1981

STATE OF ALASKA

LONG TERM ENERGY PLAN

Appendices

Prepared For

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Governor

By

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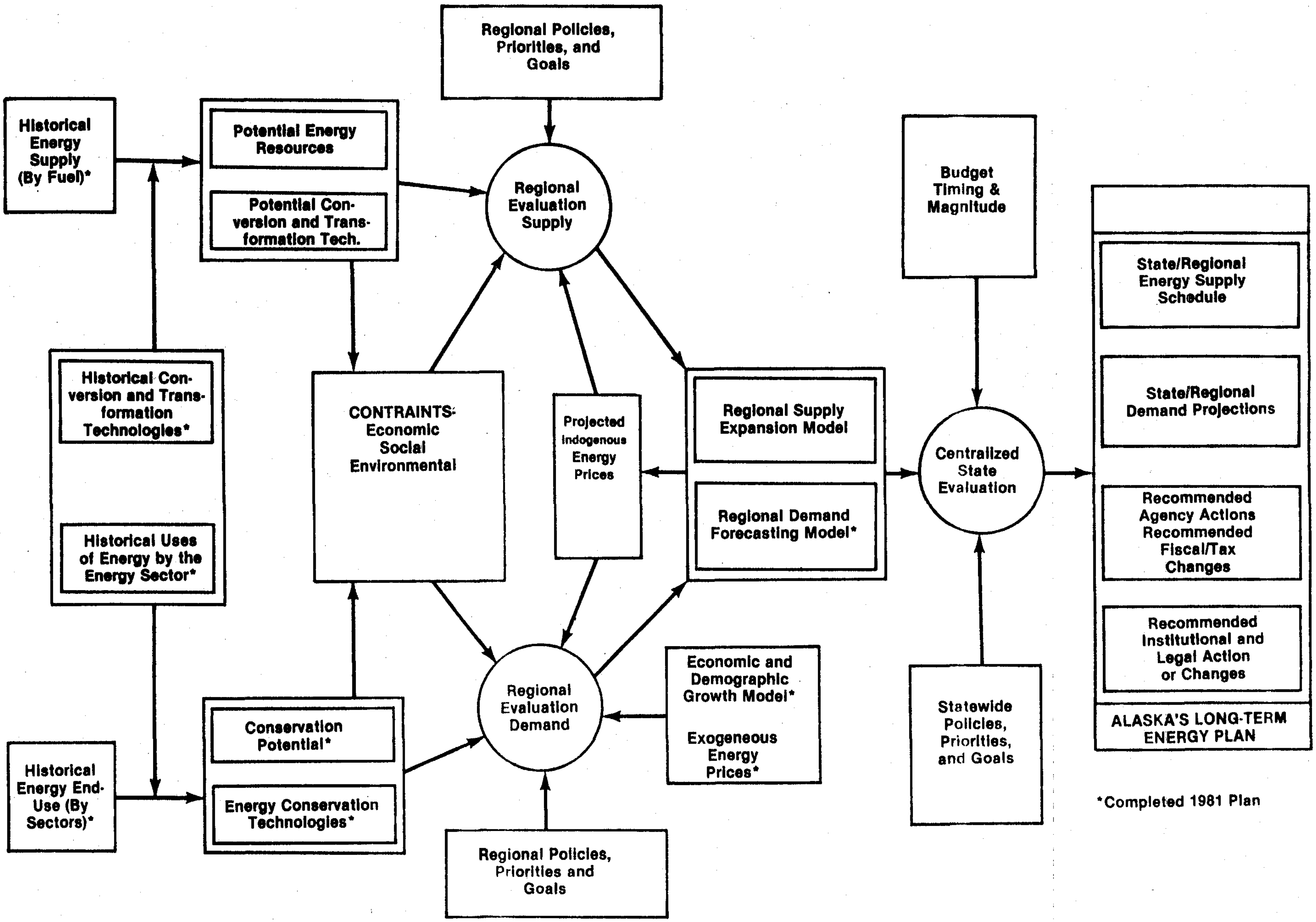
APPENDIX A

FLOW DIAGRAM OF ALASKA'S LONG-TERM ENERGY PLAN

ALASKA'S LONG-TERM ENERGY PLAN — FLOW DIAGRAM



APPENDIX B

REGIONAL ALASKAN ENERGY BALANCES

Preliminary Data

REGIONAL ALASKAN ENERGY BALANCES -- 1979
(in billion btu, 10**9)

ALASKA TOTAL

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	15381	2965714		761377	5116		3747588
(2) Imports	-	27965	51637	-	-	-	+79602
(3) Exports	-	-2848985	-43311	-66098	-	-	-2958395
(4) Stck/reinj	-60	-	-	-525770	-	-	-525830
(5) TPE	15321	144693	8326	169509	5116	-	342965
(6) Electricity	-10457	-	-10085	-40454	-5116	15503	-49619
(7) E. Prod/tran	-	-12649	-3139	-52888		-3952	-72688
(8) Refineries	-	-131994	124765	-2558		-	-9787
(9) Stat. Dif.	-	-	-	-	-	-	-3
(10) TFC	4864		119867	73599		12538	210868
(11) Industry	62		3915	57494		3581	65052
(12) Trans	-		80605	-		-	80605
(13) Comm	825		5082	3368		3080	12355
(14) Marine	-		9315	-		-	9315
(15) Nat. Def.	3846		2336	5505		1697	13384
(16) Res	131		18614	7232		4180	30157

Explanation of the rows and columns of Alaska's energy balances.

- The first row, refers to the total energy produced, in its raw form, in Alaska in 1979. In order to make all of the diverse forms of energy comparable, the fuels are expressed in terms of British thermal units (Btus).

- Each column of the balance refers to a particular form of energy -- solids, crude oil, petroleum products, natural gas, hydro power, electricity, and the total for all fuels.

- Rows ttwo and three refer to the export/import sector for energy trade. These categories do not refer to international trade, but are the figures of net imports and exports sent to and from Alaska to other countries and other states. For the regional balances, exports and imports refer to the trade to and from each region.

- Row four is any stock adjustments. It also includes the reinjection of natural gas.

- Row five is total primary energy (TPE), by fuel, available for transformation or conversion in Alaska. However, to be useful, much of that energy will have to be converted and transformed.

- Rows six through eight account for the conversion of crude oil to petroleum products and fossil fuel to electricity, the transformation of hydro to electricity, and the major losses in transporting crude oil from the North Slope and transmitting energy.

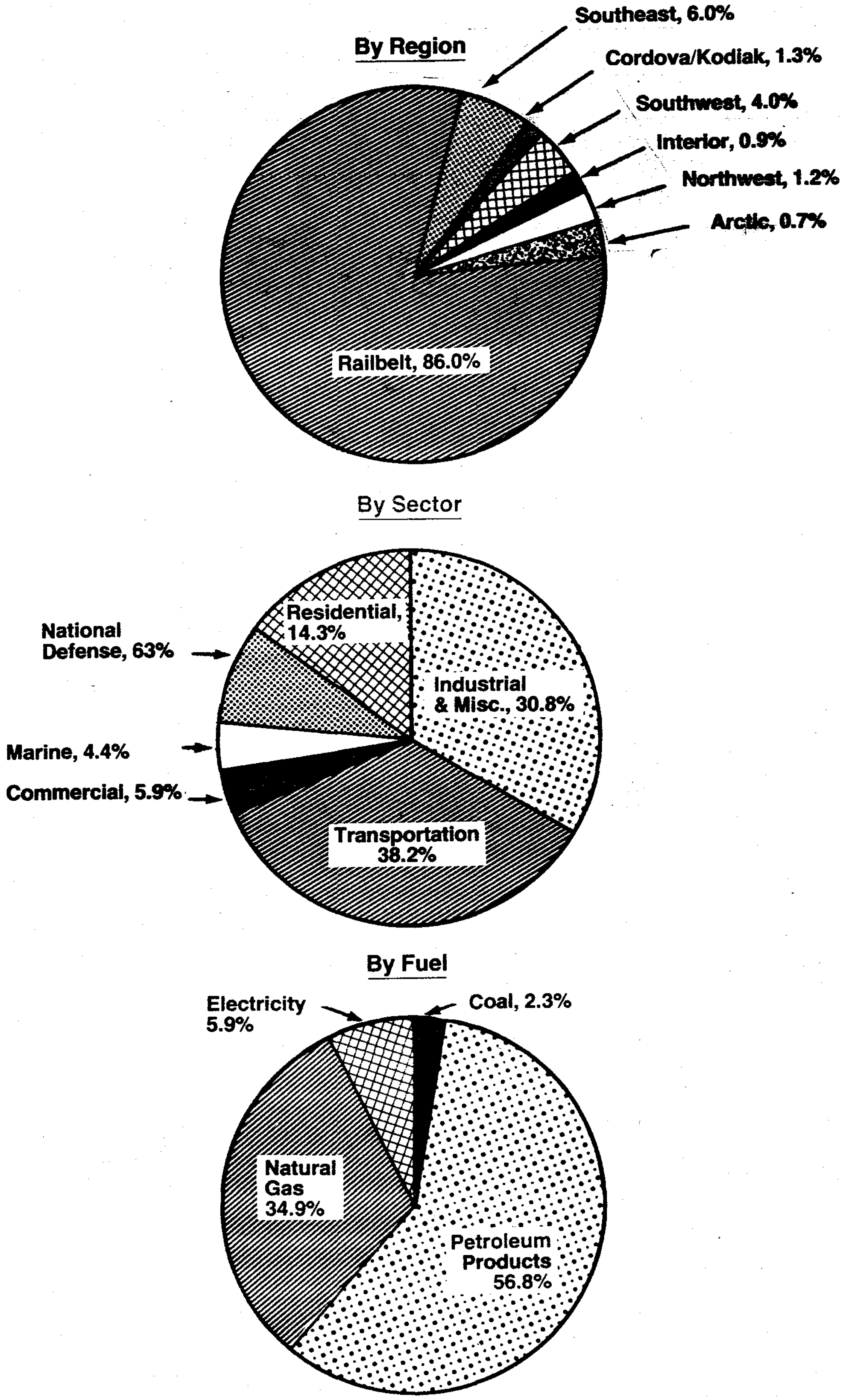
- Row nine, statistical differences, is needed to make the computer happy.

- Row ten, final energy consumption (TFC), is Alaska's end-use of energy. This is the form and quantity of energy sold to consumers.

- Rows eleven through sixteen break the final end-use down into the following categories: industrial, transportation, commercial, marine, government, and residential.

FIGURE III-1

ALASKA ENERGY END-USE, BY REGION, SECTOR AND FUEL 1979



REGIONAL ALASKAN ENERGY BALANCES -- 1979
(in billion btu, 10**9)

ARCTIC

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	-	2176836		44685	-		3163701
(2) Imports	-	-	235	-	-	-	+235
(3) Exports	-	-2712584	-	-	-	-	-2712584
(4) Stck/reinj	-	-	-	-402230	-	-	-402230
(5) TPE	-	4252	-235	44635	-	-	49122
(6) Electricity	-	-	-503	-6890	-	+1615	-5778
(7) E. Prod/tran	-	-	-3139	-36943		-1531	-41613
(8) Refineries	-	-4252	+4017	-82		-	-317
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	-		610	720		84	1414
(11) Industry	-		41	102		7	150
(12) Trans	-		427	-		-	427
(13) Comm	-		21	147		27	195
(14) Marine	-		36	-		-	36
(15) Nat. Def.	-		-	364		41	405
(16) Res	-		-85	107		9	201

NOTES:

1. Electricity Generation

	gas	oil
Utilities	159	51
Nat'l Def.	124	48
Industry	6607	404

2. Energy Sector, Gas

Pipeline	8916
Electricity	6890
Refinery	82
Misc.	27945

3. Energy Sector, Oil

"Highway" Diesel	3016
Refining Loss	235
Electricity	503

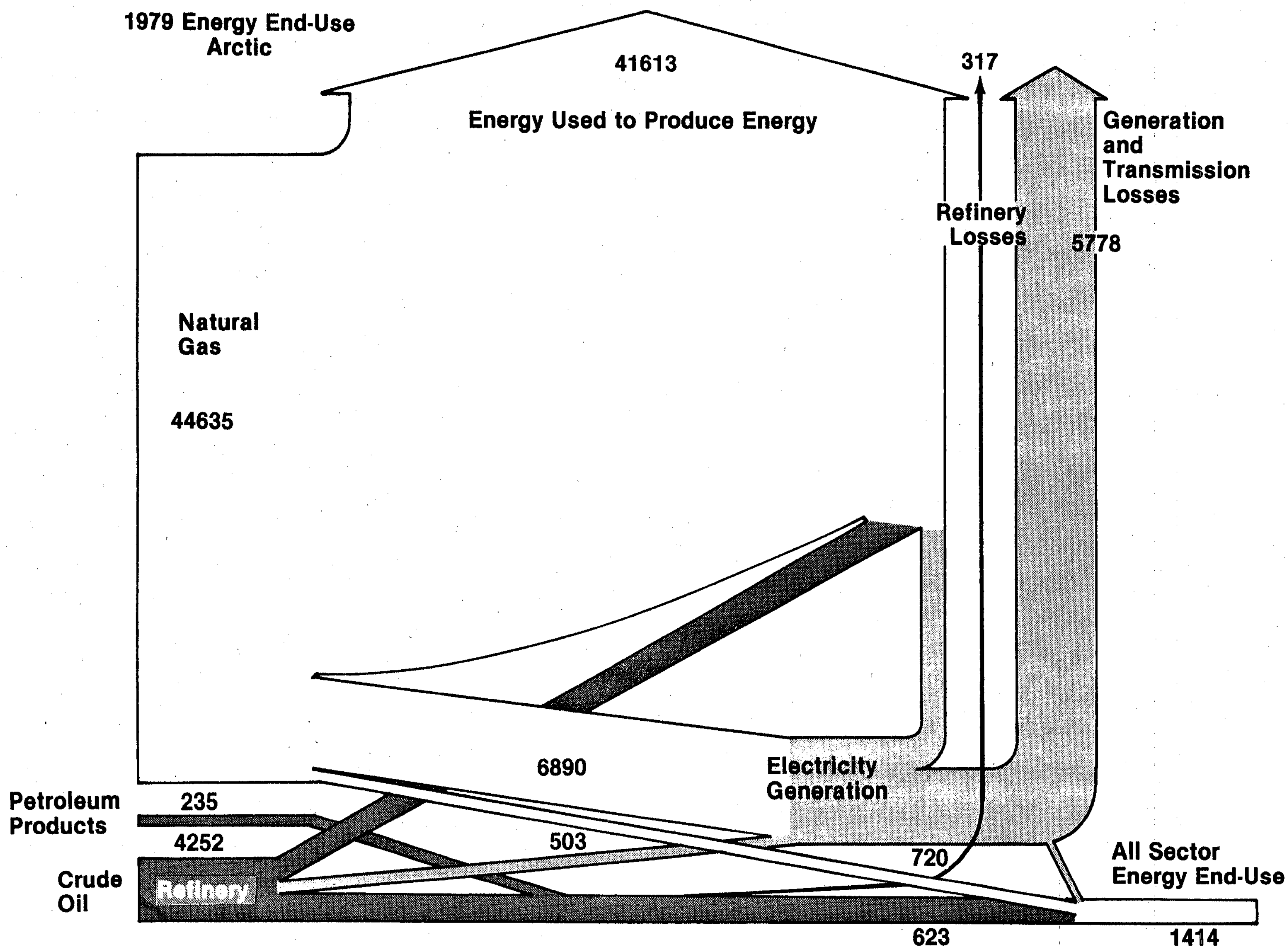
4. Transportation

H. gasoline	175
H. Diesel	133
Av Gas	46
Av Jet	73

5. Marine

Gasoline	20
Diesel	14
Other	2

FIGURE B-2
(in Billion Btu, 10^9 Btu)



Preliminary Data

REGIONAL ALASKAN ENERGY BALANCES -- 1979
(IN BILLION BTU, 10**9)

NORTHWEST

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	-	-		-	-		-
(2) Imports	-	-	3006	-	-	-	3006
(3) Exports	-	-	-	-	-	-	-
(4) Stck/reinj	-	-	-	-	-	-	-
(5) TPE	-	-	3006	-	-	-	3006
(6) Electricity	-	-	-627	-	-	+175	-452
(7) E. Prod/tran	-	-	-	-		-14	-14
(8) Refineries	-	-	-	-		-	-
(9) Stat. Dif.	-	-	-	-	-	-1	-1
(10) TFC	-		2379	-		160	2539
(11) Industry	-		110	-		84	194
(12) Trans	-		1160	-		-	1160
(13) Comm	-		198	-		24	222
(14) Marine	-		97	-		-	97
(15) Nat. Def.	-		329	-		21	350
(16) Res	-		485	-		31	516

NOTES:

1. Electricity Generation
   Utilities 415
   Nat'l Def 77

   Industry 135

2. Transportation Fuels
   H. Gasoline 474
   H. Diesel 361

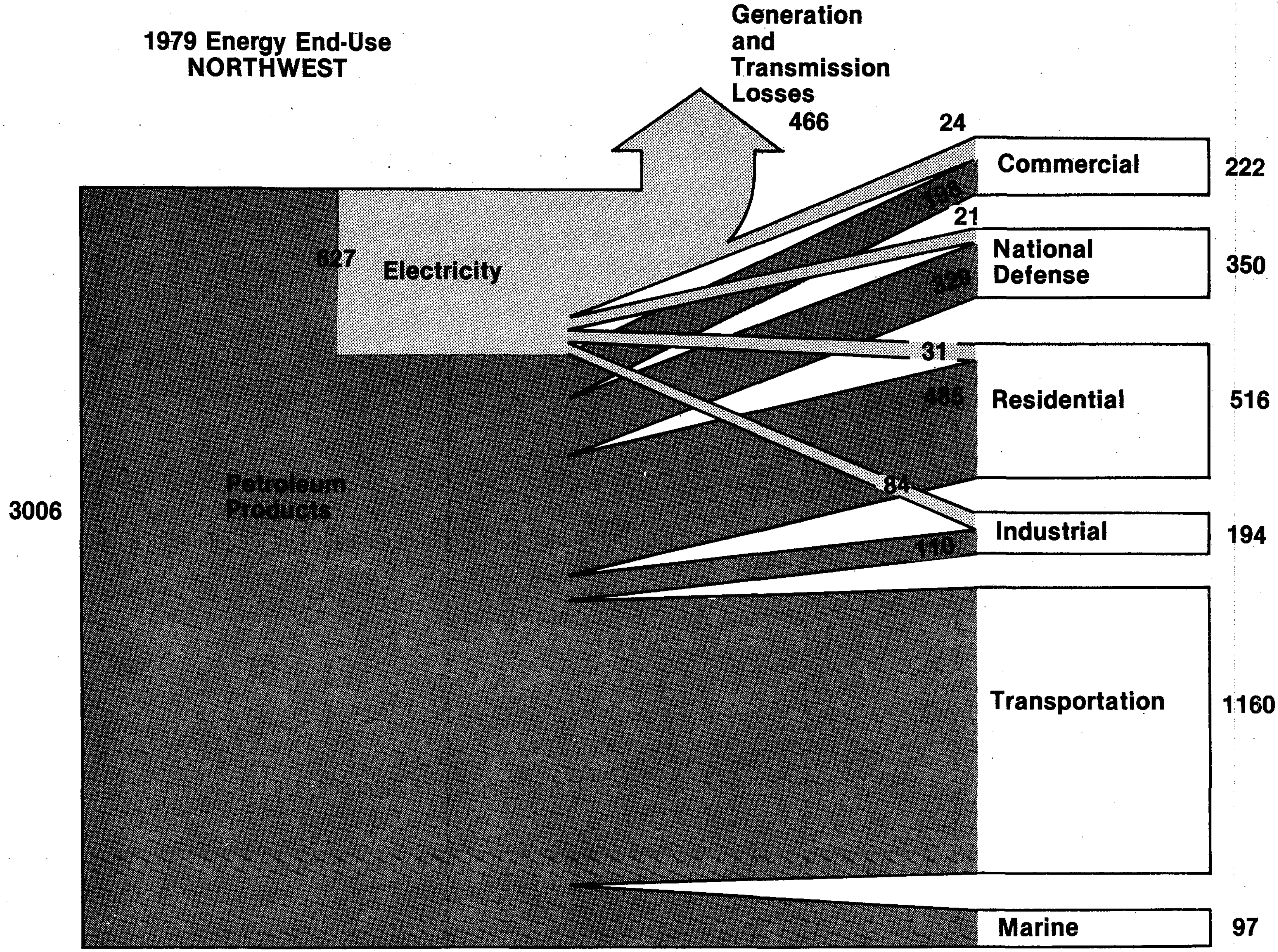
   Av. Gas 126
   Av. Jet 199

3. Marine
   Gasoline 54
   Diesel 38

   Other 5

4. Residential Heating Oil
   Gov. 329
   Residential 485
   Total 814

Figure B-3
(in Billion Btn, Btu 109)**



Preliminary Data

REGIONAL ALASKAN ENERGY BALANCES -- 1979
(in billion btu, 10**9)

INTERIOR

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	-	-		-	-		-
(2) Imports	-	+3175	2033	-	-	-	5208
(3) Exports	-	-	-	-	-	-	-
(4) Stck/reinj	-	-	-	-	-	-	-
(5) TPE	-	-	3175	2033	-	-	5208
(6) Electricity	-	-	-192	-	-	+49	-143
(7) E. Prod/tran	-	-3175	-	-		-7	-3182
(8) Refineries	-	-	-	-		-	-
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	-		1841	-		42	1883
(11) Industry	-		63	-		17	80
(12) Trans	-		1209	-		-	1207
(13) Comm	-		111	-		11	122
(14) Marine	-		-	-		-	-
(15) Nat. Def.	-		-	-		-	-
(16) Res	-		458	-		14	472

NOTES:

1. Electricity Generation

   Utilities 192

2. Energy Sector

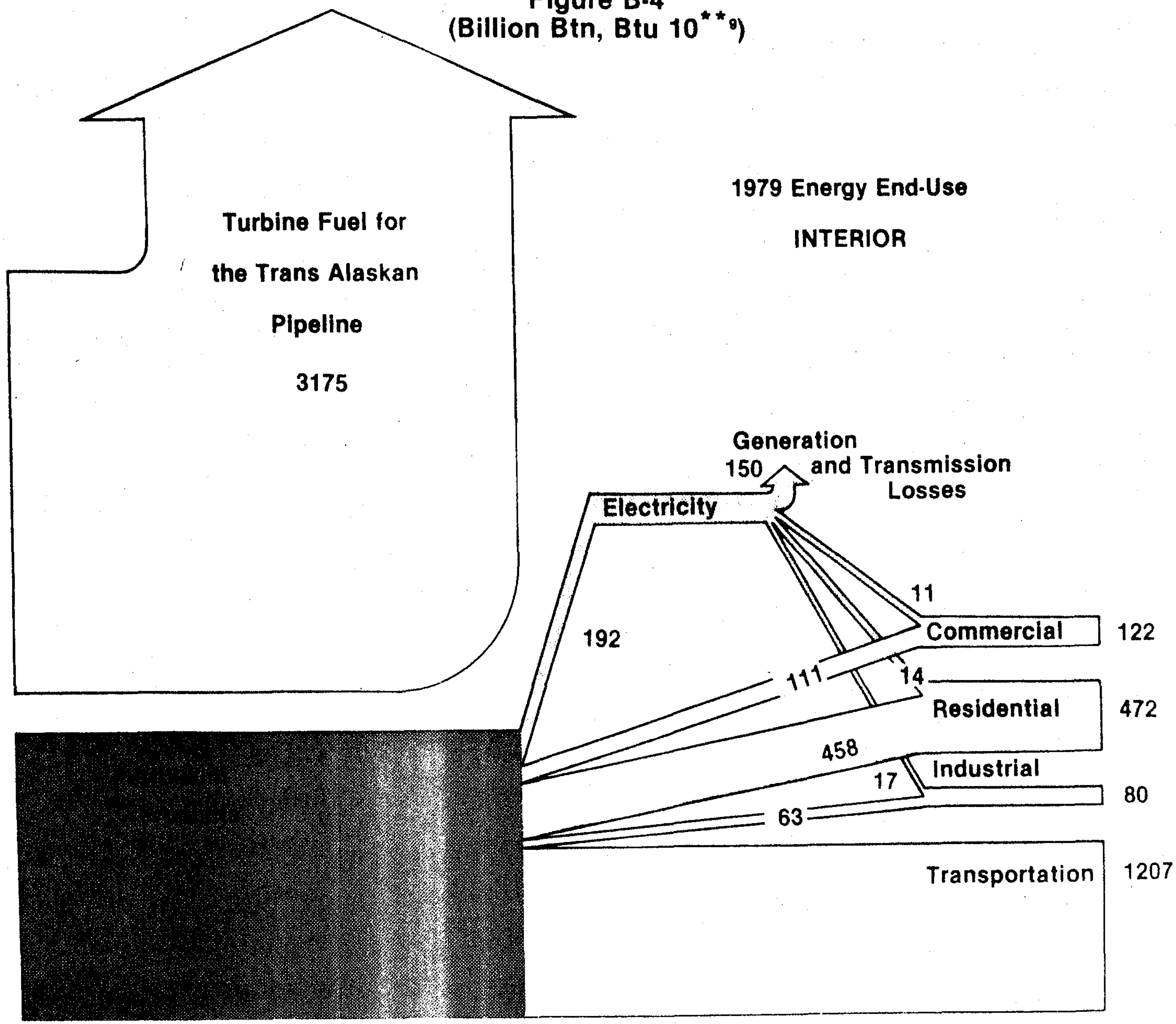
   Pipeline 3175
   Transmission Loss 7

3. Transportation

   H. Gasoline 307
   H. Diesel 331

   Av. Gas 45
   Av. Jet 526

Figure B-4
(Billion Btn, Btu 109)**



Preliminary Data

REGIONAL ALASKAN ENERGY BALANCES -- 1979
(in billion btu, 10**9)

SOUTHWEST

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	-	-		-	-		-
(2) Imports	-	-	9932	-	-	-	9932
(3) Exports	-	-	-	-	-	-	-
(4) Stck/reinj	-	-	-	-	-	-	-
(5) TPE	-	-	9932	-	-	-	9932
(6) Electricity	-	-	-2146	-	-	+589	-1557
(7) E. Prod/tran	-	-	-	-		-18	-18
(8) Refineries	-	-	-	-		-	-
(9) Stat. Dif.	-	-	-	-	-	-1	-1
(10) TFC	-		7786	-		570	8356
(11) Industry	-		293	-		37	330
(12) Trans	-		5660	-		-	5550
(13) Comm	-		338	-		90	428
(14) Marine	-		102	-		-	102
(15) Nat. Def.	-		1242*	-		395	1637
(16) Res	-		151	-		48	199

NOTES:

1. Electricity Generation

Utilities	706
Nat'l Def	1440
	2146

2. Transportation

H. Gasoline	1435
H. Diesel	1550
Av. Gas	211
Av. Jet	2464
	5660

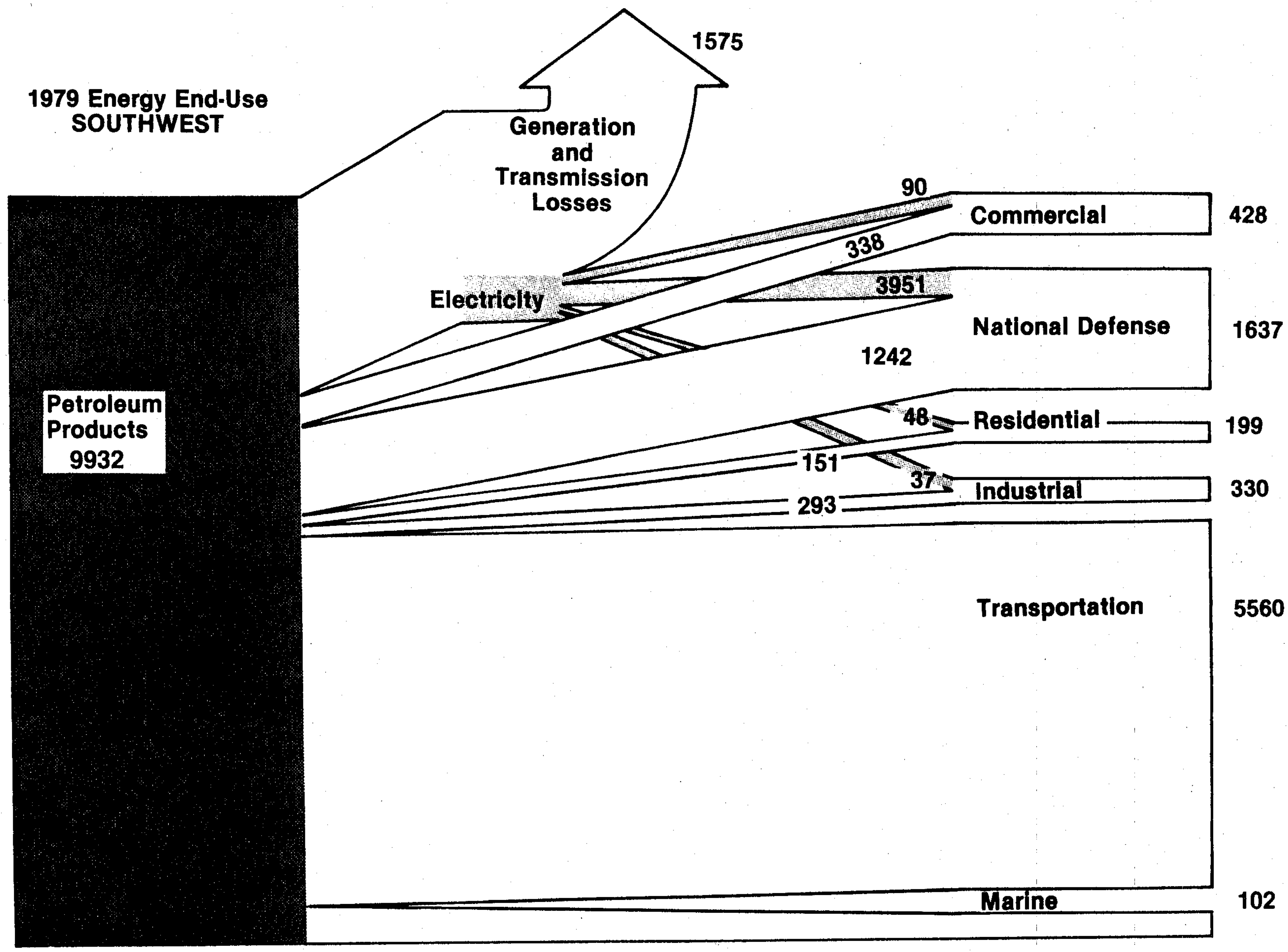
3. Marine

Gasoline	62
Diesel	37
Other	03
Total	102

4. Res. Heating Oil

Gov.	1242
Res.	0151
	1393

Figure B-5
(in Billion Btn, Btu 10^9)



Preliminary Data

REGIONAL ALASKAN ENERGY BALANCES -- 1979
(in billion btu, 10**9)

CORDOVA/KODIAK

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	-	-		-	-		-
(2) Imports	-	-	3546	-	-	-	3546
(3) Exports	-	-	-	-	-	-	-
(4) Stck/reinj	-	-	-	-	-	-	-
(5) TPE	-	-	3646	-	-	-	3646
(6) Electricity	-	-	-1255	-	-	+346	-909
(7) E. Prod/tran	-	-	-	-		-22	-22
(8) Refineries	-	-	-	-		-	-
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	-		2391	-		324	2715
(11) Industry	-		120	-		128	248
(12) Trans	-		1008	-		-	1008
(13) Comm	-		169	-		50	219
(14) Marine	-		399	-		-	399
(15) Nat. Def.	-		386	-		81	467
(16) Res	-		309	-		65	374

NOTES:

1. <u>Electricity Generation</u>

Utilities	964
Nat'l Def.	291

2. <u>Transportation</u>

H. Gasoline	413
H. Diesel	391
Av. Gas	49
Av. Jet	155

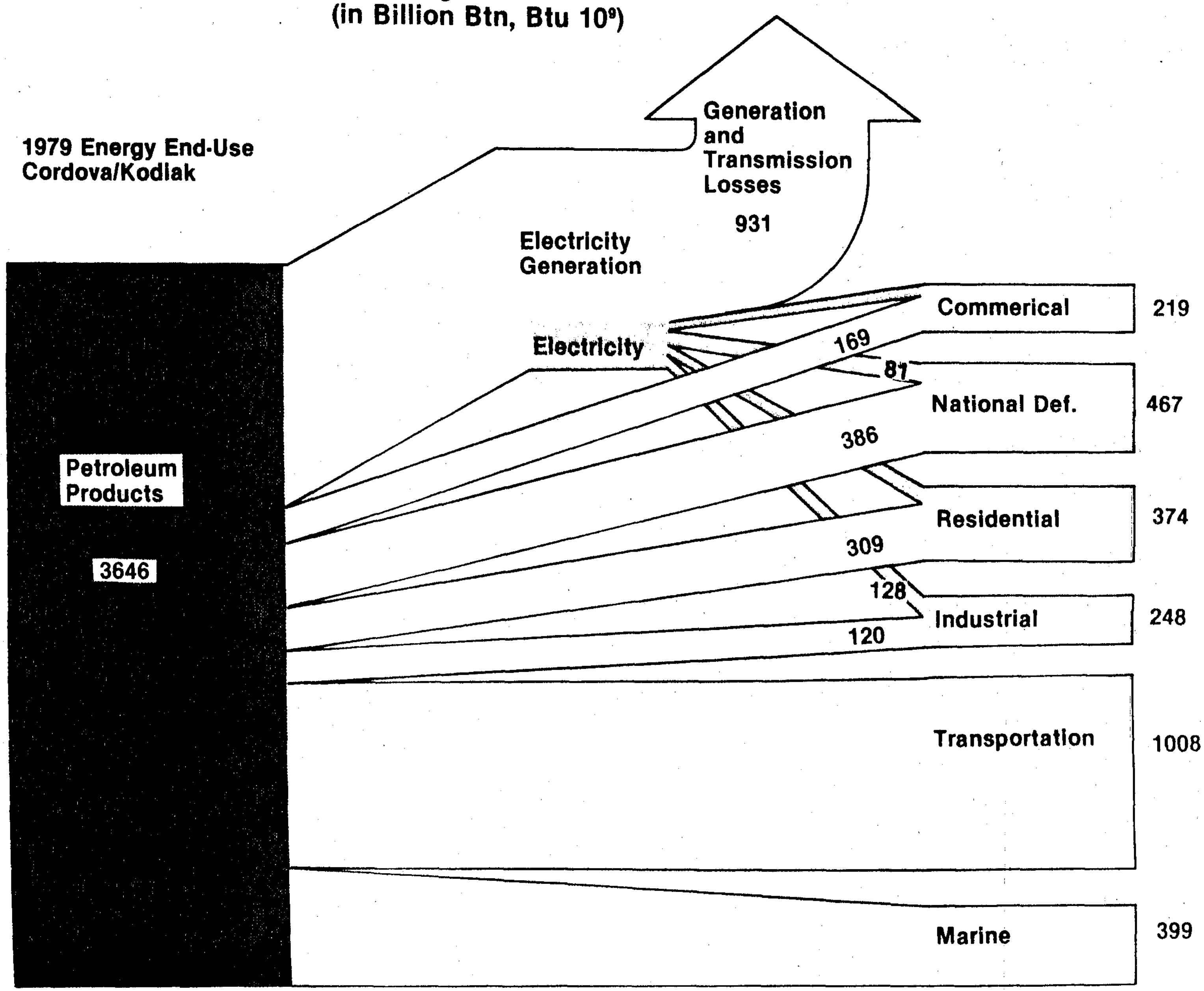
3. <u>Marine</u>

Gas	61
Diesel	334
Other	4

4. Residential Heating Oil

Gov	386
Res	309
Total	595

Figure B-6
(in Billion Btn, Btu 10^9)



Preliminary Data

REGIONAL ALASKAN ENERGY BALANCES -- 1979
(in billion btu, 10**9)

SOUTHEAST

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	3554	-		-	3065		6519
(2) Imports	-	-	11608	-	-	-	11608
(3) Exports	-	-	-	-	-	-	-
(4) Stck/reinj	-	-	-	-	-	-	-
(5) TPE	3354	-	11609	-	3065	-	18227
(6) Electricity	-3554	-	-1005	-	-3065	2240	-5384
(7) E. Prod/tran	-	-	-	-		-195	-196
(8) Refineries	-	-	-	-		-	-
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	-		10503	-		2044	12547
(11) Industry	-		524	-		1270	1794
(12) Trans	-		4418	-		-	4418
(13) Comm	-		764	-		334	1098
(14) Marine	-		1748	-		-	1748
(15) Nat. Def.	-		-	-		-	-
(16) Res	-		3149	-		440	3589

NOTES:

1. Electricity Generation

	utilities	Ind.
Oil	1005	
Hydro	3055	
Pulp	64	3490

2. Transportation

H. Gasoline	1809
H. Diesel	1714
Av. Gas	214
Av. Jet	681

3. Marine

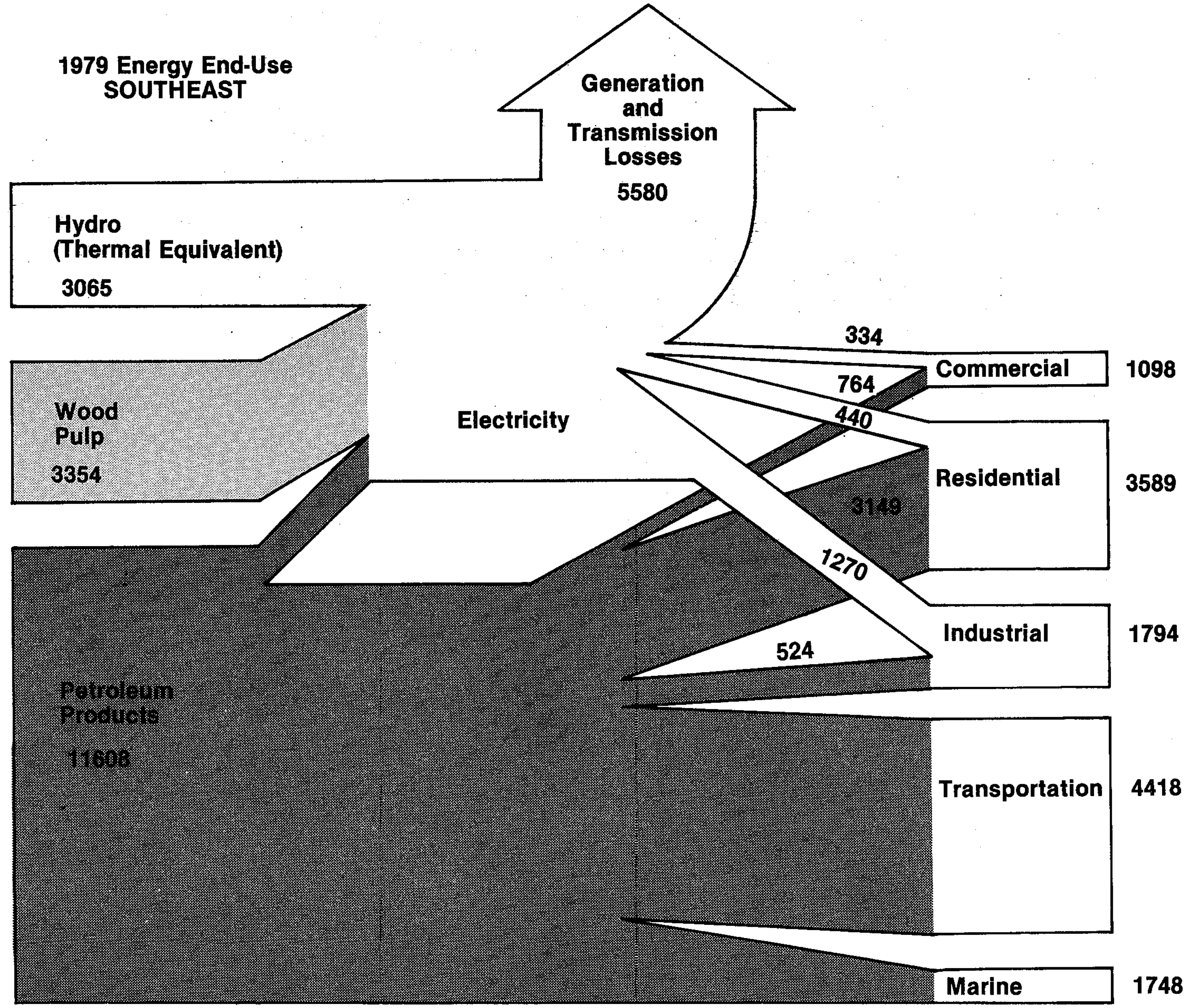
Gasoline	268
Diesel	1461
Other	0019
	1748

4. Solids
Pulp used for industrial
A small amount (2%) sold

5. Industry Electricity

Pulp Mills	1025
Utility, other	126
Utility Ind.	118

B-7
(in Billion Btu, Btn 10^9)



REGIONAL ALASKAN ENERGY BALANCES -- 1979
(in billion btu, 10**9)

RAILBELT

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	11827	248878		314512	2051		577268
(2) Imports	-	+24790	+21177	-	-	-	45967
(3) Exports	-	-136402	-43311	-66098	-	-	-245811
(4) Stck/reinj	060	-	-	-123540	-	-	-123600
(5) TPE	11767	137266	-22134	124874	2051	-	253824
(6) Electricity	-6903	-	-4357	-33574	-2051	11489	-35396
(7) E. Prod/tran	-	-9524	-	-15945		-2175	-27644
(8) Refineries	-	-127742	+120748	-2476		-	-9470
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	4864		94257	72879		9314	181314
(11) Industry	62		2764	57392		2038	62256
(12) Trans	-		66723	-		-	66723
(13) Comm	825		3481	3221		2544	10071
(14) Marine	-		6933	-		-	6433
(15) Nat. Def.	3846		379	5141		1159	10525
(16) Res	131		13973	7125		3573	24806

NOTES:

1. **Electricity Generation**

	gas	oil	coal
Utilities	27295	1840	4242
Nat'l Def.	1989	302	2428
Industry	4290	1202	-
Misc.	-	1013	239
	33574	4357	6903

