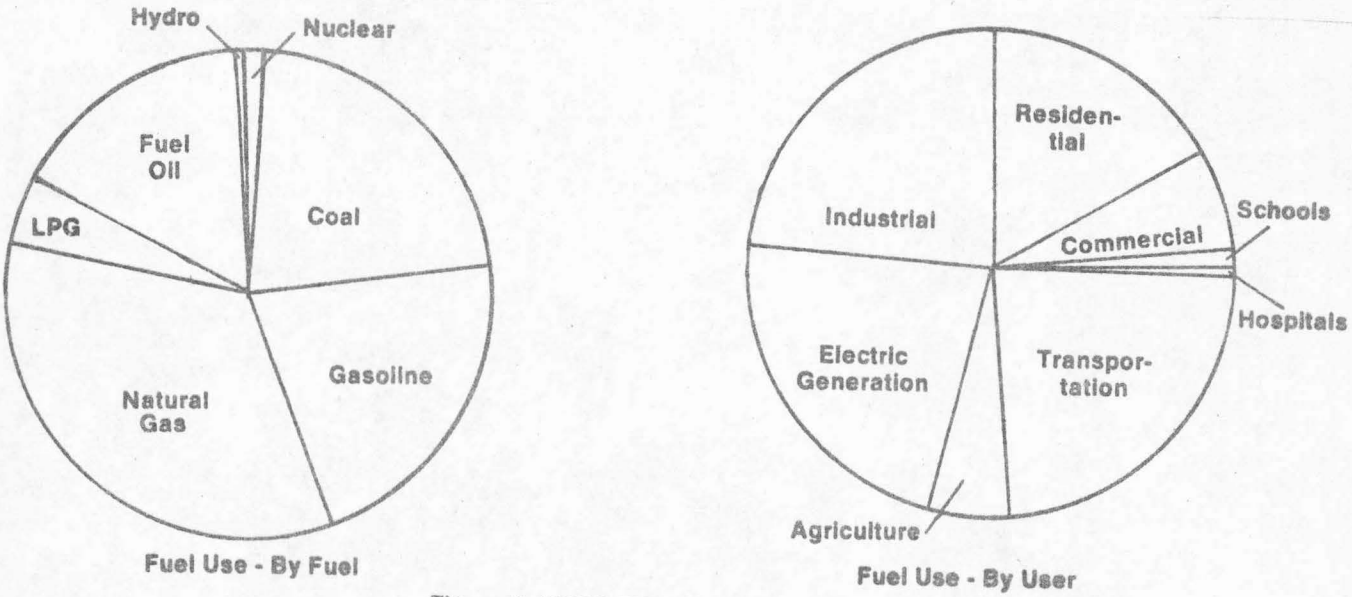


Figure 5. IOWA FUEL USE (1973)

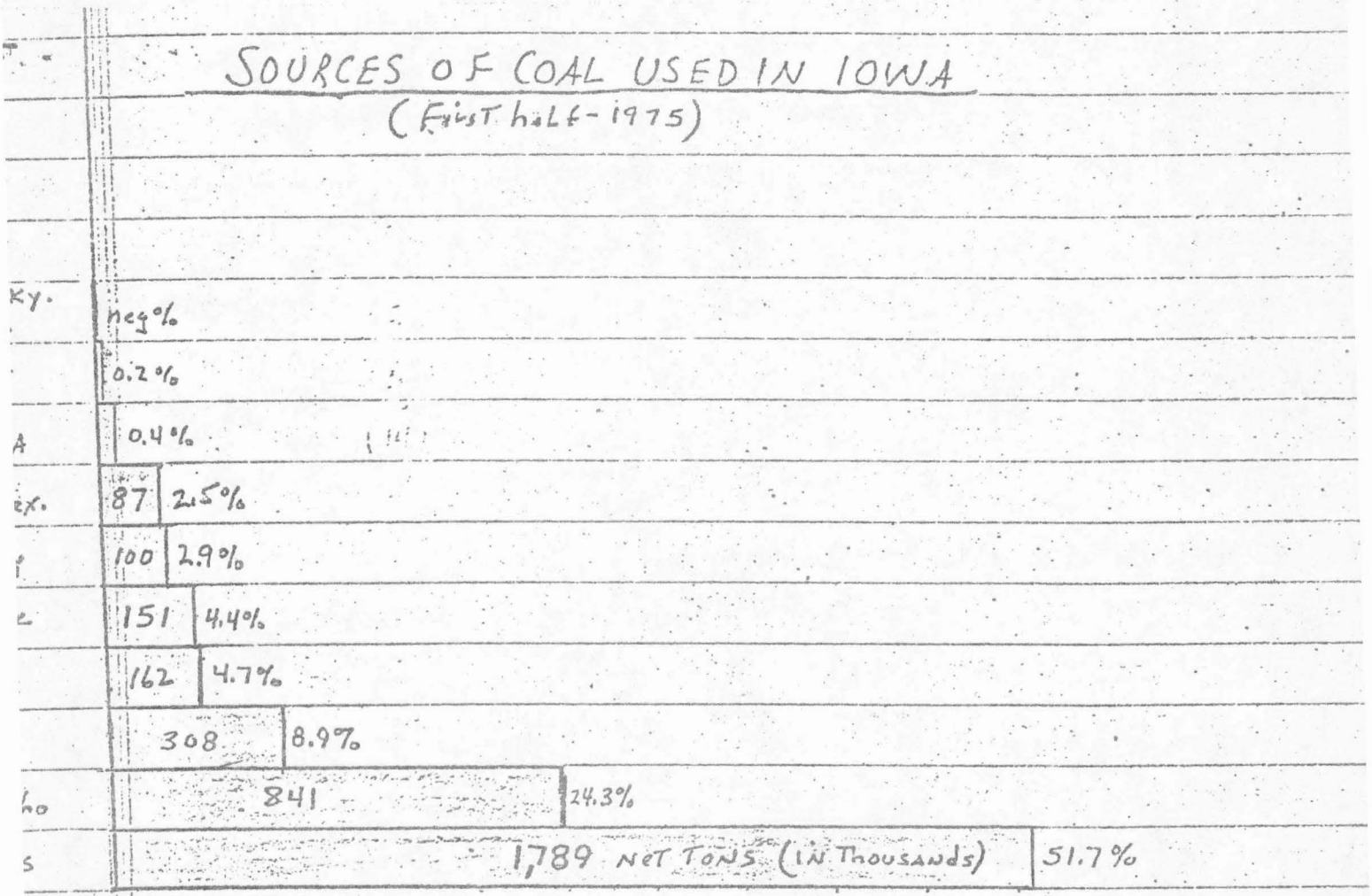
COAL

A. TRENDS IN THE US AND IOWA COAL INDUSTRIES

(Short paragraph on total coal usage in U.S. in 1975 to date and comparison with 1974 if we can get data.)

(Short paragraph on total coal usage in Iowa in 1975 when data is available.)

The sources of coal used in Iowa during the first six months of 1975 are shown in the figure below. Less than 9 percent of Iowa's coal usage consisted of coal actually mined in Iowa; over half the coal used in the state comes from Illinois.



Coal recieved in Iowa = 3,459,000 NET Tons

ce: US Bureau of Mines, Quarterly Report, "Distribution of Bituminous & Lignite produced in The U.S.

SURFACE MINING OF COAL

According to the Iowa Geological Survey, about 48,000 acres of Iowa land have been disturbed by surface mining (sand, gravel, limestone, gypsum, dolomite, and coal). Surface mining for coal accounts for ~~has affected~~ about 11,800 acres of this. It is estimated that only 800 acres have been reclaimed to ~~some~~ any extent. Renewed interest in our coal resources spurred concerns over the environmental impact of this development and helped generate support for surface-mining legislation.

Although existing Iowa law already required the registration of surface-mining operations, legislation was passed during the 1975 session of the Iowa Legislature to incorporate into this existing body of law additional specifications to be met by persons conducting surface-mining operations in the State. Basic provisions of the strip-mine control legislation, applicable after July 1, 1976, include: (1) the requirement that surface-mined land be restored to approximately its original contour, (2) prohibits the deposit of mine spoil on either the downslope or undisturbed land, (3) restore vegetation on surface-mined land at least to level prior to the mining, and (4) registration of mine operators with the State's Department of Soil Conservation.

The costs of complying with environmental standards in surface mining have been studied. One estimate calculated that during the years 1970-2000, these "social" costs of mining coal would add $1.00/ton to the cost of strip-mined coal. (Dials, George E. and Moore, Elizabeth C. "The Cost of Coal," Environment, Volume 16, No. 7: September, 1974).

This estimate for surface-mined coal includes land reclamation, control of acid mine drainage, sedimentation, diminished recreational value of the land, loss of potential production due to accidents and other costs (gaps in restitution to miners and their families after accidents, lowered property values near mine sites, damage to roads and highways.) The social costs of mining coal calculated in this study represent an increase of about 9 percent in the average 1972 selling price of U.S. coal and of almost 18 percent for surface-mined coal. However, as the selling price of coal rises, the burden of paying social costs becomes relatively less. Even if the selling price of coal is raised to cover the social costs of mining, it is believed coal can still compete with oil as a fuel used to generate electricity.

COAL AND ENVIRONMENTAL QUALITY

In the early 1970's, strict air quality standards were initiated by the Clean Air Act of 1970 (42 U.S.C. 1857 et seq.) and subsequently enforced in Iowa by the Air Quality Division of the Department of Environmental Quality. Coal development in Iowa and several other states, already slowed by rising capital and labor costs for mining operations, was further slowed by these air quality standards. However, the Arab embargo in the fall of 1973 and increasing natural gas curtailment have raised the prospects for rejuvenation of the coal industry.

The trend of increasing demand for coal, which could have been expected to naturally occur because of declining supplies of interstate natural gas and increased uncertainty over petroleum fuel supplies, was accelerated by a number of federal and state programs aimed at encouraging a greater utilization of this abundant resource. Several of Iowa's industries, particularly its utilities, were directly affected by these programs.

FEDERAL ENERGY ADMINISTRATION LOW SULFUR FUEL REGULATIONS

With a stated intent of assuring "the optimum use of limited supplies of petroleum products," the FEA established regulations limiting the use of low-sulfur petroleum fuels in power generation. The key provisions of these regulations prohibit any power generating plant with a firing rate of 50 million Btu/hour or more from converting from nonpetroleum fuel (coal) to a petroleum fuel except where required to achieve primary air quality standards. (See Title 10 Code Federal Regulations, Chapter 215).

While the purpose of these regulations to encourage coal usage for power generation may have been commendable, the compliance with this provision was not without some difficulty for at least one Iowa utility.

Because Iowa Southern Utility has burned coal and not petroleum products in its Bridgeport Power Plant near Eddyville, Iowa, on December 7, 1973 (the key date in the regulation), it was prohibited by the FEA from buying petroleum products for that unit. Meanwhile, Iowa's Department of Environmental Quality had ordered Iowa Southern to convert the Bridgeport boilers to combined coal and fuel oil in order to meet Primary National Air Quality Standards. On February 14, 1975, after some delay, the FEA granted a request by Iowa Southern for permission to purchase enough oil for its Bridgeport generating station to comply with the air quality standards for an interim period pending final reconciliation of these regulations.

ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT OF 1974

Another source of federal authority to coordinate the environmental quality standards with the shortages of less polluting petroleum fuels is the Energy Supply and Environmental Coordination Act of 1974 (PL 93-319).

Among the purposes of this Act is "to provide for a means to assist in meeting the essential needs of the United States for fuels, in a manner which is consistent, . . . , with existing national commitments to protect and improve the environment. . ." To achieve this end, the FEA was to prohibit by June 30, 1975 any power plant and, at its option, other "major fuel burning installation(s)" from burning natural gas or petroleum as its primary energy source, if the following conditions were found to exist:

1. The facility has the capacity and equipment to burn coal;

2. Burning coal at the facility is consistent with the stated purpose of the ESECA Act;

3. Coal and coal transportation are available for the facility; and

4. The prohibition would not impair the service reliability in the affected plant's service area.

Although ESECA was enacted on June 24, 1974, the first notices of intent to issue orders pursuant to this Act were not released until May 5, 1975. On that date, a notice of intent to issue orders affecting 25 Midwestern power plants including eight in Iowa was issued. The following Iowa plants are affected:

The No. 7 unit of the Ames Electric Utility at Ames
Units 1, 2 and 3 of the Sutherland Station of Iowa Electric Light and Power Co. at Marshalltown
Units 10 and 11 of the Des Moines Station of Iowa Power and Light Co.
Unit 1 of the George Neal Station of Iowa Public Service at Salix
Unit 14 of the Maynard Station of Iowa Public Service at Waterloo

After the issuance of FEA prohibitions orders on June 30, 1975, the Environmental Protection Agency began its required investigation to determine when the facilities in question could burn 100 percent coal while maintaining the National Primary Ambient Air Quality Standards. At this writing, this determination by the EPA was still underway.

Maurice Van Nostrand, Chairman of the Iowa Commerce Commission and the Iowa Energy Policy Council, made an oral presentation at a regional meeting of the Federal Energy Administration opposing the restrictions of the FEA order. One point he made was that there was no evidence the FEA order would result in any natural gas savings -- natural gas denied Iowa electrical generating plants might be consumed by electric generating plants elsewhere, perhaps at plants with a less efficient heat rate. Also the order discriminated against certain plants prior to the all-inclusive total curtailment of natural gas for power production scheduled for virtually all Iowa plants by October 1, 1976. The forced conversion from natural gas to coal would cost money to some Iowa electric consumers.

IOWA DEPARTMENT OF ENVIRONMENTAL QUALITY

~~The review by the EPA of Iowa power plants under the ESECA orders was~~ affected by a recent innovative effort. The Iowa's Department of Environmental Quality to meet the goals of the ESECA program to reconcile energy production and air pollution emission regulations while still complying with air quality standards.

Current sulfur dioxide air quality regulations for existing installations effectively limit coal to a three percent sulfur content. This limitation is uniformly applied to all coal

burning facilities in Iowa. The Air Quality Management Division of DEQ recognized that the ~~air quality~~ emission standards ~~imposed on~~ adopted by Iowa were from sparse information developed in 1970 and based primarily on sulfur dioxide pollution levels in Peoria, Illinois. The cost-efficiencies of meeting the air quality standards established under this base information were markedly affected by rises in prices of oil and low sulfur coal that accompanied OPEC oil price increases.

Recognizing the necessity to reconcile the problems of energy supply and air pollution, the Iowa Legislature appropriated $133,000 for a research project to gather data necessary to comprehensively study the problem in Iowa. Special emphasis was given to finding a means of utilizing Iowa's only abundant energy resource, coal.

In the study, Iowa coal was assumed to have a sulfur content of 6 percent. Amounts of Iowa coal necessary to meet local air quality standards were projected when mixed with 3 percent sulfur coal from Illinois or 0.5 percent sulfur coal from Wyoming. Similar projections were made assuming the success of the Iowa Coal Research Project in developing an economical way of reducing the sulfur content of Iowa coal to 3.5 percent.

The results of the research study indicate that when a case-by-case analysis is done, the allowable percent of sulfur for various installations ranges from 0.52 percent to greater than 6 percent. This means that at a few locations in the state, a regulation more restrictive than the one which presently applies may be warranted, but a less restrictive regulation could be applicable in the majority of cases. The following results apply to the state as a whole:

Amount of Iowa Coal Allowable In Tons Per Year	Based On
1,396,190	6% S* Iowa coal mixed with 3% S Illinois coal at the present rate of coal consumption.
2,281,037	6% S Iowa coal mixed with 3% S Illinois coal at present heat requirements.
3,015,577	6% S Iowa coal mixed with 0.5% S Wyoming coal at the present rate of coal consumption.
3,738,740	3.5% S Iowa coal mixed with 3% S Illinois coal at the present rate of coal consumption.
4,717,766	6% S Iowa coal mixed with 0.5% S Wyoming coal at present heat requirement.
4,730,647	3.5% S Iowa coal mixed with 0.5% Wyoming coal at the present rate of coal consumption.
5,951,282	3.5% S Iowa coal mixed with 3% S Illinois coal at present heat requirement.
7,331,557	3.5% S Iowa coal mixed with 0.5% S Wyoming coal at present heat requirement.

*S = Sulfur

In 1974, Iowa utilized about 600,000 tons of its native coal. The research indicates, therefore, that Iowa could utilize between 230 percent and 1200 percent of current Iowa coal consumption and still be consistent with meeting health-related air pollution standards. The situation appears to be optimistic, especially if the Iowa Coal Research Project is successful. Even if the coal mining project falls short of the 3.5 percent goal, an increase of nearly 700 percent in Iowa coal consumption could be allowed, and the purposes of ESECA met.

NORTH DAKOTA COAL GASIFICATION PROJECT

A major coal gasification project is now underway in North Dakota. Lignite from coal mines in western North Dakota will be converted by the Lurgi process into synthetic natural gas (SNG) and various useful by-products such as naphtha, tar oil, phenols, and ammonia. The SNG, the main product, will be transferred into the pipelines of Michigan Wisconsin Pipe Line Co. (a subsidiary of American Natural Gas Co.), which is one of the three natural gas pipeline companies serving Iowa.

The project is intended eventually to have a total of four coal gasification plants. Plans are well advanced on the first plant, which will be located in Mercer County, North Dakota, and will use lignite from the fields of the North American Coal Co. Michigan Wisconsin Pipe Line Co. has rights to the use of 3.7 billion tons of lignite owned by North American Coal. The coal will be surface mined with reclamation of the land, including the saving and respreading of two feet of topsoil. The plant will require 12 million tons of coal annually; reclamation will cost over $1000 per acre, which amounts to about 5¢ per ton of coal since 500 acres of coal will be mined annually.

Construction of the first gasification plant will begin in the summer of 1976 and be completed by the fall of 1981. The plant will use 33,000 tons of lignite daily (12 million tons annually) and produce 250 million cubic feet of SNG daily (90 billion cubic feet annually). The SNG will have a heat content of about 980 Btu/cubic foot, which is approximately the same as that of natural gas currently being sold. The plant's SNG output will be about 90 trillion Btu annually. To put this in perspective, such an amount would correspond to about 30% of Iowa's current annual natural gas use or about 10% of Iowa's current annual total energy use.

The capital cost of the plant is estimated as $1.12 billion, including $805 million for the gasification plant itself, $125 million for the coal mine to serve the plants, and $190 million

for pipelines to carry the SNG.

The gasification process has already been tried on North Dakota lignite in a test at a Lurgi gasifier in South Africa. A brief outline of the process to be used is as follows:

1. The lignite is crushed and fines (pieces less than $\frac{1}{4}$ inch across) are removed.
2. The coal goes to the gasifier vessel where it is dehydrated, devolatilized, and gasified by reaction with oxygen and steam. The raw gas produced contains carbon monoxide, hydrogen, carbon dioxide, methane, and other compounds.
3. The raw gas is cooled and scrubbed to remove dust and valuable by-products such as tar, heavy oils, and gas liquor.
4. The scrubbed raw gas undergoes several reactions to convert its carbon monoxide and hydrogen into methane.
5. The SNG is passed through chilled methanol to remove carbon dioxide and water vapor. The product has aheat content of greater than 970 Btu/cubic foot.

The energy balance of the gasification process would be as follows, based on the plant's capacity of 275 million cubic feet of SNG daily:

Input: (1) 36,767 tons of coal having a heat content of 6822 Btu/pound -- 501.6 billion Btu/day
(2) 1.35 million kWh of electricity -- 4.6 billion Btu/day

Output: (1) 275 million cubic feet of SNG at 979 Btu/f^3 -- 269.2 billion Btu/day
(2) Liquid by-products -- 31.7 billion Btu/day
(3) Coal fines -- 43.3 billion Btu/day

Total: Input = 506.2 billion Btu/day
Output = 344.2 billion Btu/day = 68% of input

ENERGY & MINERAL RESOURCES RESEARCH INSTITUTE

IOWA STATE UNIVERSITY Ames, Iowa 50010

IOWA COAL PROJECT: MAY 1974 - DECEMBER 1975

GENERAL

The Iowa Coal Research Project was established by the 1974 Iowa Legislature with a $3 million, 3-year appropriation to the Energy and Mineral Resources Research Institute at Iowa State University. The Legislature hoped to provide Iowa with a means of meeting its energy needs and at the same time to revitalize the state's once-thriving coal industry.

The primary goals of the Coal Project are to select, develop and demonstrate economical methods for 1) strip mining Iowa coal and restoring the land, and 2) cleaning the coal to meet environmental standards set by Iowa's Department of Environmental Quality.

MINING AND RESTORATION

The development of an environmentally and economically acceptable surface-mining procedure is a must if surface mining is to become a publicly accepted practice in Iowa. That is what Iowa Coal Project Demonstration Mine # 1, located in Mahaska County, is intended to demonstrate.

Between Jan. 29 and Feb. 19, 1975, eight boreholes were dug at the site of what is now the demonstration mine and it was determined that there were approximately 135,000 tons of useable coal contained in two seams.

On July 1 a contract was signed with the Star Coal Company to perform the mining operations which include the moving of nearly 1.5 million cubic yards of overburden to mine the coal and restore the land. Initial earth moving began at the site on July 16 and two days later the formal lease for the mine was signed by Coal Project officials and representatives of the John Scott estate.

Iowa Gov. Robert Ray dedicated the mine at ceremonies on Aug. 22. The first coal was removed from the mine on Sept. 17 and delivered to the Iowa State University campus. The ISU power plant had contracted to buy 25,000 tons of the coal for the 1975-76 heating season. At the end of October 9792 tons of coal

with an average heating value of 10,821 (± 608) Btu/lb, average sulfur content of 6.01 (± 1.09)%, and average ash content of 15.39 (± 3.3)% had been trucked to ISU on this contract.

On Nov. 18, the Iowa Coal Project signed a contract with Corn Belt Power Cooperative, Humboldt, Iowa, to supply 50,000 tons of coal to that utility over the next twelve months. We expect to deliver the first coal on this contract (by rail) on December 8.

Restoration at the 40-acre mine site is being carried on concurrently with mining operations. The final grade at the site will be a series of nearly level terraces approximately 40 yards wide separated by 10-feet high risers of 45 degree slope. An existing stock pond at the mine was replaced to receive drainage water from the terraced surfaces.

In cooperation with ISU's Agricultural Experiment Station, revegetation plots on the first terraces are to be planted Spring 1976. Mining operations are expected to be completed by Jan. 1, 1977. While the Iowa Coal Project appropriation expires June 30, 1977, we nevertheless plan to study agricultural productivity of this restored land at least through 1979.

COAL REFINING

Mechanical coal washing equipment is now being assembled for the $750,000 experimental coal cleaning plant under construction on the ISU campus. Tests have shown that sulfur content of Iowa coal can be reduced by up to 40% and ash content up to 50%. The finished plant will be capable of processing about 70 tons of raw coal per hour at an estimated cost of less than $1.50/ton.

Although the demonstration plant will remain on the ISU campus, the plant has been designed to be semi-portable. Similarly designed plants could be moved economically from one mine site to another.

Initial coal washing tests conducted after the establishment of the Iowa Coal Research Project indicated that the heavy media, float-sink process in conjunction with concentration tables would best clean Iowa coals. Froth flotation cells or other suitable fine coal cleaning processes were decided upon for a later phase of the operation.

In November 1974 Eagle Iron Works of Des Moines was awarded a $175,000 contract for construction of the heavy media separation plant. A concentration table (coal washing table) was ordered from Deister Concentrator Co., Fort Wayne, Indiana.

