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UNCERTAINTY IN FUTURE GLOBAL ENERGY USE AND
FOSSIL FUEL CO₂ EMISSIONS 1975 to 2075

APPENDICES C - F

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APPENDIX C: VARIABLE DEFINITIONS AND CROSS CORRELATIONS

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APPENDIX C

VARIABLE DEFINITIONS AND CROSS CORRELATIONS

VARIABLE DEFINITIONS

In constructing the model, creating variable names, and linking the model to the Monte Carlo program various naming conventions have been used. This appendix attempts to provide a concise, useful guide linking conceptual variable to model variable to Monte Carlo variable designations. Variables listed in this appendix are limited to those used in the Monte Carlo analysis; Table C-1 lists input variables (assumptions) that are varied in the Monte Carlo analysis. Table C-2 lists output variables (results) saved in the Monte Carlo analysis. The naming convention used in the Monte Carlo analysis lists all input parameters as PARMn with n = 1, 2, ..., 79. Output values are called VALn with n = 1, 2, ..., 95. Appendix A provides additional detail on the form and value of input parameters (PARMs). For a complete description of the theoretical model and operational computer code readers are referred to J. Edmonds and J. Reilly, "A Long-Term, Global, Energy Economic Model of Carbon Dioxide Release from Fossil Fuel Use," Energy Economics, Vol. 5, No. 2 (April 1983), pp. 74-88; and J. A. Edmonds, "The Long-Term Global Energy-CO₂ Model: Software Description" (1983). Both of these, along with additional relevant material, are reproduced in The IEA/ORAU Long-Term Global Energy-CO₂ Model CMP-002 (August 1984), available from the Carbon Dioxide Information Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee. These documents provide a complete description of how the variables are used in model equations.

TABLE C-1. MAPPING OF MONTE CARLO VARIABLES (PARM)
AND MODEL PARAMETERS

PARM	Model Variable*	Explanation
<u>Nonfuel Costs of Electricity Production from Coal (\$/GJ elec.)</u>		
1	HUIL(I:3,L:1-3)	OECD regions
	HUIL(I:3,L:4-9)	Non-OECD regions
Values for the two regions are deterministically linked, thus there is only 1 PARM.		
<u>Biomass</u>		
2	BIOPSM(J:1-4,1-2,1-2)	PARM(2) is a scale factor which multiplies the 4 by 2 by 2 matrix of biomass supply (shifts the supply schedule for biomass up or down). PARM(2) is assumed to apply to all price modes for all regions.
<u>Price Induced Interfuel Substitution</u>		
3	RPJ(J:1-4)	Non-OECD
	RPJK(J:1-4,K:1-3)	OECD. Values of K range from 1 to 3 and indicate residential-commercial, industrial and transport sectors, respectively, in the OECD regions.
Regional and sectoral values are deterministically linked, thus there is only one PARM.		
<u>Energy/GNP Feedback Elasticity</u>		
4	RYL(L:1-4)	OECD
5	RYL(L:5), RYL(L:7-9)	Regions not included elsewhere.
6	RYL(L:6)	MIDEST
<u>Income Elasticity</u>		
7	RYKK(K:1-3)	OECD
8	RYKL(K:1)	USSR
9	RYKL(K:2)	LDC (Less Developed Countries)

PARAM	Model Variable*	Explanation
<u>Fuel Substitution in Electricity Generation</u>		
10	RUI(I:1-5)	Parameter of the logit equation: all regions.
<u>Aggregate Energy Price Elasticity, Secondary Energy Demand</u>		
11	RPKK(K:1-3)	OECD
	RPK	Non-OECD
		Regional and sectoral values are deterministically linked, thus there is only 1 PARAM.
<u>Exogenous Energy Efficiency</u>		
12	TKL(K:1-3,L:1-9)	Regional and sectoral rates are assumed to be equal.
<u>Population</u>		
	<u>OECD:</u>	
14	ZLM(L:1-4,M:2)	1975
15	ZLM(L:1-4,M:3)	2000
16	ZLM(L:1-4,M:4)	2025
17	ZLM(L:1-4,M:5)	2050
18	ZLM(L:1-4,M:6)	2075
	<u>ACENP: China and Communist Asia:</u>	
20	ZLM(L:5,M:2)	1975
21	ZLM(L:5,M:3)	2000
22	ZLM(L:5,M:4)	2025
23	ZLM(L:5,M:5)	2050
24	ZLM(L:5,M:6)	2075
	<u>Developing Regions:</u>	
26	ZLM(L:6-9,M:2)	1975
27	ZLM(L:6-9,M:3)	2000
28	ZLM(L:6-9,M:4)	2025
29	ZLM(L:6-9,M:5)	2050
30	ZLM(L:6-9,M:6)	2075

PARM	Model Variable*	Explanation
<u>Labor Productivity</u>		
31	PROL(L:1-4)	Developed regions
32	PROL(L:5-9)	Developing regions
<u>Oil Supply Elasticity</u>		
33	RIL(I:1,L:1-9)	
<u>Conventional Oil Resources (EJ)</u>		
<u>OECD:</u>		
34	RIGISL(S:1,I:1,L:1-4)	
35	RIGISL(S:2,I:1,L:1-4)	
36	RIGISL(S:3,I:1,L:1-4)	Grades 1-5
37	RIGISL(S:4,I:1,L:1-4)	
38	RIGISL(S:5,I:1,L:1-4)	
<u>Other than OECD and MIDESE:</u>		
39	RIGISL(S:1,I:1,L:7-9)	
40	RIGISL(S:2,I:1,L:7-9)	
41	RIGISL(S:3,I:1,L:7-9)	Grades 1-5
42	RIGISL(S:4,I:1,L:7-9)	
43	RIGISL(S:5,I:1,L:7-9)	
<u>MIDESE:</u>		
44	RIGISL(S:1,I:1,L:6)	
45	RIGISL(S:2,I:1,L:6)	
46	RIGISL(S:3,I:1,L:6)	Grades 1-5
47	RIGISL(S:4,I:1,L:6)	
48	RIGISL(S:5,I:1,L:6)	
<u>Global Natural Gas Resources (EJ)</u>		
49	RIGISL(S:1,I:2,L:1)	
50	RIGISL(S:2,I:2,L:1)	Grades 1-4
51	RIGISL(S:3,I:2,L:1)	
52	RIGISL(S:4,I:2,L:1)	

PARM	Model Variable*	Explanation
<u>Natural Gas Supply Elasticity</u>		
53	RIL(I:2,L:1-9)	
<u>Global Coal Resources (EJ)</u>		
54	RIGISLI(S:1,I:3,L:1-9)	
55	RIGISLI(S:2,I:3,L:1-9)	
56	RIGISLI(S:3,I:3,L:1-9)	Grades 1-5
57	RIGISLI(S:4,I:3,L:1-9)	
58	RIGISLI(S:5,I:3,L:1-9)	
<u>Coal Supply Elasticity</u>		
59	RIL(I:3,L:1-9)	
<u>Technological Change in Coal Production (annual rate of change)</u>		
60	STISL(I:3,L:1-9)	
<u>Environmental Add-on Costs for Coal (in 1975 \$/GJ)</u>		
61	VISL(I:3,L:1-3)	OECD regions
62	VISL(I:3,L:4-9)	Non-OECD regions
<u>Global Shale Oil Resources (EJ)</u>		
63	RIGISL(S:1,I:4,L:1-9)	
64	RIGISL(S:2,I:4,L:1-9)	Grades 1-4
65	RIGISL(S:3,I:4,L:1-9)	
66	RIGISL(S:4,I:4,L:1-9)	
<u>Shale Oil Supply Elasticity</u>		
67	RIL(I:4,L:1-9)	
<u>Technological Change in Shale Oil Production (annual rate of change)</u>		
68	STISL(I:4,L:1-9)	
<u>Environmental Add-on Costs for Shale Oil (in 1975 \$/GJ)</u>		
69	VISL(I:4,L:1-3)	OECD
	VISL(I:4,L:4-9)	Non-OECD=70% of OECD

PARAM	Model Variable*	Explanation
<u>Nuclear Power Resources</u>		
70	RIGISL(S:1,I:5,L:1-9)	
71	RIGISL(S:2,I:5,L:1-9)	Grades 1-3
72	RIGISL(S:3,I:5,L:1-9)	
<u>Environmental Add-on Costs for Nuclear (1975 \$/GJ)</u>		
73	VISL(I:5,L:1-9)	
<u>Technological Change for Nuclear (annual rate of change)</u>		
74	STISL(I:5,L:1-9)	
<u>Renewable (Solar) Electricity Cost in the Year 2000 (in 1975 \$/GJ)</u>		
75	CSLT(L:1-9,M:2)	Renewable electricity cost (solar) in the year 2000. (1975 \$/GJ)
<u>Solar - not model implemented</u>		
76	STISL(I:6,L:1-9)	Solar - not model implemented
<u>Synfuel Parameters</u>		
77	HCILT(1,L:1-9,M:2)	Non-fuel cost of synoil
	HCILT(2,L:1-9,M:2)	Non-fuel cost of syngas
78	GCI(L:1-9)	The inverse of the efficiency with which the solid fuel is converted to liquids or gas for synfuel production
<u>Global hydroelectricity resource base (EJ)</u>		
79	HYDRO(3,L:1-9)	

PARM	Model Variable*	Explanation
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*Definitions of subscripts:

I: index of primary energy type:

- (1) conventional oil
- (2) natural gas
- (3) coal
- (4) unconventional oil
- (5) nuclear
- (6) renewable energy

J: secondary energy type index

- (1) liquids
- (2) gases
- (3) solids
- (4) electricity

K: index of end use sector: for OECD regions

- (1) Residential/commercial
- (2) Industrial
- (3) Transport

for non OECD regions

- (1) electric utilities
- (2) general economy

L: index of regions:

- (1) USA
- (2) Western Europe and Canada = OECD Europe
- (3) OECD PAC
- (4) USSR and Eastern Europe
- (5) China and Communist Asia = ACENP
- (6) Mideast
- (7) Africa
- (8) Latin America
- (9) South and East Asia

M: Period index:

- (1) 1975
- (2) 2000
- (3) 2025
- (4) 2050
- (5) 2075
- (6) 2100

TABLE C-2. MAPPING OF OUTPUT VALUES (VAL) TO MODEL VARIABLES

VAL	Model Variable*	Explanation
1-5	CO2M(NM)	Global carbon emissions (10^6 metric tons)
6-10	EDM(NM)	Global primary energy demand (EJ)
11-15	EDRM(NM)	Global energy demand for refinable fuels (EJ)
16-20	EFM(NM)	Global secondary energy consumption (EJ)
21-25	GNPFLM(10,NM)	Global final GNP (billions of 1975 dollars)
26-30	ZLXM(10,NM)	Global population (millions)
31-35	PIM(1,NM)	World price of primary (crude) oil (1975 US \$/GJ)
36-40	PIM(2,NM)	World price of primary gas (1975 US \$/GJ)
41-45	PIM(3,NM)	World price of primary coal (1975 US \$/GJ)
46-50	PUILM(4,1,NM)	Costs of nuclear generated electricity (in the US in 1975 \$/GJ)
51-55	PUILM(5,1,NM)	Cost of solar generated electricity (in the US in 1975 US \$/GJ)
56-60	ESUM(NM)	Global electricity production (EJ of electrical energy output)
61-65	ESIZM(1,NM)	Global shale oil production (EJ)
66-70	ESIZM(3,NM)	Global biomass production (EJ of unrefined biomass)
71-75	ESIIM(1,NM)	Global primary oil production (EJ, excluding shale oil production)
76-80	ESIIM(2,NM)	Global primary gas production (EJ)
81-85	ESIIM(3,NM)	Global coal production (EJ)
86-90	ESIM(4,NM)	Global primary nuclear production (EJ of primary equivalent energy)
91-95	ESIM(5,NM)	Global primary solar production (EJ of primary equivalent energy)

*The value of NM may range from 1 to 5, corresponding to the years 1975, 2000, 2025, 2050, and 2075, respectively. The five output values correspond to these time period designations.

CROSS CORRELATION

Tables C-3 and C-4 show the actual correlations among input values in the cases where zeros for correlations among inputs were targets and in the case where nonzero correlations of Table 4 (in the text) were the targets. The tables show the 10 highest (absolute value) correlations. The top 10 values generally give an adequate indication of the level of correlation since beyond 10 the correlations approach the zero target values.

TABLE C-3. ACTUAL CORRELATIONS: ZERO CORRELATION TARGETS

[illegible]

TABLE C-3. ACTUAL CORRELATIONS: ZERO CORRELATION TARGETS
(Continued)

SPEARMAN CORRELATION COEFFICIENTS / N = 400											
PARM57	PARM52	PARM57	PARM51	PARM73	PARM50	PARM39	PARM46	PARM53	PARM51		
1.00000	-0.05131	-0.03471	-0.03146	-0.02821	0.02773	0.02737	0.02675	0.02571	0.02259		
PARM67	PARM63	PARM61	PARM50	PARM27	PARM33	PARM53	PARM59	PARM52	PARM21		
1.00000	-0.03595	0.03135	-0.03080	-0.02966	-0.02854	-0.02447	-0.02443	0.02275	-0.02153		
PARM69	PARM52	PARM72	PARM13	PARM50	PARM58	PARM51	PARM11	PARM42	PARM45		
1.00000	-0.04773	-0.04153	-0.03351	0.03922	-0.03596	-0.03370	-0.03104	-0.03189	0.02752		
PARM70	PARM45	PARM70	PARM59	PARM29	PARM78	PARM73	PARM17	PARM51	PARM42		
1.00000	-0.04665	-0.04026	-0.03771	-0.03491	-0.03474	0.03254	0.02603	0.02585	0.02412		
PARM71	PARM71	PARM57	PARM45	PARM34	PARM55	PARM38	PARM62	PARM44	PARM53		
1.00000	0.03811	0.03451	-0.03295	0.03129	-0.02834	0.02727	-0.02676	-0.02267	0.02253		
PARM72	PARM72	PARM74	PARM49	PARM28	PARM49	PARM17	PARM7	PARM73	PARM3		
1.00000	-0.03089	-0.02790	0.02539	-0.02645	-0.02576	-0.02395	0.02319	0.02144	0.02137		
PARM73	PARM73	PARM77	PARM47	PARM11	PARM70	PARM51	PARM38	PARM42	PARM57	PARM26	
1.00000	0.05741	-0.03164	-0.03516	0.03264	0.03217	-0.02896	-0.02862	-0.02821	-0.02542		
PARM74	PARM74	PARM40	PARM25	PARM72	PARM12	PARM61	PARM77	PARM58	PARM24	PARM47	
1.00000	-0.03454	0.03352	-0.03389	-0.02987	0.02845	-0.02851	-0.02502	-0.02470	-0.02470		
PARM75	PARM75	PARM37	PARM20	PARM53	PARM52	PARM18	PARM10	PARM48	PARM46	PARM54	
1.00000	0.04405	0.03060	-0.02993	-0.02965	-0.02854	-0.02762	-0.02340	0.02336	-0.02234		
PARM76	PARM76	PARM5	PARM35	PARM55	PARM23	PARM34	PARM29	PARM43	PARM25	PARM25	
1.00000	0.03962	-0.03499	-0.03110	-0.02906	-0.02902	-0.02677	0.02619	0.02603	0.02298		
PARM77	PARM77	PARM73	PARM56	PARM3	PARM24	PARM74	PARM55	PARM48	PARM50	PARM47	
1.00000	0.05741	0.05039	-0.03530	-0.02711	-0.02651	0.02288	-0.02248	-0.02213	0.02194		
CARBON MODEL											
SPEARMAN CORRELATION COEFFICIENTS / N = 400											
PARM78	PARM53	PARM38	PARM70	PARM44	PARM51	PARM19	PARM61	PARM73	PARM12		
1.00000	-0.04163	-0.03766	-0.03474	0.03308	0.02972	0.02847	-0.02592	0.02471	0.02417		
PARM79	PARM10	PARM58	PARM23	PARM70	PARM43	PARM51	PARM40	PARM49	PARM24		
1.00000	0.04343	0.04244	-0.04232	-0.04026	0.03117	0.02734	-0.02722	0.02639	-0.02533		

3410 SUCCESS, J1

TABLE C-4. ACTUAL CORRELATIONS: NONZERO CORRELATION TARGETS

SPEARMAN CORRELATION COEFFICIENTS / N = 400										
PARM1	PARM1	PARM5	PARM48	PARM45	PARM24	PARM51	PARM6	PARM53	PARM10	PARM21
1.00000	0.03370	-0.03222	0.03163	0.03136	0.03117	0.02729	-0.02512	-0.02444	-0.02425	
PARM2	PARM2	PARM52	PARM56	PARM71	PARM49	PARM23	PARM61	PARM59	PARM16	PARM79
1.00000	0.03449	0.03562	0.03771	-0.03749	0.03512	0.02971	0.02736	0.02268	-0.02281	
PARM3	PARM3	PARM20	PARM17	PARM77	PARM52	PARM67	PARM39	PARM58	PARM51	PARM21
1.00000	0.04793	-0.04174	-0.03938	0.03219	-0.03154	0.02826	-0.02812	0.02645	-0.02525	
PARM4	PARM4	PARM5	PARM52	PARM73	PARM52	PARM25	PARM47	PARM71	PARM63	PARM30
1.00000	0.78626	0.77662	0.03722	-0.02790	-0.02581	-0.02574	-0.02497	-0.02476	0.02463	
PARM5	PARM5	PARM5	PARM53	PARM76	PARM56	PARM1	PARM54	PARM78	PARM22	
1.00000	0.78059	0.77662	-0.03693	0.03410	0.03393	0.03370	-0.03311	0.03213	0.02937	
PARM6	PARM6	PARM5	PARM53	PARM59	PARM52	PARM1	PARM77	PARM54	PARM62	
1.00000	0.78626	0.78059	-0.04736	0.02990	-0.02760	0.02723	0.02598	-0.02195	-0.02098	
PARM7	PARM7	PARM5	PARM59	PARM38	PARM45	PARM44	PARM61	PARM22	PARM56	
1.00000	0.52105	0.70442	-0.04029	0.03664	0.03336	0.03191	-0.03065	0.02854	-0.02763	
PARM8	PARM8	PARM5	PARM58	PARM51	PARM59	PARM28	PARM66	PARM41	PARM62	
1.00000	0.89105	0.68929	0.03408	-0.03371	0.03129	-0.02668	0.02603	0.02509	-0.02479	
PARM9	PARM9	PARM7	PARM6	PARM58	PARM74	PARM25	PARM54	PARM40	PARM27	
1.00000	0.70442	0.68929	0.03594	-0.03740	-0.03756	0.02566	-0.03392	0.02638	0.02559	
PARM10	PARM10	PARM72	PARM24	PARM50	PARM18	PARM75	PARM1	PARM51	PARM3	PARM35
1.00000	0.04311	-0.04297	0.02793	-0.02781	-0.02769	-0.02484	-0.02342	-0.02219	0.02261	
PARM11	PARM11	PARM41	PARM53	PARM27	PARM35	PARM37	PARM16	PARM42	PARM24	PARM29
1.00000	-0.03533	0.03477	-0.03341	-0.03293	-0.02966	0.02841	-0.02833	-0.02408	-0.02189	
SPEARMAN CORRELATION COEFFICIENTS / N = 400										
PARM12	PARM12	PARM55	PARM31	PARM73	PARM32	PARM50	PARM74	PARM68	PARM52	PARM57
1.00000	0.03142	0.88723	-0.88536	0.88092	0.89020	0.87399	0.87227	0.84617	0.83764	
PARM13	PARM13	PARM52	PARM53	PARM4	PARM45	PARM6	PARM7	PARM8	PARM9	PARM10
1.00000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000
PARM14	PARM14	PARM24	PARM75	PARM29	PARM30	PARM33	PARM53	PARM22	PARM8	PARM25
1.00000	0.03797	-0.03469	-0.03261	-0.03249	-0.02922	0.02553	-0.02379	-0.02223	0.02196	
PARM15	PARM15	PARM57	PARM55	PARM54	PARM55	PARM24	PARM59	PARM26	PARM45	PARM47
1.00000	0.04530	0.04237	-0.03439	-0.03130	0.03025	-0.02902	-0.02838	0.02825	-0.02701	
PARM16	PARM16	PARM45	PARM31	PARM51	PARM32	PARM20	PARM11	PARM23	PARM40	PARM46
1.00000	0.03222	-0.03125	-0.02990	-0.02923	-0.02864	0.02841	0.02774	-0.02622	0.02621	
PARM17	PARM17	PARM29	PARM55	PARM3	PARM52	PARM18	PARM63	PARM44	PARM20	PARM54
1.00000	-0.04633	0.04149	-0.04134	-0.03526	0.03392	0.03158	0.03148	0.03177	-0.03030	
PARM18	PARM18	PARM23	PARM52	PARM27	PARM21	PARM17	PARM65	PARM75	PARM10	PARM64
1.00000	-0.04636	-0.04154	0.03307	0.03663	0.03392	0.03360	-0.02915	-0.02781	0.02593	
PARM19	PARM19	PARM2	PARM5	PARM4	PARM5	PARM6	PARM7	PARM8	PARM9	PARM10
1.00000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000
PARM20	PARM20	PARM2	PARM59	PARM45	PARM43	PARM75	PARM17	PARM43	PARM15	PARM57
1.00000	0.04993	0.04251	-0.04150	0.04032	0.03978	0.03977	-0.03870	-0.03864	0.03790	
PARM21	PARM21	PARM43	PARM18	PARM55	PARM22	PARM17	PARM24	PARM3	PARM52	PARM41
1.00000	0.03816	0.03669	-0.03225	-0.02725	0.02573	-0.02644	-0.02525	-0.02124	-0.02425	
PARM22	PARM22	PARM44	PARM63	PARM45	PARM26	PARM5	PARM7	PARM21	PARM50	PARM14
1.00000	0.04654	0.03659	-0.03561	0.03398	0.03237	0.02854	-0.02725	-0.02226	-0.02373	
SPEARMAN CORRELATION COEFFICIENTS / N = 400										
PARM23	PARM23	PARM45	PARM79	PARM53	PARM2	PARM35	PARM42	PARM31	PARM54	PARM76
1.00000	0.04603	-0.04351	0.03540	0.03512	0.03379	-0.03176	0.02976	0.02958	-0.02936	
PARM24	PARM24	PARM45	PARM14	PARM1	PARM15	PARM64	PARM77	PARM79	PARM21	PARM41
1.00000	-0.03782	0.03707	0.03136	0.03025	-0.02938	-0.02714	-0.02693	-0.02444	-0.02408	
PARM25	PARM25	PARM2	PARM3	PARM4	PARM5	PARM6	PARM7	PARM8	PARM9	PARM10
1.00000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000	0.03000
PARM26	PARM26	PARM2	PARM41	PARM40	PARM22	PARM50	PARM56	PARM15	PARM27	PARM4
1.00000	-0.03766	-0.03630	-0.03491	0.03398	0.02987	0.02917	-0.02838	-0.02703	-0.02681	
PARM27	PARM27	PARM61	PARM18	PARM11	PARM54	PARM26	PARM9	PARM57	PARM68	PARM31
1.00000	0.03978	0.03807	-0.03341	-0.03159	-0.02703	0.02559	-0.02401	-0.02358	-0.02348	
PARM28	PARM28	PARM41	PARM42	PARM72	PARM5	PARM32	PARM53	PARM44	PARM63	PARM41
1.00000	0.03179	0.03028	0.02666	-0.02658	0.02587	0.02459	0.02328	0.02181	0.02262	
PARM29	PARM29	PARM17	PARM18	PARM32	PARM31	PARM49	PARM70	PARM73	PARM12	PARM14
1.00000	-0.04956	-0.04636	0.04154	0.03941	0.03714	-0.03556	0.03479	0.03365	-0.03261	
PARM30	PARM30	PARM43	PARM14	PARM44	PARM4	PARM36	PARM60	PARM63	PARM61	PARM46
1.00000	0.03613	-0.03249	-0.02960	0.02463	-0.02329	-0.02312	0.02273	0.02248	-0.02292	
PARM31	PARM31	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM32	PARM32	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM33	PARM33	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM34	PARM34	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM35	PARM35	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM36	PARM36	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM37	PARM37	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM38	PARM38	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM39	PARM39	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM40	PARM40	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM41	PARM41	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM42	PARM42	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM43	PARM43	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM44	PARM44	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM45	PARM45	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM46	PARM46	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	PARM29
1.00000	0.89725	0.89311	0.88472	0.88449	0.89991	0.87998	0.87744	0.84765	0.84991	
PARM47	PARM47	PARM59	PARM72	PARM12	PARM32	PARM40	PARM74	PARM68	PARM52	

TABLE C-4. ACTUAL CORRELATIONS: NONZERO CORRELATION TARGETS
(Continued)

SPEARMAN CORRELATION COEFFICIENTS / N = 400															
PARM34	PARM34	PARM55	PARM71	PARM53	PARM56	PARM76	PARM22	PARM37	PARM41	PARM8					
1.00000	-0.04152	0.03130	0.03792	-0.02754	-0.02617	0.01363	0.02136	0.02033	-0.01992						
PARM35	PARM35	PARM54	PARM45	PARM56	PARM23	PARM11	PARM76	PARM39	PARM10	PARM1					
1.00000	0.03965	0.04408	0.03570	0.03379	-0.03293	-0.03168	-0.02433	0.02261	0.02186						
PARM36	PARM36	PARM42	PARM14	PARM57	PARM56	PARM64	PARM16	PARM59	PARM53	PARM53					
1.00000	-0.03072	-0.03545	-0.03489	0.02230	-0.02915	0.02713	-0.02579	-0.02325	-0.02224						
PARM37	PARM37	PARM45	PARM75	PARM43	PARM56	PARM11	PARM46	PARM41	PARM44	PARM20					
1.00000	-0.03363	0.04544	-0.03707	0.03522	-0.02966	-0.02831	-0.02683	-0.02379	-0.02172						
PARM38	PARM38	PARM75	PARM47	PARM58	PARM71	PARM16	PARM24	PARM14	PARM25						
1.00000	-0.03928	0.03664	0.03409	0.03229	0.02735	-0.02427	-0.02405	0.02196	0.02013						
PARM39	PARM39	PARM7	PARM44	PARM45	PARM60	PARM68	PARM56	PARM3	PARM67	PARM50					
1.00000	-0.04029	0.03717	-0.03430	0.03159	0.02905	0.02828	0.02826	0.02541	0.02596						
PARM40	PARM40	PARM41	PARM65	PARM32	PARM12	PARM26	PARM9	PARM64	PARM31	PARM20					
1.00000	0.04511	0.04309	0.03752	0.03532	-0.03491	-0.03382	0.03069	0.03019	0.02996						
PARM41	PARM41	PARM40	PARM26	PARM11	PARM45	PARM48	PARM28	PARM66	PARM60						
1.00000	0.04511	-0.03630	-0.03539	-0.03465	0.03429	0.03179	-0.03012	-0.02737	-0.02753						
PARM42	PARM42	PARM30	PARM45	PARM23	PARM28	PARM51	PARM11	PARM48	PARM66	PARM59					
1.00000	-0.03645	0.03270	-0.03175	0.03028	-0.02588	-0.02533	-0.02831	-0.02740	0.02118						
PARM43	PARM43	PARM43	PARM30	PARM79	PARM46	PARM20	PARM57	PARM76	PARM65	PARM15					
1.00000	0.03914	0.03613	0.03238	0.03073	-0.02970	0.02792	0.02609	0.02139	0.02038						
PARM44	PARM44	PARM22	PARM48	PARM46	PARM39	PARM7	PARM17	PARM30	PARM60	PARM15					
1.00000	0.04454	-0.04309	-0.03773	0.03717	0.03191	0.03148	-0.02860	-0.02504	-0.02475						
SPEARMAN CORRELATION COEFFICIENTS / N = 400															
PARM45	PARM45	PARM54	PARM37	PARM77	PARM23	PARM46	PARM35	PARM64	PARM20	PARM36					
1.00000	0.06973	-0.05253	-0.04754	0.04609	-0.04525	0.04408	-0.04277	-0.04160	-0.04072						
PARM46	PARM46	PARM45	PARM54	PARM44	PARM43	PARM37	PARM67	PARM16	PARM78	PARM75					
1.00000	-0.04526	0.04059	-0.03770	0.03073	-0.02831	0.02705	0.02621	0.02562	0.02408						
PARM47	PARM47	PARM60	PARM12	PARM15	PARM50	PARM4	PARM48	PARM33	PARM58	PARM23					
1.00000	-0.03024	0.02925	-0.02701	0.02578	-0.02574	0.02482	-0.02474	0.02448	-0.02446						
PARM48	PARM48	PARM44	PARM20	PARM21	PARM33	PARM41	PARM71	PARM42	PARM53	PARM74					
1.00000	-0.04309	0.04082	0.03816	-0.03753	0.03429	-0.03222	-0.02831	-0.02625	-0.02590						
PARM49	PARM49	PARM2	PARM53	PARM79	PARM27	PARM57	PARM54	PARM30	PARM9	PARM16					
1.00000	-0.03749	-0.02829	0.02516	-0.02346	0.02274	0.02128	0.01978	0.01935	0.01892						
PARM50	PARM50	PARM33	PARM60	PARM55	PARM26	PARM66	PARM79	PARM67	PARM55	PARM39					
1.00000	-0.04973	-0.03061	-0.03024	0.02987	0.02842	-0.02793	0.02748	0.02625	0.02596						
PARM51	PARM51	PARM54	PARM58	PARM53	PARM1	PARM38	PARM16	PARM24	PARM45	PARM33					
1.00000	0.04401	0.03720	-0.03324	0.03117	0.03085	-0.02990	-0.02988	0.02914	-0.02923						
PARM52	PARM52	PARM67	PARM31	PARM12	PARM60	PARM32	PARM18	PARM3	PARM73	PARM59					
1.00000	-0.05220	0.04765	0.04617	0.04454	0.04241	-0.04194	0.03519	0.03477	0.03342						
PARM53	PARM53	PARM6	PARM56	PARM5	PARM11	PARM63	PARM75	PARM49	PARM48						
1.00000	-0.04736	0.04338	-0.03693	0.03437	-0.03324	-0.03239	-0.02866	-0.02829	-0.02525						
PARM54	PARM54	PARM45	PARM35	PARM51	PARM10	PARM46	PARM9	PARM59	PARM5	PARM27					
1.00000	0.05973	0.05365	0.04401	-0.04297	0.04059	0.03566	-0.03440	-0.03311	-0.03159						
PARM55	PARM55	PARM15	PARM17	PARM57	PARM50	PARM71	PARM76	PARM7	PARM66	PARM8					
1.00000	0.04237	0.04149	0.03280	-0.03024	-0.02853	-0.02790	0.02750	0.02520	0.02472						
SPEARMAN CORRELATION COEFFICIENTS / N = 400															
PARM56	PARM56	PARM77	PARM53	PARM58	PARM5	PARM29	PARM26	PARM36	PARM39	PARM7					
1.00000	0.05087	0.04138	-0.03527	0.03393	0.02918	0.02917	-0.02915	0.02825	-0.02750						
PARM57	PARM57	PARM15	PARM32	PARM53	PARM12	PARM59	PARM67	PARM31	PARM71	PARM73					
1.00000	0.04590	0.04375	0.04104	0.03764	-0.03742	-0.03563	0.03403	0.03334	0.03373						
PARM58	PARM58	PARM9	PARM79	PARM51	PARM59	PARM31	PARM32	PARM36	PARM73	PARM46					
1.00000	0.05394	0.04266	0.03792	0.03551	0.03512	0.03507	0.03229	0.03125	0.02890						
PARM59	PARM59	PARM65	PARM20	PARM7	PARM57	PARM54	PARM68	PARM8	PARM45	PARM2					
1.00000	0.06710	0.04201	-0.03749	-0.03742	-0.03440	-0.03378	0.03129	-0.02944	-0.02936						
PARM60	PARM60	PARM62	PARM12	PARM32	PARM73	PARM31	PARM74	PARM68	PARM52	PARM39					
1.00000	0.06913	0.05022	0.04990	0.04874	0.04991	0.04893	0.04794	0.04454	0.03159						
PARM61	PARM61	PARM62	PARM27	PARM6	PARM7	PARM2	PARM69	PARM78	PARM31	PARM3					
1.00000	0.05012	0.04912	0.04812	0.04812	0.04812	0.04812	0.04812	0.04812	0.04812						
PARM62	PARM62	PARM61	PARM2	PARM17	PARM68	PARM66	PARM31	PARM8	PARM78	PARM53					
1.00000	0.05801	0.04494	-0.03526	-0.03099	0.02966	-0.02829	-0.02479	-0.02448	0.02444						
PARM63	PARM63	PARM64	PARM43	PARM22	PARM23	PARM53	PARM17	PARM67	PARM14						
1.00000	0.04245	0.03914	-0.03707	0.03659	0.03540	-0.03239	0.03158	0.02577	0.02553						
PARM64	PARM64	PARM12	PARM45	PARM43	PARM43	PARM43	PARM40	PARM49	PARM24	PARM25					
1.00000	-0.04203	-0.04277	0.04145	-0.04138	-0.04138	-0.04138	0.03069	-0.02938	-0.02713						
PARM65	PARM65	PARM34	PARM69	PARM32	PARM73	PARM12	PARM18	PARM21	PARM15	PARM31					
1.00000	-0.04152	0.04054	0.03930	0.03747	0.03512	0.03360	-0.03255	-0.03130	0.03047						
PARM66	PARM66	PARM53	PARM60	PARM2	PARM35	PARM37	PARM41	PARM62	PARM50	PARM24					
1.00000	0.03670	0.03670	0.03670	0.03670	0.03670	0.03670	0.03670	0.03670	0.03670						

TABLE C-4. ACTUAL CORRELATIONS: NONZERO CORRELATION TARGETS
(Continued)

SPEARMAN CORRELATION COEFFICIENTS / N = 400									
PAR467	PAR467	PAR467	PAR467	PAR467	PAR467	PAR467	PAR467	PAR467	PAR467
1.00000	-0.03522	-0.03739	-0.03555	-0.03154	0.02748	0.02705	0.02641	0.02577	0.02381
PAR468	PAR471	PAR469	PAR412	PAR474	PAR431	PAR460	PAR432	PAR456	PAR459
1.00000	0.67593	0.67406	0.67227	0.58396	0.57744	0.57034	0.56969	-0.01527	-0.03378
PAR469	PAR471	PAR472	PAR473	PAR412	PAR460	PAR468	PAR474	PAR457	PAR465
1.00000	0.68733	0.89672	0.89580	0.89142	0.69819	0.67406	0.67035	0.04104	0.04064
PAR470	PAR479	PAR479	PAR479	PAR429	PAR478	PAR461	PAR417	PAR422	PAR428
1.00000	-0.04754	-0.04049	-0.03749	-0.03556	-0.03393	0.02613	0.02612	0.02222	-0.02142
PAR471	PAR471	PAR471	PAR471	PAR471	PAR471	PAR471	PAR471	PAR471	PAR471
1.00000	0.03771	0.03184	-0.03185	0.03150	-0.02653	0.02735	-0.02506	-0.02497	0.02408
PAR472	PAR472	PAR472	PAR472	PAR472	PAR472	PAR472	PAR472	PAR472	PAR472
1.00000	0.02686	-0.02666	-0.02556	-0.02511	-0.02466	0.02225	-0.02165	0.02154	0.02117
PAR473	PAR469	PAR431	PAR412	PAR412	PAR474	PAR460	PAR468	PAR465	PAR429
1.00000	0.89580	0.89312	0.88887	0.88556	0.68950	0.68774	0.67598	0.03747	0.03479
PAR474	PAR474	PAR474	PAR474	PAR474	PAR474	PAR474	PAR474	PAR474	PAR474
1.00000	0.68950	0.67379	0.67315	0.58595	0.58396	0.57998	0.57277	-0.03384	-0.03742
PAR475	PAR475	PAR475	PAR475	PAR475	PAR475	PAR475	PAR475	PAR475	PAR475
1.00000	0.04584	-0.03742	-0.03098	-0.03090	-0.03086	0.03078	-0.02915	-0.02866	-0.02769
PAR476	PAR476	PAR476	PAR476	PAR476	PAR476	PAR476	PAR476	PAR476	PAR476
1.00000	0.03410	-0.03168	-0.02936	-0.02790	0.02736	-0.02617	0.02609	0.02137	0.02404
PAR477	PAR477	PAR477	PAR477	PAR477	PAR477	PAR477	PAR477	PAR477	PAR477
1.00000	0.05567	-0.03606	-0.02714	0.02398	-0.02314	0.02145	0.02117	0.02093	0.02006
CAPSON MODEL									
SPEARMAN CORRELATION COEFFICIENTS / N = 400									
PAR478	PAR478	PAR478	PAR478	PAR478	PAR478	PAR478	PAR478	PAR478	PAR478
1.00000	-0.03928	0.03722	-0.03393	0.02213	0.03095	0.02458	-0.02668	0.02562	-0.02448
PAR479	PAR479	PAR479	PAR479	PAR479	PAR479	PAR479	PAR479	PAR479	PAR479
1.00000	-0.04351	0.04311	0.04258	-0.04043	0.03307	0.03238	-0.02793	0.02749	-0.02693

18:55 SATURDAY, J.

APPENDIX D: DETAILED RESULTS

APPENDIX D
DETAILED RESULTS

Characteristics of Output Distributions

Tables D-1 and D-2 give the basic characteristics of the output distributions for each of the 95 output VALs. See appendix C for a definition of VALs. The reader is cautioned that the distributions are not symmetric. Thus, the mean is not equal to the median nor does the mean or median plus or minus the standard deviation capture any particular percentage of the runs.

TABLE D-1. CHARACTERISTICS OF THE DISTRIBUTIONS OF OUTPUT VALUES:
RUNS WITH ZERO CORRELATIONS

(See Appendix C for definition of VALs)

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	C.V.*
VAL1	400	4105.46812	283.422673	3656.7999429	4969.44233	7.050
VAL2	400	6557.02597	2609.427511	1231.133132	16072.24157	39.756
VAL3	400	11490.12171	10230.725785	774.7162241	70216.76581	87.516
VAL4	400	18670.45175	22480.964497	617.4091204	166054.41400	120.409
VAL5	400	24684.71140	31572.383022	369.6521488	192134.43357	127.323
VAL6	400	233.42390	20.322891	194.9221376	275.93176	6.721
VAL7	400	420.32388	143.087660	157.3264969	988.09963	34.216
VAL8	400	844.57725	634.294285	98.3660513	5766.35170	82.153
VAL9	400	1497.95255	1046.301444	60.1501131	12777.72538	123.293
VAL10	400	2896.13971	5356.471047	34.6529124	52925.88418	184.946
VAL11	400	233.85389	20.792895	194.9221213	275.93177	6.721
VAL12	400	420.37556	143.408186	157.4044020	983.95973	34.114
VAL13	400	828.65792	653.539305	98.3045048	5184.82478	79.116
VAL14	400	1362.74564	1578.120264	60.1309514	12347.94321	115.668
VAL15	400	2595.35935	5032.148777	34.6847770	52029.06017	193.654
VAL16	400	177.15140	12.351957	155.1324561	200.45316	6.956
VAL17	400	308.11125	101.18161	115.8602004	697.41592	32.809
VAL18	400	538.45156	377.664913	66.1891255	2369.31629	70.087
VAL19	400	722.74618	625.517170	52.1234505	4433.50427	90.957
VAL20	400	1038.75125	1638.787346	30.9446685	16071.50686	157.520
VAL21	400	6056.15200	0.000000	6056.1500000	6056.34000	0.000
VAL22	400	14235.90565	2245.905765	7951.7374794	24330.96363	20.632
VAL23	400	33598.42875	14078.436477	9871.6522420	96713.19884	41.302
VAL24	400	78156.44404	31561.571968	9907.4556398	288831.77841	65.804
VAL25	400	181221.35489	171079.772979	9263.2557212	1091033.60607	94.403
VAL26	400	3975.00000	0.000000	3975.0000000	3975.00000	0.000
VAL27	400	5900.53106	195.408083	5377.4860840	6439.42962	3.112
VAL28	400	7383.54173	346.733430	6504.6591797	8442.71631	4.639
VAL29	400	8223.12785	322.217137	7324.2802734	9292.11752	4.772
VAL30	400	8491.45390	544.744486	7130.7604980	9912.71925	6.415
VAL31	400	1.83980	0.000000	1.4398000	1.83980	0.000
VAL32	400	2.40350	0.553311	1.1834250	1.75678	23.021
VAL33	400	3.05879	1.422379	1.6117402	1.64920	31.676
VAL34	400	6.47341	5.943771	1.9592300	56.74509	94.742
VAL35	400	11.43430	25.450132	2.0448174	263.14134	214.090
VAL36	400	0.62560	0.000000	0.6256000	0.62560	0.000
VAL37	400	0.45520	0.166788	0.3384949	1.68777	19.301
VAL38	400	1.65747	0.912103	0.5609070	7.07579	45.030
VAL39	400	3.48039	3.935266	0.5527351	30.88707	113.079
VAL40	400	8.61176	24.414014	0.5168203	270.74703	283.497
VAL41	400	0.51210	0.000000	0.5121000	0.51210	0.000
VAL42	400	0.68167	0.231528	0.3667417	2.29150	33.979
VAL43	400	0.88910	0.478033	0.2067348	3.97754	53.766
VAL44	400	1.48905	1.847720	0.1867553	17.97823	124.170
VAL45	400	3.30533	9.549757	0.0555498	94.31079	283.920
VAL46	400	9.19251	0.000000	9.1925100	9.19251	0.000
VAL47	400	17.78006	9.975893	7.0161557	43.98080	58.107
VAL48	400	24.20072	17.836181	5.4870749	77.31477	73.701
VAL49	400	29.17556	24.425604	4.4728538	108.80808	83.721
VAL50	400	26.19739	22.737461	3.8744118	106.44905	86.772
VAL51	400	22.175920	0.000000	22.1759200	22.175920	0.000
VAL52	400	121.45363	63.013451	43.4865203	240.93392	51.712
VAL53	400	85.10362	78.878705	9.6347508	261.78432	92.468
VAL54	400	85.10362	78.878705	9.6347508	261.78432	92.468
VAL55	400	85.10362	78.878705	9.6347508	261.78432	92.468

TABLE D-1. CHARACTERISTICS OF THE DISTRIBUTIONS OF OUTPUT VALUES:
RUNS WITH ZERO CORRELATIONS (Continued)

(See Appendix C for definition of VALs)

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	C.V.*
VAL56	400	22.68909	12.551529	0.9108284	45.65155	55.320
VAL57	400	47.09175	29.357355	1.0353281	190.42215	60.218
VAL58	400	120.58510	124.131982	0.2649964	1146.89852	102.941
VAL59	400	205.99532	394.657125	0.3541131	3359.13563	149.497
VAL60	400	622.42564	1415.078766	0.4909952	15034.38455	227.348
VAL61	400	0.000000	0.000000	0.0000000	0.000000	
VAL62	400	0.01900	0.100705	0.0000000	1.01475	530.196
VAL63	400	0.30333	0.946097	0.0000000	18.79685	311.292
VAL64	400	1.36612	14.061915	0.0000000	274.93352	715.212
VAL65	400	9.29790	65.944896	0.0000000	1231.38063	709.245
VAL66	400	0.00000	0.000000	0.0000000	0.000000	
VAL67	400	27.59231	45.721030	0.1897456	279.36152	165.759
VAL68	400	160.37153	109.572908	0.1104473	697.15753	178.071
VAL69	400	127.18496	193.335324	0.0138666	874.45042	155.854
VAL70	400	225.57877	287.941233	0.0000000	1274.29543	127.815
VAL71	400	115.75003	0.000000	118.750000	118.750000	0.000
VAL72	400	165.25121	63.110271	53.5478235	440.23352	38.119
VAL73	400	227.70497	170.715786	26.2776176	976.75693	74.373
VAL74	400	180.28494	114.328424	0.0500000	577.56101	63.526
VAL75	400	100.64244	85.760479	0.0000000	380.11106	85.213
VAL76	400	41.36202	0.000000	41.3620200	41.362020	0.000
VAL77	400	49.06341	22.114549	14.0516094	176.03059	45.069
VAL78	400	117.22953	81.844737	13.5661252	516.36347	69.756
VAL79	400	144.78771	101.904113	0.0000000	670.01228	70.292
VAL80	400	95.81954	97.321859	0.0000000	820.39894	101.564
VAL81	400	75.51000	0.000000	75.5100000	75.510000	0.000
VAL82	400	121.15403	72.308437	0.0000000	363.73143	59.693
VAL83	400	231.18383	302.756105	0.0000000	2256.22187	120.436
VAL84	400	568.72485	924.092612	0.0000000	6969.04038	162.465
VAL85	400	909.35909	1352.358102	0.0000000	8292.58778	149.716
VAL86	400	6.47638	5.890425	0.0000000	29.03523	90.552
VAL87	400	20.53721	36.626792	0.0000000	321.23134	178.244
VAL88	400	108.62339	231.180276	0.0000000	2459.56392	212.216
VAL89	400	309.40226	898.821449	0.0000000	9817.31581	290.532
VAL90	400	1144.93758	4131.573791	0.0000000	48994.31696	360.456
VAL91	400	0.33914	0.130182	0.0000000	1.12089	332.588
VAL92	400	0.47306	1.122632	0.0000000	11.10211	281.177
VAL93	400	19.27153	54.150232	0.0000000	575.31063	292.170
VAL94	400	97.57234	334.187134	0.0000000	3966.02327	404.095
VAL95	400	341.07571	1419.505682	0.0000000	16126.02254	416.185

*Coefficient of Variation.

TABLE D-2. CHARACTERISTICS OF THE DISTRIBUTIONS OF OUTPUT VALUES:
RUNS WITH NONZERO CORRELATIONS

(See Appendix C for definition of VALs)

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	C.V.*
VAL1	400	4105.49351	289.407529	3658.528499	4989.61590	7.049
VAL2	400	6290.51712	2435.474808	1649.4604926	18538.03463	38.778
VAL3	400	10158.11920	8873.058914	1263.2616421	72510.49357	87.349
VAL4	400	15365.78954	19603.411097	1018.7067517	148922.17790	127.591
VAL5	400	22432.50765	33356.903412	520.7722544	345357.94187	157.815
VAL6	400	233.82584	20.387172	194.9221370	275.93176	8.719
VAL7	400	399.76304	119.139452	188.4241291	947.60006	29.552
VAL8	400	589.32103	476.609295	154.1643517	3612.14351	63.122
VAL9	400	1048.07397	1065.609292	101.3647225	7561.12401	101.682
VAL10	400	1754.91192	2498.866232	82.5862974	27632.44992	142.593
VAL11	400	233.82563	20.387176	194.9221213	275.93177	8.719
VAL12	400	399.76153	117.504641	188.4045517	947.55791	29.425
VAL13	400	679.63604	457.392889	153.9878013	3503.70210	67.300
VAL14	400	965.13208	856.427232	103.1877145	7011.55559	89.773
VAL15	400	1540.15258	2127.367527	82.2976161	24847.64399	136.127
VAL16	400	177.55199	12.350944	155.1304551	200.45316	6.956
VAL17	400	293.53430	86.142035	156.9799813	754.23345	29.144
VAL18	400	465.49703	297.302096	133.5151106	2304.01398	63.868
VAL19	400	576.16965	447.203993	101.7780486	3054.35232	77.617
VAL20	400	770.31574	847.871560	80.8451690	8823.34591	110.658
VAL21	400	6056.35000	0.000000	6056.360000	6056.35000	0.000
VAL22	400	14239.29433	3769.226685	7520.714416	25573.41993	27.376
VAL23	400	37135.78724	13693.894349	7770.6863644	105221.85509	58.411
VAL24	400	79734.94359	73921.839830	7870.7758290	410412.96093	92.477
VAL25	400	191624.71133	247610.635782	6365.363472	1485993.15320	129.215
VAL26	400	2975.30300	0.000000	3974.000000	3975.00000	0.000
VAL27	400	5900.62911	195.383863	5378.6442871	6438.44969	3.311
VAL28	400	7383.55222	346.731736	6504.6591797	8442.71631	4.696
VAL29	400	8223.22542	392.416612	7324.2802734	9232.11792	4.772
VAL30	400	8491.46513	544.715054	7133.232419	9920.22330	6.415
VAL31	400	1.83980	0.000000	1.839800	1.83980	0.000
VAL32	400	2.35679	0.507665	1.3063477	3.61240	21.541
VAL33	400	3.65156	0.697723	1.8862270	6.11698	19.112
VAL34	400	5.05177	3.092595	2.2376462	27.30375	61.218
VAL35	400	7.89495	11.665493	2.3922982	173.44352	147.559
VAL36	400	0.62560	0.000000	0.625600	0.62560	0.000
VAL37	400	0.85124	0.137743	0.5447206	1.52332	16.185
VAL38	400	1.47839	0.343864	0.5746012	4.07644	36.729
VAL39	400	2.56368	1.650773	0.5583743	13.70334	72.136
VAL40	400	3.15785	10.3114754	0.5441358	152.84118	199.982
VAL41	400	0.51210	0.000000	0.5121000	0.51210	0.000
VAL42	400	0.89117	0.288707	0.2932697	2.43011	41.831
VAL43	400	0.87310	0.452471	0.2537030	3.18474	51.823
VAL44	400	1.17875	0.309105	0.2215807	8.64601	77.111
VAL45	400	1.95295	4.163785	0.1467853	67.15552	213.216
VAL46	400	9.14251	0.000000	9.1925100	9.19251	0.000
VAL47	400	17.06324	8.324005	7.8840287	39.31920	48.783
VAL48	400	21.78338	13.167636	6.7906409	63.95365	60.512
VAL49	400	24.52565	16.155925	5.8802260	88.75985	65.874
VAL50	400	21.22773	13.552570	4.9801343	86.34999	63.844
VAL51	400	221.75323	0.000000	221.7582600	221.75520	0.000
VAL52	400	121.85293	63.012522	43.4865503	240.93793	51.713
VAL53	400	85.32279	78.879659	9.6347508	261.72932	92.470
VAL54	400	85.30277	78.879659	9.6347508	261.78732	92.470
VAL55	400	85.30279	78.879659	9.6347508	261.74932	92.470

TABLE D-2. CHARACTERISTICS OF THE DISTRIBUTIONS OF OUTPUT VALUES:
RUNS WITH NONZERO CORRELATIONS (Continued)

(See Appendix C for definition of VALs)

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	C.V. *
VAL56	400	22.68994	12.550471	0.9108284	45.85155	55.316
VAL57	400	43.72483	24.508021	1.7114005	124.13494	56.188
VAL58	400	89.97725	75.754215	0.8465233	542.89676	84.173
VAL59	400	162.22991	189.798480	1.0975234	1688.91624	116.994
VAL60	400	320.35504	555.788447	1.6399796	6842.09613	173.553
VAL61	400	0.000000	0.000000	0.000000	0.000000	.
VAL62	400	0.000000	0.000000	0.000000	0.000000	1420.371
VAL63	400	0.175000	0.493067	0.000000	8.13339	281.614
VAL64	400	1.23938	13.659407	0.000000	271.82869	1019.830
VAL65	400	4.74494	43.312215	0.000000	855.07348	912.043
VAL66	400	0.000000	0.000000	0.000000	0.000000	.
VAL67	400	26.80383	42.343719	0.3315465	262.04648	157.976
VAL68	400	52.15596	84.426983	0.2593494	582.78310	161.840
VAL69	400	96.36377	151.936562	0.1522760	888.42943	157.670
VAL70	400	177.10374	248.578653	0.1048651	1259.57758	140.358
VAL71	400	118.79200	0.000000	118.790000	118.79000	0.000
VAL72	400	159.00518	53.778744	61.9288269	346.82519	33.823
VAL73	400	199.44224	143.310456	37.1698259	825.79983	71.856
VAL74	400	166.37223	94.448440	0.000000	489.12516	56.769
VAL75	400	114.02189	78.484950	0.000000	367.44698	68.433
VAL76	400	41.36202	0.000000	41.362020	41.36202	0.000
VAL77	400	46.47517	18.169077	16.7486237	127.59537	39.324
VAL78	400	105.25033	66.226655	22.6785434	489.93990	64.811
VAL79	400	134.24229	91.529021	0.000000	681.83119	68.183
VAL80	400	96.55900	85.656538	0.000000	654.66671	86.908
VAL81	400	77.51000	0.000000	75.510000	75.51000	0.000
VAL82	400	116.02371	74.443004	0.000000	492.04202	64.184
VAL83	400	215.72002	268.567564	0.000000	2313.74249	124.717
VAL84	400	445.08906	837.692632	0.000000	4170.73317	181.458
VAL85	400	805.15193	1515.918003	0.000000	14589.16788	184.277
VAL86	400	6.47560	5.886531	0.000000	25.25575	90.903
VAL87	400	14.09354	20.061325	0.000000	155.09034	142.445
VAL88	400	40.94337	51.312228	0.000000	579.60241	149.727
VAL89	400	79.63960	161.099737	0.000000	1949.79982	204.800
VAL90	400	283.97145	757.045750	0.000000	8976.87281	266.592
VAL91	400	0.03915	0.130167	0.000000	1.12080	332.453
VAL92	400	0.42897	1.162945	0.000000	9.04069	271.100
VAL93	400	15.13419	45.639340	0.000000	509.52418	300.374
VAL94	400	53.03402	194.107939	0.000000	1780.99376	366.000
VAL95	400	196.01143	887.317904	0.000000	12555.09038	452.687

*Coefficient of Variation.

OTHER DETAILED RESULTS

Tables D-3 through D-20 give relatively detailed characteristics of the distributions of output saved in the Monte Carlo analysis, including the moments of the distributions and various percentile values. Each table contains the SAS output for the case where zero correlation among outputs is assumed and where a set of hypothesized nonzero correlations are assumed.