2. **Energy Sector**
   Pipeline 9524
   Utility Losses 810

   Energy Sector Sheet 1295

3. **Industrial Electricity**
   Utilities, other 10
   Utilities, Ind. 15

   RCA 2
   MSC 1

4. **Comm Electricity**
   U of Alaska 70
   Utility 2474

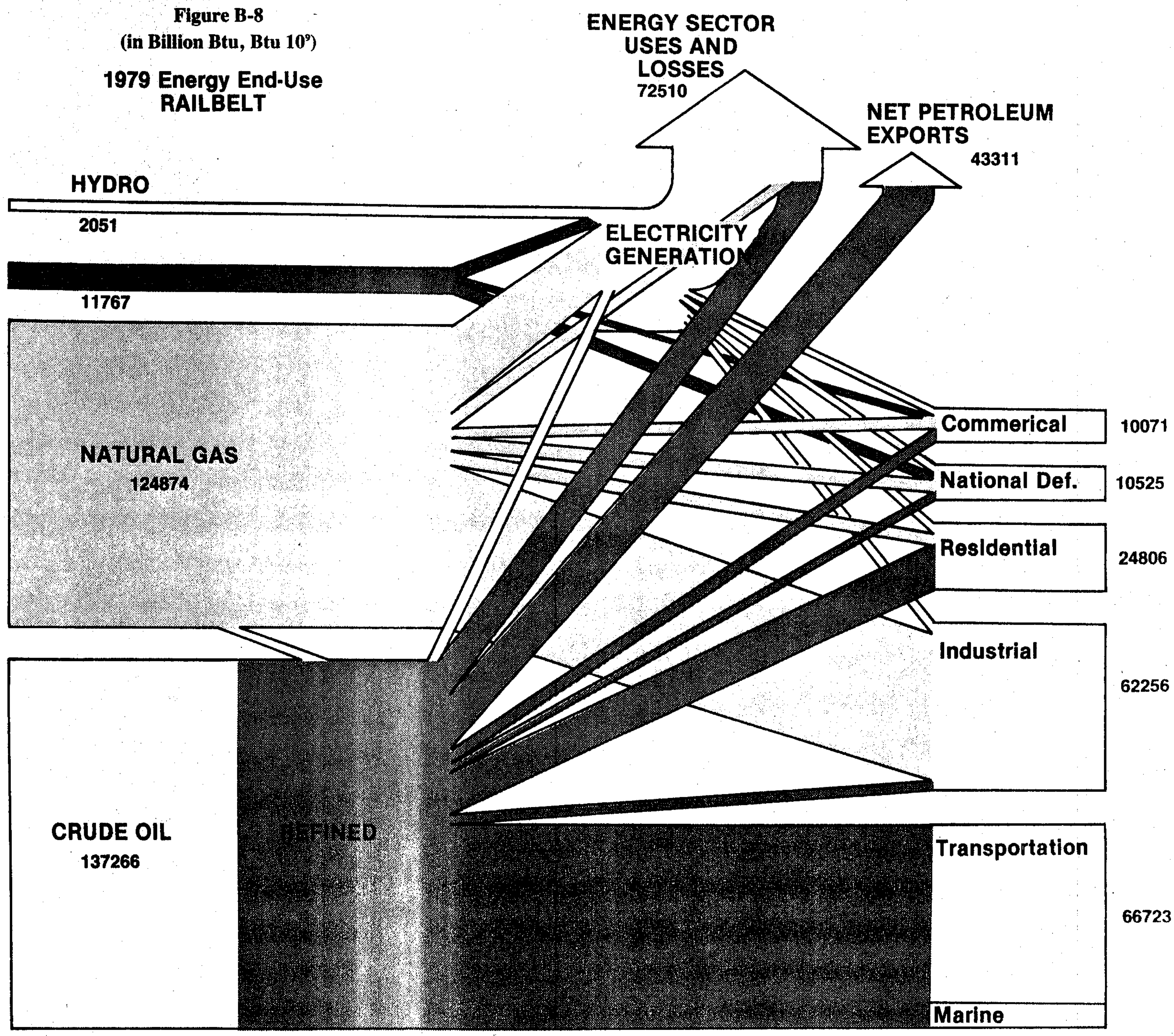
5. **Industry**
   Gas-ammoniea/urea 53258
   Utility Gas 4134

6. **Transportation**
   H. Gasoline 180
   H. Diesel 58
   Av. Gas 13
   Av. Jet 41
   56

7. **Marine**
   Gasoline 560
   Diesel 5360
   Other 0013
   5933

Figure B-8
(in Billion Btu, Btu 10^9)

1979 Energy End-Use
RAILBELT



Preliminary Data

ANNUAL ALASKAN ENERGY BALANCES -- 1970
(in billion Btu, 10**9)

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	12583	484952		223514	3777		+724935
(2) Imports	-	+14221	+18573	-	-	-	+32794
(3) Exports	-	-429908*	-13285	-58870	-	-	-502053
(4) Stck/reinj	-	-	-	-75407	-	-	-75407
(5) TPE	+12583	69275	+5288	+89337	+3777	-	180259
(6) Electricity	-8323	-	-2000	-11214	-3777	+4372	-20942
(7) E. Prod/tran	-	-	-	-48055		-1051	-49105
(8) Refineries	-	-69275*	+65481	-592		-	-4386
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	4259		68759	29476		3321	105825
(11) Industry	59		2117	20422		949	23547
(12) Trans	-		50000	-		-	50000
(13) Comm	642		2565	1235		816	5258
(14) Marine	-		3500	-		-	3500
(15) Nat. Def.	3419		1183	5530		449	10581
(16) Res	140		9404	2289		1107	12940

*Estimated on the best available data

ANNUAL ALASKAN ENERGY BALANCES -- 19[illegible]
(in billion Btu, 10**9)

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	15025	456952		234996	3725		+710598
(2) Imports	-	+13400	+20928	-	-	-	+34328
(3) Exports	-	-390917	-16506	-65200	-	-	-473723
(4) Stck/reinj	-	-	-	-76170	-	-	-76170
(5) TPE	15025	79435	4322	92626	3725	-	+195133
(6) Electricity	-9951	-	-2644	-13533	-3725	+5088	-24765
(7) E. Prod/tran	-	-	-	-46553		-1223	-47876
(8) Refineries	-	-79435*	+75085	-522		-	-4782
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	5074		76763	31918		3865	117623
(11) Industry	75		2214	21558		1104	24951
(12) Trans	-		52281	-		-	52281
(13) Comm	766		3562	1328		949	6610
(14) Marine	-		3977	-		-	3977
(15) Nat. Def.	4083		1646	6228		523	12480
(16) Res	150		13078	2984		1289	17321

*Estimated on the best available data

Preliminary Data

ANNUAL ALASKAN ENERGY BALANCES -- 19[illegible]
(in billion Btu, 10**9)

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	14947	427240		229707	3611		+675505
(2) Imports	-	+12529	+23094	-	-	-	+35623
(3) Exports	-	-355421	-20758	-61726	-	-	-437905
(4) Stck/reinj	-10	-	-	-78490	-	-	-78500
(5) TPE	14937	84348	2336	89491	3611	-	+194723
(6) Electricity	-9883	-	-3422	-15437	-3611	+5544	-27814
(7) E. Prod/tran	-	-	-	-37693		-1332	-39025
(8) Refineries	-	-84348*	+79728	-580		-	-5200
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	5049		78642	34781		4212	122684
(11) Industry	75		2408	23894		1203	27580
(12) Trans	-		56853	-		-	56853
(13) Comm	762		2909	1455		1035	6162
(14) Marine	-		4453	-		-	4453
(15) Nat. Def.	4062		1343	6389		570	12364
(16) Res	150		10666	3042		1404	15262

*Estimated on the best available data

Preliminary Data

ANNUAL ALASKAN ENERGY BALANCES -- 1973
(in billion Btu, 10**9)

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	15098	424209		230015	2984		+672307
(2) Imports	-	+12440	+20713	-	-	-	+33153
(3) Exports	-	-352292*	-17298	-62881	-	-	-442476
(4) Stck/reinj	-	-	-	-90501	-	-	-90501
(5) TPE	15098	74357	3415	76634	2684	-	+172488
(6) Electricity	10059	-	-3329	-19551	-2984	+6105	-28918
(7) E. Prod/tran	-	-	-	-21548		-1467	-23015
(8) Refineries	-	-74357*	+70285	-955		-	-4927
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	5039		70371	35580		4638	115628
(11) Industry	69		1872	24165		1325	27431
(12) Trans	-		44195	-		-	44195
(13) Comm	713		3580	1780		1139	7132
(14) Marine	-		6357	-		-	6357
(15) Nat. Def.	4103		1615	6353		628	12699
(16) Res	155		12832	3281		1546	17814

*Estimated on the best available data

Preliminary Data

ANNUAL ALASKAN ENERGY BALANCES -- 1974
(in billion Btu, 10**9)

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	25456	419151		235522	3412		+673541
(2) Imports	-	+12291	+24344	-	-	-	+36635
(3) Exports	-	-328072*	-21623	-63788	-	-	-413483
(4) Stck/reinj	-9	-	-	-89501	-	-	-89510
(5) TPE	15447	103370	2721	82233	3412	-	+207183
(6) Electricity	-10256	-	-3143	-20160	-3412	+6503	-30368
(7) E. Prod/tran	-	-	-	-24631		-1586	-26217
(8) Refineries	-	-103370*	+97709	-624		-	-6285
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	5191		97287	36819		5017	144313
(11) Industry	66		3045	25720		1433	30264
(12) Trans	-		71875	-		-	71875
(13) Comm	763		3388	1585		1232	6958
(14) Marine	-		4991	-		-	4991
(15) Nat. Def.	4200		1564	6174		679	12617
(16) Res	162		12424	3339		1673	17598

*Estimated on the best available data

Preliminary Data

ANNUAL ALASKAN ENERGY BALANCES -- 1975
(in billion Btu, 10**9)

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	15585	417485		264347	3725		+701162
(2) Imports	-	+12243	+42306	-	-	-	+54549
(3) Exports	-	-314394*	-27029	-65785	-	-	-408208
(4) Stck/reinj	-20	-	-	-98134	-	-	-98154
(5) TPE	15565	115334	15277	99428	3725	-	+249349
(6) Electricity	-10375	-	-4513	-23092	-3725	+7190	-34535
(7) E. Prod/tran	-	-	-	-33419		-1728	-35147
(8) Refineries	-	-115334*	+109017	-1275		-	-7592
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	5190		119781	41642		5462	172075
(11) Industry	66		3933	28230		1560	33789
(12) Trans	-		92824	-		-	92824
(13) Comm	719		3319	2410		1342	7790
(14) Marine	-		5003	-		-	5003
(15) Nat. Def.	4240		1532	6910		739	13421
(16) Res	165		12170	4092		1821	18248

*Estimated on the best available data

Preliminary Data

ANNUAL ALASKAN ENERGY BALANCES -- 1976
(in billion Btu, 10**9)

FUEL	Solids[1]	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	15271	388651		279568	4533*10		+688023
(2) Imports	-	+11397	+57338	-	-	-	+68735
(3) Exports	-	-274072	-33786	-65478	-	-	-373336
(4) Stck/reinj	-60	-	-	-114526	-	-	-114586
(5) TPE	15211	125976	23552	99564	4533	-	+269836
(6) Electricity	-10173	-	-5120	-25735	-4533	8776	-36785
(7) E. Prod/tran	-	-20961	-3139	-29360		-2109	-56069
(8) Refineries	-	-105015	106842	-955		-	+872
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	5038		122135	43014		5667	176854
(11) Industry	66		3883	28762		1904	34615
(12) Trans	-		91652	-		-	91652
(13) Comm	899		3979	2169		1638	8685
(14) Marine	-		6195	-		-	6195
(15) Nat. Def.	3912		1836	6812		902	13462
(16) Res	161		14590	5271		2223	22245

*Estimated on the best available data

Preliminary Data

ANNUAL ALASKAN ENERGY BALANCES -- 1977
(in billion Btu, 10**9)

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	15134	993845		387483	5341		+1401803
(2) Imports	-	+21489	+57374	-*	-	-	+88863
(3) Exports	-	-898406	-42174	-68986	-	-	-1009565
(4) Stck/reinj	-16	-	-	-188891	-	-	-188907
(5) TPE	15118	116928	25200	129606	5341	-	+292193
(6) Electricity	-10314	-	-10435	26959	-5341	14869	-38190
(7) E. Prod/tran	-	-12603	-3139	-53285		-3236	-72263
(8) Refineries	-	-104325	104365	-1898		-	-1858
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	4804		115991	47454		11633	179882
(11) Industry	59		3546	33299		3227	40131
(12) Trans	-		83695	-		-	83695
(13) Comm	989		4261	3151		2775	11176
(14) Marine	-		5900	-		-	5900
(15) Nat. Def.	3599		1967	6558		1865	14089
(16) Res	157		15622	4346		3766	23891

*Estimated on the best available data

Preliminary Data

ANNUAL ALASKAN ENERGY BALANCES -- 1978
(in billion Btu, 10**9)

FUEL	Solids	Crude	Petro	Gas	Hydro	Elect	Total
(1) Production	15369	2597324		621370	4936		+3238999
(2) Imports	-	+32144	+61526	-	-	-	+93670
(3) Exports	-	-2492425	-42804	-62761	-	-	-2597990
(4) Stck/reinj	-12	-	-	-397893	-	-	-397904
(5) TPE	15357	137043	18722	60717	4932	-	+335775
(6) Electricity	-10403	-	-10108	-36331	-4936	16249	-45529
(7) E. Prod/tran	-	-13463	-3139	-53534		-3778	-73919
(8) Refineries	-	-123575	123250	-1762		-	-2087
(9) Stat. Dif.	-	-	-	-	-	-	-
(10) TFC	4954		128725	69090		12471	215240
(11) Industry	-		3844	54417		3526	61851
(12) Trans	-		90716	-		-	90716
(13) Comm	1012		3075	3003		3032	12122
(14) Marine	-		8139	-		-	8139
(15) Nat. Def.	3717		2342	6896		1797	14752
(16) Res	101		18609	4774		4116	27660

*Estimated on the best available data

APPENDIX C

ENERGY DEMAND FORECASTS AND METHODOLOGY

ENERGY DEMAND FORECASTS AND METHODOLOGY

DEMAND FORECASTING METHODOLOGY

The energy industry is highly capital intensive, with exceptionally long intervals between the moment the need for additional supplies is perceived and the moment that increased supplies are forthcoming to users on a practicable basis. Therefore, the existence of accurate long-run forecasts in these industries is of more than academic interest.

The forecasting methodology employed for this study is a combination of alternative methodologies. In order to assess the relative merits and drawbacks of the various methodologies, it is useful to outline alternative methods of demand forecasting and to indicate the relative advantages and disadvantages of each for the present purposes.

A theoretical medium useful in demand forecasting is the concept of a demand curve. A demand curve illustrates the various amounts of a commodity that buyers will purchase at possible alternative prices. Traditional economic theory states that the demand curve for most goods is downward sloping, i.e., as the price of the good increases, the amount demanded decreases.

Related to the demand curve is a more general concept, the demand function. The demand function is a mathematical equation which recognizes explicitly that the demand for a good is related to many elements other than the price of that good, as, for example, the price of substitutes and complements, consumer tastes, state regulation, consumer incomes, the stock of complementary goods and the like. These elements are all incorporated in the geometical form of the demand curve; in the demand function they are recognized explicitly.

A demand function consists of three principal elements:

1. Independent variables, including the various incomes, stocks, and prices, etc., that influence the demand for a commodity.

2. Dependent variables, the elements that are to be explained, i.e., the various demands.

3. Elasticities, which describe the observed behavioral relationships between dependent and independent variables. Simply put, demand elasticity describes the relative change in consumer demand (the dependent variable) relative to a small change in the independent variable.

Most alternative demand forecasting methodologies can be distinguished on the basis of the relative emphasis ascribed to one of these three elements.

A. TIME SERIES ANALYSIS AND TRENDING

Where both the elasticities and the independent variables - the underlying causes of demand - show a stable pattern over time historically, but also when they are expected or likely to be stable in the future too, it is simplest and least expensive to employ time series analysis as the basis for long-run forecasting.

Time series analysis can be defined as a method of forecasting by which attention is focused primarily on the past behavior of the dependent variable without much analytical consideration of why the dependent variable behaved as it did.

Where the past behavior of the dependent variable can be described by means of a growth rate, the use of time series analysis to describe future demand is called trending. Trending has been a traditional method of forecasting among electrical utilities because this method has, in the past, yielded satisfactory results with a minimum expenditure of effort.

The methodology generally employed appears to assume that past trends will be representative of the immediate future. The technique, however, also can incorporate the slowdown in electricity demand growth characteristic of more recent years.

It should be fully recognized that "uncritical use" (without due regard for its limitations) of trending can lead to inappropriate results, particularly at a time of great economic and political uncertainty. It should be noted also that the term "trending" is somewhat misleading in that forecasters often apply ad hoc modifications to a forecast derived via trend extrapolation.

A more sophisticated form of time series analysis is associated with the names of Box and Jenkins.(1) Instead of applying a simple growth rate to demand, this method describes a point in the future as some function of a sequence of observations in the past. Its great advantage is that data requirements are limited to historical observations of the dependent variable. Moreover, once the forecasting equation is determined, the generation of a forecast involves only the substitution of output for a particular year as an input in the subsequent year. If the only objective of a forecaster is to be accurate, and it is relatively unimportant to develop an understanding of the underlying economic mechanism, time series analysis can be comparatively cost effective. However, changes in the economic structure, such as population growth or the cost of the commodity demanded, could seriously undermine the accuracy of trending and time series analysis. Another major disadvantage of this approach is that the causal variables are implicit rather than explicit. As a result, it is difficult to apply time series methods to analyze policy choices since this generally requires manipulation of the independent variables.

B. END-USE ANALYSIS

A major alternative approach to demand forecasting is end-use analysis. This mode places its major emphasis on the independent, rather than on the dependent variables.

End-use analysis recognizes that energy is in fact an intermediate good whose demand is derived from some ulterior demand. In particular, the demand for energy is contingent on the demand for energy-using goods, including motor vehicles, space heating units, electrical and gas appliances, as well as various energy-using industrial processes.

One salient advantage of this method is that it proceeds quickly to the ultimate sources of energy demand. Therefore, the forecast is easily associated with its underlying assumptions.

An example of a forecast whose methodology is generally influenced by this approach has been published recently by the Environmental Research Center of Washington State University.(2) In the foregoing study, the projections of industrial energy demand rest on the assumption that the energy per dollar of output remains constant between 1971 and 2000. OBERS projections of earnings are then employed as a proxy for output. In this case the end-use, i.e. industrial output, determines energy demand via a constant utilization ratio.

This example illustrates two chief liabilities of end-use energy demand forecasting. First, as with econometric methods, it is contingent on highly accurate projections of the end-use which, in fact, may be difficult to forecast. Second, it depends on constant energy input for each dollar of output - an unstable relationship during a period of rapidly rising energy prices.

A sophisticated variant of end-use analysis involves the use of inter-industry analysis in general and the Leontief Input-Output

Model in particular. This latter model sets up relationships among various industries described by input-output coefficients, which indicate the amount of input from one industry required per unit of output of another.

Inter-industry analysis permits the establishment of a relationship between energy use and final consumer demand for various commodities. It may prove easier, in fact, to forecast final demand than total output. This would warrant the use of an interindustry model.

However, inter-industry analysis requires three basic theoretical assumptions. First, it must be assumed that the economy is in general equilibrium, suggesting that price levels are not greatly fluctuating. Second, it must be assumed that the amount of an industrial sector's output demanded for final consumption is determined outside the interindustry framework, so that changes in final demand will affect only the amounts of industry output and not the industry interrelationships. Third, production functions are assumed to be linear - the ratio of inputs to production remain constant.

While these assumptions are probably satisfactory for forecasting the near future - a few years - for long run forecasting they are subject to severe criticism. Over a period of 25 years, technological changes in method of production will undoubtedly occur. A very simple change could be the substitution of labor for energy or capital.

The data requirements for an input-output model are enormous. Manufacturers of goods and services must be surveyed to determine how much they sell and to whom. In order to check the accuracy of these relationships, manufacturers should also be asked from whom and in what quantities they purchase goods and services.

C. HYBRID FORECASTING

The blending of exponential trending and end-use analysis illustrates both the advantages and the drawbacks of combining a number of these approachs into a single forecasting procedure. In the forecast of industrial load, the load in each industry is first projected on the basis of past industrial growth. These projections are then modified on the basis of planned additions and conversions in the various industries. The latter are in many cases the results of surveys and do not represent a contractual obligation either on the part of the utility to supply or the industry to purchase power. For the residential sector, estimates of space heating conversions and saturation are undertaken on a judgmental basis. These are coupled with forecasts of average consumption per unit for space heating, lighting, and for major appliances. These latter forecasts incorporate information both as to recent trends as well as judgments regarding probable changes in these trends. Finally, a projection of the number of customers is undertaken, consistent with past trends for this variable. These three elements together yield a forecast for residential load.(3)

Such a hybrid methodology is subject to one encompassing difficulty. Its results are dependent on a series of discrete assumptions, each of which is open to question. For example, forecasts might assume that future residential conversions from oil heating to electricity will be significantly higher than presently prevailing rates. While this and each of the other assumptions might be justified a priori, the effect of their combined presence is to diminish the credibility of the overall forecast.

While a combination of time series analysis and input-output analysis might appear desirable, the data problems are horrendous. The idea would be to trend or to forecast via the Box and Jenkins approach the ratios of inputs to output, called input coefficients. But it is a rare case where the researcher has more than one or two input-output tables to work from. Washington is an exception with three, but even this is too small a number for a time series.

What is needed is one unified model that avoids the oversimplicity of trending and even time series analysis, a methodology that allows for significant discontinuities in the factors determining load. At the same time, such a model should eschew the data problems and questionable assumptions associated with input-output analysis. In effect what is required is a compromise between the analytical elegance and directness of end-use methods and the procedural simplicity, practical applicability, and cost effectiveness of time series analysis.

D. ECONOMETRIC FORECASTING

Econometric forecasting combines time series analysis and end-use analysis. This method looks neither at the independent nor dependent variables in particular, but rather at the relationships among them. These relationships are characterized by values for elasticities which, in essence, are measures of consumer behavior.

Unlike trending, for example, econometric forecasting does not assume a consistency in growth rates of independent variables between the historical and forecast period. Moreover, unlike end-use analysis, econometric forecasting can allow for non-systematic variations in energy use coefficients relative to output or final demand.

However, for econometric analysis to sustain its validity, there is a significant element of continuity that must be obtained between the historical and forecast periods. Namely, the consumer behavior observed in the historical period, rather than the growth rates or the ratios of inputs to output, is assumed to apply to the forecast period as well. It should be noted that this assumption is subject to legitimate objection. For example, it is conceivable that behavior in an energy scarce environment will differ substantially from that in an energy abundant environment. In particular, the sensitivity of consumers to changes in the cost of energy goods might very possibly increase over time. The elasticities associated with the historical period might then not apply to the forecast period. This would call into question the uncritical application of econometric forecasting.

Within the overall compass of econometric demand forecasting, there are a number of significant subdivisions. For example, some econometric studies impose elasticity values based on estimates derived under different circumstances, but which the forecaster nevertheless feels are applicable to the situation at hand. Typical in this regard is the use of elasticities derived from national data in a regional model.

Another distinction can be made between econometric estimates made on the basis of time series data as compared to estimates made on the basis of cross-sectional data. Only the former allows for the explicit introduction of factors which describe responses over time. Cross-sectional elasticities are generally associated with long-term responses. However, these may, in fact, reflect geographical and/or cultural differences.

The estimating procedure typical of econometric analysis is the calculation of a curve describing the dependent variable (in this case demand) as a function of many different independent variables. This curve fits the historical data such that its parameters exhibit desirable statistical properties. Thus, the correct estimation of an econometric model is directly dependent on the quality of available historical data. Econometrics has been maligned unjustly for being excessively "theortical". In fact, its chief advantage is its intimate dependence on the nuances of past economic relationships. The theoretical content of trending is far greater than that of econometric modeling. For example, trending involves the (theoretical) assumption that past trends regarding all significant independent variables, as well as the behavior associated with consumer response to the independent variables, will stay constant between the historical and forecast periods.

Econometrics assumes merely a constancy of behavior and not both of behavior and trends.

E. A SUMMARY OF CERTAIN ADVANTAGES AND WEAKNESSES OF THE ECONOMETRIC METHOD

The value of econometrics in forecasting is recognized for two major reasons, generality and flexibility.

As noted, the assumptions underlying this method are generally less stringent as compared to the usual alternatives. This is particularly advantageous at a time of major discontinuity and disruption in the underlying economic structure. For example, it is conceivable that significant discontinuities may occur in the future prices of certain energy goods as a consequence of political, economic or technological developments. Clearly, under these circumstances, time series methods would render misleading results as compared to econometric analysis; only in the latter can the possibility of such a discontinuity be incorporated in an appropriate set of assumptions regarding the forecast of future energy prices, which enter the econometric model as explicit independent variables.

Flexibility is still another major advantage of econometric analysis. It is perhaps curious that nowhere in this comparison of alternative forecast methods has a claim been advanced for a particular method in terms of whether it yields accurate forecasts. In fact, it is to be expected that most forecasts will be wrong. The forecaster who thinks otherwise is subject to self-delusion. Therefore, it is most advantageous to consider alternative contingencies and policy scenarios defined in terms of consistent sets of independent variables and to assess their respective impact on the dependent variable. The econometric model defined in terms of a multitude of variables, including policy variables, variables describing external circumstances, price variables, end-use variables, and the like, is uniquely suited to the process of scenario formulation and analysis.

At the same time, the increasing acceptance of econometric analysis as a practicable tool should not obscure its many drawbacks and difficulties. These must be acknowledged and continually borne in mind.

In the first place, an econometric specification shifts the burden of forecasting from the dependent to the explanatory (independent) variables. Each of the latter must be forecast independently. The techniques to achieve this objective must transcend the methodological limitations of time-series analysis. Information specific to the future behavior of particular variables must be applied. Where this information is lacking, econometrics yields little in the way of forecast accuracy in comparison to time-series methods, and is substantially less cost-effective.

Secondly, the structural specification of an econometric model may employ variables which are proxies for other variables and which obscure the true structure of the system. For example, if electricity demand is a function of industrial output, and if output varies directly with industrial employment, the use of employment in the model may give significant statistical results, while obscuring the true cause and effect relationships within the system. This disadvantage is avoided through the end-use methodology, but at substantial cost.

Thirdly, econometric forecasting implicitly assumes that each of the independent variables can be forecast independently. This, in practice, is not necessarily true. For example, increases in electricity rates to industry may have adverse impacts on employment. This is not accounted for in a model where employment and rates are forecasted independently. While in principle the influence of cross impacts can be incorporated into the original specification, resulting problems of "identification" preclude this being done for every episode of interdependency.

Fourthly, the forecasts of so-called "independent" variables may themselves depend upon estimates of the variables being forecast. In such a case, a series of intermediate forecasts must be introduced into a revised forecast of the explanatory variables until these forecasts converge to a limiting value. Without such an iterative procedure, the forecasts are subject to a degree of internal inconsistency.

Finally, the field of econometric estimation invariably harbors a multitude of obstacles and complexities which, if unaccounted for, can trap the unwary practitioner. The validity of those assumptions which justify the use of one or the other method of estimation is often questionable in practice. Even the validity of statistical tests which normally indicate the presence of econometric difficulties can be nullified under certain fairly common conditions.

For all these reasons, the application of econometrics should proceed only with great caution.

END-USE ANALYSIS IN PRACTICE

The primary role of end-use analysis is in forecasting energy demand for final consumption. End-use analysis is desirable for two reasons: First, it provides an accounting framework which does not double-count. For instance oil-fired electricity generation is not an end use of oil; instead, the electricity is used by various consumers. Second, it is flexible enough to permit considerable disaggregation and to include consideration of a variety of demographic, economic, and energy policy variables. The most desirable type of end-use model is the econometric end-use (EEU) model since it incorporates causal factors into the estimation procedure.

The major obstacle to EEU is that it requires substantial data. The current situation in Alaska does not permit construction of as elaborate a forecasting methodology as is desirable. However, this may to some extent be remedied in time. Consequently, this section begins with a theoretical or generic discussion of end-use forecasting to elaborate on the rationale for its use, before proceeding to the explicit Alaska analysis which is possible at this time.

For discussion purposes we consider the Northwest Energy Policy Project (NEPP) Model. It considers five primary end-use sectors: residential, commercial, industrial, transportation, and government. Some of these are further disaggregated. Data requirements are large. In each case, however, the basic reasoning is that the end-use sector demands energy as a function of three basic types of factors: prices (or other rationing devices), population (and related demographic variables), and employment (or, more generally, economic activities).

Industrial, commercial, and government sectors are energy using economic activities which can be thought of as enterprises which use energy, among other things, as an input to the production of goods and services. In NEPP, government is included in the commercial sector. In that sector, equations are of two types: Allocations or expenditure shares are estimated for oil, gas, and electricity. These depend on the prices of the three fuels, respectively. Total energy demand, in the other equation, depends on, among other things , employment in the commercial sector. The industrial sector is divided into 22 subsectors and coal is added as a source of energy. The form of the equations corresponds to that for the commercial sector.

The transportation sector cuts across all the rest in that both business and public enterprises as well as households use passenger and freight services of all types. The NEPP effort specifies separate equations for passenger automobiles, single unit trucks, combinations, and jets. All equations depend, inter alia, on the price of the fuel used, and on some income or employment variable. Autos and single-unit trucks were assumed to use gasoline, combination trucks to use diesel oil, and jet aircraft to use jet fuel.

Residential use consists of space heating, lighting, and appliance use. Some appliances are thought to be subject to "saturation," i.e., assuming a household has a primary home, only one range, e.g., is needed in that home . The NEPP effort combines marginal energy prices and saturation parameters to specify equations for saturation ratios for five energy uses in homes: ranges, dryers, water heaters, space heating, and air conditioners. Energy used for each of these uses was estimated outside the model. A wastebasket equation including energy use for electric lighting, refrigeration, televisions, and other appliances not included in the saturation ratio equations was also estimated.

Since the equations are formulated on a per household basis, and by energy type, estimates of households are used as multipliers of the estimates of energy uses derived from the equations.

ALASKAN ENERGY CONSUMPTION

The Alaska situation has a number of unique features. First, and most obvious, the average annual number of heating degree days is much higher than any other state. Second, the population is dispersed and the land transportation system undeveloped. Third, a large share of the population is located at or near the coast. Fourth, the Prudhoe Bay area produces a large percentage of U.S. petroleum and has large natural gas reserves.

These features combine to cause Alaska to have relatively atypical energy consumption patterns, particularly as regards the residential and transportation sectors. For instance, home heating is more important and air conditioning less important than anywhere else in the country. Automobiles and trucks are less important per capita in Alaska than in any other state, but private boats and snowmobiles are important since they are utilized for subsistence and personal transportation in Alaska. Private airplanes and marine freight transportation are also relatively important.

Recent study of Alaskan energy demand has emphasized electric power and has focused on the Railbelt. Before turning to electricity, however, we consider oil and natural gas consumption. Goldsmith and O'Connor (4) estimate approximately 68 million barrels of crude oil equivalent consumption for 1980, up from about 52 million in 1976. Most of the growth is attributed to two industrial uses: natural gas used in production of ammonia-urea on the Kenai Peninsula, and use of both oil and natural gas to power the pump stations for the Alyeska pipeline. The authors point out that considerable natural gas is used for reinjection, but this should not be considered consumption, since most can eventually be recovered. In 1980 petroleum liquids consumption was estimated at 27 million barrels as compared to 41 million barrels of crude equivalent of natural gas, net of reinjection.

There are three natural gas market areas within the state. Prudhoe Bay is the largest with its use for production and transmission of crude oil. Barrow is a small market with government and utility uses. Cook Inlet has several consuming uses: gas utility, electricity generation, industrial, military, as well as reinjection and exports in the form of liquid natural gas (LNG).

The major uses of petroleum liquids are transportation uses which accounted for 63 percent, space heating which accounted for 15 percent and electric utilities and the oil pipeline together utilized the remaining 22 percent of estimated consumption in 1980.

The transportation uses were further broken down as noted in Table 1.1. The segmented breakdown is as follows: 32 percent for highway, 10 percent for marine, and 58 percent for aviation. The authors estimated these data from Alaska motor vehicle excise taxes on fuel. The corresponding natural gas estimates were obtained from a State of Alaska Division of Oil and Gas Conservation report.

TABLE C-1

Alaskan consumption of Transportation Fuels - 1980

(million barrels of crude oil equivalent)

Fuel/Mode	Surface	Marine	Aviation	Total
Gasoline	3.76	.16	.37	4.29
Diesel	2.14	1.56	----	3.70
Jet Fuel	----	----	10.03	10.03
Total	5.90	1.72	10.40	18.02

Source: Goldsmith and O'Connor (1981), obtained from Alaska Department of Revenue.

The projections of consumption of natural gas and petroleum liquids for 2000 are for increases of approximately 100 percent each. Assumptions for these projections are dominated by the one for population which is projected to grow to 700,000 in 2000, an increase from about 408,000 in 1980. Other assumptions are modest. Per capita use of transportation fuels remains constant over time. The space heating modal split and use per customer remain constant, as well. Industrial consumption grows rapidly, in conjunction with population.

These assumptions combined to suggest that consumption will grow with industrial and population growth. Population is presumed to grow quite rapidly -- which it will if there is rapid industrial or military expansion. The constancy of per capita use for transportation and space heating is in question. It assumes away conservation, conversions and other like reactions to increased real fuel prices and changes in the relative prices of oil and natural gas, and of each of these in relation to other fuels: coal, nuclear, wood, alcohol, not to mention more exotic sources. On balance, these projections are likely to be high, based as they are on population growth and business as usual.

The electric power study for the Railbelt, Goldsmith and Huskey (5), is a much more detailed analysis. It utilizes the Man-in-the-Arctic (MAP) statewide econometric model, which is used to project employment, population, and fiscal variables. In addition, three other components were developed: a household formation component, a regional allocation component, and a housing stock component.

The household formation model depends on cohort specific rates of household formation. It distinguishes between military, civilian non-native, and native households.

Recent changes in average household size for Alaska and for the U.S. are built into the analysis.

The regional share depends on growth in the region's basic sector (mining, agriculture-forestry-fisheries, manufacturing, federal government, and the export component of construction and transportation). Four equations estimate population growth, two categories of support employment, and state and local employment.

The housing stock includes single family, duplex, multi-family, and mobile homes. The initial housing stock of each type in any year is equal to that in the previous year less removals (demolitions, accidental losses, conversions). New construction is spurred by housing demand in excess of the initial housing stock, if any.

Housing demand equations were estimated for three of the four housing types using the linear probability formulation (a constrained regression technique.) Family size and income were used as major determinants of housing type choice.

Then three scenarios specifying economic and demographic changes between 1979 and 2005 were developed. Three state government fiscal scenarios were also assumed. These were used to produce statewide projections from the MAP model. The three economic scenarios and the mid-level fiscal scenario were used to establish regional projections. As a reference point we reproduce statewide population projections. For each scenario 1980 population was projected to be about 422 thousand. The low, medium, and high population projections for 2000 were about 536, 700 and 831 thousand, respectively. The driving force in the regional projection model was the basic sector which was projected exogenously for the regions in question. It should be noted that the median scenario here produces population which is comparable to the one for the oil and gas study summarized above.

Household formation projections for the next 25 years reflect the declining average household size. Growth in the housing stock parallels that in the number of households, but does not grow as rapidly since each region begins the projection period with excess housing. Vacancy rates and removals were based on recent U.S. and Alaskan experience.

The basic consuming unit for residential electricity is the (non-military-based) household. Most data on energy consumption are, however, housing units. There are three important housing stock measures: occupied housing units, occupied plus vacant but available units, and second homes. The measure of most interest is occupied housing units, Population in group quarters is available in the 1970 Census materials and was projected and netted out of residential.

Railbelt housing stock space heat mode split was estimated from several sources. Natural gas is available only in the Anchorage and Kenai-Cook Inlet areas. All residential gas customers were assumed to use it for space heating. Most of the rest of residential space heating is by oil or electricity Those heated by propane, wood, and coal were netted out. Electric space heating percents were estimated from utility, census, realtor, and Federal Power Commission data. Then electric space heating requirements were estimated from information on floor space, heating degree days, and structure type. This is because wall and roof surface area increases less than proportionally as floor space increases. Also, mobile homes were estimated to require twenty percent more energy to heat per square foot than standard housing.

Appliance saturation rates were estimated from 1970 census data and more recent data for the Western Region and the nation. Four appliances -- water heaters, cooking ranges, clothes dryers, and refrigerators -- may operate on fuels other than electricity. Census data for communities for 1970 (and changes from 1960) were used to estimate appliance mode splits. No gas refrigerators were reported, so these were dropped from consideration.

Electrical appliance average annual consumption varies with respect to household location, size, income and features of the appliance stock. For instance, self-defrosting refrigerators use more energy than manual-defrost ones, while solid state televisions use less than tube types. The age of the appliance stock is thus of importance. In addition, there is a federal mandate for appliance efficiency covering the first few years of the forecast period. This may cause reductions in electricity use for the forecast period. The analysis allows for all of these changes, but not for even more radical design changes which are technically possible, but perhaps unacceptable to customers.

The electric power requirements for the Railbelt were projected on the basis of an end-use model. The submodels were: residential appliances, residential spaceheating, commercial-industrial-government, street lighting, and second homes. Residential appliances include nine major appliances, lighting, and small appliances.

The submodel for residential appliances first calculates the number of households who own and operate each appliance. This is the product of households, the saturation rate, and the electric mode split (for appliances which may be fueled by gas or oil). They are further disaggregated by vintage.

The space heating model forecasts requirements for the four housing types mentioned. For each type, this is the product of the electric mode split, the number of projected units and the average consumption per unit. Again, there is disaggregation by age of unit.

The commercial-industrial-government submodel is driven by net increases in employment. Street lighting is a small, fixed percentage of sales in other categories. Consumption by second homes is based on an estimate of the number of households with second homes. These last two categories together comprise only about one percent of total consumption.

The projection assumptions and results are given in detail in Goldsmith and Huskey. In summary, their most likely case projects an average annual rate of growth in electricity sales to final consumers in the Railbelt of 4.1 percent between 1980 and 2010, with somewhat more rapid growth in the 1990's and less rapid growth after 2000. The reasons given for projecting slower growth than historically are:

- Population growth in the most likely case is projected at an average of 2.4 percent annually. The statewide population growth rate during the twenty years since statehood is approximately three percent.

- Rising real prices and conservation will moderate the rise of electricity consumption per customer.

- Electric utilities will saturate their market areas.

ENERGY DATA SOURCES

The 1979 regional breakdown of energy data developed for the Long-Term Energy Plan and used throughout this report is based on reports by Alaska's natural gas utilities, information from the Alaskan Power Administration, Institute of Social & Economic Research (ISER), Usebelli coal mine, Alaskan Department of Revenue, and U.S. Department of Energy.

Each of Alaska's electrical utilities have an annual report which contains marketing information. At a minimum the report contains total generation and a break down of sales to the residential, commercial, industrial, and other sectors. The Alaskan Power Administration has kept records of this information, although it has not been published. That data, utility by utility, from 1970 to 1979 is contained as Appendix D. The electricity generation and sales data has been organized by the regional breakdown used in the Long-Term Energy Plan and was the basis for the figures in the regional energy balances.

Considerable electricity generated in Alaska is not sold commercially. For example, the pulpmills in Southeast generate electricity from woodwaste for use in their industrial processes. Likewise the oil and gas industry generates electricity at Cook Inlet and in the Arctic to produce oil and gas. Alaskan Power Administration collects figures on these generation facilities. But, reliable data on transmission losses, etc. is not available. The electricity used in producing energy is contained in line 7 of the energy balances -- it is not end-use energy. The electricity produced by pulp mills and other non-energy industries is end-use energy and is contained in the industrial sector line 11. However, this may slightly overstate consumption because, as mentioned, transmission and generation losses are unknown.

Natural gas production and aggregate use is contained in the Alaska, Historical and Projected Oil and Gas Consumption-1980, published annually by ISER and the Department of Natural Resources (DNR). The breakdown of gas consumption into end-uses in the Railbelt is from the region's two utilities annual report to Federal Energy Regulatory Commission (FERC). The breakdown of natural gas use in the Arctic, at Barrow and in the Prudhoe Bay region was estimated from a variety of sources including personal communications from energy suppliers in the region. Natural gas end-use in the Arctic is the weakest part of the natrual gas data base, particularly in the Prudhoe Bay area. Natural gas used for electrcial generation was estimated on the basis of total MWH produced -- data maintained by the Alaskan Power Administration.

The Usebelli mine maintains complete records of their customers and the quantity of coal sold. Since the coal is either marketed in the Railbelt or exported, there is no confusion about the regional breakdown. However, there are problems in defining energy end-use because coal used by the University of Alaska and the military is used to produce both space heat and electricity. This year the split between the two uses was made by estimating the quantity of coal that would have been required to produce electricity without space heating. This estimate was made on the basis of the total MWH of electricity generated from coal (data available from Alaskan Power Administration). The remainder, sales minus theoretical generation, was placed in the commercial and national defense sectors.

By far the most difficult data to obtain was on petroleum end-use. As explained earlier in the chapter on energy end-use, data on petroleum is incomplete. This is because the state does not tax oil used in furnaces, which includes both distillates and residual oils. Table C-2 provides a breakdown of petroleum consumption. The first nine columns are based on actual reports made to the Alaskan Department of Revenue. Column 3, Highway Other,

Table C-2

Petroleum Consumption
in Alaska 1979
(in Barrels per day)

ALASKA	HWY. GAS.	HWY. DIESEL	HWY. OTHER	AV. GAS.	AV. JET	AV. BONDED	MARINE GAS	MARINE DIESEL	MARINE OTHER	ESTIMATED UNREPORTED FUELS PLUS OFF-HIGHWAY DIESEL: HEATING OIL COMML.	HEATING OIL RES.	ELECT. GEN.	& MISC.	TOTAL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
SOUTHEAST	943.9	805.2		116.1	338.2	0	139.7	687.1	8.7	359.1	1480.9	472.5	246.5	5598.9
CORDOVA/ KODIAK	215.4	184.0		26.4	77.2	0	31.9	156.8	1.9	79.2	326.8	590.3	56.2	1746.1
SOUTHWEST	748.9	728.7		114.5	1223.9	0	32.1	17.4	1.5	158.9	655.2	1009.1	137.7	4827.9
INTERIOR	160.04	155.7		24.4	261.5	0	0	0	0	52.1	215.2	90.2	29.4	988.5
NORTHWEST	247.6	169.16		58.2	98.6	0	28.3	17.7	2.4	92.8	383.1	294.6	51.8	1454.2
ARCTIC	91.1	148.1		25.1	35.3	0	10.4	6.5	0.88	9.7	39.9	236.3	19.1	1956.3
RAILBELT	9417.8	2747.9		727.1	20614.4	4356.4	292.4	2991.1	6.2	1637.0	6751.7	2049.1	1300.1	52891.2
TOTAL	11824.5	5273.4	5315.2	1102.2	22650.4	4355.4	535.1	3876.7	21.8	2389.0	9853.1	4742.4	1840.9	74781.1

is turbine fuel for the pipelines. The remaining four columnms are figures that have been estimated from a variety of sources. The primary source is the U.S. DOE annual report of fuel oil use. This report includes all petroleum fuels sold in Alaska. The figures are not, however, suitable for direct use for several reasons.

The DOE's report is for fuel oil sold commercially, thus it does not contain the turbine fuel used on the pipeline. Secondly, the DOE report defines fuels by chemical composition rather than by end use. So, individual categories such as No. 2 heating fuel may not reflect actual consumption. Finally, the DOE report includes fuels such as bunker oils which are sold but not consumed in Alaska.

Column 14 - the State total - was arrived at by taking the DOE total, subtracting bunker residual fuels and adding turbine diesel. The total for columns 10 and 11 corresponds to the DOE total for heating oils. Column 12 is based on the Alaskan Power Administration's figures on electricity generation from oil. Column 13 is simply the remainder which makes everything total.

The regional breakdown of the first nine columns is based on Department of Resources data. It is, however, an estimate because the Department of Resources only publishes required data by judicial districts. To estimate consumption in the census regions, per capita consumption for each of the four judicial districts was calculated. The characteristics of the districts were conpared to census regions. Regional population figures were then multiplied by the per capita consumption thought to be typical. An adjustment was made for the Arctic and Northwest since most of the highway diesel was obviously consumed around Prudhoe Bay.

The regional breakdown of heating oil, columns 10 and 11, is based on the number of housing structures and degree days, after discounting the consumption of other energy sources such as coal and natural gas. The breakdown between residential, commercial and national defense is somewhat arbitrary. The regional breakdown of diesel for electricity generation is actual data from Alaska Power Administration. Industrial and miscellaneous fuels are simply distributed on a per capita basis.

DEMAND FORECASTING FOR THE LONG-TERM ENERGY PLAN

INTRODUCTION

It is essential that several qualifications be made to guarantee that the forecast results are not misinterpreted. First, there is no such thing as a definitive forecast. A forecast is not a prediction in the strict sense of the term. Any forecast of energy demand utilizing econometric or input/output techniques will depend heavily on the accuracy of forecasts made for the exogeneous (input) varibles. Great effort has been expended in this analysis to choose or generate forecasts for the exogenous variables which are both reasonable and consistent.