Design work was completed on the building to house the coal refining plant in April and in May Advanced Building Systems, Ames, was awarded a $77,000 contract to construct the building which was completed in October.

Engineering specifications work on the preparation plant was completed in September and the bulk of the remaining process equipment was ordered:

The status of the preparation plant as of December 1975 is:

Engineering Design and Drafting	~75% complete
Steel Fabrication	~50% complete
Settling Basin	~50% complete
Machinery Assembly (conveyors)	~15% complete
Internal Building Construction	~25% complete
Electrical	~20% complete
Mechanical (plumbing and heating)	~10% complete
Machinery Delivery	~90% complete

The plant is scheduled for completion on or about June 1, 1976 with initial shakedown work to be performed on coal from Iowa Coal Project Demonstration Mine #1.

Following shakedown, representative amounts of coal from the seven other operating mines in Iowa will be processed. In each case, enough coal will be processed so that washability results can be established for the coals.

Other engineering work in progress includes 1) the development of a suitable method to improve processing of coal fines, i.e. particles of smaller diameter than the mesh sizes currently used in the crushing operations, and 2) establishing specifications for a crushing plant for use at either the ISU mine site or at the preparation plant on campus for crushing/particle size evaluation.

SECONDARY GOALS

A full economic analysis is being made of the coal cleaning and the mining and restoration operations. Project scientists are working to develop new methods of detecting and evaluating coal seams, of chemically cleaning coal, and of producing fuel by-products.

Clay deposits often associated with Iowa coal are being investigated for possible use as ceramic brick and tile products. The environmental impact of surface mining is being studied as well.

STAFFING

More than 75 researchers and student volunteers work on the project. Task forces have been organized for each goal, and persons representing 15 different disciplines participate in the research activities. The research staff includes engineers, scientists, economists and industrial specialists. Efforts are being made to insure this project achieves the benefits of interdisciplinary cooperation and close liaison with industry. Contact has been established with the Iowa Energy Policy Council, Soil Conservation Department, Iowa Geological Survey, Iowa coal mine operators, utilities and several coal projects in other states.

ADMINISTRATION

The Iowa Coal Research Project was assigned by the Iowa Legislature to the Energy and Mineral Resources Research Institute (EMRRI) of Iowa State University. The administrative staff was assembled from Iowa State University faculty.

The staff includes:

Dr. Robert S. Hansen, EMRRI Director--Director, Iowa Coal Research Project

Dr. Daniel J. Zaffarano, Vice President for Research and Dean of the Graduate College--Acting Chief, Coal Division EMRRI

Dr. Lyle V. A. Sendlein, Professor of Geology--Assistant Coal Division Chief, Mining and Restoration

Mr. R. W. Fisher, Plant Manager and Senior Engineer, Ames Laboratory ERDA--Assistant Coal Division Chief, Coal Beneficiation Research

Dr. Thamon E. Hazen, Professor of Agricultural Engineering and Assistant Director Agricultural Experiment Station--AES Participation

Mr. Robert W. Shearer, Associate Professor of Chemical Engineering--Assistant to the Chief, Coal Division

Advisory Committee:

Dr. Hansen
Dr. Zaffarano
Dr. Sendlein
Mr. Fisher
Mr. Shearer
Dr. John Pesek, Head, Agronomy Department
Dr. John Lemish, Professor of Geology
Dr. Matthew Avcin, Iowa Geological Survey
Mr. Marvin Ross, State Mine Inspector

IOWA GEOLOGICAL SURVEY COAL RESEARCH PROJECT

The Iowa Geological Survey is carrying out a coal research project authorized by the 1973 Iowa legislature. The primary purpose of this project is to define more precisely the coal reserves of the state in terms of quantity and quality and to develop a sedimentological model to enable prediction of where a particular coal will or will not be encountered. In addition, information is being compiled about the nature of the materials associated with the coal in order that mining and reclamation of surface-mined areas can be carried on in an economically and environmentally acceptable manner.

All available information about Iowa coal is being brought together. The chief source of new information is the drilling program being conducted by the Geological Survey. In this program the entire sequence of coal-bearing rock is being cored on a six-mile grid. The cores, which are cylinders of rock, are analyzed for stratigraphic information. In addition, the U. S. Geological Survey is cooperating in performing trace and standard analyses of the coals and associated shales.

To date a total of 26 holes have been drilled for a total of 8,200 feet, of which 4,600 feet of rock are potentially coal bearing. In that drilling, 99 coals with a total thickness of 150 feet were encountered. Of these, 51 are 14 inches or more in thickness, which are the only coals presently considered thick enough to be classed as reserves. Only eight of the coals encountered are in the thick-coal range and those have an average thickness of 4.6 feet.

Drilling has been concentrated in Davis, Jefferson, and Van Buren Counties. The 24 holes drilled in those counties have encountered approximately 435 million tons, of which about 80 percent are previously unidentified reserves. Approximately another 110 million tons have been identified in beds less than 14 inches thick. These figures may be compared with the previous estimate of 3.5 billion tons measured and indicated reserves and 3.7 billion tons inferred reserves for the whole state, showing that Iowa's coal reserves are considerably larger than previously estimated.

The Coal Research Project was authorized by the Legislature in 1973 and an allocation of $148,000 was made for the first year of the project. Subsequent funding has remained at about the same level for each fiscal year.

COAL SLURRY PIPELINE

A major struggle is taking place over legislation to grant rights-of-way (eminent domain) to coal slurry pipelines. Such a pipeline transports pulverized coal and water (in approximately equal amounts) from coal mines to consumers. The water is removed and the coal dried before use.

Some small coal slurry pipelines already exist in the U.S. and other countries. Several large lines are now being planned, the most notable being a 1038-mile line 38 inches in diameter from Wyoming coal mines to power plants of Middle South Utilities in Arkansas, Louisiana, Mississippi and other southern states.

Such pipelines would compete with railroads, which now transport much of the coal from western states to users elsewhere. The railroads say they can handle the expansion of western coal mining by upgrading their tracks and purchasing more locomotives and hopper cars. They claim that their economic survival would be threatened by coal slurry pipelines.

The slurry pipeline companies argue that they would provide needed competition to the railroads and would affect the environment much less than the railroads. They also claim that the coal could be transported more cheaply by pipeline.

The U.S. Congress has been considering bills which would grant coal slurry pipelines the right to eminent domain. At present the pipelines can acquire land rights-of-way only by negotiation, which is impossible at times (as when the line crosses a railroad). Under the legislation being considered, the pipeline companies would operate as common carriers under Interstate Commerce Commission (ICC) regulation, and before starting eminent domain proceedings they would have to obtain a certificate of public convenience and necessity from the ICC.

An important issue in the whole controversy is that of water rights. The slurry would consume large amounts of water that permanently leave the coal mining area. Water is scarce in many parts of the west with large coal reserves. The proposed Wyoming to Arkansas slurry line has water rights from underground acquifers in Wyoming.

E Fluid Fossil Fuels

Data

PETROLEUM

Petroleum is the largest single source of energy in both the United States and Iowa. Because as a liquid, most refined derivatives of crude oil can be stored and transported easily, reliance on this fuel, particularly in transportation, has increased dramatically. Over the last twenty years, petroleum has consistently accounted for approximately 45% of United States' total gross consumption of energy; over half of this, or about 25% of the total gross consumption was transportation uses which rely almost exclusively on petroleum fuel. In Iowa, reliance on petroleum is not as great as nationwide; however, petroleum remains the largest single source of energy used by Iowans, representing in 1974 nearly 44% of the state's total energy use.

Because the derivatives of crude oil refinement vary so much in physical characteristics, heat content, and other properties, petroleum products are used in a number of ways, in addition to transportation, throughout the economies of Iowa and the nation. The most common non-transportation use of petroleum products is space heating.

2

~~Petroleum section continued~~

The most common non-transportation use of petroleum products is space heating. In 1974 over 64 percent of petroleum products in Iowa dedictated to non-transportation uses were consumed in space heating of homes, offices, and factories throughout Iowa. The remaining fraction of petroleum usage is for various "non-fuel" uses. This type of consumption of petroleum products, such as feedstock for various industrial processes and manufacture of plastics, has grown steadily over the years as the importance of consuming petroleum products in ways other than burning have become apparent and valuable. In 1974, approximately 11 percent of the total demand for petroleum was represented in non-fuel uses.

The Declining Supply of U.S. Crude Oil - CAPS

DOMESTIC PRODUCTION

Like natural gas supplies in the United States, domestic reserves of crude oil has steadily declined in recent years as production exceeded exploration's ability to supplement reserves. Declines in reserves and the R/P ratio, similar to those of the natural gas industry, are apparent in the petroleum industry.

- chart of petroleum R/P ratio, production, reserve,

Also like the natural gas industry, United States crude oil production rose steadily until 1970 to a level of over 3.3 billion barrels of crude oil or a level of slightly 9 million barrels per day. By contrast domestic production in 1974 was just over 3 billion barrels of crude oil, or 8-1/3 million barrels per day. During this same period reserve additions have droped markedly from a high of 3.1 billion barrels in 1970 to less than 2 billion barrels of crude oil in 1974. Similarly the reserve production ratio (R/P ratio) has steadily declined as production during the year exceeds reserve additions each year. In 1965 the R/P ratio

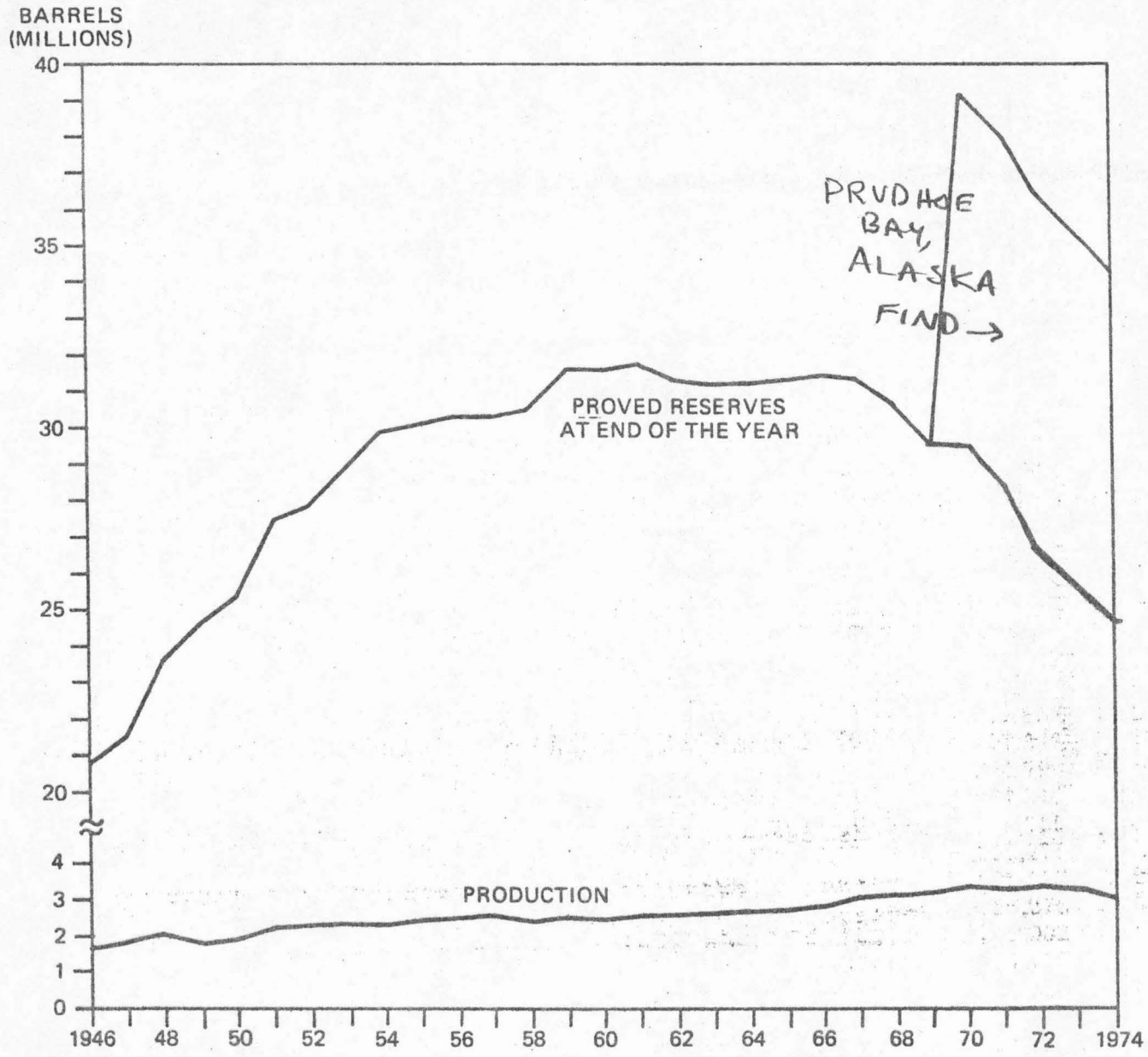


Figure 9. Production and Proved Crude Oil Reserves in the U.S., 1946 - 1974

for United States crude oil was 11.7, while in 1974 the ~~same~~ R/P ratio was less than 8.1. (The figures indicated exclude approximately 9.6 billion barrels of crude oil discovered in the ~~Prudo~~ Prudhoe Bay region of Alaska in 1968, ~~of~~ which will not be available for production until the Alaskan pipeline, currently under construction, is completed.)

TP With ~~Unlike~~ Imports natural gas, ~~for which~~ there is no feasible alternative of filling the gap created by increasing demand and declining domestic supplies, ~~and declining production results in less use (curtailments)~~ systems of curtailments are necessary. Petroleum, however, characteristics make it possible to offset lower domestic production through increased imports of crude oil and petroleum products. The United States has gradually and steadily become more and more dependent on foreign sources to supply this major part of its energy supplies. TP From a totally self-supporting status in 1950, when exports actually exceeded imports, the United States in 1973 had developed a reliance on imported sources to supply nearly 35 percent of its petroleum. Just two years later, in 1975, even after the country experienced the affects of this reliance through the Arab embargo, the United States dependents CE on foreign oil had increased to over 40 percent of its petroleum needs. During this same year period, the price for imported crude oil charged by OPEC (Organization of Petroleum Exporting Countries) rose from less than $4 in mid-1973 to nearly $14 at the end of 1975. Clearly, with petroleum products the problem has not been of immediate supply

availability, but a problem of coping with the economic and political implications of the increasing dependence on foreign sources of crude oil ~~Coping with the Shortage of Petroleum~~ Remaining Reserves of Petroleum

Like natural gas, the immediate problem of adequate supply is accompanied by a longer term ~~product~~ problem of sufficient continuing supply. Crude oil also is a finite, non-renewable energy resource, and while estimates vary of remaining United States' undiscovered recoverable oil resources, the general consensus, confirmed by a recent United States Geological Survey report, indicates that there are approximately 100 billion barrels of undiscovered, recoverable crude oil in the continental United States. At current consumption levels and with existing technologies, this means that the remaining volumes of recoverable oil in the United States could not last much beyond the next fifty years. those limits cannot now be determined with certainty. If domestic producing rates are to be sustained at current levels (and they have been dropping), annual additions to petroleum reserves ~~must~~ would have to be improved significantly through expanded efforts ~~defined~~ to find the undiscovered reserves of recoverable oil.

Coping with the Shortage →

Project Independence

In March of 1974 the Federal government began a comprehensive study to evaluate the nation's energy problems and develop a "blueprint" of necessary national energy policies to cope with the energy problems with which our nation was faced. The culmination of this effort was the Project Independence report issued at the end of 1974. The study's name and its general method of organization reflected the concern of the administration on the increasing dependence on foreign oil for ~~domestic~~ nations

petroleum supplies. The impact of ~~alternative~~ various prices of OPEC oil (which accounts for over 75 percent of the nation's imports) on both domestic consumption and domestic production of oil was evaluated. Logically, at a higher world price of oil, petroleum consumption specifically was projected to dampen while the higher world market price would stimulate domestic production. Conversely lower priced world oil would tend to encourage increased consumption and hamper expansion of the domestic production effort. The impact of various prices of imported oil on not only domestic oil but domestic coal, natural gas production, and nuclear power expansion, synthetic fuel development, and the potential contributions of exotic sources of energy are studied in the report. ~~While the project Independence report came to no firm conclusions or recommendations it did compare the impact of alternative energy strategies on national vulnerability to increasing imports, economic and regional implications of those strategies and environmental impacts of those strategies.~~ Several major uncertainties, ~~however, contributed to a lessening in the validity of the report~~. The report did not develop nor have ~~substantial~~ many studies been undertaken, which establishes the price elasticity of various energy forms; The amount of undiscovered recoverable reserves of petroleum and natural gas remains unclear; especially at alternative energy prices. Finally, the time necessary to implement effective domestic measures is unclear as technology and capitol generation questions pose major restraints in this area.

~~While the overall purpose of project independence was not to establish a plan of total dependence on foreign sources of energy by 1980 but to establish policies which achieve "acceptable" level of political and economic vulnerability. While the report~~

~~SUMMARY~~

Project Independence Blueprint merely identified the implications of various policy alternatives; it ~~does~~ did not recommend any one or group of policy alternatives. For instance, although $11 oil prices could make the United States energy self sufficient by 1985, i.e., at zero imports, $7 oil prices would reduce our vulnerability to only 3 million barrels per day - a level with which short term conservation measures could easily deal, according to recent. ~~with~~ Although $11 oil prices would accelerate domestic supplies of petroleum, it would adversely affect the environment, and may well be constrained by materials, equipment, labor, and capital shortages. Although a strict conservation strategy has positive environmental effects and reduces the above noted constraint problems, such a strategy requires governmental intervention and regulation in several market areas currently free from such intrusion. ~~Any actions designed to increase our domestic self sufficiency would have some impact on the world price of oil. The more appreciable that impact, the greater uncertainty to domestic energy investments.~~

In redefining the goal of Project Independence, the FEA said, "Energy independence does not necessarily mean the complete elimination of energy imports. Rather, the objective is the achievement of tolerable levels of our vulnerability to import disruptions." ~~However the administration achieves this goal, it must be in a realistic long-term policy that recognizes the economic, environmental, and institutional constraints imposed on energy supply and demand.~~

While the report left a number of uncertainties, it did provide a basis for dialogue among consumers, energy industry representatives and state and federal government officials, as well as a framework for developing a national energy policy.

Regulation of Petroleum Products

Soon after the Arab oil embargo in October, 1973, the Federal government enacted a comprehensive program to regulate the allocation of "middle distillates", i.e., kerosene, #1 and #2 heating oils and diesel fuels. Part of this program was a system to handle emergencies through a state set-aside system, modeled after Iowa's fuel pool of one year earlier. In early 1974 a broader mandatory program went into effect which allocated existing supplies of most petroleum products based on historical consumption and end use, pricing regulations regarding these petroleum products, and a system of securing adjustments to minimize undue hardships.

The state set aside system was continued and expanded to cover a number of allocated petroleum products. Each month a set percentage of the total allocated product to be brought into the state in any given month was set aside for the state energy offices to redirect to alleviate emergencies or hardships caused by supply shortages. For propane, gasoline and residual oil the applicable set aside percentage was 3 percent; for middle distillates it was 4 percent.

Regulatory Scheme: Allocation Determination

The amount of fuel allocated to a particular purchaser was determined by three things: (1) the amount historically used by that purchaser, (2) the use to which the fuel was put, e.g. agricultural purposes, residential space heating, and (3) the suppliers availability of fuel. Suppliers were required to serve those purchasers it had supplied during the correspondings months of 1972; for instance, if supplier A provided fuel to a wholesale purchaser during 1972, supplier A had the obligation to

SET-ASIDE PROGRAM

~~FUEL ALLOCATION~~

The state set-aside program is designed to reduce the hardships experienced by wholesalers of petroleum products and propane who have difficulties in obtaining fuels. Under this program, for which federal authority has existed since November 1973 in the case of middle distillates (fuel oil) and since February 1974 for gasoline and liquid propane gas, a portion of the fuel coming into Iowa is set aside for distribution by the state's fuel allocation officers, who are on the staff of the Iowa Energy Policy Council. The fraction of the fuel that is set aside is 4 percent in the case of middle distillates and 3 percent in the case of gasoline and propane. The fuel allocation office issues warrants to wholesaler purchaser-resellers for fuel from the state set-aside.

During the first ~~nine~~ eleven months of 1975, the warrants issued amounted to ~~23,585,000~~ 28,259,00 gallons of fuel. The breakdown of this quantity is as follows:

Gasoline: ~~13,180~~ 15,814,000 gallons total, of which

51 ~~52~~% was for sale to commercial and service stations

38 ~~37~~% for agriculture

4% for trucking

4% for government

3% for construction

Middle distillates: ~~9,220~~ 11,016,000 gallons, of which

35 ~~32~~% was for agriculture

25 ~~25~~% for heating

23 ~~24~~% for trucking

7 ~~8~~% for utilities

6 ~~7~~% for consturction

4 ~~3~~% for government

Liquid propane gas: 1,~~185~~ 429,000 gallons, of which

54 ~~64~~% was for heating and cooking

44 ~~34~~% for agriculture

2% for commercial

supply purchaser B during 1974.

Historically developed allocations assigned to a particular purchaser could be adjusted upon a demonstration to the federal Energy Administration that the purchaser's business had experienced unusual growth, or had a large number of high priority customers.

FEA Price Regulations

Under the federal mandatory price regulations, the allowable price which could be charged for crude oil and certain petroleum products was also limited to historical, or base period, experience. Basically in the element of petroleum distribution change was allowed to charge prices in excess of "base prices" only to recover allowable increased costs on a dollar-for-dollar basis. The price of "old" crude oil, or the base period production level, was limited to the price on May 15, 1973, plus $1.35 per barrel to cover added costs. This regulation has restricted old domestic crude oil to a ceiling price of $5.25 per barrel. Generally speaking, "new" crude oil, and crude from "stripper wells" (i.e. wells which had an average daily production of less than 10 barrels per day) were free from price regulations. As a result a "two-tier" crude oil pricing system developed, whereby old crude oil was kept at a regulated level of $5.25 per barrel and other crude oil was unregulated and generally tract the price of imported oil.

This two-tier crude oil pricing system and the price regulations of refined products contributed to a wide disparity in prices for refined petroleum products. As various companies incurred different allowable costs, substantially different "add-ons" were reflected in the price of the product. Also, petroleum refining companies had widely divergent mixes of regulated old crude oil and other more expensive unregulated sources. Many of the companies that had grown reliant

on unregulated sources of crude oil or refined products, such as companies in the northeat portion of the country which had historically depended on imported oil, were put at a competitive disadvantage relative to other companies with a greater portion of lower priced crude oil.

Crude Oil allocation Program - "Entitlements"

Because refineries had varying mixes of crude oil and the more expensive unregulated crude oil, the product costs varied considerably from company to company. Specifically, when imported oil prices dramatically rose as a result of the Arab embargo, major integrated oil companies, with more secure supplies of lower priced domestic crude oil, enjoyed a definite economic advantage over small or independent refiners who historically relied on imported and other crude oil that is not subject to price regulations. In an effort to overcome this inequity created among various petroleum refiners, the FEA developed a program to fairly distribute the benefits of low priced old oil among all sectors of the petroleum industry. The agency's plan was to assure that domestically refined petroleum products would be sold at equitable prices in all regions of the United States by all sectors of the petroleum marketing system. Under this program, the FEA computed a national old oil supply ratio, or the volume of old oil divided by the volume of total crude oil. After comparing each refinery's old oil/ratio to the national old oil supply ratio, the FEA issued each refinery a certain number of "entitlements" to include in its crude oil receipts a certain number of barrels of old oil which would result in an old oil supply ratio equal to the national old oil supply ratio.