TABLE D-5. SECONDARY ENERGY DEMAND, 2000-2075

(Exajoules)

Nonzero Correlation Case

Nonzero Correlation Case

1000
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Zero Correlation Case

Nonzero Correlation Case

**TABLE D-7. GLOBAL POPULATION
(Millions)**

Zero Correlation Case

Nonzero Correlation Case

1000
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TABLE D-8. WORLD PRICE OF CRUDE OIL
(1975 U.S. dollars/gigajoule)

Zero Correlation Case

Nonzero Correlation Case

[illegible]

TABLE D-9. WORLD PRICE OF GAS
(1975 U.S. dollars/gigajoule)

Zero Correlation Case

Nonzero Correlation Case

VARIABLE=VAL37									
MOMENTS					QUANTILESIDEF=41				
N	400	SUM WGTs	400		100% MAX	1.40777	99%	0.92093	
MEAN	0.005201	SUM	348.08		75% Q3	0.005277	95%	1.17423	
STD DEV	0.104389	VARIANCE	0.010895		50% MED	0.005277	90%	1.00513	
SKEWNESS	0.104389	KURTOSIS	3.28067		25% Q1	0.74307	10%	0.90227	
U33	0.104389	C33	0.005277		OR MIN	0.330495	5%	0.00227	
U55	0.104389	C55	0.005277		RANGE	1.14928	1%	0.00227	
T1MEAN=0	0.005201	STD MEAN	0.005277		Q3-Q1	0.20573			
SCN NAME	0.005201	PROB>111	0.0001		MODE	0.330495			
RUN = 0	400	PROB>111	0.0001		CARBON MODEL				3110
UNIVARIATE									
MOMENTS					QUANTILESIDEF=41				
N	400	SUM WGTs	400		100% MAX	7.07579	99%	0.01050	
MEAN	1.00707	SUM	348.08		75% Q3	1.00707	95%	1.29103	
STD DEV	0.104389	VARIANCE	0.010895		50% MED	1.00707	90%	1.00513	
SKEWNESS	0.104389	KURTOSIS	3.28067		25% Q1	1.00707	10%	0.90227	
U33	0.104389	C33	0.005277		OR MIN	0.330495	5%	0.00227	
U55	0.104389	C55	0.005277		RANGE	6.31409	1%	0.00227	
T1MEAN=0	0.005201	STD MEAN	0.005277		Q3-Q1	0.67658			
SCN NAME	0.005201	PROB>111	0.0001		MODE	0.330495			
RUN = 0	400	PROB>111	0.0001		CARBON MODEL				3110
UNIVARIATE									
MOMENTS					QUANTILESIDEF=41				
N	400	SUM WGTs	400		100% MAX	30.0071	99%	21.7222	
MEAN	1.00707	SUM	348.08		75% Q3	1.00707	95%	1.00513	
STD DEV	0.104389	VARIANCE	0.010895		50% MED	1.00707	90%	1.00513	
SKEWNESS	0.104389	KURTOSIS	3.28067		25% Q1	1.00707	10%	0.90227	
U33	0.104389	C33	0.005277		OR MIN	0.330495	5%	0.00227	
U55	0.104389	C55	0.005277		RANGE	29.3243	1%	0.00227	
T1MEAN=0	0.005201	STD MEAN	0.005277		Q3-Q1	0.67658			
SCN NAME	0.005201	PROB>111	0.0001		MODE	0.330495			
RUN = 0	400	PROB>111	0.0001		CARBON MODEL				3110
UNIVARIATE									
MOMENTS					QUANTILESIDEF=41				
N	400	SUM WGTs	400		100% MAX	170.1109	99%	107.1007	
MEAN	0.005201	SUM	348.08		75% Q3	1.00707	95%	1.00513	
STD DEV	0.104389	VARIANCE	0.010895		50% MED	1.00707	90%	1.00513	
SKEWNESS	0.104389	KURTOSIS	3.28067		25% Q1	1.00707	10%	0.90227	
U33	0.104389	C33	0.005277		OR MIN	0.330495	5%	0.00227	
U55	0.104389	C55	0.005277		RANGE	169.103	1%	0.00227	
T1MEAN=0	0.005201	STD MEAN	0.005277		Q3-Q1	0.67658			
SCN NAME	0.005201	PROB>111	0.0001		MODE	0.330495			
RUN = 0	400	PROB>111	0.0001		CARBON MODEL				3110

VARIABLE=VAL37									
MOMENTS					QUANTILESIDEF=41				
N	400	SUM WGTs	400		100% MAX	1.52332	99%	1.26623	
MEAN	0.005201	SUM	348.08		75% Q3	0.005277	95%	1.00513	
STD DEV	0.104389	VARIANCE	0.010895		50% MED	0.005277	90%	1.00513	
SKEWNESS	0.104389	KURTOSIS	3.28067		25% Q1	0.74307	10%	0.90227	
U33	0.104389	C33	0.005277		OR MIN	0.330495	5%	0.00227	
U55	0.104389	C55	0.005277		RANGE	1.14928	1%	0.00227	
T1MEAN=0	0.005201	STD MEAN	0.005277		Q3-Q1	0.20573			
SCN NAME	0.005201	PROB>111	0.0001		MODE	0.330495			
RUN = 0	400	PROB>111	0.0001		CARBON MODEL				10158 3
UNIVARIATE									
MOMENTS					QUANTILESIDEF=41				
N	400	SUM WGTs	400		100% MAX	0.07604	99%	3.26666	
MEAN	1.00707	SUM	348.08		75% Q3	1.00707	95%	2.17727	
STD DEV	0.104389	VARIANCE	0.010895		50% MED	1.00707	90%	1.00513	
SKEWNESS	0.104389	KURTOSIS	3.28067		25% Q1	1.00707	10%	0.90227	
U33	0.104389	C33	0.005277		OR MIN	0.330495	5%	0.00227	
U55	0.104389	C55	0.005277		RANGE	6.31409	1%	0.00227	
T1MEAN=0	0.005201	STD MEAN	0.005277		Q3-Q1	0.67658			
SCN NAME	0.005201	PROB>111	0.0001		MODE	0.330495			
RUN = 0	400	PROB>111	0.0001		CARBON MODEL				10158 2
UNIVARIATE									
MOMENTS					QUANTILESIDEF=41				
N	400	SUM WGTs	400		100% MAX	15.7033	99%	0.00227	
MEAN	1.00707	SUM	348.08		75% Q3	1.00707	95%	0.00513	
STD DEV	0.104389	VARIANCE	0.010895		50% MED	1.00707	90%	0.00513	
SKEWNESS	0.104389	KURTOSIS	3.28067		25% Q1	1.00707	10%	0.90227	
U33	0.104389	C33	0.005277		OR MIN	0.330495	5%	0.00227	
U55	0.104389	C55	0.005277		RANGE	14.696	1%	0.00227	
T1MEAN=0	0.005201	STD MEAN	0.005277		Q3-Q1	0.67658			
SCN NAME	0.005201	PROB>111	0.0001		MODE	0.330495			
RUN = 0	400	PROB>111	0.0001		CARBON MODEL				10158 1
UNIVARIATE									
MOMENTS					QUANTILESIDEF=41				
N	400	SUM WGTs	400		100% MAX	132.001	99%	17.3917	
MEAN	0.005201	SUM	348.08		75% Q3	1.00707	95%	1.00513	
STD DEV	0.104389	VARIANCE	0.010895		50% MED	1.00707	90%	1.00513	
SKEWNESS	0.104389	KURTOSIS	3.28067		25% Q1	1.00707	10%	0.90227	
U33	0.104389	C33	0.005277		OR MIN	0.330495	5%	0.00227	
U55	0.104389	C55	0.005277		RANGE	131.001	1%	0.00227	
T1MEAN=0	0.005201	STD MEAN	0.005277		Q3-Q1	0.67658			
SCN NAME	0.005201	PROB>111	0.0001		MODE	0.330495			
RUN = 0	400	PROB>111	0.0001		CARBON MODEL				10158 4

D-14

Nonzero Correlation Case

[illegible]

Nonzero Correlation Case

[illegible]

TABLE D-12. COSTS OF SOLAR GENERATED ELECTRICITY
(1975 U.S. dollars/gigajoule)

Zero Correlation Case

VARIABLE=VAL32		MOMENTS		QUANTILESDEF=Q1		QUANTILESDEF=Q1	
MEAN	121.453	400	239.421	100% MAX	240.930	99%	239.421
S10 DEV	510.000	400	239.421	75% Q3	181.400	95%	239.421
VARIANCE	261.000	400	239.421	50% MED	100.000	50%	239.421
CURIOSITY	0.000000	400	239.421	25% Q1	40.000	25%	239.421
C55 MEAN	510.000	400	239.421	0% MIN	0.000	0%	239.421
S10 MEAN	510.000	400	239.421	RANGE	181.400	RANGE	239.421
PROB>10	0.000000	400	239.421	MODE	100.000	MODE	100.000
SUM NAME	510.000	400	239.421	CARBON	100.000	CARBON	100.000
NUM % 0	0.000000	400	239.421	MODEL	100.000	MODEL	100.000
UNIVARIATE							
VARIABLE=VAL33							
MOMENTS							
MEAN	121.453	400	239.421	100% MAX	240.930	99%	239.421
S10 DEV	510.000	400	239.421	75% Q3	181.400	95%	239.421
VARIANCE	261.000	400	239.421	50% MED	100.000	50%	239.421
CURIOSITY	0.000000	400	239.421	25% Q1	40.000	25%	239.421
C55 MEAN	510.000	400	239.421	0% MIN	0.000	0%	239.421
S10 MEAN	510.000	400	239.421	RANGE	181.400	RANGE	239.421
PROB>10	0.000000	400	239.421	MODE	100.000	MODE	100.000
SUM NAME	510.000	400	239.421	CARBON	100.000	CARBON	100.000
NUM % 0	0.000000	400	239.421	MODEL	100.000	MODEL	100.000
UNIVARIATE							
VARIABLE=VAL34							
MOMENTS							
MEAN	121.453	400	239.421	100% MAX	240.930	99%	239.421
S10 DEV	510.000	400	239.421	75% Q3	181.400	95%	239.421
VARIANCE	261.000	400	239.421	50% MED	100.000	50%	239.421
CURIOSITY	0.000000	400	239.421	25% Q1	40.000	25%	239.421
C55 MEAN	510.000	400	239.421	0% MIN	0.000	0%	239.421
S10 MEAN	510.000	400	239.421	RANGE	181.400	RANGE	239.421
PROB>10	0.000000	400	239.421	MODE	100.000	MODE	100.000
SUM NAME	510.000	400	239.421	CARBON	100.000	CARBON	100.000
NUM % 0	0.000000	400	239.421	MODEL	100.000	MODEL	100.000
UNIVARIATE							
VARIABLE=VAL35							
MOMENTS							
MEAN	121.453	400	239.421	100% MAX	240.930	99%	239.421
S10 DEV	510.000	400	239.421	75% Q3	181.400	95%	239.421
VARIANCE	261.000	400	239.421	50% MED	100.000	50%	239.421
CURIOSITY	0.000000	400	239.421	25% Q1	40.000	25%	239.421
C55 MEAN	510.000	400	239.421	0% MIN	0.000	0%	239.421
S10 MEAN	510.000	400	239.421	RANGE	181.400	RANGE	239.421
PROB>10	0.000000	400	239.421	MODE	100.000	MODE	100.000
SUM NAME	510.000	400	239.421	CARBON	100.000	CARBON	100.000
 		

Nonzero Correlation Case

(exajoules of electricity output)

Nonzero Correlation Case

[illegible]

TABLE D-14. GLOBAL SHALE OIL PRODUCTION, 2000-2075
(exajoules)

Zero Correlation Case

Nonzero Correlation Case

UNIVARIATE									
VARIABLE-VALUES		MOMENTS		QUANTILES(DEF=4)		VARIABLE-VALUES		MOMENTS	
MEAN	1.0000	SUM MGTS	400	1000 MAX	1.0000	SUM MGTS	400	1000 MAX	1.0000
SID DEV	0.0000	VARIANCE	0.0000	1000 MEAN	0.0000	VARIANCE	0.0000	1000 MEAN	0.0000
SKEWNESS	0.0000	KURTOSIS	0.0000	1000 STD	0.0000	KURTOSIS	0.0000	1000 STD	0.0000
COV	0.0000	CSS	0.0000	1000 MIN	0.0000	CSS	0.0000	1000 MIN	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	RANGE	0.0000	1000 MEAN	0.0000	RANGE	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODE	0.0000	1000 STD	0.0000	MODE	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.0000	MODC	0.0000
1000 MAX	0.0000	1000 MAX	0.0000	MODC	0.0000	1000 MAX	0.0000	MODC	0.0000
1000 MEAN	0.0000	1000 MEAN	0.0000	MODC	0.0000	1000 MEAN	0.0000	MODC	0.0000
1000 STD	0.0000	1000 STD	0.0000	MODC	0.0000	1000 STD	0.0000	MODC	0.0000
1000 MIN	0.0000	1000 MIN	0.0000	MODC	0.0000	1000 MIN	0.		

TABLE D-15. GLOBAL BIOMASS
(exajoules of solids)

Nonzero Correlation Case

[illegible]

(exajoules)

Zero Correlation Case

[illegible]

Nonzero Correlation Case

100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
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TABLE D-18. GLOBAL COAL PRODUCTION, 2000-2075

(exajoules)

Nonzero Correlation Case

Zero Correlation Case

[illegible]

TABLE D-19. GLOBAL NUCLEAR PRODUCTION, 2000-2075

(exajoules of primary equivalent)

Zero Correlation Case

Nonzero Correlation Case

[illegible]

TABLE D-20. GLOBAL SOLAR ELECTRIC PRODUCTION, 2000-2075
(exajoules of electrical output)

Zero Correlation Case

Nonzero Correlation Case

VARIABLE=VAL92	MOMENTS	QUANTILESDEF=Q1	QUANTILESDEF=Q1
1000 MAX	420	11.1021	0.00000
750 Q3	180.422	0.18304	0.00000
500 Q1	132.241	0.00000	0.00000
250 MED	110.000	0.00000	0.00000
0 MIN	0.00000	0.00000	0.00000
RANGE	11.1021	0.00000	0.00000
Q1-Q3	0.18304	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
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CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
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MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	180.422	0.00000	0.00000
VARIANCE	132.241	0.00000	0.00000
COV	110.000	0.00000	0.00000
STD DEV	11.1021	0.00000	0.00000
CI5	0.18304	0.00000	0.00000
CI3	0.00000	0.00000	0.00000
CI1	0.00000	0.00000	0.00000
MEAN	0.00000	0.00000	0.00000
MODE	0.00000	0.00000	0.00000
CARSON MODEL	0.00000	0.00000	0.00000
UNIVARIATE	0.00000	0.00000	0.00000
SUM MCTS	420	0.00000	0.00000
SUM	1		

APPENDIX E

MONTE CARLO TECHNIQUES

APPENDIX E
MONTE CARLO TECHNIQUES

This appendix describes in technical detail the Monte Carlo techniques used in the uncertainty analysis. It documents the choice of Latin Hypercube sampling and the methodology employed to attribute output variability to input uncertainty.

Monte Carlo Methods

A variety of techniques have been developed to determine the dependence of predictions of simulation models on inputs, initial conditions, and parameters. It is important to select from these techniques the ones most appropriate for the particular model and question(s) being examined (Gardner, in press). Monte Carlo methods were judged appropriate in this case because the simulations of the model are relatively inexpensive and because recent improvements have drastically improved both efficiency and precision of the Monte Carlo technique (Gardner et al. 1983; Iman et al. 1980).

The analysis of the emissions model was performed with PRISM (Gardner et al. 1983), a computer program specially written to perform Monte Carlo simulations for the estimation of sensitivity indices and the analysis of model uncertainties. The techniques used in PRISM are quite general and have been successfully used on a variety of models (e.g., Bartell et al. 1983, Hoffman and Gardner 1983). PRISM draws samples from the frequency distributions for model parameters, and uses them as model inputs to generate results which are saved for later analysis. This process is repeated until an adequate sample of model parameters and corresponding predictions has been collected. All results are then analyzed to determine the uncertainty of the predictions due to variations in the parameters.

Simple random sampling of parameter values has been shown to be less efficient than systematic methods (McGrath et al., 1975; Iman et al., 1980). Latin Hypercube sampling (McKay et al., 1979; Iman et al., 1980) appears to be the most efficient systematic sampling method where efficiency is defined as the minimum number of samples necessary to adequately represent the probability distribution of each model parameter. The practical result of applying Latin Hypercube methods is that approximately 10 times fewer samples than simple random sampling are needed (e.g., approximately a 10-fold reduction in computer costs associated with the analysis).

The Latin Hypercube method used by PRISM has two important advantages over other systematic sampling methods. First, because all parameter values are generated before model simulations are begun, the properties of the whole series of parameter sets can be numerically examined to ensure that they meet the criteria specified in the input file. Second, any parameter may be correlated with another no matter what distribution it is drawn from.

The method of generating parameter values begins by specifying N , the number of parameter sets. The upper and lower limits of each parameter are then determined and the width of the interval within which a single sample will lie is specified as $w_i = (u_i - l_i)/N$, where u_i is the upper limit and l_i is the lower limit of parameter i . To make the procedure as general as possible the upper and lower limits are expressed as cumulative probabilities ($P(u_i)$ and $P(l_i)$, respectively). When $P(l_i) = 0$ and $P(u_i) = 1$ then the equation simplifies to $w_i = 1/N$. Thus the range of all possible parameter values is segmented into lengths of equal probability density of

1/N. This ensures, particularly when N is not very large, that the entire range of each parameter will be evenly sampled and the distribution of each parameter will be better represented with fewer samples. The next step is to ensure that each of the N segments will be randomly associated with the N segments of the other NP-1 parameters, where NP is the number of parameters to be randomly varied. This is accomplished in PRISM by drawing N by NP samples of normal random numbers and ranking each NP vector from 1 (smallest) to N (largest). The resulting N by NP matrix of ranks (r_{ij} 's) is, in fact, a table of random associations of N segments for NP parameters. Because the IMSL (1980) routines used to generate the normal random numbers allow the specification of a variance/covariance matrix, the NP parameter vectors can be independently selected and correlated. These correlations of the ranks of the parameter values are the same as the Spearman Rank Correlation Coefficient (Conover 1971). The final transformation of ranks to actual parameter values does not alter these rank correlations. Thus, on input, a correlation specified between any two parameters will represent a correlation of the ranks of the final output values.

A technique suggested by Iman and Conover (1982) has been used in PRISM to insure that the covariance relationships in the N by NP matrix of ranks are as close as possible to the values specified in the input file. This procedure numerically removes spurious correlations due to the random sampling process. For instance, when 200 sets of 32 parameters were generated by PRISM without numerical correction there were 91 correlations (out of 595 possible correlations) with an absolute value greater than 0.1, with the highest correlation equal to 0.21. After this matrix was numerically adjusted there were no correlations greater than 0.04 (Gardner et al., 1983). This feature is important in the analysis stage because it

assures that statistical relationships between parameters and model responses will not be influenced by random artifacts. The final step of PRISM involves selecting a random probability, p_{ij} , within each w_i segment, transforming the p_{ij} 's through the inverse probability distributions to obtain the actual parameter values (f_{ij}). If r_{ij} is the j th segment number for the i th parameter, then p_{ij} , the cumulative probability, is

$$p_{ij} = r_{ij} w_i - (w_i v)$$

where v is a uniform random number distributed from 0.0 to 1.0 (calculated by URAND, Forsyth et al. 1977).

Transformation of the p_{ij} to the final parameter value, f_{ij} , is made by means of the inverse cumulative density functions (icdf) which mathematically maps the probability of occurrence (p_{ij}) into the realized parameter value (f_{ij}). The form of the icdf is specified for each parameter in the input to PRISM. If the distribution is uniform then the final value is obtained by

$$f_{ij} = p_{ij} (u_i - l_i) + l_i$$

where u_i and l_i are the upper and lower values of the i th parameter. If the distribution of parameter i is normal then $p(u_i)$ and $p(l_i)$, the probability of the upper and lower limits respectively, are calculated by calls to IMSL routine MDNOR. The w_i is adjusted to these limits by

$$w_i = (p(u_i) - p(l_i))/N$$

and the p_{ij} is calculated as in the uniform method. The final transformation of p_{ij} into f_{ij} , is made by a call to the inverse normal distribution (IMSL routine MDNRIS) with the result multiplied by the standard deviation and added to the mean for the i th parameter. Generation of values from other distributions is accomplished by the use of the appropriate inverse probability function (see Gardner et al., 1983 for further details).

Attribution of Uncertainty to Input Uncertainty

Many methods have been developed to measure the sensitivity of model predictions to changes in model parameters or input values (Gardner, in press; Rose and Swartzman, 1981). A general approach for the analysis of relationships between model parameters and predictions has been recently developed (Gardner, 1984).

If a single parameter, f , of a model is randomly varied from a pre-specified probability distribution, then the slope, B , of the regression of y , the model prediction, on f is the least squares estimate of S , the classical sensitivity index. It can be shown that B is an exact estimate of S if the parameter perturbations are very small (Gardner et al., 1981). If several parameters are independently varied, then the multiple regression of y on all the f 's simultaneously estimates all the parameter sensitivities (e.g., the B 's associated with each parameter). The adequacy of this method of estimating linear relationships between model predictions and parameters can be evaluated by inspection of R^2 , the ratio of regression sum of squares to total sum of squares. If R^2 is nearly 1.0, then linear methods are adequate to describe the relationship between parameters and predictions. The divergence of R^2 from 1.0 indicates that nonlinear effects and interactions between parameters are important.

This same multiple regression equation also provides the necessary information for forming a useful uncertainty index (Dowing et al., submitted). The contribution of each parameter to the regression sum of squares (i.e., the amount of the variability of y explained by a particular parameter) divided by the total sum of squares forms an index, U ,

representing the variability of the model prediction explained by each parameter. The values of U range from 0.0 to 1.0, allowing a comparison between parameters. Note that the indices S and B are not normalized, being expressed in units of y and f .

These indices, produced by a single method, provide a parsimonious description of model sensitivities and uncertainties. The adequacy of each index can be determined by comparison between them and by inspection of the R^2 statistic. This approach can be extended to the multivariate situation where several model predictions and their relationships to model parameters are to be simultaneously considered (see Gardner et al., 1984).

APPENDIX F

THE IEA/ORAU LONG-TERM GLOBAL ENERGY
ECONOMIC MODEL SOFTWARE

APPENDIX F

THE IEA/ORAU LONG-TERM GLOBAL ENERGY ECONOMIC MODEL SOFTWARE

This appendix contains a complete listing of the software and data base used to generate the Monte Carlo analysis:

1. Fortran code for the IEA/ORAU Long-Term Global Energy Economic Model: lines 1-5147
2. Fortran code linking the model to the PRISM Monte Carlo software: lines 5148-5768.
3. Fortran code for the PRISM Monte Carlo software: lines 5769-6164.
4. Data set: median inputs to the IEA/ORAU model: lines 6165-7031
5. Data set: Monte Carlo data set: lines 7032-7110.
6. Shadow output for the Monte Carlo data set: lines 7032-7136.35.
7. SAS Monte Carlo analysis code: lines 7137-7453.


```

1.5 //AZTCOM2 JOB (24392,1025),'BRENKERT BLOC 1505',TIME=(50,00)
2.5 //ROUTE XEO WHENEVER
3.5 //JDRPARM LINES=60
4.5 //EXEC PGM=TEHPRG4
5.5 //SYSPRINT DD SYSOUT=A
6.5 //DD2 DD UNIT=3330-1,VOLUME=SER=ENVSCI,DISP=OLD
7.5 //SYSIN DD *
8.5 SCRATCH DSN=ENVSCI.AZT24382.CUCO,VOL=3330-1=ENVSCI
9.5 UNCATLG DSN=ENVSCI.AZT24382.CUCO
10.5 //EXEC SPDASCR
11.5 //SYSIN DD *
12.5 T.AZT24382.NCCO
13.5 //
14.5 //* EXEC FORTHCLG.PARM.CO='EU--1',
15.5 REGION.CO=1024K
16.5 //FORT.SYSPRINT DD DUMMY
17.5 //* FROM EDMONDS MODEL
18.5 //FORT.SYSIN DD *
19.5
20.5
21.5
22.5
23.5
24.5
25.5
26.5
27.5
28.5
29.5
30.5
31.5
32.5
33.5
34.5
35.5
36.5
37.5
38.5
39.5
40.5
41.5
42.5
43.5
44.5
45.5
46.5
47.5
48.5
49.5
50.5
51.5
52.5
53.5
54.5

```

THIS PROGRAM USES A MODIFIED LATIN HYPERCUBE SAMPLING SCHEME. THE PRINCIPLE FEATURES ARE AS THOSE DESCRIBED IN INMAN, R.L. ET AL. 1980. LATIN HYPERCUBE SAMPLING, (PROGRAM USER'S GUIDE). SANDIA LABORATORIES, SAND79-1473. THE MODIFICATIONS INCLUDE:

1. ALL DISTRIBUTIONS MAY INCLUDE MAXIMA AND MINIMA
2. ALL DISTRIBUTIONS MAY BE RANK CORRELATED
3. SELECTED SAMPLES ARE POST ADJUSTED AS SUGGESTED BY INMAN AND CONOVER (IN PRESS)
4. PEARSON DISTRIBUTIONS POSSIBLE

PROGRAM DEVELOPED BY R. H. GARDNER, 23 MAY 1983

USING OTHER INPUT PARAMETERS:
CHANGE SUBROUTINE TRANSF
AND # PNAME IN BLOCKDATA

USING OTHER OUTPUT VALUES:
CHANGE SUBROUTINE TRANSV AND CHECK NOPT'S

USING OTHER DISTRIBUTION TYPES OR STANDARD DEVS:
CHANGE SUBROUTINE MINMAX

CHANGING # PARAMETERS OR # ITERATIONS:
CHANGE MONTE CARLO VARIABLE DIMENSIONS
AND INPUT NP AND NITER

CHECK SUBROUTINE DUTSAS

WHEN CHANGES ARE MADE CHECK SAS

```

50.5 C** BLOCK DATA
51.5 C
52.5 BLOCK DATA
53.5 COMMON/BLKR/N,ISEED,NP,MAXNP,MAXN
54.5 COMMON/BLKNAM /PNAME(100)
COMMON/BLKD/XLOG,XNORM,TRAIG,UNFM,CNST,BLNK,
EPER,BETA,SEGM,FOLD,GAM

```

```

55. COMMON/BLKI/PNAM(100),PMU(100),SD(100),PMIN(100),PMAX(100),
56. &PNID(100),DIST(100),RUI(100),B2(100)
57. COMMON/BLSLAT/PM(79,5),SEG(79,5),NPM
58.
59. DATA PNAM/100*'/,DIST/100*'/
60. DATA XLOG/'L',XNORM/'N',TRAIG/'T',UNFM/'U',CNST/'C'/
61. DATA BLNK/'',PER/'P',BETA/'B',SEG/'S',FOLD7/'F',GAM/'G'/
62. DATA PNAME/'P1','P2','P3','P4','P5','P6','P7','P8',
63. &'P9','P10','P11','P12','P13','P14','P15','P16','P17','P18',
64. &'P19','P20','P21','P22','P23','P24','P25','P26','P27','P28',
65. &'P29','P30','P31','P32','P33','P34','P35','P36','P37','P38',
66. &'P39','P40','P41','P42','P43','P44','P45','P46','P47','P48',
67. &'P49','P50','P51','P52','P53','P54','P55','P56','P57','P58',
68. &'P59','P60','P61','P62','P63','P64','P65','P66','P67','P68',
69. &'P69','P70','P71','P72','P73','P74','P75','P76','P77','P78',
70. &'P79','P80'/'
71. DATA MAXNP/100/,MAXN/400/
72. END
73.
74.
75.
76.
77. C** MAIN
78. C**
79. COMMON/BLXR/NITER,ISEED,NP,MAXNP,MAXN
80.
81. C
82. I=0
83. IFLAG=0
84. CALL CARBON(I,IFLAG)
85. CALL TRANSV(I)
86. CALL OUTSAS(I)
87. CALL MINMAX
88.
89. C INITIATE RANDOM NUMBER GENERATOR BY LATIN HYPERCUBE
90. CALL LATIN
91.
92. C DO CALCULATION NITER TIMES
93. DO 20 NR=379,382
94. IFLAG=0
95. PRINT 1000,NR
96. 1000. FORMAT(' ',XXNSIM ',I4)
97. CALL LATGO(NR)
98. CALL TRANSF(NR)
99. CALL CARBON(NR,IFLAG)
100. IF(IFLAG.NE.0) GOTO 20
101. CALL TRANSV(NR)
102. CALL OUTSAS(NR)
103. 20 CONTINUE
104. STOP
105. END
106.
107. C
108. C*****
109. C***** THE IEA GLOBAL CO(2) ANALYTICAL FRAMEWORK *****
110. C*****
111. C
112. SUBROUTINE CARBON(NSIM,IFLAG)
113.

```

```

110. *****
111. ***** THE IEA GLOBAL CO(2) ANALYTICAL FRAMEWORK *****
112. *****
113.
114.
115.
116.
117.
118.
119.
120.
121. ***** START MAIN PROGRAM ***** START MAIN PROGRAM *****
122. *****
123.
124. MAKE ALL REAL VARIABLES DOUBLE PRECISION
125.
126. IMPLICIT REAL*8 (A-H,O-Z); INTEGER (I-N)
127.
128. C COMMON BLOCKS
129. C
130. COMMON/RE/BSJKLW(4,3,9,6),RPJT(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
131. &RYJK(4,3),RYK(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
132. COMMON/REP/BSL(9),BPKL(3,9),BSUILM(6,9,6),GNP(9,6),GNPLM(10,6),
133. &GNPBL(9),HJJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(3),RPKL(3,9),
134. &PHYDRO(9),RUI(5),RYL(9),SJKL(4,3,9),TEST,TRI(3),
135. &TXILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
136. COMMON/REVX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
137. &OLDPI(3),DX(3),NAGN,NFAIL,NTIMES
138. COMMON/RES/DESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
139. &BSCIL(2,9),CIL(5,9),CSLT(4,3),ESRLM(6),ESR2M(6),
140. &ESILM(3,9,6),ESIL2M(3,9,6),ESRLM(6,9,6),
141. &FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
142. COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
143. &PTM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
144. &PUILM(6,9,6),TKL(3,9),NUB
145. COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
146. &EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
147. &FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
148. &SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSH(4,2,2),
149. COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
150. &EDIM(6,6),EDKC(4,9),EDLM(9,6),EDKM(6),EDKKM(6),
151. &EDRM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKL(4,9,6),EDRLM(9,6),
152. &EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
153. &EPCLM(10,5),EPGLM(10,6),
154. COMMON/OUT2/ESM(6),ESIM(6,6),ESCH(9,6),ESRM(6),ESRM(6,6),
155. &ESILM(6,6),ESL2M(6,6),ESLM(9,6),ESL2M(9,6),ESRLM(9,6),
156. &ESUM(6),ESUIM(6,6),ESUILM(6,9,6),
157. &ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
158. &GRPFLM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
159. &SYNLM(6,9,6),SYNLH(9,6)
160. COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NKL(9)
161. &NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NC02,NOPT(10),IDUNIT,
162. &NSTEP,NPUNT
163. COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
164. &COZIM(8,6),COZLM(9,6),COZM(6)
165. COMMON/RS/OISLM(3,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
166. &RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
167. C
167.1 COMMON/BLKYAL/VALUES(95)
167.2 COMMON/BLKRAM/PARMT(79)

```

```

147.3      COMMON/TEM/TPIN(3,6)
147.4      REAL*4 PART
148.      C
149.      C
150.      C
151.      C
152.      C
153.      C
154.      C
155.      C
156.      C
157.      C
158.      C
159.      C
160.      C
161.      C
162.      C
163.      C
164.      C
165.      C
166.      C
167.      C
168.      C
169.      C
170.      C
171.      C
172.      C
173.      C
174.      C
175.      C
176.      C
177.      C
178.      C
179.      C
180.      C
181.      C
182.      C
183.      C
184.      C
185.      C
186.      C
187.      C
188.      C
189.      C
190.      C
191.      C
192.      C
193.      C
194.      C
195.      C
196.      C
197.      C
198.      C
199.      C
200.      C
201.      C
202.      C
203.      C
204.      C
205.      C
206.      C
207.      C
208.      C
209.      C
210.      C
211.      C
212.      C

COMMON/TEM/TPIN(3,6)
REAL*4 PART

CALL DATA INPUT SUBROUTINES

MDUMP=1
IF(NSIM.EQ.0) CALL NSET(NSIM)
IF(NSIM.EQ.0) CALL OREAD(NSIM)
IF(NSIM.GT.0) GO TO 3
DO 7 II=1,3
DO 8 MMM=1,6
TPIN(II,MMM)=PIM(II,MMM)
CONTINUE
CONTINUE
CONTINUE
DO 2 II=1,3
DO 4 MMM=1,6
PIM(II,MMM)=TPIN(II,MMM)
CONTINUE
CONTINUE

READ CALLS SUBROUTINE TRANSF TO TRANSFER
READ IN PARAMETERS TO COMMON/BLKRAN

MXHOLD=MAXAGN

*****
***  ITERATE OVER NM PERIODS  ***
*****
DO 30 N=1,NM
NUB=0

INITIALIZE EXPORT/IMPORT VARIABLES
DO 10 L=1,NL
DO 5 I=1,NMKT
XIL(I,L)=0.00
CONTINUE
CONTINUE
NAGN=0
NTIMES=0
CONTINUE
100

CALL THE WORLD ENERGY MODEL

CALL PPPP
CALL PSPS
CALL SSSS
CALL DDDD

IN THE FIRST PERIOD PRINT OUT
BASE RUN RESULTS

IF(M.EQ.1) GO TO 20

TEST FOR CONVERGENCE

```

```

213. C -----
214. CALL XXXX
215. C *****
216. C IF THE SEARCH ROUTINE NEARS ITS ITERATION LIMIT, PRINT THE
217. C INTERMEDIATE OUTPUT
218. C
219. C IF(NAGN.LT.MAXAGN) GOTO 15
220. C IF(MDUMP.EQ.2) MDUMP=3
221. C IF(MDUMP.EQ.1) MDUMP=2
222. C IF(MDUMP.EQ.3) MDUMP=1
223. C NOPT(3)=2
224. C NOPT(4)=2
225. C
226. C IF ITERATION LIMIT REACHED, PRINT THE ABANDONMENT MESSAGE
227. C
228. C WRITE(6,1000) MAXAGN
229. C 1000 FORMAT(1H0,'NO EQUILIBRIUM AFTER',I4,'TRIES--ABANDONING RUN.
230. C WRITE(6,1002)
231. C 1002 FORMAT(1X,'NO EQUILIBRIUM REACHED, THIS RUN ABANDONED')
232. C IF(MDUMP.EQ.2) GOTO 3
233. C
234. C 1003 NOPT(3)=1
235. C NOPT(4)=1
236. C PRINT 18,VALUES
237. C PRINT 9,PARMT
238. C 9 FORMAT(1,'PARMT:',5G12.6)
239. C CALL TRANSV(NSIM)
240. C PRINT 18,VALUES
241. C 18 FORMAT(1,'VALUES:',5G12.6)
242. C WRITE(29) PARMT,VALUES
243. C IFLAG=1
244. C RETURN
245. C *****
246. C
247. C 15 CONTINUE
248. C
249. C IF THE CONVERGENCE PROCESS IS INCOMPLETE
250. C RUN THE MODEL AGAIN
251. C
252. C IF(NFAIL.EQ.1) GO TO 100
253. C
254. C 20 CONTINUE
255. C
256. C SUMMARIZE RESULTS
257. C
258. C CALL POST
259. C
260. C ENERGY PRODUCTION AND USE REPORT OPTIONS FOR PERIOD M
261. C
262. C IF ((NOPT(5).EQ.1) .AND. (NOPT(6).EQ.1)) GO TO 21
263. C IF(NSIM.EQ.0) CALL OUTPUT(NSIM)
264. C
265. C ENERGY PRICE REPORT OPTION FOR PERIOD M
266. C
267. C 21 IF (NOPT(7).EQ.1) GO TO 22
268. C CALL PRICES(NSIM)
269. C

```

```

265.      22 CALL C02(NSIM)
266.      30 CONTINUE
267.      C
268.      C
269.      C
270.      IF(NOPT(9) .EQ. 1) GO TO 35
271.      CALL MTARL(NSIM)
272.      35 CONTINUE
273.      C
274.      RETURN
275.      END
276.      C*****
277.      C
278.      C
279.      C
280.      C
281.      C
282.      C
283.      C
284.      C
285.      C
286.      C
287.      C
288.      C
289.      C
290.      C
291.      C
292.      C
293.      C
294.      C
295.      C
296.      C
297.      C
298.      C
299.      C
300.      C
301.      C
302.      C
303.      C
304.      C
305.      C
306.      C
307.      C
308.      C
309.      C
310.      C
311.      C
312.      C
313.      C
314.      C
315.      C
316.      C
317.      C
318.      C
319.      C
320.      C
321.      C
322.      C
323.      C
324.      C
325.      C
326.      C
327.      C
328.      C
329.      C
330.      C
331.      C
332.      C
333.      C
334.      C
335.      C
336.      C
337.      C

```

CALL C02(NSIM)
 CONTINUE
 OUTPUT OPTION CONTROL FOR THE SUMMARY TABLES
 IF(NOPT(9) .EQ. 1) GO TO 35
 CALL MTARL(NSIM)
 CONTINUE
 RETURN
 END

 SUBROUTINE NSET(NSIM)

 — THE PROGRAM CONTROL PARAMETER SUBROUTINE —
 THIS SUBROUTINE SETS VALUES FOR THE PROGRAM CONTROL PARAMETERS.
 MODEL VERSION: A.07.31.84
 INTEGER OUTPUTS: MAXAGN, NCO2, NF, NFF, NI, NIG, NIM, NI*, NIS, NJ,
 NJUMP, NKKL, NKL, NKMAX, NKKMAX, NL, NMREAD, NMKT,
 NOPT, NU
 REAL OUTPUT: TEST
 SUBROUTINES CALLED: NONE
 CODED BY:
 JAE EDMONDS
 1 JANUARY 1982
 LATEST REVISION:
 8 JULY 1984

 MAKE ALL REAL VARIABLES DOUBLE PRECISION
 IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
 COMMON BLOCKS
 COMMON/RE/BSJKLH(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
 &RYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
 COMMON/REPN/RPSL(9),BPKL(3,9),BSUJLM(6,9,6),GNP(9,6),GNPLM(10,6)
 &GNPRL(9),HIJ(3),HJI(4),HJK(4,3),HJIL(6,9),ZL(9),RPKL(3,9),
 &PHYDRD(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
 &TXJLM(3,9,6),TXJLM(4,9,6),XIL(3,9)
 COMMON/REVX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VTJ(3,3),XI(3),OLDXI(3)
 &OLDPI(3),DX(3),NAGN,NFAIL,NTIMES
 COMMON/RFS/BESTLM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
 &BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR2M(6),
 &ESILM(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
 &FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
 COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
 &PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
 &PUJLM(6,9,6),TKL(3,9),NUB
 COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),

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338. & EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
339. & FJL(4,9),GCI(2),GII(3),GUI(5),HYDRO(5,9),PILM(6,9,6),PROL(9),
340. & SCIL(3,9),SUIL(5,9),TESIL(9),YLM(9,6),BIOLM(9,2),BINPSM(4,2,2),
341. COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CCVM(6),EDM(6),
342. & EDIM(6,6),EDKL(4,9),EDL(9,6),EDRM(6),EDRKM(6),
343. & EDKIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDKKLM(4,9,6),EDRLM(9,6),
344. & EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
345. & EPCLM(10,6),EPGLM(10,6)
346. COMMON/OUT2/ESM(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
347. & ESIM(6,6),ESI2M(6,6),ESLM(9,6),ESL2M(9,6),ESKLM(9,6),
348. & ESUM(6),ESUIM(6,6),ESUIM(6,9,6),
349. & ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
350. & GNPFM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
351. & SYNLM(6,9,6),SYNLM(9,6)
352. COMMON/PCP/NF,NFF,NZ,NIG,NIM,NIP,NTS,NNIS,NJ,NJUMP,NKKL(9),NKLC
353. & NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NCQZ,NOPT(10),IUNIT,
354. & NSTEP,NPUNT
355. COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
356. & CDZIM(8,6),CDZLM(9,6),CDZM(6)
357. COMMON/RS/OISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
358. & RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
359. LOCAL VARIABLES: A, A1, A2, IUNIT, JUNIT, R
360.
361. C
362. C
363. C
364. C
365. DATA R(1)/4HUSA /, R(2)/4H /, R(3)/4H /,
366. & R(4)/4HCANA/, R(5)/4HDA E/, R(6)/4H EUR/,
367. & R(7)/4HOECD/, R(8)/4H PAC/, R(9)/4HIFIC/,
368. & R(10)/4HUSSR/, R(11)/4H/E. /, R(12)/4HEUR./,
369. & R(13)/4HCHIN/, R(14)/4HA/ET/, R(15)/4H.AL./,
370. DATA R(16)/4HMIDD/, R(17)/4HLE E/, R(18)/4HAST /,
371. & R(19)/4HAFRI/, R(20)/4HCA /, R(21)/4H /,
372. & R(22)/4HLATI/, R(23)/4HNA M/, R(24)/4HER /,
373. & R(25)/4HS.EE/, R(26)/4H. AS/, R(27)/4HIA /
374. C
375. C
376. C
377. C
378. C
379. C
380. C
381. C
382. C
383. C
384. C
385. C
386. C
387. C
388. C
389. C
390. C
391. C
392. C
393. C
394. C
395. C
396. C
397. C

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        INTEGER R(27)

        DIMENSION A(20),A1(7),A2(7)

        DATA R(1)/4HUSA /, R(2)/4H /, R(3)/4H /,
& R(4)/4HCANA/, R(5)/4HDA E/, R(6)/4H EUR/,
& R(7)/4HOECD/, R(8)/4H PAC/, R(9)/4HIFIC/,
& R(10)/4HUSSR/, R(11)/4H/E. /, R(12)/4HEUR./,
& R(13)/4HCHIN/, R(14)/4HA/ET/, R(15)/4H.AL./,
DATA R(16)/4HMIDD/, R(17)/4HLE E/, R(18)/4HAST /,
& R(19)/4HAFRI/, R(20)/4HCA /, R(21)/4H /,
& R(22)/4HLATI/, R(23)/4HNA M/, R(24)/4HER /,
& R(25)/4HS.EE/, R(26)/4H. AS/, R(27)/4HIA /

        SET INPUT VARIABLE VALUE

        JUNIT=5

        READ IN THE OUTPUT UNIT NUMBER (6=TERMINAL OR PRINTER; 9 OR 9
        CAN BE USED FOR DISK OUTPUT; AND 10 IS USED FOR TAPE OUTPUT)

        READ (JUNIT,1100) A1,IUNIT
        IUNIT=IUNIT
        WRITE(IUNIT,2101) A1,IUNIT

        ! READ IN THE OUTPUT OPTIONS !

        DO 1 KK=1,6
          READ (JUNIT,3000) A
          WRITE(IUNIT,4000) A
1 CONTINUE

        DO 3 IL=1,10,2
          IM=IL+1
          DO 2 KK=1,3

```

```

398.          READ (JUNIT,3000)  A
399.          WRITE(IUNIT,4000)  A
400.      2      CONTINUE
401.          READ (JUNIT,1200)    A1,NOPT(1L),A2,NOPT(1M)
402.          WRITE(IUNIT,2200)    A1,NOPT(1L),A2,NOPT(1M)
403.      3      CONTINUE
404.
405.      C-----
406.      C READ IN THE NUMBER OF TIME PERIODS
407.      C-----
408.
409.      DO 4 KK=1,3
410.          READ (JUNIT,3000)  A
411.          WRITE(IUNIT,4000)  A
412.      4      CONTINUE
413.
414.      C
415.          READ (JUNIT,1100)  A1,NM
416.          WRITE(IUNIT,2101)  A1,NM
417.
418.      C
419.      C SET THE EXCESS DEMAND LIMIT
420.      C TEST = .0047D0
421.
422.      C
423.      C SET PARAMETER VALUES
424.
425.          MAXAGN= 75
426.          NCO2  = 8
427.          NF    = 3
428.          NFF   = 2
429.          NI    = 6
430.          NIG   = 5
431.          NI4   = 2
432.          NIP   = 4
433.          NIS   = 4
434.          NNIS  = 5
435.          NJ    = 4
436.          NJUMP = 25
437.          NKMAX = 3
438.          NKKMAX= NKMAX+1
439.          NL    = 9
440.          NMREAD= 6
441.          NMKT  = 3
442.          NU    = 5
443.          DO 10 L=1,NL
444.              NKL(L)=1
445.              IF (L.LE. 3) NKL(L)=3
446.              NKKL(L)=NKL(L)+1
447.          10      CONTINUE
448.
449.      C
450.      C -- OUTPUT OPTION CONTROL
451.      C
452.          IF(NOPT(1) .EQ. 1) GO TO 110
453.
454.      C-----
455.      C -- PRINT THE PROGRAM CONTROL PARAMETERS --
456.      C-----
457.          WRITE(IUNIT,2000)

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453. WRITE(IUNIT,2010)
454. WRITE(IUNIT,2020) NFF
455. WRITE(IUNIT,2030) NF
456. WRITE(IUNIT,2040) NI
457. WRITE(IUNIT,2045) NIG
458. WRITE(IUNIT,2150) NIM
459. WRITE(IUNIT,2160) NIP
460. WRITE(IUNIT,2165) NIS
461. WRITE(IUNIT,2166) NNIS
462. WRITE(IUNIT,2050) NJ
463. WRITE(IUNIT,2060) NJUMP
464. WRITE(IUNIT,2070) NKMAX
465. WRITE(IUNIT,2080) NKKMAX
466. WRITE(IUNIT,2090) NL
467. WRITE(IUNIT,2100) NM
468. WRITE(IUNIT,2105) NMPEAD
469. WRITE(IUNIT,2140) NMKT
470. WRITE(IUNIT,2110) NU
471. WRITE(IUNIT,2170) NCO2
472. WRITE(IUNIT,2180) MAXAGN
473. WRITE(IUNIT,2190) TEST
474. WRITE(IUNIT,2120)
475. DO 100 L=1,NL
476. LA=1+3*(L-1)
477. LB=LA+2
478. WRITE(IUNIT,2130) (R(LL),LL=LA,LB),NKL(L),NKKL(L)
479.
480. 100 CONTINUE
481.
482. C
483. 1100 FORMAT (7A4,I2)
484. 1200 FORMAT (2(7A4,I2))
485. 2000 FORMAT(1H1,////1X,27X,'PROGRAM CONTROL PARAMETERS')
486. 2010 FORMAT(1H0,23X,'--INITIALIZED IN SUBROUTINE NSET--',//)
487. 2020 FORMAT(1X,'NFF'=' , I3, 5X, 'NUMBER OF SYNFUELS')
488. 2030 FORMAT(1X,'NF'=' , I3, 5X, 'NUMBER OF FOSSIL FUELS')
489. 2040 FORMAT(1X,'NI'=' , I3, 5X, 'NUMBER OF PRIMARY ENERGY TYPES')
490. 2045 FORMAT(1X,'NIG'=' , I3, 5X, 'NUMBER OF RESOURCE GRADES FOR FOS
491. &L FUELS AND URANIUM')
492. 2050 FORMAT(1X,'NJ'=' , I3, 5X, 'NUMBER OF SECONDARY ENERGY TYPES')
493. 2060 FORMAT(1X,'NJUMP'=' , I3, 5X, 'NUMBER OF YEARS BETWEEN PERIODS')
494. 2070 FORMAT(1X,'NKMAX'=' , I3, 5X, 'MAXIMUM NUMBER OF END-USE SECTORS
495. 2080 FORMAT(1X,'NKKMAX'=' , I3, 5X, 'MAXIMUM NUMBER OF END-USE SECTORS
496. &LUS UTILITIES')
497. 2090 FORMAT(1X,'NL'=' , I3, 5X, 'NUMBER OF REGIONS')
498. 2100 FORMAT(1X,'NM'=' , I3, 5X, 'NUMBER OF FORECAST PERIODS')
499. 2101 FORMAT(1X,7A4,I2)
500. 2105 FORMAT(1X,'NMREAD'=' , I3, 5X, 'NUMBER OF PERIODS READ IN INPUT')
501. 2110 FORMAT(1X,'NU'=' , I3, 5X, 'NUMBER OF COMPETING FUELS IN ELEC
502. &IC GENERATION')
503. 2120 FORMAT(1H0,29X,'END USE SECTORS' /
504. &1H0,'REGION',9X,'FINAL DEMAND SECTORS',3X,'PLUS UTILITIES')
505. 2130 FORMAT(1X,3A4,14X,I1,18X,I1)
506. 2140 FORMAT(1X,'NMKT'=' , I3, 5X, 'NUMBER OF INTERNATIONAL MARKETS')
507. 2150 FORMAT(1X,'NIM'=' , I3, 5X, 'NUMBER OF BIOMASS TYPES')
508. 2160 FORMAT(1X,'NIP'=' , I3, 5X, 'NUMBER OF BIOMASS SUPPLY SCHEDULE
509. &EGMENTS')
510. 2165 FORMAT(1X,'NIS'=' , I3, 5X, 'NUMBER OF RESOURCE CONSTRAINED FU
511. &S')
512. 2166 FORMAT(1X,'NNIS'=' , I3, 5X, 'NIS PLUS ONE FOR NUCLEAR POWER')
513. 2170 FORMAT(1X,'NCO2'=' , I3, 5X, 'NUMBER OF CO2 EMISSION CATEGORIES
514. 2180 FORMAT(1X,'MAXAGN'=' , I3, 5X, 'MAXIMUM NUMBER OF ITERATIONS PER
515.
516.
517.

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518.      6R100')
519.      2100 FORMAT(1X, 'TEST =', F6.4, 2X, 'CONVERGENCE TEST VALUE')
520.      2200 FORMAT(1X, 2(7A4,12))
521.      3000 FORMAT(20A4)
522.      4000 FORMAT(1X,20A4)
523. C
524. C 110 CONTINUE
525. C
526. C      RETURN
527. C      END
528. C *****
529. C
530. C      SUBROUTINE DREAD(INSI4)
531. C *****
532. C
533. C      -- DATA INPUT MODULE --
534. C
535. C      THIS SUBROUTINE READS AND PRINTS EXOGENOUS INPUT DATA AND PARAMET
536. C      VALUES IN THE FOLLOWING ORDER:
537. C
538. C      PIM,TRI      STISL      BSJKLM
539. C      NXIL,TXILM,TXJLM  BESIL      RPKK,RPJK
540. C      ZL,ZLM      ESFILM      RPK,RPJ
541. C      PROLM,GNPBL      FLRL      RYKK,RYJK
542. C      GIJ,HJJ      HYDRO      RYJ,RYKLT
543. C      GUI,HUIL,RUI      CILT (SOLAR)      RY
544. C      PAUL      HCILT      COI
545. C      RSUIM      GCI,RCI      SBURNL,SHALE
546. C      TJKLM      GJK,GJ      SFEDIL
547. C      RIGISL      HJK,HJ      BIOPSM
548. C      CIGIS      SJKLP,BSKL      BIDL
549. C      VISL      RYSH
550. C      DILSET
551. C      RIL
552. C
553. C      MODEL VERSION:  A.07.31.84
554. C
555. C      SUBROUTINES CALLED:  NONE
556. C
557. C      CODED BY:  JAE EDMONDS
558. C      COMPLETED: 1 JANUARY 1982
559. C
560. C
561. C
562. C
563. C
564. C
565. C
566. C
567. C
568. C
569. C
570. C
571. C
572. C
573. C
574. C
575. C
576. C
577. C

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LATEST REVISION BY: DAN WAHL
 ON 3. NOVEMBER 1982
 PURPOSE: ADDED VARIABLES BBESIL
 RSYIL, AND RYSHT.

REVISED BY: JAE EDMONDS
 6 JANUARY 1984
 PURPOSE: MAJOR MODEL REVISION
 1) REPLACE GNP WITH PROL
 AND CHANGE ZLM TO READ
 IN AS ABSOLUTE POPULATION
 AND REMOVE ZL

8 JULY 1984
 VARIABLES DELETED ARE :
 AIL, BIL, DIL, RESIL,
 EASTIM, CILT, RIL,
 BESIL, DILSET
 VARIABLES ADDED ARE:
 RIGISL, CIGIS, VISL,

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*****
DILSET, RIL, STISL,
BESIL, ESFILM
*****
MAKE ALL REAL VARIABLES DOUBLE PRECISION
      IMPLICIT REAL*8 (A-H,O-Z),   INTEGER (I-N)

COMMON BLOCKS

COMMON/RE/RSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
&PYJK(4,3),RYXL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
COMMON/REP/BSL(9),RPKL(3,9),BSUILM(6,9,6),GNP(9,6),GNPLM(10,
&GNPBL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(4),RPKL(3,9),
&PHYDKO(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
&TXILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
COMMON/REX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(
&OLDPI(3),DX(3),NAGN,NFAIL,NTIMES
COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
&BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR2M(6),
&ESILM(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
&FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
&PIM(3,6),PJLM(4,9,6),PKLM(3,9,6),
&PUILM(6,9,6),TKL(3,9),NUB
COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
&EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
&FJL(4,9),GCII(2),GIJ(3),GUT(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
&SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(4,2),BIOPSM(4,2,2)
COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
&EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
&EDRIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKL(4,9),EFLM(9,6),
&EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
&EPCLM(10,6),EPGLM(10,6)
COMMON/OUT2/ESM(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
&ESILM(6,6),ESI2M(6,6),ESLIM(9,6),ESL2M(9,6),ESRLM(9,6),
&ESUM(6),ESUIM(6,6),ESUILM(6,9,6),
&ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
&GNPFLM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
&SYNLM(6,9,6),SYNLM(9,6)
COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NHIS,NJ,NJUMP,NKKL(9),NKL
&NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NC02,NOPT(10),IDUNIT
&NSTEP,NPUNT
COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
&CO2IM(8,6),CO2LM(9,6),CO2M(6)
COMMON/RS/QISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
&RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
-- DECLARE CHARACTER VARIABLES --

      DIMENSION  A(20),NOTES(5),ANOTE(12),NOTE2(5)

1000  FORMAT (6F10.0,5A4)
1010  FORMAT (3I10,7A4)
1020  FORMAT (4F10.0,7A4)
1026  FORMAT (6F10.0,5A4)
1030  FORMAT (5F10.0,7A4)
1031  FORMAT (7F9.0,2A4)
1040  FORMAT (2F10.0,5A4)
1045  FORMAT (2(5A4,F6.2,4X))

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033. 1060 FORMAT (3F10.0,7A4)
034. 1070 FORMAT (6F10.0,5A4)
040. 1080 FORMAT (F10.0,5A4,50X)
041. 1090 FORMAT (F10.0,40X,7A4)
042. 1095 FORMAT (7F10.0,2A4)
043. 1100 FORMAT (20A4)
044. 2000 FORMAT (1X,6F10.4,5A4)
045. 2005 FORMAT (1X,6(F8.2,2X),5A4)
046. 2010 FORMAT (1X,3I10,7A4)
047. 2020 FORMAT (1X,4F10.2,7A4)
048. 2025 FORMAT (1X,4(F8.4,2X),7A4)
049. 2026 FORMAT (1X,6(F8.4,2X),5A4)
050. 2030 FORMAT (1X,5F10.4,7A4)
051. 2031 FORMAT (1X,6F9.2,F9.4,2A4)
052. 2032 FORMAT (1X,7F9.0,2A4)
053. 2033 FORMAT (1X,5F10.0,7A4)
054. 2034 FORMAT (1X,5F10.2,7A4)
055. 2040 FORMAT (1X,F10.3,F10.0,7A4)
056. 2042 FORMAT (1X,2(F8.2,2X),7A4)
057. 2045 FORMAT (1X,2(5A4,F6.2,4X))
058. 2060 FORMAT (1X,3F10.4,7A4,20X)
059. 2070 FORMAT (1X,6F10.0,5A4)
060. 2080 FORMAT (1X,F10.4,5A4)
061. 2090 FORMAT (1X,F10.4,40X,7A4)
062. 2095 FORMAT (1X,7F10.2,2A4)
063. 2100 FORMAT (1X,20A4)
064. 2105 FORMAT ('1')
065. C
066. C SET MODEL VERSION NUMBER
067. C MVRSN = 2
068. C
069. C -----
070. C -- INITIALIZE I/O UNIT VALUES --
071. C -----
072. C
073. C IUNIT=5
074. C JUNIT=IUNIT
075. C
076. C IF (NOPT(2)-1) 1,2,1
077. C 1 WRITE(JUNIT,2105)
078. C 2 CONTINUE
079. C
080. C -----
081. C -- READ IN ENERGY PRICE PARAMETERS -----
082. C -----
083. C
084. C DO 4 KK=1,12
085. C READ (IUNIT,1100) A
086. C IF (NOPT(2)-1) 3,4,3
087. C 3 WRITE(JUNIT,2100) A
088. C 4 CONTINUE
089. C
090. C READ (IUNIT,1050) (TRI(I),I=1,NF),NOTES
091. C IF (NOPT(2)-1) 5,6,5
092. C 5 WRITE(JUNIT,2060) (TRI(I),I=1,NF),NOTES
093. C
094. C 6 DO 8 M=1,NMREAD
095. C READ (IUNIT,1060) (PIH(I,M),I=1,NF),NOTES
096. C IF (NOPT(2)-1) 7,8,7
097. C 7 WRITE(JUNIT,2060) (PIH(I,M),I=1,NF),NOTES

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      8 CONTINUE
      -----
      -- READ IN TRADE BARRIER COEFFICIENTS --
      -----

      DO 34 KK=1,3
        READ (IUNIT,1100) A
        IF (NOPT(2)-1) 33,34,33
33      WRITE(JUNIT,2100) A
34 CONTINUE

      C
      DO 35 I=1,NF
        DO 36 KK=1,3
          READ (IUNIT,1100) A
          IF (NOPT(2)-1) 31,36,31
31      WRITE(JUNIT,2100) A
36 CONTINUE
        DO 37 L=1,NL
          READ (IUNIT,1026) (TXILM(I,L,M),M=1,NMREAD),NOTES
          IF (NOPT(2)-1) 32,37,32
32      WRITE(JUNIT,2026) (TXILM(I,L,M),M=1,NMREAD),NOTES
37 CONTINUE
35 CONTINUE

      C
      -----
      -- READ IN FINAL CONSUMPTION TAXES --
      -----

      DO 38 KK=1,3
        READ (IUNIT,1100) A
        IF (NOPT(2)-1) 28,38,28
28      WRITE(JUNIT,2100) A
38 CONTINUE

      C
      DO 41 J=1,NJ
        DO 39 KK=1,3
          READ (IUNIT,1100) A
          IF (NOPT(2)-1) 29,39,29
29      WRITE(JUNIT,2100) A
39 CONTINUE
        DO 40 L=1,NL
          READ (IUNIT,1026) (TXJLM(J,L,M),M=1,NMREAD),NOTES
          IF (NOPT(2)-1) 27,40,27
27      WRITE(JUNIT,2026) (TXJLM(J,L,M),M=1,NMREAD),NOTES
40 CONTINUE
41 CONTINUE

      C
      -----
      -- READ IN POPULATION DATA (ZLM) --
      -----

      DO 45 KK=1,7
        READ (IUNIT,1100) A
        IF (NOPT(2).EQ. 1) GO TO 45
        WRITE(JUNIT,2100) A
45 CONTINUE

      C
      DO 50 L=1,NL
        READ (IUNIT,1031) ZL(L),(ZLM(L,M),M=1,NMREAD),ANOTE
        IF (NOPT(2).EQ. 1) GO TO 50
        WRITE(JUNIT,2032) ZL(L),(ZLM(L,M),M=1,NMREAD),ANOTE

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755.      50 CONTINUE
756.      C
757.      DO 55 KK=1,8
758.          READ (IUNIT,1100) A
759.          IF (NOPT(2).EQ. 1) GO TO 55
760.          WRITE(JUNIT,2100) A
761.      55 CONTINUE
762.      C
763.      C
764.      C
765.      C
766.      C
767.      C
768.      C
769.      C
770.      DO 60 L=1,NL
771.          READ (IUNIT,1040) PROL(L),GNPBL(L),NOTES
772.          IF (NOPT(2).EQ. 1) GO TO 60
773.          WRITE(JUNIT,2040) PROL(L),GNPBL(L),NOTES
774.      60 CONTINUE
775.      C
776.      C
777.      C
778.      C
779.      C
780.      C
781.      C
782.      C
783.      C
784.      C
785.      C
786.      C
787.      C
788.      C
789.      C
790.      C
791.      C
792.      C
793.      C
794.      C
795.      C
796.      C
797.      C
798.      C
799.      C
800.      C
801.      C
802.      C
803.      C
804.      C
805.      C
806.      C
807.      C
808.      C
809.      C
810.      C
811.      C
812.      C
813.      C
814.      C
815.      C
816.      C
817.      C

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50 CONTINUE
 DO 55 KK=1,8
 READ (IUNIT,1100) A
 IF (NOPT(2).EQ. 1) GO TO 55
 WRITE(JUNIT,2100) A
 55 CONTINUE

 READ IN LABOR PRODUCTIVITY GROWTH AND
 BASE LEVEL OF GNP

 DO 60 L=1,NL
 READ (IUNIT,1040) PROL(L),GNPBL(L),NOTES
 IF (NOPT(2).EQ. 1) GO TO 60
 WRITE(JUNIT,2040) PROL(L),GNPBL(L),NOTES
 60 CONTINUE

 READ IN REFINERY COEFFICIENTS AND BASE SECONDARY ENERGY PRICES

 DO 110 KK=1,11
 READ (IUNIT,1100) A
 IF (NOPT(2)-1) 105,110,105
 105 WRITE(JUNIT,2100) A
 110 CONTINUE
 C
 READ (IUNIT,1000) (GIJ(I),HIJ(I),I=1,NF),NOTES
 IF (NOPT(2)-1) 115,111,115
 115 WRITE(JUNIT,2000) (GIJ(I),HIJ(I),I=1,NF),NOTES
 C

 READ IN ELECTRIC POWER GENERATION COEFFICIENTS

 111 DO 119 KK=1,13
 READ (IUNIT,1100) A
 IF (NOPT(2)-1) 118,119,118
 119 WRITE(JUNIT,2100) A
 119 CONTINUE
 C
 READ (IUNIT,1000) (GUI(I),I=1,NI),NOTES
 IF (NOPT(2)-1) 116,117,116
 116 WRITE(JUNIT,2000) (GUI(I),I=1,NI),NOTES
 117 DO 120 L=1,NL
 READ (IUNIT,1000) (HUIL(I,L),I=1,NI),NOTES
 IF (NOPT(2)-1) 133,120,133
 133 WRITE(JUNIT,2000) (HUIL(I,L),I=1,NI),NOTES
 120 CONTINUE
 READ (IUNIT,1030) (RUI(I),I=1,NU),NOTES
 IF (NOPT(2)-1) 131,132,131
 131 WRITE(JUNIT,2030) (RUI(I),I=1,NU),NOTES
 C