Second, this demand model is a long-run forecasting model. The model is designed and constructed to explain fluctuations in energy consumption over an extended period of time. The projections of independent variables reflect this philosophy and, as a result, do not incorporate analysis of short-run business cycles or weather and other determinants of seasonality which would be necesary in order to forecast short-term changes in consumption.

Also, the user must be aware of the aggregate nature of the model. State or area averages (or totals) have value for statistical purposes, but these oftentimes fail to recognize differences among individual generation or delivery systems. A rate of growth or forecast characterizing one particular fuel use for a region as a whole may well be inadequate as a guide to what can occur in one or a group of villages. For this reason, the statistical material presented herein was developed on a village or census sub-area basis where ever possible and aggregated into regional data.

Extreme care must be taken in the interpreatation of the data and the results of this study so as not to draw conclusions from a state or regional analysis and apply them indescriminantly to the local level.

No forecasting model can be a perfect "crystal ball", the main focus of development is to provide a workable tool for policy analysis. A forecasting model should not be a static tool and ideally should be in a state of continual change as more and better information becomes available. Potential alterations include new forecasts of independent variables, reestimation of coefficients and further disaggregation of end-uses modeled. Persons using or refining the model should be continually aware of the use for which such models are designed - policy analysis.

In order to accurately assess the impact of any government policy whether it be an aggressive conservation program, expansion of alternative energy resources or subsidization of the consumer through price subsidy or controls, it is necessary to analyze the levels of growth in the absence of the government programs. It is the purpose of this analysis to provide a base forecast from which to compare the impact of various options. No attempt was made to forecast all of the various options to growth that might materialize but rather provide a model that is capable of addressing the various issues that are involved if any of the alternatives materialize. In order to achieve this goal the forecasting model was built in an attempt to address the major economic and demographic variables that might impact energy growth. The ultimate specification of the model was limited by the data base that was available at the time of the estimation of the model.

As noted above every attempt was made to disaggregate each end-use consuming sector to the level at which energy consumption decisions are actually made. The decision criteria utilized in determining this level of disaggregation were (1) the quantity and quality of data that were available and the subsequent econometric estimation results, and (2) the analytical returns of having the additional information in the disaggregated detail. (That is, there is probably not a significant return in disaggregating oil consumption down to all of its possible end-uses in some of the regions given its minimal use in some activities relative to oil use in other areas).

Given these criteria, the breakdown of uses varies depending upon the region, the end use and the type of end use energy.

The model itself is broken down into three major end-use fuel types:

A. Electricity

B. Oil

1. Gasoline
2. Diesel
3. Jet Fuel

C. Natural Gas

The following is a description of the model by each of the energy sources. Its contents are primarily descriptive in nature.

A. ELECTRICITY

The electricity component of the model is disaggregated into the end-use sectors:

1. Residential
2. Commercial
3. Industrial / Other

The residential sector equation was estimated econometrically, using Alaskan utility specific cross-sectional data. The theory would tell us that the consumption of electricity by the residential sector would be a function of the price of electricity, the price of substitute fuels, the population (households), Income, housing configuration, and temperature, among other variables. Given the data limitations as they now exist whithin the state made it impossible at this point to address all of the variables that influence consumption.

The equation estimated to model residential electricity consumption was obtained by ordinary least squares and took the form:

$$\mathrm{Ln(CRes)} = 20.8102 + 1.03008\ \mathrm{Ln(Pop)} - 2.231\ \mathrm{Ln(HHD)}$$

$$(2.6454)\quad (6.3759)\qquad\qquad (-2.8648)$$

where:

CRes = total residential consumption of electricity

Pop = population of service area

HHD = Heating Degree Days

t values are in parentheses under coefficient estimates

R-2 = 0.7273 D.F = 31

The estimated equation does not include price of electricity and income, two important components that are essential in the decision making process regarding energy consumption. Numerous attempts were made to include these variables into the specifications but the results were statistically unacceptable in terms of R-2, t values and relative size of the coefficients. It is our opinion that these results emanate from an inadequate estimate of income per capita on a subregional or community basis. This result might be interpreted as implying that the elasticity of price at the levels of consumption that are now being observed in the areas under consideration is not significantly differentfrom zero or in other words at levels of present consumption the residential consumer is not exhibiting any significant response to price. The equation presently used in the model implies that there for a 1% increase in population there is approximately a 1% increase in residential consumption of electricity.

The equation utilized in the commercial sector, like the residential sector, was estimated econometrically using Alaska utility specific cross-sectional data. The equation took the following form:

$$\mathrm{Ln(CCOM)} = -2.0268 + .6137\ \mathrm{Ln\ (TY)}$$

$$(-1.3963)\quad (6.8524)$$

where:

CCOM = Total Commercial Consumption of Electricity

TY = Real Total Income

t values are in parenthesis under coefficient estimates

$R2 = 0.5400$ D.F. = 40

The real total income variable is a proxy for Gross Regional Product (fraction of GNP), which is a measure of economic activity in the area. The real total income variable is computed as the product of real percapita income and population.

The equation indicates that consumption of electricity in the commercial sector is a function of both population and real per capita income. Alternative specifications were attempted but in mose cases were not statistically acceptable. Ideally this formulation would also include the price of electricity as an independent variable, however, its level of significance in this formulation was so small as to be clearly unacceptable. This result might be interperated as implying that the price elasticity for electricity is not significantly different from zero in the commercial sector of the economy. In other words, there is no significant response to price at current levels of consumption under the existing rate structure(s).

The Industrial/Other sectors were estimated using Alaskan utility specific cross-sectional data and took the following form:

$$\text{Ln (CIND + O)} = 3.58651 - .8007 \text{ Ln (PE)} + .89209 \text{ Ln (POP)}$$

$$(1.6491) \quad (-1.6168) \quad (5.157)$$

where:

CIND + O = total Industrial and other electrical consumption

PE = price/KWH of electricity

Pop = Population of service area

t values are in parenthesis under coefficient estimates

$R2 = 0.58783$ D.F. = 27

The equaton indicates that consumption in the industrial and other sectors is a function of the price of electricity and population. The elasticities are in the range of estimates derived in studies in the Lower Forty-Eight. But it is our feeling that the estimates of the price elasticity might be in the high range and therefore overstate the impact of price increases. The size of the elasticity might occur as a consequence of a supply and location problem rather than price resposiveness alone. That is, in areas where the price of electriity is high the supply of electricity may be limited and therefore unaccessable at increasing levels.

PETROLEUM PRODUCTS

DIESEL

The diesel fuel component of the model is disaggrated into the following end-use sectors:

1. Residential Heating
2. Commercial Heating
3. Industrial
4. Transportation

Unfortunately it was not possible to estimate all of these end-use sectors econometrically. Given the constraints of time and budget no reliable time series or cross-sectional data base could be collected which contained sufficient information on the dependent and theoretically desirable independent variables necessary to estimate descriptive equations for the residential, commercial and industrial sectors.

For the residential sector, economic theory indicates that the consumption of diesel fuel for heating would be a function of the price of diesel fuel, the prices of substitute fuels, income, the configuration of housing stock and the number of households. In lieu of having sufficient data on these and other variables with which to estimate relationships an input/output framework was chosen. In this case it was postulated that the I/O coefficients would be 1.0 (one) for households and zero for all other variables.

This variable was chosen as the numer of households being heated is the most significant determinate of heating fuel consumption. This equation contains the implicit assumption that the proportion of households heating with diesel fuel will remain unchanged over the forecast period. Mathematically this formulation can be expressed as:

$$Ln\ (RDH) = C + Ln\ (HH)$$

where:

RDH = Residential Diesel Consumption for Heating

C = a constant

HH = The Number of Households

For the commercial sector, economic theory tells us that consumption of diesel fuel for heating would be a function of diesel fuel price, the prices of substitute fuels, the configuration of structures being heated and either the number/volume of structures heated or some measure of economic activity strongly correlated to the use of commercial space. As no econometric equation could be estimated due to the data limations, an I/O coefficient was postulated for the most appropriate measure of economic activity. In this case, basic employment was chosen as the best proxy for economic activity and a coefficient of 1.0 (one) was assigned. Mathematically this formulation may be expressed as:

$$Ln\ (CDH) = C + Ln\ (BE)$$

where:

CDH = Commercial Consumption of Diesel for Heating

C = a constant

BE = Basic Employment

This equation incorporates an implicit assumption that, on average, the configuration of commercial structures being heated with diesel fuel will remain unchanged. This assumption, although stringent, is necessary as no data on the historical changes in mix of structure types (from which current trends might be deduced) was readily available, particularly on a regional basis.

In the industrial sector, economic theory implies that energy consumption is a function of the price of each of the possible fuels used for the industrial process under consideration, the process itself (vis a vis the mix of labor and capital employed) and the level of output generated. Unfortunately, the information which would allow modeling of individual industries or industrial processes is not available at the time of this writing. Again, in lieu of econometrically estimating relationships for this sector an input/output framework was chosen for forecasting total industrial diesel fuel use.

In this case the most appropriate measure of output would be value added by manufacture. However, no reliable forecasts for value added are available and no suitable information and methodology for such a forecast could be developed without extensive survey of Alaskan industry. For the purpose at hand, basic employment was chosen as the most appropriate measure of industrial activity to serve as a proxy for industrial output. For this sector basic employment was assigned a coefficient of 1.0 (one) for the I/O framework chosen. The formulation may be expressed as:

$$Ln\ (ICD) = C + Ln\ (BE)$$

where:

ICD = Industrial Consumption of Diesel Fuel

C = a constant

BE = Basic Employment

This formulation encorporates the implicit assumption that the use intensity of diesel fuel by industry will remain relatively constant over the forecast period. Although this assumption may not be valid if there is a substantial influx of new manufacturers (different processes) into Alaska, none of the available information lends itself to a viable forecast for changes in use intensities by fuel type. Indeed, this problem would still remain even if the data were available to develop an econometric model of total industrial diesel fuel use.

Transportation diesel fuel use is forecast with an estimating equation obtained from 1971-1979 annual data by ordinary least squares regression of the form:

$$\text{Ln TD} = -10.8045 + 1.35910 \text{ Ln E}$$

$$(-3.493) \quad (5.1977)$$

where:

TD = Transportation Sector Consumption of Diesel Fuel

E = Total Alaskan Employment

t values are in parentheses under coefficient estimates

R-2 = 0.76482

Transportation use of diesel fuel has been growing rapidly in recent years despite rising nominal and real prices. We were unable to find any evidence that there has been a dampening effect on diesel use from price. Consequently, the best predictor was chosen on the basis of economic criteria from the available variables. Total employment appeared more reasonable than basic employment or population. The elasticity of demand with respect to total employment is estimated at about 1.4 . This is really a statistically derived input-output type coefficient, but as a first cut it is likely to be preferable to simply utilizing population as the primary generator of this type of economic activity.

GASOLINE

Gasoline consumption is forecast with an estimating equation obtained from 1971-1979 annual data by an ordinary least squares regression of the form:

$$\text{Ln }(G) = -7.00954 - 0.473467 \text{ Ln }(PG) + 0.987937 \text{ Ln }(E)$$

$$(-4.0412) \quad (-2.0040) \qquad\qquad (7.7290)$$

where:

G = Total Alaskan Consumption of Gasoline

PG = The real price of gasoline

E = Total Alaskan Employment

t values are in parentheses under coefficient estimates

R-2 = 0.94126

With the double log functional form, the coefficient estimates are interpreted as short-run elasticities, in this case one year. Other formulations were attempted. By far the next most interesting result was a formulation with the dependent variable specified per capita and with the same independent set as above. However, it was statistically inferior in terms of both R-2 and t-values. The variables chosen were run with a lag and with a dummy for the first three (pre-embargo) years, but these were without significance in all cases. In addition, they had a damaging effect on the reasonableness of the elasticity estimates of the real price of gasoline and total employment.

The short run price elasticity for gasoline of about -0.47 is on the sensitive side. It suggests that as real price changes, consumption changes in the opposite direction by nearly half as much, proportionally. In combination with total Alaskan employment, with an elasticity of nearly unity, the equation is a good first approximation for a forecasting model.

JET FUEL

Jet fuel consumption is forecast with an estimating equation obtained from 1971-1979 annual data by ordinary least squares regression of the form:

$$\mathrm{Ln}\ (J) = -8.209479 + 1.3483054\ \mathrm{Ln}\ (B)$$
$$(-3.3673) \qquad (5.7394)$$

where:

J = Total Alaskan Consumption of Jet Fuel

B = Basic Alaskan Employment

t values are in parentheses under coefficient estimates
R-2 = 0.764882

Since the double log functional form is used, the coefficient estimates can be interpreted as short run elasticities. As with diesel, we were unable to find a dampening effect from price in the historical series available. Jet fuel consumption is primarily business related. In addition, there is an anomalous situation in that polar routes for transcontinental flights grew importantly during the decade. This probably caused growth in Alaskan jet fuel to be biased on the high side. In any case, we chose basic employment as the most valid predictor primarily on economic criteria; it appeared to be more reasonable than total employment or population. The elasticity of demand with respect to basic employment is estimated at about 1.3. This is, again, a statistically derived input-output coefficient, but it is felt to be preferable to merely using population to generate forecasts of this type of economic activity.

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2 ENVIRONMENTAL RESEARCH CENTER, 1975, Energy Forecasts for the Pacific Northwest, Washington State University, Chapter 3.

3 WOODFILL, Douglas, July 1975, "Forecast of Electrical Energy Sales for the Seattle Service Area to 1990", Department of Lighting, City of Seattle, p. 1.

4 GOLDSMITH, Scott and Kristina O'Conner, "Alaska - Historical and Projected Oil and Gas Consumption," Institute of Social and Economic Research, Anchorage, January 1981.

5 GOLDSMITH, Scott, and Huskey, Institute of Social and Economic Research, Anchorage, June 1980.

ENERGY DEMAND FORECAST

The energy demand forecast is based on the model as described in the previous section. This section will outline the basic economic and demographic assumptions that were utilized in the model. It is essential that several qualifications be made to guarantee that the results are not misinterpreted. First, there is no such thing as a definitive forecast. The results of a given forecast will depend upon the legitimacy of the forecasts of the exogenous, or input, variables. Any change in these underlying assumptions will alter the magnitudes of the forecast. Second, a forecasting model is not a static tool and ideally would be in a state of continual transition as more and better information becomes available. Potential alterations not only include the refinement of the independent variables, base values, and projections, but also involves re-estimation of key coefficients.

Third, the demand model is a long-run forecasting model used to forecast demand for energy by five year increments to the year 2005. For this reason one should be cautioned against utilizing the results in a short run context. The model is designed and constructed to aid in explaining the dynamic fluctuation in energy consumption over an extended period of time. The projection of the independent variables reflect this philosophy and as a result, do not incorporate the short run business cycles that would be necessary in forecasting short run energy demand.

In addition, it is essential that the user of the forecasted results be familiar with the underlying assumptions and limitations of the model, lest the results be misinterpreted. One must be cognizant of the fact that the model is based on a system of equations that were estimated econometrically, and as such, are subject to a degree of error. In part, this error is introduced by the implicit assumption that there is no interdependence among the independent variables. This can be partially avoided in the estimation by the use of two-stage regression which directly specifies such interdependence as a mathematical formula. In most cases, this process is not adequate to totally remove biases caused by interdependence.

Another underlying assumption is that the econometric method presupposes that the internal structure of the economy is constant. Therefore, no interpretations concerning major technological changes, exhaustion of resources, or other structural changes occur. If an attempt was made to simulate such changes (for instance, by entering projections which caused relative prices to vary by orders of magnitude) estimation errors would be compounded to the point of producing meaningless results. Any interpretation must proceed within the framework specified by the projections of the exogenous variables, and any new framework specified for further forecasting must proceed within the limits of the econometric specificatins.

There is one exception to this approach relative to forecasting which were incorporated into the model, by necessity. Natural gas forecasts were taken from analysis performed exogenous to this study.

All other quantities demanded depend upon the specifications of the model, the base values of the dependent and independent variables appear in subsequent sections. Discussion of the projections of the independent variables utilized will follow.

FORECASTS OF THE INDEPENDENT VARIABLES

As noted earlier, the forecasted levels of the energy consumption will depend extensively on the projected values of the exogenous, or independent variables. Tables C-3 through C-9 give the projected values of the major economic and demographic variables. The assumptions with regard to, and sources of, these growth patterns will follow the projection tables. The assumptions made regarding the exogenous events impacting energy supply and/or demand are presented in Table C-10. This table should be examined carefully by the reader, as it presents the framework within which the forecasts must be analyzed.

The projections of basic employment, total employment, and population are presented for the six non-railbelt regions and the state total for 1979, 1985, 1990, 1995, 2000, and 2005. These data are based on unpublished projections by the Institute of Social and Economic Research. Their methodology has been discussed elsewhere in this report and is described in detail in their Railbelt electricity study. The data were scaled to preliminary 1980 census population figures for Alaska Census Divisions and thus differ from the ISER projections only by these region-specific constants. Thus, the ISER-supplied growth rates are used for all these projections.

TABLE C-3.

REGIONAL AND TOTAL ALASKAN EMPLOYMENT AND POPULATION PROJECTIONS

ARCTIC

Year	Basic	Total	Pop
1979	1,454	2,296	4,160
1985	1,741	2,976	4,397
1990	1,910	3,170	4,782
1995	2,191	3,748	5,692
2000	2,354	4,178	6,374
2005	2,599	4,613	7,038

TABLE C-4

NORTHWEST

Year	Basic	Total	Pop
1979	1,162	4,061	11,280
1985	1,560	5,157	12,441
1990	1,803	5,671	15,221
1995	2,207	7,014	17,363
2000	2,440	8,055	19,445
2005	2,694	8,893	21,468

TABLE C-5

INTERIOR

Year	Basic	Total	Pop
1979	1,119	2,280	5,400
1985	1,368	3,000	6,191
1990	1,519	3,278	6,732
1995	1,772	3,629	7,680
2000	1,917	4,022	8,094
2005	2,117	4,440	8,937

TABLE C-6

SOUTHWEST

Year	Basic	Total	Pop
1979	9,334	13,323	29,950
1985	10,494	16,779	37,599
1990	11,200	17,954	40,394
1995	12,377	20,514	46,082
2000	13,056	22,331	51,604
2005	14,415	24,656	56,975

TABLE C-7

SOUTH CENTRAL

Year	Basic	Total	Pop
1979	3,380	6,217	12,238
1985	4,094	8,195	14,205
1990	4,528	8,914	16,356
1995	5,251	10,508	18,659
2000	5,669	11,878	20,895
2005	6,259	13,114	23,069

TABLE C-8

SOUTHEAST

Year	Basic	Total	Pop
1979	5,034	26,254	53,613
1985	5,682	34,448	65,487
1990	6,0787	36,802	71,727
1995	6,734	44,093	81,828
2000	7,113	50,213	90,974
2005	7,853	55,439	100,443

TABLE C-9

ALASKA TOTAL

Year	Basic	Total	Pop
1979	37,071	167,411	400,331
1985	47,506	218,540	478,356
1990	50,961	236,435	520,181
1995	56,655	283,016	593,428
2000	60,439	324,174	664,542
2005	64,475	371,319	744,179

Sources: Institute of Social and Economic Research, unpublished data U.S. Census 1980 preliminary counts, Applied Economics Associates.

TABLE C-10

SUMMARY OF BASIC ECONOMIC PROJECTIONS

Special Projects

Descriptions

Dates & Employment

Source:

TRANS-ALASKA PIPELINE

The construction of the TAPS was completed in 1977. Additional construction of four pump stations is assumed as well as pipeline operations.

1979-1982 - Pump station construction employment of 90/year.
1977-2000 - Operations employment of 1000/yr.

E. Porter, Bering-Norton Statewide-Regional Economic and Demographic Systems, Impact Analysis, Alaska OCS Socioeconomic Studies Program, Bureau of Land Management, 1980.

NORTHWEST GASOLINE

Construction of natural gas pipeline from Prudhoe Bay which includes construction of an associated gas conditioning facility on the North Slope.

1981-1985 - Construction peak employment of 7,823 (1983).
1986-2000 - Operations begin employing 400 petroleum and 200 transport workers.

E. Porter, 1980.

PRUDHOE BAY PETROLEUM PRODUCTION

Primary recovery from Sadlerochit formation, secondary recovery using water flooding of that formation and development of the Kuparuk formation.

1982-1984 - Construction of water flooding project peak employment of 2,917 (1983)

E. Porter, 1980.
1980-2000 - Mining employment long-run average of 1,802/year.

UPPER COOK INLET PETROLEUM PRODUCTION

Employment associated with declining oil production is assumed to be replaced by employment associated with rising gas production maintaining current levels of employment.

1980-2000 - Mining employment of 705/year.

E. Porter, 1980

NATIONAL PETROLEUM RESERVE IN ALASKA PETROLEUM PRODUCTION

Petroleum production in NPRA - Production in two fields with total reserves of 1.2 billion barrels equivalents of oil and gas. Construction of 266 miles of pipeline.

Leased between 1995 and 2013. Exploration and development begins in 1998. Average mining employment of 286 (between 1998-2000).

Based on mean scenario under Management Plan 4 in Office of Minerals Policy and Research Analysis, U.S. Dept. of Interior, Final Report of the 105 (b) Economic and Policy Analysis, 1979.

OUTER CONTINENTAL SHELF PETROLEUM PRODUCTION

Production in six OCS lease sale areas: Beaufort 1 (1979) Lower Cook (1981) Beaufort 2 (1983) Navarian Basin 1 (1984) Hope Basin (1985) Chukchi Basin (1994)

Peak OCS Employment - Mining - 4,900 (1996) - construction - 3,300 (1992)

E. Porter, 1980 (for Lower Cook and Bring-Norton lease sales). Employment scenarios for remainder of sales estimated based on N. Gulf (Sale 55) high case adjusted to include LNG plant (Huskey and Nebesky, Northern Gulf Petroleum Scenarios: Economic and Demographic Systems Impacts, Socioeconomic Studies Program, Alaska OCS Office, 1979). Northern Gulf Scenario was adjusted by differenced in resource estimates to produce scenarios for specific areas.

BELUGA COAL PRODUCTION

Major development of Beluga coal reserves for export.

1985-1990; 1994 - Constructin with peak employment of 400 (1987).
1988-2000 - Production employment of 370/yr.for long-run average.

Pacific Laboratory, Beluga Coal Field Development: Social Effects and Management Alternatives, 1979.

ALPETCO PROJECT

Development of modified Alpetco proposal; configuration is primarily as a refinery rather than petrochemical operation.

1982-1984 - Construction employment of 900/year 1985-2000 - Operations employment of 518/yr.

E. Porter, 1980.

PACIFIC LNG PROJECT

Construction of current proposal by Pacific LNG

1982-1985 - Construction peak employment of 1,323/year (1984).
1986-2000 - Operations employment of 100/yr.

E. Porter, 1980.

INDUSTRY ASSUMPTIONS

OTHER MINING

No expansion of existing non-special project mining.

Employment constant at 1979 level, 2,350/yr.

AGRICULTURE

Assumes that a relatively low priority is given to agriculture development because of priorities for recreation and wilderness or the lack of markets.

Employment grows to 1,037 by 2000.

M. Scott, Southcentral Alaska's Economy and Population, 1965-2025: A Base Study and Projections, Economics Task Force, Alaska Water Resources Study (Level B), 1979.

FISHERIES/FOOD PROCESSING

Maintenance of current levels of employment in existing fishery. Expansion of bottomfishery to replace one-half of foreign fishery in the 200 mile limit.

Employment in fisheries increases to 1,228 by 2000. Construction of hatchery and processing facilities employs 75/yr. Appropriate expansion of food processing industry.

M. Scott, 1979. M. Scott "Prospects for a Bottomfish Industry in Alaska," Alaska Review of Social and Economic Conditions, 1980.

FORESTRY/PULP AND PAPER MANUFACTURING

Employment expands to accommodate 960 million board feet of lumber.

M. Scott, 1979.

OTHER MANUFACTURING

Expansion of existing manufacturing of locally consumed goods.

Growth of output at 2% per year.

Regional distribution based on existing distribution of employment.

FEDERAL GOVERNMENT

Civilian employment assumed to grow at recent historical rate. Military constant at current level.

Civilian employment grows at .05% per year

M. Scott, 1979.

Source: Scott Goldsmith and Lee Huskey, "Electric Power Consumption for the Railbelt: A Projection of Requirements, Technical Appendices, Institute of Social and Economic Research, Anchorage, 1980.

PETROLEUM PRODUCT PRICE FORECAST

A. BASE PRICE FORECASTS

In the near future, OPEC is likely to formally ratify a long-term strategy which includes an oil price policy. The basic elements of the cartel's pricing strategy, even though it has not been formally approved, have been public. Essentially, the cartel intends to index oil prices to a formula based on inflation, exchange rates, and the real rate of economic growth in the major consuming nations.

OPEC's long-term strategy represents a major shift in tactics for the cartel. Despite utterances to the contrary, previous oil pricing decisions have been heavily influenced, if not determined, by short-term market conditions. The price increases in 1974 and 1979 are well known; less well known is the fact that the price of oil actually declined in real terms from 1974 through 1978. Obviously, the OPEC producers would prefer that oil prices not decline in the 1980's.

The driving force behind the new strategy has been Shiek Yamani of Saudi Arabia, and he is determined to develop a framework which will moderate the inherent instability in oil pricing. He believes that such instability has been detrimental to the West and to OPEC. This attitude is in sharp contrast to the perceptions of many oil consumers who view OPEC as an arch-type monopoly.

The new OPEC strategy contains two key elements--an index formula for pricing and an agreement in principal to share production cuts in order to shore up a glutted market. It is, of course, not certain that the long-term strategy will be approved in its present form or, if approved, that it will be successfully implemented. Nonetheless, the new OPEC strategy deserves careful study. In its weakest application, the price index formula will influence oil pricing trends; in other applications it may, as intended, determine oil price movements.

OPEC views the index formula as a minimum price floor. It is not their intention that the index should set a rigid fixed prices insensitive to market developments. As might be expected, however, their view of flexibility mainly allows for upward movements. (However, at least some OPEC members believe that, during a shortage, the cartel should practice some price restraint.) The aim of the OPEC long-term strategy is to bring about an orderly balance between demand and supply.

As mentioned before, the index developed by OPEC is based on three independent series: a) an inflation index composed of movements in export prices of OPEC's major trading partners and corresponding movements in the consumer price index, b) exchange rate movements of the nine major industrilized currencies vis-a-vis the U.S. dollar, c) the weighted average real economic growth of the industrialized countries. The first two series are intended to maintain OPEC's purchasing power and terms of trade. The final series, based on real economic growth, is intended to increase oil prices in real terms, thus stimulating the transition to alternative energy resources.

Based on OPEC's strategy paper, the Pacific Northwest Energy Policy Workshop simulated the OPEC oil price index. A model has been developed which inputs assumptions about CPI, export prices, exchange rates, and economic growth for each of the major industrilized countries and then calculates the resulting change in the oil price index formula.

There are two major elements to any price indexing scheme: the rate at which the index changes and the base to which it is applied. In the case of oil, both consumers and producers might agree that, in principal, indexing is a good idea. Consumers, however, would like to apply the index to a 1972 oil price while producers would like to apply it to a 1974 oil price.

OPEC's indexing formula was unilaterally developed by the cartel's experts. So, as might be expected, the formula favors the producers. The index is biased because of double counting; the U.S. inflation rate and dollar exchange rate changes both apply to the oil price formula. The movement of the dollar vis-a-vis other currencies and U.S. inflation are not, of course, independent. For example, increases in the U.S. inflation rate are likely to stimulate further declines in the dollar. Given the successful application of the OPEC formula, this would result in escalated increases in oil prices.

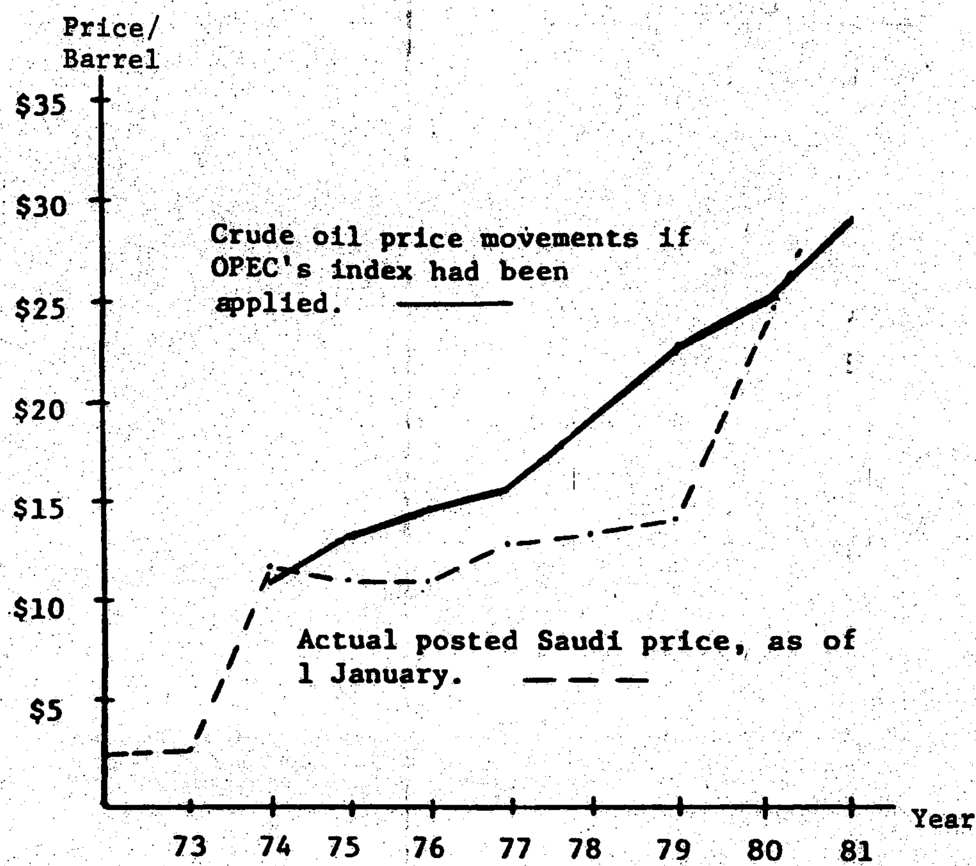
The double counting is not, however, a mistake. A large percentage of OPEC assets are denominated in dollars, and the cartel is as concerned about financial stability as it is about the level of oil prices.

The cartel's index begins in 1973. It can be calculated through 1979 with actual data as illustrated in Figure C-1. Movements in the index for 1980, or for future years, can only be calculated on the basis of projected economic data. From 1973 to 1979 the index increased at an annual rate of 16%. The U.S. inflation rate during the period averaged 8.5%, so that if the index had been used, there would have been a substantial increase in oil prices in real terms. There are two important reasons for the large increase in the index. Generally, export price increases were higher than internal inflation rates. This was particularly true in the period following the 1974 oil price explosion. Secondly, during the six-year decline in the dollar averaged nearly 3% each year from 1973 to 1979. Since oil is priced in terms of dollars, this resulted in a substantial decline in OPEC's purchasing power. OPEC made up for this with the 1979 price increases.

Future movements in the OPEC oil price index have been forecast in Petroleum and the Northwest: Disruption or Transition.

Figure C-1

OIL PRICE MOVEMENTS



Overall crude oil prices are forecast to grow at 3.9% (above inflation) from 1980 to 2000. Heating oil growth rates are 3.0%, gasoline 2.7% and residual oil 3.4%. For the Alaskan energy demand forecast, adjustments have been made for higher Alaskan distribution costs. The impact is not significant.

B. REGIONAL PRICE FORECASTS

In the case of the modeling any of the Lower Forty-Eight States the type of base price forecast discussed above (inclusive of taxes and normal markups) would be utilized directly as an input variable. For the unique conditions of Alaska, however, such a forecast does not adequately reflect the product price at the point of consumption. The base price forecast in this case reflects real price trends at the main bulk plants, or distribution centers.

In most areas transportation costs from bulk plant to consumer make up a significant fraction of the prices faced by the end-user for any petroleum product. This transport or shipping component of fuel prices tends to be much lower in the Southeast and Railbelt areas than in any other parts of Alaska, based on examination of historical data for individual cities and villages. This result is, indeed, intuitive given the higher population densities of these regions as well as the more highly developed delivery systems of the areas. These are primarily regularly scheduled barge routes in the Southeast and the rail and highway systems of the Railbelt.

Outside these areas the primary method of shipping fuels from bulk plant to end-user is via barge. Air transport from bulk plant to consumers is of secondary importance with commercial land transport being tertiary. The importance of personal land transport of fuels by the end-user via truck and snowmachine could not be quantified from the available data but is known to be a not uncommon occurance in northern areas of the state, particularly in winter.

* Rural Alaska Community Action Program, "Energy Profile for Alaska", December, 1979.

An attempt was made to directly address all of these considerations in generating the forecasts for prices of diesel fuel and gasoline on a regional basis. The first step in was to compute rates of growth in base prices for each five year increment of the forecast period. Base prices were then selected for each region. This selection process was accomplished from historical survey data representing a large sample of Alaskan villages and cities.* In those regions for which there was not one predominant bulk plant, the median bulk plant prices for diesel and gasoline were chosen as being representative for the given region. These base period (1979) values were then increased over the forecast period by the annual average rates of growth computed from the base price forecast.

The resultant series represents real prices of petroleum fuels at the bulk plant for each region. The arithmetic mean transport (shipping) charges were then estimated for each region. This estimation proceeded on a judgmental basis as the cross-sectional data available on a village by village basis included bulk prices and various shipping rates but did not include consumption data which might have been used to weight the transportation charges.

With continuing research, data were also available for the cross-sections as to storage facilities and type of transport normally utilized which enabled estimation of the appropriate shipping rates for each village. As consumption statistics for the cross-sections were not available, the regional estimates of average shipping charges were made on the basis of relative populations of the cities and villages and the informed judgement of the analysts.

On the basis of available information, these average shipping rates were determined to have changed much more slowly than fuel prices over the historical period for which data was available. As a first approximation for this forecast the mean shipping rates were held constant over the forecast period. These shipping rates by region were then added to the forecasts for real prices at the representative regional bulk plants. The resultant forecasts represent real fuel prices at the point of consumption inclusive of taxes, markups and all transportation costs.

ELECTRICITY PRICE FORECAST

At present there is no comprehensive methodology for forecasting the price of electricity in the state of Alaska. As noted, numerous times in this report the Alaskan energy picture is extremely diverse and the electricity pricing scheme is no exception. The price ultimately charged the consumer is a function of not only the fuel source and the conversion technology utilized in the production of the electricity but also on the various subsidy programs that have been, are now, and will be implemented in the future by the state. It has been estimated by the Alaska Power Administration that the energy sources utilized by the state in the generation of electricity are as follows:

Natural Gas	56%
Oil	18%
Coal	10%
Hydro	10%
Other	6%

Given the alternatives now being utilized and their geographical spread, what is necessary is a comprehensive capacity expansion model that would allow the analyst the capability of estimating the changes in electricity price under alternative technological or capacity expansion assumpions as well as alternative scenarios regarding fuel prices. At present such a model does not exist at the State-wide or regional level. In addition, the State has implemented a subsidy program in an effort to mitigate the impact on residential consumers of the rapidly increasing prices of fuels such as oil on the costs of supplying electricity and the ultimate price the consumer pays.

The forecast of the price of electricity was regionally specific. In those regions that are highly dependent upon diesel for the generation of electricity the increases in the price of electricity were tied to increases in the price of diesel through the following formula:

$$(Pe\ (t) - Pe\ (t-1)) = \frac{\text{Price of Diesel } (t) - \text{Price of Diesel } (t-1)}{\text{Kwh / Gallon of Diesel}}$$

We assumed that in the areas of the Arctic where natural gas is abundant and the Southwest were hydro is installed and, the potential is high for increased hydro capacity the forecast of price of electricity is constant in real terms.

FORECAST OF ENERGY DEMAND

This section summarizes the forecasts of energy demand by energy source, economic sector, region and the State. Given the level of detail involved in the forecasts, only portions of the forecasts will be explicitly analyzed and it will be left to the reader to review the results of the individual sectors.

FORECASTS BY ENERGY SOURCE

A. ELECTRICITY

Electricity is forecasted to increase in all regions and the State as a whole for the study period. The growth rate for the State as a whole for all sectors and the sum of the non-railbelt regions is 1.995% per year to the year 2005. This is significantly less than the growth that has occured in the State from 1976 to 1979 which has average 8.5% per year. This difference can be explained partially by the reduced forecasts of growth in population and economic activity as forecasted by the MAP economic model.

The growth of electricity consuomption at the regional level range from 2.1511 average annual rate of growth in the Southeast to .8480 average annual rate of growth in the interior. The lower growth rate in the interior region can be attributed to the price effects of increased petroleum and subsequent generation costs resulting in retention in growth in the commercial and industrial use of electricity. Residential consumption increased at a level somewhat greater than the growth in population reflecting a relatively constant per capita use.

National Defense energy requirements are assumed to remain constant for the state at 526 thousand Mwh (526 x 10**3 Mwh) of net generation.

Self supplied industrial net energy requirements are determined exogenously and are composed of projects identified and included in the ISER economic forecasts.

B. PETROLEUM

Given the level of detail in the forecasts, only some of the results will be presented. Petroleum consumption is forecast to increase in the State and in all six non-railbelt regions and for the three fuel types: gasoline, diesel, and jet fuel. For both the total of the six regions and the State diesel is the fastest growing fuel, on average, followed by jet fuel and gasoline, respectively. This pattern is also true for the historical period 1971-1979 for the State totals from which statistical parameters were estimated.

The State total growth rate for 1980-2005 for diesel consumption is forecast to be approximately 3.19 percent, for jet fuel consumption about 3.14 percent, and for gasoline consumption about 2.55 percent. These compare with the forecast average annual growth rate of population which is 2.4 percent for the State total. The expected pressures for economic growth in Alaska combined to generate higher rates of growth in these fuels, the more they are business-related and at a increasing per-capita use level.

For the six non-Railbelt regions, the picture is slightly different. The population growth rate, following ISER, is forecast to be, again, 2.4 percent. But the fuel use growth rates are below those for the state totals, reflecting the relatively strong economic growth projected for the railbelt. The fuel use growth rates are projected to be 2.98 percent for diesel, 2.63 percent for jet fuel, and 2.11 percent for gasoline. The total, or weighted average, growth rate is 2.66 percent, slightly above population, since the use of diesel in the six non-Railbelt regions is proportionally higher than for the State total.

The same patterns generally hold in the individual regions. There are differences, but they are small. For instance, in the Southeast, the projected growth rate for gasoline slightly exceeds that for jet fuel. This may be due in part to Southeast being service- rather than export-oriented insofar as the employment data categories used herein are concerned. In the Northwest, the growth rate for jet fuel exceeds that for diesel; it should be noted that the base for jet fuel is very small.

The projected growth rates are generally reasonable and reflect likely economic and population growth in Alaska. However, the more disaggregate the analysis, the less accurate the forecasts are likely to be. It is more comfortable to agree with the State totals and non-railbelt totals than with any of the individual non-railbelt regional forecasts. This is for two reasons. First, the lack of data at a regional level necessitated relatively primitative estimates of initial petroleum use conditions. Second, it is inherently easier to forecast spatial economic activity the larger the area chosen. Put another way it is easier to broadly suggest the direction, type, and location of economic activity, than to pinpoint its location, timing, extent, etc. For all these reasons it is easier to feel comfortable with the division, say, between Railbelt and non-Railbelt than between Arctic and Northwest.

C. NATURAL GAS

Natural Gas consumption is projected to approximately double between 1980 and 2005. This forecast follows Goldsmith and O'Connor (1981) and was exogenously forecasted by them. The projection is broken down by consuming sectors and includes electricity generation and LNG exports but not reinjection. Table C-11 indicates the actuals for 1980 and the projections for 2005.

The projections are based on the following assumptions. Population grows to 700,000 by 2005 as a result of basic economic growth and State fiscal policy. This is similar to the mid-level forecast employed in the Railbelt electricity study. Natural gas is the preferred spaceheating and industrial fuel for new customers in the Anchorage area. New electricity generation in Anchorage is assumed to be provided by natural gas through 1990. New projects which stimulate natural gas use include the natural gas pipeline in 1985 and the facility for shipping LNG to California in 1986.

TABLE C-11.

ALASKA NATURAL GAS CONSUMPTION NET OF REINJECTION
(million barrels of crude oil equivalent)

use/year	1980	2000
Utility Electricity	4.9	8.0
Space Heat	2.5	4.0
Industrial	24.4	55.7
LNG Exports	8.7	11.3
Total	40.5	79.0
Total Net of LNG	26.9	59.7

GOLDSMITH, Scott and Kristina O'Conner, "Alaska - Historical and Projected Oil and Gas Consumption," Institute of Social and Economic Research, Anchorage, January 1981.

APPLIED ECONOMICS ASSOCIATES,INC. / ALASKA LONG-TERM ENERGY PLAN

REGIONAL FORECASTING MODEL

ARCTIC

ITS ARE BILLIONS OF BTU.S (10**9 BTU.)

ELECTRIC	1979	1985	1990	1995	2000	2005	AARG
RESIDENTIAL TOTAL	8.7381	9.2524	10.0864	12.0702	13.5627	15.0192	2.1051
COMMERCIAL	68.0913	70.4514	74.1688	82.5426	88.4799	94.0238	1.2489
INDUSTRIAL	7.0082	7.3641	7.9356	9.2706	10.2555	11.2027	1.8205
OTHER	.3856	.4052	.4366	.5101	.5643	.6164	1.8205
TOTAL ELECTRIC	84.2232	87.4730	92.6274	104.3934	112.8624	120.8621	1.3988

TROLEUM	1979	1985	1990	1995	2000	2005	AARG
DIESEL							
RESIDENTIAL HEATING	85.0200	89.8739	97.7284	116.3374	130.2787	143.8400	2.0430
COMMERCIAL HEATING	20.6600	24.5799	26.9629	30.9311	33.2284	36.6878	2.2332
INDUSTRIAL	40.6700	48.3865	53.0776	60.8890	65.4114	72.2214	2.2332
TRANSPORTATION	148.7900	211.7074	230.7032	289.5673	335.6566	383.9999	3.7139
TOTAL DIESEL	295.1400	374.5478	408.4722	497.7249	564.5752	636.7491	3.0016
GASOLINE							
TOTAL GASOLINE	241.0600	297.7160	304.0713	343.3906	364.5689	382.7762	1.7944
JET FUEL							
TOTAL	73.2000	92.5212	104.8154	126.1309	138.9228	158.7695	3.0227
TOTAL PETROLEUM	609.4000	764.7849	817.3590	967.2465	1068.0669	1178.2948	2.5684

NATURAL GAS	1979	1985	1990	1995	2000	2005	AARG
TOTAL NATURAL GAS	720.0000	839.3459	953.7797	1083.8150	1231.5790	1399.4890	2.5891

TAL ENERGY CONSUMPTION FOR THE REGION

ALL FUELS	1979	1985	1990	1995	2000	2005	AARG
	1413.6232	1691.6038	1863.7661	2155.4549	2412.5083	2698.6460	2.5181

APPLIED ECONOMICS ASSOCIATES,INC. / ALASKA LONG-TERM ENERGY PLAN

REGIONAL FORECASTING MODEL

NORTHWEST

ITS ARE BILLIONS OF BTU.S (10**9 BTU.)