For example, assume in March, 1975, the National Old Oil Supply Ratio was 40 percent, i.e., the aggregate volume of old oil received by refiners was 40 percent of the volume of crude oil runs to stills plus 30 percent of the volume of eligible imports. For the same period, Refiner A's crude oil runs to stills were 100 barrels - 35 barrels of which is "old" oil - and Refiner B's crude oil runs to stills was 200 barrels - 90 barrels of which were old oil.

Each refiner was issued entitlements by the FEA of sufficient number of entitle it to have enough old oil to bring its Oil Oil Supply Ratio to the national average. In the example above, Refiner A is issued 40 entitlements and Refiner B is issued 80 entitlements.

$$\frac{\text{40 entitlements for A}}{\text{100 bbls crude oil runs to stills}} = \frac{\text{80 entitlements for B}}{\text{200 bbls crude oil runs to stills}} = 4($$

Because Refiner A has entitlements for five more barrels of oil than it actually had, it must sell these additional entitlements. Refiner B, with 10 fewer entitlements than it needs to include 90 barrels of oil oil in its crude oil receipts for November, must buy enough entitlements to include all of its 90 barrels of old oil.

The FEA sets the price of entitlements monthly at a price fixed with regard to the weighted average prices for oil oil and weighted average prices from unregulated crude oil. The cost of entitlements has risen steadily, from $5 per entitlement during November, 1974, to nearly $8.25 for October, 1975.

By Refiner B purchasing entitlements and Refiner A selling entitlements, the competitive disadvantages Refiner A experienced by having a disproportionate amount of unregulated crude oil are substantially reduced. Rather than spreading the advantages of oil oil, it seems the FEA has

Impact of ~~Old~~ Crude Oil Allocation Program in Iowa

The refiners and importers who benefit from this program are unevenly distributed throughout the country. The east coast states depend more heavily on unregulated crude and imported eligible products. The refiners serving the Midwest generally have more old crude oil in their crude oil receipts. The net effect of the entitlement program will be to lower the prices of petroleum products in those areas most dependent on the nonregulated crude and imported products and to raise the prices of petroleum products in those areas more dependent on low-priced old oil. In Iowa, the general impact of the program has been to increase the costs of petroleum products at most outlets.

Recent National Energy Policy Development

The authority which provided the basis for the regulations to control the price of domestic oil and to allocate domestic petroleum supplies, the emergency petroleum allocation act of 1973, was ~~set~~ scheduled to expire on August 31, 1975, before Congress was able to develop a comprehensive energy policy program. Attempts to extend the EPAA for six months met with Presidential veto. In the middle of October, 1975, after a six-week period of "limbo", the Ford administration agreed to a 30-day extension until November 15, 1975 to provide Congress to complete action on a comprehensive energy bill. Another 30-day extension was granted on Noember 15, after House and Senate conferees of the Energy Policy Bill indicated they were close ~~xxxxxxxxx~~ to agreement on the provisions of the bill.

While the bill contains a number of provisions relating to issues other than petroleum pricing, such as auto efficiency standards, petroleum industry reporting requirements, and state energy conservation programs, the petroleum pricing provision was the most significant. Under the terms of the comprehensive

energy bill formula domestic crude oil prices would role back temporarily approximately 11 percent from the $8.75 average of early December, 1975, to approximately $7.66 per barrel. This average price for domestic crude oil reflects both old and new domestic oil. The composite average price of crude oil would then gradually raise to $11.21 by April, 1979. Crude oil and petroleum product price control and allocation control would be effective for 40 months, after which it would convert to a standby authority. Alaskan oil and certain stripper well oil would be exempt from the price controls provided for under the bill.

~~One problem anticipated~~

- dealer franchise bill
in query

Natural Gas Section

Because of its properties as a clean, reliable, efficient and versatile source of energy, demand for natural gas has increased rapidly both in Iowa and in the nation. Its value as a premium fuel can be seen from its rapidly increasing role in providing the energy requirements for the nation and the State of Iowa. Presently, natural gas represents about one-third of the total energy used in the nation and almost one-half of the non-transportation uses--twice the amount supplied by either coal or oil. In Iowa, natural gas represents an even greater portion of the total energy used. In 1974, over 37 percent of Iowa's total energy requirement was met by natural gas. And over 51 percent of the state's non-transportation energy demand was met with natural gas.

Due to its physical characteristics, natural gas is difficult to store and transport by any means other than pipeline. For this reason, the United States' source of natural gas is basically limited to reserves existing in the North American continent. Rapid depletions in these reserves and certain pricing policies have recently threatened to change our fuel consumption patterns sharply.

The Growing Shortage of Natural Gas

Since 1968, consumption of natural gas throughout the nation has far exceeded the additions to the proven reserve of natural gas supply on the North American continent. Since 1970, the demand for natural gas nationwide has exceeded the ability of

the distribution system to supply it. In that year, many natural gas distribution companies found it necessary to curb expansion of service to new customers and to curtail existing service to existing customers.

When a distribution company experiences a greater demand for natural gas than the amount of gas it is capable of delivering, it is forced to "curtail", or reduce the amount of natural gas delivered, to a level short of the full amount demanded. Nationwide, curtailments have grown from .1 trillion feet during the 1970 heating season to over 2.0 Tcf during the 1975 heating season. The State of Iowa has not escaped these curtailments or the impacts of the result from them.

In a comprehensive study of the natural gas curtailments for the 1975-76 heating season, the Natural Gas Task Force of the Federal Energy Administration named Iowa as one of twenty-one states considered to be the most critical in the nation. The information, gathered from the natural gas distributors throughout the State, provided the information base for the survey. According to this report 18 percent of the total natural gas requirements for the 1975-76 heating season were projected to be curtailed; this includes not only the interruptible natural gas service, but even some firm natural gas service.

TABLE A

1975-76 Heating Season (Projected)
November-March (MMCF)

Service	Deliveries	Curtailments	Require-ments	Percent Of Requirements Curtailed	Percent Change In Curtailmen 74-75 to 75-76
Interruptible	32,771	34,070	66,841	51	8
Firm	135,374	1,752	137,126	1	220
TOTAL	168,145	35,822	203,967	18	12

Source: Natural Gas Curtailments, 1975-76 Heating Season
Natural Gas Task Force, Federal Energy Administration
October, 1975

According to projections from the three interstate pipelines serving Iowa, available supplies of natural gas will continue to decline for the rest of this decade. To ease the impact of the reduced natural gas supplies, the natural gas distribution companies are phasing out the use of natural gas for low priority uses such as electrical generation and other boiler firing uses in industry. Historically, these volumes of natural gas for boiler use and electrical generation were consumed primarily during the summer when other gas demands are low. As available supplies decline and distribution companies' ability to store gas in the consuming region improved, the low priority uses of natural gas have been reduced.

In the northern two-thirds of Iowa, served by Northern Natural Gas Company, all electrical generation will be fired by fuels other than natural gas after the bginning of the 1976-77 heating season. Furthermore, all large volume industrial users (more than 200 Mcf per day) will rely on fuels other than natural gas at the

beginning 1977-78 heating season. Because of this marked reduction in natural gas availability for large industrial and electrical generation purposes, greater demand on alternative fuels such as propane and middle distillates are projected for the 1975-76 heating season and subsequent years.

Why Is There A Natural Gas Shortage?

Many people believe that there is no "real" shortage of natural gas, that vast amounts of the resource still exist and are available for consumption. Many of these same people indicate the primary reason for the natural gas shortages in Iowa and other non-producing states is an alleged inept regulation of interstate gas prices by the Federal Power Commission. The immediate reason for the sharply increased curtailment of the natural gas in non-producing states, such as Iowa, may be attributed in part to the disparity between interstate and intrastate natural gas prices, and many of the projections of curtailment for the remainder of this decade would, in all likelihood, be substantially changed if the interstate natural gas policy were altered. In spite of this, there is good reason to believe that, regardless of policy changes, natural gas consumption in Iowa and the nation as a whole will continue to decline and will never return to the peak levels it achieved in 1972.

Natural Gas Pricing Policy

According to the Natural Gas Act, passed in 1938, authority to regulate the transportation and sale of natural gas in interstate commerce was given to the Federal Power Commission;

however, the Act said it did not apply "to the production or gathering of natural gas" (Natural Gas Act, 50 U.S.C. §§ 717(b)). Because of this exclusion, the Federal Power Commission made no attempt to regulate sales of natural gas by independent producers to the interstate pipeline companies until 1954, when the Supreme Court held that the Federal Power Commission did, in fact, have the authority to regulate the prices at which natural gas field producers sold gas to interstate pipeline companies.

In the now famous Phillips Petroleum Co. vs. Wisconsin case, the Court found congressional intent was to give the Federal Power Commission jurisdiction over the rates of all wholesales of natural gas in interstate commerce. With this decision, the interstate/intrastate dual pricing system of natural gas was started. Under this system, prices at which interstate pipelines buy new natural gas supplies were regulated by the Federal Power Commission, while the price which could be paid by pipelines distributing gas within the producing state was either regulated locally or not at all.

This dual system created very little problem until demand for this premium fuel exceeded the available supply. When this occurred, the unregulated price of intrastate natural gas began to dramatically exceed the FPC regulated price for natural gas. The disparity grew even more as oil prices rose dramatically in October of 1973, in conjunction with the Arab oil embargo and subsequent price increases.

TABLE B

$/MM Btu

	1960-70	Feb. 1971	Jan. 1973	Oct. 1973	Jan. 1974	Jan. 1975
Imported oil	.32	.39	.46	.91	2.08	2.25
Interstate gas	.24	.36	.42	.45	.46	.52
Intrastate gas	(Data now being gathered)					2.10

In 1973, the Federal Power Commission proposed to set a nationwide price of 42¢ per Mcf for all interstate gas from wells begun on or after January 1, 1973. According to the table, the cost per Mcf of natural gas on a BTU equivalency basis to the imported crude oil at that time would have been 46¢ per Mcf. With the quadrupling of imported oil prices during the past two years, however, we have experienced a similar quadrupling of the price of unregulated intrastate natural gas.

In its first annual report, the Council recognized the difficulty the dual intrastate/interstate gas market created for the interstate pipelines serving Iowa. In urging that natural gas be viewed as a limited national resource, the Council recommended the elimination of this dual market system. In October, 1975, the Council recommended this elimination occur through a deregulation of new natural gas supplies rather than an extension of federal regulation over intrastate sales. (See page , supra.)

Depleted Reserves of Natural Gas

The price disparity between the interstate and intrastate markets has not been the sole reason for the natural gas shortage realized nationwide. An analysis of the success of new exploration for natural gas and the additions to existing proved reserves of natural gas reveals that the valuable resource is highly limited. While natural gas production in 1974 in the lower 48 states was down 5.8 percent from the prior year, reserve additions also showed a marked decline. Preliminary data of the Federal Power Commission indicates that production during 1975 will continue this declining trend.

As natural gas production draws on existing proved reserves of natural gas, successful exploration contributes additions to that proved reserve supply. By comparing the size of proved reserves to the annual production (R/P ratio) we can determine how long the existing reserve would last without any additions and with no increase of current consumption rates. Even though production peaked at about 22.6 Tcf during 1973, reserve additions for that year were only 6.8 Tcf. The resulting R/P ratio was just over 11, or, in other words, absent further reserve additions at current production level, the proved reserve available at that time would last only eleven years.

Since 1967, natural gas production has exceeded additions to the reserves in the lower 48 states. This has resulted in a reduction in the proved reserves of 29 percent from its peak of 289 Tcf in 1967 to 205 Tcf at the end of 1974. Reserves committed

to interstate sales have dropped over 39 percent during this same period. Because the domestic supply gap of natural gas cannot be readily filled by imports, the decline in these reserves is more evident and more startling than a corresponding decline in domestic crude oil supply.

While the decline in interstate reserve additions may in part be attributable to natural gas prices which do not fully compensate for the expense and risk of exploration, declining reserve additions have also characterized the unregulated intrastate market. Studies of the trends in the natural gas finding rate (Mcf/foot of successful gas well) has led the Federal Power Commission to conclude that reserve additions will continue to decline markedly as new supplies of natural gas become more difficult to find.

The U.S. Geological Survey recently revised its projections of the amount of natural gas that remains to be discovered in the lower 48 states. As recently as March of 1974, the survey had estimated the nation's undiscovered recoverable natural gas resources at between 1,000 and 2,000 Tcf. The recent revisions issued in May of 1975 put U.S. undiscovered natural gas between 322 Tcf and 655 Tcf. (The lower end of the range is regarded as discoverable at a 95 percent probability while the upper end of the range is judged as having a probability of 5 percent.)

Estimates by other geologists lead to a new consensus that undiscovered gas potential is about 500 Tcf. At current production rates, this would last less than 25 years. Since the start of the oil and gas industry, a total of 713 Tcf of natural gas has

discovered; this means that approximately 59 percent of the original natural gas endowment that is considered to be economically and technologically recoverable has already been discovered with only 41 percent remaining to be discovered in the future. Many of these deposits are in smaller scattered deposits and in formations of low permiability, which make it more difficult and expensive to recover than the natural gas discovered and produced to date.

Coping With The Shortage

The Federal Power Commission has taken a number of actions to provide short-term assistance to the interstate gas market. Recognizing the imbalance between the bargaining power of the regulated interstate pipeline and the unregulated intrastate gas buyers, the Federal Power Commission has initiated a number of measures to help those interstate pipelines cope with the reduced availability of natural gas.

For several years the Commission has had a provision, in its Rule 2.68, permitting gas to be sold between distribution companies or an intrastate supplier to a distribution company for a period of sixty days without the prior authorization normally required. The price for such emergency sixty-day natural gas was to be judged on a "just and reasonable" standard.

As early as 1971, the Federal Power Commission realized the need to deal with existing and potential curtailment situations in an orderly fashion. In that year, it issued Order No. 431 requiring jurisdictional pipelines to file curtailment plans. The sharp differences in curtailment philosophies and curtailment

implementation plans reflected in the filed curtailment plans made it necessary to impose a uniform national curtailment policy.

In January 1973, the Commission issued its statement of policy on priorities of deliveries during periods of curtailment of natural gas customers. That order, No. 467, established a recommended priority of service listing for jurisdictional pipelines to follow in establishing their curtailment plans. The following list reflects this curtailment priority scheme:

1. Residential, small commercial (less than 50 Mcf on a peak day).

2. Large commercial requirements (50 Mcf or more on a peak day), firm industrial requirements for plant protection, feedstock and process needs, and pipeline customer storage injection requirements.

3. All industrial requirements not specified (2), (4), (5), (6), (7), (8), or (9).

4. Firm industrial requirements for boiler fuel use at less than 3,000 Mcf per day, but more than 1,500 Mcf per day, where such alternate fuel capabilities can meet such requirements.

5. Firm industrial requirements for large volume (3,000 Mcf or more per day) boiler fuel use where alternate fuel capabilities can meet such requirements.

6. Interruptible requirements of more than 300 Mcf per day, but less than 1,500 Mcf per day, where alternate fuel capabilities can meet such requirements.

7. Interruptible requirements of intermediate volumes (from 1,500 Mcf per day through 3,000 Mcf per day), where alternate fuel capabilities can meet such requirements.

8. Interruptible requirements of more than 3,000 Mcf per day, but less than 10,000 Mcf per day, where alternate fuel capabilities can meet such requirements.

9. Interruptible requirements of more than 10,000 Mcf per day, where alternate fuel capabilities can meet such requirements.

While Iowa's two largest interstate pipelines, Northern Natural Gas Company and Natural Gas Pipeline Co. of America, have followed this "end use" curtailment scheme, Michigan-Wisconsin Pipeline Company, serving extreme southeastern Iowa has received approval for a modified "pro rata" curtailment plan.

Procedures for pipeline companies' response to emergency situations during curtailment were established in FPC Order No. 467-A. Under this Order, procedures were set forth whereby a jurisdictional pipeline company could initiate a variance from the normal curtailment scheme unilaterally to avoid damage to life or property.

In April of 1974, the Commission issued Order No. 467-C, which defined procedures for end-users to follow in filing requests for relief from these curtailment schemes of pipelines serving them. In addition to demonstrating the necessity for this "extraordinary relief," the end-user applying must be joined by either the state regulatory commission or the distribution company. This procedure does not create more gas for the jurisdictional company experiencing the shortage, but merely reallocates the shortage among the customers of the distribution company.

Other efforts have been also undertaken to shift natural gas from low priority uses, particularly as a boiler fuel where more plentiful alternative fuels are available. Under the ESECA orders issued in the latter part of 1975, a number of power plants of four Iowa utilities were prohibited from using natural gas.

(see pages , supra)

In a major effort to eliminate the intrastate/interstate pricing disparity of natural gas, Congress, during the latter part of 1975, worked extensively on a plan to deal on an emergency and a long-term basis with the nation's problem of shrinking natural gas supplies. This plan basically removed the price limitations on the gas flowing in interstate commerce and it placed the interstate buyers at a parity with the intrastate purchasers. (See fuel pricing policy, page , supra.)

Another way in which pipeline companies are able to save available natural gas supplies for high priority uses is the utilization of storage facilities in areas of high seasonal demand. Not only does this storage result in increased availability of natural gas for residential and small commercial customers during the winter months when demand for natural gas is high, but also results in a lower unit cost for transporting the gas by more fully utilizing the pipeline facilities during periods of low demand. The storage of gas in this way is achieved in two basic ways: storage in underground reservoirs or in liquefied form in large tanks. Examples of these sorts of storage facilities for natural gas are found in the central Iowa region.

Approximately thirty-five miles west of Des Moines, near Redfield, Iowa, Northern Natural Gas Company has an underground storage field begun in 1953. The gas stored in these underground systems does not flow into a large empty cavity in the earth, but rather into some form of porous rock, sand or gravel. The

(picture)

geologic formation necessary for underground storage requires that it be roughly in the shape of an inverted bowl to trap the gas pumped into it, large enough to hold the necessary amount of gas, sufficiently porous to have adequate gas storage capability, and be topped with an impervious "caprock" to prevent any of the gas from escaping.

North of the city of Des Moines near Interstate 80 is a large LNG (liquefied natural gas) storage facility operated by Iowa Power and Light Company. That facility also stores natural gas in periods of low demand for use during the winter season during periods of peak demand. To store the gas in this fashion it is necessary to keep it at low temperatures and high pressures. The technology required to do this is expensive but helps assure adequate supplies of gas for users of natural gas in the central Iowa region during times of highest demand.

At the close of the first session of the Sixty-Sixth General Assembly, the Senate had passed a measure intending to prohibit the underground storage of natural gas within city limits. Concern about the dangers of storing natural gas under heavily populated areas was the primary argument of the proponents of the measure. At this writing it was unclear what action the House of Representatives would take on this pending legislation.

FUEL PRICING POLICY

A fundamental issue in many of the comprehensive programs dealing with energy shortages is whether the prices of the fuels should be regulated. Interstate natural gas has been under federal price controls since the 1954 Phillips Petroleum Supreme Court Decision and domestic petroleum has been under price controls since 1971, first under the Economic Stabilization Act and later under the authority of the Emergency Petroleum Allocation Act of 1973. The arguments for natural gas deregulation and oil decontrol correspond closely. A summary of the arguments on these issues follows.

SHOULD FEDERAL PRICE CONTROLS ON DOMESTICALLY-PRODUCED OIL AND NATURAL GAS BE LIFTED?

PRO: DEVELOPMENT INCENTIVES NEEDED

The removal of price controls on domestic crude oil and interstate natural gas is a necessary and integral part of the program to reduce energy consumption, curtail dependence on imported crude oil, and improve supplies of natural gas nationwide. In addition to conserving domestic supplies of these fuels by reducing demand, decontrol would stimulate domestic production, and displace some supplies of crude oil that would otherwise have to be imported.

Natural gas deregulation and oil decontrol will provide incentives to yield necessary levels of domestic production until such time as supplementary energy resources can be developed and exploited. Without sufficiently higher prices for oil and natural gas -- and the higher profits which these prices would

generate -- the producing companies wouldn't make enough money to carry out the necessary exploration.

By holding down the price of domestic oil, government policy had been encouraging domestic consumption at the very time when the announced intent of policy has been to decrease or at least slow the growth in petroleum product consumption. Federal regulation of natural gas has created a gap between intra- and interstate gas sales prices that prevents interstate pipelines from obtaining new supplies in the producing states.

The increase in oil consumption which had resulted from the artificially lower prices had increased imports, causing a substantial drain from the U.S. economy to the other oil-producing nations of the world. Decontrol of oil -- by allowing price increases which could reduce consumption -- would prevent this outflow. This money would remain inside the United States where it would be spent for domestic goods and services, actually stimulating the economy by creating demand and jobs.

Decontrol and deregulation would enable the energy industry to sell its product at a higher price, thereby generating the cash necessary to meet the massive capital needs of the next decade. The free enterprise system is the quickest, most efficient and fairest way of accomplishing energy sufficiency.

CON: PRICE NOT COST RELATED

The Organization of Petroleum Export Countries' oil now costs the United States and other purchasers as much as $14 per barrel.

In the last two years, the price of domestic oil which is not controlled -- "new" oil -- has tracked the price of OPEC oil from $3 per barrel to this current price, and it is generally assumed that decontrolled "old" oil would also cost this much, even though it costs less than $1 per barrel to produce.

"The oil companies are eager to forego price regulation by our government," consumer advocate Ralph Nader has said, "only because they can get a higher price through regulation by the governments of the OPEC cartel."

Nader has estimated that the overall cost of the additional domestic oil which decontrol would produce by 1980 would be nearly $100 per barrel.

The OPEC governments rather than the American government will set the price of American oil and hence the prices of our natural gas and coal. Prices should be set which would give the oil and gas industry a generous profit, but not as generous as the OPEC price. According to Nader, the OPEC cartel will be able to use its control over the world oil price to leverage our economy's energy payments substantially up or down at its whim.

Gas deregulation and oil decontrol would be harmful to consumers and limited in their impact upon increased production of oil.

pp. 7

During 1975, the Energy Policy Council studied the various proposals of fuel pricing policy under consideration in Congress. In October, the Council also had experts representing oil and natural gas industries and federal and state regulatory authorities develop the merits of these arguments before them. As a

result of these special "seminars," the following policy recommendations were made and sent to Iowa's Congressional delegation:

THE EPC SUPPORTS PRESIDENT FORD'S GOAL OF REDUCING OIL IMPORTS BY ONE MILLION BARRELS PER DAY BY THE END OF 1975 AND TWO MILLION BARRELS BY THE END OF 1977, BUT RECOGNIZES THAT THE RECESSION MIGHT JUSTIFY POSTPONING THE MEETING OF THIS OBJECTIVE TO LATER IN THE 1970's.

THE COUNCIL WILL ENCOURAGE THE PETROLEUM INDUSTRY AND THE FEDERAL ENERGY ADMINISTRATION TO MAINTAIN BALANCED INVENTORIES OF KEY PETROLEUM PRODUCTS, WITH SPECIAL ATTENTION TO THE NEED FOR ADEQUATE SUPPLIES OF MIDDLE-LEVEL DISTILLATES.