 READ IN ELECTRIC UTILITY BASE PRICE DATA

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010. 132 DO 121 KK=1,3
014.   READ (IUNIT,1100) A
020.   IF (NOPT(2)-1) 134,121,134
021. 134 WRITE(JUNIT,2100) A
022. 121 CONTINUE
023. C
024.   DO 122 L=1,NL
025.   READ (IUNIT,1060) (PAUIL(I,L),I=1,NF),NOTES
026.   IF (NOPT(2)-1) 135,122,135
027. 135 WRITE(JUNIT,2060) (PAUIL(I,L),I=1,NF),NOTES
028. 122 CONTINUE
029. C
030. C
031. C
032. C
033. C
034.   DO 125 M=1,NMREAD
035.   DO 123 KK=1,6
036.   READ (IUNIT,1100) A
037.   IF (NOPT(2)-1) 136,123,136
038. 136 WRITE(JUNIT,2100) A
039. 123 CONTINUE
040. C
041.   DO 124 L=1,NL
042.   READ (IUNIT,1030) (BSUILM(I,L,M),I=1,NU),NOTES
043.   IF (NOPT(2)-1) 137,124,137
044. 137 WRITE(JUNIT,2030) (BSUILM(I,L,M),I=1,NU),NOTES
045. 124 CONTINUE
046. 125 CONTINUE
047. C
048. C
049. C
050. C
051. C
052. C
053. C
054. C
055.   DO 130 KK=1,3
056.   READ (IUNIT,1100) A
057.   IF (NOPT(2)-1) 139,130,139
058. 139 WRITE(JUNIT,2100) A
059. 130 CONTINUE
060. C
061.   DO 160 L=1,3
062.   NK=NKL(L)
063.   READ (IUNIT,1060) (TKL(K,L),K=1,NK),NOTES
064.   IF (NOPT(2)-1) 150,160,150
065. 150 WRITE(JUNIT,2060) (TKL(K,L),K=1,NK),NOTES
066. 160 CONTINUE
067. C
068.   DO 180 KK=1,3
069.   READ (IUNIT,1100) A
070.   IF (NOPT(2)-1) 179,180,179
071. 179 WRITE(JUNIT,2100) A
072. 180 CONTINUE
073. C
074.   DO 190 L=4,NL
075.   NK=NKL(L)
076.   READ (IUNIT,1080) (TKL(K,L),K=1,NK),NOTES
077.   IF (NOPT(2)-1) 189,190,189
078. 189 WRITE(JUNIT,2080) (TKL(K,L),K=1,NK),NOTES

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-- READ IN FUEL SHARE WEIGHTS BY PERIOD, FUEL AND REGION --

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-- READ TKL--RATE OF END-USE ENERGY EFFICIENCY IMPROVEMENT
-- BY SECTOR AND REGION --

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190 CONTINUE
-----
      READ RIGISL--RESOURCE BASE AMOUNTS

DO 700 KK=1,4
  READ (IUNIT,1100) A
  IF (NOPT(2).EQ.1) GO TO 700
  WRITE(JUNIT,2100) A
700 CONTINUE

DO 710 IG=1,NIG
  DO 712 KK=1,4
    READ (IUNIT,1100) A
    IF (NOPT(2).EQ.1) GO TO 712
    WRITE(JUNIT,2100) A
  712 CONTINUE
  DO 714 L=1,NL
    READ (IUNIT,1030) (RIGISL(IG,IS,L),IS=1,NNIS),NOTES
    IF (NOPT(2).EQ.1) GO TO 714
    WRITE(JUNIT,2033) (RIGISL(IG,IS,L),IS=1,NNIS),NOTES
  714 CONTINUE
710 CONTINUE

      READ CIGIS--EXTRACTION COST AMOUNTS

DO 720 KK=1,8
  READ (IUNIT,1100) A
  IF (NOPT(2).EQ.1) GO TO 720
  WRITE(JUNIT,2100) A
720 CONTINUE

  NNIG=NIG+1
  DO 722 IG=1,NNIG
    READ (IUNIT,1030) (CIGIS(IG,IS),IS=1,NNIS),NOTES
    IF (NOPT(2).EQ.1) GO TO 722
    WRITE(JUNIT,2034) (CIGIS(IG,IS),IS=1,NNIS),NOTES
  722 CONTINUE

      READ--VISL ENVIRONMENTAL COST AMOUNTS

DO 730 KK=1,6
  READ (IUNIT,1100) A
  IF (NOPT(2).EQ.1) GO TO 730
  WRITE(JUNIT,2100) A
730 CONTINUE

  DO 734 L=1,NL
    READ (IUNIT,1030) (VISL(IS,L),IS=1,NNIS),NOTES
    IF (NOPT(2).EQ.1) GO TO 734
    WRITE(JUNIT,2034) (VISL(IS,L),IS=1,NNIS),NOTES
  734 CONTINUE

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938. 750 CONTINUE
939. C
940. C
941. C
942. C
943. C
944. DO 752 KK=1,6
945. READ (IUNIT,1100) A
946. IF (NOPT(2).EQ.1) GO TO 752
947. WRITE(JUNIT,2100) A
948. 752 CONTINUE
949. C
950. C
951. DO 754 L=1,NL
952. READ (IUNIT,1020) (RIL(IS,L),IS=1,NIS),NOTES
953. IF (NOPT(2).EQ.1) GO TO 754
954. WRITE(JUNIT,2020) (RIL(IS,L),IS=1,NIS),NOTES
955. 754 CONTINUE
956. C
957. C
958. C
959. C
960. C
961. DO 758 KK=1,7
962. READ (IUNIT,1100) A
963. IF (NOPT(2).EQ.1) GO TO 758
964. WRITE(JUNIT,2100) A
965. 758 CONTINUE
966. C
967. DO 760 L=1,NL
968. READ (IUNIT,1030) (STISL(IS,L),IS=1,NNIS),NOTES
969. IF (NOPT(2).EQ.1) GO TO 760
970. WRITE(JUNIT,2030) (STISL(IS,L),IS=1,NNIS),NOTES
971. 760 CONTINUE
972. C
973. C
974. C
975. C
976. DO 768 KK=1,7
977. READ (IUNIT,1100) A
978. IF (NOPT(2).EQ.1) GO TO 768
979. WRITE(JUNIT,2100) A
980. 768 CONTINUE
981. C
982. DO 770 L=1,NL
983. READ (IUNIT,1030) (BESIL(IS,L),IS=1,NNIS),NOTES
984. IF (NOPT(2).EQ.1) GO TO 770
985. WRITE(JUNIT,2034) (BESIL(IS,L),IS=1,NNIS),NOTES
986. 770 CONTINUE
987. C
988. C
989. C
990. C
991. READ ESFIL--INITIAL ENERGY SUPPLY ESTIMATES
992. DO 772 KK=1,10
993. READ (IUNIT,1100) A
994. IF (NOPT(2).EQ.1) GO TO 772
995. WRITE(JUNIT,2100) A
996. 772 CONTINUE
997. C
DO 778 L=1,NL

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998.          READ (IUNIT,1030) (ESFIL(IS,L),IS=1,NNIS),NOTES
999.          IF (NOPT(2).EQ.1) GO TO 778
1000.         WRITE(JUNIT,2030) (ESFIL(IS,L),IS=1,NNIS),NOTES
1001. 778 CONTINUE
1002. C
1003. C
1004. C ----- READ NATURAL GAS FLARING RATE PARAMETERS -----
1005. C
1006. C
1007.         DO 220 KK=1,8
1008.             READ (IUNIT,1100) A
1009.             IF (NOPT(2)-1) 219,220,219
1010.             WRITE(JUNIT,2100) A
1011. 219 CONTINUE
1012. C
1013.         DO 230 L=1,NL
1014.             READ (IUNIT,1060) (FLRL(II,L),II=1,3),NOTES,ANOTE
1015.             IF (NOPT(2)-1) 229,230,229
1016.             WRITE(JUNIT,2060) (FLRL(II,L),II=1,3),NOTES,ANOTE
1017. 229 CONTINUE
1018. C
1019. C ----- READ IN HYDROELECTRIC PARAMETERS BY REGION -----
1020. C
1021. C
1022. C
1023.         DO 240 KK=1,10
1024.             READ (IUNIT,1100) A
1025.             IF (NOPT(2)-1) 239,240,239
1026.             WRITE(JUNIT,2100) A
1027. 239 CONTINUE
1028. C
1029.         DO 250 L=1,NL
1030.             READ (IUNIT,1030) (HYDRO(I,L),I=1,5),NOTES,ANOTE
1031.             IF (NOPT(2)-1) 249,250,249
1032.             WRITE(JUNIT,2030) (HYDRO(I,L),I=1,5),NOTES,ANOTE
1033. 249 CONTINUE
1034. C
1035. C ----- READ SOLAR COST PARAMETERS -----
1036. C
1037. C
1038. C
1039.         DO 380 KK=1,7
1040.             READ (IUNIT,1100) A
1041.             IF (NOPT(2)-1) 379,380,379
1042.             WRITE(JUNIT,2100) A
1043. 379 CONTINUE
1044. C
1045.         DO 390 L=1,NL
1046.             READ (IUNIT,1060) (CSLT(L,NT),NT=1,3),NOTES
1047.             IF (NOPT(2)-1) 389,390,389
1048.             WRITE(JUNIT,2060) (CSLT(L,NT),NT=1,3),NOTES
1049. 389 CONTINUE
1050. C
1051. C ----- READ SYN FUEL ADD ON COSTS -----
1052. C
1053. C
1054. C
1055. C
1056.         DO 533 KK=1,11
1057.             READ (IUNIT,1100) A

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1058. IF (NOPT(2)-1) 372,533,372
1059. 372 WRITE(JUNIT,2100) A
1060. 533 CONTINUE
C
1061. DO 534 L=1,NL
1062. READ (IUNIT,1000) (HCILT(1,L,IT),IT=1,3),(HCILT(2,L,IT),IT=
1063. ,NOTES
1064. IF (NOPT(2)-1) 373,534,373
1065. 373 WRITE(JUNIT,2005) (HCILT(1,L,IT),IT=1,3),(HCILT(2,L,IT),IT=
1066. ,NOTES
1067. 534 CONTINUE
C
1068.
1069.
1070.
1071. -- READ SYNFUEL CONVERSION EFFICIENCY --
1072.
1073.
1074. READ (IUNIT,1100) A
1075. IF (NOPT(2)-1) 391,392,391
1076. 391 WRITE(JUNIT,2100) A
C
1077.
1078. 392 READ (IUNIT,1045) NOTES,GCI(1),NOTE2,GCI(2)
1079. IF (NOPT(2)-1) 393,394,393
1080. 393 WRITE(JUNIT,2045) NOTES,GCI(1),NOTE2,GCI(2)
C
1081.
1082.
1083. -- READ SYNFUEL ELASTICITY CONTROL PARAMETER --
1084.
1085.
1086. 394 READ (IUNIT,1045) NOTES,RCI(1),NOTE2,RCI(2)
1087. IF (NOPT(2)-1) 395,396,395
1088. 395 WRITE(JUNIT,2045) NOTES,RCI(1),NOTE2,RCI(2)
C
1089.
1090.
1091.
1092. -- READ ENERGY SERVICE INPUT-OUTPUT COEFFICIENTS --
1093.
1094.
1095. 396 DO 400 KK=1,9
1096. READ (IUNIT,1100) A
1097. IF (NOPT(2)-1) 399,400,399
1098. 399 WRITE(JUNIT,2100) A
1099. 400 CONTINUE
C
1100.
1101. DO 410 K=1,NF
1102. READ (IUNIT,1020) (GJK(J,K),J=1,NJ),NOTES,ANOTE
1103. IF (NOPT(2)-1) 409,410,409
1104. 409 WRITE(JUNIT,2025) (GJK(J,K),J=1,NJ),NOTES,ANOTE
1105. 410 CONTINUE
1106. READ (IUNIT,1020) (GJ(J),J=1,NJ),NOTES,ANOTE
1107. IF (NOPT(2)-1) 411,412,411
1108. 411 WRITE(JUNIT,2025) (GJ(J),J=1,NJ),NOTES,ANOTE
C
1109.
1110.
1111. -- READ NON-ENERGY INPUT-OUTPUT COEFFICIENTS --
1112.
1113.
1114. 412 DO 420 KK=1,6
1115. READ (IUNIT,1100) A
1116. IF (NOPT(2)-1) 419,420,419
1117. 419 WRITE(JUNIT,2100) A

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1118. 420 CONTINUE
1119. C
1120. DO 430 K=1,NF
1121. READ (IUNIT,1020) (HJK(J,K),J=1,NJ),NOTES,ANOTE
1122. IF (NOPT(2)-1) 429,430,429
1123. 429 WRITE(JUNIT,2025) (HJK(J,K),J=1,NJ),NOTES,ANOTE
1124. 430 CONTINUE
1125. READ (IUNIT,1020) (HJ(J),J=1,NJ),NOTES,ANOTE
1126. IF (NOPT(2)-1) 431,432,431
1127. 431 WRITE(JUNIT,2025) (HJ(J),J=1,NJ),NOTES,ANOTE
1128. C
1129. C
1130. C
1131. C
1132. C
1133. C
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1136. C
1137. C
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1174. C
1175. C
1176. C
1177. C

420 CONTINUE

DO 430 K=1,NF
  READ (IUNIT,1020) (HJK(J,K),J=1,NJ),NOTES,ANOTE
  IF (NOPT(2)-1) 429,430,429
429  WRITE(JUNIT,2025) (HJK(J,K),J=1,NJ),NOTES,ANOTE
430  CONTINUE
  READ (IUNIT,1020) (HJ(J),J=1,NJ),NOTES,ANOTE
  IF (NOPT(2)-1) 431,432,431
431  WRITE(JUNIT,2025) (HJ(J),J=1,NJ),NOTES,ANOTE

----- READ BASE ENERGY SERVICE CONSUMPTION SHARES -----

432 DO 440 KK=1,7
    READ (IUNIT,1100) A
    IF (NOPT(2)-1) 439,440,439
439  WRITE(JUNIT,2100) A
440  CONTINUE

C
DO 460 L=1,NL
  NK=NKL(L)
  DO 450 K=1,NK
    READ (IUNIT,1030) (SJKLP(J,K,L),J=1,NJ),BSKL(K,L),NOTES,A
    IF (NOPT(2)-1) 449,450,449
449  WRITE(JUNIT,2030) (SJKLP(J,K,L),J=1,NJ),BSKL(K,L),NOTES,A
450  CONTINUE
460  CONTINUE

----- READ LOGIT FUNCTION WEIGHTS AND SECTORAL ENERGY SERVICE DEMANDS -----

DO 468 M=1,NMREAD
  DO 462 KK=1,7
    READ (IUNIT,1100) A
    IF (NOPT(2)-1) 461,462,461
461  WRITE(JUNIT,2100) A
462  CONTINUE

C
DO 466 L=1,NL
  NK=NKL(L)
  DO 465 K=1,NK
    READ (IUNIT,1020) (BSJKLM(J,K,L,M),J=1,NJ),NOTES,ANOTE
    IF (NOPT(2)-1) 464,465,464
464  WRITE(JUNIT,2025) (BSJKLM(J,K,L,M),J=1,NJ),NOTES,ANOTE
465  CONTINUE
466  CONTINUE
468  CONTINUE

----- READ OECD END-USE ELASTICITIES -----

DO 470 KK=1,6
  READ (IUNIT,1100) A
  IF (NOPT(2)-1) 471,470,471
471  WRITE(JUNIT,2100) A

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1178. 477 CONTINUE
1179. C
1180. DO 480 K=1,NKMAX
1181. READ (IUNIT,1030) RPKK(K),(RPJK(J,K),J=1,NJ),NOTES,ANOTE
1182. IF (NOPT(2)-1) 479,480,479
1183. 479 WRITE(JUNIT,2030) RPKK(K),(RPJK(J,K),J=1,NJ),NOTES,ANOTE
1184. 480 CONTINUE
1185. C
1186. DO 490 KK=1,2
1187. READ (IUNIT,1100) A
1188. IF (NOPT(2)-1) 489,490,489
1189. 489 WRITE(JUNIT,2100) A
1190. 490 CONTINUE
1191. C
1192. READ (IUNIT,1030) RPK,(RPJ(J),J=1,NJ),NOTES,ANOTE
1193. IF (NOPT(2)-1) 498,499,498
1194. 498 WRITE(JUNIT,2030) RPK,(RPJ(J),J=1,NJ),NOTES,ANOTE
1195. C
1196. DO 500 KK=1,4
1197. READ (IUNIT,1100) A
1198. IF (NOPT(2)-1) 501,500,501
1199. 501 WRITE(JUNIT,2100) A
1200. 500 CONTINUE
1201. C
1202. DO 510 K=1,NKMAX
1203. READ (IUNIT,1030) RYKK(K),(RYJK(J,K),J=1,NJ),NOTES,ANOTE
1204. IF (NOPT(2)-1) 509,510,509
1205. 509 WRITE(JUNIT,2030) RYKK(K),(RYJK(J,K),J=1,NJ),NOTES,ANOTE
1206. 510 CONTINUE
1207. C
1208. DO 520 KK=1,2
1209. READ (IUNIT,1100) A
1210. IF (NOPT(2)-1) 519,520,519
1211. 519 WRITE(JUNIT,2100) A
1212. 520 CONTINUE
1213. C
1214. READ (IUNIT,1020) (RYJ(J),J=1,NJ),NOTES,ANOTE
1215. IF (NOPT(2)-1) 521,522,521
1216. 521 WRITE(JUNIT,2025) (RYJ(J),J=1,NJ),NOTES,ANOTE
1217. C
1218. 522 DO 481 KK=1,6
1219. READ (IUNIT,1100) A
1220. IF (NOPT(2)-1) 483,481,483
1221. 483 WRITE(JUNIT,2100) A
1222. 481 CONTINUE
1223. C
1224. DO 497 L=1,2
1225. READ (IUNIT,1080) RYKL(L),NOTES
1226. IF (NOPT(2)-1) 523,497,523
1227. 523 WRITE(JUNIT,2080) RYKL(L),NOTES
1228. 497 CONTINUE
1229. C
1230. DO 528 KK=1,3
1231. READ (IUNIT,1100) A
1232. IF (NOPT(2)-1) 525,528,525
1233. 525 WRITE(JUNIT,2100) A
1234. 528 CONTINUE
1235. C
1236. DO 530 L=1,NL
1237. READ (IUNIT,1080) RYL(L),NOTES

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1236.      IF (NOPT(2)-1) 529,530,529
1239.      WRITE(JUNIT,2080) RYL(L),NOTES
1240.      530 CONTINUE
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      IF (NOPT(2)-1) 529,530,529
      WRITE(JUNIT,2080) RYL(L),NOTES
      530 CONTINUE

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      -- READ IN CARBON RELEASE PARAMETERS --
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      DO 531 KK=1,7
      READ (IUNIT,1100) A
      IF (NOPT(2)-1) 532,531,532
      532 WRITE(JUNIT,2100) A
      531 CONTINUE

      KK=NC02-1
      READ (IUNIT,1095) (COI(I),I=1,KK),ANOTE
      IF (NOPT(2)-1) 548,547,548
      548 WRITE(JUNIT,2095) (COI(I),I=1,KK),ANOTE

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      -- READ GAS FLARING PARAMETERS --
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      547 DO 550 KK=1,7
      READ (IUNIT,1100) A
      IF (NOPT(2)-1) 549,550,549
      549 WRITE(JUNIT,2100) A
      550 CONTINUE

      DO 560 L=1,NL
      READ (IUNIT,1000) (SBURNL(L,IT),IT=1,3),(SHALE(L,IT),IT=1,
      3 NOTES
      IF (NOPT(2)-1) 559,560,559
      559 WRITE(JUNIT,2005) (SBURNL(L,IT),IT=1,3),(SHALE(L,IT),IT=1,
      3 NOTES
      560 CONTINUE

      -----
      -- READ FEEDSTOCK PARAMETERS --
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      DO 570 KK=1,6
      READ (IUNIT,1100) A
      IF (NOPT(2)-1) 569,570,569
      569 WRITE(JUNIT,2100) A
      570 CONTINUE

      DO 580 L=1,NL
      READ (IUNIT,1060) (SFEDIL(I,L),I=1,NF),NOTES
      IF (NOPT(2)-1) 579,580,579
      579 WRITE(JUNIT,2060) (SFEDIL(I,L),I=1,NF),NOTES
      580 CONTINUE

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      -- READ BIOMASS COEFFICIENTS --
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1294.      DO 500 KK=1,3
1299.      READ (IUNIT,1100) A
1300.      IF (NOPT(2)-1) 589,590,589
1301.      WRITE(JUNIT,2100) A
1302.      589
1303.      590 CONTINUE
1304.      C
1305.      DO 600 IP=1,NIP
1306.      READ (IUNIT,1020) (BIOPSM(IP,1,IM),BIOPSM(IP,2,IM),IM=1,NIP
1307.      ,NOTES
1308.      IF (NOPT(2)-1) 599,600,599
1309.      599 WRITE(JUNIT,2025) (BIOPSM(IP,1,IM),BIOPSM(IP,2,IM),IM=1,NIP
1310.      ,NOTES
1311.      600 CONTINUE
1312.      C
1313.      DO 610 KK=1,3
1314.      READ (IUNIT,1100) A
1315.      IF (NOPT(2)-1) 609,610,609
1316.      609 WRITE(JUNIT,2100) A
1317.      610 CONTINUE
1318.      C
1319.      DO 620 L=1,NL
1320.      READ (IUNIT,1040) (BIOLM(L,IM),IM=1,NIM),NOTES
1321.      IF (NOPT(2)-1) 619,620,619
1322.      619 WRITE(JUNIT,2042) (BIOLM(L,IM),IM=1,NIM),NOTES
1323.      620 CONTINUE
1324.      C
1325.      DO 931 KK=1,3
1326.      READ (IUNIT,1100) A
1327.      IF (NOPT(2) .EQ. 1) GO TO 931
1328.      WRITE(JUNIT,2100) A
1329.      931 CONTINUE
1330.      C
1331.      READ (IUNIT,1080) RYSHT,NOTES
1332.      IF (NOPT(2) .EQ. 1) GO TO 932
1333.      WRITE(JUNIT,2090) RYSHT,NOTES
1334.      932 CONTINUE
1335.      C
1336.      CALL READ(NSIM)
1337.      CALL OPRINT(NSIM)
1338.      RETURN
1339.      END
1340.      C*****
1341.      C
1342.      SUBROUTINE OPRINT(NSIM)
1343.      C*****
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QUESTION

STREET
BIBL
RY

LATEST REVISION BY: DAN WAHL
ON 3 NOVEMBER 1982
PURPOSE: ADDED VARIABLES BBESIL
: RSYIL, AND RYSHT.

REVISED BY: JAE EDMONDS
6 JANUARY 1984
PURPOSE: MAJOR MODEL REVISION
1) REPLACE GNP WITH PROL
AND CHANGE ZLM TO READ
IN AS ABSOLUTE POPULATION
AND REMOVE ZL

8 JULY 1984
VARIABLES DELETED ARE :
AIL, BIL, DIL, RESIL,
EASTIM, CILT, RIL,
BESILM, DILSET
VARIABLES ADDED ARE :
RIGISL, CIGIS, VISL,
DILSET, RIL, STISL,
BESIL, ESFILM

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MAKE ALL REAL VARIABLES DOUBLE PRECISION
      IMPLICIT REAL*8 (A-H,O-Z),  INTEGER (I-N)
COMMON BLOCKS

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COMMON/RE/BSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
ERYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
COMMON/REPN/BPSL(9),RPKL(3,9),BSUJLM(6,9,6),GNP(9,6),GNPLM(11,
E GNP9L(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
E PHYDKO(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
E TXILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
COMMON/REYX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDX
E OLDPI(3),DX(3),NAGN,NFAIL,NTIMES
COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
E BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR2M(6),
E ESILIM(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
E FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
E PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
E PUILM(6,9,6),TKL(3,9),NUB
COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
E EDRIKL(5,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
E FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9,
E SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSM(4,2)


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1350.001 COMMON/OUT1/CEFLM(9,6),CEFLM(6),CONLM(4,6),CONM(6),EDM(6),
1350.002 & EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
1350.003 & EDRIM(6,9),EDJLKM(6,6),EDJIL(5,9),EDRKL(4,9,6),EDRLM(9,6),
1350.004 & EFH(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),FFLM(9,6),
1350.005 & EPCLM(10,6),EPGLM(10,6)
1350.006 COMMON/OUT2/ESH(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
1350.007 & ESILM(6,6),ESI2M(6,6),ESLIM(9,6),ESL2M(9,6),ESRLM(9,6),
1350.008 & ESUM(6),ESUIM(6,6),ESUILM(6,9,6),
1350.009 & ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
1350.010 & GNPFLM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
1350.011 & SYNLM(5,9,6),SYNLH(9,6)
1350.012 COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NK
1350.013 & NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NCDZ,NOPT(10),IOUH
1350.014 & NSTEP,NPUNT
1350.015 COMMON/RC/CDI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
1350.016 & CDZIM(8,6),CDZLM(9,6),CDZM(6)
1350.017 COMMON/RS/CSISL(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
1350.018 & RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
1350.019 C -- DECLARE CHARACTER VARIABLES --
1350.020 C
1350.021 DIMENSION A(20),NOTES(5),ANOTE(2),NOTE2(5)
1350.022 C
1350.023 1000 FORMAT (6F10.0,5A4)
1350.024 1010 FORMAT (3I10,7A4)
1350.025 1020 FORMAT (4F10.0,7A4)
1350.026 1026 FORMAT (6F10.0,5A4)
1350.027 1030 FORMAT (5F10.0,7A4)
1350.028 1031 FORMAT (7F9.0,2A4)
1350.029 1040 FORMAT (2F10.0,5A4)
1350.030 1045 FORMAT (2(5A4,F6.2,4X))
1350.031 1060 FORMAT (3F10.0,7A4)
1350.032 1070 FORMAT (6F10.0,5A4)
1350.033 1080 FORMAT (F10.0,5A4,50X)
1350.034 1090 FORMAT (F10.0,40X,7A4)
1350.035 1095 FORMAT (7F10.0,2A4)
1350.036 1100 FORMAT (20A4)
1350.037 2000 FORMAT (1X,6F10.4,5A4)
1350.038 2005 FORMAT (1X,6(F8.2,2X),5A4)
1350.039 2010 FORMAT (1X,3I10,7A4)
1350.040 2020 FORMAT (1X,4F10.2,7A4)
1350.041 2025 FORMAT (1X,4(F8.4,2X),7A4)
1350.042 2026 FORMAT (1X,6(F8.4,2X),5A4)
1350.043 2030 FORMAT (1X,5F10.4,7A4)
1350.044 2031 FORMAT (1X,6F9.2,F9.4,2A4)
1350.045 2032 FORMAT (1X,7F9.0,2A4)
1350.046 2033 FORMAT (1X,5F10.0,7A4)
1350.047 2034 FORMAT (1X,5F10.2,7A4)
1350.048 2040 FORMAT (1X,F10.3,F10.0,7A4)
1350.049 2042 FORMAT (1X,2(F9.2,2X),7A4)
1350.050 2045 FORMAT (1X,2(5A4,F6.2,4X))
1350.051 2050 FORMAT (1X,3F10.4,7A4,20X)
1350.052 2070 FORMAT (1X,6F10.0,5A4)
1350.053 2080 FORMAT (1X,F10.4,5A4)
1350.054 2090 FORMAT (1X,F10.4,40X,7A4)
1350.055 2095 FORMAT (1X,7F10.2,2A4)
1350.056 2100 FORMAT (1X,20A4)
1350.057 2105 FORMAT ('1')
1350.058 C
1350.059 C SET MODEL VERSION NUMBER

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1356.14      NVKSN = 2
1356.141    C
1356.142    C -----
1356.143    C -- INITIALIZE I/O UNIT VALUES --
1356.144    C -----
1356.145    C
1356.146      IUNIT=5
1356.147      JUNIT=IUNIT
1356.148    C
1356.149      IF (NOPT(2)-1) 1,2,1
1356.15      1 WRITE(JUNIT,2105)
1356.151      2 CONTINUE
1356.152    C
1356.153    C -----
1356.154    C -- READ IN ENERGY PRICE PARAMETERS --
1356.155    C -----
1356.156    C
1356.157      DO 4 KK=1,12
1356.158        READ (IUNIT,1100) A
1356.159        IF (NOPT(2)-1) 3,4,3
1356.16      3 WRITE(JUNIT,2100) A
1356.161      4 CONTINUE
1356.162    C
1356.163      READ (IUNIT,1060) (TRI(I),I=1,NF),NOTES
1356.164      IF (NOPT(2)-1) 5,6,5
1356.165      5 WRITE(JUNIT,2060) (TRI(I),I=1,NF),NOTES
1356.166    C
1356.167      DO 8 M=1,NMREAD
1356.168        READ (IUNIT,1060) (PIN(I,M),I=1,NF),NOTES
1356.169        IF (NOPT(2)-1) 7,8,7
1356.17      7 WRITE(JUNIT,2060) (PIN(I,M),I=1,NF),NOTES
1356.171      8 CONTINUE
1356.172    C
1356.173    C -----
1356.174    C -- READ IN TRADE BARRIER COEFFICIENTS --
1356.175    C -----
1356.176    C
1356.177      DO 34 KK=1,3
1356.178        READ (IUNIT,1100) A
1356.179        IF (NOPT(2)-1) 33,34,33
1356.18      33 WRITE(JUNIT,2100) A
1356.181      34 CONTINUE
1356.182    C
1356.183      DO 35 I=1,NF
1356.184        DO 36 KK=1,3
1356.185          READ (IUNIT,1100) A
1356.186          IF (NOPT(2)-1) 31,36,31
1356.187          31 WRITE(JUNIT,2100) A
1356.188          36 CONTINUE
1356.189          DO 37 L=1,NL
1356.19        READ (IUNIT,1026) (TXILM(I,L,M),M=1,NMREAD),NOTES
1356.191        IF (NOPT(2)-1) 32,37,32
1356.192        32 WRITE(JUNIT,2026) (TXILM(I,L,M),M=1,NMREAD),NOTES
1356.193        37 CONTINUE
1356.194        35 CONTINUE
1356.195    C
1356.196    C -----
1356.197    C -- READ IN FINAL CONSUMPTION TAXES --
1356.198    C -----
1356.199    C
1356.199      DO 38 KK=1,3
1356.199        READ (IUNIT,1100) A

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1356.2      IF (NOPT(2)-1) 28,38,29
1356.201    28 WRITE(JUNIT,2100) A
1356.202    39 CONTINUE
1356.203    C
1356.204    DO 41 J=1,NJ
1356.205    DO 39 KK=1,3
1356.206    READ(IUNIT,1100) A
1356.207    IF (NOPT(2)-1) 29,39,29
1356.208    29 WRITE(JUNIT,2100) A
1356.209    39 CONTINUE
1356.21    DO 40 L=1,NL
1356.211    C READ(IUNIT,1026) (TXJLM(J,L,M),M=1,NMREAD),NOTES
1356.212    IF (NOPT(2)-1) 27,40,27
1356.213    27 WRITE(JUNIT,2026) (TXJLM(J,L,M),M=1,NMREAD),NOTES
1356.214    40 CONTINUE
1356.215    41 CONTINUE
1356.216    C
1356.217    C
1356.218    C --- READ IN POPULATION DATA (ZLM) ---
1356.219    C
1356.22    C
1356.221    DO 45 KK=1,7
1356.222    C READ(IUNIT,1100) A
1356.223    IF (NOPT(2).EQ.1) GO TO 45
1356.224    WRITE(JUNIT,2100) A
1356.225    45 CONTINUE
1356.226    C
1356.227    DO 50 L=1,NL
1356.228    C READ(IUNIT,1031) ZL(L),(ZLM(L,M),M=1,NMREAD),ANOTE
1356.229    IF (NOPT(2).EQ.1) GO TO 50
1356.23    WRITE(JUNIT,2032) ZL(L),(ZLM(L,M),M=1,NMREAD),ANOTE
1356.231    50 CONTINUE
1356.232    C
1356.233    DO 55 KK=1,8
1356.234    C READ(IUNIT,1100) A
1356.235    IF (NOPT(2).EQ.1) GO TO 55
1356.236    WRITE(JUNIT,2100) A
1356.237    55 CONTINUE
1356.238    C
1356.239    C
1356.24    C --- READ IN LABOR PRODUCTIVITY GROWTH AND ---
1356.241    C BASE LEVEL OF GNP
1356.242    C
1356.243    DO 60 L=1,NL
1356.244    C READ(IUNIT,1040) PROL(L),GNPBL(L),NOTES
1356.245    IF (NOPT(2).EQ.1) GO TO 60
1356.246    WRITE(JUNIT,2040) PROL(L),GNPBL(L),NOTES
1356.247    60 CONTINUE
1356.248    C
1356.249    C
1356.25    C --- READ IN REFINERY COEFFICIENTS AND BASE SECONDARY ENERGY PRICE
1356.251    C
1356.252    C
1356.253    DO 110 KK=1,11
1356.254    C READ(IUNIT,1100) A
1356.255    IF (NOPT(2)-1) 105,110,105
1356.256    105 WRITE(JUNIT,2100) A
1356.257    110 CONTINUE
1356.258    C
1356.259    READ(IUNIT,1000) (GIJ(I),HIJ(I),I=1,NF),NOTES

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1356.24 IF (NOPT(2)-1) 115,111,115  

1356.261 115 WRITE(JUNIT,2000) (GIJ(I),HIJ(I),I=1,NF),NOTES  

1356.262 C  

1356.263 C  

1356.264 C  

1356.265 C  

1356.266 --- READ IN ELECTRIC POWER GENERATION COEFFICIENTS ---  

1356.267 C  

1356.268 111 DO 119 KK=1,13  

1356.269 C READ (IUNIT,1100) A  

1356.27 IF (NOPT(2)-1) 118,119,118  

1356.271 118 WRITE(JUNIT,2100) A  

1356.272 119 CONTINUE  

1356.273 C  

1356.274 C  

1356.275 READ (IUNIT,1000) (GUI(I),I=1,NI),NOTES  

1356.276 IF (NOPT(2)-1) 116,117,116  

1356.277 116 WRITE(JUNIT,2000) (GUI(I),I=1,NI),NOTES  

1356.278 117 DO 120 L=1,NL  

1356.279 C READ (IUNIT,1000) (HUIL(I,L),I=1,NI),NOTES  

1356.28 IF (NOPT(2)-1) 133,120,133  

1356.28 133 WRITE(JUNIT,2000) (HUIL(I,L),I=1,NI),NOTES  

1356.281 120 CONTINUE  

1356.282 C  

1356.283 READ (IUNIT,1030) (RUI(I),I=1,NU),NOTES  

1356.284 IF (NOPT(2)-1) 131,132,131  

1356.285 131 WRITE(JUNIT,2030) (RUI(I),I=1,NU),NOTES  

1356.286 C  

1356.287 C  

1356.288 --- READ IN ELECTRIC UTILITY BASE PRICE DATA ---  

1356.289 C  

1356.29 C  

1356.291 132 DO 121 KK=1,9  

1356.292 C READ (IUNIT,1100) A  

1356.293 IF (NOPT(2)-1) 134,121,134  

1356.294 134 WRITE(JUNIT,2100) A  

1356.295 121 CONTINUE  

1356.296 C  

1356.297 DO 122 L=1,NL  

1356.298 C READ (IUNIT,1060) (PAUIL(I,L),I=1,NF),NOTES  

1356.299 IF (NOPT(2)-1) 135,122,135  

1356.3 135 WRITE(JUNIT,2060) (PAUIL(I,L),I=1,NF),NOTES  

1356.301 122 CONTINUE  

1356.302 C  

1356.303 C  

1356.304 C  

1356.305 --- READ IN FUEL SHARE WEIGHTS BY PERIOD, FUEL AND REGION ---  

1356.306 C  

1356.307 DO 125 M=1,NMREAD  

1356.308 DO 123 KK=1,6  

1356.309 C READ (IUNIT,1100) A  

1356.31 IF (NOPT(2)-1) 136,123,136  

1356.311 136 WRITE(JUNIT,2100) A  

1356.312 123 CONTINUE  

1356.313 C  

1356.314 DO 124 L=1,NL  

1356.315 C READ (IUNIT,1030) (BSUILM(I,L,M),I=1,NU),NOTES  

1356.316 IF (NOPT(2)-1) 137,124,137  

1356.317 137 WRITE(JUNIT,2030) (BSUILM(I,L,M),I=1,NU),NOTES  

1356.318 124 CONTINUE  

1356.319 125 CONTINUE

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1356.321 C
1356.322 C
1356.323 C
1356.324 C
1356.325 C
1356.326 C
1356.327 C
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1356.371 C
1356.372 C
1356.373 C
1356.374 C
1356.375 C
1356.376 C
1356.377 C
1356.378 C
1356.379 C

-----
-- READ TKL--RATE OF END-USE ENERGY EFFICIENCY IMPROVEMENT --
-- BY SECTOR AND REGION --
-----

DO 130 KK=1,8
  READ (IUNIT,1100) A
  IF (NOPT(2)-1) 139,130,139
139 WRITE(JUNIT,2100) A
130 CONTINUE

DO 160 L=1,3
  NK=NKL(L)
  READ (IUNIT,1060) (TKL(K,L),K=1,NK),NOTES
  IF (NOPT(2)-1) 150,160,150
150 WRITE(JUNIT,2060) (TKL(K,L),K=1,NK),NOTES
160 CONTINUE

DO 180 KK=1,3
  READ (IUNIT,1100) A
  IF (NOPT(2)-1) 179,180,179
179 WRITE(JUNIT,2100) A
180 CONTINUE

DO 190 L=4,NL
  NK=NKL(L)
  READ (IUNIT,1080) (TKL(K,L),K=1,NK),NOTES
  IF (NOPT(2)-1) 189,190,189
189 WRITE(JUNIT,2080) (TKL(K,L),K=1,NK),NOTES
190 CONTINUE

-----
READ RIGISL--RESOURCE BASE AMOUNTS

DO 700 KK=1,4
  READ (IUNIT,1100) A
  IF (NOPT(2).EQ.1) GO TO 700
  WRITE(JUNIT,2100) A
700 CONTINUE

DO 710 IG=1,NIG
  DO 712 KK=1,4
    READ (IUNIT,1100) A
    IF (NOPT(2).EQ.1) GO TO 712
    WRITE(JUNIT,2100) A
712 CONTINUE

DO 714 L=1,NL
  READ (IUNIT,1030) (RIGISL(IG,IS,L),IS=1,NNIS),NOTES
  IF (NOPT(2).EQ.1) GO TO 714
  WRITE(JUNIT,2033) (RIGISL(IG,IS,L),IS=1,NNIS),NOTES
714 CONTINUE
710 CONTINUE

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1355.388 C
1355.389 C
1355.390 C
1355.391 C
1355.392 C
1355.393 C
1355.394 C
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1355.397 C
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1355.433 C
1355.434 C
1355.435 C
1355.436 C
1355.437 C
1355.438 C
1355.439 C

READ CIGIS--EXTRACTION COST AMOUNTS

DO 720 KK=1,9
  READ (IUNIT,1100) A
  IF (NOPT(2).EQ.1) GO TO 720
  WRITE(JUNIT,2100) A
720 CONTINUE

NNIG=NIG+1
DO 722 IG=1,NNIG
  READ (IUNIT,1030) (CIGIS(IG,IS),IS=1,NNIS),NOTES
  IF (NOPT(2).EQ.1) GO TO 722
  WRITE(JUNIT,2034) (CIGIS(IG,IS),IS=1,NNIS),NOTES
722 CONTINUE

READ--VISL ENVIRONMENTAL COST AMOUNTS

DO 730 KK=1,6
  READ (IUNIT,1100) A
  IF (NOPT(2).EQ.1) GO TO 730
  WRITE(JUNIT,2100) A
730 CONTINUE

DO 734 L=1,NL
  READ (IUNIT,1030) (VISL(IS,L),IS=1,NNIS),NOTES
  IF (NOPT(2).EQ.1) GO TO 734
  WRITE(JUNIT,2034) (VISL(IS,L),IS=1,NNIS),NOTES
734 CONTINUE
750 CONTINUE

READ RIL--PRICE ELASTICITY OF SUPPLY FOR
FOSSIL FUELS, EVALUATED AT DILSET

DO 752 KK=1,6
  READ (IUNIT,1100) A
  IF (NOPT(2).EQ.1) GO TO 752
  WRITE(JUNIT,2100) A
752 CONTINUE

DO 754 L=1,NL
  READ (IUNIT,1020) (RIL(IS,L),IS=1,NIS),NOTES
  IF (NOPT(2).EQ.1) GO TO 754
  WRITE(JUNIT,2020) (RIL(IS,L),IS=1,NIS),NOTES
754 CONTINUE

READ STISL--RATE OF TECHNOLOGICAL CHANGE
BY SUPPLY MODE AND REGION

DO 758 KK=1,7
  READ (IUNIT,1100) A
  IF (NOPT(2).EQ.1) GO TO 758
  WRITE(JUNIT,2100) A
758 CONTINUE

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1356.44      DO 760 L=1,NL
1356.441    C      READ (IUNIT,1030) (STISL(IS,L),IS=1,NNIS),NOTES
1356.442      IF (NOPT(2).EQ.1) GO TO 760
1356.443      WRITE(JUNIT,2030) (STISL(IS,L),IS=1,NNIS),NOTES
1356.444    760 CONTINUE
1356.445    C
1356.446    C      READ BESIL--MINIMUM LEVEL OF SHORT TERM
1356.447    C      SUPPLY AND REGION
1356.448    C
1356.449    DO 768 KK=1,7
1356.45    C      READ (IUNIT,1100) A
1356.451      IF (NOPT(2).EQ.1) GO TO 768
1356.452      WRITE(JUNIT,2100) A
1356.453    768 CONTINUE
1356.454    C
1356.455    DO 770 L=1,NL
1356.456    C      READ (IUNIT,1030) (BESIL(IS,L),IS=1,NNIS),NOTES
1356.457      IF (NOPT(2).EQ.1) GO TO 770
1356.458      WRITE(JUNIT,2034) (S(I),I=1,N),E
1356.459      WRITE(JUNIT,2034) (BESIL(IS,L),IS=1,NNIS),NOTES
1356.46    770 CONTINUE
1356.461    C
1356.462    C      READ ESFIL--INITIAL ENERGY SUPPLY ESTIMATES
1356.463    C
1356.464    DO 772 KK=1,10
1356.465    C      READ (IUNIT,1100) A
1356.466      IF (NOPT(2).EQ.1) GO TO 772
1356.467      WRITE(JUNIT,2100) A
1356.468    772 CONTINUE
1356.469    C
1356.47    DO 778 L=1,NL
1356.471    C      READ (IUNIT,1030) (ESFIL(IS,L),IS=1,NNIS),NOTES
1356.472      IF (NOPT(2).EQ.1) GO TO 778
1356.473      WRITE(JUNIT,2030) (ESFIL(IS,L),IS=1,NNIS),NOTES
1356.474    778 CONTINUE
1356.475    C
1356.476    C -----
1356.477    C -- READ NATURAL GAS FLARING RATE PARAMETERS --
1356.478    C -----
1356.479    C
1356.48    DO 220 KK=1,8
1356.481    C      READ (IUNIT,1100) A
1356.482      IF (NOPT(2)-1) 219,220,219
1356.483    219      WRITE(JUNIT,2100) A
1356.484    220 CONTINUE
1356.485    C
1356.486    DO 230 L=1,NL
1356.487    C      READ (IUNIT,1060) (FLRL(II,L),II=1,3),NOTES,ANOTE
1356.488      IF (NOPT(2)-1) 229,230,229
1356.489    229      WRITE(JUNIT,2060) (FLRL(II,L),II=1,3),NOTES,ANOTE
1356.49    230 CONTINUE
1356.491    C
1356.492    C -----
1356.493    C -- READ IN HYDROELECTRIC PARAMETERS BY REGION --
1356.494    C -----
1356.495    C
1356.496    DO 240 KK=1,10
1356.497    C      READ (IUNIT,1100) A
1356.498      IF (NOPT(2)-1) 239,240,239
1356.499    239      WRITE(JUNIT,2100) A

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1356.5 240 CONTINUE
1356.501 C
1356.502 C DO 250 L=1,NL
1356.503 C READ (IUNIT,1030) (HYDRD(I,L),I=1,5),NOTES,ANOTE
1356.504 C IF (NOPT(2)-1) 240,250,240
1356.505 249 WRITE(JUNIT,2030) (HYDRD(I,L),I=1,5),NOTES,ANOTE
1356.506 250 CONTINUE
1356.507 C
1356.508 C -----
1356.509 C -- READ SOLAR COST PARAMETERS --
1356.51 C -----
1356.511 C
1356.512 C DO 380 KK=1,7
1356.513 C READ (IUNIT,1100) A
1356.514 C IF (NOPT(2)-1) 379,380,379
1356.515 379 WRITE(JUNIT,2100) A
1356.516 380 CONTINUE
1356.517 C
1356.518 C DO 390 L=1,NL
1356.519 C READ (IUNIT,1060) (CSLT(L,NT),NT=1,3),NOTES
1356.52 C IF (NOPT(2)-1) 389,390,389
1356.521 389 WRITE(JUNIT,2060) (CSLT(L,NT),NT=1,3),NOTES
1356.522 390 CONTINUE
1356.523 C
1356.524 C -----
1356.525 C -- READ SYNFUEL ADD ON COSTS --
1356.526 C -----
1356.527 C
1356.528 C DO 533 KK=1,11
1356.529 C READ (IUNIT,1100) A
1356.53 C IF (NOPT(2)-1) 372,533,372
1356.531 372 WRITE(JUNIT,2100) A
1356.532 533 CONTINUE
1356.533 C
1356.534 C DO 534 L=1,NL
1356.535 C READ (IUNIT,1000) (HCILT(1,L,IT),IT=1,3),(HCILT(2,L,IT),IT=1,
1356.536 C $ ,NOTES
1356.537 C IF (NOPT(2)-1) 373,534,373
1356.538 373 WRITE(JUNIT,2005) (HCILT(1,L,IT),IT=1,3),(HCILT(2,L,IT),IT=1,
1356.539 C $ ,NOTES
1356.54 534 CONTINUE
1356.541 C
1356.542 C -----
1356.543 C -- READ SYNFUEL CONVERSION EFFICIENCY --
1356.544 C -----
1356.545 C
1356.546 C READ (IUNIT,1100) A
1356.547 C IF (NOPT(2)-1) 391,392,391
1356.548 391 WRITE(JUNIT,2100) A
1356.549 C
1356.55 C 392 READ (IUNIT,1045) NOTES,GCI(1),NOTE2,GCI(2)
1356.551 C IF (NOPT(2)-1) 393,394,393
1356.552 393 WRITE(JUNIT,2045) NOTES,GCI(1),NOTE2,GCI(2)
1356.553 C
1356.554 C -----
1356.555 C -- READ SYNFUEL ELASTICITY CONTROL PARAMETER --
1356.556 C -----
1356.557 C
1356.558 C 394 READ (IUNIT,1045) NOTES,RCI(1),NOTE2,RCI(2)
1356.559 C

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1356.55 IF (NOPT(2)-1) 395,399,395
1356.561 395 WRITE(JUNIT,2045) NOTES,ACIT(1),NOTE2,PCIT(2)
1356.562 C
1356.563 C
1356.564 C
1356.565 -- READ ENERGY SERVICE INPUT-OUTPUT COEFFICIENTS --
1356.566 C
1356.567 C
1356.568 396 DO 400 KK=1,9
1356.569 C READ(IUNIT,1100) A
1356.57 IF (NOPT(2)-1) 399,400,399
1356.571 399 WRITE(JUNIT,2100) A
1356.572 400 CONTINUE
1356.573 C
1356.574 DO 410 K=1,NF
1356.575 C READ(IUNIT,1020) (GJK(J,K),J=1,NJ),NOTES,ANOTE
1356.576 IF (NOPT(2)-1) 409,410,409
1356.577 409 WRITE(JUNIT,2025) (GJK(J,K),J=1,NJ),NOTES,ANOTE
1356.578 410 CONTINUE
1356.579 C READ(IUNIT,1020) (GJ(J),J=1,NJ),NOTES,ANOTE
1356.58 IF (NOPT(2)-1) 411,412,411
1356.581 411 WRITE(JUNIT,2025) (GJ(J),J=1,NJ),NOTES,ANOTE
1356.582 C
1356.583 C
1356.584 -- READ NON-ENERGY INPUT-OUTPUT COEFFICIENTS --
1356.585 C
1356.586 C
1356.587 412 DO 420 KK=1,6
1356.588 C READ(IUNIT,1100) A
1356.589 IF (NOPT(2)-1) 419,420,419
1356.59 419 WRITE(JUNIT,2100) A
1356.591 420 CONTINUE
1356.592 C
1356.593 DO 430 K=1,NF
1356.594 C READ(IUNIT,1020) (HJK(J,K),J=1,NJ),NOTES,ANOTE
1356.595 IF (NOPT(2)-1) 429,430,429
1356.596 429 WRITE(JUNIT,2025) (HJK(J,K),J=1,NJ),NOTES,ANOTE
1356.597 430 CONTINUE
1356.598 C READ(IUNIT,1020) (HJ(J),J=1,NJ),NOTES,ANOTE
1356.599 IF (NOPT(2)-1) 431,432,431
1356.6 431 WRITE(JUNIT,2025) (HJ(J),J=1,NJ),NOTES,ANOTE
1356.601 C
1356.602 C
1356.603 C
1356.604 -- READ BASE ENERGY SERVICE CONSUMPTION SHARES --
1356.605 C
1356.606 C
1356.607 432 DO 440 KK=1,7
1356.608 C READ(IUNIT,1100) A
1356.609 IF (NOPT(2)-1) 439,440,439
1356.61 439 WRITE(JUNIT,2100) A
1356.611 440 CONTINUE
1356.612 C
1356.613 DO 460 L=1,NL
1356.614 NK=NKL(L)
1356.615 DO 450 K=1,NK
1356.616 C READ(IUNIT,1030) (SJKLP(J,K,L),J=1,NJ),BSKL(K,L),NOTES,AN
1356.617 IF (NOPT(2)-1) 449,450,449
1356.618 449 WRITE(JUNIT,2030) (SJKLP(J,K,L),J=1,NJ),BSKL(K,L),NOTES,ANO
1356.619 450 CONTINUE

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1356.62 460 CONTINUE
1356.621 C
1356.622 C -----
1356.623 C -- READ LOGIT FUNCTION WEIGHTS AND SECTORAL ENERGY SERVICE DEMANDS --
1356.624 C -----
1356.625 C
1356.626 DO 463 M=1,N*READ
1356.627 DO 462 KK=1,7
1356.628 C READ (IUNIT,1100) A
1356.629 IF (NOPT(2)-1) 461,462,461
1356.63 461 WRITE(JUNIT,2100) A
1356.631 462 CONTINUE
1356.632 C
1356.633 DO 466 L=1,NL
1356.634 NK=NKL(L)
1356.635 DO 465 K=1,NK
1356.636 C READ (IUNIT,1020) (BSJKLM(J,K,L,M),J=1,NJ),NOTES,ANOTE
1356.637 IF (NOPT(2)-1) 464,465,464
1356.638 464 WRITE(JUNIT,2025) (BSJKLM(J,K,L,M),J=1,NJ),NOTES,ANOTE
1356.639 465 CONTINUE
1356.64 466 CONTINUE
1356.641 468 CONTINUE
1356.642 C
1356.643 C -----
1356.644 C -- READ DECD END-USE ELASTICITIES --
1356.645 C -----
1356.646 C
1356.647 DO 470 KK=1,6
1356.648 C READ (IUNIT,1100) A
1356.649 IF (NOPT(2)-1) 471,470,471
1356.65 471 WRITE(JUNIT,2100) A
1356.651 470 CONTINUE
1356.652 C
1356.653 DO 480 K=1,NKMAX
1356.654 C READ (IUNIT,1030) RPKK(K),(RPJK(J,K),J=1,NJ),NOTES,ANOTE
1356.655 IF (NOPT(2)-1) 479,480,479
1356.656 479 WRITE(JUNIT,2030) RPKK(K),(RPJK(J,K),J=1,NJ),NOTES,ANOTE
1356.657 480 CONTINUE
1356.658 C
1356.659 DO 490 KK=1,2
1356.66 C READ (IUNIT,1100) A
1356.661 IF (NOPT(2)-1) 489,490,489
1356.662 489 WRITE(JUNIT,2100) A
1356.663 490 CONTINUE
1356.664 C
1356.665 C READ (IUNIT,1030) RPK,(RPJ(J),J=1,NJ),NOTES,ANOTE
1356.666 IF (NOPT(2)-1) 498,499,498
1356.667 498 WRITE(JUNIT,2030) RPK,(RPJ(J),J=1,NJ),NOTES,ANOTE
1356.668 C
1356.669 499 DO 500 KK=1,4
1356.67 C READ (IUNIT,1100) A
1356.671 IF (NOPT(2)-1) 501,500,501
1356.672 501 WRITE(JUNIT,2100) A
1356.673 500 CONTINUE
1356.674 C
1356.675 DO 510 K=1,NKMAX
1356.676 C READ (IUNIT,1030) RYKK(K),(RYJK(J,K),J=1,NJ),NOTES,ANOTE
1356.677 IF (NOPT(2)-1) 509,510,509
1356.678 509 WRITE(JUNIT,2030) RYKK(K),(RYJK(J,K),J=1,NJ),NOTES,ANOTE
1356.679 510 CONTINUE

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1356.701 C DO 520 KK=1,7
1356.702 C READ (IUNIT,1100) A
1356.703 IF (NOPT(2)-1) 519,520,519
1356.704 519 WRITE(JUNIT,2100) A
1356.705 520 CONTINUE
1356.706 C
1356.707 C READ (IUNIT,1020) (RYJ(J),J=1,NJ),NOTES,ANOTE
1356.708 IF (NOPT(2)-1) 521,522,521
1356.709 521 WRITE(JUNIT,2025) (RYJ(J),J=1,NJ),NOTES,ANOTE
1356.710 C
1356.711 522 DO 481 KK=1,6
1356.712 C READ (IUNIT,1100) A
1356.713 IF (NOPT(2)-1) 483,481,483
1356.714 483 WRITE(JUNIT,2100) A
1356.715 481 CONTINUE
1356.716 C
1356.717 DO 497 L=1,2
1356.718 C READ (IUNIT,1080) RYKL(L),NOTES
1356.719 IF (NOPT(2)-1) 523,497,523
1356.720 523 WRITE(JUNIT,2080) RYKL(L),NOTES
1356.721 497 CONTINUE
1356.722 C
1356.723 DO 528 KK=1,3
1356.724 C READ (IUNIT,1100) A
1356.725 IF (NOPT(2)-1) 525,528,525
1356.726 525 WRITE(JUNIT,2100) A
1356.727 528 CONTINUE
1356.728 C
1356.729 DO 530 L=1,NL
1356.730 C READ (IUNIT,1080) RYL(L),NOTES
1356.731 IF (NOPT(2)-1) 529,530,529
1356.732 529 WRITE(JUNIT,2080) RYL(L),NOTES
1356.733 530 CONTINUE
1356.734 C
1356.735 C
1356.736 C
1356.737 C
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DD 540 L=1,NL
READ (IUNIT,1000) (SURNAL
IF (NOPT(2)-1) 597,580,579
WRITE (JUNIT,2005) (SRURNAL)
NOTES

560 CONTINUE

-- READ FEEDSTOCK PARAMETERS --

DD 570 KK=1,5
READ (IUNIT,1100) A
IF (NOPT(2)-1) 569,570,569
WRITE (JUNIT,2100)

569 CONTINUE

DD 580 L=1,NL
READ (IUNIT,1060) (SFEDIL
IF (NOPT(2)-1) 579,580,579
WRITE (JUNIT,2060) (SFEDIL)

579 CONTINUE

-- READ BIOMASS COEFFICIENTS --

DD 590 KK=1,13
READ (IUNIT,1100) A
IF (NOPT(2)-1) 589,590,589
WRITE (JUNIT,2100)

589 CONTINUE

DD 600 LP=1,NLP
READ (IUNIT,1020) (BIOPSM
NOTES
IF (NOPT(2)-1) 599,600,599
WRITE (JUNIT,2025) (BIOPSM)
NOTES

600 CONTINUE

DD 610 KK=1,3
READ (IUNIT,1100) A
IF (NOPT(2)-1) 609,610,609
WRITE (JUNIT,2100)

610 CONTINUE

DD 620 L=1,NL
READ (IUNIT,1040) (BIOLML
IF (NOPT(2)-1) 619,620,619
WRITE (JUNIT,2042) (BIOLML,

620 CONTINUE

DD 931 KK=1,3
READ (IUNIT,1100) A
IF (NOPT(2)-1) 629,930,629

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1356.8 01 WRITE(JUNIT,2100) A
1356.8 02 931 CONTINUE
1356.8 03 C
1356.8 04 READ(IUNIT,1000) RYSHT,NOTES
1356.8 05 IF(NDPT(2).EQ.1) GO TO 932
1356.8 06 WRITE(JUNIT,2030) RYSHT,NOTES
1356.8 07 932 CONTINUE
1356.8 08 C
1356.8 09 RETURN
1357.0 END
1358.0 *****
1359.0 C
1360.0 FUNCTION XNTERP(X,Y,Z,T)
1361.0 *****
1362.0 C
1363.0 THIS FUNCTION INTERPOLATES BETWEEN AN INITIAL VALUE (X) AND A
1364.0 FINAL VALUE (Y) IF THE CURRENT PERIOD (T) IS LESS THAN THE
1365.0 TRANSITION PERIOD (Z).
1366.0 C
1367.0 REAL*8 X,Y,Z,T,TT,XNTERP
1368.0 C
1369.0 IF (T.GE. Z) XNTERP=Y
1370.0 IF (T.GE. Z) RETURN
1371.0 TT=T/Z
1372.0 XNTERP=X**((1.00-TT)*Y**TT
1373.0 C
1374.0 RETURN
1375.0 END
1376.0 *****
1377.0 C
1378.0 SUBROUTINE PPPP
1379.0 *****
1380.0 C
1381.0 -- THE PRIMARY ENERGY PRICE PREPROSSOR --
1382.0 C
1383.0 THIS SUBROUTINE COMPUTES THE PRICE OF PRIMARY ENERGY BY REGION
1384.0 AND FUEL TYPE FOR: OIL, GAS, SOLIDS, SOLAR AND HYDRO. NUCLEAR
1385.0 ENERGY PRODUCTION COSTS ARE DETERMINED IN THE SUPPLY MODULE.
1386.0 C
1387.0 C
1388.0 C
1389.0 C
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1391.0 C
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IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
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MON BLOCKS
COMMON/RE/BSJKLM(4,3,9,6),RPJ(4,3),RPJK(4,3),RPK,RPKK(3),RYJ(4),
& RYJK(4,3),RYKL(2),RYKK(3),SJJK(4,3,9),ZLM(9,6),ZLXM(10,6)
COMMON/REP4/RPSL(9),BPKL(3,9),BSUJLM(6,9,6),GNP(9,6),GNPLM(10,6)
& GNPBL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
& PHYDRO(9),RUI(5),RYL(9),SJJKLP(4,3,9),TEST,TRI(3),
& TXJLM(3,9,6),TXJLM(4,9,6),XIL(3,9)
COMMON/REVX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
& OLDPI(3),DX(3),NAGN,NFAIL,NTIMES
COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
& BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRLM(6),ESR2M(6),
& ESILM(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
& FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
& PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
& PUJLM(6,9,6),TKL(3,9),NUB
COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),FJKL(4,3,9),
& EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
& FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
& SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSM(4,2,2)
COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONH(6),EDM(6),
& EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
& EDRIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKL(4,9,6),EDRLM(9,6),
& EFH(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
& EPCLM(10,6),EPGLM(10,6)
COMMON/OUT2/ESH(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
& ESILM(6,6),ESI2M(6,6),ESLIM(9,6),ESL2M(9,6),ESRLM(9,6),
& ESUM(6),ESUIM(6,6),ESUJLM(6,9,6),
& ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
& GNPFLM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
& SYNLM(6,9,6),SYNLH(9,6)
COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NKL
& NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NC02,NOPT(10),IDUNI(1)
& NSTEP,NPUNT
COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
& CO2IM(8,6),CO2LM(9,6),CO2M(6)
COMMON/RS/QISL(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
& RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
COMMON/BLKRN/PARMT(79)
REAL*4 PARMT
REAL*8 B,C,T,TT,R,Q,V,W,XX

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INUC      =4
ISNUC     =5
ISOLAR    =5
T         =(M-1)*NJUMP

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1455.      TT      =N.JUMP
1456.      MM1     =M-1
1457.      MM2     =M-2
1458.
1459.      *****
1460.
1461.      C-----
1462.      C      SET PRIMARY ENERGY PRICES
1463.      C-----
1464.
1465.      DO 20 L=1,NL
1466.      C-----
1467.      C      COMPUTE REGIONAL FOSSIL FUEL PRICES
1468.      C-----
1469.      DO 10 I=1,NF
1470.      PILM(I,L,M)=(PIM(I,M)+TRI(I))*TXILM(I,L,M)
1471.      IF(M.NE.1) PILM(I,L,M)=(PIM(I,M)+TRI(I)/2.DO)*TXILM(I,L,M)
1472.
1473.      10 CONTINUE
1474.      20 CONTINUE
1475.
1476.      *****
1477.      *** IF NOT THE FIRST TIME THROUGH ***
1478.      *** NUCLEAR, SOLAR, AND HYDRO COSTS ***
1479.      *** WERE COMPUTED. ROUTINE RETURNS ***
1480.      *****
1481.      IF(MAGN.NE.0) RETURN
1482.      C-----
1483.      C      DO 30 L=1,NL
1484.      C-----
1485.      C      SOLAR SUPPLY IS PERFECTLY ELASTIC AT PRICE PILM
1486.      C-----
1487.      PILM(ISOLAR,L,M)=XNTERP(CSLT(L,1),CSLT(L,2),CSLT(L,3),T)
1488.
1489.      C-----
1490.      C      SET HYDRO ELECTRIC PRICE
1491.      C-----
1492.      PILM(NI,L,M)=HYDRO(4,L)
1493.
1494.      -----
1495.      LONG-RUN SUPPLY SCHEDULE FOR
1496.      IS=5= NUCLEAR
1497.      -----
1498.
1499.      C-----
1500.      C      ESTIMATE CUMULATIVE PRODUCTION TO DATE
1501.      C-----
1502.
1503.      IS=ISNUC
1504.      I=INUC
1505.      Q=0.00
1506.      IF(M.EQ.1) QISLM(IS,L,M)=0.00
1507.      IF(M.EQ.2) QISLM(IS,L,M)=TT*ESUILM(I,L,MM1)
1508.      IF(M.EQ.3) QISLM(IS,L,MM1)=ESUILM(I,L,MM2)+ESUILM(I,L,MM1)
1509.      IF(M.EQ.3) QISLM(IS,L,MM1)=QISLM(IS,L,MM1)+TT/2.00
1510.      IF(M.EQ.3) QISLM(IS,L,M)=2.00*QISLM(IS,L,MM1)-QISLM(IS,L,MM2)
1511.      Q=Q+QISLM(IS,L,M)
1512.
1513.      30 CONTINUE
1514.
1515.      C-----
1516.      C      USE CUMULATIVE PRODUCTION TO COMPUTE NUCLEAR PRICE
1517.      C-----
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1525. C
1526. C
1527. C
1528. C
1529. C
1530. R=0.00
1531. DO 50 IG=1,NIG
1532. W=0.00
1533. DO 40 L=1,NL
1534. W=W+RIGISL(IG,IS,L)
1535. R=R+RIGISL(IG,IS,L)
1536. 40 CONTINUE
1537. IF(O.LE.R) GO TO 70
1538. 50 CONTINUE
1539. C
1540. C
1541. C
1542. C
1543. C
1544. C
1545. DO 60 L=1,NL
1546. CIL(15,L)=100.00
1547. PILM(4,L,M)=CIL(15,L)
1548. 60 CONTINUE
1549. RETURN
1550. C
1551. C
1552. C
1553. C
1554. C
1555. C
1556. C
1557. 70 CONTINUE
1558. C
1559. IG1=IG+1
1560. W=(R-O)/W
1561. C=W*CIGIS(IG,IS)+(1.00-W)*CIGIS(IG1,IS)
1562. C
1563. C
1564. C
1565. C
1566. C
1567. C
1568. DO 80 L=1,NL
1569. TECH=(1.00+STISL(15,L))*T
1570. C
1571. IF(M.LE.3) V=VISL(15,L)*T/75.00
1572. IF(M.GT.3) V=VISL(15,L)
1573. C
1574. C
1575. C
1576. C
1577. C
1578. C
1579. CIL(15,L)=(C+V)/TECH
1580. PILM(4,L,M)=CIL(15,L)
1581. 80 CONTINUE
1582. C
1583. C
1584. RETURN

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END

SUBROUTINE SSSS

— THE SUPPLY MODULE —

THIS MODULE GENERATES SUPPLIES FOR ALL REGIONS AND FOSSIL FUELS
AS WELL AS A SUPPLY PRICE FOR NON-FOSSIL BACKSTOP TECHNOLOGIES.