ECTRIC	1979	1985	1990	1995	2000	2005	AARG
RESIDENTIAL TOTAL	31.3358	34.6643	42.6670	48.8669	54.9104	60.8054	2.5825
COMMERCIAL	44.9249	47.7098	53.9949	58.5408	62.7522	66.6830	1.5307
INDUSTRIAL	68.8610	72.5824	84.0380	91.3167	96.8451	100.9760	1.4832
OTHER	15.1390	15.9572	18.4756	20.0759	21.2913	22.1994	1.4832
TOTAL ELECTRIC	160.2607	170.9137	199.1755	218.8003	235.7991	250.6639	1.7353

TROLEUM	1979	1985	1990	1995	2000	2005	AARG
DIESEL							
RESIDENTIAL HEATING	814.4300	898.2867	1058.9794	1253.6952	1403.9539	1550.0533	2.5061
COMMERCIAL HEATING	197.5000	265.1395	306.3373	375.0754	414.5753	457.7457	3.2858
INDUSTRIAL	110.3600	148.1559	171.2046	209.5864	231.6584	255.7814	3.2858
TRANSPORTATION	403.4800	558.1984	635.1938	847.9997	1023.2870	1170.6935	4.1821
TOTAL DIESEL	1525.7700	1869.7805	2211.7651	2686.3566	3073.4746	3434.2744	3.1696
GASOLINE							
TOTAL GASOLINE	653.6500	796.9813	845.4178	1004.8018	1105.3239	1167.4558	2.2559
JET FUEL							
TOTAL	198.4900	295.2546	358.8107	471.3147	539.4384	616.5199	4.4554
TOTAL PETROLEUM	2377.9100	2962.0169	3415.9936	4162.4731	4718.2369	5218.2500	3.0690

TAL ENERGY CONSUMPTION FOR THE REGION

ALL FUELS	1979	1985	1990	1995	2000	2005	AARG
	2538.1707	3132.9306	3615.1591	4381.2734	4954.0359	5468.9139	2.9965

INTERIOR

UNITS ARE BILLIONS OF BTU.S (10**9 BTU.)

ELECTRIC	1979	1985	1990	1995	2000	2005	AARG
RESIDENTIAL TOTAL	14.6409	14.1490	15.4249	17.6671	18.6490	20.6518	1.3318
COMMERCIAL	10.8570	10.6382	11.1997	12.1430	12.5407	13.3264	.7913
INDUSTRIAL	9.8982	9.2809	9.6735	10.5118	10.5607	11.0114	.4108
OTHER	6.7899	6.3665	6.6358	7.2108	7.2443	7.5536	.4108
TOTAL ELECTRIC	42.1860	40.4346	42.9338	47.5326	48.9947	52.5432	.8480

PETROLEUM	1979	1985	1990	1995	2000	2005	AARG
DIESEL							
RESIDENTIAL HEATING	457.6400	442.7058	481.4108	549.2094	578.8196	639.0733	1.2927
COMMERCIAL HEATING	110.9500	135.5897	150.6312	175.6290	190.0260	209.7951	2.4805
INDUSTRIAL	62.5500	76.4410	84.9210	99.0139	107.1305	118.2756	2.4805
TRANSPORTATION	331.0900	480.6650	542.2297	620.4665	715.8742	818.9342	3.5445
TOTAL DIESEL	962.2300	1135.4014	1259.1927	1444.3188	1591.8503	1786.0782	2.4075
GASOLINE							
TOTAL GASOLINE	351.6600	446.1117	472.1249	503.6509	538.4602	570.9467	1.8814
JET FUEL							
TOTAL	526.3000	689.7151	794.8254	977.6385	1087.2092	1242.4134	3.3588
TOTAL PETROLEUM	1840.1900	2271.2282	2526.1430	2925.6081	3217.5197	3599.4383	2.6140

TOTAL ENERGY CONSUMPTION FOR THE REGION

ALL FUELS	1979	1985	1990	1995	2000	2005	AARG
	1882.3760	2311.6628	2569.0768	2973.1407	3266.5144	3651.9815	2.5817

APPLIED ECONOMICS ASSOCIATES, INC. / ALASKA LONG-TERM ENERGY PLAN

REGIONAL FORECASTING MODEL

SOUTHWEST

ITS ARE BILLIONS OF BTU.S (10**9 BTU.)

ECTRIC	1979	1985	1990	1995	2000	2005	AARG
RESIDENTIAL TOTAL	47.9603	60.6354	65.2831	74.7707	84.0163	93.0377	2.5806
COMMERCIAL	485.4828	556.2167	583.3275	632.4448	677.9357	720.4091	1.5296
INDUSTRIAL	15.6338	18.4963	19.0714	20.7235	21.9778	22.9156	1.4816
OTHER	21.3967	25.3144	26.1014	28.3626	30.0792	31.3627	1.4816
TOTAL ELECTRIC	570.4026	662.6628	693.7833	756.3015	814.0089	867.7251	1.6261

TROLEUM	1979	1985	1990	1995	2000	2005	AARG
DIESEL							
RESIDENTIAL HEATING	1393.1700	1749.0209	1879.0258	2143.5934	2400.4661	2650.3134	2.5043
COMMERCIAL HEATING	337.8500	379.8575	405.4331	448.0262	472.5930	521.7917	1.6858
INDUSTRIAL	292.9600	329.3860	351.5633	388.4971	409.7997	452.4614	1.6858
TRANSPORTATION	1589.7000	2174.8506	2384.3960	2857.9995	3207.5503	3669.6537	3.2698
TOTAL DIESEL	3613.6800	4633.1149	5020.4182	5838.1162	6490.4092	7294.2202	2.7382
GASOLINE							
TOTAL GASOLINE	1707.2300	2083.1046	2167.3962	2400.5081	2525.3159	2688.2581	1.7616
JET FUEL							
TOTAL	2462.9100	2884.5159	3149.4005	3603.4881	3872.4157	4425.6025	2.2797
TOTAL PETROLEUM	7783.8200	9600.7354	10357.2149	11842.1124	12888.1409	14408.0807	2.3965

TAL ENERGY CONSUMPTION FOR THE REGION

ALL FUELS	1979	1985	1990	1995	2000	2005	AARG
	8354.3026	10263.3982	11030.9983	12598.4140	13702.1498	15275.8058	2.3463

APPLIED ECONOMICS ASSOCIATES, INC. / ALASKA LONG-TERM ENERGY PLAN

REGIONAL FORECASTING MODEL

CORDOVA/KODIAK

UNITS ARE BILLIONS OF BTU.S (10**9 BTU.)

ELECTRIC	1979	1985	1990	1995	2000	2005	AARG
RESIDENTIAL TOTAL	65.2511	76.0814	87.9721	100.7584	113.2177	125.3737	2.5436
COMMERCIAL	130.6275	143.1423	156.0781	169.2216	181.3937	192.7573	1.5077
INDUSTRIAL	124.1286	141.7846	160.7855	180.8375	200.0500	218.5231	2.1991
OTHER	3.6372	4.1546	4.7113	5.2989	5.8618	6.4031	2.1991
TOTAL ELECTRIC	323.6444	365.1629	409.5470	456.1164	500.5231	543.0572	2.0106

PETROLEUM	1979	1985	1990	1995	2000	2005	AARG
DIESEL							
RESIDENTIAL HEATING	694.9600	806.6828	928.8102	1059.6010	1186.5781	1310.0712	2.4684
COMMERCIAL HEATING	168.5100	204.0967	225.7547	261.7960	282.6273	312.0556	2.3983
INDUSTRIAL	119.6300	144.8940	160.2696	185.8564	200.6451	221.5370	2.3983
TRANSPORTATION	729.0400	1061.2239	1189.6832	1487.8223	1757.3766	2010.4857	3.9787
TOTAL DIESEL	1712.1400	2216.8975	2504.5176	2995.0757	3427.2270	3854.1494	3.1700
GASOLINE							
TOTAL GASOLINE	522.6600	668.6629	708.5120	810.9932	887.4084	946.7096	2.3112
JET FUEL							
TOTAL	155.3700	201.1686	230.4713	281.4157	312.0189	356.6006	3.2470
TOTAL PETROLEUM	2390.1700	3086.7289	3443.5009	4087.4846	4626.6544	5157.4596	3.0022

TOTAL ENERGY CONSUMPTION FOR THE REGION

ALL FUELS	1979	1985	1990	1995	2000	2005	AARG
	2713.8144	3451.8918	3853.0479	4543.6010	5127.1775	5700.5168	2.8958

APPLIED ECONOMICS ASSOCIATES,INC. / ALASKA LONG-TERM ENERGY PLAN

REGIONAL FORECASTING MODEL

SOUTHEAST

TS ARE BILLIONS OF BTU.S (10**9 BTU.)

.CTRIC	1979	1985	1990	1995	2000	2005	AARG
RESIDENTIAL TOTAL	440.4824	541.2907	594.4972	680.9046	759.4304	840.9723	2.5185
COMMERCIAL	333.7072	377.3025	398.9787	432.5768	461.6412	490.5623	1.4929
INDUSTRIAL	1143.8690	1367.3786	1483.0417	1667.9953	1833.3556	2002.6586	2.1774
OTHER	126.1314	150.7772	163.5311	183.9254	202.1593	220.8279	2.1774
TOTAL ELECTRIC	2044.1900	2436.7490	2640.0486	2965.4021	3256.5864	3555.0210	2.1511

ROLEUM	1979	1985	1990	1995	2000	2005	AARG
IESEL							
RESIDENTIAL HEATING	3148.7900	3846.1975	4212.7103	4805.9235	5343.1094	5899.2144	2.4440
COMMERCIAL HEATING	763.4900	861.7469	921.7293	1021.4143	1078.8260	1191.0787	1.7252
INDUSTRIAL	524.4400	591.9325	633.1343	701.6077	741.0437	818.1500	1.7252
TRANSPORTATION	3193.3000	4620.0552	5054.3576	6461.8481	7710.2940	8820.9106	3.9847
TOTAL DIESEL	7630.5200	9919.9322	10821.9315	12990.7935	14873.2731	16729.3536	3.0653
ASOLINE							
TOTAL GASOLINE	2289.6900	2918.9510	3041.2361	3540.6517	3906.7863	4172.0483	2.3345
ET FUEL							
TOTAL	680.6700	801.3562	877.4614	1007.7677	1084.8806	1239.7792	2.3330
TOTAL PETROLEUM	10600.8800	13640.2395	14740.6289	17539.2129	19864.9401	22141.1811	2.8732

AL ENERGY CONSUMPTION FOR THE REGION

LL FUELS	1979	1985	1990	1995	2000	2005	AARG
	12645.0700	16076.9885	17380.6775	20504.6151	23121.5265	25696.2021	2.7647

APPLIED ECONOMICS ASSOCIATES,INC. / ALASKA LONG-TERM ENERGY PLAN

REGIONAL FORECASTING MODEL

RAIL BELT

ITS ARE BILLIONS OF BTU.S (10**9 BTU.)

ELECTRIC	1979	1985	1990	1995	2000	2005	AARG
RESIDENTIAL TOTAL	3572.9620	4703.9164	5426.7082	6685.3642	8239.9000	9510.6419	3.8372
COMMERCIAL	5550.0000	7792.9076	8722.7439	11497.8634	14438.4575	17247.9998	4.4576
OTHER	191.3402	227.2750	261.6883	330.5037	406.1844	475.0079	3.5591
TOTAL ELECTRIC	9314.3022	12724.0990	14411.1404	18513.7313	23084.5419	27233.6496	4.2129

PETROLEUM	1979	1985	1990	1995	2000	2005	AARG
DIESEL							
RESIDENTIAL HEATING	14355.1200	17165.5028	18533.1911	21130.8269	23722.2821	26723.0450	2.4189
COMMERCIAL HEATING	3480.5800	5041.8773	5344.5614	5836.0379	6231.2023	6376.1821	2.3557
INDUSTRIAL	2764.1000	4004.0030	4244.3794	4634.6851	4948.5046	5063.6402	2.3557
TRANSPORTATION	12215.1000	17628.3254	19708.8511	25383.3737	30871.8156	37951.3379	4.4566
TOTAL DIESEL	32814.9000	43839.7085	47830.9829	56984.9235	65773.8046	76114.2053	3.2889
GASOLINE							
TOTAL GASOLINE	19940.0600	25376.4699	26860.2642	31438.9074	35175.1693	39578.7030	2.6718
JET FUEL							
TOTAL	41481.2800	68367.4261	73958.4909	83272.4664	90963.2057	93828.2881	3.1891
TOTAL PETROLEUM	94236.2400	137583.6046	148649.7380	171696.2974	191912.1796	209521.1964	3.1209

TURAL GAS	1979	1985	1990	1995	2000	2005	AARG
TOTAL NATURAL GAS	72879.0000	94750.5000	117913.6000	146739.4000	182612.0000	227254.1000	4.4712

TOTAL ENERGY CONSUMPTION FOR THE REGION

ALL FUELS	1979	1985	1990	1995	2000	2005	AARG
	176429.5422	245058.2036	280974.4784	336949.4287	397608.7215	464008.9461	3.7892

APPLIED ECONOMICS ASSOCIATES,INC. / ALASKA LONG-TERM ENERGY PLAN

REGIONAL FORECASTING MODEL

ALASKA STATE

ITS ARE BILLIONS OF BTU.S (10**9 BTU.)

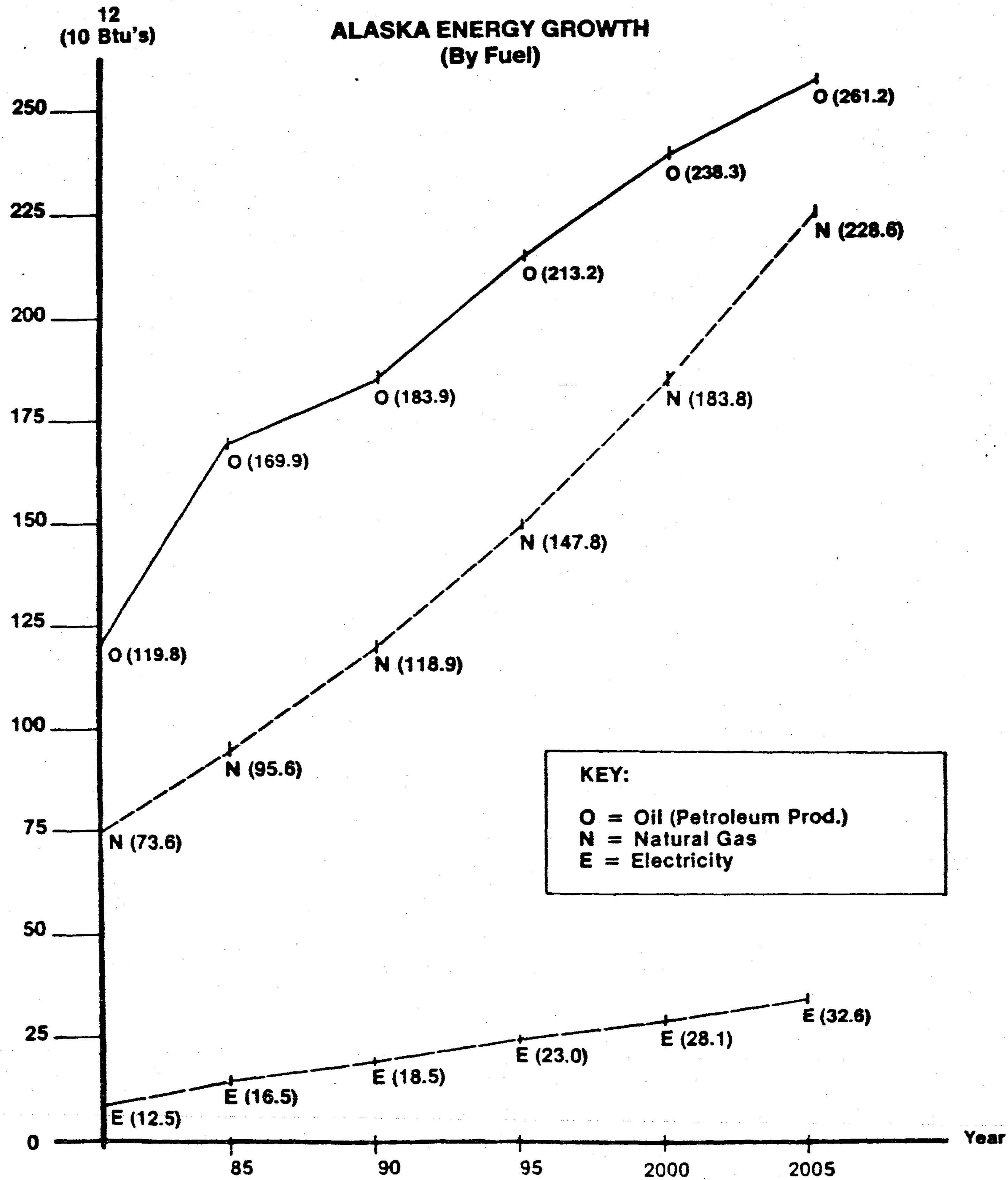
ECTRIC	1979	1985	1990	1995	2000	2005	AARG
RESIDENTIAL TOTAL	4181.3796	5439.9896	6242.6388	7620.4022	9283.6865	10666.5020	3.6674
COMMERCIAL	6623.6907	9000.3685	10000.4915	12885.3329	15923.2007	18825.7616	4.0994
INDUSTRIAL	1369.3988	1616.8869	1764.5456	1980.6554	2173.0447	2367.2875	2.1276
OTHER	364.8200	430.2500	481.5801	575.8872	673.3846	763.9710	2.8836
TOTAL ELECTRIC	12539.2891	16487.4950	18489.2560	23062.2778	28053.3165	32623.5222	3.7460

TROLEUM	1979	1985	1990	1995	2000	2005	AARG
DIESEL							
RESIDENTIAL HEATING	20949.1300	24998.2704	27231.8560	31059.1866	34765.4879	38915.6112	2.4105
COMMERCIAL HEATING	5079.5400	6912.8875	7381.4599	8148.9098	8703.0783	9105.3366	2.2702
INDUSTRIAL	3914.7100	5343.1990	5698.5498	6280.1357	6704.1935	7002.0670	2.2616
TRANSPORTATION	18611.0000	26735.0260	29745.4146	37949.0771	45621.8544	54826.0155	4.2430
TOTAL DIESEL	48554.3800	63989.3829	70057.2803	83437.3093	95794.6141	109849.0303	3.1899
GASOLINE							
TOTAL GASOLINE	25706.0100	32587.9979	34399.0225	40042.9038	44503.0329	49506.8977	2.5528
JET FUEL							
TOTAL	45578.2200	73331.9577	79474.2755	89740.2219	97998.0914	101867.9731	3.1416
TOTAL PETROLEUM	119838.6100	169909.3384	183930.5784	213220.4350	238295.7384	261223.9011	3.0424

TURAL GAS	1979	1985	1990	1995	2000	2005	AARG
TOTAL NATURAL GAS	73599.0000	95589.8459	118867.3797	147823.2150	183843.5790	228653.5890	4.4564

TAL ENERGY CONSUMPTION FOR THE REGION

ALL FUELS	1979	1985	1990	1995	2000	2005	AARG
	205976.8991	281986.6793	321287.2141	384105.9278	450192.6338	522501.0123	3.6451



12
(10 Btu's)
ALASKA ENERGY GROWTH
(By Fuel)
250
225
200
175
150
125
100
75
50
25
0
O (261.2)
O (238.3)
N (228.6)
O (213.2)
O (183.9)
N (183.8)
O (169.9)
N (147.8)
O (119.8)
N (118.9)
N (95.6)
N (73.6)
KEY:
O = Oil (Petroleum Prod.)
N = Natural Gas
E = Electricity
E (32.6)
E (28.1)
E (23.0)
E (18.5)
E (16.5)
E (12.5)
Year
85
90
95
2000
2005

APPENDIX D
ALASKAN UTILITY ELECTRICITY SALES 1978-79

Utility – Alaska Electric Light and Power Company (Juneau) AEL&P

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]										
Losses[2]										
Energy Use										
Residential					31875	33866	36175	38702	42143	45815
Commercial					21367	24533	27018	29553	31406	34654
Industrial					--	--	--	--	--	--
Population										
Customers[4]										
Revenue[5]										

Utility – Anchorage Municipal Light and Power Department – AML&P

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	267802	316750	363167	411966	461112	435897	500634	537130	550210	568798
Losses[2]	16194	24016	22303	22916	26259	30534	30275	44694	51756	46142
Energy Use	251608	292734	340864	389050	434853	405363	470359	492436	498454	522656
Residential	54518	63038	72993	82663	89946	105214	119474	117986	115639	116211
Commercial	159538	181374	205288	233312	250409	289296	339550	365510	372511	396811
Industrial	29322	39020	53062	63448	84552	321	1990	10	39	
Other[3]	8230	9302	9521	9627	9946	10532	9345	8930	10265	9634
Population										
Customers[4]	10780	11293	12622	13048	13852	14674	15138	16159	16740	16887
Revenue[5]	$4794773	$5427870	$6064607	$6788551	$7442319	$8193086	$11901075	$13831669	$14228946	$16804130

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Alaska Power Administration — Eklutna (Anchorage) – APA-E

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]										
Losses[2]										
Energy Use	152265	140085	157069	88236	115739	132937	114217	194992	176555	170929
Residential	80865	70405	89278	51167	69252	51253	55699	111144	107112	97200
Commercial	45900	44180	45880	14841	29961	57864	36512	56789	42002	48053
Industrial	25500	25500	21911	22228	16526	23820	22006	27059	27441	25676
Other[3]										
Population										
Customers[4]	3									
Revenue[5]										

Utility – Aniak Power Co. – APC

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						247	547	599	683	1038
Losses[2]						29	23	15	13	29
Energy Use						218	524	584	670	1009
Residential						153[E]	367[E]	409[E]	469[E]	706[E]
Commercial						65[E]	157[E]	175[E]	201[E]	303[E]
Other[3]										
Population						273				
Customers[4]						49	49	77	77	87
Revenue[5]						$45222	$107584	$123751	$138259	$225987

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Alaska Power & Telephone Company (Craig, Hydaburg-Skagway, Tok) – AP&T

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	5941	7098	7906[E]	8398[E]	9501	10931	11568	14015	15038	16136[E]
Losses[2]	1265[E]	1511	1683[E]	1404[E]	1588	1950	1733	1964	2031	2180[E]
Energy Use	4676[E]	5587	6223[E]	6994[E]	7913	8981	9835	12051	13007	13856
Residential	1431[E]	1710	1905[E]	2136[3]	2417	2966	3401	3730	4002[E]	4294[E]
Commercial	2356[E]	2815	3135[E]	4858[E]	5496	6015	6434	3432	3683[E]	3952[E]
Industrial	889[E]	1062	1183[E]					3744	4017[E]	4310[E]
Other[3]								1145	1229[E]	1319[E]
Population										
Customers[4]	490[E]	585	652[E]	709[E]	802	836	880	963	1033[E]	1109[E]
Revenue[5]	$343100	$409918	$456580	$550878	$623249	$762455	$861720	$1116588	$1221230	$1310372

Utility – Alaska Village Electric Cooperative (48 Villages) – AVEC

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	3246	6621	9596	11020	11785	13628	16572	17665	19118	19574[E]
Losses[2]	571	763	1750	1542	1876	2274	2909	2294	3134	3209[E]
Energy Use	2675	5858	7846	9478	9909	11354	13663	15371	15984	16365
Residential	861[E]	1886[E]	2527[E]	3053[E]	3192[E]	3658	4252	4889	5213	5263
Commercial	321[E]	703[E]	942[E]	1138[E]	1190[E]	1364	1491	1486	1627	1714
Industrial	1474[E]	3228[E]	4325[E]	5225[E]	5463[E]	6260	7844	8911	9056	9300
Other[3]	17[E]	37[E]	50[E]	60[E]	63[E]	72	76	85	88	88
Population										
Customers[4]	698[E]	1528[E]	2046[E]	2472[E]	2584	2684	2761	3025	3099	3234
Revenue[5]	$655776	$1436089	$1923447	$2323532	$2429192	$2842953	$3430513	$4242299	$5475318	$5610560

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Arctic Utilities, Inc. (Deadhorse) – AUI

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]								4955	4840	3952
Losses[2]								629	518	367
Energy Use								4326	4322	3585
Residential								433[E]	432[E]	359[E]
Commercial								3893[E]	3890[E]	3226[E]
Industrial										
Other[3]										
Population										
Customers[4]								7	9	11
Revenue[5]								$1089289	$978389	$1258718

Utility – Barrow Utilities and Electric Cooperative – BU & EC

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]					2512	4609	5692	6830[E]	8196[E]	10200[PE]
Losses[2]					525	*	335	402[E]	482[E]	600[E]
Energy Use					1987	4608	5357	6428[E]	7714[E]	9600[E]
Residential					916	1241	1441	1729[E]	2075[E]	2582[E]
Commercial					1071	3308	1948	2338[E]	2806[E]	3491[E]
Industrial							1908	2290[E]	2748[E]	3419[E]
Other[3]						59	60	72[E]	86[E]	108[E]
Population						2307				
Customers[4]					431	493	477			
Revenue[4]					$229498	$513797	$551380			

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Bethel Utilities Corporation, Incorporated – BUC

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						17041	8317	16738	18217	18745
Losses[2]						1549	2960	670	729	750
Energy Use						15492	5357	16068	17488	17995
Residential						3309	1441	4020	4376	4915
Commercial						5195	1948	5764	6273	13080
Industrial						6988	1908	6284	6839	
Other[3]							60			
Population						2921				
Customers[4]						971	478	1021	1284	1430
Revenue[5]						$1170837	$587621	$1612561	$1847071	$2372942

Utility – Bettles Light and Power – BL & P

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						524	629[E]	755[E]	905[E]	1069
Losses[2]						12	35[E]	78[E]	105[E]	165
Energy Use						512	594[E]	677[E]	800	904
Residential						9[E]	11[E]	12[E]	14[E]	16
Commercial						123[E]	143[E]	163[E]	192[E]	217
Industrial										
Other[3]						380[E]	441[E]	503[E]	594[E]	671
Population						50				
Customers[4]						16	18[E]	20[E]	22[E]	24
Revenue[5]						$117702	$139514[E]	$174393[E]	$217991[E]	$272489

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Chugach Electric Association (Anchorage) – CEA

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						946151	1090986	1236499	1351005	1449102
Losses[2]						351443	424146	510283	570832	646570
Energy Use				483029	515105	594708	666841	726210	780173	802532
Residential						359922	397845	432070	472040	477189
Commercial						97578	110327	118800	130859	137623
Industrial						113164	131472	147003	172403	182742
Other[3]						24043	27196	28336	4870	4977
Population										
Customers[4]						35922	39463	43182	46675	47268
Revenue[5]						$16958479	$21186692	$26083951	$30989054	$33848880

Utility – Cordova Public Utilities (Cordova Electric Cooperative)* – CPU (CEC)*

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]			8683	10114	10853	11936	13567	13420	15194	16445[P]
Losses[2]			1188	1338	1526	1544	1900	1879[E]	1741[E]	1884[E]
Energy Use			7495	8776	9327	10392	11667	11541[E]	13453[E]	14561
Residential			2604	2747	3159	3765	3821	3780[E]	3880[E]	4200
Commercial			1457	1545	1507	5237	3907	3862[E]	4443[E]	4809
Industrial			2441	3392	3454		2663	2634[E]	4330[E]	5336
Other[3]			993	1092	1207	1390	1276	1262[E]	200[E]	216
Population										
Customers[4]			726	729	769	799	864	895	931	
Revenues[5]										

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Copper Valley Electrical Association (Glennallen & Valdez) – CVEA

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	10702	11726	11803	12591	15624	26887	39287	47461	43835	41499
Losses[2]	1207	1323	1511	1422	1583	3044	6434	5088	5503	4976
Energy Use	9495	10403	10292	11169	14041	23843	32853	43273	38332	36523
Residential	2382	2610	2796	2887	3751	7656	10235	10895	9545	9354
Commercial	2098	2299	2204	2519	3659	6194	7358	7144	6393	6656
Industrial	4708	5158	4969	5423	6320	9392	14565	23473	21567	19524
Other[3]	307	336	323	340	311	601	695	861	827	989
Population	N/A									
Customers[4]	850	931	937	1000	1260	1568	2120	2163	2034	2086
Revenue[5]	$719511	$788356	$793533	$846511	$1041680	$1809769	$2764222	$3828450	$4072575	$4512790

Utility – Dot Lake Electric – DLE

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						190		190	200	
Losses[2]										
Energy Use										
Residential		196			205	190	224	190		
Commercial										
Industrial										
Other[3]										
Population						60				
Customers[4]					16	20	20	20		
Revenue[5]					$20825	$25210	$27875	$24504	$20246	

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Fairbanks Municipal Utilities System – FMU

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	85638	106666	120349	115410	122980	137157	139608	133409	128170	130500
Losses[2]	10990	9185	21945	20751	10809	3106	4149	2544	7991	15201
Energy Use	74648	97481	98404	94659	112171	134051	135459	130865	120179	115299
Residential	23619	26456	24248	25952	25909	30180	31302	29497	27109	25899
Commercial	37941	36448	32833	39029	45771	60132	63177	62693	62000	59300
Industrial			6388		2952	2932	2757	3052	3410	
Other[3]	13088	34577	34935	29678	37539	40807	38223	35623	27660	30100
Population										
Customers[4]	5493	5510	5605	5531	5734	5769	5906	5941	5675	5675
Revenue[5]	$3175885	$3661125	$4130770	$4494590[E]	$4789400	$5733357				

Utility – Fort Yukon Utilities – FYU

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						1305	1365	1336	1403	1737
Losses[2]						*	*	41	52	54
Energy Use						1305	1365	1295	1355	1691
Residential						204	255	308	314	324
Commercial						170	174	173	234	358
Industrial						923	930	806	797	1001
Other[3]						6	7	8	9	8
Population						637				
Customers[5]						198	234	235	242	26
Revenue[5]						$232470	$250864	$252343	$279722	$380876

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Glacier Highway Electric Association (Juneau) – GHEA

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						7136	7671	8367	9080	9909
Losses[2]						904	927	1252	1152	1442
Energy Use						6232	6744	7115	7928	8467
Residential						3794	4126	4291	4936	5353
Commercial						868	952	965	923	911
Industrial						754	876	987	1137	1571
Other[3]						816	790	873	932	632
Population										
Customers[5]						667	705	777	845	875
Revenue[5]						$372194	$465486	$501822	$568274	

Utility – Golden Valley Electric Association, Inc. (Fairbanks Area) – GVEA

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]					249761	332018	343522	362890	342232	327351
Losses[2]					19144	37471	42062	38774	33831	28639
Energy Use					230617	294547	301460	324116	308401	298712
Residential					127873	160200	162370	168275	150804	142960
Commercial					44263	51822	27409	37808	36941	37285
Industrial					58079	82150	111326	117618	120262	118151
Other[3]					402	375	355	415	394	316
Population										
Customers[4]					9164	10462	12055	13355	14715	15363
Revenue[5]					$8072256	$12688713	$16097798	$17536827	$19467621	$20965612

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Homer Electric Association (Kenai Peninsula) – HEA

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]				117712	126472	146958	179678	207229	240358	265733
Losses[2]				9305	10209	11035	18034	13243	15766	18750
Energy Use				108407	116263	135923	161644	193986	224592	246983
Residential				31848	34913	45089	56053	71071	94846	108992
Commercial				17813	20335	24788	30350	35507	43798	47135
Industrial				56130	58218	62806	72063	83989	82984	87955
Other[3]				2616	2717	3240	3178	3419	2964	2901
Population										
Customers[4]				4822	5241	5841	6696	7980	9332	10198
Revenue[5]				$3344502	$3707711	$4339359	$5049103	$6072774	$7027308	$7915581

Utility – Haines Light and Power – HL & P

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						12186	8081	7074	6753	6455[P]
Losses[2]						853	566	496	473	452[E]
Energy Use						11333	7515	6578	6280	6003[E]
Residential						6036	5931	5541	2585	2471[E]
Commercial						*	*	*	*	
Industrial						5297	1584	1037	565	540[E]
Other[3]						**	**	**	**	
Population										
Customers[4]						625	562	581	585	
Revenue[5]						$586075	$463360	$535460	$484825	

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Kodiak Electric Association – KDEA

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	31701	32797	33358	40656	40688	43748	51346	53444	57817	60791
Losses[2]	4153	2684	2170	2779	2580	2142	3159	2887	4077	4574
Energy Use	27548	30113	31188	37877	38108	41106	48187	50557	53740	56217
Residential	8267	9043	9539	10294	10596	11561	12524	12912	13961	14763
Commercial	6247	5595	6104	7380	7126	7499	8844	10031	11388	9673
Industrial	12340	14746	14809	19466	19726	21391	26130	26847	27613	31014
Other[3]	694	729	736	737	660	655	689	767	778	767
Population										
Customers[4]	1977	2040	2113	2166	2248	2314	2460	2583	2870	3060
Revenue[5]	$1191647	$1286399	$1347852	$1580102	$1947200	$2405396	$3331361	$4099714	$4768111	$6538098

Utility – Ketchikan Public Utilites – KPU

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]					73767	77269	80867	82194	86514	84800[P]
Losses[2]					13794	13153	13895	15502	15388	15083[E]
Energy Use					59973	64116	66972	66692	71126	69717[E]
Residential					31128	32838	35059	35082	36754	36026[E]
Commercial					20313	25077	25786	25236	27682	27134[E]
Industrial					7147	4770	4868	5265	5554	5444[E]
Other[3]					1385	1431	1259	1109	1136	1113[E]
Population					7468					
Customers[4]					4832	4898	5073	5268	5396	
Revenue[5]					$2059935	$2369479	$2774557	$3122525	$3883621	

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Kotzebue Electric Association, Incorporated – KtEA

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						6781	8370	9441	10053	10454
Losses[2]						781	1619	1764	1491	1209
Energy Use						6000	6751	7677	8562	9245
Residential						1770[E]	1992	2228	2397	2448
Commercial						1681[E]	1891	2184	2380	2506
Industrial						2105[E]	2368	2733	3255	3718
Other[3]						444[E]	500	532	530	573
Population						2431				
Customers[4]							490	553	590	594
Revenue[5]							$926249	$1140229	$1353204	$1540785

Utility – Matanuska Electric Association (Palmer-Talkeetna) – MEA

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	54822	67238	72369	83928	98919	137293	161666	201483	245570	255623
Losses[2]	5258	5111	3785[E]	5895[E]	6948	20727	15194	26626	21902	21974
Energy Use	49564	62127	68584[E]	70833[E]	91971	116566	146472	174857	223668	233649
Residential	29702	38465	42311[E]	50802[E]	59876	77592	96702	116014	155339	160769
Commercial	10533	12730	14273[E]	14502[E]	17092	18849	23247	27469	36415	35213
Industrial	9017	10566	10708[E]	12533[E]	14772	19907	26112	31055	31726	37504
Other[E]	312	366	392	196	231	218	411	319	188	163
Population										
Customers[4]	4213	4724	5140	5253[E]	6191	7275	8235	9557	11369	12520
Revenue[5]	$1722041	$2105866	$2266567	$2539162	$2992701	$3961790	$5503455	$6537934	$8914352	$10962472

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Manley Utility Company (Manly Hot Springs) – MUC

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						182	182	182	200	200[P]
Losses[2]						9	9	9	10	10
Energy Use						173[E]	173[E]	173[E]	190[E]	190[E]
Residential						17[E]	17[E]	17[E]	19[E]	19[E]
Commercial						156[E]	156[E]	156[E]	171[E]	171[E]
Industrial										
Other[3]										
Population						70				
Customers[4]									26	
Revenue[5]									$23020	

Utility – Metlakatla Power and Light – MP & L

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	15122	16181	18210	19717	18614	16845	15288	16025	14944	15307[P]
Losses[2]	1665	1758	2440	2540	2179	2748	1691	1190	380	389[E]
Energy Use	13457	14423	15770	17177	16435	14097	13597	14835	14564	14918[E]
Residential	6380	7026	7104	6942	6894	6814	6352	6339	6383	6531[E]
Commercial	443	522	719	1080	1172	1350	1408	1330	1316	1348[E]
Industrial	6231	6387	7535	8292	7704	5565	5089	6280	6018	6164[E]
Other[3]	403	488	412	863	665	368	748	886	847	868[E]
Population										
Customers[4]	340	351	364	378	407	402	425	448	429	
Revenue[5]	$334656	$346109	$426091	$512099	$557947	$515959	$615291	$750106	$721878	

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – McGrath Light and Power – MGL & P

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						1828	1931	1985	2320	2202[P]
Losses[2]						402	432	504	524	497[E]
Energy Use						1426	1499	1481	1796	1705[E]
Residential						113	127	147	181	172[E]
Commercial						1313	1372	1334	1615	1533[E]
Industrial										
Other[3]										
Population						296				
Customers[4]						95	95	96	116	
Revenue[5]						$162509	$176248	$202354	$259687	

Utility – Naknek Electric Association, Inc. – NEA

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						5388	5530	6021	6268	7238[P]
Losses[2]						654	1220	887	976	1127[E]
Energy Use						4734	4310	5134	5292	6111[E]
Residential						1109	1133	1349	1478	1707[E]
Commercial						2421	1988	2518	2544	2938[E]
Industrial						1183	1172	1267	1566	1808[E]
Other[3]						21	17		(-)296	(-342)[E]
Population						1265				
Customers[4]						299	327	323	368	
Revenue[5]						$501855	$567952	$631843	$799027	

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Nushagak Electric Cooperative, Inc. (Dillingham) – NEC

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]		2774				4430	4690	5199	6239	7016[P]
Losses[2]		221				468	289	430	710	798[E]
Energy Use		2553				3962	4401	4769	5529	6218[E]
Residential		833				1360	1405	1596	1829	2057[E]
Commercial		942				2563	1849	3136	3663	4119[E]
Industrial		477					877	37	37	42[E]
Other[3]		301				39	270			
Population						1252				
Customers[4]		355				471	462	501	571	
Revenue[5]		$226974				$445765	$522797	$624788	$728418	

Utility – Nikolski Power and Light – NiP&L

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]									150	150[P]
Losses[2]									7[E]	7[E]
Energy Use										
Residential									143[E]	143[E]
Industrial									14[E]	14[E]
Other[3]									129[E]	129[E]
Population										
Customers[4]									27	
Revenue[5]									$22106	

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Northern Power & Engineering Corporation, Inc. (Cold Bay) – NP&E

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						3005	2782	2544	2727	2889
Losses[2]						124	101	110	118	125
Energy Use						2881	2681	2434	2609	2764
Residential						525	449	395	492	508
Commercial						954	918	837	887	945
Industrial						1402	1314	1202	1223	1066
Other[3]									7	245
Population						215				
Customers[4]						22	26	26	54	57
Revenue[5]						$252544	$243647	$239565	$314564	$432823

Utility – Northway Power and Light – NPL

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						1574	1351	1463[E]	1432[E]	1400[P]
Losses[2]							186	201[E]	197[E]	193[E]
Energy Use						1574	1165	1262[E]	1235[E]	1207[E]
Residential						315[E]	233[E]	252[E]	247[E]	241[E]
Commercial						1259[E]	932[E]	1010[E]	988[E]	966[E]
Other[3]										
Population						55				
Customers[4]						43	45			
Revenue[5]						$131201	$145296			

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Paxson Lodge, Inc. – PLI

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]		736	725[E]	715[E]	709	768	788		780	737
Losses[2]		25	25	25	25	25	25	25	25	25
Energy Use		711	700[E]	690[E]	684	743[E]	763	744[E]	755	712
Residential		79	70[E]	63[E]	57	118[E]	133	120[E]	120	125
Commercial		632[E]	630[E]	627[E]	627	625[E]	630	624[E]	635	587
Other[3]										
Population										
Customers[4]		1			1	1	4		4	4
Revenue[5]		$7451			$5720		$13375		$11999	$12460

Utility – Petersburg Municipal Power and Light – PMP&L

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	14047	16314	16798	17286	18735	18991[E]	16008[E]	19344	19182	21545[P]
Losses[2]	2631	3216	3460	3081	3615	3664[E]	1108[E]	1339	283	2988
Energy Use	11416	13098	13338	14205	15120	15327	14900	18005	18899	18557
Residential	5649	5742	5321	5735	5886	6226	5891	6613	7254	7024
Commercial	3214	3524	4177	4452	4070	4984	4306	5567	5521	4902
Industrial	1992	3232	3139	3118	3746	4117	4703	5825	6124	6631
Other[3]	561	600	701	900	1418					
Population	2042	2042	2042	2042	2024	2386	2126	2126	2126	2126
Customers[4]	905	936	979	1003	1023	1013	1046	1102	1159	
Revenue[5]	$338215	$379095	$419083	$429097	$738488	$676487	$796119	$943882	$1082483	

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – PPS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]							312	4831	5643	5100
Losses[2]									122	
Energy Use								4831	5521	5100
Residential								704	757	802
Commercial								4069	4764	4173
Industrial										
Other[3]								58		125
Population							528			
Customers[4]							130	149	147	171
Revenue[5]								$391392	$444404	$422020

Utility – Pelican Utility Company – PPS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						1723	2168	2169	2552	2379[P]
Losses[2]						1073	173	267	426	397[E]
Energy Use						650	1995	1902	2126	1982[E]
Residential						142	157	161	189	176[E]
Commercial						508	131	164	199	186[E]
Industrial							1707	1577	1738	1620[E]
Other[3]										
Population										
Customers[4]						69	81	76	76	
Revenue[5]						$35487	$74011	$122361	$138014	

Source: Alaska Power Administration

Footnotes:

[1] All electrical numbers are in MWH.
[2] Includes miscellaneous station and utility losses, transmission, and company uses.
[3] Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4] Includes all categories of customers.
[5] Includes all categories of revenue.
[E] Estimate
[P] Preliminary

Utility – Sitka Electric Department – SED

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	28159	29623	31076	31124	30922	36354	39882	41622	45456[E]	49872[P]
Losses[2]	4221	4437	4887	4277	5296	6239	6995	7300[E]	7973[E]	8748[E]
Energy Use	23928	25186	26189	26847	25626	30115	32887	34322[E]	37483[ME]	41124[E]
Residential	8694	9563	10425	11103	11657	13690	14970	15623[E]	14966[ME]	16420[E]
Commercial	5305	5573	5868	5881	5340	6866	8113	8467[E]	11458[ME]	12571[E]
Industrial	7344	7342	6914	6824	5794	6086	5938	6197[E]	8719[ME]	9566[E]
Other[3]	2595	2708	2982	3039	2835	3473	3866	4035[E]	2340[ME]	2567[E]
Population										
Customers[4]	1874	1934	2005	2053	2181	2348	2451			
Revenue[5]	$671713	$731063	$760389	$786158	$815871	$1002545	$1140043			

Utility – Seward Electric System – SES

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	11208	13110	14891	15310	16065	19713	20646	19525	23155	25365
Losses[2]	2366	2497	3008	2152	2937	3241	2664	2251	3682	2265[E]
Energy Use	8842	10613	11883	13158	13128	16472	17982	17274	17473	23100
Residential	3559	4101	4215	4696	4664	5120	5632	6020	6807	7200*
Commercial	1472	1595	1834	1997	2251	2772	3275	3791	4041	4895[E]
Industrial	669	1157	1612	1943	2102	4113	4373	3448	3307	4005[E]
Other[3]	3142	3760	4223	4521	4110	4462	4704	4015	5317	7000*
Population	1587									
Customers[4]	907	977	960	960	987	1043	1108	1175	1257	
Revenue[5]									$841635	

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Tlingit-Haida Regional Electric Authority (Angoon, Hoonah, Kake, Kashan, Klanock) – T-HREA

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]								7929	6240	13972[P]
Losses[2]								1693	1332	2981[E]
Energy Use								6236[E]	4908	10991[P]
Residential								3037[E]	2390	5352[E]
Commercial								2122[E]	1670	3740
Industrial								1078[E]	848	1899[E]
Other[3]										
Population										
Customers[4]									632	
Revenue[5]									$809010	