TO ENCOURAGE INCREASED PRODUCTION OF DOMESTIC OIL, OUR NATION'S OIL PRODUCERS MUST BE GIVEN MORE FINANCIAL INCENTIVE THAN PROVIDED UNDER THE EXISTING CONTROLLED PRICE SYSTEM. TO DO THIS, WHILE ELIMINATING THE CERTAIN SHOCK IMMEDIATE DECONTROL WOULD HAVE ON OUR INDUSTRY AND OUR PRIVATE CITIZENS, PARTICULARLY OUR POOR, THE REMOVAL OF OIL PRICE CONTROLS SHOULD BE GRADUAL AND EXTEND OVER A PERIOD NOT LESS THAN 39 MONTHS. A FEDERAL OR STATE SET-ASIDE PROGRAM SHOULD BE IN FORCE DURING THIS PHASE OUT.

THE DECLINE IN NATURAL GAS SUPPLIES SHOULD BE MODERATED BY FEDERAL END-USE REGULATIONS WHICH ALLOCATE AVAILABLE SUPPLIES TO RESIDENTIAL USES, AGRICULTURAL USE AND USE AS A CHEMICAL FEEDSTOCK, WHERE ALTERNATIVE MATERIALS ARE UNAVAILABLE. THE USE OF NATURAL GAS AS A BOILER FUEL SHOULD BE PHASED OUT AS RAPIDLY AS THIS CAN BE DONE WITHOUT CREATING SERIOUS ECONOMIC REPERCUSSIONS.

THE PRESENT DUAL INTERSTATE AND INTRASTATE MARKET FOR NATURAL GAS SHOULD BE ELIMINATED. THE DUAL MARKET MAY DENY CONSUMER STATES, SUCH AS IOWA, AN EQUITABLE SHARE OF THIS LIMITED RESOURCE. THIS INTERSTATE / INTRASTATE NATURAL GAS MARKET DUALITY SHOULD BE ELIMINATED BY SUSPENDING FEDERAL REGULATION OVER SALES FROM NEW GAS WELLS FOR THE NEXT FIVE YEARS. ALL CONTRACTS DURING THIS PERIOD WOULD BE FREE FROM FEDERAL REGULATIONS FOR THE LIFE OF THE AGREEMENT.

TO DEAL WITH THIS WINTER'S EXPECTED NATURAL GAS SHORTAGES, INTERSTATE PIPELINES WITH INSUFFICIENT NATURAL GAS FOR PRIORITY CUSTOMERS' REQUIREMENTS SHOULD BE ALLOWED TO PURCHASE INTRASTATE GAS ON AN EMERGENCY BASIS FOR A PERIOD OF UP TO 180 DAYS.

TO FACILITATE THE DISTRIBUTION OF NATURAL GAS FOR HIGHER PRIORITY END USES, THE COUNCIL SUPPORTS THE DEVELOPMENT OF STORAGE FACILITIES WHEREVER THIS CAN BE DONE SAFELY.

ARCTIC GAS

During the past decade, large reserves of petroleum and natural gas have been discovered in Alaska. The petroleum discoveries have attracted much attention and led to the construction (now in progress) of the Trans-Alaska Pipeline to carry crude oil from the northern slope of Alaska to the southern part of the state, from which it can be transported by tanker to the continental United States.

There have also been natural gas discoveries, with proven reserves on the order of 30 trillion cubic feet (equivalent to about 18 months' consumption of natural gas by the U.S.) and estimated reserves several times as high. The method of transporting this gas to the continental U.S. has not yet been decided. Two proposals are vying for consideration (see map, p. 282).

The Arctic Gas Transmission System would be a 2600 mile pipeline through Alaska and Canada to Montana. This system is being proposed by Arctic Gas, Inc., a consortium of companies engaged in the natural gas business. Over $90 million have been spent over the last 6 years on studies for this system, including $16 million for environmental studies. The pipeline would be started in 1976 and completed by 1980. It would carry 3.25 billion cubic feet per day at startup and 4.5 billion cubic feet per day within three years of startup. In addition to carrying gas from Alaska, the pipeline could also carry gas from the Mackenzie Delta area in northern Canada. There would be a fork in the pipeline at Caroline Junction, Alberta, to permit gas to move to the U.S. west coast or to midwestern and eastern markets.

The continental U.S. portion of the pipeline would be the Northern Border Pipeline, which would carry gas from Montana as far east as Pennsylvania. There would be 246 miles of this pipeline in Iowa, from Kossuth to Scott counties. The Northern Border Pipeline would also pass through extensive coal field regions in Montana and North Dakota and could be used to transported gas produced from coal in those regions (see the section on the North Dakota Coal Gasification Project, p. 171).


PRUDHOE BAY
Alaskan Arctic Gas Pipeline Co.
ALASKA
Fairbanks
TRAVAILLANT LAKE
Canadian Arctic Gas Pipeline, Ltd
YUKON TERRITORY
POINT GRAVINA
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
LABRADOR
NEWFOUNDLAND
PRINCE EDWARD I.
NEW BRUNSWICK
NOVA SCOTIA
MAINE
CAROLINE JUNCTION
KINGSGATE
EASTPORT
MORGAN
MONTANA
NORTH DAKOTA
MINNESOTA
WISCONSIN
MICHIGAN
NEW YORK
VT
N. H.
MASS.
CONN.
RHODE I.
PENNSYLVANIA
NEW JERSEY
DELMONT
MD.
DEL.
WEST VIRGINIA
VIRGINIA
OHIO
ILLINOIS
INDIANA
IOWA
SOUTH DAKOTA
WYOMING
NEBRASKA
IDAHO
OREGON
UTAH
NEVADA
CALIFORNIA
ARIZONA
ALABAMA
Washington Co.
Pacific Gas Transmission Co.
Northern Border Pipeline Co.
Interstate Transmission Assoc.
Pacific Gas & Electric Co.
Southern California Pipeline
LOS ANGELES
Trans-Alaskan Oil Pipeline Route (TAPS)
Proposed Artic Gas Transmission System
Proposed El Paso Transmission System

A proposed alternative to the Arctic Gas proposal is the El Paso Transmission System proposed by a consortium of companies headed by El Paso Natural Gas Co. This system would have a gas pipeline closely paralleling the Trans-Alaska oil pipeline. At the southern terminus of the line, the gas would be converted to liquid natural gas (LNG) for shipment to California, where the LNG would be reconverted into gas and pumped into existing and new transcontinental pipelines. The pipeline for this system would be 809 miles long. There would be about 11 LNG ships constantly operating between Alaska and California.

Either gas transmission system (including the LNG ships for the El Paso proposal) would cost about $8 to 9 billion.

NUCLEAR ENERGY

A. The U.S. Situation

STATISTICS

During the first eight months of 1975 nuclear power capacity in the U.S. remained almost constant at about 34,000 net magawatts of electric power, which amounts to about 7½ percent of total U.S. electric utility capacity. The total number of plants either operating, under construction, or planned increased slightly from 235 to 241.

Actual electric power production by nuclear power plants amounted to 6.0% of total U.S. electric power production for 1974 and 8.3% during the first 7 months of 1975. The corresponding figures for 1972 and 1973 were 3.1% and 4.5%, respectively.

NUCLEAR PARKS

In accordance with Public Law 93-438 (the Energy Reorganization Act of 1974), the U.S. Nuclear Regulatory Commission has been carrying out an exhaustive study of nuclear parks, with its report due to Congress in January, 1976.

A nuclear park is a large expanse of land devoted to nuclear energy. Several types of nuclear parks are under discussion:

-- A "power-only" park would consist of 10 to 40 nuclear power plants producing 1200 megawatts each (about twice the size of the Duane Arnold Energy Center near Palo, Iowa). A park of this size would provide 2 to 8 times as much electric capacity as is currently used by the whole state of Iowa (including all types of electric power capacity, not just nuclear power). The park would occupy 19 to 75 square miles of land for the park itself and typically 40 to 250 square miles for its transmission corridors. It would use 130,000 to 530,000 gallons of water per minute for cooling purposes. The capital cost would be $8 to $40 billion.

-- A "fuel-cycle-only" park, or "integrated fuel cycle facility," would contain from 3 to 6 nuclear fuel reprocessing plants and 6 to 10 nuclear fuel fabrication plants, and perhaps some nuclear waste storage facilities. It would occupy 8 to 25 square miles of land. Its water usage would not be significant.

-- A combination park with both nuclear power plants (typically 40 such plants) and fuel cycle facilities. It would occupy 25 to 40 square miles of land, have transmission corridors taking 150 to 250 square miles of land, require 530,000 gallons of water per minute, and cost $30 to $40 billion.

The concept of a large power park could be extended to parks with coal-burning plants or a combination of coal-burning and nuclear plants, and is not restricted only to large nuclear parks.

It is a possibility that a site in Iowa could be chosen for a large energy park. Such a park would be sufficiently near to serve many large metropolitan areas, such as Des Moines, Chicago, Minneapolis, St. Louis, Kansas City, or Omaha-Council Bluffs. It would be in a region of sufficiently low population density to satisfy U.S. Nuclear Regulatory Commission rules and regulations for siting of nuclear facilities. Although Iowans think of farm land as valuable, land acquisition costs for a large energy park would probably be less than 1 percent of the total cost of the park; for example, a park of 80 square miles (51,200 acres) of farm land valued at $2000/acre would have land worth $100 million compared to a total park cost of $40 billion.

A large energy park would have enormous environmental effects. The water requirements, regardless of whether the plants were nuclear or coal-burning, would be a substantial portion of the water available to the state. The waste heat from the power plants would be a substantial perturbation on the weather in and near the park. The air quality near the energy park would have to be carefully monitored, as would the amount of radioactivity in the vicinity if nuclear plants were used.

RECOMMENDATION: THE ENERGY POLICY COUNCIL RECOMMENDS THAT THE STATE OF IOWA AFFIRM ITS AUTHORITY TO GIVE FINAL APPROVAL TO ANY PROPOSED SITE AND CONSTRUCTION OF AN ENERGY PARK WITHIN THE BORDERS OF THE STATE.

In view of the importance ~~to the State of Iowa~~ of ~~its~~ Iowa's agricultural land resources, serious environmental concerns, and ~~questions~~ uncertainties regarding trends in energy development, the Iowa Energy Policy Council believes that final authority to permit the installation of an energy park in the State should rest with state government rather than with any federal or regional agency. The Council recommends this authority rest with the Iowa State Commerce Commission in conjunction with the power plant siting authority as earlier recommended by the Council. ~~to be with the Commission.~~

B. NUCLEAR ENERGY IN IOWA

STATISTICS

At the beginning of 1974 there were two nuclear power plants supplying electricity to Iowa -- the Quad-Cities plants at Cordova, Illinois, which provides about 240 megawatts of capacity for use by Iowa customers of Iowa-Illinois Gas and Electric Co., and the Genoa Nuclear Generating Station of Dairyland Power Cooperative at Genoa, Wisconsin, which provides about 8 megawatts of electric power capacity to rural electric cooperatives in Iowa.

In 1974 two new nuclear power plants began serving Iowa -- the Duane Arnold Energy Center at Palo, Iowa, all of whose 550 megawatts are used in Iowa, and the Cooper Nuclear Station near Brownsville, Nebraska, which provides about 390 megawatts to Iowa customers of Iowa Power and Light Co.

For all of 1974 these nuclear power plants provided 23 percent of the electricity sold in Iowa, well above the national average of 6 percent. During the last quarter of 1974, when all four plants were in operation, nuclear electricity amounted to 45 percent of all the electricity sold in Iowa.

A variety of problems and shutdowns discussed later in this chapter reduced the percentage for 1975 from that experienced in late 1974. During the first nine months of 1975 the nuclear power plants supplied about 30% of the electricity sold in Iowa. (see Table xx).

Table xx. Net nuclear generation of electrical energy for use in Iowa. Data are in megawatt-hours.

	1974	1975 (9 months)
Duane Arnold	1,402,000 MWh	1,516,000
Cooper	943,000	1,586,000
Quad-Cities	1,188,000	723,000
Genoa	47,000	24,000
Total	3,580,000	3,849,000

CORE SPRAY SYSTEM INSPECTION

In early 1975 five small cracks were discovered in the pipe walls of two core spray water lines at Commonwealth Edison's Dresden No. 2 nuclear power plant in Illinois. The Nuclear Regulatory Commission ordered 23 licensed boiling water reactors throughout the country to shut down to check for possible similar cracks. The Duane Arnold Energy Center and the Cooper Nuclear Generating Station were both shut down for several days in February, but no cracks were found at either one. The Cooper plant was shut down 5½ days, during which time Iowa Power and Light Co., which purchases half the plant's output, was required to burn over 1.5 million gallons of fuel oil to produce electricity to replace the nuclear electricity; the added fuel cost was approximately $600,000.

VIBRATING RODS

In April 1975 the Nuclear Regulatory Commission ordered the Cooper Nuclear Generating Station to reduce its power and coolant flow to no more than 50% of previously authorized limits because monitoring results had shown vibrations in the reactor core. General Electric, manufacturer of the boiling water reactor used at Cooper, had determined that the flow of coolant water through bypass holes in the plate supporting the reactor core was causing instrument rods to vibrate and wear away and crack the channel boxes.

At the same time ten other boiling water reactors were ordered to study if vibrations were occurring in their plants. One of the ten was the Duane Arnold Energy Center, which found it had a similar problem and was likewise ordered to reduce its power.

After further investigation, General Electric decided it could fix the reactors by drilling new bypass holes in a different location. This was done at the Duane Arnold Energy Center during the summer of 1975 and at Cooper Nuclear Generating Station in the fall. The Cooper work will be a partial fix permitting operation at up to 85% of capacity, with a permanent fix permitting operation at 100% of capacity to be completed during the spring 1976 refueling shutdown.

COOPER NUCLEAR STATION LAWSUIT

A variety of mechanical and construction problems occurring at the Cooper Nuclear Station near Brownsville, Nebraska, led its owner, the Nebraska Public Power District (NPPD), to file a civil action seeking over $150 million in damages in U.S. District Court in Lincoln on September 26, 1975.

$25 million in damages are being sought from General Electric (the reactor manufacturer and the project manager for the plant design and construction) and from Burns & Roe (architect-engineer for the nuclear facility) for the restriction of plant capacity due to the incore vibration problem (see p. 412).

$15 million in damages are being sought from Westinghouse Electri Corp. (manufacturer of the turbine generator), Control Components, Inc. (subcontractor for the by-pass valve), and Burns & Roe for defects in the by-pass system.

$10 million in damages are sought from Burns & Roe for defects in the in-take structure drawing in cooling water from the Missouri River; the defects permit silt, stones, and other objects to pass into the plant and damage equipment.

Damages are sought from Ganeral Electric, Burns& Roe, and Chicago Bridge and Iron Co. (contractor for the reactor containment structure) regarding the design adequacy of the containment structure to meet Nuclear Regulatory Commission requirements for theoretical maximum load conditions.

$100 million are being sought from General Electric and Burns & Roe for improper engineering, construction, and project management, involving breach of warranty and negligence.

Iowa Power and Light Co. has a long-term (30-year) contract to purchase half the electrical output of the Cooper Station, so any recovery by NPPD in its lawsuit would reduce the total capital cost of the plant and result in a lower cost to Iowa Power for the energy purchased.

PLANS FOR A NEW NUCLEAR PLANT IN IOWA

On August 13, 1975, Iowa Power and Light Co., Associated Electric Cooperative (a Missouri corporation), and Central Iowa Power Cooperative, signed a Memorandum of Understanding to undertake jointly the construction of a nuclear power plant in central Iowa. Neither the site nor the exact size of the plant have been determined, but the size is expected to be approximately 1200 megawatts. The unit would go into service no earlier than May 1, 1984. The Memorandum replaces a previous memorandum between Iowa Power and Light Co. and Iowa Electric Light and Power Co.

Iowa Power and Light Co. has agreed to take between 400 and 450 megawatts of the new plant's capacity. Its cost for this portion is estimated at $400 million including interest costs and inflation; this corresponds to about $200 million in direct 1975 dollars.

C. NUCLEAR REPORT

During 1975 the Iowa Energy Policy Council made a special study of the nuclear energy issue. The result of this study was a report, Nuclear Energy: 1975, which was dated May 2, 1975. The initial drafts of the report were commented on extensively and were the subject of a public hearing in Des Moines on April 11.

The main recommendations of the Council with respect to nuclear power are given in the enclosed box. The complete report may be consulted for further information and discussion of the recommendations.

RECOMMENDATIONS

A. THE ENERGY POLICY COUNCIL OPPOSES THE IDEA OF A NUCLEAR POWER MORATORIUM IN IOWA.

B. THE ENERGY POLICY COUNCIL BELIEVES THE NUCLEAR POWER QUESTION IS ONE PART OF A LARGER ELECTRIC POWER QUESTION WHICH SHOULD BE THE SUBJECT OF ONGOING STATE RESEARCH AND ANALYSIS.

C. DECISIONS MADE REGARDING ANY MAJOR NEW ENERGY FACILITIES HAVE A SIGNIFICANT IMPACT ON THE PUBLIC INTEREST AND THE ENERGY POLICY COUNCIL AND ANY SUCCESSOR ENERGY POLICY AGENCY SHOULD TAKE AN ACTIVE PART IN SUCH DECISIONS.

D. THE POWERS OF THE IOWA STATE COMMERCE COMMISSION SHOULD BE EXPANDED TO REQUIRE THE APPROVAL OF THE COMMISSION FOR THE ESTABLISHMENT AND ERECTION OF MAJOR NEW ELECTRIC GENERATING FACILITIES.

E. THE ENERGY POLICY COUNCIL BELIEVES THAT THE NUCLEAR POWER PLANT QUESTION ALSO INVOLVES THE HANDLING, TRANSPORTATION, STORAGE, AND DISPOSAL OF NUCLEAR WASTES WHICH POSE PROBLEMS WHICH SHOULD BE ADDRESSED THROUGH THE APPROPRIATE FUNDING OF THE AUTHORITY GRANTED TO THE DEPARTMENT OF ENVIRONMENTAL QUALITY UNDER CHAPTER 455B, DIVISION IV, PART 2, OF THE CODE OF IOWA.

THE NATIONAL SOLAR ENERGY DEMONSTRATION PROGRAM

The U.S. Energy Research and Development Administration has announced plans to develop solar energy at a rate that will permit it to meet 7% of the nation's energy requirements by the year 2000 and 25% by the year 2020. ERDA's program has been detailed in its June 1975 publication, Definition Report for the National Solar Energy Research, Development and Demonstration Program.

ERDA's plans are in response to the Solar Energy Research, Development, and Demonstration Act of 1974 and other federal legislation with regard to solar energy. The agency points out that solar energy can contribute significantly to four of the national energy goals:

-- increasing the utilization of essentially inexhaustible domestic energy resources
-- efficiently transforming fuel resources into more desirable forms
-- transforming consumption patterns to improve energy utilization
-- protecting and enhancing the general health, safety, welfare and environment related to energy

ERDA is focusing on several promising areas, some of which will be demonstrated before 1980 and others which will be demonstrated by the mid-1980's.

The areas which are most advanced at present are solar energy for heating and cooling of buildings and the conversion of wind energy into electricity. (Wind is a result of the circulation of the atmosphere, which is powered by solar energy.) Several demonstration projects now exist for solar heating of buildings, and the combined heating and cooling of builidings will be demonstrated in the late 1970's. Wind energy conversion systems are now being constructed, and units up to one megawatt will be demonstrated in the next few years. Solar heat is also now being developed for agricultural and industrial purposes. In the agricultural area the main uses for solar energy will be for crop drying, heating animal shelters, and heating greenhouses.

By the late 1970's ERDA also expects to have pilot plants for producing fuels from biological materials such as agricultural wastes, logging by-products, and perhaps special crops raised for conversion into fuels. Fermentation processes will be used to produce methane and alcohol and pyrolysis will be used to produce gaseous fuels and oils.

By the mid-1980's ERDA expects to have a number of demonstration plants for converting solar energy into electricity. One type of plant will use photovoltaic cells ("solar cells") to convert solar radiation directly into electricity. Photovoltaic cells are now technically feasible but are too costly to use for this purpose. The emphasis of ERDA's research in this area will be to reduce the cost of growing crystals for solar cells by a factor of 40 so that power plants can be built at a cost of about $500 per peak kilowatt, comparable to the present cost of nuclear power plants. Another technology to be investigated is that of converting solar thermal energy into electricity using large solar collector areas. ERDA also plans to investigate using thermal energy from the oceans to produce electricity.

Overall, ERDA estimates that solar energy could provide 1% of U.S. energy needs by 1985, 7% by 2000, and 25% by 2020, the contributions by different methods being those shown in the accompanying table.

In its solar energy program ERDA expects to involve private industry very heavily at every stage. This will help ensure that the proper questions are being addressed and answered, and that market needs and constraints are taken into account.

Table . Estimates of the Energy and Fuels to be Supplied in the U.S. by Solar Energy. Source: U.S. Energy Research and Development Administration, Definition Report for the National Solar Energy Research, Development and Demonstration Program (June 1975), p. I-4.

	1985	2000	2020
DIRECT THERMAL APPLICATIONS (in units of Q=Quads=10^{15} Btu per year)			
Heating and Cooling	0.15Q	2.0 Q	15 Q
Agricultural Applications	0.03	0.6	3
Industrial Applications (Process Heat)	0.02	0.4	2
TOTAL	0.2 Q	3 Q	20 Q
FUELS FROM BIOMASS	0.5 Q	3 Q	10 Q
SOLAR ELECTRIC CAPACITY (in units of thousands of megawatts, GWe)			
Solar Thermal	0.05 GWe	20 GWe	70 GWe
Photovoltaic	0.1	30	80
Wind	1.0	20	60
Ocean Thermal	0.1	10	40
Total Electric Capability	1.3 GWe	80 GWe	250 GWe
Equivalent Fuel Energy*	0.07 Q	5 Q	15 Q
OVERALL ENERGY EQUIVALENT IN QUADS	~1Q	~10Q	~45Q
TOTAL PROJECTED U.S. ENERGY DEMAND	100 Q	150 Q	180 Q
ESTIMATED SOLAR FRACTION OF U.S. ENERGY DEMAND	1%	7%	25%

* Assuming a conventional electrical generation efficiency of 32%.

CAPITOL COMPLEX

The 1975 Iowa legislature provided funds for a solar energy demonstration project at the State Capitol Complex in Des Moines. This project is under the direction of Stanley L. McCausland, Director of the Department of General Services.