VERSION: A.31.07.84

INTEGER INPUTS: M, NF, NFF, NIG, NIS, NL, NU

REAL INPUTS: RESIL, BSCIL, CIGIS, CIL, CILT, ESFILM, FLRL,
GCI, HCILT, HYDRO, PILM, RCI, RIL, RIGISL, RSYIL,
RYSHT, STISL, TXJLM, VISL

REAL OUTPUTS: RESILM, ESIL, ESILM, ESILZM, ESRLM, ESRLZM,
ESRILM, SCIL, SFLRL

SUBROUTINES CALLED: NONE

CODED BY:

JAE EDMONDS
1 JANUARY 1982

LATEST REVISION:
LATEST REVISION:
9 AUGUST, 1982
(NEW BASE SUPPLY ALGORITHM AND
BIOMASS COMPUTATIONS ADDED)
31 JULY 1984
BY: JAE EDMONDS
MAJOR SUPPLY REVISION
*RESOURCE CONSTRAINTS PLACED
ON FOSSIL FUEL PRODUCTION
FOR CONVENTIONAL OIL,
CONVENTIONAL GAS,
COAL,
UNCONVENTIONAL OIL,
NUCLEAR
*TECHNOLOGICAL AND ENVIRONME
TAL COSTS SEPERATED AND SUPP
SIDE TECHNOLOGICAL CHANGE
ADDED
*EXOGENOUS MIDEAST OIL DROPPED
*UNCONVENTIONAL GAS DROPPED

MAKE ALL REAL VARIABLES DOUBLE PRECISION

IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)

COMMON BLOCKS

COMMON/RE/BSJKLH(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
ERYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
COMMON/REPN/RPSL(9),RPKL(3,9),BSUILM(6,9,6),GNP(9,6),GNPLM(10,6)
& GNPBL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),

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1645.      & PUYJKA(9),RUI(5),PYL(9),SJKLP(4,3,9),TEST,TRI(3),
1646.      & TXILM(3,9,6),TXJL(4,9,6),XIL(3,9)
1647.      & COMMON/REFVX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
1648.      & OLJPI(3),DX(3),NAG,IFAIL,NTIMES
1649.      & COMMON/RES/BSILM(5,9,6),ESRL1(9,6),ESRL2(9,6),
1650.      & BSCIL(2,9),CIL(5,9),CSLT(9,3),ESKIM(6),ESR2M(6),
1651.      & ESIL1M(3,9,6),ESIL2M(3,9,6),ESKILM(6,9,6),
1652.      & FLKL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
1653.      COMMON/DREP/7BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
1654.      & PTM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
1655.      & PUILM(6,9,6),TKL(3,9),NUB
1656.      COMMON/DOSPE2/EDIL(6,9),EDIKL(5,4,9),
1657.      & EDRIKL(5,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
1658.      & FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRU(5,9),PILM(6,9,6),PROL(9),
1659.      & SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSM(4,2,2),
1660.      COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
1661.      & ED1M(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
1662.      & EDRIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKL(4,9,6),EDRLM(9,6),
1663.      & EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
1664.      & EPCLM(10,6),EPGLM(10,6)
1665.      COMMON/OUT2/ESH(6),ESHM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
1666.      & ES1M(6,6),FS12M(6,6),ESLM(9,6),ESL2M(9,6),ESRLM(9,6),
1667.      & ESUM(6),ESUIM(6,6),ESUIM(6,9,6),
1668.      & ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
1669.      & GNPFM(10,6),GNPPCH(10,6),SYNM(6),SYNIM(6,6),
1670.      & SYNILM(6,9,6),SYNLM(9,6)
1671.      COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NKL(9)
1672.      & NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NC02,NOPT(10),TOUNIT,
1673.      & NSTEP,NPUNT
1674.      COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
1675.      & CO2IM(8,6),CO2LM(9,6),CO2M(6)
1676.      COMMON/RS/OISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
1677.      & RIL(5,9),STISL(5,9),BSIL(5,9),ESFIL(5,9)
1678. C LOCAL VARIABLES
1679. C
1680.      REAL*8      B,C,E,E1,EHOLD,FACT,H,SHARE,SLOPE,SUM,T,
1681.      &          TT,T1,P,R,V,TECH
1682. C
1683.      INTEGER      IIP,IC0AL,IGAS,IOIL,IUDIL,MH1,MAXR
1684. C
1685.      IOIL = 1
1686.      IGAS = 2
1687.      IC0AL = 3
1688.      IUDIL = 4
1689.      T = (M-1)*NJUMP
1690.      TT = NJUMP
1691.      T1 = T-TT
1692.      MH1 = M-1
1693. C-----
1694. C          LONG-RUN SUPPLY SCHEDULE FOR
1695. C          IS=1= CONVENTIONAL OIL
1696. C          2= CONVENTIONAL GAS
1697. C          3= COAL
1698. C          4= UNCONVENTIONAL OIL
1699. C-----
1700. C
1701. C          :-----:
1702. C          : COMPUTE ESTIMATED CUMULATIVE PRODUCTION :
1703. C          :-----:
1704. C

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1705. DO 50 L=1,NL
1706.
1707. *****
1708. *** ZERO TOTAL FUEL COUNTER ***
1709.
1710. DO 10 I=1,NF
1711. ESTIL(I,L)=0.00
1712. CONTINUE
1713.
1714. -----
1715. | ESTIMATE CUMULATIVE PRODUCTION TO DATE |
1716. -----
1717.
1718. DO 70 IS=1,NIS
1719. MAXR=0
1720.
1721. *****
1722. *** SET PRIMARY FUELS INDEX ***
1723. *****
1724.
1725. I=IS
1726. IF(IS.GT.NF) I=IS-NF
1727.
1728. *****
1729. *** START BY ZEROING OISLM FOR (M.EQ.1) AND ***
1730. *** SETTING OUTPUT TO ESFIL FOR 1975 ***
1731. *****
1732.
1733. IF(M.GT.1) GO TO 20
1734.
1735. OISLM(IS,L,M)=0.00
1736. E=ESFIL(IS,L)
1737. GO TO 60
1738.
1739. *****
1740. *** FOR (M.GT.1) COMPUTE CUMULATIVE PRODUC- ***
1741. *** TION FROM THE DOMESTIC SUPPLY PRICE AND ***
1742. *** THEN ESTIMATE ANNUAL PRODUCTION RATES ***
1743. *****
1744.
1745. 20 CONTINUE
1746.
1747. -----
1748. | COMPUTE RATE OF TECHNOLOGICAL |
1749. | CHANGE AND ENVIRONMENTAL COST |
1750. -----
1751. P=PIN(I,M)
1752. TECH=(1.00+STISL(IS,L))*T
1753. IF(M.LE.3) V=VISL(IS,L)*T/75.00
1754. IF(M.GT.3) V=VISL(IS,L)
1755.
1756. -----
1757. | LOCATE THE MOST PROFITABLE |
1758. | RESOURCE GRADE |
1759. -----
1760. NNIG=NIG+1
1761. R=0.00
1762. DO 30 IG=1,NNIG
1763. IF(IG.LE.NIG) R=R+RIGISL(IG,IS,L)
1764. C=CIGIS(IG,IS)
1765. C=(C+V)/TECH

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1755. 30 IF(I.GT.P) GO TO 40
1756. CONTINUE
1757. MAYR=1
1758. C
1759. C
1760. C
1761. C
1762. C
1763. C
1764. C
1765. C
1766. C
1767. C
1768. C
1769. C
1770. 40 CONTINUE
1771. C
1772. C
1773. C
1774. C
1775. C
1776. C
1777. C
1778. C
1779. C
1780. C
1781. C
1782. C
1783. C
1784. C
1785. C
1786. C
1787. C
1788. C
1789. C
1790. C
1791. 50 CONTINUE
1792. C
1793. C
1794. C
1795. C
1796. C
1797. C
1798. C
1799. C
1800. C
1801. C
1802. C
1803. C
1804. C
1805. C
1806. C
1807. C
1808. C
1809. C
1810. C
1811. C
1812. C
1813. C
1814. C
1815. C
1816. C
1817. 60 CONTINUE
1818. C
1819. C
1820. C
1821. C
1822. C
1823. 70 CONTINUE

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IF(I.GT.P) GO TO 40
 CONTINUE
 MAYR=1
 COMPUTE CUMULATIVE PRODUCTION
 CONTINUE
 IF PRICES ARE TOO LOW ZERO
 PRODUCTION. IF RESOURCE IS
 EXHAUSTED SET QISLM TO MAX.
 IF(IG.EQ.1) E=0.00
 IF(IG.EQ.1) QISLM(IS,L,M)=QISLM(IS,L,MM1)
 IF(IG.EQ.1) GO TO 60
 IF(MAYR.EQ.1) QISLM(IS,L,M)=R
 IF(MAYR.EQ.1) GO TO 50
 IF RESOURCE IS ACTIVE COMPUTE
 CUMULATIVE PRODUCTION
 IG1=IG-1
 IG2=IG-2
 SLOPE=RIGISL(IG1,IS,L)
 SLOPE=SLOPE/((CIGIS(IG,IS)-CIGIS(IG1,IS))/TECH)
 IF(IG.LE.NIG) R=R-RIGISL(IG,IS,L)
 QISLM(IS,L,M)=R-SLOPE*(C-P)
 CONTINUE
 ESTIMATE ANNUAL PRODUCTION
 RATE FROM CUMULATIVE PRODUCTION
 IF(IS.LE.NF) E1=ESIL1M(I,L,MM1)
 IF(IS.EQ.IUOIL) E1=ESIL2M(I,L,MM1)
 E=2.00*(QISLM(IS,L,M)-QISLM(IS,L,MM1))/TT-E1
 MAKE SURE THAT OUTPUT IS POS-
 ITIVE BUT WITHIN SHORT-TERM
 CAPACITY LIMITS
 IF(E.LE.0.00) QISLM(IS,L,M)=QISLM(IS,L,MM1)
 IF(E.LE.0.00) E=0.00
 B=BESIL(IS,L)
 EHOLD=E1*YLM(L,M)/YLM(L,MM1)
 IF(B.LT.EHOLD) B=EHOLD
 P=PIM(I,M)/PIM(I,MM1)
 B=B*P**RIL(I,L)
 IF(B.LT.E) QISLM(IS,L,M)=QISLM(IS,L,MM1)+TT*(B+E1)
 IF(B.LT.E) E=B
 ASSIGN OUTPUT TO SUPPLY VARIABLES
 CONTINUE
 IF (IS.LE.NF) ESIL1M(I,L,M)=E
 IF (IS.GT.NF) ESIL2M(I,L,M)=E
 ESIL(I,L) = ESIL(I,L) + E
 CONTINUE

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1824.      ESIL2M(ICOAL,L,M)=0.00
1825.
1826.      GO CONTINUE
1827.
1828.      -----
1829.      COMPUTE BIOMASS SUPPLY OF SOLID FUELS
1830.      -----
1831.
1832.      DO 680 L=1,NL
1833.          ESIL1M(ICOAL,L,M)=ESIL(ICOAL,L)
1834.
1835.          -- ZERO THE TOTAL BIOMASS COUNTER --
1836.
1837.          ESIL2M(ICOAL,L,M)=0.00
1838.
1839.          -- SET THE BASE YEAR BIOMASS OUTPUT TO ZERO
1840.
1841.          IF (M.EQ. 1) GO TO 680
1842.
1843.          -- ITERATE OVER MODES --
1844.
1845.          DO 660 IM=1,NIM
1846.              DO 640 IP=1,NIP
1847.
1848.              -- CHECK EACH CRITICAL POINT TO FIND THE PRICE
1849.              PAIR BETWEEN WHICH THE MARKET PRICE LIES --
1850.
1851.              IF(PILM(ICOAL,L,M)-BIOPSM(IP,1,IM)) 620,600,600
1852.
1853.              -- IF THE PRICE LIES ABOVE THE SATURATION PRICE,
1854.              THEN SET THE SHARE TO THE SATURATION LEVEL --
1855.
1856.              600 CONTINUE
1857.                  IF (IP.LT. NIP) GO TO 640
1858.                  SHARE=BIOPSM(NIP,2,IM)
1859.                  GO TO 630
1860.
1861.              -- AFTER CRITICAL POINTS ARE LOCATED BEGIN
1862.              COMPUTING BIOMASS PENETRATION SHARE --
1863.
1864.              620 CONTINUE
1865.                  IF (IP.EQ. 1) SHARE=0.00
1866.                  IF (IP.EQ. 1) GO TO 630
1867.                  IF (IP.GT. 1) IIP=IP-1
1868.                  SLOPE=(BIOPSM(IP,2,IM)-BIOPSM(IIP,2,IM))
1869.                      /(BIOPSM(IP,1,IM)-BIOPSM(IIP,1,IM))
1870.                  SHARE=BIOPSM(IIP,2,IM)+SLOPE
1871.                  *(PILM(ICOAL,L,M)-BIOPSM(IIP,1,IM))
1872.              630 CONTINUE
1873.
1874.              -- COMPUTE MODAL BIOMASS CONTRIBUTION --
1875.
1876.              EHOLD=BIOLM(L,IM)*SHARE
1877.              IF (IM.EQ.1) EHOLD=EHOLD+YLM(L,M)*RYSH
1878.              GO TO 650
1879.
1880.              640 CONTINUE
1881.              650 CONTINUE
1882.                  ESIL2M(ICOAL,L,M)=ESIL2M(ICOAL,L,M)+EHOLD
1883.              660 CONTINUE
1884.
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1534.      -- FINALLY ADD COAL TO RICHASS --
1535.      C      ESIL(ICOAL,L)=ESIL1M(ICOAL,L,M)+ESIL2M(ICOAL,L,M)
1536.      600 CONTINUE
1537.      C
1538.      C      +-----+
1539.      C      | ADJUSTMENTS |
1540.      C      +-----+
1541.      C
1542.      C      DO 210 L=1,NL
1543.      C
1544.      C      -- ADJUST FOR FLARING AND NON-COMMERCIAL GAS USE
1545.      C      SFLRL(L)=XINTERP(FLRL(1,L),FLRL(2,L),FLRL(3,L),T)
1546.      C      ESIL1M(IGAS,L,M)=ESIL1M(IGAS,L,M)*(1.DO-SFLRL(L))
1547.      C      ESIL(IGAS,L)=ESIL1M(IGAS,L,M)
1548.      C
1549.      C      +-----+
1550.      C      | COMPUTE SYNFUEL CONTRIBUTION TO REFINABLE OIL AND GAS |
1551.      C      +-----+
1552.      C
1553.      C      SCIL(ICOAL,L)=1.DO
1554.      C      SUM=SCIL(ICOAL,L)
1555.      C      DO 200 I=1,NFF
1556.      C
1557.      C      -- COMPUTE NON-ENERGY COSTS --
1558.      C      H=XINTERP(HCILT(1,L,1),HCILT(1,L,2),HCILT(1,L,3),T)
1559.      C
1560.      C      -- COMPUTE NUMERATOR OF COAL OUTPUT SHARES --
1561.      C      PCIL(I,L) = PIM(ICOAL,M)*TXJLM(ICOAL,L,M)*GCI(I)+H
1562.      C      SCIL(I,L) = (PCIL(I,L)/(PIM(I,M)*TXJLM(I,L,M)))*RCI(I)
1563.      C      SUM = SUM + SCIL(I,L)
1564.      C      200 CONTINUE
1565.      C
1566.      C      +-----+
1567.      C      | COMPUTE COAL OUTPUT SHARES AND |
1568.      C      | SUPPLY TO REFINERIES |
1569.      C      +-----+
1570.      C
1571.      C      DO 205 I=1,NFF
1572.      C      SCIL(I,L) = SCIL(I,L)/SUM
1573.      C      ESR1LM(I,L,M)=ESIL1M(ICOAL,L,M)*SCIL(I,L)
1574.      C      ESR2LM(I,L,M)=ESIL2M(ICOAL,L,M)*SCIL(I,L)
1575.      C      ESR1LM(ICOAL,L,M)=ESR1LM(I,L,M)+ESR2LM(I,L,M)
1576.      C
1577.      C      +-----+
1578.      C      | COMPUTE HYDRO ELECTRIC PRODUCTION |
1579.      C      +-----+
1580.      C
1581.      C      FACT=DEXP(HYDRO(1,L)+HYDRO(2,L)*T)
1582.      C      ESIL(NI,L)=HYDRO(3,L)*FACT/(1.DO+FACT)
1583.      C      TESTIL(L)=ESIL(NI,L)
1584.      C

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210 CONTINUE
C
DO 3010 L=1,NL
IF(ESIL1M(1,L,M).LT.0.) PRINT 311,ESIL1M(1,L,M),L,M
IF(ESIL1M(2,L,M).LT.0.) PRINT 312,ESIL1M(2,L,M),L,M
IF(ESIL1M(3,L,M).LT.0.) PRINT 313,ESIL1M(3,L,M),L,M
IF(ESIL2M(1,L,M).LT.0.) PRINT 314,ESIL2M(1,L,M),L,M
IF(ESIL2M(2,L,M).LT.0.) PRINT 315,ESIL2M(2,L,M),L,M
IF(ESIL2M(3,L,M).LT.0.) PRINT 316,ESIL2M(3,L,M),L,M
311 FORMAT(' ',1M,1,M',G12.6,2I4)
312 FORMAT(' ',1M,2,M',G12.6,2I4)
313 FORMAT(' ',1M,3,M',G12.6,2I4)
314 FORMAT(' ',2M,1,M',G12.6,2I4)
315 FORMAT(' ',2M,2,M',G12.6,2I4)
316 FORMAT(' ',2M,3,M',G12.6,2I4)
3010 CONTINUE
C
      RETURN
      END
C *****
C
      SUBROUTINE  PSPS
C *****
C
      -- THE SECONDARY ENERGY PRICE PREPROCESSOR --
C
      THIS SUBROUTINE TAKES THE PRICES FOR PRIMARY ENERGY BY REGION AND
      FUEL TYPE AND CONVERTS THEM INTO THE PRICES OF SECONDARY FUELS,
      ELECTRICITY, AND ENERGY SERVICES. IT COMPUTES BASE GNP FROM DEMO-
      GRAPHIC AND LABOR PRODUCTIVITY DATA AND THEN ADJUSTS FINAL GNP
      FOR ENERGY PRICE EFFECTS.
C
      MODEL VERSION:  A.31.07.84
C
      INTEGER INPUTS:  NF,NJ,NJ,NKL,NKMAX,NM,NU
      REAL INPUTS:     RSUILM,GTJJ,GJ,GJK,GNP,GUI,HIJ,HJ,NK,HUIL,HYDRO,
                      PILM,KUI,RY,SJKLP,TXJLM
C
      REAL OUTPUTS:    PJKLM,PJLM,PKLM,PUILM,SUIL,YLM
C
      LOCAL VARIABLES: PS,T,SUM
      LOCAL INTEGERS:  NK,NNF
C
      SUBROUTINES CALLED:  NONE
C
      WRITTEN BY:
      JAE EDMONDS
      31 JULY 1984
C
      LATEST REVISION:
      NONE
C *****
C
      MAKE ALL REAL VARIABLES DOUBLE PRECISION
C
      IMPLICIT  REAL*8 (A-H,O-Z),  INTEGER (I-N)
C
      COMMON BLOCKS
C
      COMMON/RF/BSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),

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1990.  & DYJL(4,3),TYL(1),PYKL(3),SJKL(4,3,9),ZLXY(10,6)
1991.  & COMMON/REP4/PSL(9),RPL(15,9),RSUJLM(10,6),SPL(10,6),GNPLM(10,6)
1992.  & GNPL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(10,9),ZL(9),RPVL(13,9),
1993.  & PHYL(13,9),HYL(13),RYL(9),SJKLP(4,3,9),TEST,TPL(13),
1994.  & TYILM(13,9),TXJLM(4,9,6),XIL(13,9)
1995.  & COMMON/RKVY/EDINKT(6),ESIMKT(6),UIJ(3,3),YIJ(3,3),YI(3),OLDXI(3)
1996.  & ULUPI(3),UX(3),NAGN,NFATL,NTIME,S
1997.  & COMMON/RFS/DESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
1998.  & ESCIL(12,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR2M(6),
1999.  & ESILM(13,9,6),ESIL2M(13,9,6),ESKILM(16,9,6),
2000.  & FLRL(13,9),MCILT(12,9,3),PCI(2),SFLRL(9),RYSHT
2001.  & COMMON/DREPT/SSKL(13,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
2002.  & PIM(13,6),PJLM(14,9,6),PJKL(4,3,9,6),PKLM(13,9,6),
2003.  & PUJLM(16,9,6),TKL(13,9),HUB
2004.  & COMMON/DOSPER/EDIL(6,9),EDIKL(5,4,9),
2005.  & EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
2006.  & FJL(4,9),GCI(2),GIJ(3),GII(5),HYORO(5,9),PILM(6,9,6),PROL(9),
2007.  & SCIL(13,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSM(4,2,2)
2008.  & COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
2009.  & EDIM(5,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRK(6),
2010.  & EDKIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKL(4,9,6),EDRLM(9,6),
2011.  & EEFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
2012.  & EPCLM(10,6),EPGLM(10,6)
2013.  & COMMON/OUT2/ESM(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
2014.  & ESILM(6,6),ESL2M(6,6),ESLM(9,6),ESL2M(9,6),ESKLM(9,6),
2015.  & ESU4(6),ESUIM(6,6),ESUJLM(6,9,6),
2016.  & ESUL(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(10,6),
2017.  & GNPELM(10,6),GNPPCH(10,6),SYN4(6),SYNIM(6,6),
2018.  & SYNIL(15,9,6),SYNLM(9,6)
2019.  & COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NMIS,NJ,NJUMP,NKKL(9),NKL
2020.  & NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NCO2,NOPT(10),IDUNIT
2021.  & NSTEP,NPUNT
2022.  & COMMON/KC/COI(7),SBURNL(9,3),SFEDIL(13,9),SHALE(9,3),
2023.  & CO2IM(8,6),CO2LM(9,6),CO2M(6)
2024.  & COMMON/RS/OISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
2025.  & NIL(5,9),STISL(5,9),BESTIL(5,9),ESFIL(5,9)
2026.  C
2027.  REAL*8 PS
2028.  C
2029.  C
2030.  C -- BEGIN REGIONAL DO LOOP
2031.  C
2032.  MM1=M-1
2033.  MM2=M-2
2034.  DO 130 L=1,NL
2035.  NK=NKL(L)
2036.  SUIL(NI,L)=HYDRO(5,L)
2037.  C
2038.  C COMPUTE THE PRICES OF SECONDARY FOSSIL FUELS
2039.  C
2040.  DO 50 J=1, NF
2041.  I=J
2042.  PJLM(J,L,M)=(PILM(I,L,M)*GIJ(I)+HIJ(I))*TXJLM(J,L,M)
2043.  50 CONTINUE
2044.  C
2045.  C
2046.  C COMPUTE THE PRICE OF ELECTRICITY
2047.  C
2048.  C -- COMPUTE ELECTRICITY GENERATION PRICES FOR ALL COMPETING FUELS
2049.  C

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C      DO J=1,NF
C      PULM(J,L,M)=PULM(J,L,M)+PAUL(J,L)*GUL(J)+HUL(J,L)
C      CONTINUE
50  CONTINUE
    NF=NF+1
    DO 70 I=NF,N1
    PULM(I,L,M)=PULM(I,L,M)*GUL(I)+HUL(I,L)
70  CONTINUE

CCCCC
--  COMPUTE THE ELECTRICITY FUEL SHARES AND PRICE
    SUM=0.00
    DO 80 I=1,NU
    SUL(I,L)=3SULM(I,L,M)*PULM(I,L,M)+RU(I)
    SUM =SUM + SUL(I,L)
80  CONTINUE

C      PULM(NJ,L,M)=SUL(M,L)*PULM(MI,L,M)
    DO 90 I=1,NU
    SUL(I,L)=(1.00-SUL(MI,L,M))*SUL(I,L)/SUM
    PULM(NJ,L,M)=PULM(NJ,L,M)+SUL(I,L)*PULM(MI,L,M)
90  CONTINUE
    PULM(NJ,L,M)=PULM(NJ,L,M)+TXJLM(NJ,L,M)

CCCCC
COMPUTE THE ENERGY SERVICE PRICES
    PS=0.00
    DO 100 K=1,NK
    PKLM(K,L,M)=0.00
    RPKL(K,L)=0.00
    DO 100 J=1,NJ
    IF (NK.EQ. 1) PP=PJLM(J,L,M)*GUL(J)+HJ(J)
    IF (NK.NE. 1) PP=PJLM(J,L,M)*GUL(J,K)+HJ(K,J,K)
    PKLM(K,L,M)=PKLM(K,L,M)+SJKLP(J,K,L)*PKLM(J,K,L,M)
    IF (NK.NE. 1) PP=PP-HJ(J)
    IF (NK.NE. 1) PP=PP-HJ(K,J)
    RPKL(K,L)=RPKL(K,L)+PP*SJKLP(J,K,L)
100  CONTINUE
    PS=PS+BSKL(K,L)*PKLM(K,L,M)
    IF (NK.EQ. 1) RPKL(K,L)=RPKL(K,L,M)/RPKL(K,L)
    IF (NK.NE. 1) RPKL(K,L)=RPKL(K)*PKLM(K,L,M)/RPKL(K,L)
110  CONTINUE
    PS=PS/BSKL(1) BPSL(L)=PS
    DO 115 K=1,NK
    IF (M.EQ. 1) BPKL(K,L)=PKLM(K,L,M)
    PKLM(K,L,M)=PKLM(K,L,M)/BPKL(K,L)
115  CONTINUE

CCCCC
--  COMPUTE BASE GNP FOR ALL REGIONS
--  INITIALIZE BASE GNP TO 1 FOR --
  
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2110.      -- THE BASE PERIOD --
2111.      C -----
2112.      IF (M.EQ. 1) YLM(L,M)=1.00
2113.      IF (M.EQ. 1) GNP(L,M)=1.00
2114.      IF (M.EQ. 1) GO TO 130
2115.      C -----
2116.      C FOR NON-BASE YEARS
2117.      C 1) COMPUTE ACTUAL LABOR PRO-
2118.      C DUCTIVITY FOR PREVIOUS
2119.      C PERIOD
2120.      C 2) COMPUTE BASE LABOR PRO-
2121.      C DUCTIVITY FOR PREVIOUS
2122.      C PERIOD
2123.      C 3) COMPUTE BASE GNP FOR CUR-
2124.      C ENT PERIOD
2125.      C -----
2126.      IF (M.EQ. 2) GNP(L,M)=YLM(L,M1)*(1.00+PROL(L))*NJUMP*
2127.      & (ZLM(L,M1)/ZL(L))
2128.      IF (M.EQ. 2) GO TO 120
2129.      GNP(L,M)=(ZLM(L,M1)/ZLM(L,M2))*(1.00+PROL(L))*NJUMP*
2130.      & YLM(L,M1)
2131.      120 CONTINUE
2132.      C
2133.      C ADJUST GNP FOR ENERGY PRICE
2134.      C
2135.      C YLM(L,M)=GNP(L,M)*PS**RYL(L)
2136.      C
2137.      130 CONTINUE
2138.      C
2139.      C
2140.      RETURN
2141.      END
2142.      C *****
2143.      C
2144.      SUBROUTINE DDDD
2145.      C *****
2146.      C *****
2147.      C
2148.      C -- THE ENERGY DEMAND MODULE --
2149.      C
2150.      C THIS SUBROUTINE COMPUTES THE DEMAND FOR PRIMARY AND SECONDARY ENER
2151.      C BY REGION AND SECTOR.
2152.      C
2153.      C
2154.      C INTEGER INPUTS: M, NF, NFF, NI, NJ, NKKL, NKL, NKKMAX, NKMAX, NL,
2155.      C NU
2156.      C
2157.      C REAL INPUTS: BSJKLH, BSKL, ESIL, GIJ, GJ, GJK, GUI,
2158.      C PJL, PJKL, PKL, RPJ, RPJK, RPK, RPKK, RYJ, RYJK,
2159.      C RYKLT, RYKK, SCIL, SUIL, TESIL, TJKLM, YLM, ZLM
2160.      C
2161.      C REAL OUTPUTS: EDIKL, EDIL, EDRIKL, EFJKL, ESIL, FJKL, FJL, SJKL,
2162.      C
2163.      C SUBROUTINES CALLED: NONE
2164.      C
2165.      C WRITTEN BY:
2166.      C JAE EDMONDS
2167.      C 1 JANUARY 1982
2168.      C
2169.      C LATEST REVISION:
2170.      C 17 AUGUST, 1982
2171.      C *****

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C MAKE ALL REAL VARIABLES DOUBLE PRECISION
C
C IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
C
C COMMON BLOCKS
C
COMMON/RF/RSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
  & RYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
COMMON/REP4/BPSL(9),BPKL(3,9),BSUJLM(6,9,6),GNP(9,6),GNPLM(10,6)
  & GNP9L(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
  & PHYDRO(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
  & TXJLM(3,9,6),TXJLM(4,9,6),XIL(3,9)
COMMON/REYX/ESIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),DLDXI(3)
  & OLDPI(3),OX(3),MAGN,NFAIL,NTIMES
COMMON/RES/BESILM(5,9,6),ESRL14(9,6),ESRL24(9,6),
  & BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR24(6),
  & ESILM(3,9,6),ESIL24(3,9,6),ESKJLM(6,9,6),
  & FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUL(3,9),PCIL(3,9),
  & PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
  & PUJLM(6,9,6),TKL(3,9),NUB
COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
  & EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
  & FJL(4,9),GCI(2),GIJ(3),GUI(3),HYDRO(5,9),PILM(6,9,6),PROL(9),
  & SCIL(3,9),SUJL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),PIOPSH(4,2,2),
COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
  & EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(5),
  & EDRI(6,9),FDRIM(6,6),EDRI(6,9),EDRKL(4,9,6),EDRLM(9,6),
  & EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
  & EPCLM(10,6),EPGLM(10,6)
COMMON/OUT2/ESH(6),ESH(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
  & ESILM(6,6),ESI24(6,6),ESLIM(9,6),ESL24(9,6),ESRLM(9,6),
  & ESUM(6),ESUM(6,6),ESUJLM(6,9,6),
  & ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
  & GNPFLM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
  & SYNILM(6,9,6),SYNLM(9,6)
COMMON/PCP/NF,NFF,NJ,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NKL(9)
  & NMAX,NKKAX,NL,NM,NMREAD,NMKT,NU,NMAXGN,NCO2,NOPT(10),IOUNIT,
  & NSTEP,NPUNT
COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
  & CO2IM(8,6),CO2LM(9,6),CO2M(6)
COMMON/RS/QISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
  & RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
C
C LOCAL VARIABLES
C
REAL*8 E,FK(3),RATIO,RYK,RYKT(2),SHARE,SUM,T,TES,TT,X,
  & TECH
INTEGER NK,NT
C
C-----
C ! INTERPOLATE INCOME ELASTICITY VALUES !
C-----
C
NT=(4-1)*NJUMP
T=NT
TT=NJUMP
DO 45 IT=1,2
  FK(1)=RYKL(IT)
  IF(IT.EQ.1) FK(2)=RYKL(IT)*0.80D0

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2230.      IF (IT.EQ.2) FK(2)=RYKL(IT)*0.7100
2231.      FK(3)=75.00
2232.      RYKT(IT)=XNTEPP(FK(1),FK(2),FK(3),T)-1.00
2233. 45 CONTINUE
2234.
2235. C
2236. C
2237.      DO 150 L=1,NL
2238.      NK=NKL(L)
2239.      X=YL(L,M)/(ZLM(L,M)/ZLM(L,1))
2240.
2241. C
2242. C
2243. C
2244. C
2245. C
2246. C
2247. C
2248. C
2249. C
2250. C
2251. C
2252. C
2253. C
2254. C
2255. C
2256. C
2257. C
2258. C
2259. C
2260. C
2261. C
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2281. C
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2283. C
2284. C
2285. C
2286. C
2287. C
2288. C
2289. C

      IF (IT.EQ.2) FK(2)=RYKL(IT)*0.7100
      FK(3)=75.00
      RYKT(IT)=XNTEPP(FK(1),FK(2),FK(3),T)-1.00
45 CONTINUE

      DO 150 L=1,NL
      NK=NKL(L)
      X=YL(L,M)/(ZLM(L,M)/ZLM(L,1))

      !-----
      ! CALCULATE FK. THE DEMAND FOR ENERGY SERVICES BY SECTOR K !
      !-----
      DO 30 K=1,NK
      IF (NK-1) 10,10,20
10      CONTINUE
      IF (L.EQ.4) RYK=RYKT(1)
      IF (L.NE.4) RYK=RYKT(2)
      FK(K)=BSKL(K,L)*PKLM(K,L,M)**RPKL(K,L)*X**RYK*YL(L,M)
      GO TO 30
20      FK(K)=BSKL(K,L)*PKLM(K,L,M)**RPKL(K,L)*X**RYKK(K)
      FK(K)=FK(K)*ZLM(K,M)/ZLM(L,1)
      IF (K.EQ.2) FK(K)=BSKL(K,L)*PKLM(K,L,M)**RPKL(K,L)
      IF (K.EQ.2) FK(K)=FK(K)*YL(L,M)**RYKK(K)
30 CONTINUE

      COMPUTE NUMERATOR AND DENOMINATOR OF SJKL.
      USE SJKL AS TEMPORARY NUMERATOR.

39      DO 90 K=1,NK
      SUM=0.00
      DO 70 J=1,NJ
      IF (NK-1) 40,40,50
40      SJKL(J,K,L)=BSJKLM(J,K,L,M)*PJKLM(J,K,L,M)**RPJ(J)*X**R
      GO TO 60
50      SJKL(J,K,L)=BSJKLM(J,K,L,M)*PJKLM(J,K,L,M)**RPJK(J,K)
      *X**RYJK(J,K)
60      SUM=SUM+SJKL(J,K,L)
70      CONTINUE
      DO 80 J=1,NJ
      SJKL(J,K,L)=SJKL(J,K,L)/SUM
80      CONTINUE
90 CONTINUE

      COMPUTE TOTAL FUEL DEMANDS

      DO 140 J=1,NJ
      FJL(J,L)=0.00
      DO 130 K=1,NK
      TECH=(1.00+TKL(K,L))*T
      FJKL(J,K,L)=SJKL(J,K,L)*FK(K)/TECH
      IF (NK-1) 100,100,110
100      FJKL(J,K,L)=FJKL(J,K,L)*GJ(J)
      GO TO 120
110      FJKL(J,K,L)=FJKL(J,K,L)*GJK(J,K)
120      FJL(J,L)=FJL(J,L)+FJKL(J,K,L)
130      CONTINUE
140 CONTINUE
150 CONTINUE

```

```

2290. C      DO 230 L=1,NL
2291.      NK=NKL(L)
2292.      NKK=NKKL(L)
2293.      IF (NUB.EJ. 1) GO TO 151
2294.
2295. C
2296. C
2297. C
2298. C      *-----*
2299. C      * REALIGN ELECTRIC UTILITY SHARES TO CONFORM TO SUPPLY *
2300. C      * ASSUMPTIONS AND FINAL DEMAND LEVELS *
2301. C      *-----*
2302.      IF (ESIL(NI,L).GT. FJL(NJ,L)) ESIL(NI,L)=FJL(NJ,L)
2303.      C=(1.00-ESIL(NI,L)/FJL(NJ,L))/(1.00-SUIL(NI,L))
2304.      DO 156 I=1,NU
2305.          SUIL(I,L)=SUIL(I,L)*C
2306. 156 CONTINUE
2307.      SUIL(NI,L)=ESIL(NI,L)/FJL(NJ,L)
2308. C
2309. C      COMPUTE ELECTRIC UTILITY DEMANDS FOR FOSSIL FUELS
2310. C
2311.      DO 160 I=1,NI
2312.          ESUILM(I,L,M)=SUIL(I,L)*FJL(NJ,L)
2313. 160 CONTINUE
2314.      SHARE=0.00
2315.      E=0.00
2316.      EFJKL(NJ,1,L)=0.00
2317.      DO 170 I=1,NF
2318.          EFJKL(I,1,L)=FJL(NJ,L)*SUIL(I,L)+GUI(I)
2319.          EDKIKL(I,1,L)=EFJKL(I,1,L)*GIJ(I)
2320.          EDRIKL(I,L)=EDRIKL(I,1,L)
2321.          E=E+EDRIKL(I,1,L)
2322.          SHARE=SHARE+SUIL(I,L)
2323. 170 CONTINUE
2324. C
2325. C      *-----*
2326. C      * COMPUTE PRIMARY EQUIVALENCE RATIO *
2327. C      * FOR FOSSIL FUELS IN ELECTRICITY *
2328. C      *-----*
2329.      IF (ESIL(NI,L)-FJL(NJ,L)) 175, 176, 176
2330. 175 RATIO=E/(SHARE*FJL(NJ,L))
2331.      GO TO 177
2332. 176 RATIO=1.00
2333. 177 CONTINUE
2334. C
2335. C      COMPUTE PRIMARY EQUIVALENCE FOR RENEWABLES
2336. C
2337.      NN=NF+1
2338.      DO 180 I=NN,NI
2339.          ESRILM(I,L,M)=FJL(NJ,L)*SUIL(I,L)*RATIO
2340.          ESIL(I,L)=ESRILM(I,L,M)
2341.          EDRIKL(I,1,L)=ESRILM(I,L,M)
2342.          EDIKL(I,1,L)=EDRIKL(I,1,L)
2343.          EDIL(I,L)=EDRIKL(I,L)
2344. 180 CONTINUE
2345. C
2346. C
2347. C      *-----*
2348. C      * COMPUTE REFINABLE ENERGY DEMAND REQUIREMENTS FOR END-USE SECTORS *
2349. C      *-----*

```

```

2350.      DO 220 K=1,NK
2351.          KK=K+1
2352.          DO 200 I=1,NF
2353.              J=I
2354.              EFJKL(I,KK,L)=FJKL(I,K,L)
2355.              EDRIKL(I,KK,L)=EFJKL(I,KK,L)*G1J(I)
2356.              EDRIKL(I,L)=EDRIKL(I,L)+EDRIKL(I,KK,L)
2357.          200 CONTINUE
2358.      C
2359.      C ASSIGN ELECTRICITY
2360.      C          EFJKL(NJ,KK,L)=FJKL(NJ,K,L)
2361.      C
2362.      C ALLLOCATE ZERO PRIMARY ELECTRICITY TO DIRECT END USE
2363.      C
2364.      C          DO 210 I=NN,NI
2365.      C              EDIKL(I,KK,L)=0.00
2366.      C              EDRIKL(I,KK,L)=0.00
2367.      C
2368.      C          210 CONTINUE
2369.      C          220 CONTINUE
2370.      C
2371.      C          GO TO 230
2372.      C
2373.      C
2374.      C
2375.      C
2376.      C
2377.      C
2378.      C
2379.      C
2380.      C
2381.      C
2382.      C
2383.      C
2384.      C
2385.      C
2386.      C
2387.      C
2388.      C
2389.      C
2390.      C
2391.      C
2392.      C
2393.      C
2394.      C
2395.      C
2396.      C
2397.      C
2398.      C
2399.      C
2400.      C
2401.      C
2402.      C
2403.      C
2404.      C
2405.      C
2406.      C
2407.      C
2408.      C
2409.      C

```

CONSERVATION AND NON-ELECTRIC
 SOLAR CALCULATIONS

```

151 CONTINUE
COMPUTE FUEL TYPE SHARES BASED ON PERIOD ONE PRICES
FOR CONSERVATION AND NON-ELECTRIC SOLAR CALCULATIONS
SUIL(NI,L)=HYDRO(5,L)
SUM=0.00
DO 153 I=1,NU
    SUIL(I,L)=BSUILM(I,L,M)*PUILM(I,L,1)*RUI(I)
    SUM=SUM+SUIL(I,L)
153 CONTINUE
IF (TESIL(L) .GT. FJL(NJ,L)) TESIL(L)=FJL(NJ,L)
DO 154 I=1,NU
    SUIL(I,L)=(1.00-(TESIL(L)/FJL(NJ,L)))*SUIL(I,L)/SUM
154 CONTINUE
SUIL(NI,L)=TESIL(L)/FJL(NJ,L)
COMPUTE DEMAND FOR SECONDARY FUELS
EFJKL(NJ,1,L)=0.00
DO 163 I=1,NF
    EFJKL(I,1,L)=FJL(NJ,L)*SUIL(I,L)*GUI(I)
163 CONTINUE
DO 164 K=1,NK
    KK=1+K
    DO 165 J=1,NF
        EFJKL(I,KK,L)=FJKL(I,K,L)
    165 CONTINUE
    EFJKL(NJ,KK,L)=FJKL(NJ,K,L)
164 CONTINUE

```

```

2410. C 230 CONTINUE
2411. C
2412. C RETURN
2413. C END
2414. C *****
2415. C
2416. C SUBROUTINE XXXX
2417. C
2418. C *****
2419. C
2420. C
2421. C
2422. C
2423. C
2424. C
2425. C
2426. C
2427. C
2428. C
2429. C
2430. C
2431. C
2432. C
2433. C
2434. C
2435. C
2436. C
2437. C
2438. C
2439. C
2440. C
2441. C
2442. C
2443. C
2444. C
2445. C
2446. C
2447. C
2448. C
2449. C
2450. C
2451. C
2452. C
2453. C
2454. C
2455. C
2456. C
2457. C
2458. C
2459. C
2460. C
2461. C
2462. C
2463. C
2464. C
2465. C
2466. C
2467. C
2468. C
2469. C

```

RETURN
 END

 SUBROUTINE XXXX

 -- EXCESS DEMAND CALCULATOR --
 THIS SUBROUTINE CALCULATES EXCESS DEMANDS FOR ALL WORLD MARKETS. TES
 FOR CONVERGENCE TO EQUILIBRIUM, AND INITIATES A CONVERGENCE PROCESS
 EQUILIBRIUM IN ANY MARKET FAILS TO EXIST. IF EQUILIBRIUM IS ATTAINED
 THEN THE CONSISTENCY OF THE EXPORT/IMPORT SPECIFICATION IS TESTED.
 INTEGER INPUTS: NF, NL, NMKT, NXIL
 REAL INPUTS: EDIL, ESIL, TEST
 INTEGER OUTPUTS: NFAIL, NAJUST, NXIL (UNDER SOME CIRCUMSTANCES)
 REAL OUTPUTS: EDIMKT, ESIMKT, XI, DX
 SUBROUTINES CALLED: REVISE
 WRITTEN BY:
 JAE EDMONDS
 1 JANUARY 1982
 LATEST REVISION:
 1 JANUARY 1982

 MAKE ALL REAL VARIABLES DOUBLE PRECISION
 IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
 COMMON BLOCKS
 COMMON/RE/RSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
 & RYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
 COMMON/REP4/BPSL(9),BPKL(3,9),BSUILM(6,9,6),GNP(9,6),GNPLM(10,6)
 & GNPBL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
 & PHYDRO(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
 & TXILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
 COMMON/REX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
 & OLUPI(3),DX(3),NAGN,NFAIL,NTIMES
 COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
 & BSCIL(2,9),CIL(5,9),CSLT(9,3),ESR1M(6),ESR2M(6),
 & ESIL1M(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
 & FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
 COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
 & PIN(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
 & PUILM(6,9,6),TKL(3,9),NUB
 COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
 & EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
 & FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
 & SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSH(4,2,2),
 COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),

[illegible]

COMMON/RE/RSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),R^PK,RPKK(3),RYJ(4),
ERYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
COMMON/REP4/BP^SL(9),BP^SKL(3,9),RSU^ILM(6,9,6),GNP(9,6),GNPLM(10,6)
6 GNPBL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(4),RPKL(3,9),
6 PHYDRO(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),

```

2555.5      & TYILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
2556.5      COMMON/REVVY/FJIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
2556.5      & ULDP(3),DX(3),NAGN,NFAIL,NTIMES
2557.5      COMMON/RES/RESILM(5,9,6),ESRL1(9,6),ESRL2(9,6),
2557.5      & ESCIL(2,9),CIL(5,9),CSLT(9,3),ESKLM(6),ESR2M(6),
2558.5      & ESIL1(3,9,6),ESIL2(3,9,6),ESRIL(6,9,6),
2558.5      & FLRL(3,9),HCILT(2,4,3),RCI(2),SFLRL(9),RYSHT
2559.5      COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUL(3,9),PCIL(3,9),
2559.5      & PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
2570.5      & PUILM(6,9,6),TKL(3,9),NUB
2570.5      COMMON/DNSPER/EDIL(6,9),EDIKL(6,4,9),
2571.5      & EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
2571.5      & FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
2572.5      & SCIL(3,9),SUIL(6,9),TESIL(9),YL(9,6),BIOLM(9,2),BINPSH(4,2,2),
2572.5      COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
2573.5      & EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
2573.5      & EDRIH(6,9),EDRIKM(6,6),EDRIL(6,9),EDKLM(4,9,6),EDRLM(9,6),
2574.5      & EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
2574.5      & EPCLM(10,6),EPGLM(10,6)
2575.5      COMMON/OUT2/ESH(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIH(6,6),
2575.5      & ESIM(6,6),ESI2M(6,6),ESLM(9,6),ESL2M(9,6),ESRLM(9,6),
2576.5      & ESUM(6),ESUIM(6,6),ESUIM(6,9,6),
2576.5      & ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
2577.5      & GNPFM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
2577.5      & SYNILM(6,9,6),SYNLM(9,6)
2578.5      COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NKL
2578.5      & NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NCO2,NOPT(10),IOUNIT
2579.5      & NSTEP,NPUNT
2579.5      COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
2580.5      & CO2IN(8,6),CO2LM(9,6),CO2M(6)
2580.5      COMMON/RS/OISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
2581.5      & RIL(5,9),STISL(5,9),BSIL(5,9),ESFIL(5,9)
2581.5      C LOCAL VARIABLES
2582.5      C
2582.5      REAL*8 DP(3),X,OLDX
2583.5      REAL*8 DETERM,VEC1(3),VEC2(3),W(3,3)
2583.5      INTEGER NDOWN
2584.5      C
2584.5      C *****
2585.5      C *** SET NPUNT TEST VARIABLE USED TO *****
2585.5      C *** INITIATE THE AREA SEARCH ROUTINE *****
2586.5      C *****
2586.5      C
2587.5      C NPUNT=5
2587.5      C *****
2588.5      C *** IF THIS IS THE FIRST TIME THROUGH THE ***
2588.5      C *** CONVERGENCE PROCESS THEN SKIP THIS SECTION. ***
2589.5      C
2589.5      C *****
2590.5      C IF(NAGN.EQ.0) GO TO 5
2590.5      C IF(NDOWN.GT.NPUNT) GO TO 5
2591.5      C
2591.5      C
2592.5      C
2592.5      C
2592.5      C
2593.5      C
2593.5      C
2593.5      C
2594.5      C
2594.5      C
2595.5      C

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CHECK TO SEE IF CONVERGENCE IS ACTUALLY OCCURRING:
A POSITION IS CONSIDERED IMPROVED
IF THE TOTAL VARIANCE OF THE POSITION
HAS DECREASED.

```

C INITIALIZE "X", THE CURRENT

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2535.5 C VARIANCE FROM EQUILIBRIUM VARIABLE, AND "OLDX" THE PREVIOUS
2536.5 C ITERATION'S VARIANCE REGISTER TO 0.0
2536.5 C
2537.5 C X=0.0
2537.5 C OLDX=0.0
2538.5 C DO 2 I=1,NMKT
2538.5 C X=X+XI(I)**2
2539.5 C OLDX=OLDX+OLDXI(I)**2
2539.5 C 2 CONTINUE
2600.5 C IF (X .LT. OLDX) GO TO 5
2600.5 C
2601.5 C IF X IS NOT LESS THAN OLDX THEN DEMAND AND SUPPLY ARE DIVERGING.
2601.5 C IF DEMAND AND SUPPLY ARE ACTUALLY DIVERGING, HALVE THE PRICE CHANGE
2602.5 C ON THE NPOINT-TH CONSECUTIVE PASS WITH DIVERGING
2602.5 C EQUILIBRIUM, CALL PUNT
2603.5 C
2603.5 C IF (NDOWN.EQ.NPUNT) CALL PUNT
2604.5 C NDOWN=NDOWN+1
2604.5 C IF (NDOWN.GT.NPUNT) RETURN
2605.5 C
2605.5 C 3 DO 4 I=1,NMKT
2606.5 C DP(I)=-.25DO*DP(I)
2606.5 C 4 CONTINUE
2607.5 C
2607.5 C SKIP DOWN TO NEW PRICE COMPUTATION
2608.5 C
2608.5 C GO TO 70
2609.5 C
2610.5 C *****
2610.5 C *** COMPUTE SUPPLY AND DEMAND ELASTICITIES ***
2610.5 C *****
2611.5 C 5 CONTINUE
2611.5 C NDOWN=0
2612.5 C CALL ELAS
2612.5 C
2613.5 C COMPUTE THE PRICE ELASTICITY DEMAND - SUPPLY DIFFERENCE MATRIX 'W'
2613.5 C
2614.5 C DO 20 I=1,NMKT
2614.5 C DO 10 J=1,NMKT
2615.5 C W(I,J)=UIJ(I,J)-VIJ(I,J)
2615.5 C 10 CONTINUE
2616.5 C 20 CONTINUE
2616.5 C
2617.5 C SOLVE FOR REQUIRED PRICE CHANGES
2617.5 C
2618.5 C FIRST, COMPUTE 'W' INVERSE:
2618.5 C
2619.5 C CALL MINV(W,NMKT,DETERM,VEC1,VEC2)
2619.5 C (NOTE: SUBROUTINE MINV ZEROES OUT DETERM, VEC1, AND VEC2)
2620.5 C
2620.5 C -----
2621.5 C -- INDICATE THAT MINV HAS BEEN CALLED --
2621.5 C -----
2622.5 C NTIMES=NTIMES+1
2622.5 C
2623.5 C -- OUTPUT OPTION CONTROL
2623.5 C
2624.5 C IF (NDPT(3)-1) 110,210,110
2624.5 C
2625.5 C 110 CONTINUE