Utility – Tanana Power Company – TPC

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						1724	1757	1707	1737	1740[P]
Losses[2]						116	108	*	*	--[E]
Energy Use						1620	1649	1707	1737	1740[E]
Residential						437	452	535	707	710[E]
Commercial						184	184	396	186	186[E]
Industrial						999	1013	776	844	844[E]
Other[3]										
Population						447				
Customers[4]									139	
Revenue[5]						$169496	$192146	$207837	*	

Source: Alaska Power Administration

Footnotes:

[1] All electrical numbers are in MWH.
[2] Includes miscellaneous station and utility losses, transmission, and company uses.
[3] Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4] Includes all categories of customers.
[5] Includes all categories of revenue.
[E] Estimate
[P] Preliminary

Utility – Wrangell Municipal Light and Power – WML&P

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]	7199	8275	8998	9724	10305	10753	11651	12732	14085	13994[P]
Losses[2]	698	1348	1753	2194	1668	2141	3184	3898	4293	4265[E]
Energy Use	6501	6927	7245	7530	8637	8612	8467	8834	9792	9729[E]
Residential	2783	2969	3219	3426	3597	3826	3872	3916	3811	3786[E]
Commercial	3231	3595	3844	3978	4392	4085	3982	4143	5173	5140[E]
Industrial	56	42	24	24	583	585	499	660	676	672[E]
Other[3]	431	321	158	102	65	116	114	115	132	131[E]
Population	1973	2029	2029	2029	2029	2787	3152	3152	3152	3152
Customers[4]	666	665	827	837	875	905	957	1022	1057	
Revenue[5]	$272257	$305472	$307921	$336337	$372876	$541096	$662801	$655174	$796908	

Utility – Yukutat Power Incorporated – YPI

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						3651	3953	4499	4525	4087[P]
Losses[2]						445	506	407	428	387
Energy Use						3206	3447	4092	4097	3700[E]
Residential						718	902	1161	1298	1171[E]
Commercial						2488	2545	2931	2789	2519[E]
Industrial										
Other[3]										
Population										
Customers[4]						152	172	185	186	
Revenue[5]						$278310	$309266	$363798	$373761	

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – City of Manokotak – COM

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]							200	200	198	200
Losses[2]							10	10	10	10
Energy Use							190[E]	190[E]	188[E]	190[E]
Residential							19[E]	19[E]	19[E]	19[E]
Commercial							171[E]	171[E]	169[E]	171[E]
Industrial										
Other[3]										
Population										
Customers[4]										
Revenue[5]										

Utility – City of Unalaska

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						657	657	657	900	900
Losses[2]						33	33	33	45	45
Energy Use						624[E]	624[E]	624[E]	855[E]	855[E]
Residential						218[E]	218[E]	218[E]	299[E]	299[E]
Commercial						406[E]	406[E]	406[E]	556[E]	556[E]
Other[3]										
Population						510				
Customers[4]										
Revenue[5]										

Source: Alaska Power Administration

Footnotes:

[1] All electrical numbers are in MWH.
[2] Includes miscellaneous station and utility losses, transmission, and company uses.
[3] Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4] Includes all categories of customers.
[5] Includes all categories of revenue.
[E] Estimate
[P] Preliminary

Utility – Hughes (Esther J. James) – H(EJJ)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]										
Losses[2]										
Energy Use										
Residential										
Commercial										
Other[3]										
Population										
Customers[4]										
Revenue[5]										

Utility – Iliamna (Newhalen, Nondalten)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]									476	475
Losses[2]									24[A]	24[A]
Energy Use									452[E]	453[E]
Residential									45[E]	45[E]
Commercial									407[E]	408[E]
Other[3]										
Population										
Customers[4]										
Revenue[5]										

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Napakiak – NaC

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]									290	300
Losses[2]									15	15
Energy Use									275[E]	285[E]
Residential									28[E]	29[E]
Commercial									247[E]	256[E]
Other[3]										
Population										
Customers[4]										
Revenue[5]										

Utility – Nome Light and Power Utilities – NL&P

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						11996	13589	13772	13915	14398[P]
Losses[2]						1388[E]	1572[E]	1593[E]	1609[E]	1665[E]
Energy Use						1608[E]	12017[E]	12179[E]	12301[E]	12733[E]
Residential						2810[E]	3183[E]	3226[E]	3259[E]	3372[E]
Commercial						2875[E]	3257[E]	3301[E]	3335[E]	3451[E]
Industrial						4266[E]	4833[E]	4898[E]	4949[E]	5121[E]
Other[3]						658[E]	745[E]	755[E]	763[E]	789[E]
Population						2585				
Customers[4]										
Revenue[5]										

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Semloh Supply (Lake Minchumina) – SS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						190	190	190	190	190
Losses[2]						10	10	10	10	10
Energy Use						180[E]	180[E]	180[E]	180[E]	180[E]
Residential						18[E]	18[E]	18[E]	18[E]	18[E]
Commercial						162[E]	162[E]	162[E]	162[E]	162[E]
Industrial										
Other[3]										
Population						30				
Customers[4]										
Revenue[5]										

Utility – Teller Light & Power Utilities (Teller Power Company) – TL&PU (TePC)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						170	170	170	180	180[P]
Losses[2]						9	9	9	9	9[A]
Energy Use						161[E]	161[E]	161[E]	171	171[E]
Residential						16[E]	16[E]	16[E]	17[E]	17[E]
Commercial						145[E]	145[E]	145[E]	154[E]	154[E]
Industrial										
Other[3]										
Population						219				
Customers[4]										
Revenue[5]										

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

Utility – Tanakee Springs – TSU

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]								200	200	200[P]
Losses[2]								10[A]	10[A]	10[A]
Energy Use								190[E]	190[E]	190[E]
Residential								19[E]	19[E]	19[E]
Commercial								171[E]	171[E]	171[E]
Industrial										
Other[3]										
Population										
Customers[4]										
Revenue[5]										

Utility – North Slope Borough Power & Light System – NSEP&L (NSB)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Generation[1]						*334	86	86	200	200[P]
Losses[2]						17	4	4	10	10
Energy Use						317	82[E]	82[E]	190[E]	190[E]
Residential						32[E]	8[E]	8[E]	19[E]	19[E]
Commercial						285[E]	74[E]	74[E]	171[E]	171[E]
Industrial										
Other[3]										
Population						384				
Customers[4]										
Revenue[5]										

Source: Alaska Power Administration

Footnotes:

[1]All electrical numbers are in MWH.
[2]Includes miscellaneous station and utility losses, transmission, and company uses.
[3]Includes street lighting, boats (which sometimes are in residential data), town government, etc.
[4]Includes all categories of customers.
[5]Includes all categories of revenue.
[E]Estimate
[P]Preliminary

APPENDIX E

ENERGY RESOURCES/PROJECTS UNDERWAY
MARCH 1981

Resource/ Project	Purpose/ Comments	Region	Responsible Agency	Capacity or Fuel Type
General Technologies				
Single Wire Ground Demonstration	Demonstrate economic and technical feasibility of system which will allow centralization of rural electrical systems. Bethel-Nakakiak system energized in October 1980	Southwest Northwest	DEPD	Electrical Distribution
Organic Rankine Cycle Power System	To demonstrate the use of ORC to power emergency lighting system currently being installed in rural Alaskan communities (Noorvik)	Northwest	DOT/PF	Electricity
Multi-Fuel Furnace Demonstrations	3 boilers of different sizes will be used for hot water and space heating for a cluster of new housing	Northwest	DEPD	Coal, oil, wood, peat.
Hydrogen Use in Alaska	To determine the status of different hydrogen production technologies and the potential application of the technologies to Alaska	Statewide	DEPD	Hydrogen
Fuel Cell Testing	A continuing program of research to augment Federal and private programs of development of commercial fuel cells.	Statewide	DOT/PF	Electricity and waste heat for space heating.
Railbelt Transmission Intertie	Detailed feasibility studies and route selection underway.	Southcentral Interior	APA	Electrical Distribution
Brevig Mission Distribution System	Selection of contractors underway.	Northwest	APA/City of Brevig Mission	Electrical Distribution
Reconnaissance Studies	Studies underway (Tanana, Cordova, Sitka, Angoon, Shungnak, Kiana, Ambler, Scammon Bay, King Cove, Goodnews Bay, Togiak, Grayling, Kaltag, Savoonga, White Mountain, Elim, Sand Point, Akhiok, Larsen Bay, Old Harbor, Ouzinkie, Russian Mission, Sheldon Point, Hughes Buckland, Koyukuk, Crooked Creek, Chuathbaluk, Stony River, Sleetmute, Red Devil, Takotna Telida, and Nikolai	Statewide	APA	N/A
Southeast Interconnection	Technical, economic, and analysis of the feasibility of an electrical transmission line interconnection within Southeast Alaska	Southeast	APAdm	Electrical Distribution

Resource/ Project	Purpose/ Comments	Region	Responsible Agency	Capacity or Fuel Type
Peat				
Rural Alaska Peat Farm	The demonstration of the harvesting and use of peat as a fuel resource for space heating in rural areas	Statewide	DEPD	Peat
Biomass				
AVEC Wood Gasification Demonstration Project	Phase I has developed a wood and coal gasifier that can be used with diesel generators. Phase II will conduct testing in Anchorage area (Nulato will be site of rural testing).	Statewide	DEPD/AVEC	Gas to power diesel generators
Delta Agriculture Project Biomass Assessment Study	Assessment identified potential energy uses of biomass from land clearance.	Interior	DEPD	87-100 tons per year processed fuel pellets 13.2-15.8 MW electrical potential. 10-12 million gallons/year methanol
Interior Wood Assessment Study	Contract has been awarded	Interior	DEPD	Unknown
Hoonah Wood-Fueled Generation Project	Feasibility assessment	Southeast	APA	2.7MW
Noatak School Wood-fired Boiler Project	System design underway	Northwest	APA	Space Heating
Feasibility of using Gasohol and Alcohol Fuels in Alaska	Determine potential use problems by field testing in DOTPF vehicles	Statewide	DOT/PF	Transportation
Solar Energy				
State Solar Planning	Continuing solare planning activities and State participating in Western Sun.	Statewide	DEPD	N/A
Prototype of Passive Solar Alaskan School Design Manual Development	Design of a modular school building that will incorporate solar heating and the preparation of a manual for use in new design and retrofit of school buildings.	Statewide	DOT/PF	Space Heating
Solar Heated Fire Station Demonstration Project	The design and construction of solar assisted buildings that will serve as garages for fire fighting equipment.	Interior	DOT/PF, Chena Goldstream Volunteer Fire Department.	Space Heating
Wind				
Rockwell Wind Energy Program	Demonstration of two small wind energy systems in Alaska	Northwest/ Southcentral	DEPD/USDOE	2.2kW:Kotzebue. 18kW; Homer

Resource/ Project	Purpose/ Comments	Region	Responsible Agency	Capacity or Fuel Type
Kotzebue Wind Project	Wind system intertied into community college	Northwest	DEPD/Chukchi Community College	2kW
Alaska Wind Demonstration Wind Monitoring and Supplemental Budget	This project is proposed to support the current wind energy demonstration projects in the state by providing data on results and information on equipment operation.	Statewide	DEPD	N/A
Homer Wind Project	Move the current wind machine in Homer to a permanent site.	Southcentral	Alaska Energy Center	Electricity
Line Village: Wind Regime Analysis	Wind insufficient for use. Photovoltaic cell use for refrigeration is under construction (Lime Village Region?)	Southwest	DEPD	Electricity
Nelson Lagoon Wind Demonstration Project	Feasibility of grid demonstrated. System encountered difficulties.	Southwest	DEPD/USDOE	18kW
Wind Anemometer Loan Program	Provides 30 anemometers on loan to citizens of the state.	Statewide	DEPD	N/A
Newhalen Wind Demonstration Project	Wind generator was constructed for use in providing use for community laundry (facility is down for repair).	Southwest	DEPD/USPHS	8kW
Sheldons Point Wind Demonstration Project	Prototype to be tested 12/80. If successful, wind farm to be erected spring '81 with a max of 13 systems.	Southwest	DEPD	1.8kW/each
Wind Power Demonstration (Skagway)	Find and install vertical axis machine, intertie into existing electrical system.	Southeast	APA/DEPD/ City of Skagway	N/A
Unalakleet Wind Demonstration Project	Install Wind Machine Summer of 1981.	Northwest	APA/DEPD/ Unalakleet Valley Electric	20-40kW
Geothermal				
Alaska Geothermal Development Plan-1979	Determined 15 sites with greatest geothermal potential.	Statewide	DEPD/OIT/ U.S.D.E.	N/A
Geothermal Commercialization Grant	Three sites will be selected by the contractor for commercial analysis	Statewide	DEPD	Geothermal heat
Kotzebue Geothermal Study	Heat resource determined to be insufficient for direct use, may be used as a pre-heater for other district heating techniques.	Northwest	DEPD/APA	Geothermal Water
Tenakee Springs Geothermal Study	Core drilling to confirm geothermal resource will take place.	Southeast	DEPD	Geothermal Water
Pilgrim Hot Springs Geothermal Study	1979 drilling results indicate potential for direct use.	Northwest	DEPD	Hot Water 300kW
Dutch Harbor-Unalaska Geothermal Project	Determine extent of geothermal resource on the island	Southwest	APA/DEPD	Hot water Steam

Resource/ Project	Purpose/ Comments	Region	Responsible Agency	Capacity or Fuel Type
Tidal				
Angoon Tidal Power Alternative Study	Tidal resource determined not to be competitive with other resources.	Southeast	APA	Unknown
Cook Inlet Tidal Study	To determine the technical and economic feasibility of the construction and operation of tidal energy facilities in the Cook Inlet.	Southcentral	Office of the Governor/APA/ DEPD/DPDP	Unknown

Resource/ Project	Purpose/ Comments	Region	Responsible Agency	Capacity or Fuel Type
Waste Heat				
Waste Heat Organic Rankine Cycle (ORC) Electrical Generator Demonstration Project	To demonstrate use of low temperature fluids to increase efficiency of electrical generation by diesel from waste heat, or geothermal. A demonstration is underway at Manley Hot Springs.	Interior	DEPD/ University of Alaska	2.5kW, (300kW proposed Pilgrim Hot Springs)
Waste Heat for Agriculture Feasibility Study (proposed)	To develop demonstration projects to establish the feasibility of economic waste heat capture systems for agricultural uses.	Northwest/ Interior	DEPD	N/A
Golden Valley Waste Heat Recovery Project	Use of waste heat from the Trans-Alaska Pipeline to produce electricity	Interior	DEPD/ Golden Valley Electrical Cooperative/ Alyeska	To be determined
Nushagak Waste Heat Recovery Project	The Nushagak Electric Cooperative will construct and operate waste heat recovery equipment on diesel generators (Dillingham).	Southwest	APA/Nushagak Electric Cooperative	N/A
Rural Waste Heat Demonstration Project	Design for several waste heat demonstration projects is underway.	Statewide	APA	To be determined
Fairbanks District Heat Study	Feasibility study underway	Interior	APA/Fairbanks	Space Heating

APPENDIX F

ECONOMIC AND JOB IMPACTS OF SOLAR AND CONSERVATION

Appendix F

ECONOMIC AND JOB IMPACTS OF SOLAR AND CONSERVATION

Prepared by: Alternative Energy Development Commission, Task Force Final Report, July, 1980.

A. Introduction and Findings

Several studies recently have attempted to document the economic benefits to society of solar and conservation. We have not been able to do a detailed critique of these studies or an analysis specific to Oregon. However, we were sufficiently impressed with the direction and magnitude of their findings to believe they will be relevant to Oregon, and have summarized them here.

Many conservation and solar energy measures are cost-effective compared to conventional energy supplies (coal and nuclear generated electricity, oil, and natural gas). The dollar savings resulting from these measures will increase economic activity and consumer satisfaction. Jobs are a common measure of this activity, and are used as a proxy in the studies surveyed here.

The studies indicate that:

1. Solar and conservation create more jobs per dollar invested and per unit of energy produced (saved) than conventional energy and power supplies. The secondary effects created by increased discretionary income resulting from cost-effective solar and conservation are a major component of this benefit, often

exceeding the direct effects.

2. A larger portion of the money and jobs associated with solar and conservation would remain in the state or region rather than being exported out of the state or country.

These studies do not include, among others, the following considerations:

a. environmental damages;
b. the uncertainty associated with continued dependence on energy imports;
c. effects on peak capacity; and,
d. costs to the State of regulatory proceedings.

If these social costs/benefits could be adequately translated into dollars, the economic benefits (jobs) of solar and conservation would likely be even more attractive.

B. Methodology

Solar and conservation can effect the economy and create jobs in four ways.

1. Direct effects. The Conservation/Solar Scenario provides direct, on-site employment for insulation installers, solar equipment specialists, heating and ventilation workers and plumbers, among others.

2. Indirect effects. The industries that supply on-site workers with materials and services experience indirect employment effects when they step up production to satisfy an increasing demand. Their greater activity, in turn, diffuses employment effects to other economic sectors, such as mining and transportation.

3. <u>Induced effects.</u> The workers and businesses directly and indirectly affected by increased economic activity receive wages or profits, some portion of which returns to the economy as further spending. This induces a second round of employment effects.

4. <u>Responding effects.</u> The Conservation/Solar Scenario would lower fuel costs, thereby increasing household discretionary income. Diverting this money to consumer goods rather than energy purchases would generate a large number of additional jobs.

The two most complete studies to date have been done by Leonard Rodberg for the U.S. Congress Joint Economic Committee, and by the Council of Economic Properties (CEP). These studies have attempted to assess the direct, indirect and responding effects of a conservation/solar scenario for their target areas. Figures F-1 and F-2 illustrate CEP's methodology, which is similar to Rodberg's approach.

Basically, the studies began with an analysis of the costs for the conservation/solar and conventional scenarios of providing an equivalent amount of energy, based on official projected energy needs for the target areas. A bill of goods was prepared itemizing the costs of the components and services for the scenarios, by SIC code. Using the Bureau of Labor Statistics's (BVLS) Input-Output tables they calculated the national direct and indirect employment effects of each scenario. CEP used the Regional Industrial Multiplier System (RIMS) of the Department of Commerce to calculate the regional impact associated with the conservation/solar scenarios were assumed to be spent as increased discretionary income on personal consumer goods and services, and the direct and indirect employment effects of this were calculated. Jobs lost by avoiding the conventional route were subtracted from the sum of the direct and indirect employment generated by the Conservation/Solar Scenario (employment of the solar and conservation measures plus employment resulting from personal consumption expenditures).

C. Survey of Case Studies

Rodberg's study for the Joint Economic Committee of the U.S. Congress found that to meet projected 1990 new energy demand in the U.S. by conventional means would cost $118.8 billion, producing 1.137 million jobs. Saving the same amount of energy by solar and conservation would cost only $65.6 billion, creating 2.17 million jobs (direct and indirect), a net creation of 1.033 million new jobs. In addition, the $53.2 billion saved could be used to purchase other goods and services, creating an additional 1.87 million jobs. Thus, solar/conservation would create a total of 3.5 times as many jobs as an equal investment in conventional energy, or 2.5 times as many jobs after the jobs lost in the conventional energy sector are deducted (Table F-1).

Rodberg also notes that:

"Within a few years after the onset of a substantial conservation and solar investment, the savings from reduced use of nonrenewable fuels will far exceed the investment, allowing funds to be shifted from energy into the purchase of other goods and services.... With (conventional) energy prices rising relative to other costs, increasing portions of the consumers's dollar will be taken up with direct and indirect energy costs...(R)elatively less income will be available for the purchase of other goods and services having low energy, high job content."

The BLS projections Rodberg used assumed that the cost of energy rises no faster than the general rate of inflation. If, as Rodberg assumes,

"the price of these fuels will very likely rise faster than this, the dollar saving will probably be greater and the number of jobs created by the shift in spending correspondingly larger."

The Council on Economic Priorities has recently completed an analysis of the job impacts of solar and conservation relative to conventional fuels and nuclear energy on Long Island, and reached conclusions similar to Rodberg's. Table F-2 summarized CEP's findings.

Nationally, the Conservation/Solar Scenario would create 2.4 to 2.7 times more jobs than continued consumption of oil, gas, and electricity, and 3.9 to 4.4 times more jobs regionally. They also estimate that the Conservation/Solar Scenario would create 1.4 times as many jobs nationally as an equal investment in nuclear energy, and 2.2 times as many jobs regionally. The Conservation/Solar Scenario actually creates fewer direct and indirect jobs nationally than conventional energy consumption, <u>but the employment effect of</u> the increased discretionary income tips the balance in favor of <u>Conservation/Solar.</u>

Investment in the Conservation/Solar Scenario would create more jobs within the region, while simultaneously enhancing national employment. In other words, the region does not gain at the expense of other regions, but both benefit. CEP found that unemployment on Long Island would be reduced from 6.3 to 5.5 percent with the Conservatioon/Solar Scenario. The respending effect is the crucial variable in both CEP's and Rodberg's analysis.

A 1979 report by the California Energy Commission investigated the comparative employment effects of various energy-technologies. They reached three important conclusions:

1. In producing the same amount of useful energy, solar energy can create 5 to 120 times the number of jobs as coal or nuclear power and at least 3 times as much as oil-based power plants.

2. Most jobs created by solar energy will not be directly in the

solar field. Over 90 percent will be indirect and induced employment.

3. Relatively few solar installers are needed. Consequently, maximum feasible implementation need not be constrained by a shortage of trained solar installers.

Meg Schacter of the U.S. Department of Energy surveyed several other energy-employment sudies. Most of these studies indicate the same general results, but the analyses were less comprehensive than Rodberg's and CEP's.

The U.S. Congressional Office of Technology Assessment has calculated that a solar water heating system in Albuquerque, New Mexico, would create 1.5 to 2.5 more jobs than producing the same amount of energy from a coal-fired power plant. They also estimate that a dollar spent on solar equipment manufactures d in the U.S. rather than on imported oil would increase GNP $2 to $5.

The Solar Domestic Policy Review (DPR) compared the direct and indirect employment effects of two accelerated solar scenarios (Maximum Practical and Technical Limits cases) with base case employment from 1978 to 2000. The results indicate that total employment over the period for the Maximum Practical Case is about 3 million man years higher than for the base case, and about 10 million man years higher for the Technical Limits Case. However, DPR did not take account of labor-saving production techniques that would probably be necessary to meet the levels of demand.

Bruce Hannon of the University of Illinois calculated the change in direct and indirect employment together with the respending effect for a number of energy-conserving "shifts" in consumer expenditures, including shifts from plane and car to train, throwaway to refillable bottles, and other shifts that would not effect us here. However, he concludes that, largely because of the respending effect, full employment would be reached by reducing energy use 5 to 10 percent through the implementation of these energy-saving changes, assuming 1975 unemployment levels.

Schacter concludes that, for the same amount of energy, solar heating systems create 2 to 8 times more direct jobs than conventional power plants. Conservation measures such as direct insulation, weatherstripping, etc., create direct jobs at less than one-third the cost per job of nuclear power, and will be economical in all parts of the country. They create less direct jobs than nuclear and other conventional powerplants per energy equivalent. However, she cautions that direct job creation may be misleading, as indicated by the respending effects illustrated in the Rodberg and CEP study. Based on a study by the California Public Policy Center, solar creates 55-80 times as many direct jobs and LNG, to provide an equivalent amount of energy. CPPC assumes solar collector costs to decrease to one-fourth to two fifths the present average cost. If they remain at their present cost, there would be no cost advantage for solar compared to its LNG equivalent, although the direct employment advantage would remain. For the same amount of energy conservation measures create 26 times as many direct jobs as LNG at one-ninth to one-fifth the cost. The respending effect would increase this figure. Finally, preliminary analysis indicates that an energy strategy designed to promote the development of these industries would have a favorable effect on direct job creation.

A 1976 BPA study also found that: "High impact conservation programs create more jobs than would be created by building new power plants to generate an equivalent amount of energy."

D. Types of Jobs Created

It is unclear what kinds of jobs will be created by solar and conservation. Skill levels are particularly important considering the displacement of labor employed in the conventional energy industry that would occur. For example, if solar technologies create predominantly low-skilled jobs, they offer limited job opportunities for skilled workers of conventional power plants.

Many solar related jobs are skilled or semi-skilled, involved in manufacturing and the building trades. Many of the conservation jobs would be unskilled, involved in installation. Solar and conservation would require one foreman for every ten workers, compared to one for every three workers in conventional power plants. It is uncertain what kind of jobs will be created by the respending effect, although it will probably be a mix of skilled, semi-skilled, and unskilled. Thus, solar and conservation could create more jobs for unskilled and semi-skilled workers than do conventional energy supplies, without decreasing skilled or managerial positions.

We must ask whether the public welfare, in terms of employment and energy security as well as other social benefits, should not override the dislocation of a few individuals. The additional demand for other goods and services generated by the increased personal consumption expenditures involved with the Conservation/Solar Scenario may circumvent dislocation of any workers, while simultaneously creating new jobs. If not, measures should be taken to smooth the transition of displaced workers from the convention energy industries into other fields.

Technologies that result in a significantly different distribution of income between wage-earners and capitalists will have differnt effects in the national level of investment, economic growth, and ultimately employment. However, as Amory Lovins suggests, solar and conservation will provide capital for business people as well as jobs for workers.

Finally, most of the direct jobs associated with the Conservation/Solar Scenarios will be located where the population is. There will be no major geographical dislocation of the work force, nor any boom towns in remote areas, as with coal, nuclear, or synthetic fuels plants.

E. Applicability of These Studies to Oregon

It is difficult to estimate the economic/employment effect of solar and conservation in Oregon short of doing a detailed case study. Oregon's economy and climate, in particular, would influence the cost-effectiveness and employment impacts of solar and conservation measures. However, all the studies to date that we have surveyed are so consistent in their findings that we must question whether the results in Oregon would vary in any substantial way.

CEP's analysis of the job impacts of Conservation/Solar and Conventional Scenarios on Long Island appears to have the most relevance for Oregon. It was the most comprehensive study, and it estimated the regional as well as the national economic/job impacts. Other than the large hydro system, which is near its physical capacity, Oregon, like Long Island, has no indigenous conventional energy resources. Costs for new conventional supplies and conservation and solar measures are comparable between the two regions. The major distinction between the two regions is the mix of sufficiently diverse that the indirect and induced impacts of solar/conservation on the regional level should not differ significantly from the findings of the CEP or other analyses.

SOURCES

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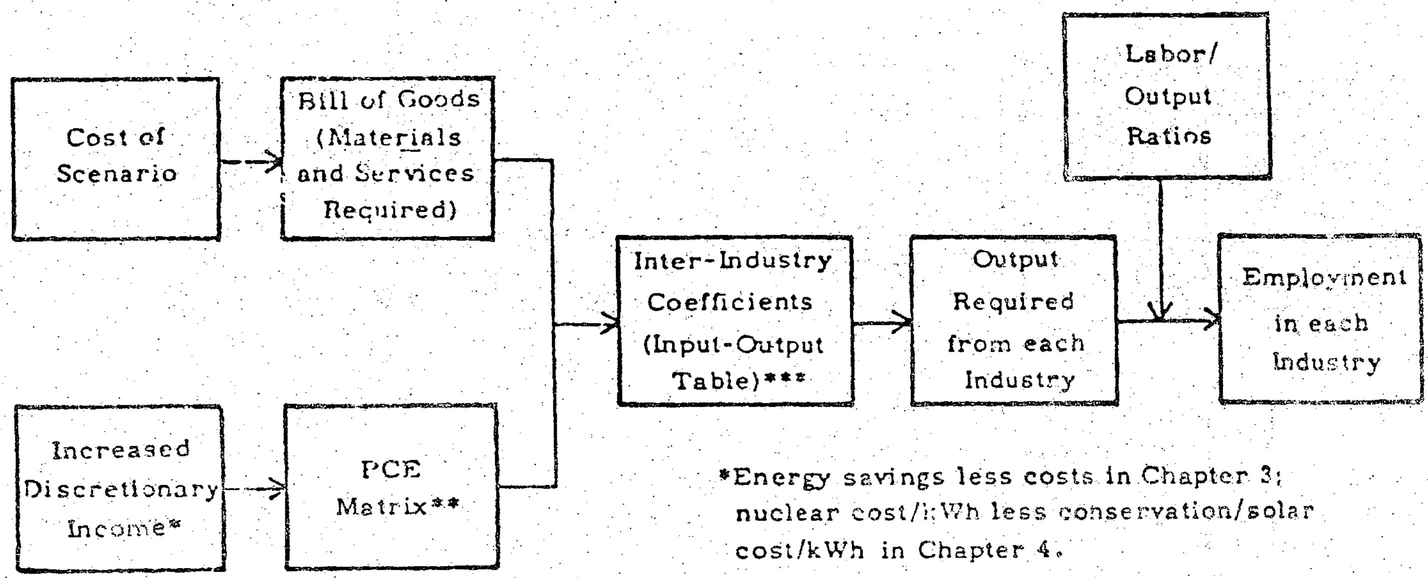
Figure F-1

EMPLOYMENT/DEMAND RELATIONSHIPS
IN CEP'S EMPLOYMENT ANALYSIS



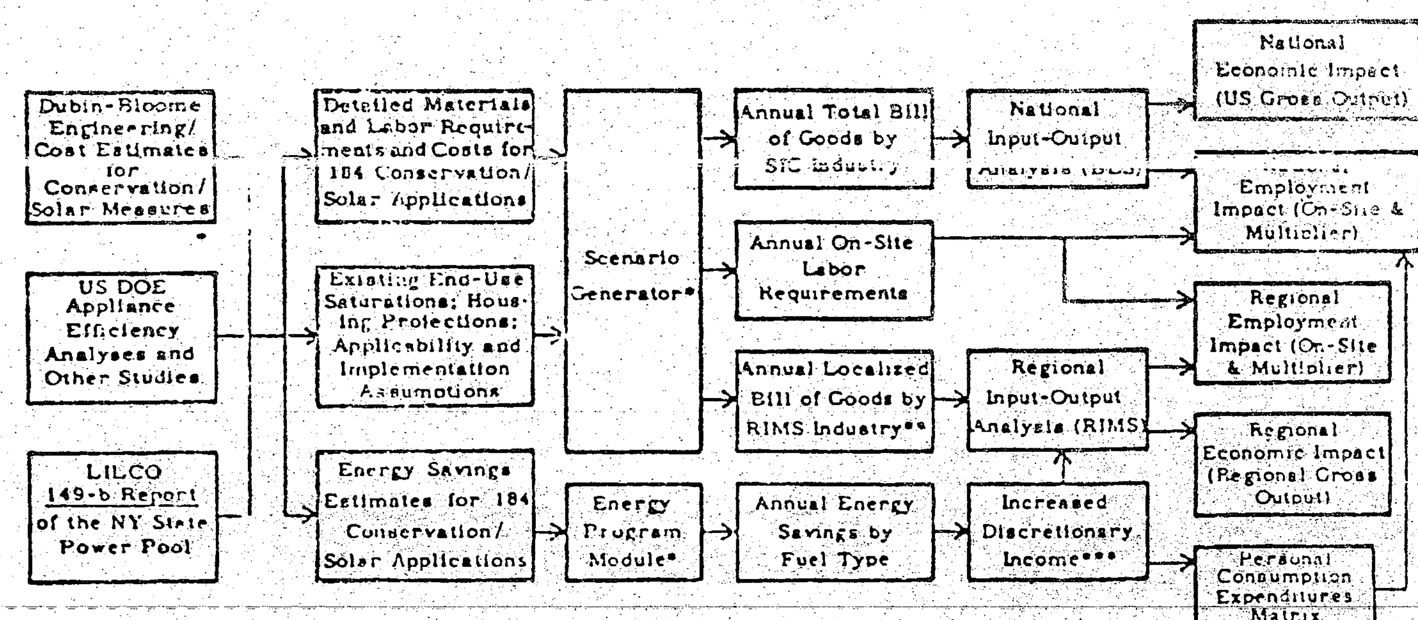
*Energy savings less costs in Chapter 3; nuclear cost/kWh less conservation/solar cost/kWh in Chapter 4.

**Personal consumption expenditures matrix.

***RIMS or BLS.

Figure F-2

SCHEMATIC SUMMARY OF METHODS—
CONSERVATION/SOLAR



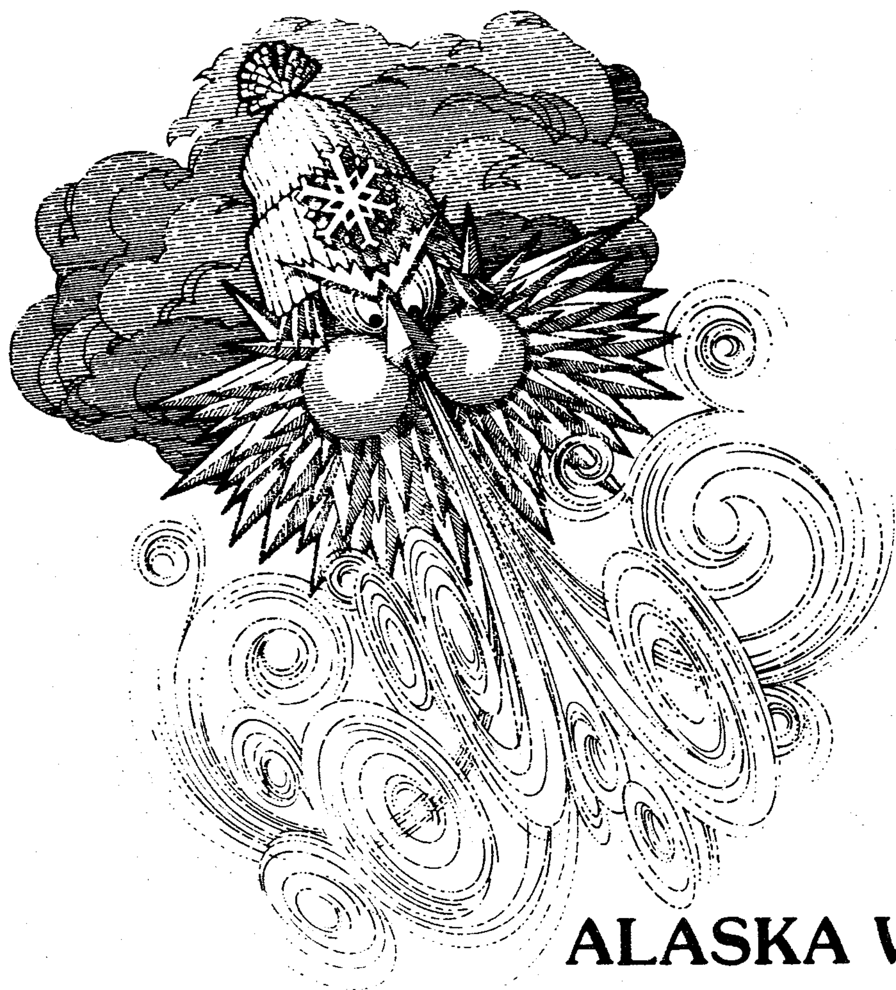
*Programs can select measures and implementation assumptions for the various scenarios (see Appendix G).

**Includes household income.

***Energy savings less costs in Chapter 3; nuclear cost/kWh less conservation/solar cost/kWh in Chapter 4.

APPENDIX G

ALASKA WIND SUMMARY



ALASKA WIND SUMMARY

LOCATION	AVERAGE ANNUAL MPH	% of year Wind Blows 8-38 MPH	% of year Wind Blows 7-28 MPH	% of year Wind Blows 4-31 MPH
Anchorage	6.4	34.4		
Adak	15.1	74.9		
Alatna				20.
Aniak	6.4	37.1		
Amchitka	21.	82.7		
Annette	10.9	62.6		
Annex Creek				50.
Atka				91.
Attu	13.	63.4		
Barrow	12.2	75.3		
Barter Island	12.9	70.		
Beaver				64.
Bethel	11.3	70.		
Bettles	7.7			
Big Delta	9.3	44.3		
Broad Pass				34.
Candle				40.
Cape Decision				76.
Cape Hinchenbrook				80.
Cape Lisburne AFS	12.1	63.7		
Cape Newenham	11.3	63.6		
Cape Romanzof	13.5	68.7		
Cape Sarichef	15.8	44.7% between 14 and 36 MPH		

LOCATION	AVERAGE ANNUAL MPH	% of year Wind Blows 8-38 MPH	% of year Wind Blows 7-28 MPH	% of year Wind Blows 4-31 MPH
Cape Spencer				80.
Cape St. Elias				77.
Central House				14.
Chicken				14.
Chitna				36.
Circle				17.
Circle Hot Springs				12.
Coal Creek				45.
Cold Bay	19.			
Copper Center				46.
Cordova	5.1	27.7		
Council				70.
Craig				62.
Crooked Creek				37.
Deering				69.
Dillingham	11.1			
Driftwood Bay	9.5	58.7		
Dutch Harbor	9.6	59.6		
Eagle				46.
Eielson AFB	3.1	13.4		
Eldred Rock				62.
Elim			18.	
Elmendorf AFB	5.1	24.		
Fairbanks	4.9	23.2		
Farewell	13.1			
Five Finger Light			18.	
Flat			16.	
Fort Yukon	7.6	46		
Gambell	18.3			
Galena	4.5	22.6		
Golovin			20.	
Good Pastor			1.	
Guard Island			15.	
Gulkana	6.6	16.8% between 13 and 31 MPH		
Gustavus	8.5			
Haines	9.1			
Healy			3.	
Holy Cross			2.	
Homer	8.1			
Hot Springs			6.	
Hughes			5.	
Iliamna	10.2			
Indian Mountain	6.2	34.7		
Jack Wade			0	
Juneau	8.5	48.1		
Kenai	7.6	44.1		
Kake	6.0			
Kalskag			7.	
Kanakanak			25.	
Kasilof			3.	
King Salmon	10.6	32.2% between 13 and 31 MPH		
Ketchikan			4.	
Kodiak	9.8	29.9 between 13 and 31 MPH		
Kotzebue	12.8	69.9		
Koyuk	12.5			
Livengood			9.	
Lonely	9.9			
Manley	5.2			
Mary Island			14.	
McGrath	4.8	23.8		
Minchumina	6.8			
Moses Point	12.1	42.9% between 13 and 31 MPH		
Mountain Village	23.3			
Naknek	see King Salmon			

LOCATION	AVERAGE ANNUAL MPH	% of year Wind Blows 8-38 MPH	% of year Wind Blows 7-28 MPH	% of year Wind Blows 4-31 MPH
Nenana	5.8	34.5		
Nikolski	16.3	79.5		
No Grub			1.	
Nome	11.	61.8		
Northeast Cape	12.9	44.3% between 13 and 31 MPH		
Northway	4.4	6.8% between 13 and 31 MPH		
Nulato			3.	
Ohogamute			10.	
Oliktok	11.6			
Ophir			7.	
Palmer	7.9	41.4		
Paxson	4.5		2.	
Petersburg	5.4			
Pigot			5.	
Pilgrim Springs			8.	
Pilot Point			28.	
Platinum			39.	
Point Hope	18.3			
Point Lay	12.2			
Port Heiden	14.8	77.7		
Port Moller	10.2	58.4		
Portage			4.	
Radio Ville			14.	
Black Rapids			33.	
Richardson			4.	
Ruby			7.	
Sand Point	10.7			
Savoonga			21.	
Scotch Gap			35.	
Sentinel			16.	
Seward			10.	
Shemya	18.5	81.4		
Shishmaref			11.	
Sitka	7.9			
Skagway	11.8			
Skwentna	4.7			
Solomon			32.	
Sparrevohn	5.4	31.9		
Stampede			0.	
Stevens Village			3.	
Stoney River			2.	
St. Paul Island	17.1	86		
Stuyahok			7.	
Summit	11.3		9.	
Talkeetna	4.9			
Tanacross	5.4			
Tanana	8.3	39.1		
Tanalian Point			6.	
Tatalina	4.9	28.2		
Teller	10.6	34.5% between 13 and 31 MPH		
Tenakee			6.	
Tin City	17.1	82.4		
Tree Point			12.	
Tyonek			1.	
Umiat	6.9	38.8		
Umnak	17.9	46.5% between 13 and 31 MPH		
Unalakleet	12.1	66.6		
Valdez	5.6	20.2		
Yakataga	7.7			
Yakutat	8.1	47.2		
Wales	21.1			
Wainwright	10.			
Wiseman			1.	
Wrangell			2.	

APPENDIX H

GLOSSARY

APPENDIX H

GLOSSARY

Alternating Current (a.c.): An electric current that reverses it direction of flow at regular intervals and has alternately positive and negative values.

Ambient: The natural conditions(or environment) at a given place and time.

Ambient air quality: The prevailing quality of the surrounding air in a given area in terms of the type and amounts of various air pollutants.

Ampere (A): The unit of measurement of electric current. It is proportional to the quantity of electrons flowing through a conductor past a given point in one second. It is analagous to cubic feet of water flowing per second. It is the unit current produced in a circuit by one volt applied across a resistance of one ohn.

Andesite: Dark grayish rock consisting essentially of oligoclase or feldspar.

Anthracite: A high-rank coal with high fixed carbon, high percentages of volatile matter and moisture.

API: American Petroleum Institute -- a trade associatiton of the American petroleum industry.

Aquifer: An underground bed of stratum of earth, gravel, or porous stone that contains water. A geological rock formation, bed, or zone that may be referred to as a water-bearing bed.

Area mining: A surface mining technique used on flat terrain.

ARRG: Average annual rate of growth.

Average cost pricing: (1) In an economic context, the dividing of total cost by the number of units sold in the same period to obtain a unit cost and then applying this unit cost directly as a price. (2) In a public utility context, the pricing of the service without regard for the structure of the market, to recover those portions of total costs associated with each service in order to make total revenues equal to total costs.

Barrel (bbl.): Used as a measure of petroleum and related products. A standard barrel contains 42 U. S. gallons.

Baseload: The minimum load in a power system over a given period of time.

Bcf: One billion cubic feet. Used as a measure of natural gas.
Beneficiation: Cleaning and minimal processing to remove major impurities
or otherwise improve properties.

Bioconversion: The conversion of organic wastes into methane (natural gas) through the action of microorganisms.

Biomass conversions: The process by which plant materials are burned for direct energy use or electrical generation, or by which these materials are converted to synthetic natural gas.

Bituminous: An intermediate-rank coal with low to high fixed carbon intermediate to high heat content, a high percentage of volatile matter, and a low percentage of moisture.

Blackout: The disconnection of the source of electricity from all the electrical loads in a certain geographical area brought about by an emergency-forced outage or other fault in the generation/ transmission/distribution system servicing the area.

Bonded jet fuel: Jet fuel stored for use of international flights. Federal duties and taxes are not imposed on bonded jet fuel.

BPD: Barrels per day.

British Thermal unit (Btu): The standard unit for measuring quantity of heat energy in the English system. It is the amount of heat energy necessary to raise the temperature of one pound of water one degree Fahrenheit (3412 Btu's are equal to one kilawat hour).

Brownout: An intentional reduction of energy loads in an area by the partial reduction of electrical voltages, which results in lights dimming and motor driven devices slowing down.

Capability: The maximum load that a machine, station, or system can carry under specified conditions for a given time interval, without exceeding approved limits of temperature and stress.

Capacity: Maximum power output, expressed in kilowatts or megawatts. Equivalent terms: peak capability, peak generation, firm peakload, carrying capabilty. In transmission, the maximum load a transmission line is capable of carrying.

Capacity factor: The ratio of the average load on a generating resource to its capacity rating during a specified period of time, expressed in percent.

Carcinogenic: That which produces cancer.

Casinghead gas: A mixture of gasses produced in conjunction with crude oil.

Coke: The solid combustible residue left after the destructive distillation of coal, crude petroleum, or some other material.

Combined Cycle: Combination of a steam turbine and gas turbine in an electrical generation plant. The waste heat form the first turbine cycle provides the heat energy for the second turbine cycle.

Conservation: Improving the efficiency of energy use; using less energy to produce the same product.

Contour mining: A mining technique used in steeply-sloped terrain where a seam outcrops on a slope.