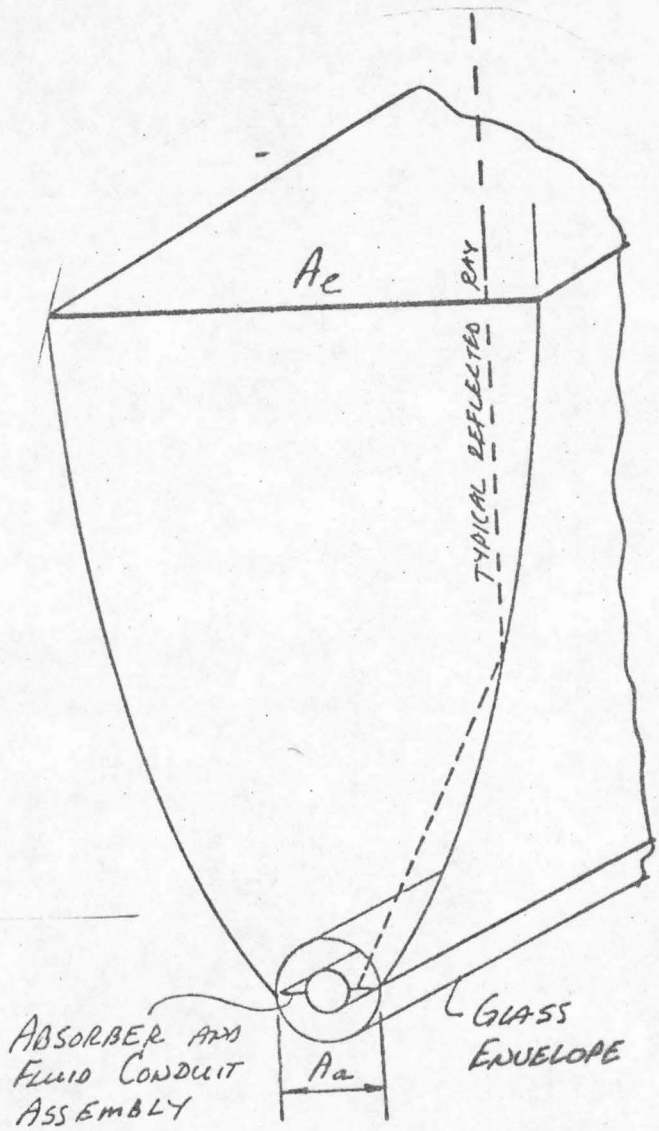
The purpose of the project is to demonstrate the feasibility of generating 100 pounds-per-square-inch steam using a new type of solar concentrator. The steam produced will be fed to the central power plant for the Capitol Complex and will augment the steam used for heating or absorption chillers.

Currently it is planned to install about 1000 square feet of concentrators on the south bluff beginning in late summer of 1976. Monitoring of the concentrator performance and field testing will begin in 1977 and continue for at least two years. From time to time existing units may be replaced by more technically advanced concentrators. Once a successfully-tested concentrator is chosen and available for mass production, at least several hundred thousand square feet of concentrators would be installed, enough to provide 25 to 50 percent of the energy requirements for the complex. It is not anticipated that there would be sufficient surplus energy to warrant the expense of a storage system; all the solar energy would represent a corresponding decrease in fossil fuel consumption at the Capitol.

The type of solar concentrator being proposed is a compound parabolic concentrating collector with an evacuated tubular absorber (see diagram). Each concentrator

will be 7-ft. to 10-ft. in length, approximately 10 inches deep and perhaps 10-inches high. The sun's rays are reflected and focused by the parabolic surfaces onto an absorber in the bottom of the trough. The absorber consists of two (2) concentric glass tubes. The inner tube contains the liquid heat transfer medium, Dowtherm J. Air is evacuated from the outer concentric space and this vacuum reduces heat loss by convection and conduction. The fluid medium will be heated to between 380°F and 400°F and pumped to a heat transfer unit where water will be converted to high-pressure steam.

The architectural firm of Brooks, Borg and Skiles are design engineers for this project, with Environmental Consulting Services, Inc. of Boulder, Colorado providing consulting back up.



The compound parabolic concentrating collector to be used at the Capitol Complex. Sunlight falling through the opening of width A_e is reflected down to an absorber of width A_a, providing concentration by a factor of A_e/A_a. This type of collector is known as the Winston collector after the high-energy physicist who invented it.

ELECTRICITY

STATISTICS

U.S.

For several decades the use of electricity in the U.S. has been doubling approximately every 10 years, which corresponds to a 7% annual growth rate. In 1974, as a consequence of the energy crisis, growth was almost nonexistent -- only 0.3%. Growth in 1975 has also been well below the historical average, only 1.9% during the first 8 months.

At present the distribution of sources of electricity is as follows (these refer to the first 8 months of 1975):

44.2% from coal
16.7% from hydroelectric dams
15.4% from oil
15.3% from natural gas
8.3% from nuclear power
0.1% from other minor sources (such as geothermal)

The trends in the sources of electricity are as follows: coal is increasing in use, as is nuclear; the use of oil and gas is decreasing, the former mainly due to its high price and the latter due to the increasing realization that natural gas is better reserved for other purposes. The total amount of natural gas used for electric power generation was 4.0 trillion cubic feet (about 1/5 of total U.S. use of natural gas) in 1972, but it declined 8.6% in 1973, another 5.7% in 1974, and during the first 7 months of 1975 declined 11.9% from the same period in 1974.

Iowa

During the early 1970's electric energy sales to Iowa consumers rose at an annual rate of 6 to 8 %. Actual increases were 7.8% in 1970, 6.1% in 1971, 8.5% in 1972, 7.1% in 1973, and 2.1% in 1974.

During the first 8 months of 1975 the sales of electricity by Iowa's major investor-owned utilities, which account for about 80% of the sales in Iowa, rose by 6.3%. The actual changes varied with the customers. Residential customers increased their usage 10.6%, commercial users increased their usage 11.2%, and industrial users decreased their usage by 1.4%.

Overall, then, the increases in sales of electricity in Iowa have exceeded the U.S. increases. The growth rate in Iowa in 1975 has been very close to the historical average, whereas the growth rate in the U.S. as a whole has been less than 1/3 the historical average. The increases in Iowa have come in the residential and commercial sectors, not the industrial sector.

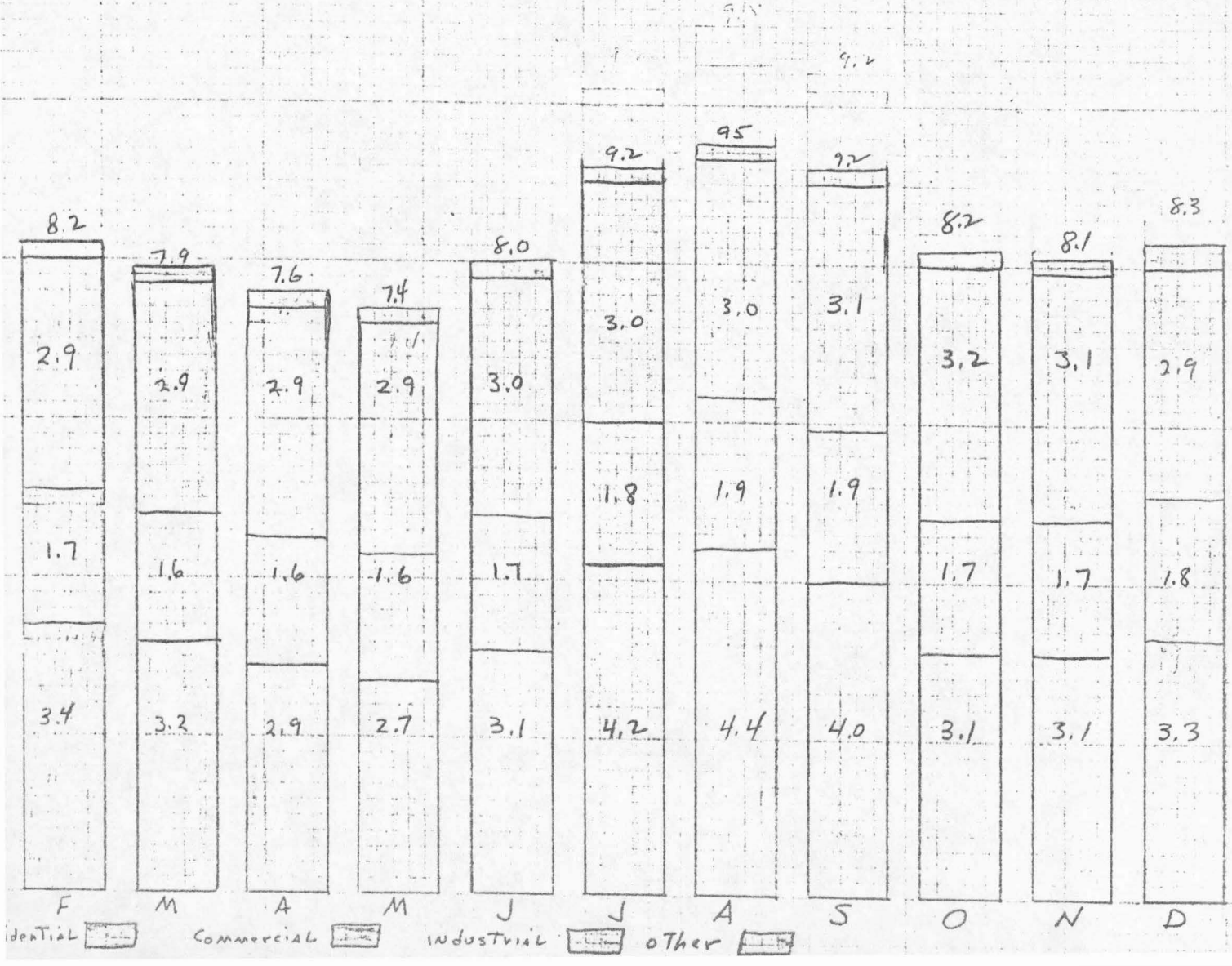
Table . Total sales of electricity in Iowa.

1969	14.36 billion kilowatt-hours
1970	15.48
1971	16.42
1972	17.82
1973	19.09
1974	19.50 (check this)

Table . Sales of electricity by major investor-owned utilities in 1974.

Residential customers	5.19 billion kWh	34%
Commercial customers	4.14	27%
Industrial customers	5.51	36%
Others (e.g., cities)	0.44	3%
Total	15.28	100%

Figure . The distribution of seasonal demand for electricity in Iowa (average for 1969-1974). The numbers refer to percentages of the total annual use; for example, residential usage in August averages 4.4% of the total annual use by all sectors.



ISCC UTILITY ADVERTISING ORDER

On January 23, 1975, the Iowa State Commerce Commission issued an order establishing rules and regulations on utility advertising and promotional practices. The order concluded the ISCC's year-long investigation into those practices, and was the result of three public hearings on the matter.

The order established that political, institutional, goodwill, and rate justification advertising by telephone, electric, and gas companies would be considered stockholders' expenses and not included in utility rates paid by the customers.

However, certain other types of advertising can be included in the rates. These are advertising activities which inform customers of (1) the reasons for and methods whereby energy may be conserved and energy consumption reduced by the customer, (2) the methods whereby customers can participate with the utility in preserving and improving the environment, (3) what customers should do in utilizing their utility service to protect their health and safety and to utilize their equipment safely and economically, (4) how to help the utility improve its load factor so that installed plant and equipment can be operated more efficiently. Reasonable advertising expenditures for the purpose of obtaining approval, modification, or revocation of franchises can also be included in utility rates.

ISCC STATEMENT OF INTENT IN THE MATTER OF PROPOSED CONSTRUCTION OF MAJOR UTILITY PLANT

On August 19, 1975, the Iowa State Commerce Commission (ISCC) issued a statement of intent to investigate and determine the prudence of any utility plant aggregating in excess of $250 million in Iowa intrastate rate base or equal liability therefore, before the utility reaches an irreversible state of planning or construction of such a utility plant.

ISCC said it would limit its investigations to its legitimate rate-making authority and not consider for nuclear plants such items as the law preempts for the U.S. Nuclear Regulatory Commission, such as environmental impact, radiation hazards, general safety, operation and construction considerations.

ISCC stated that it has the right to determine the prudence of investments by utilities and to allow or exclude such investments in the rate base or cost of service. However, it pointed out that an exclusion could harm a utility financially, or even bankrupt it, and that delaying a determination of prudence until after the plant was in service (and perhaps experiencing difficulties) was not justified.

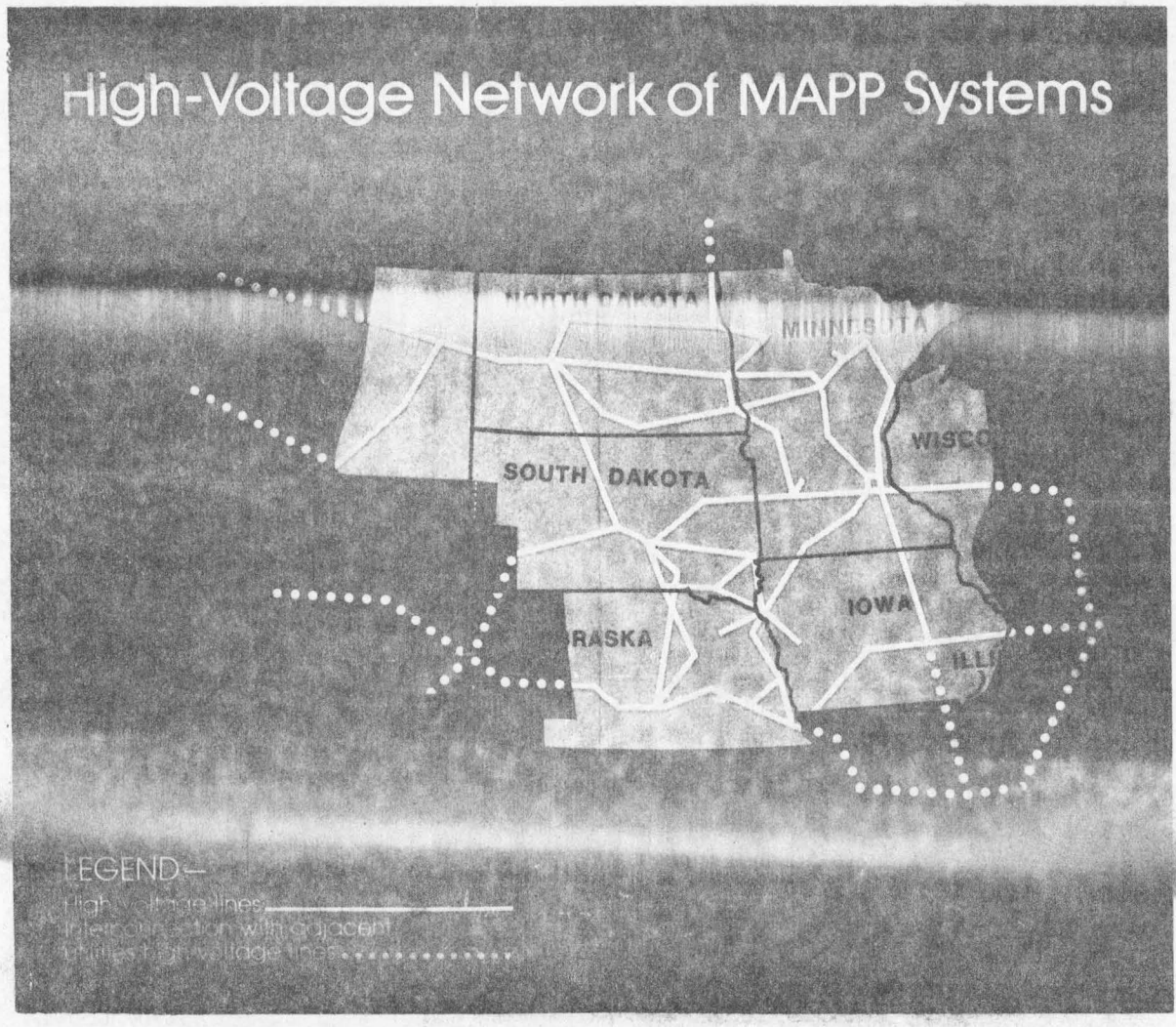
MARCA AND MAPP

An adequate and reliable bulk electric power supply involves several important factors. The capacity of the generating plants must be sufficient to ensure an ample supply. There must be fuels available to use at the generating plants. The transmission facilities must be adequate to carry the electric energy from the generating plant to the consumer.

Iowa utilities have joined two organizations which are concerned with these questions of adequacy and reliability. MARCA (Mid-Continent Area Reliability Agreement) is a council of interconnected utilities created to improve regional electric power supply reliability through coordinated planning of generation and transmission in the states of Iowa, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin, and adjacent areas. MARCA's primary goal is to achieve maximum reliability through the planning of new generation and transmission facilities of its member utilities.

MAPP (Mid-Continent Area Power Pool) has the objective of providing reliable and economical electric service to the customers of each member utility consistent with reasonable utilization of natural resources and with environmental effects. It is more concerned with the present situation, while MARCA is more concerned with planning for the future. However, the interests of the groups overlap considerably and meetings are often held simultaneously.

MAPP members include the U.S. Bureau of Reclamation, 12 investor-owned electric utilities (including the six major Iowa utilities), 11 municipal utilities (including Cedar Falls, Iowa), two public power districts in Nebraska, and seven rural electric cooperatives (including several serving Iowa).


High-Voltage Network of MAPP Systems
SOUTH DAKOTA
IOWA
LEGEND—

IOWA POWER AND LIGHT CO. LOAD MANAGEMENT PROGRAM

In an attempt to reduce electrical power laads during peak load operating periods, Iowa Power and Light Co. instituted a load management program during the summer of 1975.

Fifteen large electric customers elected to participate in the program, whereby they received a $3/kilowatt credit for the difference between their overall peak load and their peak demand during the load management periods. These periods were ten specific days on which Iowa Power projected high demands and notified the 15 customers that a load management period was in effect. Iowa Power hoped to reduce peak load requirements, which over the long term would mean a reduction in its electric capacity requirements and a corresponding reduction in capital investment.

Thirteen of the 15 customers obtained a credit because their peak loads for the year did not occur during a load management period. The credits totaled $10,563.

Railroad Assistance Program

During 1975, the Energy Policy Council saw the completion of a number of the branch line railroad assistance projects which it had funded at the end of 1974. The Rock Island branch line between Indianola and Carlisle was completed, in spite of substantial financial difficulty experienced by the Rock Island railroad which was forced to file for bankruptcy early in 1975. The Burlington Northern's branch line between Creston and Orient, Iowa also was improved. The 38.4 mile branch line between Ida Grove and Maple River was completed and had the first fifty car grain unit train carried over the line. Another Chicago and North Western Transportation Company rail line between Humboldt and Eagle Grove neared completion at the end of 1975 and was instrumental in allowing the coal purchase contract between the Iowa State Coal Research Project and the Corn Belt Power Cooperative. The Milwaukee railroad branch line between Spencer and Hearndon was the begun in late 1974 but in the spring of 1975 progress was slowed primarily due to a recession associated business slump of the railroad and inflationary costs. The Illinois Central Gulf railroad branch line between Mona Junction near Waterloo and the Minnesota border was nearly completed by the end of 1975.

The Energy Policy Council, with an additional appropriation of $3,000,000 for fiscal year 1976 approved a number of additional branchline improvement projects. The Milwaukee Spencer to Hearndon project was recast and supplemented with additional state participation. The entire 101 miles of this line is now scheduled for completed by the end of 1976. A number of Rock Island branch lines, totaling over 200 miles, were involved in the Council's largest coordinated assistance project to date. The Iowa Falls-Gateway project with a

total cost in excess of $10 million includes the branch lines from Palmer to Royal, from Iowa Falls to Estherville, and from Estherville to Rake. The Council also indicated support for a 44 mile project from Dows to Forest City, Iowa.

In September, 1975, the Energy Policy Council transferred the authority to dispense the remaining railroad assistance funds and to continue the administration of the program to the Department of Transportation, which had become fully operational on July 1, 1975.

The success of the railroad assistance program in Iowa has been viewed favorably by many other states throughout the nation as well as the federal government, as a way of effectively addressing this fundamental problem of our nation's transportation systems.

The chart indicates the Iowa Railroad Assistance Program ventures to date including those currently being considered by the Transportation Commission.

IOWA'S ENERGY EMERGENCY PLANNING

The Iowa Energy Policy Council staff is currently formulating an Iowa Energy Emergency Plan (IEEP); its purpose is to provide the Council and the governor with a number of graduated alternative procedures and measures for responding to energy resource shortages. An integral part of the Iowa Plan -- and any effective energy emergency plan -- is the incorporation of a formal procedure for anticipating and identifying an energy emergency. While the execution of these elements is simple in principle, it is difficult in practice. Comprehensive data are needed on supply, demand, and inventories from energy suppliers and distributors across the entire State. The success of the Plan, and ultimately the protection of the public against excessive hardship during an energy emergency, depends in large part on the responsiveness of these suppliers and distributors to our requests. The Council is well aware of the burden excessive paperwork places on the energy delivery sector and has been careful to request only those data absolutely essential to the functioning of the IEEP. Thus far, suppliers and distributors of energy have been most cooperative. We anticipate a continuation of that mutually beneficial relationship.

Provisions of the energy emergency plan are structured with a recognition that energy shortages have a potential to differ markedly in character. It is important to understand the nature of the shortage so that specific measures designed to alleviate a shortage correspond to specific energy resource areas.

By correlating the shortage with the contingency measure it should be possible to minimize the impact that implementation of various measures would have on the public health, safety, and general welfare of the populace.

The IEEP is based on a thorough knowledge of energy consumption patterns in Iowa. Information of this nature allows the impact of a particular fuel shortage to be associated with its users. By knowing end uses of short fuels one can select the appropriate areas of energy emergency conservation. An integral part of the Plan's approach is an analysis of the degree of flexibility in Iowa's end uses of energy, i.e., the degree of substitutibility of one energy form for another in serving a given end use.

The Energy Policy Council has undertaken the preparation of an IEEP as part of its statutory responsibility under Chapter 93, Section 8 of the Iowa Code (1975) which reads in pertinent part:

> . . .If the council by resolution determines the health, safety, or welfare of the people of this state is threatened by an actual or impending acute shortage of usable energy, it shall transmit the resolution to the governor together with its recommendation on the declaration of an emergency by the governor and recommended actions, if any, to be undertaken. Within thirty days of the date of the resolution, the governor may issue a proclamation of emergency which shall be filed with the secretary of state. The proclamation shall state the facts relied upon and the reasons for the proclamation.

The staff is currently developing specific responses to shortages. Pursuant to the proclamation of an emergency as authorized in Chapter 93, the governor by executive order may:

> 1. Regulate the operating hours of energy consuming instrumentalities of state government, political subdivisions, private institutions and business facilities to the extent the regulation is not hazardous or detrimental to the health, safety, or welfare of the people of this state. However, the governor shall have no authority to suspend, amend or nullify any service being provided by a public utility pursuant to an order or rule of a federal agency which has jurisdiction over the public utility.
>
> 2. Establish a system for the distribution and supply of energy. The system shall not include a coupon rationing program, unless the program is federally mandated.
>
> 3. Curtail public and private transportation utilizing energy sources. Curtailments may include measures designed to promote the use of car pools and mass transit systems.

It is apparent that a wide range of responses are available.

In addition to developing curtailment schemes the staff is investigating the possibility of regulating the allocation of scarce energy supplies which are not amenable to control through contingency measures. The area of fuel allocations is plagued with problems -- the determination of priorities for fuel consumption, monitoring schemes, and enforcement measures -- but may be necessary in the event of a severe shortage.

Implicit in the staff's efforts is the belief that the energy crisis will not disappear in the near future. The staff is therefore taking a careful, deliberate approach to energy emergency planning by attempting to select those measures which will have the least adverse impact on the public now and in the years to come.

ENERGY RESEARCH AND DEVELOPMENT PROGRAM

In its first annual report, Energy:1975, the Iowa Energy Policy Council made the following recommendation:

> "The state of Iowa should provide a fund for research and development into methods of improving Iowa's situation."

The Council stated that Iowa could benefit by research and development in such areas as energy conservation methods applicable to Iowa and in the use of the state's abundant renewable resources such as solar and wind energy and agricultural wastes. It recommended that state funding be directed at methods specifically suited for use in Iowa and that application for supplemental federal funding be encouraged. The Council pointed out that the state had already appropriated $3 million for the Iowa Coal Research Project at Iowa State University and another $3 million for the railroad branch line assistance program (both discussed elsewhere in this report).