```

```

2625.0 C
2625.5 C
2627.0 C
2627.5 C
2628.0 C
2628.5 C
2629.0 C
2629.5 C
2630.0 C
2630.5 C
2631.0 C
2631.5 C
2632.0 C
2632.5 C
2633.0 C
2633.5 C
2634.0 C
2634.5 C
2635.0 C
2635.5 C
2636.0 C
2636.5 C
2637.0 C
2637.5 C
2638.0 C
2638.5 C
2639.0 C
2639.5 C
2640.0 C
2640.5 C
2641.0 C
2641.5 C
2642.0 C
2642.5 C
2643.0 C
2643.5 C
2644.0 C
2644.5 C
2645.0 C
2645.5 C
2646.0 C
2646.5 C
2647.0 C
2647.5 C
2648.0 C
2648.5 C
2649.0 C
2649.5 C
2650.0 C
2650.5 C
2651.0 C
2651.5 C
2652.0 C
2652.5 C
2653.0 C
2653.5 C
2654.0 C
2654.5 C
2655.0 C

      +-----+
      | INTERMEDIATE OUTPUT |
      +-----+
      WRITE(4,1000)  NTIMES
1000  FORMAT(1X,'MINV HAS BEEN SUCCESSFULLY CALLED.  NTIMES=',I2)
      +-----+
      | END INTERMEDIATE OUTPUT |
      +-----+
210  CONTINUE

      +-----+
      | SOLVE FOR DP(I) |
      | AND CHECK FOR NEGATIVE ADJUSTED PRICES |
      +-----+

      DO 40 I=1,NMKT
      DP(I)=0.0
      DO 30 J=1,NMKT
      TEMP=-W(I,J)*XI(J)
      DP(I)=DP(I)+TEMP
30    CONTINUE
      IF(DP(I).LT.-1.00) DP(I)=-0.900
40    CONTINUE

      SAVE 'XI' VECTOR VALUES TO COMPARE WITH RECOMPUTED 'XI', AND
      SAVE 'PIM' VECTOR VALUES FOR FUTURE USE IF EQUILIBRIUM ADJUSTMENT
      OVERSHOOTS
      DO 60 I=1,NMKT
      OLDXI(I)=XI(I)
      OLDPI(I)=PIM(I,M)
60    CONTINUE

      +-----+
      | -- COMPUTE NEW PRICES -- |
      +-----+
70    CONTINUE
      DO 90 I=1,NMKT
      PIM(I,M)=OLDPI(I)*(1.00+DP(I))
90    CONTINUE

      INDICATE THAT THE CONVERGENCE PROCESS HAS BEEN USED AGAIN
      NAGN=NAGN+1
      RETURN
      END
C*****
C
      SUBROUTINE PUNT
C*****
      +-----+
      | -- THE AREA SEARCH ALGORITHM -- |
      +-----+
      THIS SUBROUTINE IS CALLED WHENEVER THE USUAL NEWTONIAN
      SEARCH ALGORITHM WITH VECTOR REDUCTION IS UNABLE TO FIND A SET
      OF PRICES WHICH REDUCE DISEQUILIBRIUM AFTER NPUNT TRIES.

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```

2055.5 C
2056.5 C
2057.5 C
2058.5 C
2059.5 C
2060.5 C
2061.5 C
2062.5 C
2063.5 C
2064.5 C
2065.5 C
2066.5 C
2067.5 C
2068.5 C
2069.5 C
2070.5 C
2071.5 C
2072.5 C
2073.5 C
2074.5 C
2075.5 C
2076.5 C
2077.5 C
2078.5 C
2079.5 C
2080.5 C
2081.5 C
2082.5 C
2083.5 C
2084.5 C
2085.5 C

MODEL VERSION: A.84

INPUTS
  INTEGER NMKT
  REAL EDRI,ESKILM,PIM

OUTPUTS
  INTEGER (NONE)
  REAL PIM

INTERNAL VARIABLES
  INTEGER: NGRID= FOR EACH PIM THE NUMBER OF PRICES OVER WHICH
                  THE SUBROUTINE WILL EXPLORE, NGRID MUST
                  BE 2 OR MORE. NSH=NUMBER OF SEARCH POINTS
                  IS=SEARCH POINT INDEX
                  ISP=INTEGER HOLDING VARIABLE
  REAL: AREA = SCALE FACTOR USED TO DETERMINE MAXIMUM
              AND MINIMUM VALUES OF PIM TO BE EXPLORED
              PMAX=PIM*AREA
              PMIN=PIM/AREA
              AREA MUST EXCEED 1.00
  GRIDST=INCREMENT EACH PRICE IS CHANGED FROM ONE
          GRID STEP TO THE NEXT
  PMIN = MINIMUM PRICE SEARCHED
  PSTAR= PRICE VECTOR WITH MINIMUM DIVERGENCE FROM
          EQUILIBRIUM. PIM IS SET EQUAL TO PSTAR
          AT THE END OF THE SEARCH
  SP = TEMPORARY HOLDING VARIABLE
  U = COUNTING VARIABLE FOR DEMAND
  V = COUNTING VARIABLE FOR SUPPLY
  XX = SQUARED EXCESS DEMAND (U-V)**2
  XMIN = MINIMUM VALUE OF XX

SUBROUTINES CALLED: PPPP,PSPP,SSSS,DDDD

WRITTEN BY:
  JAE EDMONDS
  26 OCT 1984

LATEST REVISION:
  NONE

*****

MAKE ALL REAL VARIABLES DOUBLE PRECISION

IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)

COMMON BLOCKS

COMMON/RE/BSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
&RYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
COMMON/REP/BPSL(9),BPKL(3,9),BSUJLM(6,9,6),GNP(9,6),GNPLM(10,6)
&GNPBL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
&PHYDRO(9),KUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
&TXILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
COMMON/REVX/EDIHKT(6),ESIHKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
&OLDPI(3),DX(3),NAGN,NFAIL,NTIMES
COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
&BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR2M(6),
&ESILM(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),

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LATEST REVISION: 31 JULY 1984
BY: JAE EDMONDS
*PI: CHANGED TO PIM

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2775. C *****
2776. C
2777. C MAKE ALL REAL VARIABLES DOUBLE PRECISION
2778. C
2779. C IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
2780. C
2781. C COMMON BLOCKS
2782. C
2783. C COMMON/RE/BSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
2784. C ERYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
2785. C COMMON/REP4/BPSL(9),BPKL(3,9),BSUJLM(6,9,6),GNP(9,6),GNPLM(10,
2786. C EGNPBL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
2787. C EPHYDRC(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
2788. C ETXJLM(3,9,6),TXJLM(4,9,6),XIL(3,9)
2789. C COMMON/REX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLOXI(
2790. C EOLUPI(3),DX(3),NAGN,NFAIL,NTIMES
2791. C COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
2792. C EBSCL(2,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR2M(6),
2793. C EESILM(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
2794. C EFLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
2795. C COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
2796. C EPIH(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
2797. C EPUJLM(6,9,6),TKL(3,9),NUB
2798. C COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
2799. C EEDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
2800. C E FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
2801. C E SCIL(3,9),SUIL(6,9),TESTL(9),YLM(9,6),BIOLM(9,2),BIOPSM(4,2,2)
2802. C COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
2803. C EEDI(6,6),EDKL(4,9),EDLM(9,6),EDKM(6),EDRKM(6),
2804. C EEDRIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKL(4,9,6),EDRLM(9,6),
2805. C EEFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
2806. C EEPCLM(10,6),EPGLM(10,6)
2807. C COMMON/OUT2/ESM(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
2808. C EESIM(6,6),ESI2M(6,6),ESLIM(9,6),ESL2M(9,6),ESRLM(9,6),
2809. C EESUM(6),ESUIM(6,6),ESUJLM(6,9,6),
2810. C EESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
2811. C EGNPFLM(10,6),GNPPCH(10,6),SYNM(6),SYNH(6,6),
2812. C ESYNLM(6,9,6),SYNLM(9,6)
2813. C COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NKL
2814. C ENKMAX,NKKMAX,NL,NH,NHREAD,NMKT,NU,MAXAGN,NCO2,NOPT(10),IOUNI
2815. C NSTEP,NPUNT
2816. C COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
2817. C E COZIM(8,6),COZLM(9,6),COZM(6)
2818. C COMMON/RS/QISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
2819. C EKIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
2820. C
2821. C -- LOCAL VARIABLES --
2822. C
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C      -- PEPTERB PRICES --
C      PIMOLD=PI*(I,M)
C      PIM(I,M)=PIM(I,M)+DELTA
C
C      -- RUN THE MODEL --
C
C      CALL PPPP
C      CALL PSOS
C      CALL SSSS
C      NUB=0
C      CALL DDDD
C
C      -- COMPUTE NEW MARKET SUPPLIES AND DEMANDS --
C
C      DO 60 II=1,NF
C        U=1.00
C        V=1.00
C        DO 30 L=1,NL
C          U=U+EDRIL(II,L)
C          V=V+ESRILM(II,L,M)
C        30 CONTINUE
C
C      -- CALCULATE NUMERICAL ELASTICITIES FOR FUEL I --
C        UIJ(II,I)=(U-EDINKT(II))/EDINKT(II)/(DELTA/PIMOLD)
C        VIJ(II,I)=(V-ESINKT(II))/ESINKT(II)/(DELTA/PIMOLD)
C      60 CONTINUE
C
C      -- RETURN PRICE TO ORIGINAL VALUE --
C      PIM(I,M)=PIMOLD
C      100 CONTINUE
C
C      -- OUTPUT OPTION CONTROL
C      IF(NOPT(4)-1) 110,210,110
C
C      110 CONTINUE
C
C      +-----+
C      | INTERMEDIATE OUTPUT SECTION |
C      +-----+
C
C      WRITE(6,1000) M
C      1000 FORMAT(1H1,'PERIOD',I2,' GLOBAL PRICE ELASTICITIES')
C      WRITE(6,1010) (F(II),II=1,6)
C      1010 FORMAT(1X,'DEMAND ',3(2A4,2X),4X,'SUPPLY ',3(2A4,2X))
C      DO 200 I=1,NMKT
C        IJ=1+2*(I-1)
C        IK=IJ+1
C        WRITE(6,2000) (F(II),II=IJ,IK), (UIJ(I,J),J=1,NMKT),
C          (F(II),II=IJ,IK), (VIJ(I,J),J=1,NMKT)
C      2000 FORMAT(1X,2(2A4,2X,3F10.4,1X))
C
C      200 CONTINUE
C      210 CONTINUE
C
  
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2945. C      INTERCHANGE ROWS
2946. C
2947. J=L(K)
2948. IF(J-K) 35,35,25
2949. KI=K-J
2950. DO 30 I=1,N
2951. KI=KI+N
2952. HOLD=-A(KI)
2953. JI=KI-K+J
2954. A(KI)=A(JI)
2955. A(JI)=HOLD
2956. C
2957. C      INTERCHANGE COLUMNS
2958. C
2959. I=M(K)
2960. IF(I-K) 45,45,38
2961. JP=N*(I-1)
2962. DO 40 J=1,N
2963. JK=NK+J
2964. JI=JP+J
2965. HOLD=-A(JK)
2966. A(JK)=A(JI)
2967. A(JI)=HOLD
2968. C
2969. C      DIVIDE COLUMN BY MINUS PIVOT (VALUE OF PIVOT ELEMENT IS
2970. C      CONTAINED IN BIGA)
2971. C
2972. IF(BIGA) 48,46,48
2973. D=0.00
2974. RETURN
2975. DO 55 I=1,N
2976. IF(I-K) 50,55,50
2977. IK=NK+I
2978. A(IK)=A(IK)/(-BIGA)
2979. CONTINUE
2980. C
2981. C      REDUCE MATRIX
2982. C
2983. DO 65 I=1,N
2984. IK=NK+I
2985. HOLD=A(IK)
2986. IJ=I-N
2987. DO 65 J=1,N
2988. IJ=IJ+N
2989. IF(I-K) 60,65,60
2990. IF(J-K) 62,65,62
2991. KJ=IJ-I+K
2992. A(IJ)=HOLD*A(KJ)+A(IJ)
2993. CONTINUE
2994. C
2995. C      DIVIDE ROW BY PIVOT
2996. C
2997. KJ=K-N
2998. DO 75 J=1,N
2999. KJ=KJ+N
3000. IF(J-K) 70,75,70
3001. A(KJ)=A(KJ)/BIGA
3002. CONTINUE
3003. C
3004. C      PRODUCT OF PIVOTS

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3005. C      D=D*BIGA
3006. C
3007. C      REPLACE PIVOT BY RECIPROCAL
3008. C
3009. C      A(KK)=1.00/BIGA
3010. C      CONTINUE
3011. C
3012. C      FINAL ROW AND COLUMN INTERCHANGE
3013. C
3014. C      K=N
3015. C
3016. 100    K=(K-1)
3017. C      IF(K) 150,150,105
3018. 105    I=L(K)
3019. C      IF(I-K) 120,120,108
3020. 108    JQ=N*(K-1)
3021. C      JK=N*(I-1)
3022. C      DO 110 J=1,N
3023. C      JK=JQ+J
3024. C      HOLD=A(JK)
3025. C      JI=JR+J
3026. C      A(JK)=-A(JI)
3027. 110    A(JI)=HOLD
3028. 120    J=M(K)
3029. C      IF(J-K) 100,100,125
3030. 125    KI=K-N
3031. C      DO 130 I=1,N
3032. C      KI=KI+N
3033. C      HOLD=A(KI)
3034. C      JI=KI-K+J
3035. C      A(KI)=-A(JI)
3036. 130    A(JI)=HOLD
3037. C      GO TO 100
3038. 150    RETURN
3039. C      END
3040. C *****
3041. C
3042. C      SUBROUTINE POST
3043. C *****
3044. C
3045. C      -- THE REPORT VARIABLE ASSEMBLY MODULE --
3046. C
3047. C      THIS MODULE GENERATES TOTALS AND SUBTOTALS OF ENERGY CONSUMPTION
3048. C      BY VARIOUS CATEGORIES OF GLOBAL CONSUMERS.
3049. C
3050. C      VERSION:  A.31.07.84
3051. C
3052. C      INTEGER INPUTS:  NI, NJ, NKKL, NKKMAX, NL
3053. C
3054. C      REAL INPUTS:     EDIKL, EDJKL, EDRIKL, EFJKL, ESIL, EXIL
3055. C
3056. C      REAL OUTPUTS:    EDKL, EDIL, EDI, EDL, ED, EDRIL, EFKL, EFJL, EFJ,
3057. C                      EFL, ES, ESI, ESL, ESRIL, ESRZL, EXI, EXL, EX
3058. C
3059. C      SUBROUTINES CALLED:  NONE
3060. C
3061. C      CODED BY:
3062. C      JAE EDMONDS
3063. C      1 JANUARY 1982
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LATEST REVISION:
31 JULY 1984

החברה נמצאת בתהליך של מינוי מנכ"ל חדש, ונציג את שם המינוי בהודעה נפרדת.

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      IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)

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COMMON BLOCKS

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COMMON/RE/BSJKLH(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
& RYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
COMMON/REP/NBPSL(9),BPKL(3,9),BSUJLM(6,9,6),GNP(9,6),GNPLM(10,6)
& GNP9L(9),HIJ(3),HJ(4),HJK(4,3),HJL(6,9),ZL(9),RPKL(3,9),
& PHYDR(9),HUI(5),RYL(9),SJKL(4,3,9),TEST,TRI(3),
& TXJLM(3,9,6),TXJLM(4,9,6),XIL(3,9)
COMMON/RFVX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
& OLDPI(3),DX(3),NAGN,NFAIL,NTIMES
COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
& BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR2M(6),
& ESILM(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
& FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
& PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
& PUJLM(6,9,6),TKL(3,9),NUB
COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
& EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
& FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDR(5,9),PILM(6,9,6),PROL(9),
& SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSH(4,2,2),
COMMON/OUT1/CEFLM(9,6),CEFM(6),COMLM(9,6),COMM(6),EDM(6),
& EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
& EDRIH(6,9),FORIKM(6,6),EDRIL(6,9),EDRKL(4,9,6),EDRLM(9,6),
& EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
& EPCLM(10,6),EPGLM(10,6)
COMMON/OUT2/ESH(6),ESHM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
& ESILM(6,6),ESI2M(6,6),ESLIM(9,6),ESL2M(9,6),ESRLM(9,6),
& ESUM(6),ESUM(6,6),ESUJLM(6,9,6),
& ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
& GNPFLM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
& SYNILM(6,9,6),SYNLM(9,6)
COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NKL(9)
& NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NCO2,NOPT(10),IOUNIT,
& NSTEP,NPUNT
COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHAILE(9,3),
& CO2IM(8,6),CO2LM(9,6),CO2M(6)
COMMON/RS/OISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
& RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)

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LOCAL VARIABLES:

```
REAL*8 TPJLM(4,9,6),TPJKLM(4,3,9,6),
& TEFLM(9,6),TEFJL(4,9),TEFJKL(4,4,9),TEFM(6),TPKLM(3,9,6)
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+-----+
| INITIALIZE VARIABLE VALUES |
+-----+

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$$NLL = NLL + 1$$

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C C C
170.      !-----!
171.      ! COMPUTE ENERGY TRADE STATISTICS !
172.      !-----!
173.      DO 20 L=1,NL
174.          EXLM(L,M)=0.00
175.          GNPLM(L,M)=GNP(L,M)*GNPBL(L)/(1.0D3)
176.      20 CONTINUE
177.      DO 50 I=1,NI
178.          EXIM(I,M)=0.00
179.          DO 40 L=1,NL
180.              EXIL(I,L)=EDRIL(I,L)-ESRILM(I,L,M)
181.              IF (EXIL(I,L).LE.0.D0) EXIM(I,M)=EXIM(I,M)-EXIL(I,L)
182.              EXLM(L,M)=EXLM(L,M)+EXIL(I,L)
183.          40 CONTINUE
184.      50 CONTINUE
185.
186.      EXM(M)=0.00
187.      DO 109 I=1,NF
188.          EXM(M)=EXM(M)+EXIM(I,M)
189.      109 CONTINUE
190.
C C C
191.      !-----!
192.      ! COMPUTE PRIMARY ENERGY DEMAND STATISTICS !
193.      !-----!
194.      DO 110 I=1,NF
195.          TEMP=0.00
196.          DO 80 L=1,NL
197.              IF (EXIL(I,L).GT.0.D0) GO TO 80
198.              FACT=ESIL(I,L)/ESRILM(I,L,M)
199.              EDIL(I,L)=FACT*EDRIL(I,L)
200.              NKK=NKKL(L)
201.              DO 70 K=1,NKK
202.                  EDIKL(I,K,L)=FACT*EDRIKL(I,K,L)
203.              70 CONTINUE
204.              TEMP=TEMP+FACT*EXIL(I,L)/EXIM(I,M)
205.          80 CONTINUE
206.
207.      DO 100 L=1,NL
208.          IF (EXIL(I,L).LE.0.D0) GO TO 100
209.          EDIL(I,L)=ESIL(I,L)+TEMP*EXIL(I,L)
210.          FACT=EDIL(I,L)/EDRIL(I,L)
211.          NKK=NKKL(L)
212.          DO 90 K=1,NKK
213.              EDIKL(I,K,L)=FACT*EDRIKL(I,K,L)
214.          90 CONTINUE
215.      100 CONTINUE
216.      110 CONTINUE
217.
C C C
218.      !-----!
219.      ! COMPUTE SYNFUEL PRODUCTION STATISTICS !
220.      !-----!
221.      SYNH(M)=0.00
222.      DO 125 I=1,NF
223.          SYNIM(I,M)=0.00
224.      125 CONTINUE
225.      DO 130 L=1,NL
226.          SYNLM(L,M)=0.00
227.      130 CONTINUE

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3185.      SYNL(M(I,L,M)=ESRIL(M(I,L,M)-ESIL(I,L)
3186. 120 CONTINUE
3187.      DO 119 I=1,NFF
3188.      SYNL(M(I,L,M)=SYNL(M(I,L,M)+SYNL(M(I,L,M)
3189.      SYNL(M(I,L,M)=SYNL(M(I,L,M)+SYNL(M(I,L,M)
3190. 119 CONTINUE
3191.      SYNL(M(NF,M)=SYNL(M(NF,M)+SYNL(M(NF,L,M)
3192. 130 CONTINUE
3193.      DO 135 I=1,NFF
3194.      SYNL(M)=SYNL(M)+SYNL(M(I,M)
3195. 135 CONTINUE
3196.
3197. C C C
3198. C C C
3199. C C C
3200.      ED(M)=0.00
3201.      DO 250 L=1,NL
3202.      EDLM(L,M)=0.00
3203.      EDRL(M(L,M)=0.00
3204.      ESL(M(L,M)=0.00
3205.      ESR(M(L,M)=0.00
3206.      NKK=NKKL(L)
3207.      DO 190 K=1,NKK
3208.      EDKL(K,L)=0.00
3209.      EFKL(K,L)=0.00
3210.      EDRKL(M(K,L,M)=0.00
3211.      DO 150 I=1,NI
3212.      EDKL(K,L)=EDKL(K,L)+EDIKL(I,K,L)
3213.      EDRKL(M(K,L,M)=EDRKL(M(K,L,M)+EDRIKL(I,K,L)
3214. 150 CONTINUE
3215.      DO 170 J=1,NJ
3216.      EFKL(K,L)=EFKL(K,L)+EFJKL(J,K,L)
3217. 170 CONTINUE
3218.      EDLM(L,M)=EDLM(L,M)+EDKL(K,L)
3219.      EDRL(M(L,M)=EDRL(M(L,M)+EDRKL(M(K,L,M)
3220. 190 CONTINUE
3221.      DO 220 I=1,NI
3222.      EDRL(I,L)=0.00
3223.      NKK=NKKL(L)
3224.      DO 210 K=1,NKK
3225.      EDRL(I,L)=EDRL(I,L)+EDRIKL(I,K,L)
3226. 210 CONTINUE
3227.      ED(M)=ED(M)+EDLM(L,M)
3228. 220 CONTINUE
3229. 250 CONTINUE
3230.
3231. C C C
3232. C C C
3233. C C C
3234.      ESM(M)=0.00
3235.      ESR(M)=0.00
3236.      EDR(M)=0.00
3237.      EDRKM(M)=0.00
3238.      DO 350 I=1,NI
3239.      EDIM(I,M)=0.00
3240.      EDRI(M(I,M)=0.00
3241.      EDRIKM(I,M)=0.00
3242.      ESIM(I,M)=0.00
3243.      ESRIM(I,M)=0.00
3244.      DO 300 L=1,NL

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3245.      EDIM(I,M)=EDIM(I,M)+EDIL(I,L)
3246.      EDRIM(I,M)=EDRIM(I,M)+EDRIL(I,L)
3247.      ESIM(I,M)=ESIM(I,M)+ESIL(I,L)
3248.      ESRIM(I,M)=ESRIM(I,M)+ESRILM(I,L,M)
3249.      EDRIKM(I,M)=EDRIKM(I,M)+EDRIKL(I,L)
3250.      ESLM(L,M)=ESLM(L,M)+ESIL(I,L)
3251.      ESRLM(L,M)=ESRLM(L,M)+ESRILM(I,L,M)
3252. 300    CONTINUE
3253.      ESM(M)=ESM(M)+ESIM(I,M)
3254.      ESRM(M)=ESRM(M)+ESRIM(I,M)
3255.      EDRM(M)=EDRM(M)+EDRIM(I,M)
3256.      EDKRM(M)=EDKRM(M)+EDRIKM(I,M)
3257. 350    CONTINUE
3258.
3259.      +-----+
3260.      |      COMPUTE ELECTRICITY SUPPLY STATISTICS      |
3261.      +-----+
3262.
3263.      ESUM(M)=0.00
3264.      DO 360 I=1,NI
3265.      ESUM(I,M)=0.00
3266. 360    CONTINUE
3267.      DO 380 L=1,NL
3268.      ESULM(L,M)=0.00
3269.      DO 370 I=1,NI
3270.      ESULM(L,M)=ESULM(L,M)+ESUILM(I,L,M)
3271.      ESUM(I,M)=ESUM(I,M)+ESUILM(I,L,M)
3272. 370    CONTINUE
3273. 380    CONTINUE
3274.      DO 390 I=1,NI
3275.      ESUM(M)=ESUM(M)+ESUM(I,M)
3276. 390    CONTINUE
3277.
3278.      +-----+
3279.      |      ASSEMBLE SECONDARY ENERGY DEMAND VARIABLES      |
3280.      +-----+
3281.
3282.      DO 804 J=1,NJ
3283.      EFJM(J,M)=0.00
3284.      DO 802 L=1,NL
3285.      EFJL(J,L)=0.00
3286.      NKK=NKKL(L)
3287.      DO 801 K=2,NKK
3288.      EFJL(J,L)=EFJL(J,L)+EFJKL(J,K,L)
3289. 801    CONTINUE
3290.      EFJM(J,M)=EFJM(J,M)+EFJL(J,L)
3291. 802    CONTINUE
3292. 804    CONTINUE
3293.      EFM(M)=0.00
3294.      DO 803 L=1,NL
3295.      EFLM(L,M)=0.00
3296.      DO 501 J=1,NJ
3297.      EFLM(L,M)=EFLM(L,M)+EFJL(J,L)
3298. 501    CONTINUE
3299.      EFM(M)=EFM(M)+EFLM(L,M)
3300. 803    CONTINUE
3301.
3302.      +-----+
3303.      |      COMPUTE END OF PERIOD GNP (MILLIONS OF 1975 US DOLLARS)      |
3304.      |      AND ENERGY USE PER DOLLAR GNP AND PER CAPITA      |
3305.      +-----+

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3305. C
3306. ZLXM(NLL,M)=0.00
3307. EPGLM(NLL,M)=0.00
3308. EPCLM(NLL,M)=0.00
3309. GNPPCM(NLL,M)=0.00
3310. GNPLM(NLL,M)=0.00
3311. GNPFLM(NLL,M)=0.00
3312. DO 550 L=1,NL
3313. ZLXM(L,M)=ZLXM(L,M)/(1.003)
3314. GNPFLM(L,M)=GNPFLM(L,M)*YLM(L,M)/(1.003)
3315. EPGLM(L,M)=EDLM(L,M)/GNPFLM(L,M)*(1.003)
3316. EPCLM(L,M)=EDLM(L,M)/ZLXM(L,M)*(1.003)
3317. GNPPCM(L,M)=(GNPFLM(L,M)/ZLXM(L,M))*(1.003)
3318. ZLXM(NLL,M)=ZLXM(NLL,M)+ZLXM(L,M)
3319. GNPLM(NLL,M)=GNPLM(NLL,M)+GNPLM(L,M)
3320. GNPFLM(NLL,M)=GNPFLM(NLL,M)+GNPFLM(L,M)
3321. 550 CONTINUE
3322. EPGLM(NLL,M)=EDM(M)/GNPFLM(NLL,M)*(1.003)
3323. EPCLM(NLL,M)=EDM(M)/ZLXM(NLL,M)*(1.003)
3324. GNPPCM(NLL,M)=GNPFLM(NLL,M)/ZLXM(NLL,M)*(1.003)
3325.
3326. +-----+
3327. | COMPUTE SUMMARY ENERGY SUPPLY STATISTICS |
3328. +-----+
3329.
3330. -- AGGREGATE BY REGION
3331.
3332. ESR1M(M)=0.00
3333. ESR2M(M)=0.00
3334. DO 351 L=1,NL
3335. ESR1M(M)=ESR1M(M)+ESRL1M(L,M)
3336. ESR2M(M)=ESR2M(M)+ESRL2M(L,M)
3337. ESL2M(L,M)=0.00
3338. DO 352 I=1,NF
3339. ESL2M(L,M)=ESL2M(L,M)+ESIL2M(I,L,M)
3340. 352 CONTINUE
3341. 351 CONTINUE
3342.
3343. C
3344. NII=NF+1
3345. DO 353 L=1,NL
3346. ESL1M(L,M)=0.00
3347. DO 354 I=1,NF
3348. ESL1M(L,M)=ESL1M(L,M)+ESIL1M(I,L,M)
3349. 354 CONTINUE
3350. DO 355 I=NII,NI
3351. ESL1M(L,M)=ESL1M(L,M)+ESIL(I,L)
3352. 355 CONTINUE
3353. 353 CONTINUE
3354.
3355. C
3356. -- AGGREGATE BY FUEL TYPE
3357.
3358. DO 652 I=1,NF
3359. ESI2M(I,M)=0.00
3360. DO 651 L=1,NL
3361. ESI2M(I,M)=ESI2M(I,M)+ESIL2M(I,L,M)
3362. 651 CONTINUE
3363. 652 CONTINUE
3364.
3365. C
3366. DO 356 I=1,NF
3367. ESI1M(I,M)=0.00

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3365.      DO 357 L=1,NL
3366.      ESILM(I,M)=ESILM(I,M)+ESILM(I,L,M)
3367. 357 CONTINUE
3368. 356 CONTINUE
3369.      DO 358 I=NII,N1
3370.      ESILM(I,M)=0.DO
3371.      DO 359 L=1,NL
3372.      ESILM(I,M)=ESILM(I,M)+ESIL(I,L)
3373. 359 CONTINUE
3374. 358 CONTINUE
3375.
3376. C
3377. C -----
3378. C : COMPUTE NON-ELECTRIC SOLAR/CONSERVATION STATISTICS :
3379. C -----
3380. C
3381. C -- IN PERIOD 1, THERE IS NO CONSERVATION BY DEFINITION
3382. C
3383. C IF (M-1) 682,682,685
3384. 682 DO 683 L=1,NL
3385. C CONLM(L,M)=0.DO
3386. C CEFLM(L,M)=EFLM(L,M)
3387. 683 CONTINUE
3388. C CONM(M)=0.DO
3389. C CEFM(M)=EFM(M)
3390. C GO TO 900
3391. 685 CONTINUE
3392. C
3393. C -- PRESERVE CURRENT PERIOD VARIABLE VALUES AND INSERT FIRST
3394. C PERIOD PRICE VALUES --
3395. C
3396. C DO 730 L=1,NL
3397. C NKK=NKKL(L)
3398. C NK=NKL(L)
3399. C DO 711 K=1,NK
3400. C TPJLM(K,L,M)=PKLM(K,L,M)
3401. C PKLM(K,L,M)=PKLM(K,L,1)
3402. 711 CONTINUE
3403. C TEFLM(L,M)=EFLM(L,M)
3404. C DO 700 J=1,NJ
3405. C TPJLM(J,L,M)=PJLM(J,L,M)
3406. C PJLM(J,L,M)=PJLM(J,L,1)
3407. C TEJLM(J,L)=EFJLM(J,L)
3408. C DO 690 K=1,NK
3409. C TPJLM(J,K,L,M)=PJLM(J,K,L,M)
3410. C PJLM(J,K,L,M)=PJLM(J,K,L,1)
3411. 690 CONTINUE
3412. C DO 695 K=1,NKK
3413. C TEJLM(J,K,L)=EFJLM(J,K,L)
3414. 695 CONTINUE
3415. 700 CONTINUE
3416. 730 TEFM(M)=EFM(M)
3417. C
3418. C -- DETERMINE DEMAND AT 1975 PRICES, OTHER INPUT VARIABLES AT CURR
3419. C PERIOD VALUES.
3420. C
3421. C NU9=1
3422. C CALL DDDD
3423. C
3424. C -- ASSEMBLE SECONDARY ENERGY DEMAND VARIABLES

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3425. C      DO 500 J=1,NJ
3426.      DO 450 L=1,NL
3427.      EFJL(J,L)=0.00
3428.      NKK=NKKL(L)
3429.      DO 400 K=1,NKK
3430.      E=JL(J,L)=EFJL(J,L)+EFJKL(J,K,L)
3431.      CONTINUE
3432. 400 CONTINUE
3433. 450 CONTINUE
3434. 500 CONTINUE
3435.      EFM(M)=0.00
3436.      DO 800 L=1,NL
3437.      EFLM(L,M)=0.00
3438.      DO 807 J=1,NJ
3439.      EFLM(L,M)=EFLM(L,M)+EFJL(J,L)
3440. 807 CONTINUE
3441.      EFM(M)=EFM(M)+EFLM(L,M)
3442. 806 CONTINUE
3443. C
3444. C      -- CALCULATE CONSERVATION/NON-ELECTRIC SOLAR ENERGY AS A RESIDUAL
3445. C
3446.      DO 737 L=1,NL
3447.      CONLM(L,M)=EFLM(L,M)-TEFLM(L,M)
3448.      CEFLM(L,M)=TEFLM(L,M)+CONLM(L,M)
3449. 737 CONTINUE
3450.      CUNM(M)=EFM(M)-TEFM(M)
3451.      CEFM(M)=TEFM(M)+CUNM(M)
3452. C
3453. C      -- REASSIGN CURRENT PERIOD VALUES TO PRICE AND DEMAND VARIABLES
3454. C
3455.      DO 780 L=1,NL
3456.      NKK=NKKL(L)
3457.      NK=NKL(L)
3458.      EFLM(L,M)=TEFLM(L,M)
3459.      DO 712 K=1,NK
3460.      PKLM(K,L,M)=TPKLM(K,L,M)
3461. 712 CONTINUE
3462.      DO 750 J=1,NJ
3463.      PJLM(J,L,M)=TPJLM(J,L,M)
3464.      EFJL(J,L)=TEFJL(J,L)
3465.      DO 745 K=1,NK
3466.      PJKLM(J,K,L,M)=TPJKLM(J,K,L,M)
3467. 745 CONTINUE
3468.      DO 740 K=1,NKK
3469.      EFJKL(J,K,L)=TEFJKL(J,K,L)
3470. 740 CONTINUE
3471. 750 CONTINUE
3472. 780 CONTINUE
3473.      EFM(M)=TEFM(M)
3474. C
3475. C      800 CONTINUE
3476. C
3477.      RETURN
3478.      END
3479. C*****
3480. C      SUBROUTINE OUTPUT(NSIM)
3481. C
3482. C*****
3483. C
3484. C

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THIS SUBROUTINE PRINTS ENERGY QUANTITY OUTPUTS FOR THE WORLD AND
REGIONS FOR PERIOD M

REAL INPUTS: FDIKL, EDIL, EDKL, EDI, EDL, ED, EDRIL, EFJKL, EFJL, EFKL, EF, EFJ, EFL, ES, ESIL, ESIL1, ESIL2, EST, ESL, EX, EXIL, EXI, EXL

WRITTEN BY:
JAE EDMONDS
1 JANUARY 1982

LATEST REVISION:
1 JANUARY 1982

IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)

COMMON BLOCKS

COMMON/RE/BSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
ERYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6),
COMMON/KEP4/PSL(4),BPKL(3,9),BSUJLM(6,9,6),GNP(9,6),GNPLM(10,
GNPBL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
PHYDKO(9),RUI(5),RYL(9),SJKL(4,3,9),TEST,TRI(3),
TXJLM(3,9,6),TXJLM(4,9,6),XIL(3,9)
COMMON/REVX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3,
OLDPI(3),OX(3),NAGN,NFAIL,NTIMES
COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR2M(6),
ESILM(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
PUILM(6,9,6),TKL(3,9),NUB
COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSM(4,2,2,
COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
EDRM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKL(4,9),EDRLM(9,6),
EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
EPCLM(10,6),EPGLM(10,6)
COMMON/OUT2/ESH(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
ESIIM(6,6),ESI2M(6,6),ESLM(9,6),ESL2M(9,6),ESRLM(9,6),
ESUM(6),ESUIM(6,6),ESUJLM(6,9,6),
ESULM(9,6),EX4(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
GNPFLM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
SYNLM(6,9,6),SYNLM(9,6)
COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NK
NKM,NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NC02,NOPT(10),IOUNI
NSTEP,NPUNT
COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
CO2IM(8,6),CO2LM(9,6),CO2M(6)

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3545. COMMON/RS/OISL(5,0,5),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
3546. E RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
3547. C--LOCAL PARAMETERS
3548. C
3549. INTEGER P(33),T(30),SEC(40)
3550. C
3551. DATA R(1)/4HUSA /, R(2)/4H /, R(3)/4H /,
3552. $ R(4)/4HCANA/, R(5)/4HDA E/, R(6)/4H EUR/,
3553. $ R(7)/4HDECD/, R(8)/4H PAC/, R(9)/4HIFIC/,
3554. $ R(10)/4HUSSR/, R(11)/4H/E. /, R(12)/4HEUR./,
3555. $ R(13)/4HCHIN/, R(14)/4HA/ET/, R(15)/4H.AL./
3556. DATA R(16)/4HMIDD/, R(17)/4HLE E/, R(18)/4HAST /,
3557. $ R(19)/4HAFRI/, R(20)/4HCA /, R(21)/4H /,
3558. $ R(22)/4HLATI/, R(23)/4HNA AM/, R(24)/4HER /,
3559. $ R(25)/4HSEEE/, R(26)/4H. AS/, R(27)/4HIA /,
3560. $ R(28)/4HALL /, R(29)/4HREGI/, R(30)/4HONS /,
3561. $ R(31)/4HTOTA/, R(32)/4HML TR/, R(33)/4HADE /
3562. C
3563. DATA T(1)/4HCONV/, T(2)/4HENTI/, T(3)/4HONAL/, T(4)/4H /,
3564. $ T(5)/4H /, T(6)/4HUNCO/, T(7)/4HNVEN/, T(8)/4HTION/,
3565. $ T(9)/4HAL /, T(10)/4H /, T(11)/4HTOTA/, T(12)/4HLD/,
3566. $ T(13)/4HMEST/, T(14)/4H PRI/, T(15)/4HMARY/, T(16)/4HSYNF/,
3567. $ T(17)/4HUEL /, T(18)/4HCONV/, T(19)/4HERST/, T(20)/4HONS /,
3568. DATA T(21)/4HTOTA/, T(22)/4HML AV/, T(23)/4HAILA/, T(24)/4HBLE /,
3569. $ T(25)/4H /, T(26)/4HTOTA/, T(27)/4HML IM/, T(28)/4HPORT/,
3570. $ T(29)/4HS /, T(30)/4H /
3571. C
3572. DATA SEC(1)/4HELEC/, SEC(2)/4HTRIC/, SEC(3)/4H UTI/, SEC(4)/4HLITI/
3573. $ SEC(5)/4HES /, SEC(6)/4HRESI/, SEC(7)/4HDENT/, SEC(8)/4HIAL-/
3574. $ SEC(9)/4HCOMM/, SEC(10)/4HERCE/, SEC(11)/4HINDU/, SEC(12)/4HSTRI/
3575. $ SEC(13)/4HAL /, SEC(14)/4H /, SEC(15)/4H /, SEC(16)/4HTRAN/
3576. $ SEC(17)/4HSPDP/, SEC(18)/4HTATI/, SEC(19)/4HON /, SEC(20)/4H /
3577. $ SEC(21)/4HFINA/, SEC(22)/4HML CD/, SEC(23)/4HNSJM/, SEC(24)/4HPTID/
3578. DATA
3579. $ SEC(25)/4H /, SEC(26)/4HTOTA/, SEC(27)/4HML DE/, SEC(28)/4HMAND/
3580. $ SEC(29)/4H /, SEC(30)/4H /, SEC(31)/4HTOTA/, SEC(32)/4HML SU/
3581. $ SEC(33)/4HPLY/, SEC(34)/4H /, SEC(35)/4H /, SEC(36)/4HNET /
3582. $ SEC(37)/4HIMPO/, SEC(38)/4HRTS /, SEC(39)/4H /, SEC(40)/4H /
3583.
3584.
3585.
3586.
3587.
3588.
3589.
3590.
3591.
3592.
3593.
3594.
3595.
3596.
3597.
3598.
3599.
3600.
3601.
3602.
3603.
3604.

```

COLLECT FORMAT STATEMENTS

```

2000 FORMAT (1H1)
2001 FORMAT (1H0,31X,'PRIMARY ENERGY DEMAND TABLE')
2002 FORMAT (1H0,30X,'REFINABLE ENERGY DEMAND TABLE')
2003 FORMAT (1H0,63X,'TOTAL CONSERVE-')
2004 FORMAT (1X,34X,'REGION: ',344)
2005 FORMAT (1X,10X,5A4,5(F8.2,2X))
2006 FORMAT (1X,31X,'(UNITS=EXAJOULES (J*10**18))')
2007 FORMAT (1H0,24X,'OIL GAS COAL NUCLEAR SOLAR
& HYDRO TOTAL')
2008 FORMAT (1H+,20X,7(' '))
2009 FORMAT (1X,5A4,7(F8.2,2XTT--))
2010 FORMAT (1X)
2011 FORMAT ('0')
2012 FORMAT (1X,31X,'SECONDARY ENERGY DEMAND TABLE')
2013 FORMAT (1X,61X,'PURCHASED NONELEC')
2014 FORMAT (1X,22X,'LIQUIDS GASES SOLIDS ELECTRIC FUELS

```

```

3600.      & 5BLAK      TOTAL')
3601. 2015 FORMAT (1H+,30X,5('))
3602. 2016 FORMAT (1X,21X,'PRIMARY ENERGY DEMAND SUMMARY, BY REGION AND TY
3603. &')
3604. 2017 FORMAT (1X,21X,'PRIMARY ENERGY SUPPLY SUMMARY, BY REGION AND TY
3605. &')
3606. 2018 FORMAT (1H0,31X,'IMPORT SUMMARY, BY REGION AND TYPE')
3607. 2019 FORMAT (1X,3A4,8X,7(F8.2,2X))
3608. 2020 FORMAT (1H0)
3609. 2021 FORMAT (1H+,36X,4('))
3610. 2022 FORMAT (1X,16X,3A4,8X,4(F8.2,2X))
3611. 2023 FORMAT (1X,40X,'OIL      GAS      TOTAL      SOLIDS')
3612. 2024 FORMAT (1X,25X,14,'ENERGY PRODUCTION AND USAGE REPORT')
3613. 2025 & 1X,25X,39('')
3614. 2026 FORMAT (1H0,35X,'ENERGY SUPPLY TABLE')
3615. 2027 & 1X,5A4,3(F8.2,2X),3(' N/A ',F8.2)
3616. 2028 FORMAT (1X,5A4,6(F8.2,2X),F8.2)
3617. 2029 & 1X,8X,3A4,9X,5(F8.2,2X)
3618. 2030 FORMAT (1X,20X,'REFINABLE ENERGY DEMAND SUMMARY, BY REGION AND
3619. &')
3620. 2031 FORMAT (1X,20X,'REFINABLE ENERGY SUPPLY SUMMARY, BY REGION AND
3621. &')
3622. 2032 FORMAT (1H0,23X,14,1X,'ENERGY USE PER DOLLAR GNP AND PER CAPITA
3623. & 1X,23X,45('')//)
3624. 2033 & 1X,23X,45('')//)
3625. 2034 & 1X,23X,45('')//)
3626. 2035 & 1X,23X,45('')//)
3627. 2036 & 1X,23X,45('')//)
3628. 2037 & 1X,23X,45('')//)
3629. 2038 & 1X,23X,45('')//)
3630. 2039 & 1X,23X,45('')//)
3631. 2040 & 1X,23X,45('')//)
3632. 2041 & 1X,23X,45('')//)
3633. 2042 & 1X,23X,45('')//)
3634. 2043 & 1X,23X,45('')//)
3635. 2044 & 1X,23X,45('')//)
3636. 2045 & 1X,23X,45('')//)
3637. 2046 & 1X,23X,45('')//)
3638. 2047 & 1X,23X,45('')//)
3639. 2048 & 1X,23X,45('')//)
3640. 2049 & 1X,23X,45('')//)
3641. 2050 & 1X,23X,45('')//)
3642. 2051 & 1X,23X,45('')//)
3643. 2052 & 1X,23X,45('')//)
3644. 2053 & 1X,23X,45('')//)
3645. 2054 & 1X,23X,45('')//)
3646. 2055 & 1X,23X,45('')//)
3647. 2056 & 1X,23X,45('')//)
3648. 2057 & 1X,23X,45('')//)
3649. 2058 & 1X,23X,45('')//)
3650. 2059 & 1X,23X,45('')//)
3651. 2060 & 1X,23X,45('')//)
3652. 2061 & 1X,23X,45('')//)
3653. 2062 & 1X,23X,45('')//)
3654. 2063 & 1X,23X,45('')//)
3655. 2064 & 1X,23X,45('')//)
3656. 2065 & 1X,23X,45('')//)
3657. 2066 & 1X,23X,45('')//)
3658. 2067 & 1X,23X,45('')//)
3659. 2068 & 1X,23X,45('')//)
3660. 2069 & 1X,23X,45('')//)
3661. 2070 & 1X,23X,45('')//)
3662. 2071 & 1X,23X,45('')//)
3663. 2072 & 1X,23X,45('')//)
3664. 2073 & 1X,23X,45('')//)

```

C
 C—SET INTERNAL CONTROL PARAMETERS
 C
 NKD=NKKMAX+1
 NKS=NKD+1
 NKX=NKS+1
 NLL=NL+1

```

NYR=1950+QUQU*P*M
NMF=N*+1
LC=1+3*(NL)
LE=1+3*(NLL)
LF=LE+2
KC=1+5*NK*MAX
KD=KC+4
KE=1+5*NKD
KF=KE+4

```

```

C--SET IUNIT NUMRER
IUNIT=IUNIT

```

```

C-- OUTPUT OPTION CONTROL

```

```

IF(NOPT(5)-1) 15,115,15

```

```

15 CONTINUE

```

```

C--BEGIN PRINTING OUTPUT

```

```

DO 110 L=1,NL

```

```

LA=1+3*(L-1)
LB=LA+2

```

```

NYR
(R(LL),LL=LA,LB)

```

```

WRITE(IUNIT,2000)
WRITE(IUNIT,2025)
WRITE(IUNIT,2004)
WRITE(IUNIT,2026)
WRITE(IUNIT,2006)
WRITE(IUNIT,2007)
WRITE(IUNIT,2008)
WRITE(IUNIT,2009)

5 WRITE(IUNIT,2030)

6 WRITE(IUNIT,2008)
WRITE(IUNIT,2031)
WRITE(IUNIT,2010)
WRITE(IUNIT,2009)

7 WRITE(IUNIT,2008)
WRITE(IUNIT,2009)

```

```

(T(KT),KT=1,5),(ESILM(I,L,M),I=1,NF),
(ESIL(I,L),I=NMF,NI),ESLM(L,M),
(ESL2M(L,M),I=1,NF),
(T(KT),KT=11,15),(ESIL(I,L),I=1,NI),ESLM(L,M),
(T(KT),KT=16,20),(SYNLM(I,L,M),I=1,NI),
SYNLM(L,M),
(T(KT),KT=21,25),(ESRLM(I,L,M),I=1,NI),
ESRLM(L,M)

```

```

+-----+
+ WRITE OUT PRIMARY DEMANDS +
+-----+

```

```

WRITE(IUNIT,2001)
WRITE(IUNIT,2006)
WRITE(IUNIT,2007)
WRITE(IUNIT,2008)
WRITE(IUNIT,2009)

IF (NKKL(L)-2)

```

```

(SEC(KK),KK=1,5),(EDIKL(I,1,L),I=1,NI),
EDKL(1,L)
40,30,40

```

```

3725. 30 WRITE(IUNIT,2009) (SEC(KK),KK=KC,KD),(EDIKL(I,2,L),I=1,NI),
3726. 5 EDKL(2,L)
3727. 5 GO TO 60
3728. 40 DO 50 K=2,NKKMAX
3729. KA=1+5*(K-1)
3730. KB=KA+4
3731. WRITE(IUNIT,2009) (SEC(KK),KK=KA,KB),(EDIKL(I,K,L),I=1,NI),
3732. 5 EDKL(K,L)
3733. 50 CONTINUE
3734. C
3735. 60 CONTINUE
3736. C
3737. WRITE(IUNIT,2008)
3738. WRITE(IUNIT,2009) (SEC(KK),KK=KE,KF),(EDIL(I,L),I=1,NI),EDLM(L),
3739. C
3740. C
3741. C
3742. C
3743. C
3744. WRITE(IUNIT,2010)
3745. WRITE(IUNIT,2002)
3746. WRITE(IUNIT,2006)
3747. WRITE(IUNIT,2007)
3748. WRITE(IUNIT,2008)
3749. WRITE(IUNIT,2009) (SEC(KK),KK=1,5),(EDRIKL(I,1,L),I=1,NI),
3750. 5 EDRLM(1,L,M)
3751. IF (NKKL(L)-2) 240,230,240
3752. 230 WRITE(IUNIT,2009) (SEC(KK),KK=KC,KD),(EDRIKL(I,2,L),I=1,NI),
3753. 5 EDRLM(2,L,M)
3754. 5 GO TO 260
3755. 240 DO 250 K=2,NKKMAX
3756. KA=1+5*(K-1)
3757. KB=KA+4
3758. WRITE(IUNIT,2009) (SEC(KK),KK=KA,KB),(EDRIKL(I,K,L),I=1,NI),
3759. 5 EDRLM(K,L,M)
3760. 250 CONTINUE
3761. C
3762. 260 CONTINUE
3763. WRITE(IUNIT,2008)
3764. C
3765. WRITE(IUNIT,2009) (SEC(KK),KK=KE,KF),(EDRIKL(I,L),I=1,NI),
3766. 5 EDRLM(L,M)
3767. WRITE(IUNIT,2010)
3768. WRITE(IUNIT,2009) (SEC(KK),KK=31,35),(ESRLM(I,L,M),I=1,NI),
3769. 5 ESRLM(L,M)
3770. WRITE(IUNIT,2008)
3771. WRITE(IUNIT,2009) (SEC(KK),KK=36,40),(EXIL(I,L),I=1,NI),EXLM(L),
3772. WRITE(IUNIT,2021)
3773. C
3774. C
3775. C
3776. C
3777. C
3778. WRITE(IUNIT,2011)
3779. WRITE(IUNIT,2012)
3780. WRITE(IUNIT,2006)
3781. WRITE(IUNIT,2055)
3782. WRITE(IUNIT,2015)
3783. IF (NKKL(L)-2) 80,70,80
3784. 70 WRITE(IUNIT,2005) (SEC(KK),KK=KC,KD),(EFJKL(J,2,L),J=1,NJ),

```



```

3735.          EFKL(2,L)
3736.          GO TO 100
3737. C
3738. 60 DU 90 K=7,NKKMAX
3739.      KA=1+5*(K-1)
3740.      KB=KA+4
3741.      WRITE(IUNIT,2005) (SEC(KK),KK=KA,KB),(EFJKL(J,K,L),J=1,NJ),
3742.      EFKL(K,L)
3743. 90 CONTINUE
3744. C
3745. 100 CONTINUE
3746.      WRITE(IUNIT,2015)
3747. C
3748.      WRITE(IUNIT,2005) (SEC(KK),KK=KE,KF),(EFJL(J,L),J=1,NJ),
3749.      EFLM(L,M)
3750. C
3751. 110 CONTINUE
3752. C
3753. 115 CONTINUE
3754. C
3755. -- OUTPUT OPTION CONTROL
3756. C
3757.      IF(NOPT(6)-1) 99,101,99
3758. C
3759. 99 CONTINUE
3760.      IF(INSIM.GT.0) GOTO 101
3761. C
3762. C
3763. C
3764. C
3765. C
3766. C
3767. C
3768. C
3769. C
3770. C
3771. C
3772. C
3773. C
3774. C
3775. C
3776. C
3777. C
3778. C
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3789. C
3790. C
3791. C
3792. C
3793. C
3794. C
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3797. C
3798. C
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3800. C
3801. C
3802. C
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3804. C
3805. C
3806. C
3807. C
3808. C
3809. C
3810. C
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3824. C
3825. C
3826. C
3827. C
3828. C
3829. C
3830. C
3831. C
3832. C
3833. C
3834. C
3835. C
3836. C
3837. C
3838. C
3839. C
3840. C
3841. C
3842. C
3843. C

```

WRITE OUT SUMMARY OF ENERGY USE PATTERN

```

      WRITE(IUNIT,2000)
      WRITE(IUNIT,2025) NYR
      WRITE(IUNIT,2010)
      WRITE(IUNIT,2016)
      WRITE(IUNIT,2006)
      WRITE(IUNIT,2007)
      WRITE(IUNIT,2008)
      DO 120 L=1,NL
        LA=1+3*(L-1)
        LB=LA+2
        WRITE(IUNIT,2020) (R(LL),LL=LA,LB),(EDIL(I,L),I=1,NI),
        EDLM(L,M)
      120 CONTINUE
      WRITE(IUNIT,2008)
      WRITE(IUNIT,2010)
      WRITE(IUNIT,2020) (R(LL),LL=LC,LD),(EDIM(I,M),I=1,NI),EDM(M)
      WRITE(IUNIT,2021)

```

CONTINUE BY WRITING OUT SUPPLY PATTERN SUMMARY

```

      WRITE(IUNIT,2018)
      WRITE(IUNIT,2006)
      WRITE(IUNIT,2007)
      WRITE(IUNIT,2008)
      DO 130 L=1,NL
        LA=1+3*(L-1)

```

```

3844.      LB=LA+2
3845.      WRITE(IUNIT,2020) (R(ILL),LL=LA,LB),(ESIL(I,L),I=1,NI),
3846.      ESLM(L,M)
3847. 130  CONTINUE
3848.      WRITE(IUNIT,2008)
3849.      WRITE(IUNIT,2010)
3850.      WRITE(IUNIT,2020) (R(ILL),LL=LC,LD),(ESIM(I,M),I=1,NI),ESM(M)
3851.      WRITE(IUNIT,2021)
3852.
3853. CCCCC
3854.  *-----*
3855.  * PRINTOUT SECONDARY ENERGY DEMAND SUMMARY *
3856.  *-----*
3857.      WRITE(IUNIT,2071)
3858.      WRITE(IUNIT,2012)
3859.      WRITE(IUNIT,2006)
3860.      WRITE(IUNIT,2003)
3861.      WRITE(IUNIT,2013)
3862.      WRITE(IUNIT,2014)
3863.      WRITE(IUNIT,2008)
3864.      DO 150 L=1,NL
3865.          LA=1+3*(L-1)
3866.          LB=LA+2
3867.          WRITE(IUNIT,2020) (R(ILL),LL=LA,LB),(EFJL(J,L),J=1,NJ),
3868.          EFLM(L,M),CONLM(L,M),CEFLM(L,M)
3869. 150  CONTINUE
3870.      WRITE(IUNIT,2008)
3871.      WRITE(IUNIT,2010)
3872.      WRITE(IUNIT,2020) (R(ILL),LL=LC,LD),(EFJM(J,M),J=1,NJ),EFM(M)
3873.      WRITE(IUNIT,2021) CONM(M),CEFM(M)
3874.
3875. CCCCC
3876.  *-----*
3877.  * WRITE OUT REFINABLE ENERGY DEMAND SUMMARY *
3878.  *-----*
3879.      WRITE(IUNIT,2000)
3880.      WRITE(IUNIT,2025) NYR
3881.      WRITE(IUNIT,2034)
3882.      WRITE(IUNIT,2006)
3883.      WRITE(IUNIT,2007)
3884.      WRITE(IUNIT,2008)
3885.      DO 200 L=1,NL
3886.          LA=1+3*(L-1)
3887.          LB=LA+2
3888.          WRITE(IUNIT,2020) (R(ILL),LL=LA,LB),(EDRIL(I,L),I=1,NI),
3889.          EDRLM(L,M)
3890. 200  CONTINUE
3891.      WRITE(IUNIT,2008)
3892.      WRITE(IUNIT,2010)
3893.      WRITE(IUNIT,2020) (R(ILL),LL=LC,LD),(EDRM(I,M),I=1,NI),EDRM
3894.      WRITE(IUNIT,2021)
3895.
3896. CCCCC
3897.  *-----*
3898.  * WRITE OUT REFINABLE ENERGY SUPPLY SUMMARY *
3899.  *-----*
3900.      WRITE(IUNIT,2010)
3901.      WRITE(IUNIT,2035)
3902.      WRITE(IUNIT,2006)
3903.

```

```

3904. WRITE(IUNIT,2007)
3905. WRITE(IUNIT,2008)
3906. DO 210 L=1,NL
3907. LA=1+3*(L-1)
3908. LB=LA+2
3909. WRITE(IUNIT,2020) (R(LL),LL=LA,LB),(ESRILM(I,L,M),I=1,NI),
3910. & ESRLM(L,M)
3911. 210 CONTINUE
3912. WRITE(IUNIT,2008)
3913. WRITE(IUNIT,2010)
3914. WRITE(IUNIT,2020) (R(LL),LL=LC,LD),(ESRIM(I,M),I=1,NI),ESRM(I,
3915. & M)
3916. WRITE(IUNIT,2021)
3917. C
3918. C
3919. C
3920. C
3921. WRITE(IUNIT,2047)
3922. WRITE(IUNIT,2006)
3923. WRITE(IUNIT,2010)
3924. WRITE(IUNIT,2048)
3925. WRITE(IUNIT,2022)
3926. DO 331 L=1,NL
3927. LA=1+3*(L-1)
3928. LB=LA+2
3929. WRITE(IUNIT,2023) (R(LL),LL=LA,LB),ESIL1M(1,L,M),
3930. & ESIL2M(1,L,M),SYN1LM(1,L,M),ESR1LM(1,L,M)
3931. 331 CONTINUE
3932. WRITE(IUNIT,2022)
3933. WRITE(IUNIT,2010)
3934. WRITE(IUNIT,2023) (R(LL),LL=LC,LD),ES11M(1,M),ES12M(1,M),
3935. & SYN1M(1,M),ESR1M(1,M)
3936. WRITE(IUNIT,2021)
3937. C
3938. C
3939. C
3940. C
3941. C
3942. WRITE(IUNIT,2000)
3943. WRITE(IUNIT,2025) NYR
3944. WRITE(IUNIT,2049)
3945. WRITE(IUNIT,2006)
3946. WRITE(IUNIT,2010)
3947. WRITE(IUNIT,2050)
3948. WRITE(IUNIT,2022)
3949. DO 330 L=1,NL
3950. LA=1+3*(L-1)
3951. LB=LA+2
3952. WRITE(IUNIT,2023) (R(LL),LL=LA,LB),ESIL1M(2,L,M),
3953. & ESIL2M(2,L,M),SYN1LM(2,L,M),ESR1LM(2,L,M)
3954. 330 CONTINUE
3955. WRITE(IUNIT,2022)
3956. WRITE(IUNIT,2010)
3957. WRITE(IUNIT,2023) (R(LL),LL=LC,LD),ES11M(2,M),ES12M(2,M),
3958. & SYN1M(2,M),ESR1M(2,M)
3959. WRITE(IUNIT,2021)
3960. C
3961. C
3962. C
3963. C

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3954.
3955.
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3990.
3991.
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4000.
4001.
4002.
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4006.
4007.
4008.
4009.
4010.
4011.
4012.
4013.
4014.
4015.
4016.
4017.
4018.
4019.
4020.
4021.
4022.
4023.