Demand: (1) In an economic context, the quantity of a product that will be purchased at a given price at a particular point in time. (2) In a public utitlity context, the rate at which electric energy is delivered to or by a system, expressed in kilowatts or megawatts, kilovoltampers, or over any designated period.

Direct current (d.c.): A undirectional current having a magnitude that does not vary, or that varies only slightly.

District heating: A system which provides heat for a group of noncontiguous buildings from a central heat source.

Dry gas: Natural gas produced by itself, not in association with crude oil.

Effluent: A discharge or emission of a liquid or gas, usually waste material.

Elasticity of demand: The degree to which the quantity of a product demanded responds to changes in price, income, or other factors.

Electrostatic precipitator: A device that collects particulates by placing an electrical charge on them and attracting them into a collecting electrode.

Emissions: A discharge of pollutants into the atmosphere, usually as a result of burning or the operation of internal combustion engines.

Emissions: Material that is released into the air either by a distinct source (primary emission) or as the result of a photochemical reaction of chain of reactions.

Energy: The ability to do work; the average power production over a stated interval of time; expressed in kilowatt-hours, megawatt-hours, average kilowatts, or average megawatts. Equivalent terms: energy capability, average generation, firm energy load carrying capability.

Energy capability: The net average output ability of a generating plant or plants during a specified period, in no case less than a day. Energy capability may be limited by available water supply, plant characteristics, maintenance, or fuel supply.

Firm power: Power intended to be available at all times during the period covered by a commitment, even under adverse conditions, except for reason of certain uncontrollable forces or service provisions. Equivalent terms: prime power, continuous power, assured power. Component power: firm energy, firm capacity, dependable capacity.

Fixed carbon: The solid, nonvolatile, combustible portion of coal.

Fluidized bed: A reaction chamber in which reactants (e. g. coal or wood pulp) are maintained in a fluid-like suspension by a flow of gas or liquid from below.

Forced outage: An outage that results from emergency conditions directly associated with a component requiring that component be taken out of service immediately or as soon as switching operations can be performed.

Forced outage reserves: An amount of peak generating capability planned to be available to serve peak loads during forced outages of generating units.

Fossil fuels: Coal, oil, natural gas, and other fuels originating from fossilized geologic deposits and depending on oxidation for release of energy.

Fracturing: Splitting or cracking by explosion or other source of pressure to make rock more permeable or loose.

Gasification: The process of converting a solid or liquid fuel into a gaseous fuel.

Groundwater: Water which is underground in an aquifer.

Gigawatt (GW): One million kilowatts, one thousand megawatts.

Head: Essentially, the vertical height of the water in the reservoir above the turbine; that is, the difference between the elevation of the forebay of the reservoir and the tailrace at the foot of the dam.

Heat engine: An engine for changing heat into mechanical energy, such as a steam engine or gas motor.

Heat exchanger: A device that transfers heat from one fluid to another without allowing them to mix.

Heat pump: A device that moves, concentrates, or removes heat by alternatively vaporizing and liquefying a fluid through the use of a compressor.

Hydrocarbons: Any of a vast family of compounds containing carbon and hydrogen in various combinations, found especially in fossil fuels. Hydrocarbons in the atmosphere resulting from incomplete combustion are a major source of air pollution.

Insolation: The rate of delivery of solar radiation per unit area surface.

Hydopower: A term used to identify a type o generating station, or power, or energy output in which the prime mover is driven by water power.

(kw) Kilowatt: The electrical unit of power which equals 1,000 watts.

(kwh) Kilowatt hour : The basic unit of electrical energy which equals one kilowatt of power applied for one hour.

Kwe: Electrical unit of power.

Lignite: The lowest-rank coal, with low-heat content and fixed carbon, and high percentages of volatile matter and moisture.

Liquefaction: A process by which a solid or a gas is converted to a liquid.

Liquefied natural gas (LNG): A clean flammable liquid existing under very cold conditions; that is, almost pure methane.

Liquid petroleum gas (LPG): Gas extracts from refining petroleum or in treating natural gas. Mostly propane and butane.

Load: The amount of electric power delivered to a given point on a system.

Load factor: The ratio of the average load to the peak load during a specified period of time, expressed in percent.

Load Leveling: Describes the more extensive use of storage to eliminate most or all conventional intermediate cycling equipment.

Load management: Influencing the level and state of the demand for electrical energy so that demand conforms to individual present supply situations and long run objectives and constraints.

Load shaping: Either the arrangement and operation of generating resources to meet a given load, or the arrangement of (interchange) load to meet a given resource; over specified periods of time (hourly, weekly, monthly, or yearly). Load shaping on a hydro system usually involves the adjustment of storage releases so that generation and load are continuously in balance.

Load shedding: A method whereby loads in isolated areas are dropped by automatic relays to provide protection for the bulk power system. This could occur when generation is insufficient to meet load.

Long run incremental cost pricing: Pricing associated wth meeting the cost of customer requirements for additional increments in utility service on a continuing basis when the utility has fully adjusted to its operation and facilities to the most efficient means of meeting the increased total demand. It includes the immediate expenses the utility incurs in taking on new customers as well as the cost of utility plant and associated costs necessary to provide and maintain utility service.

Low-Btu gas: Gas obtained by partial combustion of coal with air; energy content is usually 100 to 200 Btu's per cubic foot.

Marginal cost pricing: A system of pricing whereby each additional unit of a product is priced equal to the incremental cost of producing that unit; or charging a price for all units of a product equal to the incremental cost of producing the last unit.

Mcf: One thousand cubic feet. Used as a measure of natural gas. (Note: Usage in the literature varies, Mcf is sometimes used to denote one million cubic feet.)

Megawatt (MW): The electrical unit of power which equals one million watts or one thousand kilowatts.

Megawatthour (MWh): A basic unit of electrical energy which equals one megawatt of power applied for one hour.

Mitigate: In environmental usage, the reduction or control of adverse environmental impact through various measures which seek to make the impact less severe, less obvious, more acceptable, etc.

Nameplate rating: The full-load continuous rating of a generator under specified conditions as designated by the manufacturer. It is indicated on a nameplate attached mechanically to the individual machine or device.

Naptha: A light fraction of crude petroleum akin to the products gasoline and kerosene.

Nonfirm energy: Energy which is subject to interruption or curtailment by the supplier and hence, does not have the guaranteed, continuous, availability feature of firm power.

Nonfirm power: Electric power available during surplus periods, which can be interrupted by the supplying party for any reason. One class of nonfirm power currently available from BPA is caled Authorized Increase.

NOx: Various oxygen-nitrogen compounds (e. g. nitrogen dioxide, nitrous oxide) formed during combustion of fossil fuels with air.

Off-peak: A period of relatively low system demand for electrical energy as specified by the supplier, such as in the middle of the night.

OPEC: The Organization of Petroleum Exporting Countries.

Outage: In a power system, the state of a component (such as a generating unit, transmission line, etc.) when it is not available to perform its function due to some event directly associated with the component.

Overburden: The rock and soil covering a mineral to be mined.

Particulates: Finely divided solid or liquid particles in the air or in an emission. Particulates include dust, smoke, fumes, mist, spray, and fog.

Peaking: Operation of generating facilitiesto meet maximum instantaneous electrical demands.

Peaking capability: The maximum peakload that can be supplied by a generating unit, station, or system in a stated time period. It may be the maximum average load over a designated interval of time.

Peaking capacity: Generating equipment normally operated only during the hours of highest daily, weekly, or seasofuel. Highway gasoline accounted for 28 percent of the total, but some of this is used for snowmobiles and off-highway vehicles. Highway diesel accounted for only 13 percent, once again, illustrating Alaska's unique transport system. Aviation gasoline was only 3 per cent of the total. In the marine sector diesel is the dominant fuel, amounting to 89% of the total marine consumptpeakload plant: A powerplant which is normally operated to provide power during maximum load period.

Peak shaving: Use of end-use storage of off-peak power to reduce peak loads.

Photovoltaic generation: A method for direct conversion of solar electrical energy.

Pollutant: A residue (usually of human activity) which has an undesirable effect on the environment (particularly of concern when in excess of the natural capacity of the environment to render it innocuous).

Power: The time rate of transferring or transforming energy, for electricity, expressed in watts. Power, in contrast to energy, always designates a definite quantity at a given time.

Radiogenic: Produced by radioactivity.

Reliability: Generally, the ability of an item to perform a required function under stated conditions for a stated period of time. In a power system, the ability of the system to continue operation while some lines or generators are out of service.

Reserve capacity: Extra generating capacity available to meet unanticipated demands for power or to generate power in the event of loss of generation resulting from scheduled or unscheduled outages of regularly used generating capacity. Reserve capacity provided to meet the latter is also known as forced outage reserve,

Reserves: Resources which are known in location, quantity, and quality and which ane economicaly recoverable under currently available technologies.

Run of river: A hydroelectric plant with little or no ability to regulate flow.

Solar cell: A semiconductor device that produces a voltage when exposed to the sun, a form of photovoltaic generation.

Sour Crude Oil: A crude oil containing relatively large amounts of sulfur and other mineral impurities.

Storage reservoir: A reservoir in which storage is held over from the annual high-water season to the following low-water season. Storage reservoirs which refill at the end of each annual high-water season are "annual storage" reservoirs. Those which cannot refill all usable power storage by the end of each annual high-water season are "cyclic storage reservoirs.

Subbituminous: A low rank coal with low fixed carbon and high percentages of volatile matter and moisture.

Sulfur dioxide: One of several forms of sulfur in the air; an air pollutant generated principally from combustion of fuels that contain sulfur.

Sulfur oxides: Compounds of sulfur combined with oxygen that have a significant influence on air pollution.

System reserve capacity: The difference between the available dependable capacity of the system including net firm power purhases, and the actual or anticipated peak load for a specified period.

Thermal efficiency: The ratio of the electric power produced by a powerplant to the amount of heat produced by the fuel; a measure of the efficiency with which the plant converts thermal to electrical energy.

Thermal electric: The production of electricity from steam-powered turbines. The heat input required can be from a number of sources such as coal, oil, gas, and nuclear fission.

Thermal generation: Generation of electricity by applying heat to a fluid or gas to drive a turbine generator.

Turbine: A rotary engine activated by the reaction and/or impulse of a current of pressurized fluid (water, steam, liquid metal, etc.) and usually made with a series of curved vanes on a central rotating spindle.

Volt: The unit of electromotive force or electric pressure analogous to water pressure in pounds per square inch. It is the electromotive force which, if steadily applied to a circuit having a resistance of one ohm, will produce a current of one ampere.

Watershed: The area from which water drains to a single point. In a natural basin, the area contributing flow to a given place on a stream.

Wet gas: Natural gas produced in conjunction with crude oil.

APPENDIX I

ALASKA'S LONG-TERM ENERGY PLAN AND THE BUDGET PROCESS

APPENDIX I

ALASKA'S LONG-TERM ENERGY PLAN AND THE BUDGET PROCESS

Continuation of the Long-Term energy plan and its integration into the State budget process.

The section 44.56.224 of S438 calls for the preparation and revision of a long-term energy plan. This plan is to be completed annually and submitted to the legislature by February 1 of each year. In the first year, legislative funding for the activity was not approved until the middle of May, 1980. Consequently, the preparation of the plan could not coincide with the normal budget process of the state and to fit into the mandated schedule had to be completed as a separate activity. This has led to the outcome that the plan contains little in the way of action recommendations by the various agencies of the state with energy responsibilities. In addition, the Governor and the legislature are unable to review the FY 82 agency requests in contextt with the policies enumerated in the plan. To remedy this, the long-term energy plan should be prepared in conjunction with the budget process of the state's executive agencies. To do so will require that the plan due in 1982 be presented as a progress report on the status and development of the 1983 plan. In addition to the need to put the process in step with the budget decisions, the plan needs to be able to utilize the annual work of the Alaska Power Administration, the Alaska Energy Center, the Division of Energy and Power Development, the Department of Transportation and Public Facilities and other agencies with energy responsibilities. A plan due February 1 can use little of the information to be obtained from projects approved for the same fiscal year. Instead, the results of the previous fiscal year will be utlized since they reflect completed tasks that can be presented in the plan.

The completion of the Railbelt Alternatives Study in March 1982 also brings into question the value of a detailed long term energy plan at that time. The results of the Study and any recommendations that require executive or legislative action should be incorporated into the long term energy plan. That would best be fulfilled in the plan to be submitted on February 1, 1983. Then from that period onward, the plan could be submitted annually.

Figure I-1 present a schematic view of the Plan and budget process. Following is a proposed schedule for the next long term energy plan.

Timetable Milestones:

Fiscal Year 1982:

July 1981 -- Oct. 1981:

-- Agency Fiscal Year projects initiated.
These will include reconnaissance, feasibility, resource assessment and evaluation, demonstration projects and plant construction.

January 1982 - end of fiscal year:

-- Project reports or data acquisition completed. Results presented for use in the developmentt of the policy portion of the Long-Term Energy Plan.

March 1982:

-- Railbelt Alternatives Study completed.

April 1982 - June 1982:

-- DEPD prepares draft policy portion of Long-Term Plan.

June 1982:

-- Draft report submitted for agency review and coordination.

August 1982:

-- Draft report submitted to Governor in conjunction with submission of policy budgets of state agencies.

-- Project review and selection compared to draft state policies.

September 1982:

-- Draft report submitted for public review.

-- Draft project portion of Long-Term Energy Plan completed and submitted for agency review.

October 1982:

-- Detailed Capital budget submitted to Governor. This will contain project portion of the Long-Term Energy Plan.

November 1982:

-- Public review and comment on policy portion of Long-Term Energy Plan completed. Modifications and changes made in the policy portion. Agency budgets reviewed for conformance with changes.

January 1982:

-- Fiscal Year 1984 Energy Programs submitted to the Legislature in the form of the Long-Term Energy Plan and the State agency budgets and recommended State actions.

-- Public review of the project portion of the Long-Term Energy Plan is done by the legislature in conjunction with the budget review of each agency.

-- In addition, the Executive may wish to make changes to the Long-Term Energy Plan during the month of January due to new information available from the FY 83 projects initiated in July 1982.

POLICY PORTION;

Contains:

-- Details State policies in energy conservation and development, emergency planning, and sale and use of energy resources.

-- Reports on the status of renewable resources of the State and the technologies to use those resources.

-- Outlines changes in State policies.

-- Reviews State conservation programs.

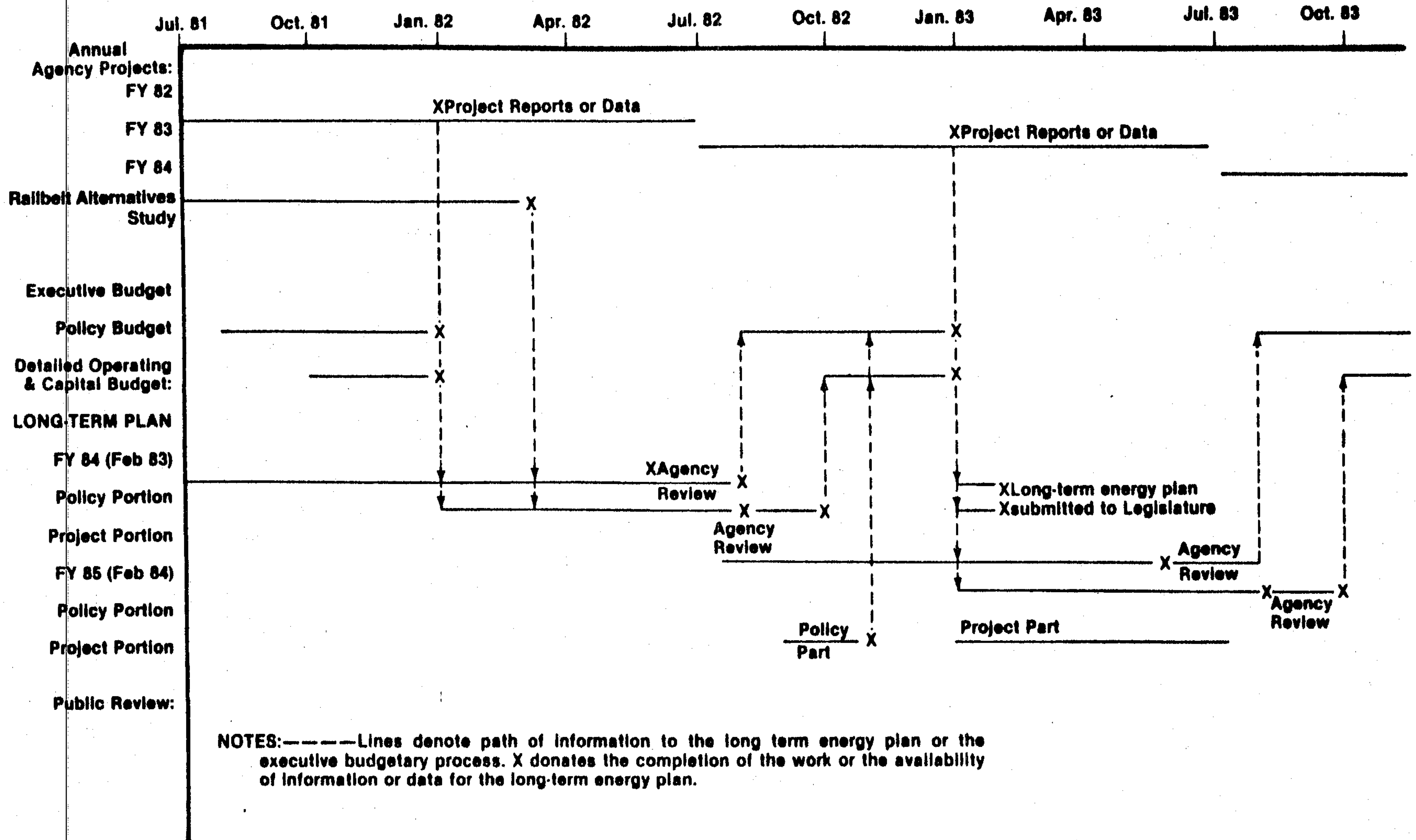
PROJECT PORTION:

-- Details State supported projects, legislation or administrative actions to carry out the State policies.

-- Details results of current State projects.

BUDGETARY PLANNING PROCESS

FIGURE I-1



NOTES:————Lines denote path of information to the long term energy plan or the executive budgetary process. X donates the completion of the work or the availability of information or data for the long-term energy plan.

APPENDIX J

LETTER FROM THE ATTORNEY GENERAL

MEMORANDUM

State of Alaska

TO: Clarissa Quinlan, Director
Division of Energy & Power Development
Dept. of Commerce & Economic Development

DATE: March 10, 1981

FILE NO: A66-288-81

TELEPHONE NO: 276-3550

FROM: WILSON L. CONDON
ATTORNEY GENERAL

SUBJECT: Governor's Energy Emergency Powers

By:
Amy J. Stephson
Assistant Attorney General
Anchorage - AGO

You have asked this office two questions relating to the governor's powers in the event of an energy emergency: (1) what energy emergency powers the governor has under present state law; and (2) what powers the governor has under the Federal Energy Emergency Conservation Act of 1979.

With regard to your first question, the governor's basic powers are outlined in Article III of the Alaska Constitution. Section 1 of Article III, which is entitled "Executive Power", states that "[t]he executive power of the State is vested in the governor." Succeeding sections then enumerate more specifically the governor's powers. Thus Section 16 states that "the governor shall be responsible for the faithful execution of the laws," and authorizes the governor to bring court actions in the name of the state to enforce compliance with constitutional or legislative mandates and to restrain violations of law. Sections 17-27 of Article III give the governor the power to convene and give messages to the legislature; to head the armed forces in the state and declare martial law; to grant pardons, commutations and reprieves, and to suspend and remit fines and forfeitures; to organize and supervise the executive departments; and to appoint various officials.

As the above indicates, the Alaska Constitution gives the governor certain specific powers, none of which includes the power to declare or take action in energy emergencies (except perhaps with regard to state agencies 1/).

1/ The governor probably could impose energy conservation measures on state executive branch agencies pursuant to his constitutional authority to supervise the executive branch.

More generally, it gives the governor the authority to enforce the constitution and state statutes. Accordingly, we do not believe that the governor has any inherent energy emergency powers but may take action in such an emergency only pursuant to statutory authority.

Turning to state laws, the only statute which we have found that even arguably gives the governor authority to take action in an energy emergency is the Alaska Disaster Act, AS 26.23. Under that act, the governor is given a very broad range of powers in the event that he declares a condition of "disaster emergency." AS 26.23.020. Among other powers, the governor is given the authority to issue orders, proclamations, and regulations necessary to carry out the purposes of the act, which orders, proclamations and regulations have the force of law. AS 26.23.020(b). In addition, the governor is specifically given the authority to allocate or redistribute fuel. AS 26.23.020(g)(10). A declared disaster emergency stays in effect until the governor finds that the danger has passed or that emergency conditions no longer exist, subject, however, to a variety of powers given the legislature to terminate a disaster emergency. AS 26.23.020(c). The act additionally contains numerous provisions regarding financing of disaster measures, cooperation among different states and political subdivisions in meeting disaster emergencies, establishment of the Alaska Division of Emergency Services, establishment of disaster plans, etc.

For your purposes, the key question with regard to the Disaster Act is under what circumstances it applies. As was noted above, the governor's powers under the act are predicated on a declaration that there exists a "disaster emergency." AS 26.23.230(2) defines "disaster emergency" as "the condition declared by proclamation of the governor or declared by the principal executive officer of a political subdivision to designate the imminence or occurrence of a disaster." AS 26.23.230(1) then states:

> "Disaster" means the occurrence or imminent threat of widespread or severe damage, injury, or loss of life or property resulting from any natural or non-military manmade cause including, but not limited to, fire, flood, earthquake, landslide, mudslide, avalanche, wind-driven water, weather condition, tsunami, oil spill or other water contamination requiring emergency action to avert danger or damage, volcanic activity, epidemic, air contaminiation, blight, infestation, explosion, riot, equipment failure, or shortage of food, water, fuel or clothing.

Although this definition of "disaster" is broad, and although it specifically includes a shortage of fuel among the situations which might constitute a disaster, the definition appears to envision situations which are more serious than those in which the division might wish the governor to be able to take action. Thus the definition requires the "occurrence or imminent threat of widespread or severe damage, injury, or loss of life or property," i.e., a fairly catastrophic state of affairs. Accordingly, it would appear that the Disaster Act might have some utility in an energy emergency but it is probably not broad enough to cover a number of situations in which the Division of Energy and Power Development might wish the governor to be able to take action.

As was noted above, the Disaster Act is the only law which even arguably empowers the governor to take action affecting the public in an energy emergency. This leads to your next question concerning the federal delegation of powers under the federal Emergency Energy Conservation Act of 1979 (EECA). Your memorandum of January 29, 1981, indicates that you are familiar with the provisions of EECA and that your only question at this time relates to the delegation provisions of Sections 212 and 213 of the Act.

Section 211(a) of EECA gives the President of the United States the authority to establish for the nation generally, and for each state, monthly emergency conservation targets for any energy source if he finds with respect to that energy source that a "severe energy supply interruption exists or is imminent or that actions to restrain domestic energy demand are required in order to fulfill the obligations of the United States under the international energy program." Section 212(a) in turn directs each state to submit to the Secretary of the Department of Energy a state emergency conservation plan designed to meet or exceed the emergency conservation target in effect for that state under Section 211(a). Section 212(b) then outlines the conservation measures that each state plan must contain. For purposes of your question, the pertinent portion of Section 212(b)(1) is as follows:

> Such plan may provide for reduced use of that energy source through voluntary programs or through the application of one or more of the following measures described in such plan:

(A) measures which are authorized under the laws of that State and which will be administered and enforced by officers and employees of the State (or political subdivisions of the State) pursuant to the laws of such State (or political subdivisions); and

(B) measures --

(i) which the Governor requests, and agrees to assume, the responsibility for administration and enforcement in accordance with subsection (d);

(ii) which the attorney general of that State has found that (I) absent a delegation of authority under Federal law, the Governor lacks the authority under the laws of the State to invoke, (II) under applicable State law, the Governor and other appropriate State officers and employees are not prevented from administering and enforcing under a delegation of authority pursuant to Federal law; and (III) if implemented, would not be contrary to State law; and

(iii) which either the Secretary determines are contained in the standby Federal conservation plan established under section 213 or are approved by the Secretary, in his discretion.

As can be seen from the above, a state emergency conservation plan may have one or both of two types of measures: under section 212(b)(1)(A), measures which are authorized under state law, and under section 212(b)(1)(B), measures which the governor of the state may take pursuant to a federal delegation. Since Alaska law provides for energy emergency measures only in the event of a disaster, as discussed above, it does not appear that Alaska could formulate an adequate emergency conservation plan employing measures authorized by state law pursuant to section 212(b)(1)(A). This is particularly true inasmuch as under section 211(a) the President may establish energy conservation targets and call for state plans in situations which do not meet the definition of disaster found in AS 26.23.230. In addition, AS 26.23.020(c) gives the Alaska legislature the authority to terminate a declared disaster emergency, which imposes an obvious limitation on the governor's disaster powers. Accordingly, unless there is new state legislation, Alaska may have to rely on a federal delegation of authority in its EECA plan.

If a state emergency conservation plan is to contain measures pursuant to a federal delegation of authority, the following requirements must be met: (1) the governor must request and agree to assume responsibility for administration and enforcement, through himself or his designees, of the measures; (2) the attorney general must find that (a) absent a delegation of authority under federal law, the governor lacks the authority under state law to invoke the measures in question, (b) that under state law, the governor and other state officers and employees are not prevented from acting pursuant to a federal delegation of authority, and (c) that if implemented, the measures would not be contrary to state law; and (3) the measures must be contained in the standby Federal conservation plan established under section 213 or be approved by the Secretary of the Department of Energy.

As the above indicates, in addition to being requested by the governor and approved by DOE, any measures which Alaska might seek to employ pursuant to a federal delegation must be analyzed under state law. Although it is already clear that the governor generally lacks the authority under state law to invoke the type of emergency energy conservation measures contemplated by EECA, this office would have to review the particular measures proposed to be included in Alaska's plan to further determine whether state law in some way prohibits the delegation or implementation of those measures.

We hope that this memorandum answers your questions.

AJS:dr

APPENDIX K

ENERGY EMERGENCY PREPAREDNESS BY NCSL

April 1981

ENERGY EMERGENCY PREPAREDNESS

PROPOSALS

ALASKA ENERGY PROJECT

NCSL ENERGY PROGRAM

National Conference
of State Legislatures

National Conference of State Legislatures

Headquarters Office
(303) 623-6600

1125 Seventeenth Street
Suite 1500
Denver, Colorado
80202

President
Richard S. Hodes
Majority Leader, Florida
House of Representatives

Executive Director
Earl S. Mackey

30 March 1981

The Honorable Terry Gardiner
House of Representatives
Alaska Legislature
Pouch V
Juneau, Alaska 99811

Dear Representative Gardiner:

Enclosed is the second report on energy emergency preparedness, entitled Proposals.

The National Conference of State Legislatures drafted the suggested legislation contained in this report in response to your interest in following up on a number of the options presented in our first report. Two bills are suggested to meet Alaska's energy emergency preparedness needs:

1. An energy emergencies act granting certain authorities the responsibility to the Division of Energy and the Governor, and others in state government; and

2. An act creating a central repository for state energy information within the Division of Energy and Power Development and granting authority to collect information on energy emergencies.

These bills have been drafted with Alaska's particular circumstances and governmental structure in mind, and could serve as the basis for important additions to the Alaska Statutes.

Sincerely,

T. Dwight Connor

T. Dwight Connor
Senior Program Director, Energy

TDC/jm

ENERGY EMERGENCY PREPAREDNESS

PROPOSALS

A report to the Alaska legislature
by the NCSL Energy Program

April 1981

National Conference of State Legislatures
1125 Seventeenth Street, Suite 1500
Denver, Colorado 80202
(303) 623-6600

The Alaska Project of the National Conference of State Legislatures (NCSL) is funded by a contract with the Alaska Legislature House Research Agency to provide technical assistance to the Alaska legislature. The assistance is designed to aid in the development of effective policies and state programs for solar, wind, and other renewable energy resources; energy emergency preparedness; and state energy organizations. The materials and opinions in this report are those of the authors and not necessarily those of the Alaska legislature or its staff.

The principal author of this report is Jill Verdick, Senior Staff Analyst, in consultation with NCSL legal staff members George W. Sherk and Ken Wonstolen. Douglas Sacarto, Associate Director of the Energy Program and Research Coordinator, supervised preparation of the report; Staff Associate Joslyn Green undertook final editing. Production was in large part the responsibility of Pat Shearer.

Contents

Introduction

The initial report of the National Conference of State Legislatures to the Alaska legislature on Energy Emergency Preparedness proposed several steps the state may take to improve its readiness for future energy shortages and perhaps even its ability to help avert shortages. Included among the initiatives proposed were planning, authorizing and coordinating state response efforts and also collecting and storing vital energy data within a central repository. The two draft bills which comprise this report suggest legislative response the state can make to help meet its needs in these areas.

The first proposed bill, entitled "Alaska Energy Emergencies Act," creates a framework within which the state can prepare for and respond to energy emergencies. It vests in the Division of Energy and Power Development responsibility for creation of a phased, comprehensive state energy contingency plan to shape state response. It sets goals and criteria for both the plan and the planning process. It requires legislative approval of the energy contingency plan.

The bill also provides for declaration of a state of energy emergency by the governor and authorizes him to take steps to activate the contingency plan. In addition, it requires state agencies and local governments to cooperate with the Division of Energy in taking steps to reduce the risk of future energy shortages in Alaska.

The second proposed bill, entitled "Alaska Energy Information Act," is aimed at providing the state with the data needed to foresee energy supply problems and therefore perhaps avert them or lessen their impact. The bill directs the Division of Energy and Power Development to collect information and requires other state agencies, local governments, energy consumers, and suppliers to assist in the task. It creates an energy information center within the Division. The bill authorizes the Division to collect the information necessary to fulfill the responsibilities outlined in the Energy Emergencies Act, and also provides for the protection of confidential information.

Enactment of this proposed legislation should provide Alaska with a strong, balanced approach to energy emergencies.

ALASKA ENERGY EMERGENCIES ACT--DRAFT

A BILL

For an Act Entitled: "An act requiring an energy contingency plan; providing for the declaration of an energy emergency; granting necessary energy emergency powers to the governor; defining conditions under which such powers are to be exercised; providing penalties; providing a period of effectiveness; and amending the state disaster act and the public utilities commission act."

<u>Section 1. Legislative findings and intent.</u>

The legislature recognizes that the people of Alaska are highly dependent upon available energy resources for their health, safety, and well-being; that energy in various forms is increasingly subject to shortages and disruptions; and that only with adequate information systems and a comprehensive emergency response plan for reducing and allocating energy use, can a severe impact on our state's citizens be avoided in an energy emergency. The legislature finds that prevention or mitigation of the effects of such shortages or disruptions is necessary for preservation of the general health and welfare of the citizens of this state.

(2) It is the intent of this act to:

(a) grant necessary planning, information gathering, energy emergency powers to the governor and the Division of Energy and Power Development, and define the conditions under which such powers are to be exercised.

Be it therefore enacted that:

1. AS 44.33 is amended by adding a new section to read:

Section 2. Definitions.

For the purposes of this act:

(1) "Energy" means all forms of energy or power used in Alaska, including but not limited to oil, gasoline and other petroleum products; natural or manufactured gas; electricity in all forms and from all sources; and other fuels of any description.

(2) "Energy emergency" means an existing or imminent domestic, regional, national or international shortage of energy which threatens curtailment of essential services or production of essential goods, or the disruption of significant sectors of the economy unless action is taken to conserve or limit the use of the energy form involved, or to allocate available energy supplies among users.

(3) "Person" means an individual, partnership, joint venture, private or public corporation, cooperative, association, firm, public utility, political subdivision, municipal corporation, government agency, or any other entity, public or private, however organized.

(4) "Energy supplier" means a person who furnishes energy in the state, or any part of the state, as determined by the Division.

(5) "Director" means the director of the Division of Energy and Power Development.

(6) "the Division" means the Division of Energy and Power Development in the Department of Commerce and Economic Development.

Section 3. Energy contingency plan.

(1) Within __ months after the effective date of this act, the Division shall prepare and issue a comprehensive plan specifying actions to be taken in the event of an energy emergency in the manner set forth in subdivision (2).

(2) Such plan shall describe in detail a variety of strategies and energy conservation measures to be implemented in a phased response to an energy emergency, and shall establish guidelines and criteria for the emergency allocation of energy to priority energy users as defined in the plan. The plan shall contain alternative conservation actions and allocation plans designed to meet various foreseeable shortage circumstances and allow a choice of appropriate responses. The plan shall be consistent with relevant federal laws and regulations and shall:

(a) seek to employ voluntary measures before mandatory measures;

(b) prevent unnecessary hardship and threats to public health and safety;

(c) minimize economic and environmental impacts of emergency response;

(d) establish programs, controls, standards, priorities or quotas for the allocation, conservation and consumption of energy; and for the suspension and modification of existing standards affecting or affected by the use of energy, including but not limited to those related to the type and composition of energy sources to be used and to the hours and days of operation of public buildings, commercial and industrial establishments, and other energy consuming facilities;

(e) establish programs to control the use, sale, or distribution of commodities, materials, goods or services;

(f) establish programs and agreements for the purpose of coordinating the energy contingency actions of the state with those of the federal government, local governments, other states, Canadian provinces, and their localities;

(g) determine at what level or phase of an energy emergency the governor shall petition the president for a temporary emergency suspension of air quality standards as required by the Clean Air Act, 42 U.S.C., Section 110(f);

(h) establish procedures for fair and equitable review of complaints and requests for exemptions from emergency conservation measures and allocations.

(3) In developing the plan, the director shall seek the advice and assistance of:

(a) the Office of the Governor;

(b) the Division of Emergency Services in the Department of Military Affairs;

(c) the Division of Community Planning and the Division of Local Government Assistance in the Department of Community and Regional Affairs;

(d) the Public Utilities Commission;

(e) electric and natural gas utilities;

(f) local governments;

(g) energy suppliers;

(h) business, industry, and labor.

(4) All agencies and political subdivisions of this state shall cooperate with the Division in developing the energy contingency plan.

The directors of the Division of Energy and Power Development and the Division of Emergency Services in the Department of Military Affairs shall exchange letters of understanding describing their respective duties and responsibilities during an energy emergency. The director may exchange such letters of understanding with any other persons as deemed appropriate. Such letters shall be incorporated into the state energy contingency plan.

In developing the plan, the Division shall seek to assign specific responsibilities to local governments, and shall report to the legislature any additional authorities to be delegated to local governments as required by the plan.

When requested to do so by the chief executive of a local government, the Division shall render assistance with energy contingency planning to such local government.

(5) The governor shall submit an approved energy contingency plan within __ months after the effective date of this act to the legislature for ratification. Ratification shall be by joint resolution of the legislature.

(6) The energy contingency plan shall be reviewed annually as part of the Long-term Energy Plan, as set forth in Section 44.56.224.

(7) In addition to preparation of the state energy contingency plan, the state, in order to reduce the state's vulnerability to energy emergencies, shall institute measures including but not limited to: energy conservation

measures, stockpiling of energy supplies, and increasing energy storage facilities.

In accordance with the aims of this subsection, the Division shall:

(a) take appropriate measures within its jurisdiction;

(b) recommend measures which other state agencies and political subdivisions may take to reduce the risk or impact of an energy emergency; and

(c) report to the legislature any additional authorities that are needed to fulfill the intent of this subsection.

Section 4. Energy emergency declaration.

(1) The governor, after making a written determination setting forth the basis for his decision that an energy emergency exists, and providing such basis to the presiding officer of each house of the legislature, may issue a declaration that such an emergency exists. Upon the issuance and publication of such a declaration, the governor shall issue such orders and take such steps as are necessary to activate the ratified state energy contingency plan.

The governor's extraordinary powers in an energy emergency shall be limited to those described in the energy contingency plan ratified by the legislature.

(2) The governor may make temporary revisions to the energy contingency plan if he finds that an emergency situation so requires. All such findings and temporary revisions to the plan shall be provided to the legislature in writing concurrently with their issuance. All temporary revisions of the energy contingency plan shall cease to be in force if not ratified by the

legislature within 15 calendar days after their issuance. All temporary revisions of the energy contingency plan shall become void 30 calendar days after their issuance.

(3) An energy emergency declared under this section and any rule or order issued as a result thereof shall remain in effect until 30 days from the date of the declaration, unless the governor rescinds it and declares the emergency ended prior to expiration of this 30-day period. No energy emergency remains in effect longer than 30 days unless renewed by the legislature; the legislature may terminate an energy emergency at any time by concurrent resolution.

(4) If the legislature is not in session when a declaration is issued, the legislature shall be called by the governor into a special session concurrently with the issuance of the declaration to consider ratification of the declaration. Such special session may be cancelled by unanimous agreement of the presiding officers of the Senate and House of Representatives and the governor before actual convening of the special session. If a special session is held, actions taken by the governor under this chapter which are not ratified by the legislature within 15 days of its convening shall be void.

(5) Each person shall carry out the responsibilities specified in the ratified energy contingency plan; violation of any provision of such plan or order pursuant thereto shall be deemed a violation of this act for purposes of enforcement under Section 6 hereof.

Section 5. Information obtainable by the Division of Energy and Power Development.

Authority to obtain information relating to an energy emergency is granted to the Division under Section 44.33.070.

Section 6. Penalties and enforcement.

Any person who violates any provision of this act or any provision of a rule, regulation, or order issued thereunder is, upon conviction, guilty of a ____________________, and punished as provided in ____________________________.

Section 7. Severability.

If a part of this act is invalid, all valid parts that are severable from the invalid parts remain in effect. If a part of this act is invalid in one or more of its applications, the part remains in effect in all valid applications that are severable from the invalid applications.

Section 8. Amending Alaska Disaster Act.

(1) Powers of the governor under an energy emergency shall be distinguished from those granted under a disaster emergency by striking from the definition of "disaster" in the Alaska Disaster Act the word "fuel." Section 26.23.230(1) shall be amended to read:

> Sec. 26.23.230. Definitions. As used in this chapter
> (1) "disaster" means the occurrence or imminent threat of widespread or severe damage, injury, or loss of life or property resulting from any natural or nonmilitary man-made cause including, but not limited to, fire, flood, earthquake, landslide, mudslide, avalanche, wind-driven water, weather condition, tsunami, oil spill or other water contamination requiring emergency action to avert danger or damage, volcanic activity, epidemic, air contamination, blight, infestation, explosion, riot, equipment failure, or shortage of food, water, ~~fuel,~~ or clothing;

Section 9. Amending Public Utilities Commission Act.

The Public Utilities Commission Act, AS 42.05, is amended by adding a new section to read:

Sec. 42.05.700. Energy contingency planning requirements for public utilities.

(1) In order to insure continuity of service to customers of Alaska's electric and natural gas utilities, the Commision shall require, by rule, each such utility to:

(a) report promptly to the Commission any anticipated shortage of electric or natural gas supply or capacity which would affect such utility's capability to serve its customers,

(b) submit to the Commission, and periodically revise, contingency plans respecting shortages of electrical or natural gas supply or capacity, and circumstances which may result in such shortages, and

(c) accommodate any such shortages or circumstances in a manner which shall give due consideration to the public health, safety, and welfare, and provide that all persons served directly or indirectly by such public utility will be treated without undue prejudice or disadvantage.

(2) The Commission shall cooperate with the Division of Energy and Power Development within the Department of Commerce and Economic Development in incorporating plans required by this section into the state energy contingency plan.

Section 10. Period of effectiveness.

This act shall become effective immediately in accordance with AS 01.10.070(c), and shall terminate on March 1, 1985.

ALASKA ENERGY INFORMATION ACT--DRAFT

A BILL

For an Act Entitled:

"An act creating within the Division of Energy and Power Development of the Department of Commerce and Economic Development a central repository for state energy information; requiring coordination with and cooperation by all state agencies collecting energy information; assigning responsibilities for the safeguarding of confidential information to the director; providing penalties; and authorizing the director to obtain all necessary information to determine whether energy shortages are imminent and whether energy conservation measures prescribed under the state energy contingency plan will be required."

Legislative findings and intent.

(1) The legislature finds that there is a need for a central repository for state energy information and for cooperation among various state agencies in the collection of energy information in order to make such collection more efficient and less costly, and in order to make state energy information more uniform and accessible for use in planning, during energy emergencies, and for all other legitimate state uses.

(2) It is the intent of this legislation to:

(a) establish within the Division of Energy and Power Development a centralized system of energy data storage and retrieval;

(b) require all state agencies involved in the collection of energy data to cooperate with the Division in the efficient collection, storage, and use of such data;

(c) authorize the Division to specify the form in which data shall be submitted to the Division;

(d) assign to the director responsibility for safeguarding confidential information provided under this act; and

(e) provide penalties for violation of this act.

Definitions.

Definitions for the purposes of this act shall be those in the Energy Emergencies Act.

Be it therefore enacted that: AS 44.33 is amended by adding a new section to read:

Section 44.33.070. Central energy information repository established.

(1) There is established in the Division of Energy and Power Development a central repository for state energy information.

(2) The Division shall coordinate the collection, storage, and use of energy information in Alaska with other state agencies and political subdivisions engaged in these activities.

(c) inventories of energy supplies from manufacturers, suppliers, and consumers;

(d) local distribution patterns of the information in (a), (b) and (c).

(2) In obtaining information under this section, the Division may subpoena witnesses and any relevant material, books, papers, accounts, records and memoranda; to administer oaths; and take depositions of persons residing within or without Alaska.

(3) In obtaining information under this section the director shall:

(a) avoid requesting information already furnished by a person in this state to a federal, state, or local authority when such information is available to the Division; and

(b) cause reporting procedures, including forms, to conform as nearly as practical with existing state, federal, and local requirements.

Confidential information.

(1) Information furnished pursuant to this act and designated by the source person as confidential shall be maintained as confidential for two years by the director and any person who obtains information which he knows to be confidential under this act. The director shall not make known in any manner any particulars of such information to persons other than the governor and those persons determined by the director.

(2) Nothing in this section shall prohibit the use of confidential information to prepare statistics or other general information for

Responsibilities of the Division.

(1) The Division may specify the form in which energy information shall be submitted for inclusion in the central repository in order to make the collection, storage, and use of the information more efficient and economical.

(2) The director shall safeguard the confidentiality of information designated as confidential by the information's supplier in the manner provided in this act under "Confidential information."

Responsibilities of state agencies.

(1) All agencies and political subdivisions of this state involved with the collection of energy data shall cooperate with the Division in carrying out its responsibilities under this act, by means including but not limited to providing energy data in the form directed by the Division.

Information collection by the Division.

(1) On a regular basis the Division may obtain information from energy producers, manufacturers, suppliers, consumers and others doing business in Alaska, and from political subdivisions and state agencies as necessary to carry out its duties under the Energy Emergencies Act and to determine whether energy shortages may be imminent or will require energy conservation or allocation measures provided for in the state energy contingency plan. Information may include, but shall not be limited to:

(a) sales volumes;

(b) forecasts of energy requirements;

APPENDIX L

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APPENDIX M

TABLE OF CONVERSIONS

APPENDIX M

ENERGY UNITS AND CONVERSION FACTORS

BRITISH THERMAL UNIT (Btu): The amount of energy required to raise the temperature of one pound of water one degree Fahrenheit (1 F) at or near the point of maximum density (39.1 F). The Btu is equivalent to 0.252 kilogram-calorie.

ELECTRICITY

Kilowatt Hour (Kwh): The amount of energy used in one hour by a load of one kilowatt.