During its 1975 session, the Iowa legislature passed, and Governor Ray signed, Senate File 289, which created an energy research and development fund within the IEPC and appropriated $250,000 to that fund for the fiscal year beginning July 1, 1975, and ending June 30, 1976. The act specified that "moneys deposited in the fund shall be used for the research and development of projects designated to improve Iowa's energy situation by developing improved methods of energy conservation, by enabling Iowans to better manage available energy resources, or through the increased development and use of Iowa's renewable or nonrenewable energy resources."

THE FIRST AWARDS

The IEPC began its energy research and development program even before passage of Senate File 289, using about $80,000 in unallocated funds made available by Federal Energy Administration

grants to the IEPC. The pilot program was announced in April 1975, with May 15, 1975 designated the deadline for receipt of proposals.

The IEPC stated that it was particularly interested in projects that were not being tried elsewhere, projects whose results could be developed and used fairly rapidly, projects that might foster the development of new industry in Iowa, and projects that might attract matching federal and private funds. The program was instituted because the Council felt that some of the usual sources for research and development funding might overlook ideas of particular benefit to the state.

A total of 34 proposals were received, 13 from the state universities, 8 from private firms, 6 from individuals, 5 from private colleges, and 2 from public interest groups. Seventeen persons assisted the IEPC by reviewing these proposals and providing comments about their technical or educational merit, the competence of the proposers, the reasonableness of the budget, and the importance of the proposed projects to Iowa.

At its July 7 meeting, the IEPC discussed the proposals and the reviewers' comments and voted to fund eight of the 34 proposals. The eight winning proposals were the following:

$14,867

- A proposal from James E. Woods, Assistant Professor of Mechanical Engineering and Architecture at Iowa State University in Ames, to investigate, both analytically and experimentally, methods of controlling the ventilation and air infiltration in state-owned or -operated buildings to minimize energy consumption while maintaining a safe and comfortable indoor air quality. The objective of the project is to reduce the energy for ventilation and infiltration by 50 to 60 percent, which might amount to 25 to 30 percent of the building's total heating and cooling load. The research could provide information to be used throughout the state for not only state buildings but also other buildings. Since the control of indoor air quality in buildings accounts for perhaps 30 percent of the total energy consumption in the U.S. (and a similar figure for Iowa), the energy savings possible are very large.

$14,644

- A proposal from Clifton D. Finney, who will set up a private research foundation, to develop an ultrafast anaerobic methane fuel system. The objective of the project is to test a concept of generating methane (the main constituent of natural gas) from wastes (such as agricultural or municipal wastes) at a very fast rate in order to reduce the costs of obtaining energy by this method. If successful, this would make it possible to use a new energy resource from Iowa agriculture. The funding is for the start of the project, which hopes to attract federal and private funding of several hundred thousand dollars.

$8245

- A proposal from John S. Neff, Associate Professor of Astronomy at the University of Iowa in Iowa City, to improve the present system of measuring direct, diffuse, and total solar radiation. The objective of the project is to develop a system involving solid state devices and related equipment so that accurate measurements can be made at low cost of the nature and amount of solar radiation at any given locality. Knowledge of the solar radiation is necessary in order to design solar systems to provide energy. The present methods are quite expensive. A successful conclusion to this research would benefit Iowa to a great extent, but the equipment would also be useful elsewhere. A marketable product could result from this project.

$17,000

- A proposal from Living History Farms Foundation, a nonprofit, educational, historical organization located in Des Moines, to design a Farm of the Future house incorporating energy conservation and solar energy plans, including a solar pond which traps solar heat during the summer for use during the winter. The objective of this project is to design a system for future rural Iowa houses which can then be built (with funds from private donations and federal grants) and serve as a demonstration on the Living History Farms site, which already has an 1840 Pioneer Farm and a 1900 Horse Farm. The construction of the solar pond will be the first such construction in the U.S. apart from small laboratory-sized ponds. A successful demonstration would encourage rural Iowans to begin making use of a renewable resource (solar energy) which the state has in abundance, relieving pressure on more traditional energy sources which need to be imported into the state.

$4260

- A proposal from David T. Nelson, Professor of Physics at Luther College in Decorah, to investigate the use of solar cells as a source of electrical power in Iowa. The objective of this project is to gain actual experience with the use of solar cells on a building in Iowa and determine the area of cells and amount of batteries necessary to satisfy the building's requirements. Federal programs are underway to develop much cheaper solar cells than are currently available, and it will be useful to the state to have information, when they are cheaper, to be able to judge their capabilities. This project develops data directly applicable to Iowa which cannot be accurately determined from data gathered elsewhere.

#2107

- A proposal from Dennis E. Barnaal, Professor of Physics at Luther College in Decorah, to monitor wind speed and solar insolation simultaneously at one site in Iowa for a period of two years. The objective of the project is to determine whether a combination of solar and wind energy systems would be a more desirable energy source, particularly for a farm, than either solar or wind energy alone. There are times when the wind is blowing but the sun isn't shining and vice versa, so that a combination system might be more reliable and require less battery storage of energy than a single system. The combination energy concept is a very promising one but has not been researched thoroughly anywhere in the U.S. to our knowledge.

#4000

- A proposal from George E. Knudson, Professor of Chemistry at Luther College, Decorah, to investigate the feasibility of production of methane gas on Iowa farms by electricity derived from wind or solar energy. The objective of the project is to test the efficiency of production of methane using electricity to generate hydrogen and pick up carbon dioxide from the air and to design prototype equipment that might carry out the process. If successful, such a process would provide an alternative to the storage of energy in the form of electrical charges in a storage battery.

#15,494

- A proposal from Eugene S. Takle, Assistant Professor of Meteorology at Iowa State University at Ames, to evaluate Iowa's wind resources for use as an energy source. The objective of the project is to obtain the basic information on the temporal (daily and seasonal) and spatial (by latitude, longitude, and height above the earth's surface) distribution of wind energy for the state of Iowa. This information is vitally important in order to assess the possible importance of wind generator systems in Iowa to supply electricity in amounts that are significant at current levels of electric power use. Much of the relevant information exists in the computer tape records of the National Weather Service, but the information is not in a directly usable form and requires extensive effort if the desired information is to be extracted.

THE SECOND AWARDS

After Senate File 289 was signed the Council announced that it would consider another group of proposals in the fall. The deadline for receipt of proposals in the second offering was October 1, 1975.

A total of 30 proposals were received, including 15 from the state universities, 10 from private firms, and 5 from private individuals.

ENERGY CONSERVATION

SECTION I - INTRODUCTION

The United States has 6 percent of the world's population but uses 30 percent of its energy, a fact that has not changed even after the 1973 oil embargo. Iowa continues to import 98 percent of its energy, in the face of above-normal rises in almost every area of energy consumption.

As our demand for energy increases and our supply diminishes, the costs and risks of an energy-enriched diet will become more apparent and more burdensome. A need is arising for us to evaluate our present life patterns.

This evaluation of our life patterns will require the adoption of an energy conservation ethic or philosophy which usually entails three distinct phases: the prevention of waste, change in technology, and decrease in demand.

One cannot deny that we have been privileged to experience many technological advances that have improved our energy perspective; however, most of the needed developments will mandate long lead times, require high capital investment costs, and may create new problems that we cannot foresee.

The new developments in technology that we have experienced must be supplemented by careful energy management aimed at the other two conservation ethic phases that promote the prevention of waste and the decrease in demand. Most people are willing to

readily prevent waste, but sometimes it is difficult to differentiate between waste and a sacrifice of decreased demand. Every entity can justify why the demand for their product should not be decreased -- they claim their product uses less energy than most, uses little energy, provides many jobs, requires little energy in production, stabilizes the economy, has become a necessity to many people, or is needed to maintain security.

Many of these arguments are justified and should be heeded. There should be efforts to make sure that no one sector of our economy is isolated and forced to sacrifice more then their share, but in order for us to make significant progress in energy conservation there will have to be some sacrifice made by all individuals and segments in society. It will require a particular finesse to make the decisions that will have to be made in the next few years to determine the proper combinations of incentive, restrictive, or educational methods that will be needed to implant the conservation ethic.

Only a very shortsighted person would consider immediate complete legislation or regulation to force conservation. Further studies are needed and interrelationships drawn on cost/benefit analyses, impacts on employment, effects of additional conservation improvements on the price of our products. and the relationship between the Gross National Product and energy conservation methods.

On the other side, however, voluntary compliance has not been working. In spite of many efforts, our consumption is still rising. The FEA reports that even required acts such as the 55 mph speed limit have found compliance only in Iowa and Kansas.

Even when the consumer is committed to compliance there are many questions involving the identification of waste, the period of recoupment on the capital investment of energy saving materials, and if the actions will be warranted or if the savings will be wasted elsewhere. The first two questions can be answered through dissemination of the proper information to the consumer, the third question may not be valid if one would consider the broad range of conservation activities of other states and other nations.

Most states and their governors have committed themselves to the conservation of energy and have instigated programming to legitimize that concern.

On the international scene, the International Energy Agency (IEA) reports that in energy conservation the U.S. ranked only 13th out of the 18 countries participating in that agency. Leading conserving countries are Great Britain and Sweden.

The Great Britain program stresses use of higher energy prices and gasoline taxes which add 25 percent to the cost of gasoline. Electricity rates have been changed to reflect more heavily on larger consumers.

Sweden is reducing energy growth from 45 percent to 2 percent until 1985 and then mandating zero energy growth by 1990. The government will fiancially support insulation of buildings, energy conserving industrial process up to 25 percent of cost, and energy saving appliances. New taxes on electricity and gasoline will raise prices 10 percent and 5 percent, respectively. The IEA's goal is to have the 18 countries import 6 percent less oil this year than in 1973.

The Office of Energy Preparedness claims that savings in the U.S. could equal 56% for transportation, 45% for the residential/commercial sector, 33-48% for the industrial sector, and 11% in electrical generation.

According to the projections made by the National Petroleum Council, in 1980, 18.5 million bbls. per day oil equivalent will be useful energy, and 23.0 will be rejected or lost:

8.3 electrical energy generation conversion losses
2.0 residential and commercial losses
3.2 industrial losses
9.3 transportation losses
0.2 miscellaneous

With these losses and possible savings in mind, Congress is considering several bills which may help to curtail some of this projected energy waste.

The Energy Conservation and Oil Policy Act, H.R. 7014 and S.622, requires the 500 most energy consumptive companies to make annual reports on their progress toward efficiency targets that the FEA would set for compliance by 1980. Secretary of Commerce would set energy efficiency standards for household appliances, and require manufacturers to disclose on labels and advertising, estimated annual operating costs and rate of energy consumption. The Act would require a minimum fleet average of cars manufactured to be 18 mph in 1978, 19 mph in 1979, 20 mph in 1980, and 27.5 mph in 1985.

H.R. 8650 includes conservation measures which include mandatory fuel economy standards for new cars and energy efficiency and labeling of major home appliances. The $150 million grant program has a target of 5 percent reduction in energy consumption by 1980. The legislation identifies these programs: Lighting and energy

efficiency standards for and restriction on the hours of public buildings; promotion of car pooling and van pooling and use of public transit; thermal efficiency and insulation requirements for new and remodeled buildings. Within federal guidelines, states could establish conservation programs tailored to local economic, geographic and weather conditions.

The energy package should be formally reported next week with floor action expected soon after.

As can be expected, these legislation measures will have an impact upon the activities and methods of Iowa's approach and responsibilities for the implementation of conservation programs. To date, the Iowa energy office has centered conservation activities to the identification and communication of conservation techniques through the means of media awareness, seminars and written materials.

The Council will still continue encouraging the methods that will improve energy situation at a total benefit to all people, businesses, and industry in the state of Iowa.

Before dicussing completely the programs implemented in Iowa it is essentialto discuss the energy conservation situation in Iowa's two major energy centers: of transportation and buildings.

SECTION II - TRANSPORTATION

In 1974, the transportation system in Iowa absorbed 232.1 trillion Btu's of motor gasoline, diesel fuel, railroad and aviation fuels. Automobiles, accounting for the greatest portion of energy consumed in the transportation sector, decremented 24.7% of our total energy use. With 1,497,497 registered autos in the State of Iowa in 1974 consuming 1,555,300,000 gallons of gasoline, it is not unreasonable to assume that an Iowa car travels an average of 10,000 miles per year and consumes a little over 1,000 gallons of gasoline. Figures that are consistent with national trends.

The problem of increasing gasoline consumption was conveyed to the public on November 9, 1973, when Governor Ray urged all Iowans to reduce driving speeds to 50 miles per hour (mph). Three days later, he made this speed limit mandatory for state government activities. Voluntary speed limitation for other Iowans was supported by a broad-based energy conservation campaign throughout the state. When the 55 mph speed limit became mandatory in February, 1974, Iowans has already been vonuntarily driving slower. These efforts resulted in a decrease in 1974 consumption over 1973 which broke a thirteen year trend of rising gasoline consumption. Statistics for 1975 from two EPC quarterly reports show a 2.4% decrease over 1974.

Figures compiled by the Traffic and Safety Division of the Iowa Department of Transportation substantiate this compliance, reporting that 1974 average daytime speed for all vehicles on primary highways was 54.4 mph and 56.9 for interstate highways, comparing with 1973 figures of 59.6 and 65.6 respectively. 1975 statistics have been comparable with those of 1974.

A side benefit of speed reductions has been a 16% drop in the total number of fatalities and a reduction of one-third on injuries, in spite of a 4% increase in motor vehicle registrations during 1974. A 1974 news release from the United States Department of Transportation indicated that Iowa was second only to Wyoming in increased enforcement of speed limits during a three-month recording period.

It would be hard to determine the actual reason for Iowa's continued gasoline consumption reduction, but it would probably be resolved to be a function of a compliance with the conservation ethic, the efforts of our public safety persons, and a validation of the concept of elasticity of fuel prices.

STEPS FOR REDUCING CONSUMPTION

Even though Iowa's record of a 23% decrease in the past two years breaking the tradition of higher consumption is commendable, it would be possible for Iowans to achieve at least a 50% savings of gasoline through the initiation of the following steps:

1. When purchasing a new car, give preference to lower weight vehicles. The weight of the vehicle is the single most important factor which affects fuel economy.

2. When selecting optional equipment, choose radial tires (reduce prolling resistance), cruise control, and manual transmissions.

3. Improve driving skills so that you will be able to maintain steady moderate speeds. As your speed increases so does the car's wind resistance. This accounts for a 21 % increase in mpg when reducing your speed from 70 mph to 55 mph.

4. Keep your car in good condition. AAA motor club tests show that even minor tune-ups and proper conditioning of the car can improve mileage by 10%.

5. Consolidate and reduce auto trips and start to carpool.

A UNIQUE FORM OF CARPOOLING

The van pool is a unique type of carpooling where the employer leases or purchases passenger vans for its commuting employees. All fixed and operating costs are covered by monthly fares charged to each commuter, exluding the driver-coordinator who rides free. Priority parking is generally available to "poolers." The van is available for use to the driver during weekends and charged a minimum for this benefit. Employers using this method notice a decrease in sick leave taken, a decrease in tardiness a reduction in the need for new parking lots, and find that the van pool is a good image maker for the company.

TRAFFIC FLOW

Another factor that greatly affects automobile and highway energy consumption efficiency is measures that will safely improve the flow of traffic such as allowing right turns on red lights and placing careful attention to the elimination of unnecessary stop signs.

The Auto Club of Missouri analyzed 44 stop signs on St. Louis main arteries and found 9 that were not necessary because they did not meet established criteria for the installation of a four-way stop on a major street; i.e., an accident experience of the type susceptible to correction by the installation of stop signs (five right-angle collisions within 12 months) or at least an average of 500 vehicles entering the intersection for a six-hour period, with at least 35% entering from the minor street, or 250 conflicting pedestrian movements during the hours when an average of 500 vehicles are entering the intersection.

Based on statistics prepared by the National Cooperative Highway Research Program (NCHRP) this would indicate that the stopping and starting maneuvers of 63,510,000 vehicles per year at these intersections are unnecessarily using more than 616,045 gallons of fuel, adding 219,742 hours to the travel time on these streets, and adding $640,402 to the consumer's cost of operating vehicles on these streets each year.

NEW TECHNOLOGY

A discussion of the automobile would not be complete without looking into the changes in technology that may occur in that field.

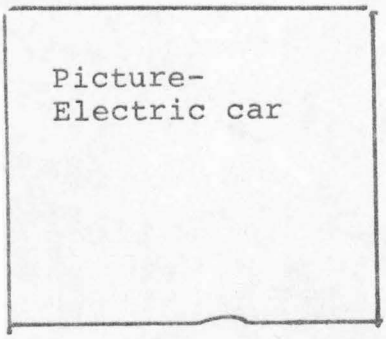
Electric cars are an area that research people are looking into as a possible means of saving petroleum. This is not a new idea, because in 1910 there were nearly 100 electric car manufacturers, but by the 1930's these cars had been replaced by their petroleum burning counterparts.

The main barrier that contributed to the demise of the electric car was the capacity of lead base batteries. To combat this, ERDA's Argonne National Laboratory engineers have been developing special

lithium-based battery cells which deliver up to five times the power and last up to 100 times longer. Performance and specification goals to be met by 1985 for commercially available electric cars include a 60 mph cruise speed, a 25-second acceleration from zero to 60 mph, a curb weight of 2,000 pounds, and a cost of around $6,000.

ERDA officials estimate that 18 million electric cars by the year 2000 would save about 740,000 barrels of oil per day. However, these savings are dependent on the fuel source for the electricity. If oil were used for the electric generation, little would be achieved.

Present electric vehicles can travel up to 35 mph for a distance of 30 miles with an overnight charge. They weight about 1100 pounds and cost approximately $3,000. The cost of electricity runs 1½ cents per mile, the battery depreciates at a rate of 1½ cents per mile, and the motor pollution emissions are zero.



MASS TRANSIT

The form of transportation that will accomplish the largest energy efficiency is a mass transit system. The potential benefits and impacts range well beyond convenience for riders and include a decrease in fuel consumption, pollution, and congestion.

A bus has the equivalency to 2.5 cars in congestion, 4.8 in polluting effects, and 2.4 in fuel consumption. In the past energy and pollution were not the parameters that were viewed as essential to the success of the mass transportation system.

The Urban Mass Transportation Administration cites important factors to a successful system are concentration of regular scheduels, notable origins and destinations, dedicated resourceful staff persons, reliable service, convenience, access, comfort, and no more than a 40% increase over comparable travel time with an automobile.

The Dial a Ride bus system being adopted in Ames utilizes smaller buses or vans. People call and the bus picks them up at their homes and takes them to their destination. Studies indicate that this system is not quite as cost-effective as other busing methods, and is more expensive to the rider, but its convenience and door-to-door delivery should encourage ridership. This system is especially accessible to handicapped and elderly persons.

Air Transportation

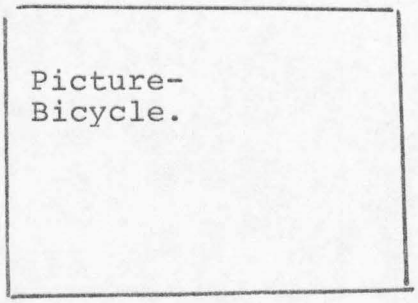
One mode of transportation that has been especially hard hit by the energy crunch, but still receives the smallest spotlight in energy conservation conversations is air travel.

Charles F. McErlean, vice chairman of the board of United Airlines, said that, "It is no exaggeration to say that unless something is done quickly to improve the fuel situation, the airlines could well go the way of the passenger railroads." United's fuel costs in

1975 were $393 million, which is a 102% increase over the fuel prices that existed in the oil embargo year of 1972. The airline's fuel prices for 1976 are expected to run more than $525 million, representing a 33⅓% increase over 1975 fuel costs.

In an effort to alleviate this problem, there is a ten-year National Aeronautics and Space Administration proposed program, costing $670 million, that is designed to increase aircraft fuel efficiency by 30% to 50% for a savings of 700,000 barrels per day. The proposed idea has received criticism from aircraft as well as federal energy officials, who state that much of the fuel economy could be achieved without expensive federal research funds devoted to air transportation which depletes only 3% of the total national energy supply, and .4% of Iowa's energy supply.

Although the industry may be able to realize some savings on its own through standardized flight time and cruise speeds, revisions in taxiing and fuel dumping procedures and increased load factors, airline representatives feel that many capital intensive energy savings devices would not be able to be purchased because of the financial problems of the airline industry.



Our most efficient transporting vehicle....

SECTION III - THE BUILDING ENVELOPE

Because our present building inventory is being replaced at the rate of only 2-3% per year, there is a need to place emphasis on conserving energy in our existing structures. A complete understanding of the interrelationships of specific systems which exist in a building must be taken into consideration when working on a conservation program that will ensure true conservation through maximized total system efficiency.

There are three types of energy systems in a building:

- Energized systems such as those providing heating, cooling, lighting and ventilation.

- Nonenergized systems such as floors, ceilings, walls, roof, windows (glazing).

- Human systems that provide needed operations, maintenance, management.

When considering these three systems it is important to weigh the factors that influence the building's energy picture.

INFILTRATION: The passage of outside air into the building through cracks. This infiltrated air must be heated or cooled to the temperature of the room. Sealing warm air leaks will reduce the loss of heat by air infiltration. This can be accomplished by putting weatherstripping around doors and windows and by caulking around small spaces. There is a one-eighth inch crack around a normal door, which is equivalent to an open area of 30 square inches. The heat lost through this area in one month would heat a home for one-half day. You can also put tarp or another covering around a foundation that would have air leaks. Also, warm draperies and rugs

can be used to stop drafts. Plug up leaks but still allow for adequate ventilation of heating system. If every household were caulked and weatherstripped, the equivalent of 580,000 barrels of home heating fuel could be saved each winter day, thus reducing chances of shortages in cold weather areas of the country.

TRANSMISSION: The amount of heat transmitted into the building or from it through the various components of the building envelope. Heat is conducted from an area of higher temperature to an area of lower temperature. Thus, during the heating season, indoor heat is transmitted through the walls to the exterior.

There are four types of heat transfer:

Radiation heat transfer: heat transmitted from warm objects to cooler objects. The sun radiates heat across space.

Convection heat transfer: removal of heat from a warm object by action or movement of air and water. This can be done through natural movement or aided by artificial means of fans or pumps.

Conduction heat transfer: transfer of heat from one end of a solid object to the other end. Materials that conduct heat slowly are heat insulators and reduce the amount of heat loss from a building.

Evaporation heat transfer: because it requires heat to change liquid to gas, a cooling action takes place when a liquid evaporates.

Insulation: a means of reducing heat transmission through walls, is measured in R-values which is the measure of the ability of a material to retard the flow of heat. The R-value is determined by dividing the "U" value into one. The U-value is the amount of heat, expressed in Btu's (British thermal unit: the amount of heat that will raise the temperature of 1 lb. of H_2O 1°F.) which will pass

through one square foot of wall, ceiling, or floor area per hour for each degree F. temperature difference between air on the inside and air on the outside. There are several types of insulating materials to choose from:

Blankets and batts: (Mineral wool, glass fiber, rock wool). Used for unfinished attic floors and rafters, underside of floor. Fire and moisture resistant. R-value 3.3 to 3.85 per inch. Mineral wool and fiber glass insulation are formed by melting rock, slag, or glass and extruding it into fine fibers, which are formed together with resins into tufts, batts, or blankets.

Rigid board: Extruded polystyrene bead board (expanded polystyrene), urethane board, glass fiber. Used for basement walls. Extruded polystyrene and urethane are their own vapor barrier. They are not fireproof and they do require professional installation. R-value 3.3 to 3.8 per inch.