C

WRITE(IUNIT,2051)
WRITE(IUNIT,2006)
WRITE(IUNIT,2010)
WRITE(IUNIT,2052)
WRITE(IUNIT,2054)

DO 332 L=1,NL
LA=1+3*(L-1)
LB=LA+2

WRITE(IUNIT,2053)

(R(LL),LL=LA,LB),ESR1M(L,M),
ESR2M(L,M),ESR1M(3,L,M)

332 CONTINUE

WRITE(IUNIT,2054)
WRITE(IUNIT,2010)
WRITE(IUNIT,2053)
WRITE(IUNIT,2021)

(R(LL),LL=LC,LD),ESR1M(M),ESR2M(M),ESR1M(3

C
C
C
C
C

! WRITE OUT NET ENERGY IMPORTS SUMMARY

WRITE(IUNIT,2019)
WRITE(IUNIT,2006)
WRITE(IUNIT,2010)
WRITE(IUNIT,2045)
WRITE(IUNIT,2022)

DO 140 L=1,NL
LA=1+3*(L-1)
LB=LA+2

WRITE(IUNIT,2023)

(R(LL),LL=LA,LB),(EX1M(I,L),I=1,NF),
EX1M(L,M)

140 CONTINUE

WRITE(IUNIT,2022)
WRITE(IUNIT,2010)
WRITE(IUNIT,2023)

(R(LL),LL=LE,LF),(EX1M(I,M),I=1,NF),EX1M(M)

C
C
C
C
C

! WRITE OUT ELECTRICITY DEMAND SUMMARY

WRITE(IUNIT,2000)
WRITE(IUNIT,2025)
WRITE(IUNIT,2040)
WRITE(IUNIT,2043)
WRITE(IUNIT,2007)
WRITE(IUNIT,2008)

NYR

DO 300 L=1,NL
LA=1+3*(L-1)
LB=LA+2

WRITE(IUNIT,2020)

(R(LL),LL=LA,LB),(EDR1M(I,1,L),I=1,N1),
EDR1M(L,M)

300 CONTINUE

WRITE(IUNIT,2008)
WRITE(IUNIT,2010)
WRITE(IUNIT,2020)
WRITE(IUNIT,2021)

(R(LL),LL=LC,LD),(EDR1M(I,M),I=1,N1),EDR

C
C
C
C

-- WRITE OUT ELECTRICITY SUPPLY SUMMARY --

```

4024.      C      WRITE(IUNIT,2010)
4025.      WRITE(IUNIT,2041)
4026.      WRITE(IUNIT,2044)
4027.      WRITE(IUNIT,2077)
4028.      WRITE(IUNIT,2008)
4029.      DO 310 L=1,NL
4030.          LA=1+3*(L-1)
4031.          LB=LA+2
4032.          WRITE(IUNIT,2020) (R(LL),LL=LA,LB),(ESULM(I,L,M),I=1,NI),
4033.              ESULM(L,M)
4034.      310 CONTINUE
4035.      WRITE(IUNIT,2008)
4036.      WRITE(IUNIT,2010)
4037.      WRITE(IUNIT,2020) (R(LL),LL=LC,LD),(ESUM(I,M),I=1,NI),ESUM(M)
4038.      WRITE(IUNIT,2021)
4039.
4040.      CCCCCC
4041.      -- WRITE OUT SYN FUEL PRODUCTION SUMMARY --
4042.      -----
4043.
4044.      WRITE(IUNIT,2042)
4045.      WRITE(IUNIT,2006)
4046.      WRITE(IUNIT,2010)
4047.      WRITE(IUNIT,2024)
4048.      WRITE(IUNIT,2022)
4049.      DO 320 L=1,NL
4050.          LA=1+3*(L-1)
4051.          LB=LA+2
4052.          WRITE(IUNIT,2023) (R(LL),LL=LA,LB),(SYNLM(I,L,M),I=1,NFF),
4053.              SYNLM(L,M),SYNLM(NF,L,M)
4054.      320 CONTINUE
4055.      WRITE(IUNIT,2022)
4056.      WRITE(IUNIT,2010)
4057.      WRITE(IUNIT,2023) (R(LL),LL=LC,LD),(SYNIM(I,M),I=1,NFF),
4058.          SYNIM(M),SYNIM(NF,M)
4059.      E
4060.      CCCCCC
4061.      -- WRITE OUT ENERGY USE PER CAPITA AND PER DOLLAR GNP --
4062.      -----
4063.
4064.      WRITE(IUNIT,2000)
4065.      WRITE(IUNIT,2036) NYR
4066.      WRITE(IUNIT,2037)
4067.      WRITE(IUNIT,2038)
4068.      DO 220 L=1,NL
4069.          LA=1+3*(L-1)
4070.          LB=LA+2
4071.          WRITE(IUNIT,2039) (R(LL),LL=LA,LB),ZLXM(L,M),GNPLM(L,M),
4072.              GNPFLM(L,M),EDLM(L,M),EPGLM(L,M),EPCLM(L,M),GNPPCM(L,M)
4073.      220 CONTINUE
4074.      WRITE(IUNIT,2038)
4075.      WRITE(IUNIT,2039) (R(LL),LL=LC,LD),ZLXM(NLL,M),GNPLM(NLL,M),
4076.          & GNPFLM(NLL,M),EDM(M),EPGLM(NLL,M),EPCLM(NLL,M),GNPPCM(NLL,M)
4077.      E
4078.      C
4079.      101 CONTINUE
4080.
4081.      CCCCCC
4082.      -- RETURN TO THE MAIN PROGRAM --
4083.      -----

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4141.
4142.
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```
C
C      RETURN
C      END
C *****
C      SUBROUTINE  PRICES(INSIM)
C *****
C      -- ENERGY PRICE PRINTER --
C
C      THIS SUBROUTINE PRINTS PRICES AND COSTS OF PRODUCING ENERGY
C      MODEL VERSION:  A.31.07.84
C      INTEGER INPUTS:  M, NI, NJ, NF, NKL, NKMAX, NL
C      REAL INPUTS:     PIM, PIL, PUIL, PJL, PKL, PJKL
C
C      SUBROUTINES CALLED:  NONE
C
C      CODED BY:
C          JAE EDMONDS
C          1 JANUARY 1982
C
C          LATEST REVISION:
C          31 JULY 1984
C          BY:  JAE EDMONDS
C
C      MAKE ALL REAL VARIABLES DOUBLE PRECISION
C      IMPLICIT  REAL*8 (A-H,O-Z),  INTEGER (I-N)
C
C      COMMON BLOCKS
C
C      COMMON/RE/BSJKLH(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
C      &RYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
C      COMMON/REPN/BPSL(9),BPKL(3,9),BSUILM(6,9,6),GNP(9,6),GNPLM(10,6)
C      &GNPSL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
C      &PHYDRO(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
C      &TXILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
C      COMMON/REVX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
C      &OLDPI(3),DX(3),NAGN,NFAIL,NTIMES
C      COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
C      &BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR2M(6),
C      &ESILM(3,9,6),ESIL2M(3,9,6),ESKILM(6,9,6),
C      &FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
C      COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
C      &PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
C      &PUILM(6,9,6),TKL(3,9),NUB
C      COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
C      &EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
C      &FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
C      &SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSH(4,2,2)
C      COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
C      &EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
C      &EDRIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKLM(4,9,6),EDRLM(9,6),
C      &EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
C      &EPCLM(10,6),EPGLM(10,6)
C      COMMON/OUT2/ESM(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
C      &ESILM(6,6),ESI2M(6,6),ESLIM(9,6),ESL2M(9,6),ESRLM(9,6),
C      &ESUM(6),ESUIM(6,6),ESUILM(6,9,6),
```

6 ESULM(9,10),EXM(6),EXIL(6,9),EXIM(5,6),EXLM(9,6),
 6 GUPFM(10,6),GNPRCM(10,6),SYNM(6),SYNMIM(6,0),
 6 SYNLIM(6,9,5),SYNLM(9,0)
 6 COMON/PCP/NE,NF,NI,NIG,NIM,NIP,NIS,MNIS,NJ,XJUMP,NKXL(9)
 6 NKMAX,NKKMAX,NL,M,NM,NMREAD,NMKT,NU,MAXAGN,NC02,NOP(10),ID
 6 NSTEP,NPUY
 6 COMON/RG/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
 6 COZIM(8,6),COZLM(9,6),COZM(6)
 6 COMON/RG/CISL(5,9,6),RIGISL(5,9),ESFIL(5,9),
 6 RIL(5,9),STISL(5,9),BESIL(5,9)
 -- LOCAL VARIABLES --

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4203.      WRITE(IUNIT,2100)
4204.      WRITE(IUNIT,2103)
4205.      WRITE(IUNIT,2104)
4206.      WRITE(IUNIT,2200)      REG, PF
4207.      WRITE(IUNIT,2201)
4208.      WRITE(IUNIT,2500)      W, (PIM(I,M),I=1,NF)
4209.      DO 100 L=1,NL
4210.          NA=1+3*(L-1)
4211.          NB=NA+2
4212.          WRITE(IUNIT,2501)      (R(LL),LL=NA,NB), (PILM(I,L,M),I=1,NI)
4213.      100 CONTINUE
C
4214.      C
4215.      C WRITE ELECTRIC UTILITY COSTS BY MODE
C
4216.      C
4217.      WRITE(IUNIT,2101)
4218.      WRITE(IUNIT,2103)
4219.      WRITE(IUNIT,2104)
4220.      WRITE(IUNIT,2200)      REG, PF
4221.      WRITE(IUNIT,2201)
4222.      DO 110 L=1,NL
4223.          NA=1+3*(L-1)
4224.          NB=NA+2
4225.          WRITE(IUNIT,2501)      (R(LL),LL=NA,NB), (PUILM(I,L,M),I=1,NI)
4226.      110 CONTINUE
C
4227.      C
4228.      C WRITE SECONDARY ENERGY PRICES
C
4229.      C
4230.      WRITE(IUNIT,2102)
4231.      WRITE(IUNIT,2103)
4232.      WRITE(IUNIT,2104)
4233.      WRITE(IUNIT,2210)      REG, SF
4234.      WRITE(IUNIT,2211)
4235.      DO 120 L=1,NL
4236.          NA=1+3*(L-1)
4237.          NB=NA+2
4238.          WRITE(IUNIT,2502)      (R(LL),LL=NA,NB), (PJLM(J,L,M),J=1,NJ)
4239.      120 CONTINUE
C
4240.      C
4241.      C
4242.      C
4243.      C
4244.      C
4245.      C
4246.      2000 FORMAT(1H1,38X,14,1X,'ENERGY PRICE REPORT')
4247.      2001 FORMAT(1X,38X,24(' '))
C
4248.      C
4249.      2100 FORMAT(1X,39X,'PRIMARY ENERGY PRICES')
4250.      2101 FORMAT(1X,7/1X,34X,'ELECTRIC POWER GENERATION COSTS')
4251.      2102 FORMAT(1X,7/1X,38X,'SECONDARY ENERGY PRICES')
4252.      2103 FORMAT(1X,46X,'BY MODE')
4253.      2104 FORMAT(1X,32X,'(1975 U.S. DOLLARS PER GIGAJoule)')
C
4254.      C
4255.      2200 FORMAT(1X,3A4,2X,3A4,5X,2A4,6X,3A4,5X,2A4,2(5X,3A4))
4256.      2201 FORMAT(1H+,7(10(' '),5X))
4257.      2210 FORMAT(1X,15X,3A4,3X,3A4,5X,2A4,6X,2A4,4X,3A4)
4258.      2211 FORMAT(1H+,15X,5(10(' '),5X))
C
4259.      C
4260.      2500 FORMAT(1X,3A4,3X,3(F7.2,8X))
4261.      2501 FORMAT(1X,3A4,3X,6(F7.2,8X))
4262.      2502 FORMAT(1X,15X,3A4,3X,4(F7.2,8X))

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4253. C
4254. C
4255. RETURN
4256. END
4257. C *****
4258. C
4259. SUBROUTINE CO2(NSIM)
4270. C *****
4271. C
4272. C
4273. C --- THE CARBON EMISSION SUBROUTINE ---
4274. C
4275. C THIS MODULE CALCULATES GROSS CARBON EMISSIONS TO THE ATMOSPHERE IN A
4276. C GIVEN PERIOD FROM ENERGY PRODUCTION AND CONSUMPTION DATA
4277. C
4278. C INTEGER INPUTS: NF, NL
4279. C REAL INPUTS: CDI, EFJL, ESIL, ESIL2M, ESRILM, SBURNL, SFEDIL,
4280. C SFLRL, SHALE
4281. C
4282. C INTERNAL INTEGERS: IOIL, IGAS, ICOAL, ISHL, ISYN, IFLR, IBIO
4283. C
4284. C REAL OUTPUTS: CO2IL, CO2IM, CO2LM, CO2M
4285. C
4286. C SUBROUTINES CALLED: NONE
4287. C
4288. C CODED BY
4289. C JAE EDMONDS
4290. C 1 JANUARY 1982
4291. C LATEST REVISION:
4292. C 1 JANUARY 1982
4293. C *****
4294. C MAKE ALL REAL VARIABLES DOUBLE PRECISION
4295. C
4296. C IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
4297. C
4298. C COMMON BLOCKS
4299. C
4300. C COMMON/RE/RSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
4301. C ERYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
4302. C COMMON/REPN/BPSL(9),BPKL(3,9),BSUILM(6,9,6),GNP(9,6),GNPLM(10,6)
4303. C & GNPL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
4304. C & PHYDR(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
4305. C & TXILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
4306. C COMMON/REFVX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
4307. C & OLOPI(3),DX(3),NAGN,NFAIL,NTIMES
4308. C COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
4309. C & BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRLM(6),ESR2M(6),
4310. C & ESILM(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
4311. C & FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
4312. C COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
4313. C & PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
4314. C & PUILM(6,9,6),TKL(3,9),NUB
4315. C COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
4316. C & EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
4317. C & FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
4318. C & SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSM(4,2,2),
4319. C COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
4320. C & EDIM(6,6),EOKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
4321. C & EDRIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKLM(4,9,6),EDRLM(9,6),
4322. C & EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),

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4323.      & ESPLM(10,6),EPGLM(10,6)
4324.      & COMMON/OUT2/ESH(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
4325.      & ESILM(6,6),ESI2M(6,6),ESL1M(9,6),ESL2M(9,6),ESRLM(9,6),
4326.      & ESULM(6),ESUIM(6,6),ESUILM(6,9,6),
4327.      & ESULM(9,6),EX4(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
4328.      & GNPPFLM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
4329.      & SYNILM(6,9,6),SYNLM(9,6)
4330.      & COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NKL(
4331.      & NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NC02,NOPT(10),IUNIT,
4332.      & NSTEP,NPUNT
4333.      & COMMON/RC/COT(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
4334.      & CO2IM(8,6),CO2LM(9,6),CO2M(6)
4335.      & COMMON/RS/OISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
4336.      & RIL(5,9),STISL(5,9),BESTL(5,9),ESFIL(5,9)
4337.
4338.      -- LOCAL VARIABLES
4339.
4340.      REAL*8 CO2IL(8,9),TEMP(4,9),SB,SH
4341.      INTEGER R(30),H(20)
4342.
4343.      -- INITIALIZE HEADERS
4344.
4345.      DATA R(1)/4HUSA /, R(2)/4H /, R(3)/4H /,
4346.      $ R(4)/4H EU /, R(5)/4H R + /, R(6)/4H CAN /,
4347.      $ R(7)/4H OECD /, R(8)/4H PAC /, R(9)/4H IFIC /,
4348.      $ R(10)/4H USSR /, R(11)/4H E. /, R(12)/4H EUR. /,
4349.      $ R(13)/4H CHIN /, R(14)/4H A/ET /, R(15)/4H AL. /
4350.      DATA R(16)/4H MIDD /, R(17)/4H LE E /, R(18)/4H AST /,
4351.      $ R(19)/4H AFRI /, R(20)/4H CA /, R(21)/4H /,
4352.      $ R(22)/4H LATI /, R(23)/4H N AM /, R(24)/4H ER /,
4353.      $ R(25)/4H S. & E /, R(26)/4H AS /, R(27)/4H IA /,
4354.      $ R(28)/4H ALL /, R(29)/4H REGI /, R(30)/4H NS /
4355.
4356.      DATA H(1)/4H REGI /, H(2)/4H ON /,
4357.      $ H(3)/4H O /, H(4)/4H IL /,
4358.      $ H(5)/4H G /, H(6)/4H AS /,
4359.      $ H(7)/4H C /, H(8)/4H OAL /,
4360.      $ H(9)/4H SYN /, H(10)/4H OIL /,
4361.      $ H(11)/4H SYN /, H(12)/4H GAS /,
4362.      DATA H(13)/4H SH /, H(14)/4H ALE /,
4363.      $ H(15)/4H BID /, H(16)/4H MASS /,
4364.      $ H(17)/4H FLA /, H(18)/4H RING /,
4365.      $ H(19)/4H TO /, H(20)/4H TAL /
4366.
4367.      -- INITIALIZE FUEL DESIGNATORS, ZERO CO2 TOTALS, AND SET IUNIT VALU
4368.
4369.      IUNIT=IUNIT
4370.      IDIL=1
4371.      IGAS=2
4372.      ICOAL=3
4373.      ISHL=6
4374.      ICL=4
4375.      ICC=5
4376.      IDIO=7
4377.      IFLR=8
4378.
4379.      CO2M(M)=0.00
4380.      DO 10 I=1,NC02
4381.      CO2IM(I,M)=0.00
4382.

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4383.      10 CONTINUE
4384.      C      T=(1-1)*NJUMP
4385.      C
4386.      C
4387.      C
4388.      C -- COMPUTE SECONDARY ENERGY DEMAND INCLUDING UTILITIES
4389.      C
4390.      DO 48 J=1,NJ
4391.      DO 47 L=1,NL
4392.      TEMP(J,L)=0.00
4393.      NKK=NKKL(L)
4394.      DO 46 K=1,NKK
4395.      TEMP(J,L)=TEMP(J,L)+EFJKL(J,K,L)
4396.      46 CONTINUE
4397.      47 CONTINUE
4398.      48 CONTINUE
4399.      C
4400.      DO 100 L=1,NL
4401.      C
4402.      C -- INTERPOLATE FLARED GAS PARAMETER VALUES
4403.      C
4404.      SB=XNTERP(SBURNL(L,1),SBURNL(L,2),SBURNL(L,3),T)
4405.      SH=XNTERP(SHALE(L,1),SHALE(L,2),SHALE(L,3),T)
4406.      C
4407.      C
4408.      C ----- COMPUTE EMISSIONS FROM ENERGY CONSUMPTION -----
4409.      C
4410.      C
4411.      DO 50 J=1,NF
4412.      I=J
4413.      COZIL(I,L)=TEMP(J,L)*(1.00-SFEDIL(I,L))*COI(I)
4414.      50 CONTINUE
4415.      C
4416.      C ----- COMPUTE EMISSIONS FROM ENERGY PRODUCTION -----
4417.      C
4418.      COZIL(ISHL,L)=ESIL2M(IOIL,L,M)*SH*COI(ISHL)
4419.      COZIL(ICL,L)=SCIL(IOIL,L)*ESIL1M(ICOAL,L,M)*(COI(ICOAL)
4420.      -COI(IOIL)/GCI(IOIL))
4421.      COZIL(ICG,L)=SCIL(IGAS,L)*ESIL1M(ICOAL,L,M)*(COI(ICOAL)
4422.      -COI(IGAS)/GCI(IGAS))
4423.      COZIL(IFLR,L)=SB*SFLRL(L)/(1.00-SFLRL(L))*ESIL(IGAS,L)
4424.      *COI(IGAS)
4425.      COZIL(IRIO,L)=-ESIL2M(ICOAL,L,M)*(SCIL(IOIL,L)*COI(IOIL)/
4426.      GCI(IOIL)+SCIL(IGAS,L)*COI(IGAS)/GCI(IGAS)
4427.      +SCIL(ICOAL,L)*COI(ICOAL))
4428.      C
4429.      C ----- TOTAL REGIONAL CO2 PRODUCTION -----
4430.      C
4431.      COZLM(L,M)=0.00
4432.      DO 70 I=1,NCO2
4433.      COZLM(L,M)=COZLM(L,M)+COZIL(I,L)
4434.      COZIM(I,M)=COZIM(I,M)+COZIL(I,L)
4435.      70 CONTINUE
4436.      COZM(M)=COZM(M)+COZLM(L,M)
4437.      100 CONTINUE
4438.      C
4439.      C
4440.      C
4441.      C OUTPUT OPTION CONTROL FOR THE CO2 RESULTS
4442.      IF (NOPT(8).EQ. 1) GO TO 110
      IF (NSIM.GT.0) GOTO 110

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[illegible]

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4503. C SUBROUTINES CALLED: NONE
4504. C
4505. C WRITTEN BY DAN WAHL
4506. C LATEST REVISION: JULY 19, 1982
4507. C NATURE OF REVISION:
4508. C
4509. C *****
4510. C
4511. C MAKE ALL REAL VARIABLES DOUBLE PRECISION
4512. C
4513. C IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
4514. C
4515. C COMMON BLOCKS
4516. C
4517. C COMMON/RE/BSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
4518. C ERYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
4519. C COMMON/REP/9PSL(9),BPKL(3,9),3SUILM(6,9,6),GNP(9,6),GNPLM(10,6)
4520. C E GNPPL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
4521. C E PHYDRD(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
4522. C E TXILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
4523. C COMMON/REX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
4524. C E OLDPI(3),OX(3),NAGN,NFAIL,NTIMES
4525. C COMMON/RES/BESILM(5,9,6),ESRLM(9,6),ESRL2M(9,6),
4526. C E BSCIL(2,9),CIL(5,9),CSLT(9,3),ESRIM(6),ESR2M(6),
4527. C E ESILM(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
4528. C E FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
4529. C COMMON/DREPT/BSKL(3,9),GJI(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
4530. C E PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
4531. C E PUILM(6,9,6),TKL(3,9),NUB
4532. C COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
4533. C E EDRIKL(5,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
4534. C E FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
4535. C E SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSM(4,2,2),
4536. C COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(5),
4537. C E EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
4538. C E EDRIH(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKLH(4,9,6),EDRLM(9,6),
4539. C E EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
4540. C E EPCLM(10,6),EPGLM(10,6)
4541. C COMMON/OUT2/ESH(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
4542. C E ESILM(6,6),ESI2M(6,6),ESLM(9,6),ESL2M(9,6),ESRLM(9,6),
4543. C E ESUM(6),ESUIM(6,6),ESUILM(6,9,6),
4544. C E ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
4545. C E GNPFLM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),
4546. C E SYNLM(6,9,6),SYNLM(9,6)
4547. C COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NKL(9)
4548. C E NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NCO2,NOPT(10),IUNIT,
4549. C E NSTEP,NPUNT
4550. C COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
4551. C E CO2IM(8,6),CO2LM(9,6),CO2M(6)
4552. C COMMON/RS/OISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
4553. C E RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
4554. C
4555. C ---LOCAL PARAMETERS
4556. C
4557. C INTEGER R(30)
4558. C
4559. C DATA R(1)/4HUSA /, R(2)/4H /, R(3)/4H /,
4560. C S R(4)/4HCANA/, R(5)/4HDA E/, R(6)/4HEUR/,
4561. C S R(7)/4HOECD/, R(8)/4H PAC/, R(9)/4HIFIC/,
4562. C S R(10)/4HUSSR/, R(11)/4H/E. /, R(12)/4HEUR./,

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4620.
4621.
4622.

DATA
R(13)/4HCHIN/R(14)/4HAEI/R(15)/4HAL.
R(16)/4HMIID/R(17)/4HLE E/R(18)/4HAST.
R(19)/4HAFRI/R(20)/4HCA /R(21)/4HAM.
R(22)/4HLATI/R(23)/4HNAW/R(24)/4HER.
R(25)/4HSE/R(26)/4HNAS/R(27)/4HIA.
R(28)/4HALL /R(29)/4HREGI/R(30)/4HONS.

COLLECT FORMAT STATEMENTS

2000 FORMAT (1H1)
2006 FORMAT (1X,31X,'(UNITS=EXAJOULES (J*10**18))')
2010 FORMAT (1X)
2021 FORMAT (1H0)
2025 FORMAT (1X,25X,14,'ENERGY PRODUCTION AND USAGE REPORT'/
2100 FORMAT (1H1,22X,'SUMMARY ENERGY PRODUCTION AND USAGE REPORT'/IX,
2101 FORMAT (1X,28X,'EXAJOULES (J*10**18) PER CAPITA')
2102 FORMAT (1X,23X,'EXAJOULES (J*10**18) PER 1975 US DOLLAR GNP')
2103 FORMAT (1X,29X,'UNITS=10**6 TONS OF CARBON')
2105 FORMAT (1X,21X,'PRIMARY ENERGY DEMAND, BY REGION AND PERIOD')
2110 FORMAT (1X,23X,'1975 2000 2050 2075
2115 FORMAT (1H+20X,6(' '))
2125 FORMAT (1X,34X,8(' '))
2125 FORMAT (1X,21X,'PRIMARY ENERGY SUPPLY, BY REGION AND PERIOD')
2130 FORMAT (1X,20X,'SECONDARY ENERGY DEMAND, BY REGION AND PERIOD')
2135 FORMAT (1X,14X,'CONSERVATION AND NON-ELECTRIC SOLAR, BY,
2140 FORMAT (1X,20X,'REFINABLE ENERGY DEMAND, BY REGION AND PERIOD')
2145 FORMAT (1X,20X,'REFINABLE ENERGY SUPPLY, BY REGION AND PERIOD')
2150 FORMAT (1X,20X,'REFINABLE OIL SUPPLY, BY REGION AND PERIOD')
2155 FORMAT (1X,20X,'REFINABLE CONVENTIONAL OIL SUPPLY, BY REGION AND
2160 FORMAT (1X,20X,'REFINABLE UNCONVENTIONAL OIL SUPPLY, BY REGION AND
2165 FORMAT (1X,20X,'REFINABLE SYNTHIL SUPPLY, BY REGION AND PERIOD')
2170 FORMAT (1X,20X,'REFINABLE GAS SUPPLY, BY REGION AND PERIOD')
2175 FORMAT (1X,20X,'REFINABLE CONVENTIONAL GAS SUPPLY BY REGION AND P
2180 FORMAT (1X,17X,'REFINABLE UNCONVENTIONAL GAS SUPPLY BY REGION AND
2185 FORMAT (1X,20X,'REFINABLE SYNGAS SUPPLY, BY REGION AND PERIOD')
2190 FORMAT (1X,20X,'REFINABLE SOLIDS SUPPLY, BY REGION AND PERIOD')
2195 FORMAT (1X,25X,'REFINABLE COAL SUPPLY, BY REGION AND PERIOD')
2200 FORMAT (1X,25X,'REFINABLE BIOMASS SUPPLY, BY REGION AND PERIOD')
2205 FORMAT (1X,25X,'NET ENERGY IMPORTS, BY REGION AND PERIOD')
2210 FORMAT (1X,25X,'ELECTRICITY DEMAND, BY REGION AND PERIOD')
2215 FORMAT (1X,25X,'ELECTRICITY SUPPLY, BY REGION AND PERIOD')
2220 FORMAT (1X,20X,'SYNTHIL PRODUCTION, BY REGION AND PERIOD')
2225 FORMAT (1X,20X,'COAL CONSUMED IN SYNTHIL PRODUCTION, BY REGION A
2230 FORMAT (1X,20X,'ENERGY USE PER CAPITA, BY REGION AND PERIOD')
2235 FORMAT (1X,20X,'ENERGY USE PER DOLLAR GNP, BY REGION AND PERIOD')
2240 FORMAT (1X,23X,'CARBON EMISSIONS, BY REGION AND PERIOD')
2245 FORMAT (1X,20X,'ENERGY USE PER DOLLAR GNP')

C

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4023. C--SET INTERNAL CONTROL PARAMETERS
4024. C
4025.     NKD=NKKMAX+1
4026.     NKS=NKD+1
4027.     NKY=NKS+1
4028.     NLL=NL+1
4029.     NYP=1950+NJUMP*M
4030.     NNF=NF+1
4031.     LC=1+3*(NL)
4032.     LD=LC+2
4033.     LE=1+3*(NLL)
4034.     LF=LE+2
4035.     KC=1+5*NKKMAX
4036.     KD=KC+4
4037.     KE=1+5*NKD
4038.     KF=KE+4
4039.
4040. C
4041. C
4042. C
4043. C
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4045. C
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4080. C
4081. C
4082. C

     SET UNIT NUMBER FOR OUTPUT
     IUNIT=IUNIT
     IF(NSIM.GT.0) GOTO 335

+-----+
| SUMMARY TABLES, BY REGION AND PERIOD |
+-----+

+-----+
| SUMMARY OF ENERGY USE(DEMAND) PATTERN |
+-----+

WRITE(IUNIT,2100)
WRITE(IUNIT,2010)
WRITE(IUNIT,2105)
WRITE(IUNIT,2006)
WRITE(IUNIT,2010)
WRITE(IUNIT,2110)
WRITE(IUNIT,2115)
DO 120 L=1,NL
  LA=1+3*(L-1)
  LB=LA+2
  WRITE(IUNIT,2120) (R(LL),LL=LA,LB),(EDLM(L,M),M=1,NM)
120 CONTINUE
WRITE(IUNIT,2115)
WRITE(IUNIT,2010)
WRITE(IUNIT,2120) (R(LL),LL=LC,LD),(EDM(M),M=1,NM)
WRITE(IUNIT,2021)

+-----+
| WRITE OUT SUPPLY PATTERN SUMMARY, BY REGION AND PERIOD |
+-----+

WRITE(IUNIT,2125)
WRITE(IUNIT,2006)
WRITE(IUNIT,2010)
WRITE(IUNIT,2110)
WRITE(IUNIT,2115)
DO 130 L=1,NL
  LA=1+3*(L-1)
  LB=LA+2

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4083.      WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(ESL*(L,M),M=1,NM)
4084.
4085. 130 CONTINUE
4086.      WRITE(IUNIT,2115)
4087.      WRITE(IUNIT,2010)
4088.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(ESM(M),M=1,NM)
4089.      WRITE(IUNIT,2021)
4090.
4091.  C C C C C
4092.  :-----WRITE OUT SECONDARY ENERGY DEMAND SUMMARY, BY REGION AND PERIOD :-----
4093.  :-----
4094.      WRITE(IUNIT,2130)
4095.      WRITE(IUNIT,2006)
4096.      WRITE(IUNIT,2010)
4097.      WRITE(IUNIT,2110)
4098.      WRITE(IUNIT,2115)
4099.      DO 140 L=1,NL
4100.          LA=1+3*(L-1)
4101.          LB=LA+2
4102.          WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(EFLM(L,M),M=1,NM)
4103.
4104. 140 CONTINUE
4105.      WRITE(IUNIT,2115)
4106.      WRITE(IUNIT,2010)
4107.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(EFM(M),M=1,NM)
4108.      WRITE(IUNIT,2021)
4109.
4110.  C C C C C
4111.  :-----CONSERVATION AND NON-ELECTRIC SOLAR SUMMARY :-----
4112.  :-----
4113.      WRITE(IUNIT,2100)
4114.      WRITE(IUNIT,2010)
4115.      WRITE(IUNIT,2135)
4116.      WRITE(IUNIT,2006)
4117.      WRITE(IUNIT,2010)
4118.      WRITE(IUNIT,2110)
4119.      WRITE(IUNIT,2115)
4120.      DO 150 L=1,NL
4121.          LA=1+3*(L-1)
4122.          LB=LA+2
4123.          WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(CONLM(L,M),M=1,NM)
4124.
4125. 150 CONTINUE
4126.      WRITE(IUNIT,2115)
4127.      WRITE(IUNIT,2010)
4128.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(CONM(M),M=1,NM)
4129.      WRITE(IUNIT,2021)
4130.
4131.  C C C C C
4132.  :-----WRITE OUT REFINABLE ENERGY DEMAND SUMMARY :-----
4133.  :-----
4134.      WRITE(IUNIT,2140)
4135.      WRITE(IUNIT,2006)
4136.      WRITE(IUNIT,2010)
4137.      WRITE(IUNIT,2110)
4138.      WRITE(IUNIT,2115)
4139.      DO 160 L=1,NL
4140.          LA=1+3*(L-1)
4141.          LB=LA+2
4142.          WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(EDRLM(L,M),M=1,NM)

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4743. 160 CONTINUE
4744.   WRITE(IUNIT,2115)
4745.   WRITE(IUNIT,2010)
4746.   WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(EDRM(M),M=1,NM)
4747.   WRITE(IUNIT,2021)
4748.
4749. C C C C
4750. :   WRITE OUT REFINABLE ENERGY SUPPLY SUMMARY   :
4751. :-----:
4752.
4753.   WRITE(IUNIT,2145)
4754.   WRITE(IUNIT,2006)
4755.   WRITE(IUNIT,2010)
4756.   WRITE(IUNIT,2110)
4757.   WRITE(IUNIT,2115)
4758.   DO 170 L=1,NL
4759.     LA=1+3*(L-1)
4760.     LB=LA+2
4761.     WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(ESRLM(L,M),M=1,NM)
4762. 170 CONTINUE
4763.   WRITE(IUNIT,2115)
4764.   WRITE(IUNIT,2010)
4765.   WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(ESRM(M),M=1,NM)
4766.   WRITE(IUNIT,2021)
4767.
4768. C C C C
4769. :   WRITE OUT REFINABLE OIL SUPPLY SUMMARY       :
4770. :-----:
4771.
4772.   WRITE(IUNIT,2100)
4773.   WRITE(IUNIT,2010)
4774.   WRITE(IUNIT,2150)
4775.   WRITE(IUNIT,2006)
4776.   WRITE(IUNIT,2010)
4777.   WRITE(IUNIT,2110)
4778.   WRITE(IUNIT,2115)
4779.   DO 180 L=1,NL
4780.     LA=1+3*(L-1)
4781.     LB=LA+2
4782.     WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(ESRILM(L,L,M),M=1,NM)
4783. 180 CONTINUE
4784.   WRITE(IUNIT,2115)
4785.   WRITE(IUNIT,2010)
4786.   WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(ESRIM(1,M),M=1,NM)
4787.   WRITE(IUNIT,2021)
4788.
4789. C C C C
4790. :   REFINABLE CONVENTIONAL OIL SUPPLY SUMMARY    :
4791. :-----:
4792.
4793.   WRITE(IUNIT,2155)
4794.   WRITE(IUNIT,2006)
4795.   WRITE(IUNIT,2010)
4796.   WRITE(IUNIT,2110)
4797.   WRITE(IUNIT,2115)
4798.   DO 190 L=1,NL
4799.     LA=1+3*(L-1)
4800.     LB=LA+2
4801.     WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(ESILIM(1,L,M),M=1,NM)
4802. 190 CONTINUE

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4803. WRITE(IUNIT,2115)
4804. WRITE(IUNIT,2010)
4805. WRITE(IUNIT,2120) (R(LL),LL=LC,LD),(ESILM(1,M),M=1,NM)
4806. WRITE(IUNIT,2021)
4807.
4808. C
4809. C
4810. C
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4860. C
4861. C
4862. C

WRITE(IUNIT,2115)
WRITE(IUNIT,2010)
WRITE(IUNIT,2120) (R(LL),LL=LC,LD),(ESILM(1,M),M=1,NM)
WRITE(IUNIT,2021)

+-----+
| REFINABLE UNCONVENTIONAL OIL SUPPLY SUMMARY |
+-----+

WRITE(IUNIT,2150)
WRITE(IUNIT,2005)
WRITE(IUNIT,2010)
WRITE(IUNIT,2110)
WRITE(IUNIT,2115)
DO 200 L=1,NL
  LA=1+3*(L-1)
  LB=LA+2
  WRITE(IUNIT,2120) (R(LL),LL=LA,LB),(ESIL2M(1,L,M),M=1,NM)
200 CONTINUE
WRITE(IUNIT,2115)
WRITE(IUNIT,2010)
WRITE(IUNIT,2120) (R(LL),LL=LC,LD),(ESI2M(1,M),M=1,NM)
WRITE(IUNIT,2021)

+-----+
| WRITE OUT REFINABLE SYNOIL SUPPLY SUMMARY |
+-----+

WRITE(IUNIT,2100)
WRITE(IUNIT,2010)
WRITE(IUNIT,2165)
WRITE(IUNIT,2006)
WRITE(IUNIT,2010)
WRITE(IUNIT,2110)
WRITE(IUNIT,2115)
DO 210 L=1,NL
  LA=1+3*(L-1)
  LB=LA+2
  WRITE(IUNIT,2120) (R(LL),LL=LA,LB),(SYN1LM(1,L,M),M=1,NM)
210 CONTINUE
WRITE(IUNIT,2115)
WRITE(IUNIT,2010)
WRITE(IUNIT,2120) (R(LL),LL=LC,LD),(SYN1M(1,M),M=1,NM)
WRITE(IUNIT,2021)

+-----+
| REFINABLE GAS SUPPLY SUMMARY |
+-----+

WRITE(IUNIT,2170)
WRITE(IUNIT,2006)
WRITE(IUNIT,2010)
WRITE(IUNIT,2110)
WRITE(IUNIT,2115)
DO 220 L=1,NL
  LA=1+3*(L-1)
  LB=LA+2
  WRITE(IUNIT,2120) (R(LL),LL=LA,LB),(ESR1LM(2,L,M),M=1,NM)
220 CONTINUE
WRITE(IUNIT,2115)

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4863.      WRITE(IUNIT,2010)
4864.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(ESR1M(2,M),M=1,NM)
4865.      WRITE(IUNIT,2021)
C
4866.      +-----+
4867.      | REFINABLE CONVENTIONAL GAS SUPPLY SUMMARY |
4868.      +-----+
4869.
4870.      WRITE(IUNIT,2175)
4871.      WRITE(IUNIT,2006)
4872.      WRITE(IUNIT,2010)
4873.      WRITE(IUNIT,2110)
4874.      WRITE(IUNIT,2115)
4875.      DO 230 L=1,NL
4876.      LA=1+3*(L-1)
4877.      LB=LA+2
4878.      WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(ESIL1M(2,L,M),M=1,NM)
4879.
4880. 230 CONTINUE
4881.      WRITE(IUNIT,2115)
4882.      WRITE(IUNIT,2010)
4883.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(EST1M(2,M),M=1,NM)
4884.      WRITE(IUNIT,2021)
C
4885.      +-----+
4886.      | REFINABLE UNCONVENTIONAL GAS SUPPLY SUMMARY |
4887.      +-----+
4888.
4889.      WRITE(IUNIT,2100)
4890.      WRITE(IUNIT,2010)
4891.      WRITE(IUNIT,2180)
4892.      WRITE(IUNIT,2006)
4893.      WRITE(IUNIT,2010)
4894.      WRITE(IUNIT,2110)
4895.      WRITE(IUNIT,2115)
4896.      DO 240 L=1,NL
4897.      LA=1+3*(L-1)
4898.      LB=LA+2
4899.      WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(ESIL2M(2,L,M),M=1,NM)
4900.
4901. 240 CONTINUE
4902.      WRITE(IUNIT,2115)
4903.      WRITE(IUNIT,2010)
4904.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(EST2M(2,M),M=1,NM)
4905.      WRITE(IUNIT,2021)
C
4906.      +-----+
4907.      | WRITE OUT REFINABLE SYNGAS SUPPLY SUMMARY |
4908.      +-----+
4909.
4910.      WRITE(IUNIT,2185)
4911.      WRITE(IUNIT,2006)
4912.      WRITE(IUNIT,2010)
4913.      WRITE(IUNIT,2110)
4914.      WRITE(IUNIT,2115)
4915.      DO 250 L=1,NL
4916.      LA=1+3*(L-1)
4917.      LB=LA+2
4918.      WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(SYN1LM(2,L,M),M=1,NM)
4919.
4920. 250 CONTINUE
4921.      WRITE(IUNIT,2115)
4922.      WRITE(IUNIT,2010)

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4923.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(SYN1M(2,M),M=1,NM)
4924.      WRITE(IUNIT,2021)
4925.
4926.      CCCCC
4927.      !-----
4928.      ! WRITE OUT REFINABLE SOLIDS SUPPLY SUMMARY
4929.      !-----
4930.      WRITE(IUNIT,2190)
4931.      WRITE(IUNIT,2006)
4932.      WRITE(IUNIT,2010)
4933.      WRITE(IUNIT,2110)
4934.      WRITE(IUNIT,2115)
4935.      DO 260 L=1,NL
4936.          LA=1+3*(L-1)
4937.          LB=LA+2
4938.          WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(ESR1LM(3,L,M),M=1,NM)
4939.      260 CONTINUE
4940.      WRITE(IUNIT,2115)
4941.      WRITE(IUNIT,2010)
4942.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(ESR1M(3,M),M=1,NM)
4943.      WRITE(IUNIT,2021)
4944.
4945.      CCCCC
4946.      !-----
4947.      ! WRITE OUT REFINABLE COAL SUPPLY SUMMARY
4948.      !-----
4949.      WRITE(IUNIT,2100)
4950.      WRITE(IUNIT,2010)
4951.      WRITE(IUNIT,2195)
4952.      WRITE(IUNIT,2006)
4953.      WRITE(IUNIT,2010)
4954.      WRITE(IUNIT,2110)
4955.      WRITE(IUNIT,2115)
4956.      DO 270 L=1,NL
4957.          LA=1+3*(L-1)
4958.          LB=LA+2
4959.          WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(ESR1LM(L,M),M=1,NM)
4960.      270 CONTINUE
4961.      WRITE(IUNIT,2115)
4962.      WRITE(IUNIT,2010)
4963.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(ESR1M(M),M=1,NM)
4964.      WRITE(IUNIT,2021)
4965.
4966.      CCCCC
4967.      !-----
4968.      ! WRITE OUT REFINABLE BIOMASS SUPPLY SUMMARY
4969.      !-----
4970.      WRITE(IUNIT,2200)
4971.      WRITE(IUNIT,2006)
4972.      WRITE(IUNIT,2010)
4973.      WRITE(IUNIT,2110)
4974.      WRITE(IUNIT,2115)
4975.      DO 280 L=1,NL
4976.          LA=1+3*(L-1)
4977.          LB=LA+2
4978.          WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(ESR12M(L,M),M=1,NM)
4979.      280 CONTINUE
4980.      WRITE(IUNIT,2115)
4981.      WRITE(IUNIT,2010)
4982.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(ESR2M(M),M=1,NM)

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CCCC
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CCCC
CCCC

WRITE(IUNIT,2021)

-- WRITE OUT SYNFUEL PRODUCTION SUMMARY --

WRITE(IUNIT,2220)
WRITE(IUNIT,2006)
WRITE(IUNIT,2010)
WRITE(IUNIT,2110)
WRITE(IUNIT,2115)

DO 285 L=1,NL
LA=1+3*(L-1)
LB=LA+2

285 CONTINUE
WRITE(IUNIT,2115) (R(LL),LL=LA,LB),(SYNLM(L,M),M=1,NM)

WRITE(IUNIT,2010)
WRITE(IUNIT,2120)
WRITE(IUNIT,2021)

(R(LL),LL=LC,LD),(SYNM(M),M=1,NM)

: COAL CONSUMED IN SYNFUEL PRODUCTION :

WRITE(IUNIT,2100)
WRITE(IUNIT,2010)
WRITE(IUNIT,2225)
WRITE(IUNIT,2006)
WRITE(IUNIT,2010)
WRITE(IUNIT,2110)
WRITE(IUNIT,2115)

DO 290 L=1,NL
LA=1+3*(L-1)
LB=LA+2

290 CONTINUE
WRITE(IUNIT,2120) (R(LL),LL=LA,LB),(SYNLM(NF,L,M),M=1,NM)

WRITE(IUNIT,2115)
WRITE(IUNIT,2010)
WRITE(IUNIT,2120)
WRITE(IUNIT,2021)

(R(LL),LL=LC,LD),(SYNM(NF,M),M=1,NM)

: WRITE OUT NET ENERGY IMPORTS SUMMARY :

WRITE(IUNIT,2205)
WRITE(IUNIT,2006)
WRITE(IUNIT,2010)
WRITE(IUNIT,2110)
WRITE(IUNIT,2115)

DO 295 L=1,NL
LA=1+3*(L-1)
LB=LA+2

295 CONTINUE
WRITE(IUNIT,2120) (R(LL),LL=LA,LB),(EXLM(L,M),M=1,NM)

WRITE(IUNIT,2115)
WRITE(IUNIT,2010)
WRITE(IUNIT,2120)
WRITE(IUNIT,2021)

(R(LL),LL=LC,LD),(EXM(M),M=1,NM)

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5043.      CCCC
5044.      :-----:
5045.      : WRITE OUT ELECTRICITY DEMAND SUMMARY :
5046.      :-----:
5047.      C
5048.      WRITE(IUNIT,2210)
5049.      WRITE(IUNIT,2006)
5050.      WRITE(IUNIT,2010)
5051.      WRITE(IUNIT,2110)
5052.      WRITE(IUNIT,2115)
5053.      DO 300 L=1,NL
5054.          LA=1+3*(L-1)
5055.          LB=LA+2
5056.          WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(EDRKLM(L,L,M),M=1,NM)
5057.      300 CONTINUE
5058.      WRITE(IUNIT,2115)
5059.      WRITE(IUNIT,2010)
5060.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(EDRKM(M),M=1,NM)
5061.      WRITE(IUNIT,2021)
5062.      C
5063.      CCCC
5064.      :-----:
5065.      : WRITE OUT ELECTRICITY SUPPLY SUMMARY :
5066.      :-----:
5067.      C
5068.      WRITE(IUNIT,2100)
5069.      WRITE(IUNIT,2010)
5070.      WRITE(IUNIT,2215)
5071.      WRITE(IUNIT,2006)
5072.      WRITE(IUNIT,2010)
5073.      WRITE(IUNIT,2110)
5074.      WRITE(IUNIT,2115)
5075.      DO 310 L=1,NL
5076.          LA=1+3*(L-1)
5077.          LB=LA+2
5078.          WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(ESULM(L,M),M=1,NM)
5079.      310 CONTINUE
5080.      WRITE(IUNIT,2115)
5081.      WRITE(IUNIT,2010)
5082.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(ESUM(M),M=1,NM)
5083.      WRITE(IUNIT,2021)
5084.      C
5085.      CCCC
5086.      :-----:
5087.      : WRITE OUT ENERGY USE PER CAPITA SUMMARY :
5088.      :-----:
5089.      C
5090.      WRITE(IUNIT,2230)
5091.      WRITE(IUNIT,2101)
5092.      WRITE(IUNIT,2010)
5093.      WRITE(IUNIT,2110)
5094.      WRITE(IUNIT,2115)
5095.      DO 320 L=1,NL
5096.          LA=1+3*(L-1)
5097.          LB=LA+2
5098.          WRITE(IUNIT,2120)      (R(LL),LL=LA,LB),(EPCLM(L,M),M=1,NM)
5099.      320 CONTINUE
5100.      WRITE(IUNIT,2115)
5101.      WRITE(IUNIT,2010)
5102.      WRITE(IUNIT,2120)      (R(LL),LL=LC,LD),(EPCLM(L,M),M=1,NM)
5103.      WRITE(IUNIT,2021)
5104.      C

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C C C C C
      WRITE OUT ENERGY USE PER DOLLAR GNP SUMMARY
C C C C C
      WRITE(IUNIT,2235)
      WRITE(IUNIT,2102)
      WRITE(IUNIT,2010)
      WRITE(IUNIT,2110)
      WRITE(IUNIT,2115)
      DO 330 L=1,NL
        LA=1+3*(L-1)
        LB=LA+2
        WRITE(IUNIT,2120) (R(LL),LL=LA,LB),(EPGLM(L,M),M=1,NM)
330 CONTINUE
      WRITE(IUNIT,2115)
      WRITE(IUNIT,2010)
      WRITE(IUNIT,2120) (R(LL),LL=LC,LD),(EPGLM(10,M),M=1,NM)
      WRITE(IUNIT,2021)
C C C C C
      CARBON EMISSIONS
C C C C C
      WRITE(IUNIT,2100)
      WRITE(IUNIT,2010)
      WRITE(IUNIT,2240)
      WRITE(IUNIT,2103)
      WRITE(IUNIT,2010)
      WRITE(IUNIT,2110)
      WRITE(IUNIT,2115)
      DO 340 L=1,NL
        LA=1+3*(L-1)
        LB=LA+2
        WRITE(IUNIT,2120) (R(LL),LL=LA,LB),(CO2LM(L,M),M=1,NM)
340 CONTINUE
      WRITE(IUNIT,2115)
      WRITE(IUNIT,2010)
      WRITE(IUNIT,2120) (R(LL),LL=LC,LD),(CO2M(M),M=1,NM)
      WRITE(IUNIT,2021)
C C C C C
      -- RETURN TO THE MAIN PROGRAM --
C C C C C
335 CONTINUE
      RETURN
      END
C
C** READ
C
      SUBROUTINE READ(NSIM)
CC
      MAKE ALL REAL VARIABLES DOUBLE PRECISION
C
      IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
C
      REAL*4 PM,SEG,PNAM,PMU,SD,PMIN,PMAX,PMID,DIST,RB1,B2
C COMMON BLOCKS
      COMMON/READBL/READIN(79)
      COMMON/BLSLAT/PM(79,5),SEG(79,5),NPM
      COMMON/BLKI/PNAM(100),PMU(100),SD(100),PMIN(100),PMAX(100),
      &PMID(100),DIST(100),RB1(100),B2(100)

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5153. COMMON/RE/RS JKLM(4,3,9,6), RPJ(4), RPJK(4,3), RPK, RPKK(7), RYJ(4),
 5154. ERYJK(4,3), RYKL(2), RYKK(3), SJKL(4,3,9), ZLM(9,6), ZLX(10,6)
 5155. COMMON/REP4/BPSL(9), RPKL(3,9), RSUJLM(6,9,6), GNP(9,6), GNPLM(10,6),
 5156. EGNPR(9), HJ(3), HJ(4), HJK(4,3), HJIL(6,9), ZL(9), RPKL(3,9),
 5157. EPHYD(9), RUI(5), PYL(9), SJKLP(4,3,9), TEST, TRI(3),
 5158. EIXILM(3,9,6), TXJLM(4,9,6), XIL(3,9)
 5159. COMMON/REFVX/EDIMKT(6), ESIMKT(6), UIJ(3,3), VTJ(3,3), XI(3), OLDXI(3)
 5170. EOLDP(3), DX(3), NAGN, NFAIL, NTIMES
 5171. COMMON/RES/8ESILM(5,9,6), ESRLM(9,6), ESRL2M(9,6),
 5172. EBSCL(2,9), CIL(5,9), CSLT(9,3), ESK1M(6), ESR2M(6),
 5173. EESIL1M(3,9,6), ESIL2M(3,9,6), ESRILM(5,9,6),
 5174. EFLRL(3,9), HCILT(2,9,3), RCI(2), SFLRL(4), RYSH
 5175. COMMON/DEPT/BSKL(3,9), GJ(4), GJK(4,3), PAUL(3,9), PCIL(3,9),
 5176. EPI(3,6), PJLM(4,9,6), PJKLM(4,3,9,6), PKLM(3,9,6),
 5177. EPUJLM(6,9,6), TKL(3,9), NUB
 5178. COMMON/DOSPER/EDIL(6,9), EDIKL(6,4,9),
 5179. EEDRIKL(6,4,9), EFJKL(4,4,9), ESIL(6,9), FJKL(4,3,9),
 5180. EFL(4,9), GCI(2), GTJ(3), GUI(6), HYDRD(5,9), PILM(6,9,6), PROL(9),
 5181. ESCIL(3,9), SUJL(6,9), TESIL(9), YLM(9,6), BIOLM(9,2), SIOPSM(4,2,2),
 5182. COMMON/OUT1/CEFLM(9,6), CEFM(6), CONLM(9,6), CONM(6), EDM(6),
 5183. EEDIM(6,6), EDKL(4,9), EDLM(9,6), EDM(6), EDKM(6),
 5184. EEDRM(6,9), EDRIK(6,6), EURIL(6,9), EDRLM(4,9,6), EDRLM(9,6),
 5185. EEFH(6), EFJM(4,6), EFJL(4,9), EFKL(4,9), EFLM(9,6),
 5186. EEPCLM(10,6), EPGLM(10,6)
 5187. COMMON/OUT2/ESM(6), ESIM(6,6), ESLM(9,6), ESPM(6), FSPIM(6,6),
 5188. EESIM(6,6), ESIM2M(6,6), ESL1M(9,6), ESL2M(9,6), ESRLM(9,6),
 5189. EESUM(6), ESUIM(6,6), ESUJLM(6,9,6),
 5190. EESULM(9,6), EXM(6), EXIL(6,9), EXIM(6,6), EXLM(9,6),
 5191. EGNPFL(10,6), GNPPCM(10,6), SYN(6), SYNIM(6,6),
 5192. ESYNLM(6,9,6), SYNLM(9,6)
 5193. COMMON/PCP/NF, NFF, NI, NIG, NIM, NIP, NIS, NNIS, NJ, NJUMP, NKKL(9), NKL(9)
 5194. ENKMAX, NKKMAX, NL, NM, NMREAD, NMKT, NU, MAXAGN, NCO2, NOPT(10), IQUNIT,
 5195. NSTEP, NPUNT
 5196. COMMON/RC/CDI(7), SBURNL(9,3), SFEDIL(3,9), SHALE(9,3),
 5197. ECDZIM(8,6), CDZLM(9,6), CDZM(6)
 5198. COMMON/RS/OISLM(5,9,6), RIGISL(5,5,9), CIGIS(6,5), VISL(5,9),
 5199. ERIL(5,9), STISL(5,9), BESIL(5,9), ESFIL(5,9)

5201. C
 5202.1 DO 30 I=1,79
 5202.2 READ(5,20)PNAM(I),DIST(I),PMU(I),SD(I),PMIN(I),PMAX(I),
 5202.3 RB1(I),B2(I)
 5202.4 20 FORMAT(1X,A3,1X,A1,4X,6D10.6)
 5202.5 READIN(I)=PMU(I)
 5202.6 30 CONTINUE
 5202.7 C29 PRINT 37
 5202.8 C37 FORMAT(//T10,'NAME',5X,'DIST.',5X,'VALUE',6X,
 5202.9 E'STD. DEV.',2X,'MINIMUM',5X,'MAXIMUM',5X,'ROOT B1',5X,
 5203. E'B2')
 5203.1 C
 5203.2 DO 35 I=1,79
 5203.3 C PRINT 40,PNAM(I),DIST(I),PMU(I),SD(I),PMIN(I),PMAX(I),RB1(I),B
 5203.4 C40 FORMAT(T10,A4,T23,A1,3X,9(2X,G10.4))
 5203.5 C35 CONTINUE
 5203.6 READ(5,25) NPM
 5203.7 25 FORMAT(I4)
 5203.8 DO 50 J=1,2
 5203.9 READ(5,70) (PM(J,I),I=1,3),(SEG(J,K),K=1,3)
 5204. C70 FORMAT(3D10.6/,3D10.6)
 5204.1 C WRITE(6,80) (PM(J,I),I=1,3),(SEG(J,K),K=1,3)
 C80 FORMAT(' ','PM ',3(G12.6,1X),/,' ','SEG ',3(G12.6,1X))


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5204.2 50 CONTINUE
5204.3 DO 52 J=1.70
5204.4 JJ=2+J
5204.5 K=AD(5.72) (PM(JJ,I),I=1.5),(SEG(JJ,K),K=1.5)
5204.6 72 FORMAT(5D10.6/,5D10.6)
5204.7 WRITE(6.82) (PM(JJ,I),I=1,NPM),(SEG(JJ,K),K=1,NPM)
5204.8 C82 FORMAT(' ',PM',5(G12.6,1X),/' ',SEG',5(G12.6,1X))
5204.9 52 CONTINUE
5205.1 DO 54 J=1.4
5205.2 JJ=72+J
5205.3 READ(5.70) (PM(JJ,I),I=1.3),(SEG(JJ,K),K=1.3)
5205.4 C WRITE(6.80) (PM(JJ,I),I=1.3),(SEG(JJ,K),K=1.3)
5205.5 54 CONTINUE
5205.6 READ(5.72) (PM(77,I),I=1.5),(SEG(77,K),K=1.5)
5205.7 C WRITE(6.82) (PM(77,I),I=1,NPM),(SEG(77,K),K=1,NPM)
5205.8 READ(5.70) (PM(78,I),I=1.3),(SEG(78,K),K=1.3)
5205.9 C WRITE(6.80) (PM(78,I),I=1.3),(SEG(78,K),K=1.3)
5206.1 READ(5.70) (PM(79,I),I=1.3),(SEG(79,K),K=1.3)
5206.2 C WRITE(6.80) (PM(79,I),I=1.3),(SEG(79,K),K=1.3)
5206.3 C PRINT 1001,SEG
5206.4 1001 FORMAT(' ',SEG ARRAY',10G12.6)
5230. CALL TRANSF(NSIM)
5231. RETURN
5232. END
5233. C
5234. C** TRANSF
5235. C
5236. SUBROUTINE TRANSF(NSIM)
5237. C MAKE ALL REAL VARIABLES DOUBLE PRECISION
5238. IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
5239. C COMMON BLOCKS
5240. COMMON/KE/RSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
5241. &RYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
5242. COMMON/REP4/PSL(9),BPKL(3,9),RSUJLM(6,9,6),GNP(9,6),GNPLM(10,6)
5243. &GNPRL(9),HIJ(3),HJ(4),HJK(4,3),HJL(6,9),ZL(9),RPKL(3,9),
5244. &PHYDRD(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
5245. &TXILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
5246. COMMON/REX/EDIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
5247. &OLDPI(3),DX(3),NAGN,NFAIL,NTIMES
5248. COMMON/RES/BESILM(5,9,6),ESRL1M(9,6),ESRL2M(9,6),
5249. &BSCIL(2,9),CIL(5,9),CSLT(9,3),ESKLM(6),ESR2M(6),
5250. &ESIL1M(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
5251. &FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
5252. COMMON/DREP/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
5253. &PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
5254. &PUILM(6,9,6),TKL(3,9),NUB
5255. COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
5256. &EDRIKL(6,4,9),EFJKL(4,4,9),ESTL(6,9),FJKL(4,3,9),
5257. &FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRD(5,9),PILM(6,9,6),PROL(9),
5258. &SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSM(4,2,2),
5259. COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
5260. &EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
5261. &EDRIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKL(4,9,6),EDRLM(9,6),
5262. &EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
5263. &EPCLM(10,6),EPGLM(10,6)
5264. COMMON/OUT2/ESH(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
5265. &ESILM(6,6),ESI2M(6,6),ESLIM(9,6),ESL2M(9,6),ESRLM(9,6),
5266. &ESUM(6),ESUIM(6,6),ESUJLM(6,9,6),
5267. &ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
5268. &GNPFLM(10,6),GNPPCM(10,6),SYNM(6),SYNIM(6,6),

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5274.      & SYXIL(5,9,6),SYXILM(9,6)
5275.      & COMMON/PCP/NE,NFE,NI,NIG,NIM,NIP,NTS,NNIS,NJ,NJUMP,NKKL(9),NKL(9)
5276.      & NKKMAX,NKKMAY,NL,NM,NMREAD,NMKT,NU,MAXAGN,NCD2,NOPT(10),IDUNIT,
5277.      & NSTEP,NDUNT
5278.      & COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
5279.      & CO2IM(8,6),CO2LM(9,6),CO2M(6)
5280.      & COMMON/RS/RSISL(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
5281.      & RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
5282.
5283.      C
5284.      COMMON/READBL/READIN(79)
5285.      COMMON/SLKRN/PARMT(79)
5286.      REAL*4 PARMT
5287.      IF(NSIM.GT.0) GO TO 100
5288.
5289.      C
5290.      PRINT 4,READIN
5291.      FORMAT(1,' ',PARMS USED: ',6G12.6)
5292.      DO 10 I=1,79
5293.      PARMT(I)=READIN(I)
5294.      10 CONTINUE
5295.      CALL MAP(NSIM)
5296.      RETURN
5297.      100 DO 15 I=1,79
5298.      READIN(I)=PARMT(I)
5299.      15 CONTINUE
5300.      CALL MAP(NSIM)
5301.      RETURN
5302.      END
5303.
5304.      C
5305.      SUBROUTINE MAP(NSIM)
5306.
5307.      C
5308.      C MAKE ALL REAL VARIABLES DOUBLE PRECISION
5309.      C
5310.      C IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
5311.      C
5312.      C COMMON BLOCKS
5313.      C
5314.      COMMON/RE/RSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
5315.      & RYJK(4,3),PYKL(2),PYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
5316.      COMMON/REPN/RPSL(9),BPKL(3,9),RSUJLM(6,9,6),GNP(9,6),GNPLM(10,6)
5317.      & GNPBL(9),HIJ(3),HJ(4),HJK(4,3),HUIL(6,9),ZL(9),RPKL(3,9),
5318.      & PHYDRO(7),RII(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
5319.      & TXILM(3,9,6),TXJLM(4,9,6),XIL(3,9)
5320.      COMMON/REYX/EDIMKT(6),FSIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLOXI(3)
5321.      & OLUPI(3),DX(3),NAGN,NFAIL,NTIMES
5322.      COMMON/RES/BFSILM(5,9,6),ESRL1M(9,6),ESRL2M(9,6),
5323.      & BSCIL(2,9),CIL(5,9),CSLT(9,3),ESR1M(6),ESR2M(6),
5324.      & ESIL1M(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
5325.      & FLRL(3,9),HCILT(2,9,3),RCI(2),SFLRL(9),RYSHT
5326.      COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUIL(3,9),PCIL(3,9),
5327.      & PIM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
5328.      & PUJLM(6,9,6),TKL(3,9),NUB
5329.      COMMON/DOSPER/EDIL(6,9),EDIKL(5,4,9),
5330.      & EDRIKL(5,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
5331.      & FJL(4,9),GCI(2),GIJ(3),GUI(5),HYDRO(5,9),PILM(6,9,6),PRDL(9),
5332.      & SCIL(3,9),SUJL(6,9),TESIL(9),YL(9,6),BIDLM(9,2),EIDPSH(4,2,2)
5333.      COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
5334.      & EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRKM(6),
5335.      & EDRIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDKLM(4,9,6),EDRLM(9,6),
5336.      & EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
5337.      & EPCLM(10,6),EPGLM(10,6)