At the point of consumption .... 3,412.0 Btu/Kwh
At the point of generation (approximate)....... 10,500.0 Btu/Kwh

COAL

Short Ton (ST) = 2,000 lb.
Alaskan (domestic) coal .... 8220.0 Btu/lb.
or...16.44 million Btu/ST

NATURAL GAS

Dry...1031.0 Btu/cu. ft.
or..100,000.0 Btu/Therm

PETROLEUM PRODUCTS

Barrel (bbl) = 42.0 U.S. gallons
Crude Oil Equivalent........................ 5.800 million Btu/bbl
Asphalt (6.65 bbl/ton)...................... 6.636 million Btu/bbl
Aviation Gasoline........................... 5.048 million Btu/bbl
Diesel Fuel (No. 2)......................... 5.825 million Btu/bbl
Distillate Fuel Oil......................... 5.825 million Btu/bbl
Gasoline.................................... 5.248 million Btu/bbl
Jet Fuel.................................... 5.513 million Btu/bbl
Kerosene.................................... 5.670 million Btu/bbl
Liquified Petroleum Gas (LPG)............... 4.011 million Btu/bbl
Lubricants.................................. 5.522 million Btu/bbl
Residual Fuel Oil........................... 6.287 million Btu/bbl

SOURCE: Applied Economics Associates, Inc. and Energy Analysis and Planning, Inc.

APPENDIX N

PUBLIC COMMENTS

JAY S. HAMMOND, Governor

OFFICE OF THE GOVERNOR

DIVISION OF POLICY DEVELOPMENT AND PLANNING
Governmental Coordination Unit

POUCH AW (MS - 0165)
JUNEAU, ALASKA 99811
PHONE: (907) 465-3565

June 9, 1981

JUN 1981

Ms. Clarissa Quinlan
Department of Commerce &
Economic Development
Division of Energy &
Power Development
338 Denali St.
7th Floor, MacKay Building
Anchorage, AK 99501

Subject: STATE OF ALASKA LONG TERM ENERGY PLAN
State I.D. No. SD300-81050504

Dear Ms. Quinlan:

The Alaska State CLearinghouse (SCH) has completed review of the referenced proposal.

The Department of Fish and Game (ADF&G) commented:

> "The Alaska Department of Fish and Game has reviewed the above referenced long term energy plan draft.
>
> "We have no specific comments regarding this plan but do support comprehensive long term energy planning which emphasizes development of renewable energy resources, environmental soundness and proven feasibility.
>
> "We request the opportunity to review subsequent energy plans and specific energy related projects as they are developed."

We received fhe following comment from the Department of Natural Resources (DNR):

> "'Page 60--The Water Management Section is concerned with water allocations for hydropower, especially where the potential for conflict among users exists. This potential is greatest where there is limited water resource and competing users, for example, small individual hydroelectric facilities. A program of water rights education and water flow record is suggested as part of the long term energy plan. This program should be initiated thru a cooperative effort involving various state agencies having expertise in the areas of hydroelectric generation, water measurement, and water rights procedure. Streamflow measurements should be coordinated

"'Page 87--Cost of geothermal energy-geothermal resource below 120 deg C is treated as a water resource and requires a water right permit to develop the resource. DMEM procedure for leasing geothermal resources should be covered.

"'Page 88--Recommendations - Complete regulations for hydrothermal and geothermal resources to implement HB779.'

"General Comments - There is no mention of any attempts to cut government red tape and encourage development of energy resources."

The Department of Transportation and Public Facilities (DOT/PF) has the following comment:

"Our research section has reviewed the subject document and submitted the following comments:

"'State of Alaska Long Term Energy Plan' is an extremely well written and well prepared document. It is probably the most readable report of it's kind that I have seen produced by a State agency. It should be praised for it's comprehensiveness and the clarity of the language which allows the reader to grasp the implications of what is being said instead of being put to sleep.

"The separation of the information into three separate volumes permits the reader to select what level of detail is germane to his or her needs. The Executive Sumary is particularly good because it is an 'accurate' summary of the detailed report, unlike many I've seen which bear little substantial resemblance to the material actually presented.

"I believe that if every Alaskan read this report it would create a general understanding of the total state energy picture which would shatter a major part of the irresponsible rhetoric concerning energy which is continually heard from all sectors both inside and outside of State government. I say this in spite of the fact that there are a few small shortcomings which require attention; these are itemized below:

"<u>Note</u>: The following comments are related to the plan volume only and do not consider the executive summary of the appendix.

"1. Page 77, Solar Energy - Historical Background and Information: It should be Richard <u>Seifert</u> and John P. <u>Zarling</u>. Somewhere in this section it should be pointed out that DOT/PF is in the process of publishing a Solar Energy design manual for Alaska which should be available July 1, 1981. We also have a report out entitled 'Passive Solar Heating in Alaska'.

"2. Page 79, Current Costs, Passive Solar: The figures given for Alburquerque and Madison are meaningless as presented and tend to distort rather than clarify. While 'no such figures are available for Alaska' is a true statement, it would be better in this case to let it go at that rather than introduce a number which is relative at best, with no understandable point of reference. It would be appropriate perhaps, to say the Passive Solar building design was already proved cost effective in most regions of the lower forty-eight states. However, in passive design each design is so unique it is impossible to quote numbers without misleading the reader since a number suggests a norm and no one yet has such numbers for anywhere in the nation.

"3. Page 83, Alaskan Activities: DOT/PF has available <u>now</u> an 'Alaskan Wind Power Users Manual' and is preparing a second, more comprehensive version.

"4. Page 92, Potential Fuel Cell Development: It is not true to say that 'an additional problem is created by the current requirement to use fossil fuels, as a fuel source,' as is stated at the bottom of the second paragraph. Fuel cell which use methanol and other alcohols are at the same stage of development as are methane fueled models. Methanol is of course a fuel which can economically be derived from renewable sources as well as from fossil fuel sources. At this point in time a fuel cell in combination with a methanol reformer appears to be a most promising alternative to diesel electric generation for rural areas of Alaska since a liquid fuel such as methanol could be supplied using the existing infrastructure.

"5. Page 92-93, Current State Actions: DOT/PF is conducting a research project which would lay the ground work for a fuel cell demonstration in a prototype school building. In this case the fuel used would be methanol.

"6. The report often alludes to the fact that energy is a ubiquitous consideration which requires involvement by many sectors of government. What is missing, however, is some description of exactly (or as closely as possible) which agencies are responsible for or are working on which areas of the general problem. I realize this is a request of not small proportion, but if the report is to be a definitive statement by the executive branch then it is this type of hard policy which would be most useful."

The suggestions and recommendations as provided by DNR and DOT/PF are self explanatory and will be of interest to the Division of Energy and Power Development as this energy plan is developed.

Thank you for giving us the opportunity to review this plan.

Sincerely,

David W. Haas

David W. Haas
State-Federal Assistance Coordinator

cc: Bob Baldwin, DNR
Laurence Soden, DOT/PF

STATE OF ALASKA

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF MILITARY AFFAIRS

ALASKA DIVISION OF EMERGENCY SERVICES

P.O. BOX 2267
PALMER, ALASKA 99645

June 24, 1981

Lloyd Pernella, Director
Division of Energy & Power Development
338 Denali Street
Anchorage, Alaska 99501

Dear Mr. Pernella:

We have completed a review of your Long Term Energy Plan draft. This was accomplished for the Department of Military Affairs and this Division.

I commend your efforts to accomplish this much needed item of contingency planning. We will expect to maintain active liaison as you complete the Energy Emergency Plan. I have no doubt that the Alaska Disaster Act, AS 26.23, as written, will serve the needs of this plan. It may be appropriate that this document be designated and incorporated as an annex to our State Emergency Plan.

Initial contact has been established between your Energy Emergency Planner and my Plans & Programs Branch; I trust this will continue.

Sincerely,

Edward S.E. Newbury
Director

ESEN:HEW:dg

U.S. Department of Transportation
Federal Aviation Administration

Alaskan Region

701 C Street, Box 14
Anchorage, Alaska
99513

June 15, 1981

Dr. Lloyd Pernella, Director
Division of Energy & Power Development
338 Denali Street
Anchorage, Alaska 99501

Dear Dr. Pernella:

I appreciate the opportunity to comment on the State's Long Range Energy Plan. The FAA has a vital stake in the supply of the various forms of energy in Alaska--as do all forms of transportation operating in the State.

Some length of time has ensued since I received a copy of the plan from Mr. Noonan, and I regret the delay in response. Our staff has been rather drastically reduced, but the number of studies and related documents have not appreciably abated.

The plan is of personal interest to me--not just because I have been involved in the energy sphere here in FAA, but also because the years I spent in the "bush" dramatically called to my attention the vital role of energy resources in rural Alaska. Further, I believe that probably some of the State's most significant decisions for the future will be made in the area of energy resource development.

We are most interested in following the progress of State energy planning in the forthcoming stages as envisioned in the draft.

Sincerely,

E.I. Williams

E.I. Williams
Planning-Appraisal Officer

Department Of Energy
Alaska Power Administration
P.O. Box 50
Juneau, Alaska 99802

May 27, 1981

Ms. Clarissa Quinlan, Director
Dept. of Commerce & Economic Development
Division of Energy & Power Development
338 Denali Street
Anchorage, AK 99501

Dear Clarissa:

We appreciate the opportunity to comment on the April 1981 draft, State of Alaska Long Term Energy Plan.

We recognize that you and your consultants were under tight constraints on both time and money for this ambitious project. While we don't agree with all the material between the covers, we think the new study and report represent important strides forward and will help focus attention on Alaska's important energy issues.

We expect the data on energy balances will prove especially valuable.

With only minor reservations, we agree with the 22 recommendations. The reservations are as follows:

2 "Establish a clear delineation between planning, advocacy, and evaluation and designate appropriate State agency responsibilities for each."

We certainly support a strong, independent evaluation process, but believe that further division of responsibilities in energy project development is unwise.

5 (the Advisory Council)

The report doesn't have enough information on the role, makeup, and staffing of the Council to justify the recommendation.

7 (with respect to comprehensive economic and demographic forecasting model)

The modeling techniques are fine in theory, but the results to date in Alaska and elsewhere do not suggest the technology will be all that helpful in the foreseeable future. We certainly support

We're pleased the new plan could make use of our power statistics, but caution that much of 1979 data will be revised. There are quite a few problems with appendix D, and Bob Loney suggests that data be used with caution.

Finally, parts of the report come off more as a lecture in economic theory than an energy plan related to Alaskan facts. This may be the main problem with the chapter on conservation. It is a serious problem in Chapter II, "The nature and scope of Alaska's energy policy." We suggest Chapter II be rewritten to include the legislative base for Alaska's present energy policy (including the basis for the statewide plan), the policies as articulated by the Governor, and then commentary on the policy choices facing the State.

Once again, we concur in the principal recommendations, and believe the new report is an important contribution to solving Alaskan energy problems.

Sincerely,

Robert J. Cross
Administrator

Tesoro Alaska Petroleum Company

R.J. Downey
Senior Vice-President

May 19, 1981

Clarissa Quinlan
Director
State of Alaska
Department of Commerce &
Economic Development
338 Denali Street
Anchorage, Alaska 99501

Dear Ms. Quinlan:

Thank you for sending me the draft of Alaska's Long Term Energy Plan.

On page 47 of the report the statement is made that Tesoro is also a crude oil producer and that the net crude oil production in Fiscal Year 1979 averaged 36,063 BPD. It should be pointed out that all but about 5,000 bbls of that production came from Trinidad Tesoro Petroleum Company and the majority interest in this company is owned by the government of Trinidad and Tobago. Trinidad and Tobago also own a refinery and they have directed that the production of the Trinidad Tesoro Company be used to supply the local refinery. Therefore this production is not available for use by Tesoro.

You have obviously spent much painstaking time on preparing this report. We think that this information should be included in your report in the interest of accuracy.

Very truly yours,

R.J. Downey

RJD/ph

cc: Dennis Juren
John Tagliarino

GENERAL COMMENTS

1. Effects of the Alaska National Interest Lands Conservation Act (ANILCA): The Alaska Lands Act in its title 11 contains some of the most far-reaching effects on newly proposed transportation and utility systems that have ever been encountered in governmental project formation. To omit any reference to the effects of this Act on new utility systems is to launch a grossly incomplete plan. Very detailed consideration should be given to the conservation units set up under ANLICA: and the Act's possible influence on various kinds of new energy systems should be assessed.

2. Transportation: Almost no consideration has been given in this Plan to the very considerable influence of the limited modes of transportation in Alaska. Very concise strategies must be developed for maintaining transportation systems in times of scarce resources. Any plan not taking into consideration the very serious reliance of the State's people upon transportation, especially air transportation, would be of little consequence.

COMMENTS: DRAFT, STATE OF ALASKA LONG-TERM ENERGY PLAN

EXECUTIVE SUMMARY

1. Page 1: Final paragraph of column 1: In regard to the sentence "Revenue from petroleum and natural gas can be combined with a willing work force and vast energy resource potential to provide an array of local energy supply and conservation options."

   COMMENT: The need is for a dedicated political decision to plan for specific energy options by regions in the State.

2. Page 1, column 2, paragraph 2: With regard to the sentence: "As Alaska's long-term energy plan evolves, criteria for energy decisions and the information base on which they are made will become more definitive."

   COMMENT: This is a purely "reactive" approach. It is, in fact, a "cart before the horse" response. My recommendation would be that a specific program be developed as a commitment of the State to: (1) Compile an inventory of modal availability; (2) Examine options by area; (3) Prioritize such options; (4) Attain political decisions ratifing such options; (5) Embody those actions and political commitments in the State long-range Plan.

3. Page 2, column 2, paragraph 2: In respect to the sentence "Because of the timing of preparation, the Governor and the legislature are unable to review agency requests in the context of policies enumerated in the plan."

   COMMENT: The nature of the field of Energy Planning is such that multi-year planning and programming is a necessity.

4. Page 3, column 2, penultimate paragraph: Regarding the sentence "Alternative energy development in Alaska will be encouraged by research and development activities and by grant and loan programs."

   COMMENT: This is a second step. Basic assumptions and political decisions as to desired regional development should preceed this step.

5. Page 4, first paragraph, first column: Regarding the sentence "Coordination among all of the agencies involved in energy production, distribution and regulation is the responsibility of the Governor's office."

   COMMENT: Here again, if we have no basic assumptions, why coordination with producers/distributors? Is this just window shopping?

6. Page 6, Figure 2: This figure, at this point, is quite confusing.

   COMMENT: Numbers are not explained and the diagram is somewhat difficult to use without more preliminary discussion.

7. Page 9, column 1, first paragrah under heading Expanding Energy Options: In regard to the sentence "Given today's rapidly changing energy conditions, it is important that Alaska keeps its energy options open."

COMMENT: However, such options should not be so "open" as to preclude some basic assumptions.

8. Page 14, under recommendations, item 5: "Establish an Energy Advisory Council to assist in the annual update and refinement of the Plan."

COMMENT: Further comment will be given below. For the present, the reviewer would only state that no case has been made for such a council in the executive summary.

COMMENTS: DRAFT, STATE OF ALASKA LONG-TERM ENERGY PLAN

1. Page 1, column 2: With respect to the sentence "The most important role of Alaska's long-term energy plan, and those who administer it, should be that of evaluation and not advocacy."

   COMMENT: This is not necessarily true. Compartmentalization leads to stumbling, uncoordinated action. Those involved in developing and placing into operation such a plan will, in the nature of things, be advocates to some extent.

2. Page 6 column 1, paragraph 3:

   COMMENT: Regarding the energy data base, I believe that one of the first comprehensive efforts must be that of compiling inventory data.

3. Page 7, Figure I2:

   COMMENT: To the extent that the plan will be used by those not acquainted with planning techniques, such involved and complicated diagrams and illustrations should not be used. A State Plan is not the place for scholastic exercises. What point (or points) are being made here? If the purpose is to compare Plan timing with other events, it does not do the job very simply or well.

4. Page 9, column 1, paragraph 2: Regarding the sentence "Alaska Statutes require that the Plan be submitted to the legislature no later than 1 February each year, and yet funding for the Plan is not available before the beginning of the fiscal year."

   COMMENT: The answer to this problem is that the plan should be an on-going multi-year program. This concept merely follows the method used for many years in other massive capital-improvement endeavors such as highways and airports construction.

5. Page 9, paragraph 4, column 1: Regarding the sentence "To remedy this problem, the long-term energy plan should be prepared in conjunction with the budget process."

   COMMENT: Agree. But on a multi-year time track.

6. Page 9, column 2, third paragraph, last sentence: Regarding the need for a central repository and coordination center for energy data and information.

   COMMENT: Agree basically. However, the answer is not the creation of a new agency.

7. Page 10, second column: Regarding the administrative handling of the Plan.

   COMMENT: The entire column illustrates, graphically, the present fragmentation of the energy program.

8. Page 11, column 1, third paragraph, penultimate sentence: Regarding setting standards for evaluation and establishing a single method for information and data collection.

COMMENT: Such a standardized system can, of course, be achieved. But not without organizational purification.

COMMENT: What is wrong with using simple words from everyday language? Throughout the study we find such agrandizements of simple words like "method" (using instead, "methodology") as well as the use of ordinary words in unusual contexts, as in the use of "secular" on page 8 of the Executive Summary.

9. Page 11, column 1, last paragraph, first sentence: Regarding a clear distinction between energy project/program advocacy and evaluation.

COMMENT: Perhaps. However, there is no reason why such division of responsibility can not be accomplished within the frame work of a well-organized Energy Division or Department.

10. Page 11, column 2, first paragrpah, last sentence: "In Alaska that process will not work because the State government is heavily involved in most of the projects."

COMMENT: This is pure nonsense. State governments are always involved in projects where state funding is provided. I would agree, however, that the divisions' business be de-politicized to the degree possible.

11. Page 11, column 2, paragraph 5, first sentence: Regarding the clear and present danger of the isolation of planners from the real world.

COMMENT: Agree totally. There is a real problem in state-wide expertise in this respect. Wholly "urbanized" people, fresh from their ivory towers, are making life style-affecting decisions for rural communities. How many planners in Alaska have had any association with the "bush"?

12. Page 11, column 2, final paragraph: Regarding regular contact and assistance from outside the immediate planning sphere.

COMMENT: Field work is what is needed here.

13. Page 11, column 2, final paragraph, final sentence: Regarding the establishment of an Energy Advisory Council.

COMMENT: Totally disagree. There is no need for additional organizations. These are all functions that can--and should be--handled by a cohesive and inter-acting Energy organization. The problem now is fragmentation of the program--and it is a problem that can only be exacerbated by the creation of new organizational entities.

14. Page 12, recommendations:

a. Regarding timing of the Plan: We would substitute on-going multi-year planning.

b. Regarding deliniation among planning, advocacy, and evaluation; this can be handled intra-organizationally.

c. Inculding within the Long-Term Energy Plan responsibility for technical and economic review and evaluation: Agree completely.

d. Regarding specific technical and economic criteria: Agree.

e. Establish Energy Advisory Council: Do not agree. See above.

15. There are good reasons for elevating Energy to a Departmental level (and one of them is not merely because the Federal Government has done so). State policy should, among other things, use energy initiatives to build creditibility with other states and Congress. For example: If we have as a keystone policy the rapid transition to alternative energy sources (prime example: Hydro), we could, and should, proclaim loud and clear that one of our primary objectives in doing so is to reserve fossil fuels for states that are not as blessed with natural resources as we are.

16. Page 15, entire page: Background.

COMMENT: There seems to be a good deal more padding here than is absolutely necessary.

17. Page 16, column 2, second paragraph, first sentence: Regarding the State's energy policy.

COMMENT: This is a questionable, if not argumentative, statement. First of all, it is not an energy policy, but an economic one.

18. Page 18, entire page:

COMMENT: This last section is "motherhood and apple pie." There is not much meat on these bones. For example: The matter of preplanning and cost benefit analysis is not touched upon.

19. General Comment on Chapter 2: It is the reviewer's opinion that the State should embark upon a comprehensive energy planning program. The needs seen in such an effort are as follows:

a. A complete organizational study should be accomplished involving all energy-involved departments.

b. Massive data gathering and structuring of same would be an early requirement.

c. After such organizational and data gathering projects have been completed, assessment of all possible options (by geographic areas) should go forward:

(1) Local input should be solicited.

(2) Cost benefit studiesshould then take place for all options.

(3) Regional recommendations, as to proposed future development, would be a next step.

(4) Multi-year strategies would then be developed for the recommended options within regional areas.

(5) Emergency alternates should be included.

d. A total plan with all its strategies should be submitted to the legislature.

e. A multi-year programming strategy for overall State promulgation should be developed.

f. The multi-year plan should be geared to budget-legislative cycle.

g. Provision should be made for monitoring of technological advances.

h. Oversite of programmed accomplishment should be carried out.

i. Continuous revalidation and adjustments should occur.

j. Publication (to all states) on progress of the plan would be a continuing part of the program.

20. Page 21, column 1, paragrph 1: With respect to the sentence "Essentially, there are five independent energy systems..."

COMMENT: Artificial categories of geographic areas they obviously are. Homogeneous systems they are not.

21. Page 22, column 2, second paragraph, last sentence: "As a major energy producer, Alaska uses a lot more energy per capita than does Oregon, where only 1/5 of the State's energy consumption is provided from in-state resources."

COMMENT: This is pure sophistry. We do not use more energy because we produce it. This kind of sensationalism will present a deleterious image to residents of other states.

22. Page 23, Table III-1: This data adequately explains Figure III-2. If it is not to be included in the Executive Summary, then III-2 should not be included either.

23. The reason for an Executive Summary is to provide reviewers with an overview of the basic document. It must stand on its own.

24. Page 27, final paragraph on the page: Regarding the sentence "The Arctic has 1 percent of the State's population, and with Prudoe Bay produces over 2,000 times the end-use energy consumed."

COMMENT: This is not particularly relevant. Probably the same kind of relationship could be shown for the area around Midland-Odessa, Texas.

25. Page 29, column 2, third paragraph, penultimate sentence: Regarding the sentence "Other than an evaluation of airline schedules not a lot can be done to improve the efficiencies in the short term."

COMMENT: This certainly is not true. How about some new and innovative approaches?

26. Page 31, Tables III-8 and III-9: The use categories in the study give this reviewer a great deal of trouble, e.g., Marine is really a part of transportation. Also, were is the line drawn between Industry and Commercial? Assumptions and definitions of terms are very poorly articulated throughout the document.

27. Page 39, first column, second paragraph, final sentence: Regarding planning beginning at the community and regional levels.

COMMENT: There is a confusion here, as to who is doing the planning.

28. Page 40, column 2, third paragraph under Resource Availability: This first paragraph does not make sense.

29. Page 47, first column, final paragraph, final sentence: The sentence is incomplete.

30. Page 49, column 2, thrid paragraph under Recommendations: First paragraph is very poorly written. Perhaps the words "compatibility" and "should" need to be omitted.

31. Page 58, second column: The entire paragraph beginning at the bottom of the column down to the next paragraph beginning "The topography...", should be deleted. It is repeated again on page 59, second column, and is out of place.

32. Pages 63 and 64: These pages merely repeat Table IV-8 given on pages 60 and 61.

33. Page 65, column 2, beginning fourth paragraph: Something is missing here. Note the words "is reviewed" and "...a description of the resource size and location is presented..." Is this an introduction to the following pages?

34. Page 66, section beginning "resources should be selected on the basis of:" This is exactly the "first step" previously alluded to--and must be done on a regional and subregional basis. In fact, this process would establish a State blueprint for future activities.

35. Page 68, column 1, second paragraph: The binding on pages 69 and 70 should be reversed.

36. Page 69, column 2, under Resource Uses: "Peat has long been an energy resource in Finland and Ireland."

    COMMENT: Yes. But how does our total resource compare with theirs? This is the most basic relevant point and should be covered, if only peremptorily.

37. Page 75, end of the page: Conversion of municipal and residential garbage is given rather short shrift here. That method, with its attendant avoidance of collection and disposal costs should be investigated in some depth.

38. Page 79, column 1, under Photovoltaic: Regarding final sentence stating that photovoltaic use is not yet economically competitive.

    COMMENT: Except when ancillary costs avoidances are a by-product.

39. Page 79, column 1, under Current Costs: No mention is made of the Homer and Wasilla projects. It is hard to understand how these were overlooked--both have been well publicized.

40. Page 80, second column, third recommendation: How about an incentive program for those living in active and/or passive solar homes (to provide for data gathering)?

41. Page 81, column 1, first paragraph: Included should be the FAA on-going uses at Kenai and Sitka.

42. Page 82, column 2, top of page in the table: What do the notes following small-scale and large-scale refer to?

43. Page 83, final paragraph, second column: Terrible sentence structure. How about: "Operating data and development information gathered from existing systems should be collated and made available to potential users?"

44. Pages 84 and 85, Figures IV-7 and IV-8: With the scanty discussion on wind power, preceding, the relevence of these figures is difficult to grasp. For example: How many readers of the Plan will be familiar with the concepts of "wind power density" and "ridgecrest estimates"?

45. Page 86, column 2, under Availability of Geothermal Energy: First paragraph is repeated immediately below it, in its entirety, and should be deleted.

46. Page 96, column 2, second paragraph: The phrase "Organic Fluid Ranking Cycle systems" is exploded upon the scene without any preliminary discussion. What does it do? How does it operate? It is small wonder that the politicians don't pay any attention to the engineers and technicians. They can't understand them!

47. Page 103, column 2, second paragraph, penultimate sentence: With respect to the statement: "In Alaska, energy conservation activities in the transportation sector are almost non-existant."

COMMENT: This is absolutely not a true statement. What segment(s) of the transportation sector did the consultant contact?

48. Page 107, column 2, final sentence: The final part of the sentence is missing.

49. Page 112, second column second paragraph: Regarding discussion on impact of federal mandates.

COMMENT: It is time for the State to initiate and carry out its own program. It should be an instrument of inter-state influence.

50. Page 120, the International Problem: Entire discussion centers about embargoes and other oil flow disruptions due to economic and political exigencies.

COMMENT: How about US/Foreign-Power war? That contingency should be a part of the Plan.

51. Page 124, column 2, second paragraph: Regarding the sentence "As a result, the contingency plan for dealing with a serious shortage will have to be very carefully prepared and implemented as soon as officials are certain about the disruption."

COMMENT: If we wait that long, it's too late.

52. Page 127, column 1, Measures to Constrain Demand: Item 11: Prohibit or limit the use of private planes for nonessential uses.

COMMENT: The State needs to perfect a State and Regional Defense Airlift plan (SARDA) such as that available in many other states. In times of scarce resources, that plan should also include use of certain designated aircraft as is done in the SARDA plan.

53. Page 127, second column under Measures to Provide Supplemental Supplies: Item 4: "The Alaska Energy Contingency Plan should be completed and submitted to the legislature for approval by January 1982."

COMMENT: A very laudable ambition that is absolutely impossible of achievement.

Resource Development Council
for Alaska, Inc.
444 West 7th Avenue, Anchorage, Alaska 99501
Box 516, Anchorage, Alaska 99510 - 907/278-9615

COMMENTS ON THE STATE OF ALASKA'S

LONG-TERM ENERGY PLAN (DRAFT), DATED APRIL 1981

The Energy Committee of the Resource Development Council has reviewed the State's Energy Plan and has made the following comments:

This is neither a good plan nor a good policy statement. It appears to be a critique of the present system rather than a plan or policy.

As a plan it does not determine needs or how the needs are to be addressed. There is no action plan to initiate incentives for the development of resources for energy. A long-range plan should establish objectives and goals; this was sadly lacking. The documents do contain many suggestions which, if adopted, would result in more studies and a larger bureaucracy.

As a policy, some suprising and potentially dangerous thoughts are expressed. Two examples:

"The State's policy initiatives are aimed at ensuring that energy is reliably available at reasonable rates." That statement is in direct opposition to the State's standing policy on its royalty energy, which is to get top dollar for it.

"The State will ensure that energy facilities are developed in an economically and environmentally sound manner." The State cannot ensure economic viability; or at least should not.

The study has revealed a lack of coordination, responsibility, and a lack of centralized data collecting.

Oil and gas are major sources of energy in Alaska. Little emphasis is placed on this in the plan (note: one paragraph on Cook Inlet natural gas). Much of the information is inaccurate and misleading. Any long-range plan using such limited information relating to a major source of energy as a basis for decisions must have a negative value. Nothing in the report mentions the beneficial effect that new oil and gas discoveries would have as known fields are depleted.

The study did point out that most of the state money is being spent haphazardly on alternative energy resources (not true research) or conservation programs with unknown predicted results. Almost nothing was spent to further develop the known resources or to use

COMMENTS

concerning

STATE of ALASKA

LONG TERM ENERGY PLAN
(DRAFT)

submitted by

the

KODIAK AREA NATIVE ASSOCIATION

May 27, 1981

KODIAK AREA NATIVE ASSOCIATION

Post Office Box 172 - Kodiak, Alaska 99615 - Phone (907) 486 - 5725

The Kodiak Area Native Association (KANA) appreciates the opportunity to submit comments concerning the Draft State of Alaska Long Term Energy Plan. The KANA has been regularly involved with energy issues affecting Alaskan Natives since the organization became incorporated. The KANA is a member of the Alaska Rural Energy Association (AREA) and has actively participated in the association's programs that have developed a position on rural energy.

The subject document draft has been perceived by the KANA not as a plan but, more astutely as a report to the state on the purpose and intent of developing an evergy plan. A plan is comprised of a set policy on an issue, goals and objectives which provide a process to deal with that issue, and accurate information to base decisions which resolve the issue. This draft only presents itself as a necessary handbook giving information and recommendations to the state so that an energy plan can be developed.

The KANA supports all recommendations stated in the Draft to develop a plan. The AREA has advocated similiar recommendations to the state to establish an orderly process for making energy decisions for Alaska. One important recommendation that AREA has advocated is the need for regional energy planning. Because of Alaska's immense geographical size, energy resource variety, socio-economic and socio-cultural diversity, regional energy planning is extremely essential in the development of a state energy plan. The ANSCA Act has identified thirteen (13) regions within Alaska. In each of these regions is an organization that has the ability to assist the state in the coordination of state energy programs and to provide, as inicated in this draft, the keystone of accurate and reliable information on energy, especially rural energy.

Attached to these comments is a preliminary work plan for a Regional Energy Planner conceptualized by the KANA. The planner plays a vital role in the energy planning process. Responsibilities of the planner are illustrated in the attached preliminary job description developed to correspond with the work plan. The responsibilities are condusive only to the Koniag Region: Therefore each region would have to develop its own specific work program to address the particular energy needs of the region.

The KANA is pleased that the state of Alaska is pursuing an energy plan and feels that the draft provides the necessary information and guidelines to develop one. This orgranization reemphasize the importance of regional energy planning and strongly urges that the concept be incorporated in the final document. The KANA board has formalize their attitudes towards the state's position on energy planning in resolution form to be adopted at the next board meeting in June, 1981. The resolution accompanies these comments. Again, thank you for allowing the KANA to express their views on the Draft Plan.

Sincerely,

KODIAK AREA NATIVE ASSOCIATION
IONE M. NORTON

Thomas Peterson
Thomas Peterson
Economic Development Planner

TP:es

WORK PLAN

KODIAK AREA NATIVE ASSOCIATION

REGIONAL ENERGY PLANNING PROGRAM

JUNE 1, 1981 TO JUNE 30, 1982

TASK I: REGIONAL ENERGY COUNCIL FORMATION AND ASSISTANCE

OBJECTIVE: Establish the Regional Energy Council and provide technical assistance.

WORK STEPS	RESULTS	TARGET DATES
1. Establish REC		
a) Composition	Formation of REC	July, 1981
1. One member representing each village.		
2. One member representing Kodiak proper.		
2. Establish REC as Standing Committee to the KANA Board of Directors	Standing Committee	July, 1981

TASK II: GRANT-IN-AID ASSISTANCE

OBJECTIVE: Provide Technical Assistance to KANA and villages.

WORK STEPS		
1. Provide assistance in application for energy related funding projects and grants.	Completed applications.	As grants become available.

TASK III: INFORMATION AND REFERRAL

OBJECTIVE: To provide assistance to agencies conducting energy programs.

WORK STEPS	RESULTS	TARGET DATES
1. Make regular field trips to villages to retrieve information on energy resource, production, and use.	Information concerning Base data information gathered.	Quarterly
2. Research and develop statistical data base on regional energy.	Completed Base data information.	October, 1981, and May, 1982
3. Provide as liaison for the Region to Federal, State, and local agencies involved with energy programs.	Information exchange, strengthened program delivery.	On-going

TASK IV: ENERGY PROGRAM ASSISTANCE

OBJECTIVE: To provide assistance to agencies conducting energy programs.

WORK STEPS		
1. Provide coordination with agencies conducting energy programs within the region and villages.	Quality program delivery	As programs are initiated.
2. Provide assistance to agencies conducting energy programs within the region and villages.	Quality program delivery.	As programs are in progress.
3. Provide interaction between agencies conducting energy programs with the REC.	Quality program delivery	As programs are in progress.

TASK V: SERVICE DELIVERY TO REGION AND VILLAGES

OBJECTIVE: Assist REC in the development of Regional Energy strategies and plan.

WORK STEPS		
1. Develop energy strategies for each village.	Completed Energy planing strategies.	

WORK STEPS	RESULTS	TARGET DATE
a. Akhiok		First quarter
b. Karluk		First quarter
c. Kodiak proper (with Borough planning assistance)		First quarter
d. Larsen Bay		Second quarter
e. Old Harbor		Second quarter
f. Ouzinkie		Third quarter
g. Port Lions		Third quarter
2. Assist the REC in preparation of the Regional Energy Plan	Completed plan.	May, 1981

TASK VI: PLAN IMPLEMENTATION

OBJECTIVE: Assist in implementing the Regional Energy Plan.

1. Assist the REC in implementing village energy plan programs.	Begin efforts for FY83	June, 81
2. Assist the Borough in implementing energy plan program.		June, 1981
3. Provide information to REC and Borough from energy related agencies in the implementation process.		June, 1981

TASK VII: ENERGY WORKSHOPS

OBJECTIVE: Provide educational workshops related to energy issues.

WORK STEPS		
1. Provide workshop topics, agenda and materials	Two (2) workshops	August, 81; May, 82
2. Coordinate with agencies wishing to conduct further workshops.	More workshops	As assigned during workshops.
3. Address regional energy issues in workshops.	Qualitative workshops.	As assigned during workshops.
4. Provide followup on workshops.		Three weeks post workshops.

KODIAK AREA NATIVE ASSOCIATION

Post Office Box 172 - Kodiak, Alaska 99615 - Phone (907) 486 - 5725

KODIAK AREA NATIVE ASSOCIATION

RESOLUTION NO.81-2

THE VILLAGE ENERGY RECONNAISSANCE AND CONSERVATION PROGRAM

WHEREAS, the Kodiak Area Native Association has recognized the dramatic increase of fossil fuels supplied to villages in the Koniag Region; and

WHEREAS, low income residence of those villages are becoming heavily burdened by the rising costs; and

WHEREAS, continued neglect and disorderly energy program delivery by the State to provide a comprehensive energy program to decrease the amount of fossil fuel use in villages will jeopardize its existence; and

WHEREAS, the need for energy conservation, weatherization, and most of all, energy awareness through education in the villages is of paramount issue; and

NOW THEREFORE BE IT RESOLVED that the Kodiak Area Native Association urges the Governor and the Alaska State Legislature to support full funding of SSHB9, specifically Section Three (3) pursuant to the provision of development and administering a Village Energy Reconnaissance and Conservation Program and to financially support Regional Energy Planners to provide the catalyst to achieve a successful program.

Accepted this _________day of _______, 1981.

____
Chairman, Board of Directors

____
Secretary, Board of Directors

ATTEST:_____________

TESORO

ALASKA ENERGY OFFICE

May 22, 1981

Dennis F. Juren
Group Vice President
Refining, Marketing
and Transportation

Ms. Clarissa Quinlan
Director
Department of Commerce &
Economic Development
7th Floor Mackay Building
338 Denali Street
Anchorage, Alaska 99501

Dear Ms. Quinlan:

We have reviewed your draft of the State of Alaska's Long Term Energy Plan with great interest, particularly with regard to petroleum supply/demand projections and the area of emergency planning.

Although the draft emphasizes Alaska's dependence on petroleum products, we believe that this dependence vis a vis the lower 48 states is understated. First, the draft states that the 59 percent of energy end-use consumption (56.8 percent on total basis) in Alaska represented by petroleum is only slightly higher than the national average. Data published by the Federal Department of Energy in their Monthly Energy Report indicate that petroleum supplies only about 47 percent of national energy needs--some 10 percentage points below Alaska's. Secondly, we note that about 15 percent of the petroleum energy for the nation as a whole is in the form of residual fuel oil, whereas essentially no residual fuel is consumed in Alaska. If we corrected for residual fuel oil use, then a more valid comparison would be that light products (gasoline, diesel, turbine fuel, etc.) account for 56.8 percent of energy consumed in Alaska vs. about 40 percent for the nation as a whole. We believe that Alaska should take account of its unique product demand slate in developing the long term energy plan. Specifically, it should be recognized that more "bottom of the barrel" refining capacity is required per barrel of product supplied in Alaska than for the nation as a whole.

Alaska's high per capita energy consumption, use of only the lighter products, and unique distribution problems make it desirable to maintain in-state refining capacity at maximum throughput rates during periods of petroleum supply disruptions to the nation.

In this regard, we would like to point out that actions taken by the State of Alaska during non-shortage periods can have an impact on how well the State fares during shortfall situations. Although the ideal goal of any federal allocation plan would be that everyone is entitled to purchase a set percentage of his base period purchases, the implementation of the plan will not meet that objective. Based on past history, it is likely that the real allocation will take place at the interface between crude oil producers and refiners in the following manners:

- Existing supplier/purchaser relationships will again be frozen
- Under a buy/sell program, crude deficient refiners will be entitled to purchase crude up to a percentage of base period runs, not capacity (thus the need to keep runs up during non-crisis times)
- Non-major refiners having crude avails in excess of the national average will not be forced to share crude supplies

If, as expected, the standby emergency program contains the above provisions, it is very apparent that the supplier/purchaser relationships and the base period runs will have a significant impact on a particular refiner's crude availability during shortfall situations. This will, in turn, determine the product availability to consumers historically supplied by that refiner.

We believe the State of Alaska should carefully consider the potential impact during petroleum emergencies of the alternative methods of disposing of the State's royalty oil during non-emergency periods. We would be glad to project the impact on Tesoro's supply/demand balances for various scenarios. No doubt the other Alaska refiners would be willing to supply similar information.

Thank you for giving us the opportunity to comment on this plan.

Very truly yours,

Dennis F. Juren

cc: R. J. Downey
Tesoro Alaska Petroleum Company

DFJ/pmb
95/81

MEMORANDUM

State of Alaska
Department of Transportation & Public Facilities

TO: Clarissa Quinlan, Director
Division of Energy and Power Development
Department of Commerce and
Economic Development

DATE: May 26, 1981

FILE NO: 300C

TELEPHONE NO: 266-1462

FROM: Kit Duke, Director
Division of Planning & Programming
Central/Southcentral Regions

SUBJECT: 1981 Alaska Long Term Energy Plan

Thank you for the opportunity to review the draft 1981 Alaska Long Term Energy Plan.

As you stated in your transmittal memo to me, you indicated that this was the first step towards completion of the comprehensive energy policy and strategy for the State of Alaska. In view of DOT/PF's involvement in energy conservation, our energy audit work on public facilities, and concern of use of energy in transportation modes throughout the state, we have a keen interest in this plan and its ultimate completion, adoption, and annual review and updating. In that light, I would ask that we be strongly considered as members of the energy advisory council, as contained in the recommendations of the plan.

Our major comment is that there appears to be need for a definition or separation of development of energy resources vs. consumption of energy. The two are intermingled in many places in these reports, and we feel that, while development of energy resources should be part of an energy plan, there should be a more distinct separation of the two. One deals with policy issues such as oil and gas leasing and development of petrochemical resource processing industries within the state. The other section should properly deal with supply, consumption, conservation, and alternative policy issues. These report drafts do not clearly make this distinction.

Once again, thank you for the opportunity to comment and good luck in the continued development of a long range energy plan for the State of Alaska.

KD:RS/ih

Municipality of Anchorage

POUCH 6-650
ANCHORAGE, ALASKA 99502
(907) 264-4415

GEORGE M. SULLIVAN,
MAYOR

MUNICIPAL UTILITIES

June 2, 1981

Mr. Lloyd Pernela, Director
Division of Energy and Power Development
338 Denali
Anchorage, Alaska 99501

Dear Mr. Pernela:

I am offering support on the following recommendations that have significant impacts for the Anchorage area in addition to the non-Rail Belt areas. My earlier understanding of the geographic areas included in the plan would not allow consideration of the energy ties between the Rail Belt areas and the rest of the state. I was relieved to find the document developers included consideration of these energy ties.

The end use data base should be improved by incorporating the Battelle Rail Belt alternative study information, and others, into a centralized data base. The other recommendations listed in the Eenergy End Use section are also needed. Anchorage is in a very weak energy planning situation. We have been tracking energy consumption in our public buildings and are currently sampling 200 homes that have had weatherization repairs. However, we have no accurate liquid petroleum end use information. Standardization and centralization of Alaskan energy information for dissemination to local advisory groups and planners is our most urgent need.

Legislation to provide the Governor with authority to respond to energy emergencies should be approved as soon as possible. It should be noted that the Governor would be unable to optimally respond to energy emergencies without the data base listed above. It is also difficult to constrain demand, manage shortages, and provide supplemental supplies at the local level without an adequate data base and technical interpretation.

I strongly support the recommendation for the state to continue financial support of hydroelectric resource development. The combination of our dwindling natural gas resource for Anchorage's current electric generation base, air quality considerations, and long hydroelectric development schedules makes it essential for the state to finance firm renewable energy.

The recommendation for active and passive solar heating demonstrations to determine actual performance, operating characteristics and economics assistance is needed in all localities. Theoretical applications of solar technology and benefits to specific localities have little value in gaining consumer acceptance. I expect few active solar installations in Anchorage until consumers can physically touch a collector before installing one on their own residence, to "keep up with the Jones'".

Although fuel cell development is still only in the commercial demonstration phase, I see significant merit in fuel cell applications. In addition to the DOT/PF demonstrations and pending results, I would encourage the state to incorporate demonstrations' results from the lower 48 when considering statewide applications.

I appreciate the opportunity to offer these comments to the draft of a long-term energy plan. As a final comment, excluding any possible errors in the data presented, I found the draft plan informative and specific in pointing out unfulfilled state policies to Alaskan communities.

Sincerely yours,

Peter Poray

Peter Poray
Municipal Energy Coordinator
Municipal Utilities

PP/nms

July 6, 1981

Heinz Noonan
Energy Economist
Department of Commerce and Economic Development
Division of Energy and Power Development,
State of Alaska

Dear Heinz,

You asked me some time ago to respond to two letters from Tesoro Alaska Petroleum Company. In a May 22, 1981 letter, Mr. Dennis Juren, Vice President for Refining, Marketing, and Transportation makes the point that Alaska is more dependent on petroleum products than the U.S. as a whole. In fact, Mr. Juren argues that this dependence is understated in your Draft Long Term Energy Plan, if you consider there is no demand in Alaska for residual fuel oil. Stated otherwise, Alaska petroleum product demand is concentrated in lighter products --- gasoline, jet fuel, and middle distillates (diesel and heating oil).

Mr. Juren then argues, since Alaska is so dependent on petroleum products, particularly light products, the State should make sure all Alaskan refiners have enough crude oil (royalty crude oil) to be able to operate at maximum throughput capacity. Hence, if there is a major supply disruption, Alaskan refiners will be allocated a larger share of scarce crude oil supplies. Presumably, Alaska refiners could then continue to supply vital petroleum products.

Mr. Juren correctly notes, Alaska petroleum product demand is concentrated in light products, and there is little or no demand for residual oil. The curious fact is, however, Alaskan refiners produce a high proportion of residual oil for which there is no in-state demand, and a relatively small proportion of light products where the demand is high. Chevron and North Pole produce no gasoline, a fuel that makes up a large percent of the petroleum product market.