Loose fill (poured-in): Glass fiber, rock wool, cellulosic fiber, vermiculite, perlite. Used for unfinished attic floor. Need separate vapor barrier, good for irregular spaces. Glass fiber and rock wool are fire and moisture resistant. Check cellulosic fiber to make sure it meets federal specifications on fireproofing. R-value: Cellulosic 3.7 to 4.15; vermiculite 2.9 per inch. Cellulose is made from a wood pulp, usually recycled paper that is chemically treated to be moisture and fire resistant. Perlite and vermiculite are expanded mineral materials.

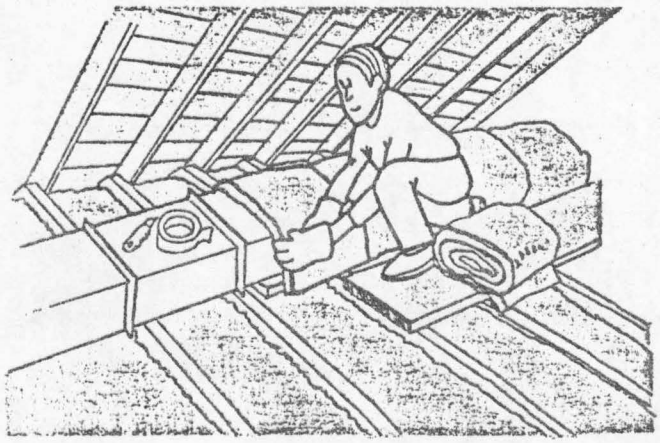
Loose fill (blown-in): Glass fiber, rock wool, cellulosic fiber. Used for unfinished attic floor, finished attic floor, finished frame walls, underside of floors. When any of these materials are blown into a closed space enough must be blown in to fill the whole space.

Ureaformaldehyde foam: Used for finished frame walls and unfinished attic floors. Moisture and fire resistant. R-value 5.0 to 6.25 per inch.

Urethane foam: Used for commercial buildings and for new structures. Moisture and fire resistant. R-value 6.25 to 7.2 per inch.

The higher the R-value, the better the insulating ability. Most sources recommend R-19 to R-30 for the ceiling and R- 1 for walls in this climate. R-values are determined by testing within the industry and are clearly marked on the insulation wrappings.

It is also advantageous to insulate heated basement areas (just the part of the wall that is above ground) and heating and air conditioning ducts that run exposed through unheated space.



If 15 million homes with inadequate attic insulation were upgraded, about 400,000 barrels of heating oil would be saved each winter day–

STORM DOORS AND WINDOWS: Any of the three types (plastic, single pan , or triple-track glass combination) are equally effective in reducing transmission of heat through windows and doors.

If the estimated 18 million single-family homes lacking this protection were so equipped, the Nation's fuel demand would drop the equivalent of 200,000 barrels each day of the winter season (enough to heat 1.6 million homes).

WINDOW GLAZING: Glass is a poor insulator. A well-insulated house has only 10% glass area.

Double glazed windows are simply windows constructed of two panes of glass with an air space between them. A double-glazed window with a one-half inch air space will cut your window heat loss in half.

Heat reflective glass also works well to intercept solar rays.

HEAT RECOVERY: Heat can be recovered from a variety of sources such as heating system exhaust air, heat producing machinery and equipment, furnaces, and lighting.

VENTILATION: The ventilation system provides a building with fresh air by exchanging inside air for outside air. During the heating season, unconditioned cold air is brought into the building while an equivalent volume of warm air is exhausted. The greater the difference between outside and inside temperature, the more energy will be consumed by the heating or cooling system to compensate for the heat gain or heat loss involved. Ventilation systems are more commonly developed for industrial structures; however, residential structures do incorporate the use of kitchen and bathroom ventilating fans.

LIGHTING: Contributes to heat gain in direct proportion to the wattage of the lamps involved. Lighting has the additional attribute of consuming energy as well as producing heat. Because lighting consumes additional energy, it is important to consider the efficiency when choosing lamps. This efficiency is measured by the light output (lumens) per electric power (watts). The higher the lumens/watts, the more efficient the lamp.


100-watt general service incandescent — 17.1-17.5 lumens/watt
100-watt extended service incandescent — 14.4-14.8 lumens/watt
24" cool white fluorescent — 50.5-65 lumens/watt
METAL HALIDE (HID) — usually used outdoors:
400-watt metal halide lamps — 75-85 lumens/watt
400-watt phosphor coated mercury — 50-56.3 lumens/watt
400-watt high pressure sodium lamps — 100-125 lumens/watt
In addition one might note that

Along with energy efficiency, it is important to consider the comfort and suitability the lighting has for the specific task.

Fluorescent lamps lose efficiency at their ends, so a U-shaped or a longer tube is more efficient.

The general service lamps are more efficient than the extended service lamps.

It is also essential to evaluate the footcandle requirements needed for a task area. A foot candle is a unit for measuring illumination. It is equal to the amount of direct light thrown by one candle on a square foot of surface every part of which is one foot away.

Task or area	Footcandle levels	How measured
Hallways or corridors	10 ± 5	Measured average, minimum 1 footcandle.
Work and circulation areas surrounding work stations	30 ± 5	Measured average.
Normal office work, such as reading and writing (on task only), store shelves, and general display areas	50 ± 10	Measured at work station.
Prolonged office work which is somewhat difficult visually (on task only)	75 ± 15	Measured at work station.
Prolonged office work which is visually difficult and critical in nature (on task only)	100 ± 20	Measured at work station.
Industrial tasks	ANSI-A11.1-1973	As maximum.

CLIMATE: Is a major factor in the need for heating and air-conditioning systems. Solar heat, a large determinant of climate, depends on the intensity and direction of the rays, materials which comprise the building envelope, the color and texture of exterior walls and roof, extent and type of solar controls, available shading.

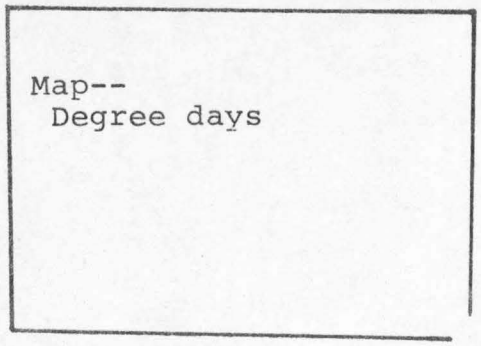
The term "degree days" has become a popular concept because it serves as a means of identifying different climatic zones and resulting weatherization needs.

Such areas as federal weatherization grants and building code requirements use the degree day zones as bases for determining their guidelines.

The concept of degree days is based on the George Segeler studies which found that steam for heating was not required when the mean daily temperature (the average of minimum and maximum outdoor air temperature for a 24-hour period) was 65^{o} F. or warmer. In addition, steam requirements increased proportionately as the mean daily temperature became lower.

The difference between 65 degrees and the mean daily temperature for any given day provides a degree day value. For example, if the mean daily temperature is 50^{o} F., the degree days are 65-50, or 15. Degree days are not counted for mean daily temperatures that are warmer than 65 degrees.

On December 8, 1975, Des Moines, Iowa, weather service had reported _____ degree days for the year for that area. This figure is a _____ percent decrease from the same period in 1974.



SYSTEMS: Contribute to heat gain because of motors or other elements that generate heat. Systems also account for additional electricity requirements of a building.

Temperature control: Thermostat settings will depend on a balance of all systems, but comfortable temperatures are 68° in the winter and 78° in the summer. It is estimated that each degree difference will save 3% of your fuel bill. Studies made at the University of Illinois indicate the 10 degree night thermostat reduction will achieve a fuel savings of between 0-15%, averaging 7%.

This setback is not recommended for very cold weather because of the long recovery period required to heat the house in the morning.

Mass metering: How people respond -- Midwest Research Institute worked on research into incremental energy usage in mass-metered apartments as opposed to single metered units and found an average of 22% higher usage in mass metering. The cost of conversion to single metering fluctuates highly but may not have cost-benefit unless the landlord's utility bills are extremely high. A Senator

from New Jersey has introduced a bill in Congress that will prohibit mass metering of residential space.

OCCUPANTS: Humans give heat to a room whenever the temperature around them is below 98.6° F. Humans also contribute to moisture content of air through perspiration and exhalation.

SECTION IV

Each method of conservation will require analysis to ensure that the program is reaching the audience for which it was intended, that through behavioral analysis the public would do what was intended, the environmental impacts, and the economic impacts of all sectors.

There are several measures for implanting conservation methods.

Incentives:

Tax rebates, credits, investment credit, rapid amortization

Weatherization programs, grants from the government, self-help projects

In December 1974, the Energy Policy Council allocated $19,999 to the State Office of Economic Opportunity for the temporary inexpensive winterization for housing of low-income Iowans. A total of 1,129 homes were winterized with plastic window and door coverings, duct tape, weatherstripping, and caulking to achieve an average net energy savings of 9.85 percent. The success and experience with this project was the impetus for the passage of the $90,000 State Winterization Program for administration is a similar manner.

The Community Service Act of 1974 authorized $493,000 to Iowa to continue winterization activities and help lessen the impact of the high cost of energy on low-income Iowans.

All three programs were administered through local community service agencies who will provide winterizing services and materials to citizens within 100-125% of the CSA income poverty guidelines, which are based on family size and income.

Actual recipients for the grants will be analyzed and chosen by Project Advisory Committees made up of 51% poor persons and including representatives of local government, resource agencies within the communities, representatives of local public utilities, and local fuel dealers.

Major emphasis will be placed on reducing air infiltration through minor home repairs, and the purchase and installation of weatherization materials.

S.F. 8650 would provide $55 million to the states each year for three years.

Restrictive:

Taxation

Prohibition

Efficiently labeling, point-of-purchase awareness

Fifty-seven major appliance manufacturers, accounting for 94% of the retail sales, have agreed to support a voluntary program by the Federal Commerce Department to reduce by 20% the energy consumption of new household appliances by 1980.

Proponents of this measure claim that 500,000 barrels of oil per day could be saved by 1985 and that some manufacturing retrofit, such as modifying insulation and lowering thermostat settings, will involve little cost.

Several organizations are now preparing reports and studies which will identify the additional energy costs of producing the new models, the economic impact of the loss of low-priced foreign market that would result if all models are upgraded, the additional retail costs of more efficient units and its resulting effect on consumer demand, the validity of the projected barrel savings, the total economic impact to business and the capital costs required for retooling.

It appears that at least 2 manufacturers are not waiting for the results of those studies, saw the voluntary program as a new business and marketing opportunity, and already have available new 1976 refrigerator and dishwasher that proport to consume only half of the energy of the 1975 models.

The new models are costlier, but consumers now have an opportunity to search for a more efficient product with incremental cost paid back to them through decreased energy bills.

energy
An Iowa building code may present a combination of restrictive and incentive methods.

The Iowa Building Code Commission, within the Office of Planning and Programming, is the state body in Iowa that has the responsibility of developing and enforcing a state-wide building code. The code that is enforced by the Commission applies to state-owned and operated structures, factory built structures such as mobile homes, and any Iowa city or county whose governing body has adopted a resolution or ordinance accepting the application of the Code. There are five cities and one county (Bremer) that have chosen to comply with the Code and 50 other Iowa communities that are considering the compliance. The Iowa Code as it is written and enforced now applies to standards on electrical, mechanical, and plumbing codes and requirements for easy access for handicapped persons. There are also descriptions on permits, inspection and powers of the building officials.

At various points in time there becomes a need for a revision or addition to the building code, as was in the case of the standards to make buildings more easily accessible to handicapped persons. A recent suggested addition to the Iowa building code is the ASHRAE 90-75 energy conservation standard.

ASHRAE 90-75, a document recently developed and approved by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, is the first national attempt at an energy conservation building code. The purpose of the ASHRAE 90-75 standard is to provide:

> "requirements (that) are directed toward the design of building envelopes with adequate thermal resistance and low air leakage, and toward the design and selection of mechanical, electrical and illumination systems and equipment which will (establish minimum standards for) the effective use of energy in new buildings."

One way that the Commission could adopt standards such as the ASHRAE would be adoption by reference if the national association of building officials would adopt the standard as part of their code; however, at that association's national convention in September, the ASHRAE standards were voted down because the officials felt that the standards were too "prescriptive", meaning that there would not be allowances for creativity or that there would be problems with interpretation.

Building standards are classified into three categories: prescriptive, component performance and performance. Prescriptive standards are specific and call for a specified requirement such as "put 6 inches of insulation in your attic." Performance standards are based on the desire for a specified performance with no specific method of compliance such as "the heat loss in your attic shall not exceed XBtu/sq. ft." Component performance standards specify performance for each component of the building rather than the building as a whole such as "the heat loss in your walls shall not exceed XBtu/sq. ft., the ceiling XBtu, the floor XBtu's, etc. The building officials who voted down the ASHRAE 90-75 were saying that the standards had too many specified requirements; however, section 10 of the ASHRAE does provide for variances of standards if you can prove that they will save more energy.

The ASHRAE standards could still be adopted by the Commission in spite of this vote. The Commission may go ahead and adopt the ASHRAE standards for state-owned buildings or they may advise legislation to require the ASHRAE 90-75 to be adopted statewide.

The American Institute of Architects supports the enactment of incentives rather than regulatory standards to encourage energy conservation in the built environment. The AIA proposes a tax incentive approach that, unlike design standards, would apply to new and existing buildings. The AIA proposal suggests that for the design and retrofitting of commercial buildings, there be a choice of an investment credit or rapid amoritizations for a percentage of the costs of the design, engineering, and construction services and equipment needed to achieve an energy efficient building. For the design and retrofitting of residential buildings, the AIA proposes a tax deduction for a percentage of the costs of the same services. The architects believe that the benefits of these incentive proposals would be to encourage the builder to pay the first cost expenses of energy efficient equipment. Many times the energy efficient equipment has to be purchased out of the builder's own pocket because it is hard to finance building materials that will not add on to the salable value of the property (i.e., will someone pay more for your building because it is well insulated?).

Promotion and Education:

It is one of the responsibilities of the Iowa Energy Council to educate the public on energy conservation methods. Many of the conservation programs sponsored by the Council identify this means of encouraging public acceptance of the conservation ethic.

Enforcement of Existing Policy:

Enforcement is one means of compliance to energy conservation methods. The only method that Iowa enforces is the 55 mph speed limit. (See transportation section)

CURRENT IOWA CONSERVATION PROGRAMS IN ENERGY.

1. **SPACE HEATING/COOLING**

   a. Weatherization Task Force. Develop information in insulation and other weatherizing measures and advise the Council on energy building standards.

   b. Thermal/Lighting Program. See below.

2. INDUSTRIAL CONSERVATION

   The most energy consumptive sector in Iowa is the industrial sector, so the Council is concerned with making technical advice available to this group and providing other positive incentives to encourage not only conservation among our present industries but encouragement for new industry to enter Iowa.

a. Commercial/Industrial Conservation Exposition. A statewide conference with mini-seminars on energy management programs for various industries and displays of energy conserving equipment and systems for industrial use.

b. Conservation Program for Large Industrial Natural Gas Users. Survey follow-up program of conservation assistance to large Iowa manufacturing companies affected by natural gas shortages.

c. Agricultural Energy Conservation Program. Development of information on energy efficiencies of alternative operation methods on farms with agricultural conservation program packets to extension services, agricultural government leaders, and individual farmers.

d. Energy Management Program for State Agencies. Provide ongoing computerized monitoring of energy use in all state agencies for the determination of measures to reduce consumption in areas where greatest savings can be achieved.

e. Thermal/Lighting Program. This FEA-sponsored program will utilize six regional seminars, a professionally developed energy audit, and student involvement to inform state educational institutions how to apply conservation techniques which work best for them.

3. CONSERVATION EDUCATION/AWARENESS

a. Media Programs. To inform the public through mass media techniques in the development of public service announcements, conservation and energy television programming is being developed in conjunction with Iowa State University Telecommunicative Arts Department.

b. Special Information. To provide specific information services, such as an energy conservation calendar, a complete guide to weatherization techniques, a weatherization display, etc., and make these materials available in a package to assist municipals in directing their residents on conservation techniques.

c. Energy Speakers' Bureau. Develop slide presentations and speaker guides on energy conservation, Iowa's energy outlook, and similar topics for use by Council and staff.

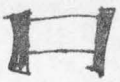
d. Regular Council Reports. To serve the public by providing energy conservation materials and information on proper energy conservation techniques through the

Iowa Energy Bulletin, the Council's quarterly and annual energy reports and the conservation section of the EPC library.

4. OTHER CONSERVATION PROGRAMS

a. Legislation. The Council is concerned that Iowans are not only provided with this information, but are also given legislative guidelines for action, such as efficiency labeling, tax incentives for insulation installation, and energy building code. Legislation like this is now being developed.

b. Research and Development. Through its energy research and development program, the Council will continue to give support to projects that show a potential for developing energy conservation techniques and energy saving devices.



STATEMENT OF PROBLEM

The State of Iowa and the nation are facing serious energy shortages now and in the years to come. The problems are myriad and many-faceted and the required solutions will be necessarily complex, yet steps can be taken now to begin to alleviate the near-term shortages and to lay the groundwork for the prevention of future shortages. Additionally, steps can be taken now to insure that the technologies and resources developed in the future can be readily and cheaply adapted to use by the citizens of the state.

Viewing the energy problem in its most rudimentary sense, one can separate it into two major components: over-consumption and under production.

Over-consumption: Whether we use energy for unnecessary tasks or in an inefficient manner, we water precious natural resources. Conservation efforts have been undertaken in an effort to slow our energy growth. But even so, evidence indicates that Iowa will be one per cent short of her energy needs within ten years, assuming that projected additional resources in fact become available. Therefore, additional conservation efforts are needed.

Reduction of consumption can take either of two forms--elimination of certain uses to which energy is put or more efficient utilization of energy resources to accomplish given objectives. Where possible, the second alternative is preferable since the resultant change in life-style is less affected. One area in which substantial savings

of energy can be realized with minimal effect on life-style is the area of building design and construction.

Of our total energy requirement approximately 30% is devoted to use in residential and commercial buildings for space heating, water heating, air conditioning, refrigeration and lighting. It has been estimated that adoption of energy conserving design practices in the construction of buildings could reduce the heating and cooling energy consumption of single family dwellings by 35%, high rise multi-family dwellings by 24% and commercial buildings by 32%. During the same ten year period that Iowa is predicted to fall one per cent short of her energy requirements, new construction will account for approximately 30% of existing residential units and 40% of all commercial space. The state can ill-afford to overlook this highly fertile ground in its efforts to conserve energy.

Under-production: The energy producing capabilites of our nation is being significantly undermined by the depletion of non-renewable fossil fuels. This is of particular concern in Iowa, since the state is so highly dependent upon natural gas, which is now considered the scarcest of the nonrenewables. the short-term answer is to conserve as much as possible. But when the supplies run out, will Iowans be prepared to adapt to existing alternatives or to new technologies and energy resources that become available?

This too appears to be an area where good design and construction practices are mandated. Building must be designed with a view toward energy resources and utilization techniques of the future. They

should be so constructed, where feasible, that changeover to new systems of space heating or cooling and water heating can be accomplished with a minimum of structural modification and expense.

PROPOSAL

Proposed is a state building energy code prescribing standards and requirements for the construction of buildings having provisions for heating or cooling systems or both, or hot water heating. The energy code would provide uniform standards applicable throughout the state promulgated and administered by a single state agency.

BENEFITS

1. Such standards would have an increasingly significant effect upon the conservation of energy as building constructed according to such standards begin to constitute an increasingly larger proportion of buildings within the state.

2. Such a conservation effort would have little or no effect on the life-style of Iowans.

3. Additional construction costs, if any, would pay for themselves as consumers would have reduced future energy needs.

4. Such standards would provide a continuing conservation device that does not depend upon voluntary compliance through crisis psychology.

5. Standards could be developed that would reduce reconstruction and remodeling costs should new energy resources and utilization techniques be required.

UNIFORM STANDARDS AT THE STATE LEVEL

The state level for promulgation of standards was selected for several reasons, with the primary reason being that the many local subdivisions of government could not be expected to develop the necessary expertise nor the broad focus necessary for the solution of problems which are national and regional in concern. Nor would local governments be adequately equipped to maintain the continuing dialogue with national or sister state organizations required to keep standards current with the state of the art. Additionally, multi-various standards within the state would result in gross inefficiencies for builders and manufacturers of construction materials. Furthermore, proposed Federal legislation would have an impact upon this decision. Senate Bill 594 introduced in the United States Senate on February 5,1975, provides in P 1005(9) that:

> No Federal officer or agency shall approve any financial assistance for the construction of any building in any area of a State unless the State has certified that the unit of general local government having jurisdiction over such area has adopted and is implementing a building code or similar requirement which provides for the enforcement of any effective energy conservation standard or standards promulgated pursuant to section 1004 of this title, or unless the State certifies that a State code on requirement providing for the enforcement of such standard or standards has been adopted and is being implemented on a statewide basis or within the area in which such building is to be located.

The process of initially certifying perhaps several hundred local city and county building codes would be an extremely burdensome task plus subsec. (d) of P 1005 would require periodic updating of the certifications.

Finally, the proposed federal legislation would make grants and technical assistance available to the states to assist in meeting

the costs of developing state building codes. Such could be more effectively utilized at the state level by eliminating the duplication of effort that would be created by numerous local governments accomplishing the same tasks.

A SINGLE ADMINISTRATIVE AGENCY

The nature of the promulgation and enforcement of a building energy code is such that an administrative body is best suited to the task. An agency can provide a repository of expertise for the effective administration of a technical and comprehensive code.

A permanent body is needed to maintain a forum for dialogue with appropriate groups within and without the state to insure that standards are kept up to date, that advances in technology are anticipated, and that the feasibility of particular standards and requirements are continuously monitored in terms of necessity versus added costs of construction.

Since the proposal envisions standards formulated to the extent possible in terms of performance objectives, rather then specifications, there must be a body to determine whether design and construction proposals, in face, meet the required objectives. Similarly, since the proposal provides for local and individual variances, there must be a body in existence to act upon requests for variances.

The proposal calls for, and proposed Federal legislation would require, effective enforcement of the energy code. This also indicates the need for a continuing body.

STATE BUILDING CODE COMMISSIONER

The proposed act would utilize the office of the state building code commissioner created by Chapter 103A of the Code of Iowa as the agency responsible for the promulgation and administration of the energy code. The use of the term agency does not imply reorganizing the office into a separate administrative entity, but is used in the broader sense as indicative of a continuing body or office responsible for the administration of the act.

The state building code commissioner's office was selected for several reasons:

1. The commissioner, his staff, the advisory council and the board of review are already in existence.
2. Rules and procedures for the administration and enforcement of the state building code, the mechanics of which are similar to those of the proposed energy code, are already in effect.
3. The office of the state building code commissioner provides a readily available source of construction related technical expertise.
4. Energy code provisions could be more easily coordinated, where necessary, with present building code requirements.

ENERGY CODE PROVISIONS--COMMENTS

1. The state building energy code act was drafted with a view toward its becoming a separate chapter of the Code of Iowa, presumably Chapter 103B. To draft the proposal as an amendment to Chapter 103A

would create needless confusion. The state building code under Chapter 103A is applicable only to state buildings, factory-built structures and in those local jurisdictions which adopt it, while the scope of the energy code is statewide and the enforcement of it varies somewhat from that of the state building code.