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[illegible]

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          PYL(L)=READIN(5)
          CONTINUE
          PXL(5)=READIN(6)

C      DO 70 K=1,3
          KYKK(K)=READIN(7)
          CONTINUE
C      RYKL(1)=READIN(8)
          RYKL(?)=READIN(9)
C
          DO 100 I=1,5
            KU(I)=READIN(10)
            CONTINUE
C
          DO 110 K=1,3
            RP(K)=READIN(11)
            CONTINUE
            RPK=READIN(11)
C
          DO 120 K=1,3
            DO 122 L=1,9
              TKL(K,L)=READIN(12)
              CONTINUE
            CONTINUE
C
          DO 130 L=1,4
            IF(L.EQ.1) DA=.187D0
            IF(L.EQ.2) DA=.359D0
            IF(L.EQ.3) NA=.108D0
            IF(L.EQ.4) DA=.346D0
            ZLM(L,1)=READIN(13)*DA*1000.DD
            ZLM(L,2)=READIN(14)*DA*1000.DD
            ZLM(L,3)=READIN(15)*DA*1000.DD
            ZLM(L,4)=READIN(16)*DA*1000.DD
            ZLM(L,5)=READIN(17)*DA*1000.DD
            ZLM(L,6)=READIN(18)*DA*1000.DD
            CONTINUE
          ZLM(5,1)=READIN(19)*1000.DD
          ZLM(5,2)=READIN(20)*1000.DD
          ZLM(5,3)=READIN(21)*1000.DD
          ZLM(5,4)=READIN(22)*1000.DD
          ZLM(5,5)=READIN(23)*1000.DD
          ZLM(5,6)=READIN(24)*1000.DD
          DO 250 L=6,9
            IF(L.EQ.6) DA=.046D0
            IF(L.EQ.7) NA=.220D0
            IF(L.EQ.8) DA=.162D0
            IF(L.EQ.9) DA=.572D0
            ZLM(L,1)=READIN(25)*DA*1000.DD
            ZLM(L,2)=READIN(26)*DA*1000.DD
            ZLM(L,3)=READIN(27)*DA*1000.DD
            ZLM(L,4)=READIN(28)*DA*1000.DD
            ZLM(L,5)=READIN(29)*DA*1000.DD
            ZLM(L,6)=READIN(30)*DA*1000.DD
            CONTINUE
          DO 310 L=1,4
            PRO(L)=READIN(31)

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5434. 310 CONTINUE
5435. DO 320 L=5,9
5436. PROL(L)=READIN(32)
5437. 320 CONTINUE
5438. C
5439. DO 330 L=1,4
5440. IF(L.EQ.1) DA=.207D0
5441. IF(L.EQ.2) DA=.271D0
5442. IF(L.EQ.3) DA=.008D0
5443. IF(L.EQ.4) DA=.514D0
5444. RIGISL(1,1,L)=READIN(34)*DA
5445. RIGISL(2,1,L)=READIN(35)*DA
5446. RIGISL(3,1,L)=READIN(36)*DA
5447. RIGISL(4,1,L)=READIN(37)*DA
5448. RIGISL(5,1,L)=READIN(38)*DA
5449. 330 CONTINUE
5450. RIGISL(1,1,5)=READIN(39)*.145D0
5451. RIGISL(2,1,5)=READIN(40)*.145D0
5452. RIGISL(3,1,5)=READIN(41)*.145D0
5453. RIGISL(4,1,5)=READIN(42)*.145D0
5454. RIGISL(5,1,5)=READIN(43)*.145D0
5455. RIGISL(1,1,6)=READIN(44)
5456. RIGISL(2,1,6)=READIN(45)
5457. RIGISL(3,1,6)=READIN(46)
5458. RIGISL(4,1,6)=READIN(47)
5459. RIGISL(5,1,6)=READIN(48)
5460. DO 390 L=7,9
5461. IF(L.EQ.7) DA=.419D0
5462. IF(L.EQ.8) DA=.364D0
5463. IF(L.EQ.9) DA=.067D0
5464. RIGISL(1,1,L)=READIN(39)*DA
5465. RIGISL(2,1,L)=READIN(40)*DA
5466. RIGISL(3,1,L)=READIN(41)*DA
5467. RIGISL(4,1,L)=READIN(42)*DA
5468. RIGISL(5,1,L)=READIN(43)*DA
5469. 390 CONTINUE
5470. C
5471. DO 490 L=1,9
5472. IF(L.EQ.1) DA=.146D0
5473. IF(L.EQ.2) DA=.094D0
5474. IF(L.EQ.3) DA=.015D0
5475. IF(L.EQ.4) DA=.288D0
5476. IF(L.EQ.5) DA=.039D0
5477. IF(L.EQ.6) DA=.229D0
5478. IF(L.EQ.7) DA=.075D0
5479. IF(L.EQ.8) DA=.080D0
5480. IF(L.EQ.9) DA=.035D0
5481. RIGISL(1,2,L)=READIN(49)*DA
5482. RIGISL(2,2,L)=READIN(50)*DA
5483. RIGISL(3,2,L)=READIN(51)*DA
5484. RIGISL(4,2,L)=READIN(52)*DA
5485. 490 CONTINUE
5486. C
5487. DO 540 L=1,9
5488. IF(L.EQ.1) DA=.257D0
5489. IF(L.EQ.2) DA=.079D0
5490. IF(L.EQ.3) DA=.061D0
5491. IF(L.EQ.4) DA=.437D0
5492. IF(L.EQ.5) DA=.131D0
5493. IF(L.EQ.6) DA=.000054D0

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5429.		IF(L.EQ.7) DA=.03000
5500.		IF(L.EQ.8) DA=.00400
5501.		IF(L.EQ.9) DA=.01200
5502.		RIGISL(1,3,L)=READIN(54)*DA
5503.		RIGISL(2,3,L)=READIN(55)*DA
5504.		RIGISL(3,3,L)=READIN(56)*DA
5505.		RIGISL(4,3,L)=READIN(57)*DA
5506.		RIGISL(5,3,L)=READIN(58)*DA
5511.	540	CONTINUE
5512.		DO 610 L=1,3
5516.		VISL(3,L)=READIN(61)
5517.	610	CONTINUE
5518.		DO 620 L=4,9
5525.		VISL(3,L)=READIN(62)
5526.	620	CONTINUE
5527.	C	
5528.		DO 630 L=1,9
5529.		IF(L.EQ.1) DA=.17600
5530.		IF(L.EQ.2) DA=.08100
5531.		IF(L.EQ.3) DA=.05900
5532.		IF(L.EQ.4) DA=.16100
5533.		IF(L.EQ.5) DA=.08100
5534.		IF(L.EQ.6) DA=.02000
5535.		IF(L.EQ.7) DA=.24100
5536.		IF(L.EQ.8) DA=.12100
5537.		IF(L.EQ.9) DA=.06100
5538.		RIGISL(1,4,L)=READIN(63)*DA
5539.		RIGISL(2,4,L)=READIN(64)*DA
5540.		RIGISL(3,4,L)=READIN(65)*DA
5541.		RIGISL(4,4,L)=READIN(66)*DA
5545.	530	CONTINUE
5546.01	C	
5546.02		DO 690 L=1,3
5546.03		VISL(4,L)=READIN(69)
5546.04	690	CONTINUE
5546.05		DO 694 L=4,9
5546.06		VISL(4,L)=READIN(69)*.7000
5546.07	694	CONTINUE
5547.	C	
5548.		DO 700 L=1,9
5549.		IF(L.EQ.1) DA=.07300
5550.		IF(L.EQ.2) DA=.13400
5551.		IF(L.EQ.3) DA=.06500
5552.		IF(L.EQ.4) DA=.17800
5553.		IF(L.EQ.5) DA=.08500
5554.		IF(L.EQ.6) DA=.00100
5555.		IF(L.EQ.7) DA=.29400
5556.		IF(L.EQ.8) DA=.15500
5557.		IF(L.EQ.9) DA=.01400
5558.		RIGISL(1,5,L)=READIN(70)*DA
5559.		RIGISL(2,5,L)=READIN(71)*DA
5560.		RIGISL(3,5,L)=READIN(72)*DA
5563.	700	CONTINUE
5564.	C	
5564.1		DO 730 L=1,9
5564.2		RIL(1,L)=READIN(33)
5564.3		RIL(2,L)=READIN(53)
5564.4		RIL(3,L)=READIN(59)
5564.5		RIL(4,L)=READIN(67)
5564.7		STISL(3,L)=READIN(60)

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5544.3 STISL(4,L)=READIN(68)
5544.4 STISL(5,L)=READIN(74)
5545.1 VISL(5,L)=READIN(73)
5545.2 730 CONTINUE
5546. C
5547. DO 750 L=1,9
5548. IF(L.EQ.1) DA=1.1900
5549. IF(L.EQ.2) DA=1.7000
5550. IF(L.EQ.3) DA=1.3700
5551. IF(L.EQ.4) DA=1.7000
5552. IF(L.EQ.5) DA=1.5900
5553. IF(L.EQ.6) DA=1.0000
5554. IF(L.EQ.7) DA=1.0300
5555. IF(L.EQ.8) DA=1.5900
5556. IF(L.EQ.9) DA=1.2200
5557. CSLT(L,2)=READIN(75)*DA
5558. C STISL(6,L)=READIN(76)
5559. 750 CONTINUE
5560. C
5561. DO 770 L=1,9
5562. HCILT(1,L,2)=READIN(77)
5563. HCILT(2,L,2)=READIN(77)*.7300
5564. 770 CONTINUE
5565. DO 780 I=1,2
5566. GCII(I)=READIN(78)
5567. 780 CONTINUE
5568. C
5569. DO 790 L=1,9
5570. IF(L.EQ.1) DA=.06200
5571. IF(L.EQ.2) DA=.12500
5572. IF(L.EQ.3) DA=.02700
5573. IF(L.EQ.4) DA=.13400
5574. IF(L.EQ.5) DA=.15500
5575. IF(L.EQ.6) DA=.01600
5576. IF(L.EQ.7) DA=.19600
5577. IF(L.EQ.8) DA=.17400
5578. IF(L.EQ.9) DA=.11200
5579. HYDRO(3,L)=READIN(79)*DA
5580. 790 CONTINUE
5581. C
5582. RETURN
5583. END
5584. C** TRANSV
5585. C
5586. SUBROUTINE TRANSV(NSIM)
5587. C MAKE ALL REAL VARIABLES DOUBLE PRECISION
5588. IMPLICIT REAL*8 (A-H,O-Z), INTEGER (I-N)
5589. C COMMON BLOCKS
5590. COMMON/RE/RSJKLM(4,3,9,6),RPJ(4),RPJK(4,3),RPK,RPKK(3),RYJ(4),
5591. ERYJK(4,3),RYKL(2),RYKK(3),SJKL(4,3,9),ZLM(9,6),ZLXM(10,6)
5592. COMMON/REPN/BPSL(9),BPKL(3,9),BSUJLM(6,9,6),GNP(9,6),GNPLM(10,6)
5593. & GNPBL(9),HIJ(3),HJ(4),HJK(4,3),HJL(6,9),ZL(9),RPKL(3,9),
5594. & PHYDRN(9),RUI(5),RYL(9),SJKLP(4,3,9),TEST,TRI(3),
5595. & TXJLM(3,9,6),TXJLM(4,9,6),XIL(3,9)
5596. COMMON/REVS/ESIMKT(6),ESIMKT(6),UIJ(3,3),VIJ(3,3),XI(3),OLDXI(3)
5597. & OLDDPI(3),DX(3),NAGN,NFAIL,NTIMES
5598. COMMON/RES/BESILM(5,9,6),ESRL1M(9,6),ESRL2M(9,6),
5599. & BSCIL(2,9),CIL(5,9),CSLT(9,3),ESR1M(6),ESR2M(6),

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5029.      & ESIL1M(3,9,6),ESIL2M(3,9,6),ESRILM(6,9,6),
5030.      & FLKL(3,9),HCILT(2,9,3),RCT(2),SFLRL(9),RYSHT
5031.      COMMON/DREPT/BSKL(3,9),GJ(4),GJK(4,3),PAUL(3,9),PCIL(3,9),
5032.      & PTM(3,6),PJLM(4,9,6),PJKLM(4,3,9,6),PKLM(3,9,6),
5033.      & PUILM(6,9,6),TKL(3,9),NUB
5034.      COMMON/DOSPER/EDIL(6,9),EDIKL(6,4,9),
5035.      & EDRIKL(6,4,9),EFJKL(4,4,9),ESIL(6,9),FJKL(4,3,9),
5036.      & FJL(4,9),GCI(2),GIJ(3),GUI(6),HYDRO(5,9),PILM(6,9,6),PROL(9),
5037.      & SCIL(3,9),SUIL(6,9),TESIL(9),YLM(9,6),BIOLM(9,2),BIOPSM(4,2,2),
5038.      COMMON/OUT1/CEFLM(9,6),CEFM(6),CONLM(9,6),CONM(6),EDM(6),
5039.      & EDIM(6,6),EDKL(4,9),EDLM(9,6),EDRM(6),EDRK(6),
5040.      & EDRIM(6,9),EDRIKM(6,6),EDRIL(6,9),EDRKLM(4,9,6),EDRLM(9,6),
5041.      & EFM(6),EFJM(4,6),EFJL(4,9),EFKL(4,9),EFLM(9,6),
5042.      & EPCLM(10,6),EPGLM(10,6)
5043.      COMMON/OUT2/ESM(6),ESIM(6,6),ESLM(9,6),ESRM(6),ESRIM(6,6),
5044.      & ESILM(6,6),ESI2M(6,6),ESLIM(9,6),ESL2M(9,6),ESKLM(9,6),
5045.      & ESUM(6),ESUIM(6,6),ESUILM(6,9,6),
5046.      & ESULM(9,6),EXM(6),EXIL(6,9),EXIM(6,6),EXLM(9,6),
5047.      & GNPFLM(10,6),GNPPCH(10,6),SYNM(6),SYNIM(6,6),
5048.      & SYNILM(6,9,6),SYNLM(9,6)
5049.      COMMON/PCP/NF,NFF,NI,NIG,NIM,NIP,NIS,NNIS,NJ,NJUMP,NKKL(9),NKL(9)
5050.      & NKMAX,NKKMAX,NL,NM,NMREAD,NMKT,NU,MAXAGN,NCO2,NOPT(10),IUNIT,
5051.      & NSTEP,NPUNT
5052.      COMMON/RC/COI(7),SBURNL(9,3),SFEDIL(3,9),SHALE(9,3),
5053.      & CO2IM(8,6),CO2LM(9,6),CO2M(6)
5054.      COMMON/RS/OISLM(5,9,6),RIGISL(5,5,9),CIGIS(6,5),VISL(5,9),
5055.      & RIL(5,9),STISL(5,9),BESIL(5,9),ESFIL(5,9)
5056.
5057.      C      COMMON/BLKVAL/VALUES(95)
5057.1
5057.2      C      DO 2 IM=1,95
5057.3      VALUES(IM)=0.000
5057.4      C      CONTINUE
5057.5
5058.
5059.      C      DO 10 IM=1,5
5060.      VALUES(IM)=CO2M(IM)
5061.      C      CONTINUE
5062.
5063.      C      DO 60 IM=1,5
5064.      IIM=5+IM
5065.      VALUES(IIM)=EDM(IM)
5066.      C      CONTINUE
5067.
5068.      C      DO 110 IM=1,5
5069.      IIM=10+IM
5070.      VALUES(IIM)=EDRM(IM)
5071.      C      CONTINUE
5072.
5073.      C      DO 160 IM=1,5
5074.      IIM=15+IM
5075.      VALUES(IIM)=EFM(IM)
5076.      C      CONTINUE
5077.
5078.      C      DO 210 IM=1,5
5079.      IIM=20+IM
5080.      VALUES(IIM)=GNPFLM(10,IM)
5081.      C      CONTINUE
5082.
5083.      C      DO 260 IM=1,5

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5684.		IIM=25+IM
5685.		VALUES(IIM)=ZLXM(10,IM)
5686.	200	CONTINUE
5687.	C	
5688.		DO 310 IM=1,5
5689.		IIM=30+IM
5690.		VALUES(IIM)=PIM(1,IM)
5691.	310	CONTINUE
5692.	C	
5693.		DO 360 IM=1,5
5694.		IIM=35+IM
5695.		VALUES(IIM)=PIM(2,IM)
5696.	360	CONTINUE
5697.	C	
5698.		DO 410 IM=1,5
5699.		IIM=40+IM
5700.		VALUES(IIM)=PIM(3,IM)
5701.	410	CONTINUE
5702.	C	
5703.		DO 460 IM=1,5
5704.		IIM=45+IM
5705.		VALUES(IIM)=PUILM(4,1,IM)
5706.	460	CONTINUE
5707.	C	
5708.		DO 510 IM=1,5
5709.		IIM=50+IM
5710.		VALUES(IIM)=PUILM(5,1,IM)
5711.	510	CONTINUE
5712.	C	
5713.		DO 560 IM=1,5
5714.		IIM=55+IM
5715.		VALUES(IIM)=ESUM(IM)
5716.	560	CONTINUE
5717.	C	
5718.		DO 610 IM=1,5
5719.		IIM=60+IM
5720.		VALUES(IIM)=ESI2M(1,IM)
5721.	610	CONTINUE
5722.	C	
5723.		DO 660 IM=1,5
5724.		IIM=65+IM
5725.		VALUES(IIM)=ESI2M(3,IM)
5726.	660	CONTINUE
5727.	C	
5728.		DO 710 IM=1,5
5729.		IIM=70+IM
5730.		VALUES(IIM)=ESI1M(1,IM)
5731.	710	CONTINUE
5732.	C	
5733.		DO 760 IM=1,5
5734.		IIM=75+IM
5735.		VALUES(IIM)=ESI1M(2,IM)
5736.	760	CONTINUE
5737.	C	
5738.		DO 810 IM=1,5
5739.		IIM=80+IM
5740.		VALUES(IIM)=ESI1M(3,IM)
5741.	810	CONTINUE
5742.	C	
5743.		DO 860 IM=1,5

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5744.      IIM=95+IM
5745.      VALUES(IIM)=FSIN(4,IM)
5746.      900 CONTINUE
5747.      C
5748.      DO 910 IM=1,5
5749.      IIM=90+IM
5750.      VALUES(IIM)=ESIN(5,IM)
5751.      910 CONTINUE
5752.      C
5753.      C
5754.      RETURN
5755.      END
5756.      C
5757.      C** OUTSAS
5758.      C
5759.      SUBROUTINE OUTSAS(NSIM)
5760.      COMMON/BLKRAN /PARMT(79)
5761.      COMMON/BLKVAL /VALUES(95)
5762.      REAL*8 VALUES
5763.      IF(NSIM.GT.0) GOTO 30
5764.      PRINT 8,PARMT
5765.      PRINT 18,VALUES
5766.      8      FORMAT(' ',PARMT:'.6G12.6')
5767.      18     FORMAT(' ',VALUES:'.5G12.6')
5768.      30     CONTINUE
5769.      WRITE(28) PARMT,VALUES
5770.      C*****WRITE(28) FROM BLKRAN AND BLKVAL TO SAS FILE
5771.      RETURN
5772.      END
5773.      C
5774.      C** MINMAX
5775.      C
5776.      SUBROUTINE MINMAX
5777.      COMMON/BLKR/NITER,ISEED,NP,MAXNP,MAXN
5778.      COMMON/BLKVAM /PNAME(100)
5779.      COMMON/BLKD/XLOG,XNDRM,TRAIG,UNFM,CNST,BLNK,PER,BETA,SEGM,FOLD,C
5780.      COMMON/BLKI/PNAM(100),PMU(100),SD(100),PMIN(100),PMAX(100),
5781.      &PHID(100),DIST(100),RB1(100),B2(100)
5782.      COMMON/BLKRAN/PARMT(79)
5783.      COMMON/BLSLAT/PM(79,5),SEG(79,5),NPM
5784.      REAL*8 RLAS(10)
5785.      C
5786.      READ IN MONTE-CARLO INFORMATION :
5787.      C      NITER --- NUMBER OF ITERATIONS
5788.      C      NP --- NO. OF VARIABLES TO BE VARIED
5789.      C      ISEED --- RANDOM NO. SEED
5790.      READ(5,4) RLAS
5791.      4      FORMAT(10A8)
5792.      PRINT 9,RLAS
5793.      9      FORMAT (/T20,10A8/T38,'LATIN HYPERCURE SAMPLING'/)
5794.      C
5795.      READ(5,5) NITER,NP,ISEED
5796.      5      FORMAT(2I5,I10)
5797.      C
5798.      PRINT INFO.
5799.      C      PRINT 10,NITER,NP,ISEED
5800.      10     FORMAT(T10,'NUMBER OF REPETITIONS = ',I5/,
5801.      & T10,'NUMBER OF PARAMETERS TO BE VARIED = ',I2/,
5802.      & T10,'RANDOM NUMBER SEED = ',I10)
5803.      C

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5817.      READ INFO. ON PARAMETERS TO BE VARIED WHERE:
5818.      PNAME --- NAME OF PARAMETER
5819.      DIST --- TYPE OF DISTRIBUTION WHERE:
5820.          U --- UNIFORM
5821.          N --- NORMAL
5822.          C --- CONSTANT
5823.          S --- CUMULATIVE
5824.      SD --- STANDARD DEV
5825.      PMIN --- MINIMUM VALUE
5826.      PMAX --- MAXIMUM VALUE
5827.      PARMD --- PARAMETER VALUES
5828.
5829.      *****FILL OUT BLKI COMMON WITH PMU ETC
5830.
5831.      DO 22 J=1,NP
5832.          ISET=1
5833.          PNAME(J)=PNAME(J)
5834.          PMU(J)=PARMT(J)
5835.          SD(J)=ABS(.02*PMU(J))
5836.
5837.      *****IF DISTRIBUTION IS NOT NORMAL SET DIFFERENT MINMAX,SD
5838.
5839.      CONTINUE
5840.
5841.      IF(ISET.EQ.0) PRINT 24,XNAME
5842.      FORMAT(//T10,20(' '),5X,A4,' IS AN INVALID PARAMETER NAME'//)
5843.
5844.      PRINT DESCRIPTION INFORMATION
5845.      PRINT 30
5846.      FORMAT(//T10,'NAME',5X,'DIST.',5X,'VALUE',5X,
5847.      & 'STD. DEV.',2X,'MINIMUM',5X,'MAXIMUM',5X,'ROOT B1',5X,
5848.      & 'B2'//)
5849.      DO 35 I=1,79
5850.          IF (PNAME(I).NE.BLANK)
5851.              &PRINT 40,PNAME(I),DIST(I),PMU(I),SD(I),PHIN(I),PMAX(I),RB1(I),
5852.              &B2(I)
5853.          FORMAT(T10,A4,T23,A1,3X,9(2X,G10.4))
5854.      CONTINUE
5855.
5856.      PRINT 45
5857.      FORMAT(//T10,'DISTRIBUTION TYPES:',//,
5858.      & T20,'N -- NORMAL',/
5859.      & T20,'U -- UNIFORM',/
5860.      & T20,'C -- CONSTANT',/
5861.      & T20,'S -- CUMULATIVE'//)
5862.      RETURN
5863.      END
5864.
5865.      ** LATIN
5866.
5867.      SUBROUTINE LATIN
5868.      COMMON/BLKR/NITER,ISEED,NP,MAXNP,MAXN
5869.      COMMON/BLKD/XLOG,XNORM,TRAIG,UNFM,CNST,BLNK,PER,BETA,SEGM,FOLD,G
5870.      COMMON/BLKI/PNAME(100),PMU(100),SD(100),PHIN(100),PMAX(100),
5871.      &PHID(100),DIST(100),RB1(100),B2(100)
5872.      COMMON/BLKIP/RPSP(400,100),SIG(5050),R(400,100)
5873.
5874.
5875.
5876.

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5877. C INITIALIZE SIG
5878.     NN=J
5879.     NIJ=0
5880.     DO 28 IJ = 1, NP
5881.     DO 27 IK = 1, IJ
5882.     NK=NK+1
5883.     SIG(NK)=0.
5884. 27 CONTINUE
5885.     NIJ=NIJ+IJ
5886.     SIG(NIJ)=1.0
5887. 26 CONTINUE
5888. C
5889. C READ IN CORRELATIONS
5890.     NC=0
5891. 40 READ(5,100,END=41) XNM1,XNM2,CORR
5892. 100 FORMAT (2(A4,1X),F20.0)
5893.     NC=NC+1
5894.     IF(NC.EQ.1) PRINT 53
5895. 53 FORMAT ('//T10, 'CORRELATIONS MATRIX SPECIFIED: '//)
5896.     PRINT 101,XNM1,XNM2,CORR
5897. 101 FORMAT (T15,A4,4X,A4,4X,G10.4)
5898. C
5899. C CREATE SIG (NORMALIZED COMPRESSED V-C MATRIX)
5900. C BECAUSE WE ARE GENERATING RANK ORDERS, ALL SD'S = 1.0
5901.     NK=0
5902.     DO 39 IJ=1, NP
5903.     DO 39 IK=1, IJ
5904.     NK=NK+1
5905.     IF(XNM1.NE.PNAM(IJ).AND.XNM1.NE.PNAM(IK)) GO TO 39
5906.     IF(XNM2.NE.PNAM(IJ).AND.XNM2.NE.PNAM(IK)) GO TO 39
5907.     SIG(NK)=CORR
5908. 39 CONTINUE
5909. C
5910.     GO TO 40
5911. C
5912. 41 DO 51 I=1, NP
5913.     IF(DIST(I).NE.XLOG) GO TO 51
5914.     IF (PMIN(I).GT.0) PMIN(I)=ALOG(PMIN(I))
5915.     PMAX(I)=ALOG(PMAX(I))
5916. 51 CONTINUE
5917.     PRINT 52,NITER,ISEED,NP,MAXNP,MAXN
5918. 52 FORMAT(' ',I4,2X,G12.6,3(I4,2X))
5919. C
5920. C GENERATE CORRELATED VALUES
5921.     DSEED=ISEED
5922.     CALL CORRNC(DSEED)
5923. C
5924. C CREATE PROBABILITIES FOR THE LIMITS OF THE NORMAL
5925. C AND LOGNORMAL DISTRIBUTION AND SAVE IN COMMON BLOCK BLKLM
5926.     CALL PLIMIT(NP)
5927. C
5928. C ADJUST THE SAMPLES ACCORDING TO PRESPECIFIED CORRELATIONS
5929. C AND CREATE ACTUAL PARAMETER VALUES IN R
5930.     CALL SAMJST
5931.     DO 31 J=1, NP
5932.     CALL RANK (R(1,J),J)
5933.     DO 31 I=1, NITER
5934.     R(I,J)=PMU(J)
5935.     IF (DIST(J).EQ.BLNK) GO TO 31
5936.     IF (DIST(J).EQ.CNST) GO TO 31

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5437. IF (DIST(J).EQ.XNORM) CALL ANORM(VALUE,J,I)
5438. IF (DIST(J).EQ.UNFM) CALL FLAT(VALUE,J,I)
5439. IF (DIST(J).EQ.SEGM) CALL SLAT(VALUE,J,I)
5440. O(I,J)=VALUE
5441. CONTINUE
5442. C
5443. RETURN
5444. END
5445. C
5446. C** LATGO
5447. C
5448. SUBROUTINE LATGO(IN)
5449. COMMON/BLKR/NITER,ISEED,NP,MAXNP,MAXN
5450. COMMON/BLKRAN/PARMT(79)
5451. COMMON/BLKIP/RPSP(400,100),SIG(5050),R(400,100)
5452. C
5453. C THIS SUBROUTINE MOVES PARAMETERS INTO PARMT
5454. DO 81 J=1,NP
5455. PARMT(J)=R(IN,J)
5456. C
5457. 81 CONTINUE
5458. IF(IN.EQ.1) PRINT 6,R
5459. C6 FORMAT(' ',R CHECK ',6G12.6)
5460. RETURN
5461. END
5462. C
5463. C** CORRELATIONS
5464. C
5465. SUBROUTINE CORRNK(IDSEED)
5466. REAL*4 WRKVEC(100),VC(5050)
5467. COMMON/BLKR/N,ISEED,NP,MAXNP,MAXN
5468. COMMON/BLKIP/RPSP(400,100),SIG(5050),R(400,100)
5469. C
5470. C SIG = SPECIFIED CORRELATION BETWEEN PARAMETERS (DATA)
5471. C R = MATRIX OF CORRELATED PARAMETERS
5472. NK=NP*(NP+1)/2.
5473. WRKVEC(1)=0.0
5474. DO 10 I=1,NK
5475. VC(I)=SIG(I)
5476. 10 CONTINUE
5477. C
5478. C GGNSM IS A SINGLE PRECISION IMSL LIBRARY ROUTINE
5479. CALL GGNSM (DSEED,N,NP,VC,MAXN,RPSP,WRKVEC,IER)
5480. RETURN
5481. END
5482. C
5483. C** PLIMIT
5484. C
5485. SUBROUTINE PLIMIT(NP)
5486. COMMON/BLKI/PNAM(100),XHU(100),XSIG(100),XMIN(100),XMAX(100),
5487. &PMID(100),DIST(100),RB1(100),B2(100)
5488. COMMON/BLKLM/PYL(100),PHI(100)
5489. C
5490. C THIS ROUTINE CONVERTS THE UPPER AND LOWER LIMITS OF
5491. C THE NORMAL DISTRIBUTION TO CUMULATIVE NORMAL DISTRIBUTION
5492. C USES IMSL ROUTINE MDNOR
5493. DO 10 I=1,NP
5494. PYL(I)=0.0
5495. PHI(I)=1.0
5496. IF(XSIG(I).LE.0) GO TO 10

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5997.      PY1=(X*AX(I)-X*U(I))/XSIG(I)
5998.      PY2=(X*AX(I)-X*U(I))/XSIG(I)
5999.      CALL MONOR(PY1,PYL(I))
6000.      CALL MONOR(PY2,PHI(I))
6001.      10 CONTINUE
6002.      C
6003.      RETURN
6004.      END
6005.
6006.      C** SAMJST
6007.      C
6008.      SUBROUTINE SAMJST
6009.      COMMON/BLKR/N,ISEED,NP,MAXNP,MAXN
6010.      COMMON/BLKIP/RPSP(400,100),C(5050),R(400,100)
6011.      DIMENSION T(5050),XM(100),SX(100),Q(5050),P(5050),
6012.      &OF(100,100),PF(100,100),S(100,100)
6013.      C
6014.      C OBTAIN CORRELATIONS REALIZED (T) FROM VALUES (R)
6015.      CALL BECDRI (RPSP,N,NP,MAXN,XM,SX,T,IER)
6016.      C
6017.      C FACTOR REALIZED CORRELATIONS (T) TO OBTAIN Q
6018.      C AND FACTOR SPECIFIED CORRELATIONS, C, TO OBTAIN P
6019.      CALL LUDECP (T,Q,NP,D1,D2,IER)
6020.      CALL LUDECP (C,P,NP,D1,D2,IER)
6021.      C
6022.      C CONVERT P AND Q TO FULL LOWER TRIANGULAR MATRICES
6023.      C AND OBTAIN Q-INVERSE
6024.      DO 5 I=1,NP
6025.      DO 5 J=1,NP
6026.      OF(I,J)=0.
6027.      PF(I,J)=0.
6028.      5 CONTINUE
6029.      C
6030.      NK=0
6031.      DO 10 I=1,NP
6032.      DO 9 J=1,I
6033.      NK=NK+1
6034.      OF(I,J)=Q(NK)
6035.      PF(I,J)=P(NK)
6036.      9 CONTINUE
6037.      OF(I,I)=1./OF(I,I)
6038.      PF(I,I)=1./PF(I,I)
6039.      10 CONTINUE
6040.      CALL LINV3F(OF,T,1,NP,MAXNP,D1,D2,T,IER)
6041.      C
6042.      C OBTAIN S=P*Q(INV)
6043.      C AND ADJUST SAMPLE RB=R*S
6044.      CALL VMULFF(PF,OF,NP,NP,NP,MAXNP,MAXNP,S,MAXNP,IER)
6045.      CALL VMULFP (RPSP,S,N,NP,NP,MAXN,MAXNP,R,MAXN,IER)
6046.      RETURN
6047.      END
6048.
6049.      C** RANK
6050.      C
6051.      SUBROUTINE RANK (X,IK)
6052.      DIMENSION X(1)
6053.      COMMON/BLKIP/RPSP(400,100),SIG(5050),R(400,100)
6054.      COMMON/BLKR/NITER,ISEED,NP,MAXNP,MAXN
6055.      C
6056.      C PROGRAM RANKS DATA AND SETS THE X VECTOR TO 2.E9

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057.      DO 20 J=1,NITER
058.      CRIT=1.E9
059.      DO 10 I=1,NITER
060.      IF (X(I).GT. CRIT) GO TO 10
061.      CRIT=X(I)
062.      ISV=I
063.      CONTINUE
064.      RPSP(ISV,IK)=J
065.      X(ISV)=2.E9
066.      CONTINUE
067.      RETURN
068.      END
069.      C
070.      C** ANORM
071.      C
072.      SUBROUTINE ANORM (VALUE,KP,KN)
073.      COMMON/BLKR/N,ISEED,NP,MAXNP,MAXN
074.      COMMON/BLKI/PNAM(100),XMU(100),XSIG(100),XMIN(100),XMAX(100),
075.      EPMID(100),DIST(100),RB1(100),B2(100)
076.      COMMON/BLKIP/RPSP(400,100),SIG(5050),R(400,100)
077.      COMMON/BLKLM/PYL(100),PHI(100)
078.      C
079.      THIS ROUTINE GENERATES NORMAL RANDOM NUMBERS BY LATIN
080.      C
081.      C
082.      C
083.      C
084.      C
085.      C
086.      C
087.      C
088.      C
089.      C
090.      C4
091.      C
092.      C
093.      C
094.      C** FLAT
095.      C
096.      SUBROUTINE FLAT(VALUE,KP,KN)
097.      COMMON/BLKR/N,ISEED,NP,MAXNP,MAXN
098.      COMMON/BLKIP/RPSP(400,100),SIG(5050),R(400,100)
099.      COMMON/BLKI/PNAM(100),XMU(100),XSIG(100),XMIN(100),XMAX(100),
100.      EPMID(100),DIST(100),RB1(100),B2(100)
101.      C
102.      C
103.      C
104.      C
105.      C
106.      C
107.      C
108.      C
109.      C
110.      C
111.      C
112.      C
113.      C4
114.      C
115.      C
116.      C

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5117. C
5118. C=* SLAT
5119. C
5120. SUBROUTINE SLAT(VALUE,KP,KN)
5121. COMMON/BLK2/N,ISEED,NP,MAXNP,MAXN
5122. COMMON/BLK1P/RPSP(400,100),SIG(5050),R(400,100)
5123. COMMON/BLK1/PNAM(100),XMU(100),XSIG(100),XMIN(100),XMAX(100),
5124. &PMID(100),DIST(100),R51(100),R2(100)
5125. COMMON/BLSLAT/PM(79,5),SEG(79,5),NPM
5126. C
5127. TMIN=XMU(KP)-1.73*XSIG(KP)
5128. TMAX=XMU(KP)+1.73*XSIG(KP)
5129. C IF(XMIN(KP).LT.TMIN)XMIN(KP)=TMIN
5130. C IF(XMAX(KP).GT.TMAX)XMAX(KP)=TMAX
5131. C
5132. C99 K=NPM-1
5133. DO 990 I=1,K
5134. C IF(XMIN(KP).GT.SEG(KP,I))SEG(KP,I)=XMIN(KP)
5135. C IF(XMAX(KP).LT.SEG(KP,NPM-I+1))SEG(KP,NPM-I+1)=XMAX(KP)
5136. C990 CONTINUE
5136.1 IF(KP.EQ.1.OR.KP.EQ.2) NPM=3
5136.2 IF(KP.GT.2.AND.KP.LT.73) NPM=5
5136.3 IF(KP.EQ.73.OR.KP.EQ.74.OR.KP.EQ.75.OR.KP.EQ.76) NPM=3
5136.4 IF(KP.EQ.77) NPM=5
5136.5 IF(KP.EQ.78.OR.KP.EQ.79) NPM=3
5137. 991 HEIGHT=(PM(KP,NPM)-PM(KP,1))/N
5138. WHERE=HEIGHT*RPSP(KN,KP)
5139. RV=WHERE-HEIGHT*URAND(ISEED)+PM(KP,1)
5140. DO 100 I=1,NPM
5141. TTRV=RV-PM(KP,I)
5142. IF(TTRV.LE.0.0) GO TO 400
5143. 100 CONTINUE
5144. 400 VALUE=SEG(KP,I-1)+(((SEG(KP,I)-SEG(KP,I-1))*(RV-PM(KP,I-1))))/
5145. (PM(KP,I)-PM(KP,I-1))
5146. C600 IF(KN.LT.10.AND.KN.LT.13)
5147. C PRINT 8,VALUE,TMIN,TMAX,XMIN(KP),XMAX(KP),PM(KP,I),SEG(KP,I),
5148. C WHERE,HEIGHT,RV,RPSP(KN,KP),I
5149. C8 FORMAT(' ','SEG',5(G12.6,1X),/' ',4X,6(G12.6,1X),I4)
5150. RETURN
5151. END
5152. /*
5153. //LKED.SYSLIB DD
5154. // DD
5155. // DD
5156. // DD DSN=A.L.RXR10276.IMSLSP,DISP=SHR
5157. /*
5158. //GO.FT28F001 DD DSN=ENVSCI.AZT24382.CUCO,DISP=(NEW,CATLG),
5159. // DCB=(RECFM=YBS,LRECL=8800,BLKSIZE=8804),UNIT=3330-1,
5160. // SPACE=(TRK,(70,20),RLSE),VOL=SER=ENVSCI
5161. //GO.FT29F001 DD DSN=T.AZT24382.NCCD,DISP=(NEW,CATLG),
5162. // DCB=(RECFM=YBS,LRECL=8800,BLKSIZE=8804),UNIT=SPDA,
5163. // SPACE=(TRK,(70,20),RLSE)
5164. //GO.FT05F001 DD *
5165. OUTPUT UNIT NUMBER = 06
5166. *****
5167. ** REPORT WRITING MENU **
5168. **
5169. ** 1 = DO NOT PRINT **
5170. ** 2 = PRINT **
5171. *****

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TRI--TRANSPORTATION COSTS FOR TRADED FUELS
PIM--INITIAL ESTIMATE OF PRICES FOR TRADED FUELS BY FUEL
AND PERIOD
(UNITS=1975 DOLLARS PER GJ (GIGAJoule))

	OIL	GAS	COAL	TRI
6203.	0.1397	2.8458	.3409	PIM M=1
6204.	1.8398	0.6256	0.5121	PIM M=2
6205.	3.01	0.34	0.63	PIM M=3
6206.	4.64	1.42	0.68	PIM M=4
6207.	5.63	2.29	0.87	PIM M=5
6208.	6.64	3.29	1.44	PIM M=6
6209.	6.70	3.43	1.43	

TXILM -- TRADE BARRIERS (SCALE FACTOR APPLIED TO FUEL PRICES)

	OIL --	TXILM	2025	2050	2075	2100	REGION
6210.	1975	2000	1.00	1.00	1.00	1.00	USA
6211.	0.98	1.00	1.00	1.00	1.00	1.00	CANADA&E
6212.	1.48	1.48	1.48	1.48	1.48	1.48	JANZ
6213.	1.10	1.10	1.10	1.10	1.10	1.10	EUSSR
6214.	0.9294	1.00	1.00	1.00	1.00	1.00	ACENP
6215.	1.00	1.00	1.00	1.00	1.00	1.00	MIDEAST
6216.	0.0929	0.40	0.70	1.00	1.00	1.00	AFR
6217.	1.9983	1.50	1.00	1.00	1.00	1.00	LA
6218.	0.9945	1.02	1.00	1.00	1.00	1.00	SEE ASIA
6219.	0.85	1.00	1.00	1.00	1.00	1.00	
6220.							
6221.							
6222.							
6223.							
6224.							
6225.							
6226.							
6227.							
6228.							
6229.							
6230.							
6231.							

GAS -- TXILM

6292.	1.00	1.00	1.00	1.00	1.00	1.00	SEE ASIA
6293.							
6294.	ELECTRICITY -- TXJLM						
6295.	1975	2000	2025	2050	2075	2100	REGION
6296.	1.00	1.00	1.00	1.00	1.00	1.00	USA
6297.	1.00	1.00	1.00	1.00	1.00	1.00	CANADAEEU
6298.	1.00	1.00	1.00	1.00	1.00	1.00	JANZ
6299.	1.00	1.00	1.00	1.00	1.00	1.00	EUSSR
6300.	1.00	1.00	1.00	1.00	1.00	1.00	ASENP
6301.	1.00	1.00	1.00	1.00	1.00	1.00	MIDEAST
6302.	1.00	1.00	1.00	1.00	1.00	1.00	AFR
6303.	1.00	1.00	1.00	1.00	1.00	1.00	LA
6304.	1.00	1.00	1.00	1.00	1.00	1.00	SEE ASIA
6305.							
6306.							

POPULATION (ZLM)
UNITS=THOUSANDS OF PERSONS

6307.	1950	1975	2000	2025	2050	2075	2100	
6308.								
6309.								
6310.								
6311.	152271.	214000.	254000.	282000.	288000.	292000.	292000.	USA
6312.	300245.	405000.	476000.	528000.	553000.	562000.	562000.	CANAEU
6313.	96307.	128000.	154000.	164000.	167000.	169000.	169000.	JANZ
6314.	286136.	395000.	472000.	516000.	533000.	541000.	541000.	EUSSR
6315.	590509.	911000.	1248000.	1499000.	1612000.	1647000.	1647000.	ASENP
6316.	39048.	81000.	147000.	199000.	232000.	241000.	241000.	MIDEAS
6317.	227039.	399000.	697000.	943000.	1101000.	1150000.	1150000.	AFR
6318.	165764.	313000.	540000.	718000.	823000.	849000.	849000.	LA
6319.	652760.	1130000.	1904000.	2515000.	2888000.	2995000.	2995000.	SEASIA
6320.								
6321.								
6322.								
6323.								
6324.								
6325.								
6326.								

LABOR PRODUCTIVITY GROWTH RATE (UNITS=ANNUAL RATE)
AND BASE GNP (UNITS=MILLIONS 1975 US DOLLARS)

6327.	LABOR	BASE	
6328.	PRODUCTIVITY	GNP	
6329.			
6330.	0.017	1519890.	USA
6331.	0.017	1817860.	WEURECAN
6332.	0.017	586400.	JANZ
6333.	0.017	966400.	EUSSR
6334.	0.029	323600.	ASENP
6335.	0.029	138410.	MIDEAST
6336.	0.029	154690.	AFR
6337.	0.029	315490.	LA
6338.	0.029	233620.	SEASIA
6339.			
6340.			

REFINERY COEFFICIENTS (GIJ AND HIJ)
"GIJ" IS A CONVERSION EFFICIENCY, THE RATIO OF JOULES OF PRIMARY
ENERGY IN TO JOULES OF ENERGY PRODUCT OUT (EXCLUSIVE OF FUELS
USED AS ENERGY BY THE REFINERY). IT IS APPROXIMATED AS 1.
"HIJ" IS A MARK-UP COST, ACCOUNTING FOR COST OF REFINING AND
DISTRIBUTING ENERGY PRODUCTS.

6341.	OIL		GAS		COAL	
6342.	GIJ	HIJ	GIJ	HIJ	GIJ	HIJ
6343.	1.00	1.425	1.00	.3487	1.00	.2600
6344.						
6345.						
6346.						
6347.						
6348.						
6349.						
6350.						
6351.						

5352. ELECTRICITY GENERATION COEFFICIENTS (GUI, FUEL, AND RUI)
 5353. "GUI" IS A GENERATION EFFICIENCY COEFFICIENT -- THE RATIO OF JOULES
 5354. OF ENERGY IN TO JOULES OF ELECTRICITY OUT. BY DEFINITION, GUI=1 FOR
 5355. NUCLEAR, HYDRO, AND SOLAR.
 5356. "FUEL" REFLECTS NONENERGY COSTS IN 1975 DOLLARS PER GJ.
 5357. "RUI" IS A LOGIT SUBSTITUTION PARAMETER GOVERNING THE RESPONSE OF
 5358. UTILITIES TO PRICE INCREASES FOR A GIVEN TECHNOLOGY -- HYDRO ENTERS
 5359. AS A FIXED AMOUNT.

	OIL	GAS	COAL	FUEL	NUCLEAR	SOLAR	HYDRO	PARAMETER
5361.								GUI
5362.	3.658	3.658	3.325		1.097	1.097	1.097	HUIL L=1
5363.	4.5330	4.5052	6.8660		1.7000	1.7000	1.7000	HUIL L=2
5364.	4.5330	4.5052	6.8660		1.7000	1.7000	1.7000	HUIL L=3
5365.	4.5330	4.5052	6.8660		1.7000	1.7000	1.7000	HUIL L=4
5366.	4.5330	4.5052	5.8630		1.7000	1.7000	1.7000	HUIL L=5
5367.	4.5330	4.5052	5.8630		1.7000	1.7000	1.7000	HUIL L=6
5368.	4.5330	4.5052	5.8630		1.7000	1.7000	1.7000	HUIL L=7
5369.	4.5330	4.5052	5.8630		1.7000	1.7000	1.7000	HUIL L=8
5370.	4.5330	4.5052	5.8630		1.7000	1.7000	1.7000	HUIL L=9
5371.	4.5330	4.5052	5.8630		1.7000	1.7000	1.7000	RUI
5372.	4.5330	4.5052	5.8630		1.7000	1.7000	1.7000	
5373.	-3.00	-3.00	-3.00		-3.00	-3.00		

5374. PAUIL -- ELECTRICITY GENERATION COEFFICIENTS
 5375. (PAUIL IS A MULTIPLICATIVE FACTOR WHICH ADJUSTS THE REFINED
 5376. FOSSILE FUEL PRICE TO ACCOUNT FOR DIFFERENT FUEL TYPE (E.G.
 5377. RESIDUAL US GASOLINE) AND DISTRIBUTION COSTS.)
 5378.

	LIQUID	GAS	FUEL	SOLID	REGION
5382.	0.4850	0.7330		1.00	US
5383.	0.5747	0.6195		0.8293	WEUR+CAN
5384.	0.5243	0.9595		1.00	OECD PAC
5385.	0.4000	1.00		1.00	EUSSR
5386.	0.4000	1.00		1.00	ACENP
5387.	1.0595	1.00		1.00	MIDEAST
5388.	0.4185	1.00		1.00	AFRICA
5389.	0.4013	1.00		1.00	L AMER
5390.	0.6059	1.00		1.00	SEE ASIA

5391. BSUILM: ELECTRIC UTILITY FUEL SHARE WEIGHTS,
 5392. BY PERIOD, FUEL AND REGION
 5393.

	OIL	GAS	1975	COAL	NUCLEAR	SOLAR	REGION
5397.	0.0915	0.0274		0.2000	0.0346	0.0253	US
5398.	0.1680	0.0694		0.2000	0.0192	0.0172	WEUR+CAN
5399.	0.1937	0.2000		0.0458	0.0082	0.0056	OECD PAC
5400.	0.1157	0.0565		0.2000	0.0060	0.0060	EUSSR
5401.	0.0547	0.0074		0.2000	0.0000	0.0011	ACENP
5402.	0.2000	0.0408		0.0000	0.0001	0.0000	MIDEAST
5403.	0.1851	0.0128		0.2000	0.0000	0.0009	AFRICA
5404.	0.2000	0.0453		0.0319	0.0080	0.0061	L AMER
5405.	0.1158	0.0007		0.2000	0.0039	0.0036	SEE ASIA

5406. BSUILM: YEAR 2000
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	OIL	GAS	COAL	NUCLEAR	SOLAR	REGION
412.	0.0181	0.0283	0.2000	0.0702	0.0651	US
413.	0.1403	0.0542	0.2000	0.0719	0.0459	WEUR+CAN
414.	0.2000	0.0567	0.1178	0.0433	0.0347	OECD PAC
415.	0.2000	0.1359	0.2000	0.0373	0.0370	EUSSR
416.	0.1346	0.0082	0.2000	0.0101	0.0002	ACENP
417.	0.2000	0.1102	0.0200	0.0045	0.0045	MIDEAST
418.	0.2000	0.0276	0.2000	0.0148	0.0134	AFRICA
419.	0.2000	0.1174	0.0951	0.0428	0.0376	L AMER
420.	0.1600	0.0113	0.2000	0.0291	0.0280	S&E ASIA

BSUILM: YEAR 2025

	OIL	GAS	COAL	NUCLEAR	SOLAR	REGION
427.	0.0850	0.1274	0.2000	0.1754	0.2000	US
428.	0.2000	0.2000	0.2000	0.2000	0.2000	WEUR+CAN
429.	0.2000	0.2000	0.2000	0.2000	0.2000	OECD PAC
430.	0.2000	0.2000	0.2000	0.2000	0.2000	EUSSR
431.	0.2000	0.1000	0.2000	0.2000	0.0353	ACENP
432.	0.2000	0.2000	0.1000	0.2000	0.2000	MIDEAST
433.	0.2000	0.2000	0.2000	0.2000	0.2000	AFRICA
434.	0.2000	0.2000	0.2000	0.2000	0.2000	L AMER
435.	0.2000	0.2000	0.2000	0.2000	0.2000	S&E ASIA
436.	0.2000	0.2000	0.2000	0.2000	0.2000	

BSUILM: YEAR 2050

	OIL	GAS	COAL	NUCLEAR	SOLAR	REGION
442.	0.1275	0.2000	0.2000	0.2000	0.2000	US
443.	0.2000	0.2000	0.2000	0.2000	0.2000	WEUR+CAN
444.	0.2000	0.2000	0.2000	0.2000	0.2000	OECD PAC
445.	0.2000	0.2000	0.2000	0.2000	0.2000	EUSSR
446.	0.2000	0.2000	0.2000	0.2000	0.2000	ACENP
447.	0.2000	0.2000	0.1000	0.2000	0.2000	MIDEAST
448.	0.2000	0.2000	0.2000	0.2000	0.2000	AFR
449.	0.2000	0.2000	0.2000	0.2000	0.2000	L AMER
450.	0.2000	0.2000	0.2000	0.2000	0.2000	S&E ASIA
451.	0.2000	0.2000	0.2000	0.2000	0.2000	

BSUILM: YEAR 2075

	OIL	GAS	COAL	NUCLEAR	SOLAR	REGION
457.	0.1275	0.2000	0.2000	0.2000	0.2000	US
458.	0.2000	0.2000	0.2000	0.2000	0.2000	WEUR+CAN
459.	0.2000	0.2000	0.2000	0.2000	0.2000	OECD PAC
460.	0.2000	0.2000	0.2000	0.2000	0.2000	EUSSR
461.	0.2000	0.2000	0.1000	0.2000	0.2000	ACENP
462.	0.2000	0.2000	0.2000	0.2000	0.2000	MIDEAST
463.	0.2000	0.2000	0.2000	0.2000	0.2000	AFR
464.	0.2000	0.2000	0.2000	0.2000	0.2000	L AMER
465.	0.2000	0.2000	0.2000	0.2000	0.2000	S&E ASIA
466.	0.2000	0.2000	0.2000	0.2000	0.2000	

BSUILM: YEAR 2100

471.

	OIL	GAS	COAL	NUCLEAR	SOLAR	REGION
472.	0.1275	0.2000	0.2000	0.2000	0.2000	US
473.	0.2000	0.2000	0.2000	0.2000	0.2000	WEUR+CAN
474.	0.2000	0.2000	0.2000	0.2000	0.2000	OECD PAC
475.	0.2000	0.2000	0.2000	0.2000	0.2000	EUSSR
476.	0.2000	0.2000	0.2000	0.2000	0.2000	ACENP
477.	0.2000	0.2000	0.2000	0.2000	0.2000	MIDEAST
478.	0.2000	0.2000	0.1000	0.2000	0.2000	AFR
479.	0.2000	0.2000	0.2000	0.2000	0.2000	L AMER
480.	0.2000	0.2000	0.2000	0.2000	0.2000	S&E ASIA
481.	0.2000	0.2000	0.2000	0.2000	0.2000	
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TAL--RATE OF END-USE ENERGY EFFICIENCY IMPROVEMENT BY SECTOR
AND REGION
UNITS=NONE

RES/COM	INDUSTRY	TRANSPORT	REGION
0.01	0.01	0.01	1=USA
0.01	0.01	0.01	2=WEUR+CAN
0.01	0.01	0.01	3=OECD PAC
NON-OECD REGIONS			
ALL SECTORS	REGION		
0.01	4=EUSSR		
0.01	5=ACENP		
0.01	6=MIDEAST		
0.01	7=AFRICA		
0.01	8=L AMER		
0.01	9=S&E ASIA		

RIGISL--RESOURCES BY GRADE AND REGION
(UNITS=EXAJOULES)

GRADE: IG=1

CONV OIL	CONV GAS	COAL	UNCON OIL	NUCLEAR	REGION
77.	670.	7964.	4691.	109.	1=USA
100.	434.	2459.	2142.	200.	2=WEUR+CAN
3.	70.	1891.	1564.	97.	3=OECD PAC
190.	1324.	13536.	4294.	267.	4=EUSSR
62.	179.	4054.	2147.	128.	5=ACENP
400.	1054.	2.	537.	2.	6=MIDEAST
180.	346.	607.	6411.	442.	7=AFRICA
159.	366.	121.	3205.	1010.	8=L AMER
29.	160.	365.	1610.	21.	9=S&E ASIA

GRADE: IG=2

CONV OIL	CONV GAS	COAL	UNCON OIL	NUCLEAR	REGION
221.	227.	9763.	9170.	584.	1=USA
290.	179.	3015.	4188.	1068.	2=WEUR+CAN
9.	29.	2313.	3057.	518.	3=OECD PAC
550.	547.	16592.	8397.	1426.	4=EUSSR
151.	73.	4970.	4197.	682.	5=ACENP
1000.	435.	2.	1049.	12.	6=MIDEAST
436.	142.	745.	12532.	2356.	7=AFRICA
384.	151.	148.	6265.	5388.	8=L AMER
70.	66.	447.	3148.	113.	9=S&E ASIA

GRADE: IG=3

CONV OIL	CONV GAS	COAL	UNCON OIL	NUCLEAR	REGION
441.	510.	13874.	88173.	100000.	1=USA
577.	330.	4284.	40266.	100000.	2=WEUR+CAN
17.	53.	3294.	29391.	100000.	3=OECD PAC
1095.	1007.	23578.	80708.	100000.	4=EUSSR
267.	135.	7062.	40354.	100000.	5=ACEYP
880.	802.	3.	10088.	100000.	6=MIDEAST
771.	263.	1058.	120503.	100000.	7=AFRICA
679.	279.	211.	60252.	100000.	8=L AMER
123.	121.	635.	30266.	100000.	9=SEE ASIA

GRADE: IG=4

CONV OIL	CONV GAS	COAL	UNCON OIL	NUCLEAR	REGION
373.	582.	19012.	264516.	100000.	1=USA
489.	377.	5871.	120797.	100000.	2=WEUR+CAN
14.	61.	4515.	88173.	100000.	3=OECD PAC
925.	1150.	32311.	242123.	100000.	4=EUSSR
204.	155.	9678.	121062.	100000.	5=ACENP
3650.	916.	4.	30266.	100000.	6=MIDEAST
591.	301.	1450.	361510.	100000.	7=AFRICA
520.	318.	289.	180755.	100000.	8=L AMER
94.	139.	871.	90797.	100000.	9=SEE ASIA

GRADE: IG=5

CONV OIL	CONV GAS	COAL	UNCON OIL	NUCLEAR	REGION
292.	0.	19012.	0.	0.	1=USA
382.	0.	5871.	0.	0.	2=WEUR+CAN
11.	0.	4515.	0.	0.	3=OECD PAC
725.	0.	32311.	0.	0.	4=EUSSR
154.	0.	9678.	0.	0.	5=ACENP
1460.	0.	4.	0.	0.	6=MIDEAST
1444.	0.	1450.	0.	0.	7=AFRICA
391.	0.	289.	0.	0.	8=L AMER
371.	0.	871.	0.	0.	9=SEE ASIA

CIGIS--MINIMUM EXTRACTION COSTS BY GRADE AND FUEL
FINAL COST IS THE MAXIMUM EXTRACTION COST AT
RESOURCE EXHAUSTION
(UNITS=1975 DOLLARS/GIGAJOULE)

CONV OIL	CONV GAS	COAL	UNCON OIL	NUCLEAR	GRADE
0.16	0.50	0.30	3.80	6.83	IG=1
0.82	1.50	0.40	7.60	15.20	IG=2
3.80	2.50	0.80	12.90	21.80	IG=3
5.10	3.60	1.60	25.60	22.00	IG=4
7.10	15.00	2.70	51.00	23.00	IG=5
12.30	16.00	5.30	52.00	24.00	FINAL

VISL--ENVIRONMENTAL COST AMOUNTS BY REGION AND FUEL
(UNITS=1975 DOLLARS/GIGAJOULE)

CONV OIL	CONV GAS	COAL	UNCON OIL	NUCLEAR	REGION
0.0	0.0	1.60	1.30	10.00	1=USA

592.	0.0	0.0	1.30	1.30	10.00	2=WEUR+CAN
593.	0.0	0.0	1.30	1.30	10.00	3=OECD PAC
594.	0.0	0.0	0.90	0.90	10.00	4=EUSSR
595.	0.0	0.0	0.90	0.90	10.00	5=ACENP
596.	0.0	0.0	0.90	0.90	10.00	6=MIDEAST
597.	0.0	0.0	0.90	0.90	10.00	7=AFRICA
598.	0.0	0.0	0.90	0.90	10.00	8=L AMER
599.	0.0	0.0	0.90	0.90	10.00	9=SEE ASIA

RIL--PRICE ELASTICITY OF SUPPLY, EVALUATED AT THE PRICE DILS:
(BY SUPPLY TYPE AND REGION)

	CONV OIL	CONV GAS	COAL	UNCON OIL	REGION
600.	1.0	1.0	1.0	1.0	1=USA
601.	1.0	1.0	1.0	1.0	2=WEUR+CAN
602.	1.0	1.0	1.0	1.0	3=OECD PAC
603.	1.0	1.0	1.0	1.0	4=EUSSR
604.	1.0	1.0	1.0	1.0	5=ACENP
605.	1.0	1.0	1.0	1.0	6=MIDEAST
606.	1.0	1.0	1.0	1.0	7=AFRICA
607.	1.0	1.0	1.0	1.0	8=L AMER
608.	1.0	1.0	1.0	1.0	9=SEE ASIA

STISL--RATE OF TECHNOLOGICAL CHANGE BY SUPPLY TYPE
AND REGION

	CONV OIL	CONV GAS	COAL	UNCON OIL	NUCLEAR	REGION
621.	0.005	0.005	0.005	0.005	0.005	1=USA
622.	0.005	0.005	0.005	0.005	0.005	2=WEUR+CAN
623.	0.005	0.005	0.005	0.005	0.005	3=OECD PAC
624.	0.005	0.005	0.005	0.005	0.005	4=EUSSR
625.	0.005	0.005	0.005	0.005	0.005	5=ACENP
626.	0.005	0.005	0.005	0.005	0.005	6=MIDEAST
627.	0.005	0.005	0.005	0.005	0.005	7=AFRICA
628.	0.005	0.005	0.005	0.005	0.005	8=L AMER
629.	0.005	0.005	0.005	0.005	0.005	9=SEE ASIA

RESIL--MINIMUM LEVEL OF SHORT-TERM SUPPLY BY TYPE
AND REGION

	CONV OIL	CONV GAS	COAL	UNCON OIL	NUCLEAR	REGION
637.	0.03	0.03	0.03	0.03	0.03	1=USA
638.	0.03	0.03	0.03	0.03	0.03	2=WEUR+CAN
639.	0.03	0.03	0.03	0.03	0.03	3=OECD PAC
640.	0.03	0.03	0.03	0.03	0.03	4=EUSSR
641.	0.03	0.03	0.03	0.03	0.03	5=ACENP
642.	0.03	0.03	0.03	0.03	0.03	6=MIDEAST
643.	0.03	0.03	0.03	0.03	0.03	7=AFRICA
644.	0.03	0.03	0.03	0.03	0.03	8=L AMER
645.	0.03	0.03	0.03	0.03	0.03	9=SEE ASIA

ESFIL--INITIAL ESTIMATE OF ENERGY SUPPLY
BY FUEL, REGION, AND PERIOD

650.
651.