Refineries in Alaska can be characterized as having little downstream refining capacity or flexibility. Chevron and North

Pole are topping plants. Tesoro has a hydrocracker and produces some gasoline. Tesoro still produces a substantial fraction of residual oil (approximately 50%) and does not have the heavy oil cracking capacity to refine residual oil into light products which can be sold in the Alaskan market. This means, Alaskan refiners must export a large percent of the oil processed in-state as resid.

Residual oil produced in Alaska is sold on the West Coast (District V) market. As in Alaska, Distric V demand is also concentrated in lighter petroleum products, relative to other parts of the U.S. Mild winters and air quality restrictions dampen demand for heating oil and residual oil, particularly high sulfur residual oil. At the same time, West Coast crude supplies are heavy (low API° gravity) and high in sulfur content and, thereby, relatively costly to refine into a light product slate. The combination of low demand for residual oil and the prevalence of heavy high sulfur feedstocks makes the diposal of resid a chronic problem for West Coast refiners.

It is therefore into a West Coast market awash in high sulfur residual oil that Alaskan refiners must sell their resid. Tesoro currently has an advantage since it produces low sulfur resid from "sweet" Cook Inlet crude. Cook Inlet crude oil production is declining, however, and Tesoro will soon have to switch to heavier higher sulfur ANS crude. Hence, it to will soon have to unload <u>high sulfur resid</u> into the West Coast market at a substantial discount in price, a price which is now well below the price of crude oil.

In order for a refiner to operate, the value of petroleum products refined from a barrel of crude oil must at least equal (or preferably exceed) the acquisition cost of its crude oil. If the residual oil prices are lower than the cost of crude oil because of weak demand and inflexible refinery stock, distillate fuel and gasoline prices must be high (or higher) to make up the difference. If not, the refiner must shut-down to avoid an operating loss. Hence, the consumer of the light products must foot the bill for the marginal refiner. This relationship is part of the reason prices of refined products in Distric V remained stable or continued to rise during the second quarter of 1981, despite falling crude oil prices everywhere, and falling petroleum product prices everywhere but the West Coast.

I draw your attention to the last paragraph of Mr. Juren's letter where it states,

> "We believe the State of Alaska should carefully consider the potential impact during petroleum emergencies of the alternative methods of disposing of the State's royalty oil during non-emergency periods. We would be glad to project the impact on Tesoro's supply/demand balances for various scenarios. No doubt the other Alaskan refiners would be willing to supply similar information."

I believe it would be worth your while to take up Mr. Juren's offer. This would enable you to match the disposition of royalty crude oil supplies and the proposed expansion plans of the in-state refiners to the demand for petroleum products. This type of information would be invaluable for your division and for the Department of Natural Resources. An analysis of this type, with the co-operation of the refiners, might show the efficient use of each barrel of oil, or bottom of the barrel refining capacity, is just as important as through-put volumes in supplying Alaskans with a product slate consistent with in-state demand.

In regards to the May 19, 1981 letter from R.J. Downey, I have attatched an errata sheet to this memorandum.

Sincerely,

Bob Williams

Bob Williams

cc: Mary Halloran
Arlon Tussing

ERRATA
Draft Long Term Energy Plan
State of Alaska

Add the following after the final sentence on page 47,

"Approximately 31,000 bpd of this production is owned by Trinidad Tesoro Petroleum Company and the majority interest in this company is owned by the governments of Trinidad and Tobago. They have directed that their share of this production be used to supply a local refinery."

Add the following to the third paragraph under Acknowledgement after the word Williams,

"who acted as a consultant on the section of this report entitled Royalty Oil and Alaska's Instate Oil Refining Industry."

"61 for 66"
ALASKA OIL FOR ALASKANS NOW

452-1745
456-6403

P.O. Box 60389
Fairbanks, Alaska 99706

May 26, 1981

Mr. Heinz Noonan
Energy Economist
Division of Energy
Power and Development

Subject: Public Hearing - Long term energy development plan

Dear Mr. Noonan,

On behalf of a local citizen's group called Alaska Oil For Alaskans Now, we wish to present the attached document concerning the use of our State's royalty oil and gas.

Included in this policy statement is our concerns for a long-term energy plan such as you are proposing and some suggestions how our proposed use of royalty oil and gas will fit into an overall energy plan.

Our group would be pleased to receive a copy of your proposed energy plan and to be kept informed as your plan progresses.

Very truly yours,

ALASKA OIL FOR ALASKANS NOW

Jerry A. Coyle

Jerry A. Coyle

KODIAK AREA NATIVE ASSOCIATION

Post Office Box 172 - Kodiak, Alaska 99615 - Phone (907) 486 - 5725

JOB DESCRIPTION

REGIONAL ENERGY PLANNER

DUTIES:

Under the general direction of the President, the Regional Energy Planner will be responsible for the following:

1. Inventory existing and alternative energy resources for the region and villages.
2. Development of a comprehensable statistical data base illustrating energy production and use in the region and villages.
3. Assistance to the Regional Energy Council comprised of one representative from each village.
4. Coordination and assistance to all agencies conducting energy programs in the region and villages.
5. Performance Analysis of energy programs conducted in the region and villages.
6. Development of the Regional Energy Plan.
7. Development of Regional Energy strategies.
8. Assistance in the implementation of the strategies and plan for the region and villages.
9. Assistance to energy related education regional and village workshops.
10. Delegate to the Alaska Rural Energy Association.

QUALIFICATIONS

Preferably a college degree or at least two (2)years of practical experience in energy technology or business management related fields. Should be familiar with rural Alaska and its characteristics. Must be able to express himself/herself articulately in conversation and in writing.

ALASKA OIL FOR ALASKANS NOW

PREAMBLE

We, the citizen members of Alaska Oil For Alaskans Now, present for consideration what we feel is a practical and equitable proposal allowing every Alaskan an immediate opportunity to share in Alaska's Royalty Oil and Gas wealth.

As can be seen from the length and detail of our proposal, we have spent a great deal of time and thought in its preparation.

After our proposal has been given due consideration we expect that it will be given enthusiastic public endorsement.

In the course of our many discussions with the public at large several statements have been made and a number of questions have been raised regarding the impracticability of having the State of Alaska adopt and carry out our recommendations on behalf of its citizens.

The major objections/questions seem to fall along two very distinct lines, each line being generally of two parts. If we may be allowed to paraphrase these objections/questions, they are as follows:

The first line - A. What purpose does the State have interfering in private enterprise?

B. What business does the State have trying to limit a private company's profits?

The second line - A. How can the State implement such a plan without setting up a new regulatory department which would immediately end up in costs, what otherwise could have been a benefit to every Alaskan?

B. How can the State monitor the firms who receive the free Royalty Oil and Gas to make sure they pass the $.66 a gallon savings on to the Alaskan consumer?

We have heard these objections/questions time and time again. What we find wonderfully surprising is that the individuals who bring up these objections/questions in our discussions invariably pursue both lines. They may start with one or the other, but they eventually touch on both. To us, this says some very special things about the Alaskan citizen.

These Alaskans are people who don't want to see State Government curtail business activity and profits or stifle business with unnecessary regulation. At the same time, they rightfully expect the State, when acting as an agent for its citizens in dealings with the private business community, to act in the same manner as any private agent. Namely, to act for the best and highest good of the people it represents. The people deserve no less.

As a citizens group we share these same sentiments and concerns with the people who question us and find nothing contradictory in them. We recognize the sense of fair play inherent in these sentiments and find it a very American, very Alaskan attitude. We applaud it.

Let us forthrightly say that none of us are experts in the field of oil and gas, nor in the field of law. As Alaskans we are asking our fellow Alaskans join with us in what we feel is a worthwhile endeavor to provide immediate and future benefits to all of the people of our great state.

Our recommendations are presented in the accompanying proposal. We welcome from the State Government any constructive input that might enhance and improve our proposals.

The emphasis in implementing our plan is on the adoption of contracting mechanisms which would allow our plan to be utilized in a fair and forthright manner. One mechanism we know of that could advantageously be used in our proposal is a method of contracting already in place and being used by the State Government. This type of contracting is generally known as Design-Construct Contracts. Its main use so far has been in the field of Public works construction through the DOT/PF. Several projects have been built in Alaska using this method of contracting. People in the highly competitive building construction field have told us they fully expect the State to increase their use of this method of contracting.

The method itself is fairly simple. The State solicits bids to design and construct a project. The State then furnishes interested firms with specifications covering general items, such as location of the project and what its overall use will be. (Along with much more detailed information, i.e., items such as what they expect the overall square footage to be, what the square footage of the various rooms need to be along with the uses of those rooms and the various electrical, mechanical, heating and ventilating systems and how they are to function.) They also outline the method that will be used in awarding the contract. This is generally a combination process consisting of a point grading system based on (1) adherence to specifications, practicability of design and aesthetic value of the design and (2) (most important to our discussion) the State sets out a ceiling price on the project and states that any firm submitting a design with a cost higher than that ceiling will be termed a non-responsive bid and not considered for the contract award.

The advantages of this method of contracting are obvious. The State is able to choose the building design that most closely suits its needs and is able to have it constructed for the lowest possible cost. In short, for the consideration of awarding the contract to the successful bidder the State receives the best and highest value for its money.

This method of contracting is successful for two reasons; (1) the State knows precisely what it wants the finished product to be and what they want to use it for. Equally important, they know within a very, very few percentage points what the project should cost to design and build. This last information is furnished to the State either by inhouse experts or outside consultants who are knowledgeable about material cost, local labor costs and the national and/or local pricing standards of overhead and profit.

We find no reason why a process such as this one could not be modified for use as the operative feature of our plan. Under our plan, the state would contract with refineries and other firms to buy, process and distribute Royalty Oil and Gas at production cost to Alaskan Consumers.

The peoples right to a maximum dollar benefit reduction from the free Royalty Oil and Gas can be addressed by the Administration through the type of contract that is written with the Refiners and Distributor in their handling of the products. As stated above, we recognize that the expertise for this contract development and management now exists in the State Administration.

Further, we recognize the ability of the State of Alaska to utilize its financial and technical resources to analyze our plan, and we encourage the State to do so. We do not assert that our plan is technically and legally perfect. We do assert that it is feasible, necessary and in keeping with our democratic and popular ideals of justice, fairness and recognition by the Government of the people's right to act on their behalf to change a policy when they feel a policy is hurting them.

CONSTITUTION

The pertinent Sections of the Constitution of the State of Alaska regarding Alaska Oil for Alaskans Now are as follows:

Article 8, Section 1: It is the policy of the State to encourage the settlement of its land and the development of its resources by making them available for maximum use consistent with the public interest.

Article 8, Section 2: The legislature shall provide for the utilization, development and conservation of all natural resources belonging to the State, including land and waters, for the maximum benefit of its people.

With reference to the Alpetco Contract:

Article 8, Section 8: The legislature may provide for the leasing of, and the issuance of permits for exploration of, any part of the public domain or interest therein, subject to reasonable concurrent uses. Leases and permits shall provide, among other conditions, for payment by the party at fault for damage or injury arising from noncompliance with terms governing concurrent use, and for forfeiture in the event of breach of condition.

The reason this is pertinent to Alaska Oil For Alaskans Now is because we've asserted that Alpetco isn't obeying their contract. We are talking about the natural resources of the State of Alaska. We have a specific section which says that in any lease or agreement with someone to develop the resources of the State, if they don't obey the contract, we can break it.

Why the Royalty Oil & Gas belongs to the People of the State:

Article 8, Section 16: No person shall be involuntarily divested of his right to the use of waters, his interest in lands, or IMPROVEMENTS AFFECTING either, except for a superior beneficial use for public purpose and then only with just compensation and by operation of law.

Article 12, Section 8: The enumeration of specified powers in this constitution shall not be construed as limiting the powers of the State.

This is pertinent to our proposed use of Royalty Oil and Gas because the Constitution of the State of Alaska encourages and allows the people to participate.

Note: Article 8, Section 16, Caps and underline is for emphasis.

CONTRACTS

Our present plan is to immediately replace the Oil now being used for Instate use by the Refineries with Royalty Oil at no cost, on a Barrel per Barrel basis. This should result in an immediate 66 cents per gallon savings to the people of Alaska. This will instantly generate a beneficial impact on the Alaskan economy through cost of living reductions.

The State should develop Contracts that will guarantee Alaskans the lowest Refining and Distribution costs possible, using free Royalty Oil and Gas. This policy will encourage additional Refineries to be placed around the State. The remaining Royalty Oil and Gas can be sold by the State in accord with existing policies.

AVAILABILITY

It is our understanding that a contract is now in effect with Alpetco which allows them to remove 27.375 million barrels of Crude Oil this year from Alaska to use as they wish. Furthermore, this contract calls for increases of Royalty Oil in the very near future. To this date, no progress has been made towards the development of a Refinery in Alaska, as the contract calls for.

An immediate investigation should be made by the Administration. If Alpetco has not lived up to the exact letter of the contract, and its intent, this contract should immediately broken.

This would then make available, more than the necessary Royalty Oil to implement this plan.

ADMINISTRATION

We are certain that within the confines of State Government and their existing Department Structure, that the auditing procedures and processes are in place to administer this policy. There is no need to have a separate Department of Energy nor any new regulatory body to enforce or oversee the Royalty Oil and Gas.

The reporting process is in place that determines how many barrels of Royalty Oil is available and how it is distributed from the Oil Wells through the Distributors.

Present Schedule of Royalty Oil

Figures are in Million Barrels

Royalty Oil:	
North Slope	68.438
Cook Inlet	4.00
Total Royalty Oil	72.438
Instate Use	
Gasoline	4.29
Diesel	5.32
Other	2.09
Space Heating	4.20
Electricity	2.90
Jet (1)	3.18
Total Instate	21.98

21.98 divided by 72.438 = 30% instate use

Source Material: Department of Natural Resources Report, Jan. 1981 and North Pole Refinery.

(1) State Report has 10.03 and is broken down, 4.65 Military Use, 2.2 International Carriers, 3.18 Commercial Carriers and Others.

INSTATE USE OF ROYALTY OIL

Our definition of instate use of Alaska Royalty Oil and Gas is Instate use.

Scheduled Airlines servicing Alaska from points outside Alaska, will be classified as Instate users, while in Alaska Air Space.

The International Carriers who only use Alaska for a fueling stop or crew change will not be classified as Instate users. The International Carriers could receive discounts based upon the economic benefit to be gained by Alaskan communities that they serve, as part of their operations, but it will be limited to the fuel they consume while in Alaska Air Space.

A resident Fisherman in Alaska, who owns, registers, services and maintains his boat, in Alaska, while operating in Alaskan Fishing areas, would get the full benefit of the Royalty Oil. Any fishing operation whose registration, ownership, crew accomodations, servicing and maintenance is outside the State of Alaska would not. This is intended to encourage more participation in the Alaskan economy by individuals and firms, so that the State receives the maximum economic impact in the use of its Royalty Oil. We feel the 66 cents a gallon should only go to the Alaska fisherman, in their struggle for survival against the Multinational Corporations.

Marine transportation, Barge Operations, and Container Vessels would also use Alaska Royalty Oil, while they are operating in Alaskan waters and servicing Alaskan cities. Once out of Alaskan waters, they would be paying the full price for the Oil they consume. The State Ferries would use Royalty Oil.

Any Trucker traveling out of Alaska, who fills his tanks before he leaves the State, is benefiting Alaskans, through the decreased cost that he has in his operation. This benefits the Alaskan customers.

The same definitions will apply for any other manufacturing, processing type operation, where raw products are removed from Alaska with a minimum benefit to Alaskans, and are taken to other points for processing and final manufacture. Royalty Oil use will be based on economic impact.

It is our feeling that we should use the Alaska Royalty Oil and Gas to encourage full use of Alaska's resources and maximum benefits to the people of Alaska.

ECONOMIC IMPACT

The present plans we have heard discussed, including the most recent proposed Royalty payment of $193.00, would not have the same economic impact on Alaska that our plan would.

Using a basis of 600,000 residents times $193.00, the impact would be $115,800,000.00. However, this full benefit would not accrue to the Alaskan community because an estimated 20-25% would be turned over to the Federal Government in the form of Income Taxes.

Our plan would have an impact of $609,945,000.00. This is based on $27.75 per barrel, times 21.98 million barrels, which is only 30% of our Royalty Oil. This is not Federally Taxable. All of it would immediately go into the Alaskan economy.

The current price on leaded gasoline is $1.40 to $1.689 per gallon.

Current home heating oil prices are approximately $1.16 to $1.34 per gallon.

The present price of Prudhoe Bay crude is $27.75 per barrel. A barrel of crude has 42 gallons. Dividing $27.75 by 42 equals $.66 per gallon. That is the savings, if Royalty Oil were to be given free for Instate use.

Heating oil--$.66 per gallon less.

Gasoline--$.66 per gallon less.

Golden Valley Electric--30 to 35% reduction in electrical cost. Golden Valley now spends $11,000,000.00 annually to buy oil.

MUS electric--2% reduction.
MUS uses, mainly, coal.

Truck Transportation--7% reduction north of Fairbanks to 10% reduction south of Fairbanks.

Air--20% reduction in Air Fares and Freight.

Rail Transportation costs--9% reduction.

One Fisherman in Kodiak, $64,000 savings in fuel last season, if this policy had been in effect.

As you think about the obvious benefits, the savings start multiplying. If Heating costs, Electrical costs, and Transportation costs are down, this eliminates the pressure for cost of living wage increases. This, in turn, reduces the cost of Government, with a resulting savings in tax dollars for their operation. Why should the State and the citizens of Alaska pay higher prices, and bigger profits to the Oil Companies.

It also means a reduction in the overhead cost for many businesses, with the resulting savings in retail purchases.

The benefits from this plan are not taxable. Grant plans are taxable.

This plan, by reducing the basic cost, allows you more purchasing power on your present income.

It benefits every Alaskan resident, regardless of time in Alaska.

It does not encourage waste, because it is still not a cheap product to use.

It gives stability to the Alaskan Energy market as we will not be subject to changes in world prices in the near future.

It would increase Tourism in Alaska through lower transportation and operating costs.

It would increase Mining as fuel is an important cost item, to this industry.

COMMITTEE GOALS

1. Request that Governor Hammond immediately implement our plan for Royalty Oil so that the economic impact of this plan can benefit every Alaskan.

Starting Thursday, May 14, 1981, begin a Statewide campaign, to send messages to Governor Hammond and the Legislature, through the appropriate Statewide Networks, that we, THE CITIZENS of ALASKA and THE OWNERS of the ROYALTY OIL, feel this plan should be implemented immediately.

FOOD SURVEY
SAFEWAY STORES
May 8, 1981

Products	Campbell, Calif.	Fairbanks, AK
Lucerne 1 gal. milk	$2.99	$3.01
1 Doz. lg. Eggs	.69	1.19
Lucerne Butter	1.85	2.11
Lean Hamburger	1.79 lb.	2.59 lb.
Cut-up Fryer Chicken	.62	1.39
Hormel Bacon	1.87	2.59
Chuck Roast	1.19	3.49
Bottom Round	1.99	4.29
Potatoes 10 lbs.	1.99	4.98
Asparagus (fresh)	.89	1.59
Celery	.79 bunch	1.19 lb.
Lettuce	3 heads 1.00	.99 lb.
Tomatoes	.59	1.98
Yellow or white onions	.69	.99
Bananas	.37	.79
Lg. Box Tide	3.39	4.95
Cascade dishwashing soap	1.77	3.29
Folgers Coffee 3 lbs.	6.85	9.19
Wheaties 1 lb.	1.51	2.65
Gravy Train 25 lbs.	8.99	12.79

The regular price labels posted on the shelves were used.

Source: Connie Kettman, California
Stephanie Conant, Alaska

EQUITABLE DISTRIBUTION

We propose that equitable distribution of Oil and Gas now exists in the participation each individual has in the economic conditions and environment in the different communities of the State.

To further clarify, we feel our proposal would guarantee an equal reduction in the primary costs to each Alaskan for the products and services they would be purchasing, and in fact are now purchasing at much higher cost.

Many plans have been discussed concerning Grants, Energy Credits, Cash Bonuses, and even direct Oil Credits that people could barter or exchange depending on their needs. All of these plans were rejected because there seemed to be no way to fairly balance the Oil that is necessary to support a Fisherman, whose livelihood depends upon the operation of his Boat, as against somebody living in the City who has a Car, as against someone who is in the Bush and depends heavily on an Airplane for his Transportation and Freight.

Examples of how the 66 cents fuel and gas savings applies:

The person accessible only by Air in a remote area of Alaska might not personally consume large amounts of fuel, however, large amounts of fuel are necessary for the airplanes that supply him and allow him to live in that style and manner. Reduced air and energy costs.

The City dweller who might have to commute to reach his place of employment. Reduced gas and energy costs.

The Fisherman who might use large amounts of fuel to conduct his business and yet his impact is measured in the maintenance and operation of his boat and the economic environment he creates in the area around him. Reduced fuel and energy cost.

We, therefore, offer that the equitability of using Alaskan Royalty Oil and Gas for the benefit of a better life in Alaska and in that development of Alaska is an equitable plan. The economic benefits that such distribution and use creates, is the most fair and equitable plan for Alaska.

PUBLICITY

The Royalty Oil allows us, for the first time, to lower our general cost of living and at least give parity with the rest of the citizens of the United States.

The first efforts for parity were mounted under Bob Bartlett, when Alaska was still a Territory, to have a cost of living allowance for Alaskans, to compensate us for the higher wages we needed to live and exist in this country. No such privilege was granted by Congress. As a consequence over the years, Alaskans have had to pay a higher share of their personal income in Income Taxes to the Federal Government, than the other citizens of the United States.

Attached, you will find a comparitive shopping list taken at the Safeway store in Campbell, California and Fairbanks, Alaska, on Friday, the 8th of May, 1981.

Unemployment figures, such as Alaska experiences annually, would be a disaster to any other State in the Union.

For many years, Alaska's Federal Highway funds have been frozen by Washington Administrations, to the detriment of our Highway network. It is our understanding that next year might be the last year of these Federal Funds for Highways. All future funding will be through the Interstate program. If so, Alaska is the only State not in the Interstate program. There is no indication Washington will place us in that Interstate program.

NATIONALIZATION OF ALASKA OIL

We recognize that a strong feeling exists in the Federal Government to nationalize Alaska's Oil and Gas, as more and more of it becomes available. We support every endeavor by the State Government to keep our Oil and Gas allocations in place and even to increase them as more State Oil and Gas becomes available. It is our intention to keep our movement alive and in place to lend immediate support to the administration should the need arise for any participation with the State against nationalization moves.

We would also lend such support in the event of movements by the Federal Government for a windfall profits tax or other taxing measures specifically designed against the people of the State of Alaska.

ROYALTY OIL TERMINATION

In the event Royalty Oil is terminated for any reason, we recommend the following policy be placed in effect.

As renewable energy sources such as Hydroelectric Power, Geothermal Power or others come on line, the need for Royalty Oil under this proposed policy will be decreased. Any Oil, as it becomes surplus, as these other sources of energy become available, will be sold at world scale prices or inaccord with current State policies at the time. The proceeds from this fund will be placed in a Royalty Oil Termination Fund. This Fund will be interest bearing and the interest proceeds will also be deposited in the Fund.

In addition, our policy recommendations is that once the purchase price of the United States Oil or Gas at the retail level increases $10 a gallon over the retail price of Oil or Gas in Alaska, that our prices will increase at the same time to maintain that $10 a gallon differential. Any proceeds from these increases will also be deposited in the Termination Fund with the interest earned to accrue to that Termination Fund.

When the Royalty Oil runs out, the difference in the price of Gas or Oil in Alaska, versus the current United States price will be divided by 10, and in 10 equal yearly increments, funds will be removed from the Termination Fund and used to subsidize that differential, so that the cost to Alaskan consumers will only be on a 1/10th, of the total per yearly increase. Any funds left over in the Termination Fund after this takes place, will be transferred to the State's General Fund.

In addition, if the fund grows to be in excess of 150% of the differential at any given time, the surplus funds in excess of 150%, can be turned over to the General Fund.

ENERGY - LONG TERM POLICY

It is our understanding that Governor Hammond is, at present, preparing an Energy Policy for the State of Alaska. We would be pleased, as a committee, to receive copies of that policy and assist in the input. Governor Hammond is to be commended for instituting such a study. The resource potential Alaska has available and the possibilities for development, makes a comprehensive plan of this type a necessity.

ENERGY - INTERIM PLAN

This policy is intended as an interim measure until the full potential of renewable energy sources are realized in Alaska. We encourage the State Administration to develop as practically and expeditiously as possible, Electrical Interties, Hydroelectric Projects on proven Hydroelectric Sites, development of future Hydroelectric, Geothermal or Solar Projects, that every Alaskan can use for his basic style of living. Through use of these sources of energy, we will not be consuming as much of our Oil and Gas as we are at present. We also encourage the use of these renewable resources, because they will reduce pollution levels in the major population centers of Alaska, that are now caused by Wood and Fossil Fuels.

We encourage the State of Alaska to develop plans for test programs to be conducted by the appropriate departments of the University of Alaska for alternate energy programs. These programs could be conducted in conjunction with the major Automobile Manufacturers in the lower 48 states, so that again we can reduce our dependency upon a nonrenewable energy form for our transportation.

ENERGY - EFFICIENCY AND USE

The State of Alaska should use every means within its power to encourage energy efficient Homes and Transportation.

We encourage the continued funding of the energy audit program. We also endorse other efforts to encourage energy conservation.

1094 Coppet Street
Fairbanks, Alaska 99701
June 6, 1981

Division of Energy and Power Development
338 Denali Street
7th Floor, Mackay Building
Anchorage, Alaska 99501

Dear Sirs:

I attended the meeting held by your office in Fairbanks recently. I appreciated very much the presentations given by the staff members. I am very happy that work is being done on a long-term energy plan for the state of Alaska. I believe that there is a real need for emergency planning here in Alaska. Those of us who have been in Fairbanks without power for hours or in some cases days with the temperature at -40 degrees know that emergency planning is a very real necessity. This is particularly true when we realize how fragile and uncertain are the sources of much of the industrialized world's petroleum supplies. Most experts agree that we really cannot count on political stability or continued cooperation during the 1980's in such key countries as Saudi Arabia. Although it probably would not be practical from a technical standpoint, I would feel much better if we could store a 3 or 6 month supply of oil in Alaska to be used only in an emergency. Perhaps we could justify such action to the other states because of our extreme temperatures, and because Alaska, unlike most states does own a significant amount of oil. Realistically, it would probably be best for us to contribute to the national reserves.

I am enclosing a copy of the proceedings of a town meeting on energy held in Fairbanks in 1977, in case one is not available in your office. I thought that some of the resource people as well as some of the articles might be of interest to you. You may keep this copy.

I teach Economics at West Valley High, and I have included a growing energy unit each year despite the fact that energy is not now included in cluded in the course objectives for Economics nor indeed is energy mentioned in any course objectives at the high school level. Some of us are trying to get that changed next year. I will be conducting a section on energy education at an in-service work day October 23rd, and I would appreciate any suggestions or materials that you could provide me with for that presentation. I feel that thelack of serious energy education in our district is a disgrace, and as yet I have not been able to persuade others that it is vital. Most seniors do not even know basic conservation practices before I get them. Nor, obviously, do they have any idea of the seriousness of the energy/resource/population problems of the world. I would like to see a course covering the main aspects of the energy/resource problems that would be a requirement for all students, but such will take time unless I am more successful, and have more help than I have in the past.

I do have one request from your office. I have some copies of the

Factsheets on alternative energy sources produced by the National Science Teachers Association under contract by the Department of Energy. They are yellow sheets, and there are 19 separate copies in the series. I feel that they are still quite good even though they were written several years ago. I made arrangements with the Hutchison Career Center to bind material for me. They are not really very usable in large classes in 19 separate sheets. I do not know if it is possible, but I would appreciate receiving a class set of 25 or 30 copies of the factsheets. If they are not available from your office, could you suggest where I might get a set so I could get them bound this summer? Thank you.

Sincerely,

Dick Korvola

Dick Korvola

P.S. I am enclosing a memorandum which I recently sent to Dr. Delores Dinneen, of our school district, which perhaps clarifies better where we are in this district with energy education, and gives you some idea of what I am trying to do.

SERVICE
Anchorage Times
Anchorage, AK

MAY 19 1981

15
25

Paper program

POLICY CHIEF Fran Ulmer, one of Gov. Jay Hammond's top advisors, has come up with a plan to overhaul the state's energy programs. Bless 'em for thinking of something. At least Ms. Ulmer and, presumably, the governor know something is amiss.

But how discouraging it is that the solutions being proposed seem to offer nothing in the way of positive, do-something action and only more of the same old paper-churning planning, more costs, more governmental interference, more bureaucracy.

All the buzz words are there, of course. If these recommendations are implemented, to use a bureaucratic phrase, things will be "more focused."

But it sounds all too much like reshuffling of the same old deck. In fact, one of Ms. Ulmer's lieutenants, commenting on the problems that prompted this months-long study, expressed the view that overlapping responsibilities of certain agencies within the state government are, "to a certain extent, more perceptual than real."

Good grief.

Overlapping or not, the whole point is missed. By whatever measure one might apply to this, the state simply is not doing an effective job when it comes to energy.

A YEAR AGO, for instance, the legislature and administration came up with a new creature of government called the Alaska Energy Center. Staffed with a roster of high-priced people and given a big budget, it was supposed to help solve the nation's energy crisis.

Its first project is a contest offering more than $100,000 in prizes for amateur architects who submit plans for energy-efficient houses.

Just a week ago, the state's Division of Energy and Power Development came forth with what was ballyhooed as a major report. It contained such recommendations as that in the event of another international oil embargo, Alaska should order schools to reduce classes to four days a week, tell businesses to go on a four-day work week, permit private citizens to drive only on alternate days and other equally non-brilliant examples of your government spending your money for policy manuals that will never be used.

Nothing in the study bore a resemblance to the new federal energy task force report submitted at about the same time to the Reagan administration and Energy Secretary James Edwards. That plan leaped over the downbeat attitude of the Carter administration, one fully embraced by the Hammond administration, which said the world is running out of energy.

Now comes this new state study, which deals in bureaucratic tables of organization, lines of authority and all those things that are important to agency heads, supervisors and budget drafters.

ALASKA, as everyone knows, is a treasure lode of energy resources that needs only a commitment by government to help private industry do the necessary exploration and development work. But you'd never know that from watching Juneau in action.

What's going to solve the energy problem is more energy and what's going to produce more energy is getting on with the job in the field — not shuffling papers in Juneau, or offering big prizes for half a dozen house plans, or telling people to get ready to work a four-day week.

There's plenty of energy out there, if only we'll get off our haunches and go out and get it.

SERVICE
Anchorage Daily News
Anchorage, AK
MAY 07 1981

05

Improved energy planning sought

By PAT O'BRIEN
Daily News reporter

An independent advisory council should be formed by the state to interpret recommendations for future energy use, conservation and contingency plans for energy emergencies, according to an overdue draft energy report issued by the state Division of Energy and Power Development.

"One of the clear and present dangers of any ongoing planning function is the isolation of the planners from the real world," the draft of the 1981 Alaska Long Term Energy Plan said.

The council would include officials from government, the fuels industries, utilities, environmental interests, consumers and business, the report said.

In a telephone interview, Clarissa Quinlan, the division's outgoing director, reaffirmed the report's central point that state energy policy-forming functions need to be kept at arm's length from energy advocacy operations.

The $150,000 plan, mandated by the legislature last year, addresses a number of future energy-related problems the state may face, including possible *oil-product* needs in the event of an emergency energy shortage.

Special attention is placed on Alaska's in-state petroleum refining industry and its ability to meet Alaska's existing and future fuel needs.

Within the section on royalty oil, the report says the state should closely coordinate its royalty oil and gas policies and programs to insure compatibility with in-state energy use forecasts.

For example, it says, production of petroleum products from in-state refineries should be planned to coincide with the state's future fuel requirements.

But substantially better information on royalty oil use and possible changes in in-state refining activities will be needed before accurate projections on needs can be made.

"The need for reliable data is paramount if state officials are to make sound decisions," the study said.

The report suggests that all options for using Alaska's royalty oil should be aimed at decreasing the state's vulnerability to future national fuel shortages.

The study notes that Alaska is the only state to actually own a major share of crude oil being produced within its borders.

ALASKA CLIPPING SERVICE
Anchorage Times
Anchorage, AK
[illegible]

Pub. Sept. 18, 25, Oct. 2, 9, 1980

STATE OF ALASKA
REQUEST FOR PROPOSALS
LONG TERM ENERGY PLAN

The Department of Commerce and Economic Development, Division of Energy and Power Development, is requesting proposals from organizations indicating interest and ability to undertake a study which will develop the Long-Term Energy Plan for the State of Alaska. Proposals will be accepted through 4:30 p.m., October 3, 1980.

Requests for Proposals can be obtained from the Division of Energy and Power Development, Department of Commerce and Economic Development, 7th Floor MacKay Building, 338 Denali Street, Anchorage, Alaska, 99501. Attention: [illegible] (907) [illegible]

AO [illegible]

Pub. Sept. 15, 16, 17, 18, 19, 1980

TIMES 6/7/81

Alaska energy use detailed in plan

DIGGINGS

by Neil Davis

by Neil Davis

Alaska pumps into the ground more than twice as much energy as it uses each year.

That is just one of the surprising facts contained in the new State of Alaska Long Term Energy Plan, now prepared in draft form by the Alaska Department of Commerce and Economic Development.

In 1979, Alaska consumed just over two-tenths of a quad of energy, and it reinjected into the ground just over half a quad of natural gas to keep the pressure high in the Prudhoe and Cook Inlet oil wells.

The term "quad" is a shorthand name for a unit used to measure energy. It is a term used only in the big leagues; but when it comes to energy production, Alaska definitely has arrived. One quad is one quadrillion (10-15) British Thermal Units (B.T.U.s). One quad is the amount of energy contained in a flow of 476,000 barrels of oil each day for one year. By means of the trans-Alaska pipeline, Alaska exported, in 1979, 2.96 quads of energy. That is about 18 times as much energy as was used that year in the state.

Another surprise is that 25 percent of the Alaskan end-use demand for energy is due to one refinery on the Kenai Peninsula which makes ammonia and urea from natural gas produced in the Cook Inlet area. Even discounting the energy consumed in that plant, Alaskans have significantly higher per capita energy consumption than do other Americans. Alaskans use almost three times as much energy per capita for transportation and marine use. That such high use exists is reasonable, considering the large distances to travel in the state and the great extent of the Alaskan coastline and the fishing and other activities that transpire along it.

Nevertheless, Alaska's main energy demand is in the Railbelt area, extending from Anchorage to Fairbanks. With 71 percent of the Alaskan population, this area accounts for 86 percent of the energy consumed in the state.

Fifty-seven percent of the energy consumed by Alaskans comes in the form of petroleum products. Yet despite being a petroleum exporter, Alaska still imports 43 percent of the petroleum products it uses. The next most important energy source for Alaskans is natural gas. It satisfies 35 percent of the energy demand. Solid fuel — coal and wood — supply 2.3 percent of the energy demand for the state. Electrical demand, amounting to 5.9 percent of total energy used in the state, is supplied by a combination of hydro, coal, wood, petroleum and natural gas.

One fact that becomes clear from the draft of the Alaska Long Term Energy Plan is that Alaskans are nearly totally dependent upon petroleum and natural gas for their energy needs. Coal, wood, hydro and other alternative sources account for only a small fraction of the total energy consumed. Once the petroleum and gas run out, Alaska will be in serious trouble unless alternatives are developed.

Draft Comments

Alaska Clipping Service
The Valley Sun
Wasilla Ak
JUN 0 9 1981

Energy plan draft holds surprises

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Editor's Note: The following report is contributed by Neil Davis of the Geophysical Institute.

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ALASKA CLIPPING SERVICE
Anchorage Times
Anchorage, AK
MAY 27 1981

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ALASKA LONG-TERM ENERGY PLAN PUBLIC HEARING

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AO-08-6453

ALASKA CLIPPING SERVICE
Anchorage Daily News
Anchorage, AK
MAY 27 1981

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ALASKA CLIPPING SERVICE
Anchorage Times
Anchorage, AK
OCT 23 1980

State to pick energy plan consultant

by John Knowlton
Times Writer

A decision is expected Friday on the selection of a consultant to prepare a statewide energy plan for submission to the Legislature.

Six consulting firms are in the running for the contract, which could fetch a $200,000 price tag, says Clarissa Quinlan, director of the state Division of Energy and Power Development.

A four-member panel will make the final selection of the consultant based on several factors and then negotiate the final price of the study, she added. A ceiling price of $150,000 for the study has been set but an additional $50,000 may be contributed by the Department of Transportation.

The firm selected will have to work quickly. The energy plan is due before the Legislature in February, and there is much work to do, Quinlan said.

She told the Alaska Power Authority today a big part of the energy plan is an analysis of statewide energy requirements, fuel types and uses and projected energy needs.

Another large part of the consultant's task will be to figure out the best way to meet regional energy needs in light of the state's goal of be- [illegible]

Two smaller tasks will be to establish a statewide energy conservation program and an emergency energy conservation plan. There are several federal requirements for establishing an emergency conservation plan, Quinlan said, including one that would require a state emergency gasoline rationing plan.

State officials have asked to be exempt from that requirement "because it definitely is unworkable in Alaska, particularly Bush Alaska," she said.

Absent from the energy analysis will be any study of the railbelt area. That work will be done by Battelle Institute which is conducting a $1 million study of alternatives to the Susitna hydroelectric project.

The statewide energy plan proposal first was adopted by the state in the late 1960s, but no funding was provided until the past year. A more comprehensive energy plan will be submitted to the Legislature in 1982 with constant annual review planned thereafter.

ALASKA CLIPPING SERVICE
Anchorage Daily News
Anchorage, AK
MAY 27 1981

business notebook

☐ A public hearing on Alaska's proposed long-term energy plan will be held this evening at the state courthouse, 303 K St. The energy plan, which was drafted by the state's Division of Energy and Power Development, addresses conservation, energy emergency planning and energy research. The meeting will begin at 7:30 p.m. in the jury assembly room.

ALASKA CLIPPING SERVICE
Fairbanks News Miner
Fairbanks, AK
JUN 0 6 1981

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"Sponsored by the Geophysical Institute of the University of Alaska."

Community Science Forum

Alaska energy use

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ALASKA CLIPPING SERVICE
The Peninsula Clarion
Kenai, AK
JUN 05 1981

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Neil's Notebook

Energy

By NEIL DAVIS

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Anchorage Times, May 11, 1981

State vulnerable to oil embargo, report says

by Dave Carpenter
Times Juneau Bureau

Juneau — Alaska would suffer "severe" effects from any disruption in U.S. oil imports from the Middle East, despite its vast pools of crude oil, according to the state's new long-term energy plan.

The state is highly vulnerable to fuel supply cutbacks because of its lack of refining capacity and dependence on petroleum products refined in the Lower 48, says a draft of the massive energy report, released this week.

The report indicates that vulnerability can be reduced only by development of an in-state refining industry.

Alaska, it says, "has a higher level of vulnerability than other regions because of the climate and remoteness of many Alaskan communities. Even a small oil shortage in Alaska could be very serious."

The report represents the state's first major step toward completion of an overall energy policy and strategy for Alaska, according to Clarissa Quinlan, director of the Division of Energy and Power Development.

Copies have been distributed by the division — which prepared it — to legislators, top state administrators and industry and special-interest groups.

Release of the plan comes only a few weeks after a report commissioned by the Legislature blasted the state's energy programs and policies as disorganized and duplicative and suffering from a lack of planning.

Quinlan said administration officials are continuing to work on a separate package for an overhaul of the state's energy efforts.

Alaska has more than $140 million in energy-related studies and projects under way, besides the "countless" studies and analyses that have been conducted over the last decade. The new energy report says the result has been "a monumental duplication of effort and a waste of money."

The study focuses on Alaska's dependence on oil products. Refined petroleum products account for more than 56 percent of all energy used in the state.

Alaskans consume twice the energy of their counterparts in other states, and the Anchorage-Fairbanks railbelt region accounts for 86 percent of the state's consumption.

The railbelt's per-capita energy consumption is 78 percent higher than the average of the other regions, according to the plan.

"Alaska has a lot of crude oil, but it is still largely dependent on refineries located elsewhere," it states. "Almost 40 percent of the petroleum products used within the state are imported from California or Washington state.

Even if the state expands its refining capacity, however, the report says federal regulations are unlikely to let Alaskans enjoy an oil surplus when industry in the Lower 48 is being brought to its knees. "One way or the other, if the U.S. loses its oil imports, Alaskans will suffer like all Americans."

Thus, even though the state produces 18 times the energy it consumes, long gasoline lines and curtailed aviation gasoline sales are likely to occur if Middle East conflicts or other problems erupt.

The administration, according to the Division of Energy and Power Development, currently is hammering together an extensive emergency energy plan.

The plan is to be completed and submitted to the Legislature for approval by January 1982.

The division suggests several options for the state to take in the event of a "petroleum emergency":

— Reduce highway speed limits to 50 mph or less.

— Prohibit travel by private cars on different days, and prohibit driving on Sundays, weekends or at other times.

— Require a tune-up of vehicles every six months.

— Prohibit space heating in commercial buildings to above 65 degrees.

— Reduce the work/school week to four days.

— Prohibit or limit the use of private planes for nonessential uses.

The plan also recommends the establishment of a strategic petroleum reserve funded and controlled by the state.

While attempting to establish further independence in the petroleum market, the state should make concerted efforts in developing hydroelectric power, the coal industry (Alaska is estimated to have between 10 percent and 23 percent of the world's coal resources) and alternative energy sources.

"Alaska has it all: oil, gas, coal, peat, hydro, geothermal, biomass, wind, and, despite rumors to the contrary, solar radiation. Alaska's energy resource base is far greater than the consumption capacity of its citizens in this century or the distant future."

However, stress the report's authors: "Probably the most important single point concerning energy development in Alaska is that not every resource can, or should be, developed immediately."

SERVICE
Alaska Journal
of Commerce
Anchorage, AK
MAY 11 1981

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(26)

Long-term energy plan announced

Clarissa Quinlan, director of the state Division of Energy and Power Development, has announced the draft of the 1981 Alaska Long-Term Energy Plan has been released.

The plan, mandated by the state legislature and prepared by the Division, addresses energy end-use, development, conservation, energy emergency planning and research and demonstration projects.

Purpose of the plan is to provide an overview of the in-state energy picture. The plan features a detailed regional breakdown of how energy is used today and an estimation of future energy demands to the year 2000.

Special attention was placed on Alaska's in-state petroleum refining industry, its ability to meet [illegible] existing and future fuel needs and its relationship to the availability of Alaska's royalty oil. The plan also provides a logical framework and approach by which the state can meet its present and future energy needs.

Among the key issues identified are:

• the state's dependence on refined petroleum products (over 56% of Alaska's energy end use), in the importation of these products from the Lower 48, and vulnerability to fuel supply disruptions.

• the extent to which hydroelectric power can meet the state's current and future electrical energy needs.

• the uncertainty of conservation's contribution or role in Alaska's energy future due to the unavailability to date of a method to calculate measurable savings.

• the absence of specific goals and objectives for the state's energy research and development programs.

• the lack of a clear delineation of planning, advocacy and evaluation activities among State agencies and the specific responsibilities of each.

"This year's work represents the State's first major step toward the completion of a comprehensive energy policy and a strategy for meeting Alaska's energy needs," she said. "The first year's effort, due to limitation of both time and money, was centered on guaging in-state energy needs, and developing a framework for a State energy policy. The plan will be completed in 1982 and will be updated annually thereafter," Quinlan added.

ALASKA CLIPPING SERVICE
Alaska Journal of Commerce
Anchorage, AK

ALASKA LONG-TERM ENERGY PLAN PUBLIC HEARING

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ALASKA CLIPPING SERVICE
Tundra Times
Fairbanks, AK

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