2. Since the primary purpose of the act is to conserve energy, it was made applicable to all buildings having a heating or air-conditioning system, or both, or provisions for hot water heating. This definition also comparts with the proposed federal legislation. However, this does not presuppose that all buildings regardless of use or occupancy will be subject to identical standards. The proposal would allow for subclassifications of buildings, and where necessary, separate standards according to the intended use, energy requirements and cost analysis for the type of building in question.

3. The comprehensiveness of standards and requirements promulgated under the act will be dependent upon the state of the art and the research and verification done by various state, federal and building industrial organizations. It is contemplated that thermal standards, for example, could be adopted currently as part of the energy code. However, the Act is broad enough to allow for the inclusion of additional energy related standards commensurate with needs and the availability of technological and cost analysis data. In addition, the Act would allow for requirements that buildings be easily modified to accommodate new energy resources and utilization techniques as they become available.

For example, if the prospect of solar water heating becomes accurately predictable and the costs are justified, a requirement could be levied that each building be constructed with an easily accessible water pipe routed through the attic or ceiling to minimize reconstruction costs when the changeover is made.

4. The certification of factory-built structures, including mobile homes and pre-fabricated units, would be accomplished in the same manner as under Chapter 103A, since all factory-builts are presently governed by the state building code and procedures are already in existence for such certification.

5. However, the enforcement of the energy code as to other buildings and as to the installation of factory-builts would be delegated to local enforcement agencies under a procedure formulated by the state building code commissioner. This procedure would utilize, to the extent possible, already existing local enforcement personnel and the familiar permit and certification system. In those local jurisdictions not having a building code or permit system, local enforcement agencies would have to be created. Interim procedures and a training program have been authorized to aid in this transition.

SUGGESTED RELATED AMENDMENTS TO THE CODE OF IOWA

Section 93.2--To include the state building code commissioner as an ex-officio member of the Energy Policy Council.

Section 332.2 (22)--To authorize counties to enforce the energy code as to all applicable buildings including farm structures which fit the energy code definition of building.

Section 103A, S--To add a subsection (S) to include in the duties of the commissioner the administration and enforcement of the provisions of Chapter 103A.

Sections 103A, 9, A, 14, A, 16--To include cross-references where applicable to the state building energy code.

Section 1. Short title. This act my be cited as the "State Building Energy Code Act."

Section 2. Legislative Findings and Intent. It is found and declared that energy shortages have existed and will continue to exist in this State. These shortages affect the continued operation of our educational system, our health care facilities, our businesses and industries as well as our individual homes. Heretofore, energy conservation standards for the design and construction of buildings have neither been developed nor applied within the State, resulting in waste of our scarce energy resources through inefficient building practices. It is the intent of the Legislature, by this Act, to protect the health and welfare of the people of the State and to assure a continuous supply of energy for future generations by mandating that reasonable energy conservation techniques be used in all areas of building design and construction. In order to insure efficient and timely utilization of new and improved technology, techniques, methods and materials, it is necessary that uniform statewide standards be developed and applied.

The Legislature intends that the administration and enforcement of this Act shall be within the jurisdiction of a single administrative agency responsible for the promulgation of uniform energy-related building requirements and standards having statewide applicability.

Section 3. Definitions. Whenever used or referred to in this Act, the terms defined herein have the meanings assigned to them unless a different meaning is clearly indicated by the context:

1. "Commissioner" means the state building code commissioner created by Chapter 103A.

2. "Council" or "advisory council" means the state building code advisory council created by Chapter 103A.

3. "Board of review" or "board" means the state building code board of review created by Chapter 103A.

4. "Code" or "energy code" means the state building energy code, provided in section 7.

5. "Building" means any combination of materials whether portable or fixed, which comprises a structure affording facilities or shelter for any use or occupancy and which includes provisions for a heating or cooling system, or both, or a hot water system. The word "building" shall be construed whenever used herein as if followed by the words "or part or parts thereof and all equipment therein" unless the context clearly requires a different meaning. The term "building" shall include mobile homes and factory-built structures.

6. "Construction" means the erection, fabrication, reconstruction, demolition, alteration, conversion or repair of a building, or the installation of equipment therein.

7. "Equipment" means facilities or installations, including, but not limited to plumbing, heating, electrical, ventilatry, air conditioning, lighting, refrigerating facilities or installations, and elevators, dumbwaiters, escalators, boilers and pressure valves.

8. "Factory-built structure" means any structure which is, wholly

or in substantial part, made, fabricated, formed or assembled in manufacturing facilities for installation or assembly and installation on a building site.

9. "Manufacturing" is the process of making, fabricating, constructing, forming or assembling a product from raw, unfinished, or semi-finished materials.

10. "Installation of factory-built structures" means the assembly on site and the process of affixing factory-built structures to land, a foundation, boatings, or an existing building.

11. "Local enforcement agency" means the agency or agencies of local government with authority to issue or revoke energy code permits and licenses, make inspections and to otherwise enforce the provision of this Act.

12. "Local government" means any county, city, municipal corporation, town, or other political subdivision of this State.

13. "Performance objective" means design and engineering criteria without reference to specific methods of construction.

14. "Specification" means detailed requirements for design, construction, or installation of buildings.

Section 4. Commissioner. The state building energy code commissioner is the commissioner created by Chapter 103A.

Section 5. Commissioner--Duties and Powers. The commissioner shall:

1. Employ the necessary staff and assistants, within the limit of available funds, to assist in carrying out the provisions of this chapter.

2. Continually study the operation of the state building energy

code and other laws relating to the construction of buildings to ascertain their effect upon the cost of building construction and determine the effectiveness of their provisions.

3. Do all things necessary or desirable to further and effectuate the general purposes of specific objectives of this chapter.

The commissioner may:

1. Require or provide for the testing of materials, devices and methods of construction.

2. Appoint experts, soncultants, technical advisors, and advisory committees for assistance and recommendations relative to the formulation of the state building energy code.

Section 6. Advisory Council. The state building energy code advisory council is that advisory council created by Chapter 103A. In addition to the duties and organizational rules prescribed by section 103A.14, which shall also be binding under this chapter, the advisory council shall:

1. Advise and confer with the commissioner in matters relating to the state building energy code.

2. Approve or disapprove the promulgation amendment or repeal of the rules and regulations referred to in section 2, and shall approve or disapprove any local or individual variances permitted by section 11. A majority vote of the council membership shall be required by these functions.

Section 7. State building energy code. The state building code commissioner with the approval of the advisory council is hereby enpowered and directed to formulate and adapt from time to time amend or revise and to promulgate, in conformity with and subject to the

conditions set forth in this chapter, reasonable rules and regulations designed to establish minimum prescriptive energy conservation and utilization standards for the design, construction, manufacture and installation of buildings to conserve energy resources and to insure adaptability of buildings to future energy resources and energy utilization techniques in order to protect the health and welfare of the citizens of the state.

The rules and regulations shall include reasonable provisions for the following:

1. Energy related standards and requirements for the design, construction, manufacture and installation of buildings.

2. Energy related standards and requirements for materials and equipment to be used in buildings.

3. Certification of use or occupancy of buildings.

4. The issuance and revocation of energy code permits or licenses for buildings.

5. Inspection of buildings to insure compliance with energy related standards and requirements.

6. The procedure whereby local government agencies may be authorized to issue or revoke permits and licenses, make inspection and to otherwise enforce the provisions of the Act.

7. The establishment of a schedule of fees for the function performed by the agency in connection with the administration and enforcement of this Act.

These rules and regulations shall comprise and be known as the State Building Energy Code.

Section 8. Standards. The state building energy code shall as far as practical:

1. Provide uniform energy conservation and utilization standards and requirements for building design, construction, manufacture, installation, materials and equipment through the adoption of applicable national codes or standards where appropriate and provide exceptions when necessary. The rules and regulations adapted shall include provisions, adjusted for local conditions, reasonably consistent with or identical to recognized and accepted standards contained in performance criteria as developed by nationally recognized model codes on standards such as those prepared by the United States Departments of Commerce and Housing and Urban Development, the National bureau of Standards, the Federal Energy Administration, The Federal Housing Authority, the American Society of Heating, Refrigerating and Air Conditiong Engineers and the National Conference of States on Bui lding Codes and Standards.

2. Establish energy related standards and requirements in terms of performance objectives, in so far as practical, to encourage the use of new technologies, techniques, and materials

3. Encourage the standardization of construction practices, methods, equipment, materials and techniques by providing standards reasonably consistent with the standards developed by other states.

4. Provide rules and regulations current with the state of the unit which do not unnecessarily retard the use of new materials, technologies or techniques.

5. Provide rules and regulations which do not unnecessarily increase

construction costs when measured against the benefits to be derived by the public.

Section 9. Scope. Except as herein provided, the state building energy code shall be applicable to all buildings constructed, manufactured, or installed within the state and shall constitute a lawful code binding upon all state boards, departments, commissions and agencies, and upon all local governments. The code shall not apply to factory-built structures manufactured in Iowa for installation outside the state.

Section 10. Implementation. Until 180 days after adoption of the state building energy code, energy related building regulations adopted by a local government shall continue in effect unless repealed. Thereafter, such regulations adopted by a local government shall be void and of no effect. A building permit validly issued pursuant to local building regulations within 180 days after adoption of the state building energy code is valid thereafter and the construction of a building or installation may be completed pursuant to and in accordance with the permit. In areas of the state having no building regulations, or not requiring building permits, the construction or installation of a building begun prior to the adoption of the state building energy code may be completed without a state energy code permit.

Until 180 days after adoption of the state building energy code, energy related building regulations promulgated by any state board, department, commission , or agency shall continue in effect unless repealed. Thereafter, such regulations shall be void and of no effect.

Factory-built structures manufactured in Iowa for installation within

the state, except those structures which manufacture was begun prior to adoption of the state building energy code, must comply with the provisions of the energy code.

Except as otherwise provided herein no building may be constructed, installed or manufactured within the state unless in compliance with the provisions of the state building energy code.

Section II. Local And Individual Variations. A local government or enforcement agency may propose to the commissioner variations in the state building energy code, for application within its jurisdiction, to accommodate local conditions requiring special or different building standards. The commissioner with the approval of the advisory council shall adopt such variation (s) if it is established to the council's satisfaction that:

1. The proposed variation is sufficiently consistent with the state building energy code so that its application will not substantially reduce statewide uniformity of building standards and requirements;

2. The proposed variation does not unnecessarily discriminate against particular technologies, techniques or materials;

3. The proposed variation does not unnecessarily increase the cost of construction in the jurisdiction; and

4. The proposed variation is necessary to protect the public health, safety, and walfare within the jurisdiction.

In addition, the commissioner with the approval of the advisory council may decide, upon application by a private party or local government, that new technologies, techniques and materials which have been

tested, when necessary, and found to meet the objectives of the state building energy code, shall be deemed to meet that code. These determinations are binding upon all local enforcement agencies throughout the state.

Section 12. Enforcement and Administration.

1. The enforcement of the state building energy code as it relates to the manufacture and design of factory-built structures shall be as provided in Chapter 103A and the rules and regulations promulgated there under, except that energy code provisions relating to the installation of factory-built structures shall be enforced by the local enforcement agency in all local government subdivisions.

2. Except as otherwise provided, responsibility for the enforcement of the state building energy code shall be delegated to local governments in accordance with such reasonable rules and regulations as the commissioner shall provide and the council shall approve. In so far as practical, existing local agencies and procedures for the enforcement of other building codes shall be utilized.

3. Within 180 days after adoption of the energy code, local governments shall create, when necessary, a local enforcement agency and shall employ and designate a building official as well as any code enforcement officers deemed necessary to assist the enforcement agency in carrying out its prescribed functions. The administrative chief of the local enforcement agency shall be called the "building official" and any additional local inspectors shall be called "code enforcement officers".

4. Local enforcement agencies shall be responsible for the examination and approval of disapproval of plans and specifications, the issuance and revocation of energy code permits, licenses, certificates of similar documents, and the inspection of buildings pursuant to the provisions of the state building energy code.

5. If a local government is not carrying out the foregoing provisions of this section, the commissioner shall perform those functions in that jurisdiction until the local government has created the necessary enforcement agency.

6. Within 180 days after adoption of the energy code local governments shall appoint local appeals boards to hear appeals brought in accordance with section 16(2) of this Act. Until the boards are established, appeals shall be made directly to the state board of review. A sufficient number of persons shall be appointed to allow appeals to be heard promptly by panels of three members, all of whom shall be free of conflicts of interest in the cases before them. A local government shall be relieved of the duty to appoint a local appeals board if it establishes to the satisfaction of the advisory council that a sufficient number of qualified persons cannot be found in the jurisdiction or through cooperation with neighboring jurisdictions.

7. Two or more local governments may establish a local enforcement agency and a local appeals board to serve their jurisdictions, and in this event they shall share the expenses incurred.

8. The commissioner may, upon request, assist a local enforcement agency in such matters as technical assistance, energy code interpre-

tation, education, training, personnel, and information collection and dissemination.

Section 13. Permits and Certificates--Issuance.

1. Except as otherwise provided in this Act, the construction or installation of a building shall not begin until an energy code permit is issued. Upon submission of an application to a local enforcement agency, if the building proposed to be erected or installed will comply with the state building energy code, a permit will be issued. A local enforcement agency may suspend or revoke a building permit if the building under construction or being installed pursuant thereto does not comply with the energy code.

2. A local enforcement agency will periodically inspect all construction and installation undertaken pursuant to permits issued by that agency to assure compliance with this Act and the state building energy code. The applicant for a permit for a building under construction or being installed is deemed to have consented to inspection by a local enforcement agency or by state enforcement officials by the act of applying for such a permit. If a building is found not to comply with the energy code, the local enforcement agency shall notify the permittee in writing to bring the building into compliance with the code, or to secure it from entry, or both. If the permittee fails to comply with the notification, the local enforcement agency shall revoke the permit.

3. No building constructed or installed after the effective date of the state building energy code, for which an energy code permit is

required, shall be used or occupied until a certificate of occupancy to a local enforcement agency, a certificate of occupancy shall be issued, if the building to which such application pertains has been constructed or installed in accordance with the building permit, the state building energy code, and other applicable laws and ordinances.

Section 14. Rules--public hearing. The procedures for the promulgation of rules and regulations and for providing for public hearings shall be those procedures established in Chapter 103A.

Section 15. Board of Review. The board of review is the state building code board of review created by Chapter 103A.

Section 16. Board of Review--Appeals.

1. The board of review shall promptly hear and decide appeals brought by any person or party in an individual capacity, or on behalf of a class of persons or parties, affected by any rule, regulation, or decision pursuant to this Act.

2. Prior to appeal to the board of review, appeals of decisions or meeting of a local enforcement agency shall be heard by the appropriate local appeals board. If there is no local appeals board for the jurisdiction, appeals shall be taken directly to the board of review.

Section 17. Board of review--procedures.

The procedures for appeal shall be those procedures established by Chapter 103A.

Section 18. Judicial review. Judicial review may be sought in accordance with the Iowa administrative procedure act and the provisions of Chapter 103A.

Section 9. Training Programs.

1. The commissioner may conduct or sponsor pre-entry and in-service education and training programs on the technical, legal and administrative aspects of the energy code administration and enforcement. For this purpose it may cooperate and contract with educational institutions, local, regional, state or national building officials' organizations, and any other appropriate organization.

2. The commissioner may reimburse code enforcement officers and other employees of the State and its subdivisions for related expenses incurred by them for attendance at in-service training programs approved by the department.

3. In the establishment and administration of education and training programs, the commissioner shall consult and cooperate with the state code enforcement officers registration board, or appropriate agency charged with such registration in order to facilitate the acceptance of these programs as meeting requirement for registration as a code enforcement officer.

Section 20. Fees. The commissioner with the approval of the council may establish a schedule of fees for the functions performed by the agency in connection with the administration and enforcement of this Act. Such schedule shall be published in the state building energy code. The amount of the fees shall be based, to the extent reasonable, on the cost of performing functions undertaken pursuant to this Act.

All fees collected by the commissioner shall be deposited in the state treasury to the credit of the general fund.

All federal grants to and federal receipts of the office of the commissioner are appropriated for the purpose set forth in the federal grants or receipts.

Each local government may establish a schedule of fees for the functions performed under this Act by the local enforcement agency.

Section 21. Injunctive Relief. The commissioner or local enforcement agency may obtain injunctive relief from any court of competent jurisdiction to enjoin the offering for sale, sale, delivery, use, occupancy, erection, alteration, or installation of any building covered by this Act, upon an affidavit of the department specifying the manner in which the building does not conform to the requirements of this Act of the State building energy code.

Section 22. Statutory Civil Action. Notwithstanding any other remedies available, any person or party, in an individual capacity or on behalf of a class of persons or parties, damaged as a result of a violation of this Act or the State building energy code, has a cause of action in any court of competent jurisdiction against the person or party who committed the violation. An award may include damages and the cost of litigation, including reasonable attorney's fees.

Section 23. (approximate language) Tenant Enforceability. Notwithstanding any other remedies available, any tenant, damaged as a result of a violation of this Act or the State Energy Building Code, where such violation occurs in the building currently rented by the tenant, may be relieved of all obligation for rent payments for a period:

1. To begin 60 days after tenant notifies landlord in writing, and either in person or by certified or registered mail, return receipt requested, of the specific violations of this Act or the

State Energy Building Code which are applicable to the building rented by the tenant, and of the tenant's intention to withhold rent if these violations are not corrected within 60 days; and

2. To end on the date when the commissioner or a local enforcement agency certifies that the building is in compliance with this Act and the State Energy Building Code, or on the date when tenant and owner reach an agreement that sufficient alterations have been made to the satisfaction of the tenant, or on the date when tenant and owner reach an agreement upon any alternative remedy which is deemed to be a full remedy for damages suffered by the tenant as a result of said violation.

Section 24. Additional Requirements For Major State Or State-Supported New Buildings Or Renovations.

1. Before any contract is executed for the construction, major alteration, or renovation of any state-owned or state-supported building, which is a major facility, the agency having jurisdiction over said construction, alteration, or renovation shall have:

a. A feasibility study made on the use of energy sources other than fossil fuels for the heating and air conditioning of the proposed building; and

b. A life-cycle cost analysis made energy-related architectural structures and operating costs of the building; to include but not be limited to such elements as:

(1) the coordination, orientation, and positioning of the facility on its physical site, if the building is a new structure;

(2) the amount and type of fenestration employed in the facility;

(3) thermal characteristics of materials, and the amount of insulation incorporated into the facility design;

(4) the variable occupancy and operating conditions of the facility, including illumination levels;

(5) architectural features which affect energy consumption;

(6) an energy consumption analysis of the major facility's heating, ventilating and air-conditioning system, lighting system, and all other energy-consuming systems. The energy consumption analysis should include but not be limited to:

(a) the comparison of two or more system alternatives;

(b) the simulation of engineering evaluation of each system over the entire range of operation of the major facility for a year's operating period; and

(c) the engineering evaluation of the energy consumption of component equipment in each system considering the operation of such components at other than full or rated outputs;

(7) a cost analysis to include but not be limited to:

(a) the initial estimated cost of each energy-consuming system being compared and evaluated;

(b) the estimated annual operating cost of all utility requirements;

(c) the estimated annual cost for energy of maintaining each energy-consuming system;

(d) the initial costs, annual operating savings, and annual operating costs (if any) of energy-saving measures which could be employed.

2. The feasibility study and the life-cycle cost analysis shall each be certified by a registered architect or registered professional engineer, or by both architect and engineer, particularly qualified by training or experience for the type of work involved.

3. A copy of the feasibility study and the life-cycle cost analysis shall remain on file with the agency responsible for their execution, and shall be open to public inspection.

4. Nothing in this Section shall be interpreted to require analysis with respect to any property eligible for, nominated to, or entered on the National Register of Historic Places, pursuant to the National Historic Preservation Act of 1966, P.L. 89-665; any historic building listed, owned, or under the jurisdiction of an historic properties commission as provided in G.S. Chapters 160A or 153A; nor any state-owned or state-assisted historic property.

Section 25. Criminal Penalties.

1. Any person who violates any provision of this Act of the state building energy code is guilty of a misdemeanor, and, upon conviction, shall be fined not more than $300.00 or imprisoned for not more than 30 days, or both, for each offense.

2. A separate violation is deemed to have occurred with respect to each building not in compliance with this Act on the state building energy code. Each day the violation continues constitutes a separate violation.

Section 26. Severability. If any provision of this Act of the application thereof to any person or circumstance is held invalid, the invalidity does not affect other provisions or applications of this Act which can be given effect without the invalid provision or application, and to this end the provisions of this Act are severable.

§1. (a) The Iowa legislature finds that:

(1) present national energy sources are limited and the capacity of the national energy supply system to meet future demand is threatened;

(2) it is in the interest of the State of Iowa to conserve energy by moderating the demand for fossil fuels and by improving the efficiency with which such fuels are used;

(3) significant energy savings for the State of Iowa and the consumer may be achieved by applying existing methods of energy conservation to the thermal design of various residential units; and

(4) it is an important State objection to encourage sound investment practices which improve the thermal design of various residential units.

(b) It is the purpose of this Act to establish a system of income tax credits in order to promote improvement of the thermal design of various units.

§2. Chapter four hundred twenty-two (422), code, 1975, is amended by adding the following new section:

NEW SECTION. CREDIT FOR INSULATION

1. A taxpayer subject to taxation under Division II of this chapter may deduct from the tax, after the same has been computed, an amount equal to the ordinary and necessary expenses paid by a taxpayer during the taxable year for the improvement of the thermal design of any existing residential unit by that taxpayer through the purchase of conventional

materials or through the installation of such conventional materials.

2. The amount which may be deducted by virtue of subsection (1) from the computed tax shall be limited as follows:

   (a) the amount to be deducted under subsection (1) shall not exceed 75% of the qualified expenditures for conventional materials paid by the taxpayer during the taxable year with respect to any existing residential unit;

   (b) the total amount to be deducted under subsection (1) shall not exceed $50 for any taxpayer for any single tax year;

   (c) the total amount to be deducted under subsection (1) shall not exceed the tax liability of the taxpayer for that year as such tax liability is computed without regard to subsection (1);

   (d) if more than one taxpayer lives within a residential unit, only one of the taxpayers living within that unit shall be entitled to the credit.

3. If the amount of the deduction from computed tax under subsection (1), as limited by subsection (2) (a) and (b), exceeds the limitation of subsection (2) (c), the excess shall be carried forward to each of the two years following the taxable year in which the expenditure was made.

4. Definitions:

   (a) For the purpose of this section, the term "conventional materials" includes caulking and weatherstripping materials,

and insulation, storm windows and storm doors, and such other materials as so defined by the Director of Revenue, in cooperation with the Director of the Energy Policy Council.

(b) For the purposes of this section, the term "residential unit" shall include single family housing units and individual housing units within a multi-family structure.

(c) For purposes of this section, the term "existing residential units" shall mean any unit defined in subsection (4) (b) which was completed at least three years prior to the year in which the deduction is sought.

3 Chapter four hundred twenty-one (421), Code, 1975, is amended by adding the following new section:

NEW SECTION. REPORTING. The Director of Revenue in cooperation with the Director of the Energy Policy Council, shall prepare an annual report, a copy of which shall be submitted to the Iowa legislature. Said report shall include:

(1) information with respect to the numbers and amounts of credits taken under the above amendment to §422, and

(2) an analysis of the energy savings achieved through operation of such amendments.

4. Education Program. The Director of the Energy Policy Council shall formulate and implement an educational program designed to inform the residents of the State of Iowa of the advantages of installing adequate insulation in residential units. Such advantages shall include, but not be limited to, the income tax credit which is provided by this Act.