(UNITS=EXAJOULES/YR)

YEAR=1975

CONV OIL	CONV GAS	COAL	UNCON OIL	NUCLEAR	REGION
20.41	20.73	17.18	0.0	0.62	1=USA
4.77	8.98	9.60	0.0	0.58	2=WEUR+CAN
0.96	0.31	2.67	0.0	0.09	3=OECD PAC
22.77	11.91	25.77	0.0	0.07	4=EUSSR
3.23	0.14	15.01	0.0	0.00	5=ACENP
42.35	1.21	0.03	0.0	0.00	6=MIDEAST
10.59	0.39	2.18	0.0	0.00	7=AFRICA
9.02	1.55	0.39	0.0	0.01	8=L AMER
3.79	0.75	2.68	0.0	0.01	9=S&E ASIA

GAS FLARING

"FLRL1" IS THE FLARING RATE IN 1975, "FLRL2" IS THE ULTIMATE FLARING RATE, AND "FLRL3" IS THE NUMBER OF YEARS TO REACH "FLRL2". THE MODEL EXPONENTIALLY INTERPOLATES BETWEEN THE RATES.

FLRL1	FLRL2	FLRL3	REGION
.055	.050	10.0	US
.070	.050	10.0	WEUR+CAN
.005	.010	10.0	JANZ
.049	.050	10.0	EUSSR
.107	.050	10.0	ACENP
.727	.050	50.0	MIDEAST
.736	.050	50.0	AFR
.523	.050	28.0	LA
.349	.050	15.0	SEASIA

RENEWABLE RESOURCE CONSTRAINED TECHNOLOGIES

PARAMETERS INCLUDE LOGISTICS FUNCTION PARAMETERS, COST, AND SHARE DATA. "HYDRO1L" ORIENTS THE PRODUCTION PATH IN TIME; "HYDRO2L" DETERMINES ITS SHAPE; "HYDRO3L" IS THE RESOURCE AMOUNT IN EJ; "HYDRO4L" IS PRODUCTION PRICE IN 1975 DOLLARS PER GJ; AND "HYDRO5L" IS THE ELECTRICITY SHARE OF HYDRO.

HYDRO1L	HYDRO2L	HYDRO3L	HYDRO4L	HYDRO5L	REGION
0.42040	0.06505	1.83	4.03	0.15297	US
0.38610	0.07198	3.51	4.03	0.34268	WEUR+CAN
0.24160	0.06884	0.77	4.03	0.20997	JANZ
-1.99788	0.09314	4.97	4.03	0.11591	EUSSR
-3.20686	0.09000	5.76	4.03	0.34665	ACENP
-3.64180	0.15488	0.61	4.03	0.09685	MIDEAST
-3.97006	0.09969	7.31	4.03	0.28723	AFR
-2.52383	0.09701	6.48	4.03	0.56237	LA
-2.77226	0.10060	4.17	4.03	0.26934	SEASIA

SOLAR COSTS: CIL1 = PRODUCTION COST IN 1975
CIL2 = FINAL PRODUCTION COSTS
CIL3 = YEARS TO REACH FINAL PRODUCTION COSTS

CIL1	CIL2	CIL3	REGION
200.60	14.35	50.00	US
402.40	14.35	50.00	WEUR+CAN
261.60	14.35	50.00	OECD PAC

712.	402.40	14.85	50.00	EUSSR
713.	321.40	14.85	50.00	ACENP
714.	120.60	14.85	50.00	MIDEAST
715.	144.00	14.85	50.00	AFR
716.	321.40	14.85	50.00	LA
717.	200.60	14.85	50.00	SEASIA

SYNFUEL PARAMETERS

(PARAMETERS INCLUDE A CONVERSION EFFICIENCY (GCI), ADD ON COSTS (HCILT1) AND AN ELASTICITY CONTROL PARAMETER (RCI). HCILT1 IS THE INITIAL VALUE, HCILT2 THE FINAL VALUE, AND HCILT3 THE NUMBER OF YEARS TO REACH THE FINAL VALUE. THE MODEL EXPONENTIALLY INTERPOLATES FOR INTERMEDIATE YEARS)

	HCILT1	HCILT2	HCILT3	HCILT1	HCILT2	HCILT3	REGION
728.	100.00	4.55	25.	100.	3.30	25.	US
729.	100.00	4.55	25.	100.	3.30	25.	WEUR+CAN
730.	100.00	4.55	25.	100.	3.30	25.	OECD PAC
731.	100.00	4.55	25.	100.	3.30	25.	EUSSR
732.	100.00	4.55	25.	100.	3.30	25.	ACENP
733.	100.00	4.55	50.	100.	3.30	50.	MIDEAST
734.	100.00	4.55	100.	100.	3.30	100.	AFRICA
735.	12.54	4.55	25.	100.	3.30	25.	L AMER
736.	12.54	4.55	25.	100.	3.30	25.	SEE ASIA
737.	100.00	4.55	50.	100.	3.30	50.	

SYNCRUDE GCI = 1.50
SYNCRUDE RCI = -6.00

SYNGAS GCI = 1.50
SYNGAS RCI = -6.00

ENERGY SERVICE INPUT-OUTPUT COEFFICIENTS

TABLE 1.
ENERGY TRANSFORMATION BY SECTOR
(GJK, GJ)

OIL	GAS	COAL	ELECTRIC	SECTOR	VARIABLE	
1.67	1.54	2.5	.86	RES/COM	GJK, J=1, NJ	K=1
1.92	1.90	2.0	1.05	INDUSTRY	GJK, J=1, NJ	K=2
3.0	3.0	3.33	1.05	TRANSPORT	GJK, J=1, NJ	K=3
2.0	1.7	2.05	0.95	AGGREGATE	GJ, J=1, NJ	

TABLE 2.
NON-ENERGY I-O COEFFICIENTS BY SECTOR
(HJK, HJ)

OIL	GAS	COAL	ELECTRIC	SECTOR	VARIABLE	
4.98	3.24	2.87	3.41	RES/COM	HJK, J=1, NJ	K=1
.41	.32	.80	1.16	INDUSTRY	HJK, J=1, NJ	K=2
98.88	200.00	200.00	153.17	TRANSPORT	HJK, J=1, NJ	K=3
2.10	2.03	1.18	1.15	AGGREGATE	HJ, J=1, NJ	

BASE ENERGY SERVICE CONSUMPTION WEIGHTS

BY FUEL BY SECTOR BY REGION
SJKLP (UNITS=UNDIMENSIONED) AND BSKL (UNITS=EXAJOULES)

OIL	GAS	COAL	ELECTRIC	BSKL	SECTOR	REGION
0.185	0.683	0.011	0.379	15.2377	RES/COM	USA

5772.	0.091	0.345	0.129	0.145	9.7881	INDUSTRY	USA
5773.	1.362	0.000	0.000	0.001	6.6411	TRANSPORT	USA
5774.	0.359	0.122	0.112	0.372	11.1476	RES/COM	WEUR+CAN
5775.	0.200	0.065	0.131	0.212	9.4047	INDUSTRY	WEUR+CAN
5776.	1.002	0.000	0.003	0.028	3.3474	TRANSPORT	WEUR+CAN
5777.	0.443	0.088	0.207	0.462	2.0876	RES/COM	OECD PAC
5778.	0.224	0.032	0.267	0.263	3.9391	INDUSTRY	OECD PAC
5779.	2.572	0.000	0.001	0.050	0.8941	TRANSPORT	OECD PAC
5780.	0.273	0.194	0.336	0.197	26.3832	AGGREGATE	USSR
5781.	0.156	0.005	0.764	0.074	9.1210	AGGREGATE	CHINA
5782.	0.687	0.212	0.009	0.093	1.8153	AGGREGATE	MIDEAST
5783.	0.437	0.009	0.340	0.214	2.2834	AGGREGATE	AFRICA
5784.	0.635	0.148	0.044	0.174	5.0414	AGGREGATE	L AMER
5785.	0.516	0.068	0.172	0.244	4.2498	AGGREGATE	SEE ASIA

BSJKLM -- LOGIT FUNCTION SCALE PARAMETERS
(UNITS BSJKLM=UNDIMENSIONED)

YEAR = 1975

	OIL	GAS	COAL	ELECTRIC	SECTOR	REGION
5791.	0.3585	0.0548	0.0008	0.5858	RES/COM	USA
5792.	0.1871	0.0124	0.0047	0.7958	INDUSTRY	USA
5793.	0.7030	0.0000	0.0004	0.2966	TRANSPORT	USA
5794.	0.5492	0.0814	0.0118	0.3577	RES/COM	WEUR+CAN
5795.	0.3184	0.0831	0.0122	0.5863	INDUSTRY	WEUR+CAN
5796.	0.0736	0.0000	0.5008	0.4256	TRANSPORT	WEUR+CAN
5797.	0.4533	0.0622	0.0058	0.4787	RES/COM	OECD PAC
5798.	0.1948	0.0420	0.0091	0.7541	INDUSTRY	OECD PAC
5799.	0.0299	0.0000	0.5779	0.3922	TRANSPORT	OECD PAC
5800.	0.4795	0.0380	0.0339	0.4486	AGGREGATE	USSR
5801.	0.5764	0.0018	0.1465	0.2753	AGGREGATE	CHINA
5802.	0.6032	0.0451	0.0025	0.3492	AGGREGATE	MIDEAST
5803.	0.7670	0.0004	0.0213	0.2113	AGGREGATE	AFRICA
5804.	0.7910	0.0186	0.0054	0.1850	AGGREGATE	L AMER
5805.	0.5508	0.0089	0.0250	0.4143	AGGREGATE	SEE ASIA

BSJKLM -- LOGIT FUNCTION SCALE PARAMETERS
(UNITS BSJKLM=UNDIMENSIONED)

YEAR = 2000

	OIL	GAS	COAL	ELECTRIC	SECTOR	REGION
5814.	0.2000	0.0548	0.0008	0.5858	RES/COM	USA
5815.	0.1871	0.0207	0.0047	0.7958	INDUSTRY	USA
5816.	0.7030	0.0000	0.0004	0.2966	TRANSPORT	USA
5817.	0.5492	0.0814	0.0118	0.3577	RES/COM	WEUR+CAN
5818.	0.3184	0.0831	0.0122	0.5863	INDUSTRY	WEUR+CAN
5819.	0.0736	0.0000	0.5008	0.4256	TRANSPORT	WEUR+CAN
5820.	0.4533	0.0622	0.0058	0.4787	RES/COM	OECD PAC
5821.	0.1948	0.0420	0.0091	0.7541	INDUSTRY	OECD PAC
5822.	0.0299	0.0000	0.5779	0.3922	TRANSPORT	OECD PAC
5823.	0.4795	0.0790	0.0339	0.4486	AGGREGATE	USSR
5824.	0.5200	0.0200	0.1039	0.2753	AGGREGATE	CHINA
5825.	0.5032	0.0451	0.0025	0.3492	AGGREGATE	MIDEAST
5826.	0.5700	0.0287	0.0213	0.2800	AGGREGATE	AFRICA
5827.	0.6001	0.0423	0.0054	0.2117	AGGREGATE	L AMER
5828.	0.6500	0.0187	0.0260	0.4400	AGGREGATE	SEE ASIA

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BSJKLM -- LOGIT FUNCTION SCALE PARAMETERS
(UNITS BSJKLM=UNDIMENSIONED)

YEAR = 2025

	DIL	GAS	COAL	ELECTRIC	SECTOR	REGION
	0.2600	0.0548	0.0008	0.5858	RES/COM	USA
	0.1871	0.0207	0.0047	0.7958	INDUSTRY	USA
	0.7030	0.0000	0.0004	0.2966	TRANSPORT	USA
	0.5492	0.0814	0.0118	0.3577	RES/COM	WEUR+CAN
	0.3184	0.0831	0.0122	0.5863	INDUSTRY	WEUR+CAN
	0.0736	0.0000	0.5008	0.4256	TRANSPORT	WEUR+CAN
	0.4533	0.0622	0.0058	0.4797	RES/COM	OECD PAC
	0.1948	0.0420	0.0091	0.7541	INDUSTRY	OECD PAC
	0.0299	0.0000	0.5779	0.3922	TRANSPORT	OECD PAC
	0.4795	0.1125	0.0198	0.4486	AGGREGATE	USSR
	0.5764	0.0400	0.0706	0.2753	AGGREGATE	CHINA
	0.6032	0.0451	0.0025	0.3492	AGGREGATE	MIDEAST
	0.5800	0.0487	0.0213	0.3400	AGGREGATE	AFRICA
	0.6001	0.0423	0.0054	0.2393	AGGREGATE	L AMER
	0.4500	0.0273	0.0260	0.4500	AGGREGATE	S&E ASIA

BSJKLM -- LOGIT FUNCTION SCALE PARAMETERS
(UNITS BSJKLM=UNDIMENSIONED)

YEAR = 2050

	DIL	GAS	COAL	ELECTRIC	SECTOR	REGION
	0.2600	0.0548	0.0008	0.5858	RES/COM	USA
	0.1871	0.0207	0.0047	0.7958	INDUSTRY	USA
	0.7030	0.0000	0.0004	0.2966	TRANSPORT	USA
	0.5492	0.0814	0.0118	0.3577	RES/COM	WEUR+CAN
	0.3184	0.0831	0.0122	0.5863	INDUSTRY	WEUR+CAN
	0.0736	0.0000	0.5008	0.4256	TRANSPORT	WEUR+CAN
	0.4533	0.0622	0.0058	0.4797	RES/COM	OECD PAC
	0.1948	0.0420	0.0091	0.7541	INDUSTRY	OECD PAC
	0.0299	0.0000	0.5779	0.3922	TRANSPORT	OECD PAC
	0.4795	0.1425	0.0128	0.4486	AGGREGATE	USSR
	0.4323	0.0800	0.0347	0.2753	AGGREGATE	CHINA
	0.6032	0.0451	0.0025	0.3492	AGGREGATE	MIDEAST
	0.4800	0.0787	0.0213	0.4000	AGGREGATE	AFRICA
	0.6001	0.0423	0.0054	0.2650	AGGREGATE	L AMER
	0.3900	0.0374	0.0260	0.4600	AGGREGATE	S&E ASIA

BSJKLM -- LOGIT FUNCTION SCALE PARAMETERS
(UNITS BSJKLM=UNDIMENSIONED)

YEAR = 2075

	DIL	GAS	COAL	ELECTRIC	SECTOR	REGION
	0.2600	0.0548	0.0008	0.5858	RES/COM	USA
	0.1871	0.0207	0.0047	0.7958	INDUSTRY	USA
	0.7030	0.0000	0.0004	0.2966	TRANSPORT	USA
	0.5492	0.0814	0.0118	0.3577	RES/COM	WEUR+CAN
	0.3184	0.0831	0.0122	0.5863	INDUSTRY	WEUR+CAN
	0.0736	0.0000	0.5008	0.4256	TRANSPORT	WEUR+CAN
	0.4533	0.0622	0.0058	0.4787	RES/COM	OECD PAC
	0.1948	0.0420	0.0091	0.7541	INDUSTRY	OECD PAC
	0.0299	0.0000	0.5779	0.3922	TRANSPORT	OECD PAC
	0.4795	0.1425	0.0128	0.4486	AGGREGATE	USSR
	0.4323	0.0800	0.0347	0.2753	AGGREGATE	CHINA

5892.	0.4032	0.0451	0.0025	0.3492	AGGREGATE	MIDEAST
5893.	0.4000	0.0787	0.0213	0.4000	AGGREGATE	AFRICA
5894.	0.5001	0.0423	0.0054	0.2650	AGGREGATE	L AMER
5895.	0.3900	0.0374	0.0260	0.4600	AGGREGATE	SEE ASIA

SSJKLM -- LOGIT FUNCTION SCALE PARAMETERS
(UNITS SSJKLM=UNDIMENSIONED)

	OIL	GAS	COAL	ELECTRIC	SECTOR	REGION
5900.	0.2600	0.0548	0.0008	0.5858	RES/COM	USA
5901.	0.1871	0.0207	0.0047	0.7958	INDUSTRY	USA
5902.	0.7030	0.0000	0.0004	0.2966	TRANSPORT	USA
5903.	0.5492	0.0814	0.0118	0.3577	RES/COM	WEUR+CAN
5904.	0.3184	0.0831	0.0122	0.5863	INDUSTRY	WEUR+CAN
5905.	0.0736	0.0000	0.5008	0.4256	TRANSPORT	WEUR+CAN
5906.	0.4533	0.0622	0.0058	0.4797	RES/COM	OECD PAC
5907.	0.1948	0.0420	0.0091	0.7541	INDUSTRY	OECD PAC
5908.	0.0299	0.0000	0.5779	0.3922	TRANSPORT	OECD PAC
5909.	0.4795	0.1425	0.0128	0.4486	AGGREGATE	USSR
5910.	0.4323	0.0800	0.0347	0.2753	AGGREGATE	CHINA
5911.	0.5032	0.0451	0.0025	0.3492	AGGREGATE	MIDEAST
5912.	0.4800	0.0787	0.0213	0.4000	AGGREGATE	AFRICA
5913.	0.5001	0.0423	0.0054	0.2650	AGGREGATE	L AMER
5914.	0.3900	0.0374	0.0260	0.4600	AGGREGATE	SEE ASIA

PRICE ELASTICITY CONTROL PARAMETERS

	AGG	OIL	GAS	COAL	ELECTRIC	SECTOR
5921.	RPKK			RPJK		
5922.	-0.7	-3.0	-3.0	-3.0	-3.0	RES/COM RPKK,JK,K
5923.	-0.7	-3.0	-3.0	-3.0	-3.0	INDUSTRY RPKK,JK,K
5924.	-0.7	-13.0	-13.0	-13.0	-13.0	TRANSPORT RPKK,JK,K
5925.	RPK			RPJ		
5926.	-0.7	-2.5	-2.5	-2.5	-2.5	AGGREGATE RPK,RPJ

INCOME ELASTICITY CONTROL PARAMETERS

	AGG	OIL	GAS	COAL	ELECTRIC	SECTOR
5931.	RYKK			RYJK		
5932.	1.00	-0.10	0.30	-0.20	0.10	RES/COM RYKK,JK,K
5933.	1.000	0.00	0.10	-0.30	0.30	INDUSTRY RYKK,JK,K
5934.	1.00	0.00	0.00	0.00	0.00	TRANSPORT RYKK,JK,K
5935.						
5936.						
5937.						
5938.						
5939.	-0.10	0.10	-0.20	0.10	RYJ,J=1,4	

RYKLT--INCOME ELASTICITY FOR THE EUSSR (L=4) AND OTHER LDC'S (L>4)
INPUT IS THE INITIAL VALUE IN 1975. THE PROGRAM INTERPOLATES
OVER A 75 YEAR PERIOD TO A FINAL VALUE 0.8 TIMES THE ORIGINAL
FOR THE EUSSR AND 0.71 TIMES THE ORIGINAL FOR OTHER LDC'S

5940.	1.25	EUSSR(L=4)
5941.	1.40	LDC'S(L>4)

RYL--ENERGY-GNP FEEDBACK ELASTICITY, BY REGION

5942.	-0.15	1=USA
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100.15	2=WEUR+CAN
100.15	3=OECD PAC
100.15	4=EUSSR
100.20	5=ACENP
100.05	6=MIDEAST
100.20	7=AFRICA
100.20	8=L AMER
100.20	9=S&E ASIA

COI — CARBON RELEASE BY SOURCE
(IN TERAGRAMS OF CARBON PER EXAJOULE)

OIL BURNUP	GAS BURNUP	COAL BURNUP	COAL LTO- UIFICATION	COAL GAS- IFICATION	SHALE OIL PRODUCTION	BIDMASS
19.7	13.8	23.9	18.9	26.9	27.9	0.0

PROPORTION OF FLARED GAS BURNED (SBURNLT T=1 IS INITIAL
(1975) SHARE, T=2 IS ULTIMATE SHARE, T=3 IS NUMBER OF YEARS
TO SBURNLT2. PROPORTION OF BACKSTOP FUEL FROM CARBONATE ROCK
(SHALET, T=1,2,3) HAS IDENTICAL INTERPRETATION.

SBURNLT1	SBURNLT2	SBURNLT3	SHALET1	SHALET2	SHALET3	REGION
0.13	0.13	1.0	0.01	0.99	70.0	US
0.47	0.15	25.0	0.01	0.45	70.0	WEUR+CAN
1.00	0.15	35.0	0.01	0.99	70.0	OECD PAC
1.00	0.15	35.0	0.01	0.90	70.0	EUSSR
1.00	0.15	35.0	0.01	0.25	70.0	ACENP
0.90	0.15	35.0	0.01	0.25	70.0	MIDEAST
0.90	0.15	35.0	0.01	0.25	70.0	AFRICA
0.35	0.15	25.0	0.01	0.25	70.0	L AMER
0.65	0.15	35.0	0.01	0.25	70.0	S&E ASIA

FEEDSTOCK USES OF FOSSIL FUELS (SFEDIL) — SHARE OF EACH
FOSSIL FUEL USED AS A FEEDSTOCK.

OIL	GAS	COAL	REGION
0.045	0.029	0.007	US
0.072	0.029	0.007	WEUR+CAN
0.092	0.029	0.007	OECD PAC
0.091	0.029	0.007	EUSSR
0.070	0.029	0.007	ACENP
0.141	0.029	0.007	MIDEAST
0.030	0.029	0.007	AFRICA
0.068	0.029	0.007	L AMER
0.082	0.029	0.007	S&E ASIA

BIDMASS COEFFICIENTS: THE SUPPLY FUNCTION FOR BIDMASS
INCLUDES WASTE AND "ENERGY FARMS" AS SEPARATE TECHNOLOGIES.
THE CODED FUNCTIONS ARE REPRESENTED BY LINEAR SEGMENTS.
THE JPARAMETERS ARE CRITICAL POINTS FOR THE FUNCTION AND
REGIONAL RESOURCES. BIOPSM ARE CRITICAL PRICE/SHARE
COMBINATIONS. BIOLM ARE MAXIMUM RESOURCE AMOUNTS — WASTE
IS DEPENDENT ON ECONOMIC ACTIVITY. THE WASTE TOTAL IS
BASED ON 1975 ECONOMIC ACTIVITY (PRICE—1975 \$/GJ, QUANTITY—EJ)

WASTE (BIOPSM) PRICE	ENERGY FARMS (BIOPSM) SHARE	WASTE (BIOPSM) PRICE	ENERGY FARMS (BIOPSM) SHARE
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012.	0.1705	0.0	0.0	0.0
013.	1.60	0.3	2.1	0.0
014.	4.60	0.3	2.6	0.2
015.	5.60	0.3	4.6	0.8

WASTE (BIDLM)	ENERGY FARMS (BIDLM)	REGION
5.48	82.29	US
7.95	00.00	WEUR+CAN
2.71	13.19	OECD PAC
6.73	98.43	EUSSR
7.04	0.00	ACENP
1.00	0.00	MIDEAST
5.71	173.44	AFRICA
7.81	225.45	L AMER
10.40	0.00	S&E ASIA

INCOME ELASTICITY OF BIOMASS SUPPLY

016.	0.50	RYST			
017.	P1	6.9000000	20.000	6.5000000	14.0000000
018.	P2	1.0000000	20.000	.200000000	4.0000000
019.	P3	-3.0000000	20.000	-7.5000000	-4.0000000
020.	P4	-.1500000	20.000	-.3000000	-.0100000
021.	P5	-.2000000	20.000	-.4000000	-.0500000
022.	P6	.0500000	20.000	-.0500000	.2000000
023.	P7	1.0000000	20.000	.2000000	1.4000000
024.	P8	1.2500000	20.000	.2000000	1.6000000
025.	P9	1.4000000	20.000	.5000000	2.2000000
026.	P10	-3.0000000	20.000	-12.00000	-.4000000
027.	P11	-.7000000	20.000	-1.3000000	-.0500000
028.	P12	.0100000	20.000	.0000000	.0300000
029.	P13	1141.0000	20.000	1141.0000	1141.0000
030.	P14	1356.0000	20.000	1214.0000	1514.0000
031.	P15	1489.0000	20.000	1282.0000	1728.0000
032.	P16	1541.0000	20.000	1326.0000	1789.0000
033.	P17	1564.0000	20.000	1280.0000	1909.0000
034.	P18	1570.0000	20.000	1221.0000	2013.0000
035.	P19	911.0000	20.000	911.0000	911.0000
036.	P20	1248.0000	20.000	1118.0000	1393.0000
037.	P21	1499.0000	20.000	1291.0000	1739.0000
038.	P22	1613.0000	20.000	1383.0000	1872.0000
039.	P23	1647.0000	20.000	1348.0000	2010.0000
040.	P24	1660.0000	20.000	1291.0000	2128.0000
041.	P25	1923.0000	20.000	1923.0000	1923.0000
042.	P26	3288.0000	20.000	2943.0000	3664.0000
043.	P27	4375.0000	20.000	3770.0000	5072.0000
044.	P28	5044.0000	20.000	4343.0000	5853.0000
045.	P29	5235.0000	20.000	4284.0000	6367.0000
046.	P30	5300.0000	20.000	4123.0000	6756.0000
047.	P31	.01700000	20.000	-.0050000	.0400000
048.	P32	.02900000	20.000	-.0100000	.0550000
049.	P33	1.0000000	20.000	0.0000000	2.0000000
050.	P34	370.00000	20.000	180.00000	700.00000
051.	P35	1070.0000	20.000	500.00000	2020.0000
052.	P36	2130.0000	20.000	1000.0000	4020.0000
053.	P37	1800.0000	20.000	850.00000	3400.0000
054.	P38	1410.0000	20.000	620.00000	2520.0000
055.	P39	430.00000	20.000	300.00000	950.00000
056.	P40	1040.0000	20.000	720.00000	2280.0000

072.	P41	1840.0000	20.0000	1280.0000	4050.0000
073.	P42	1410.0000	20.0000	970.0000	3100.0000
074.	P43	1000.0000	20.0000	730.0000	2330.0000
075.	P44	400.0000	20.0000	200.0000	1000.0000
076.	P45	1000.0000	20.0000	850.0000	1741.0000
077.	P46	880.0000	20.0000	620.0000	1260.0000
078.	P47	3650.0000	20.0000	2800.0000	5270.0000
079.	P48	1460.0000	20.0000	1030.0000	2100.0000
080.	P49	4600.0000	20.0000	2090.0000	11290.0000
081.	P50	1900.0000	20.0000	860.0000	4660.0000
082.	P51	3500.0000	20.0000	1590.0000	8590.0000
083.	P52	4000.0000	20.0000	450.0000	42450.0000
084.	P53	1.00000000	20.0000	0.00000000	2.00000000
085.	P54	31000.0000	20.0000	6500.0000	54000.0000
086.	P55	38000.0000	20.0000	80000.0000	67000.0000
087.	P56	54000.0000	20.0000	12000.0000	97000.0000
088.	P57	74000.0000	20.0000	13000.0000	110000.0000
089.	P58	74000.0000	20.0000	13000.0000	355000.0000
090.	P59	1.00000000	20.0000	0.00000000	2.00000000
091.	P60	.00500000	20.0000	-.00500000	.02000000
092.	P61	1.60000000	20.0000	0.00000000	8.00000000
093.	P62	.80000000	20.0000	0.00000000	3.00000000
094.	P63	26600.0000	20.0000	0.0000	52000.0000
095.	P64	52000.0000	20.0000	0.0000	550000.0000
096.	P65	500000.0000	20.0000	0.0000	1500000.0000
097.	P66	1500000.0000	20.0000	0.0000	27000000.0000
098.	P67	1.00000000	20.0000	0.00000000	2.00000000
099.	P68	.00500000	20.0000	-.00500000	.02500000
100.	P69	1.30000000	20.0000	0.00000000	12.80000000
101.	P70	1500.0000	20.0000	0.000000	2900.0000
102.	P71	8000.0000	20.0000	0.0000	14000.0000
103.	P72	1500000.0000	20.0000	0.0000	20000000.0000
104.	P73	10.00000000	20.0000	0.00000000	100.000000
105.	P74	.00500000	20.0000	0.00000000	.01500000
106.	P75	25.00000000	20.0000	6.00000000	200.000000
107.	P76	.02500000	20.0000	-.01000000	.06000000
108.	P77	4.50000000	20.0000	3.50000000	20.000000
109.	P78	2.00000000	20.0000	1.25000000	3.30000000
110.	P79	26.00000000	20.0000	8.00000000	45.00000000

111.	5	.50	.97		
111.01	.030	6.90	14.00		
111.02	6.50	.50	.97		
111.03	.030	1.0	4.0		
111.04	.20	.165	.50	.835	.97
111.05	.030	-5.0	-3.0	-1.5	-.4
111.06	-7.50	.165	.50	.835	.97
111.07	.030	-.20	-.15	-.05	-.01
111.08	-.30	.165	.50	.835	.97
111.09	.030	-.30	-.20	-.10	-.05
111.1	-.40	.165	.50	.835	.97
111.11	.030	.0	.05	.10	.20
111.12	-.05	.165	.50	.835	.97
111.13	.030	.70	1.0	1.20	1.40
111.14	.20	.165	.50	.835	.97
111.15	.030	.80	1.25	1.45	1.80
111.16	.20	.165	.50	.835	.97
111.17	.030	.80	1.40	1.90	2.20
111.18	.50	.165	.50	.835	.97
111.19	.030	-7.00	-3.00	-1.00	-.40
111.2	-12.00				

7111.21	.030	.165	.50	.835	.97
7111.22	-1.0	-1.0	.50	.835	.97
7111.23	.030	.165	.50	.835	.97
7111.24	.030	.002	.50	.017	.03
7111.25	.00	.00	.50	.00	.00
7111.26	.0	.0	1141.	.0	.0
7111.27	.03	.17	.50	.83	.97
7111.28	1214.	1283.	1356.	1433.	1514
7111.29	.03	.17	.50	.83	.97
7111.3	1282.	1382.	1489.	1604.	1728
7111.31	.03	.17	.50	.83	.97
7111.32	1326.	1430.	1541.	1661.	1789
7111.33	.03	.17	.50	.83	.97
7111.34	1280.	1415.	1564.	1728.	1909
7111.35	.03	.17	.50	.83	.97
7111.36	1221.	1385.	1570.	1778.	2013
7111.37	.0	.0	.50	.0	.0
7111.38	.0	.0	911.	.0	.0
7111.39	.03	.165	.50	.835	.97
7111.4	1118.	1181.	1248.	1319.	1393
7111.41	.03	.165	.50	.835	.97
7111.42	1291.	1391.	1499.	1615.	1739
7111.43	.03	.165	.50	.835	.97
7111.44	1388.	1497.	1613.	1738.	1872
7111.45	.03	.165	.50	.835	.97
7111.46	1348.	1490.	1647.	1820.	2010
7111.47	.03	.165	.50	.835	.97
7111.48	1291.	1465.	1660.	1880.	2128
7111.49	.0	.0	.50	.0	.07
7111.5	.0	.0	1923.	.0	.0
7111.51	.03	.165	.50	.835	.97
7111.52	2948.	3114.	3288.	3471.	3664
7111.53	.03	.165	.50	.835	.97
7111.54	3770.	4052.	4375.	4711.	5072
7111.55	.03	.165	.50	.835	.97
7111.56	4343.	4681.	5044.	5434.	5853
7111.57	.03	.165	.50	.835	.97
7111.58	4284.	4737.	5235.	5784.	6387
7111.59	.03	.165	.50	.835	.97
7111.6	4123.	4676.	5300.	6003.	6796
7111.61	.03	.165	.50	.835	.97
7111.62	-0.005	.005	.017	.025	.040
7111.63	.03	.165	.50	.835	.97
7111.64	-0.01	.005	.029	.040	.055
7111.65	.03	.16	.50	.83	.97
7111.66	0.0	0.3	1.0	1.5	2.0
7111.67	.03	.16	.50	.83	.97
7111.68	180.	280.	370.	540.	700.
7111.69	.03	.16	.50	.83	.97
7111.7	500.	780.	1070.	1540.	2020
7111.71	.03	.16	.50	.83	.97
7111.72	1000.	1560.	2130.	3070.	4020
7111.73	.03	.16	.50	.83	.97
7111.74	850.	1320.	1800.	2600.	3400
7111.75	.03	.16	.50	.83	.97
7111.76	620.	980.	1410.	1920.	2520.
7111.77	.03	.16	.50	.83	.97
7111.78	300.	370.	430.	690.	950.
7111.79	.03	.16	.50	.83	.97
7111.8	720.	880.	1040.	1660.	2280.

.111.31	.03	.16	.50	.83	.97
.111.32	1230.	1560.	1840.	2050.	4050.
.111.33	.03	.16	.50	.83	.97
.111.34	970.	1190.	1410.	2260.	3100.
.111.35	.03	.16	.50	.83	.97
.111.36	730.	890.	1060.	1700.	2330.
.111.37	.03	.16	.50	.83	.97
.111.38	200.	300.	400.	700.	1000.
.111.39	.03	.16	.50	.83	.97
.111.9	860.	1030.	1000.	1470.	1741.
.111.91	.03	.16	.50	.83	.97
.111.92	620.	750.	880.	1070.	1260.
.111.93	.03	.16	.50	.83	.97
.111.94	2800.	3410.	3650.	4610.	5270.
.111.95	.03	.16	.50	.83	.97
.111.96	1030.	1240.	1460.	1780.	2100.
.111.97	.03	.16	.50	.83	.97
.111.98	2090.	3350.	4600.	5440.	11290.
.111.99	.03	.16	.50	.83	.97
.112.	860.	1380.	1900.	2250.	4660.
.112.01	.03	.16	.50	.83	.97
.112.02	1590.	2550.	3500.	4140.	8590.
.112.03	.03	.16	.50	.83	.97
.112.04	450.	730.	4000.	5180.	42450.
.112.05	.03	.16	.50	.83	.97
.112.06	.0	.3	1.0	1.5	2.0
.112.07	.03	.16	.50	.83	.97
.112.08	6500.	16000.	31000.	40000.	54000.
.112.09	.03	.16	.50	.83	.97
.112.1	8000.	20000.	38000.	50000.	67000.
.112.11	.03	.16	.50	.83	.97
.112.12	12000.	33000.	54000.	76000.	97000.
.112.13	.03	.16	.50	.83	.97
.112.14	13000.	44000.	74000.	92000.	110000.
.112.15	.03	.16	.50	.83	.97
.112.16	13000.	44000.	74000.	215000.	355000.
.112.17	.03	.16	.50	.83	.97
.112.18	.0	.3	1.	1.5	2.0
.112.19	.03	.16	.50	.83	.97
.112.2	-.005	.0	.005	.01	.02
.112.21	.03	.16	.50	.83	.97
.112.22	0.0	.60	1.6	3.0	8.0
.112.23	.03	.16	.50	.83	.97
.112.24	0.0	.40	.8	2.0	8.0
.112.25	.03	.16	.50	.83	.97
.112.26	0.	300.	26600.	38900.	52000.
.112.27	.03	.16	.50	.83	.97
.112.28	0.	1000.	52000.	245000.	550000.
.112.29	.03	.16	.50	.83	.97
.112.3	0.	1000.	500000.	920000.	1500000.
.112.31	.03	.16	.50	.83	.97
.112.32	100.	10000.	1500000.	1800000.	2700000.
.112.33	.03	.16	.50	.83	.97
.112.34	0.0	.3	1.0	1.5	2.0
.112.35	.03	.16	.50	.83	.97
.112.36	-.005	.0	.005	.01	.025
.112.37	.03	.16	.50	.83	.97
.112.38	0.	.40	1.30	6.40	12.80
.112.39	.03	.16	.50	.83	.97
.112.4	0.	10.	1500.	1800.	2900.

7112.41	.03	.16	.50	.83	.97
7112.42	.03	.16	.50	.83	.97
7112.43	.03	.16	.50	.83	.97
7112.44	.03	.16	.50	.83	.97
7112.45	.03	.16	.50	.83	.97
7112.46	.03	.16	.50	.83	.97
7112.47	.03	.16	.50	.83	.97
7112.48	.03	.16	.50	.83	.97
7112.49	.03	.16	.50	.83	.97
7112.50	.03	.16	.50	.83	.97
7112.51	.03	.16	.50	.83	.97
7112.52	.03	.16	.50	.83	.97
7112.53	.03	.16	.50	.83	.97
7112.54	.03	.16	.50	.83	.97
7112.55	.03	.16	.50	.83	.97
7112.56	.03	.16	.50	.83	.97
7112.57	.03	.16	.50	.83	.97
7112.58	.03	.16	.50	.83	.97
7112.59	.03	.16	.50	.83	.97
7112.60	.03	.16	.50	.83	.97
7112.61	.03	.16	.50	.83	.97
7112.62	.03	.16	.50	.83	.97
7112.63	.03	.16	.50	.83	.97
7112.64	.03	.16	.50	.83	.97
7112.65	.03	.16	.50	.83	.97
7112.66	.03	.16	.50	.83	.97
7112.67	.03	.16	.50	.83	.97
7112.68	.03	.16	.50	.83	.97
7112.69	.03	.16	.50	.83	.97
7112.70	.03	.16	.50	.83	.97
7112.71	.03	.16	.50	.83	.97
7112.72	.03	.16	.50	.83	.97
7112.73	.03	.16	.50	.83	.97
7112.74	.03	.16	.50	.83	.97
7112.75	.03	.16	.50	.83	.97
7112.76	.03	.16	.50	.83	.97
7112.77	.03	.16	.50	.83	.97
7112.78	.03	.16	.50	.83	.97
7112.79	.03	.16	.50	.83	.97
7112.80	.03	.16	.50	.83	.97
7112.81	.03	.16	.50	.83	.97
7112.82	.03	.16	.50	.83	.97
7112.83	.03	.16	.50	.83	.97
7112.84	.03	.16	.50	.83	.97
7112.85	.03	.16	.50	.83	.97
7112.86	.03	.16	.50	.83	.97
7112.87	.03	.16	.50	.83	.97
7112.88	.03	.16	.50	.83	.97
7112.89	.03	.16	.50	.83	.97
7112.90	.03	.16	.50	.83	.97
7112.91	.03	.16	.50	.83	.97
7112.92	.03	.16	.50	.83	.97
7112.93	.03	.16	.50	.83	.97
7112.94	.03	.16	.50	.83	.97
7112.95	.03	.16	.50	.83	.97
7112.96	.03	.16	.50	.83	.97
7112.97	.03	.16	.50	.83	.97
7112.98	.03	.16	.50	.83	.97
7112.99	.03	.16	.50	.83	.97

DEMONSTRATION: MODEL
400 79 583921

7136.01	P5	P4	0.800
7136.02	P5	P6	0.800
7136.03	P4	P6	0.800
7136.04	P7	P8	0.900
7136.05	P7	P9	0.700
7136.06	P8	P9	0.700
7136.07	P12	P31	0.900
7136.08	P31	P32	0.900
7136.09	P12	P32	0.900
7136.10	P31	P60	0.600
7136.11	P60	P32	0.700
7136.12	P60	P12	0.700
7136.13	P31	P68	0.600
7136.14	P60	P68	0.600
7136.15	P68	P32	0.600
7136.16	P68	P12	0.700
7136.17	P31	P74	0.600
7136.18	P68	P74	0.600
7136.19	P74	P60	0.600
7136.20	P74	P32	0.600
7136.21	P74	P12	0.700
7136.22	P31	P69	0.900
7136.23	P69	P74	0.700
7136.24	P69	P68	0.700
7136.25	P69	P60	0.700
7136.26	P69	P32	0.900
7136.27	P69	P12	0.900
7136.28	P31	P73	0.900
7136.29	P73	P69	0.900
7136.30	P73	P74	0.700
7136.31	P73	P68	0.700
7136.32	P73	P60	0.700
7136.33	P73	P32	0.900
7136.34	P73	P12	0.900
7136.35	P61	P62	0.600

// EXEC SAS,OPTIONS=NONEWS,REGION=2048K
//PKSN DD DSN=ENVSCI.AZT24382.CUCO,UNIT=3330-1,DISP=SHR,
// VOL=SER=ENVSCI
OPTIONS LS=120;
DATA ONE;

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1142. ARRAY TEST (I) VAL1-VAL95; INFILE PRSH;
1143. INPUT (PARM1-PARM79) (RR1-RR95) (RR3-J);
1144. **DO OVER TEST; **IF TEST=0. THEN TEST=.; **END;
1145. KEEP PARM1-PARM79 VAL1-VAL95;
1146. TITLE CARBON MODEL;
1147. PKOC MEANS N MEAN STD MIN MAX CV;
1148.
1149. *** DOUBLE MACRO
1150.
1151. : MACRO MAKIT X DATA=ONE
1152. (KEEP=PARM1-PARM12 PARM14-PARM18 PARM20-PARM24 PARM26-PARM79)
1153. (COLNAME=VARB;
1154. N=NRROW(X); K=NCOL(X); K1=K+1; KY=NCOL(Y);
1155. Y=Y-J(N+1,1)*Y(.,); *CORRECT Y BY MEAN;
1156. X=X-J(N+1,1)*X(.,); *CORRECT X BY MEAN;
1157. XPY=Y*X; *CROSSPRODUCTS;
1158. YPY=Y*Y;
1159. XPX=X*X;
1160.
1161. Z MACRO MAKER;
1162. FREE X Y; *NO LONGER NEED THE DATA;
1163. C=(XPX;:;XPY);
1164. S=1/SORT(DIAG(C));
1165. CORR=C*S;
1166. PC=CORR;
1167. PC=PC-CORR;
1168. I=1;
1169. C=SWEPT(C,I);
1170. O=C(I:K,K1:K+KY);
1171. NOTET BETAS FROM REGRESSION;
1172. PRINT O ROWNAME=VARB COLNAME=YHAT;
1173. PC=SSE-DIAG(C(K1:K+KY,K1:K+KY));
1174. A=J(K,KY,O);
1175. B=A;
1176.
1177. DO I = 1 TO K; *GET PARTIALS BY REVERSE SWEEP;
1178. DO J=1 TO KY;
1179. CX=SWEPT(C,I); A(I,J)=(CX(K+J,K+J)-SSE(J,J))/YPY(J,J);
1180. IF A(I,J) LT 0.001 THEN A(I,J) = 0.;
1181. IF PC(I,J) LT 0.01 THEN PC(I,J) = 0.;
1182. END;
1183. FREE C CX XPY;
1184. NOTE SQUARED PEARSON CORRELATION COEFFICIENTS;
1185. PRINT PC ROWNAME=VARB COLNAME=YHAT;
1186. NOTE RELATIVE PARTIAL SUM OF SQUARES;
1187. PRINT A ROWNAME=VARB COLNAME=YHAT;
1188. A=1.-A;
1189. B(I,I)=RANK(A,I);
1190. END;
1191.
1192. * SET RANKS TO BLANK IF A(I,J) EQ 0;
1193. DO I = 1 TO K;
1194. DO J = 1 TO KY;
1195. IF A(I,J) GT 0.999 THEN B(I,J) = -1.E-9;
1196. END;
1197. NOTE PARTIAL SUM OF SQUARES;
1198. PRINT B;
1199. FREE A B;
1200. RSQ=DIAG(1-SSE#/YPY);
1201.

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7202. NOTE X-SQUARE; PRINT RSC ROWNAME=YHAT;
7203. ;
7204. *
7205. *+++ END OF DOUBLE MACRO - SECTION FOR UNIVARIATES
7206. ;
7207. PROC MATRIX FW=8. FUZZ;
7208. NOTE GLOBAL CARBON EMISSIONS & GLOBAL PRIMARY ENERGY 1975-2075;
7209. FETCH Y DATA=ONE(KEEP=VAL1-VAL10)
7210. COLNAME=YHAT;
7211. MAKIT; MAKER;
7212. PROC MATRIX FW=8. FUZZ;
7213. NOTE GLOBAL CONSUMPTION OF REFINABLE FUELS & GLOBAL ENERGY CONSUMPTION
7214. 1975-2075;
7215. FETCH Y DATA=ONE(KEEP=VAL11-VAL20)
7216. COLNAME=YHAT;
7217. MAKIT; MAKER;
7218. PROC MATRIX FW=8. FUZZ;
7219. NOTE GLOBAL FINAL GNP & GLOBAL POPULATION 1975-2075;
7220. FETCH Y DATA=ONE(KEEP=VAL21-VAL30)
7221. COLNAME=YHAT;
7222. MAKIT; MAKER;
7223. PROC MATRIX FW=8. FUZZ;
7224. NOTE WORLD PRICE OF FOSSIL FUELS 1975-2075 OIL GAS ;
7225. FETCH Y DATA=ONE(KEEP=VAL31-VAL40)
7226. COLNAME=YHAT;
7227. MAKIT; MAKER;
7228. PROC MATRIX FW=8. FUZZ;
7229. NOTE WORLD PRICE OF FOSSIL FUELS 1975-2075 COAL;
7230. FETCH Y DATA=ONE(KEEP=VAL41-VAL45)
7231. COLNAME=YHAT;
7232. MAKIT; MAKER;
7233. PROC MATRIX FW=8. FUZZ;
7234. NOTE ELECTRICITY COSTS FROM NUCLEAR AND SOLAR IN USA 1975-2075
7235. NUCLEAR SOLAR;
7236. FETCH Y DATA=ONE(KEEP=VAL46-VAL55)
7237. COLNAME=YHAT;
7238. MAKIT; MAKER;
7239. PROC MATRIX FW=8. FUZZ;
7240. NOTE GLOBAL ELECTRICITY OUTPUTS 1975-2075;
7241. FETCH Y DATA=ONE(KEEP=VAL56-VAL60)
7242. COLNAME=YHAT;
7243. MAKIT; MAKER;
7244. PROC MATRIX FW=8. FUZZ;
7245. NOTE GLOBAL SHALE OIL AND BIOMASS PRODUCTION 1975-2075 SHALEOIL BIOMASS
7246. FETCH Y DATA=ONE(KEEP=VAL62-VAL65 VAL67-VAL70)
7247. COLNAME=YHAT;
7248. MAKIT; MAKER;
7249. PROC MATRIX FW=8. FUZZ;
7250. NOTE GLOBAL CONVENTIONAL FOSSIL FUELS PRODUCTION 1975-2075 OIL GAS;
7251. FETCH Y DATA=ONE(KEEP=VAL71-VAL80)
7252. COLNAME=YHAT;
7253. MAKIT; MAKER;
7254. PROC MATRIX FW=8. FUZZ;
7255. NOTE GLOBAL CONVENTIONAL FOSSIL FUELS PRODUCTION 1975-2075 COAL;
7256. FETCH Y DATA=ONE(KEEP=VAL81-VAL85)
7257. COLNAME=YHAT;
7258. MAKIT; MAKER;
7259. PROC MATRIX FW=8. FUZZ;
7260. NOTE GLOBAL PRIMARY NUCLEAR AND SOLAR PRODUCTION 1975-2075;
7261. FETCH Y DATA=ONE(KEEP=VAL86-VAL95)

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7252. COLNAME=YHAT;
7253. MAKIT; MAKER;
7254. PROC UNIVARIATE ;
7255. VAR VAL1-VAL35;
7256. PROC CORR NOSIMPLE NOPROB SPEARMAN BEST=10; VAR PARM1-PARM79;
7257. WITH PARM1-PARM79;
7258. PROC CORR NOSIMPLE NOPROB SPEARMAN BEST=10;
7259. VAR PARM1-PARM79; WITH VAL1-VAL95;
7260. DATA LOW HIGH; SET ONE;
7261. IF VAL5 LT 2799. THEN OUTPUT LOW;
7262. IF VAL5 GT 76587. THEN OUTPUT HIGH;
7263. PROC PRINT DATA=LOW; VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7264. PROC PRINT DATA=HIGH; VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7265. PROC MEANS DATA=LOW N MEAN STD MIN MAX CV;
7266. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7267. PROC MEANS DATA=HIGH N MEAN STD MIN MAX CV;
7268. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7269. DATA TWO THREE FOUR; SET ONE;
7270. IF VAL2 GT 4700. AND VAL3 LT VAL2 THEN OUTPUT TWO;
7271. IF VAL2 GT 4700. AND VAL3 GT VAL2 AND VAL4 LT VAL3 THEN OUTPUT THREE;
7272. IF VAL2 GT 4700. AND VAL3 GT VAL2 AND VAL4 GT VAL3 AND VAL5 LT VAL4
7273. THEN OUTPUT FOUR;
7274. PROC MEANS DATA=TWO N MEAN STD MIN MAX CV;
7275. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7276. PROC PRINT DATA=TWO; VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7277. PROC UNIVARIATE DATA=TWO; VAR VAL1-VAL10;
7278. PROC MEANS DATA=THREE N MEAN STD MIN MAX CV;
7279. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7280. PROC PRINT DATA=THREE;
7281. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7282. PROC UNIVARIATE DATA=THREE; VAR VAL1-VAL10;
7283. PROC MEANS DATA=FOUR N MEAN STD MIN MAX CV;
7284. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7285. PROC PRINT DATA=FOUR;
7286. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7287. PROC UNIVARIATE DATA=FOUR; VAR VAL1-VAL10;
7288. DATA FIVE SIX SEVEN EIGHT; SET ONE;
7289. IF VAL2 LT 4700 THEN OUTPUT FIVE;
7290. IF VAL3 LT VAL2 THEN OUTPUT SIX;
7291. IF VAL4 LT VAL3 THEN OUTPUT SEVEN;
7292. IF VAL5 LT VAL4 THEN OUTPUT EIGHT;
7293. PROC MEANS DATA=FIVE N MEAN STD MIN MAX CV;
7294. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7295. PROC PRINT DATA=FIVE;
7296. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7297. PROC UNIVARIATE DATA=FIVE; VAR VAL1-VAL10;
7298. PROC MEANS DATA=SIX N MEAN STD MIN MAX CV;
7299. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7300. PROC PRINT DATA=SIX;
7301. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7302. PROC UNIVARIATE DATA=SIX; VAR VAL1-VAL10;
7303. PROC MEANS DATA=SEVEN N MEAN STD MIN MAX CV;
7304. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7305. PROC PRINT DATA=SEVEN;
7306. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7307. PROC UNIVARIATE DATA=SEVEN; VAR VAL1-VAL10;
7308. PROC MEANS DATA=EIGHT N MEAN STD MIN MAX CV;
7309. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7310. PROC PRINT DATA=EIGHT;
7311. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7312. PROC UNIVARIATE DATA=EIGHT; VAR VAL1-VAL10;
7313. PROC MEANS DATA=NINE N MEAN STD MIN MAX CV;
7314. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7315. PROC PRINT DATA=NINE;
7316. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7317. PROC UNIVARIATE DATA=NINE; VAR VAL1-VAL10;
7318. PROC MEANS DATA=TEN N MEAN STD MIN MAX CV;
7319. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;
7320. PROC PRINT DATA=TEN;
7321. VAR VAL1-VAL10 VAL22-VAL25 VAL32-VAL35 PARM1-PARM79;

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332. PROC UNIVARIATE DATA=EIGHT; VAL1-VAL10;
333. // EXEC SAS, OPTIONS=NONES, REGION=2048K
334. // PASH DO DSN=ENVSCI.AZT24382.SNCD, UNIT=3330-1, DISP=SHR,
335. // VOL=SEK=ENVSCI
336. OPTIONS LS=120;
337. DATA ONE;
338.   ARRAY TEST (1) VAL1-VAL95; INFILE PRSN;
339.   INPUT (PARM1-PARM79)(RR4.) (VAL1-VAL95)(RR8.);
340. DO OVER TEST; IF TEST=0, THEN TEST=.; END;
341. DO OVER TEST; TEST=LOG(TEST); END;
342. KEEP PARM1-PARM79 VAL1-VAL95;
343. TITLE1 'CARRON MODEL';
344. ***PROC UNIVARIATE PLOT;*** VAR PARM1-PARM12;
345. PROC MEANS N MEAN STD MIN MAX CV;
346. *
347. *+++ DOUBLE MACRO
348. ;
349. MACRO MAKIT
350.   FETCH X DATA=ONE
351.   (KEEP=PARM1-PARM12 PARM14-PARM18 PARM20-PARM24 PARM26-PARM79)
352.   COLNAME=VARB;
353.   N=NROW(X); K=NCOL(X); K1=K+1; KY=NCOL(Y);
354.   Y=Y-J(N,1,1)*Y(.,); *CORRECT Y BY MEAN;
355.   X=X-J(N,1,1)*X(.,); *CORRECT X BY MEAN;
356.   XPY=X*Y; *CROSSPRODUCTS;
357.   YPY=Y*Y;
358.   XPX=X*X;
359. %
360. MACRO MAKER
361.   FREE X Y; *NO LONGER NEED THE DATA;
362.   C=(XPX; XPY)/(XPY; YPY);
363.   II=1:K; *DEFINE PIVOTS FOR SWEEP;
364.   C=SWEEP(C,II); *DO REGRESSION;
365.   SSE=DIAG(C(K1:K+KY, K1:K+KY));
366.   A=J(K, KY, 0); *COLLECT PARTIALS IN A;
367. B=A;
368.   DO I = 1 TO K; *GET PARTIALS BY REVERSE SWEEP;
369.     DO J=1 TO KY;
370.       CX=SWEEP(C, I); A(I, J)=(CX(K+J, K+J)-SSE(J, J))/YPY(J, J);
371.       IF A(I, J) LT 0.001 THEN A(I, J) = 0.;
372.     END; END;
373.   FREE C CX XPX XPY;
374. NOTE RELATIVE PARTIAL SUM OF SQUARES;
375.   PRINT A ROWNAME=VARB COLNAME=YHAT;
376.   A=1.-A;
377.   DO I = 1 TO KY;
378.     B(I, I)=RANK(A(I, I));
379.   END;
380. * SET RANKS TO BLANK IF A(I, J) EQ 0;
381.   DO I = 1 TO K;
382.     DO J = 1 TO KY;
383.       IF A(I, J) GT 0.999 THEN B(I, J) =-1.E-9;
384.     END; END;
385. NOTE PARTIAL SUM OF SQUARES;
386.   PRINT B ROWNAME=VARB COLNAME=YHAT;
387.   FREE A B;
388.   DFE=N-K1;
389.   RSQ=DIAG(1-SSE#/YPY);
390. NOTE R-SQUARE; PRINT RSQ ROWNAME=YHAT;
391. %

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32. *
33. **** END OF DOUBLE MACRO - SECTION FOR UNIVARIATES
34.
35. PROC MATRIX FW=8. FUZZ;
36. NOTE GLOBAL CARBON EMISSIONS & GLOBAL PRIMARY ENERGY 1975-2075;
37. FETCH Y DATA=ONE(KEEP=VAL1-VAL10);
38. COLNAME=YHAT;
39. MAKIT; MAKER;
40. PROC MATRIX FW=8. FUZZ;
41. NOTE GLOBAL CONSUMPTION OF REFINABLE FUELS & GLOBAL ENERGY CONSUMPTION
42. 1975-2075;
43. FETCH Y DATA=ONE(KEEP=VAL11-VAL20);
44. COLNAME=YHAT;
45. MAKIT; MAKER;
46. PROC MATRIX FW=8. FUZZ;
47. NOTE GLOBAL FINAL GNP & GLOBAL POPULATION 1975-2075;
48. FETCH Y DATA=ONE(KEEP=VAL21-VAL30);
49. COLNAME=YHAT;
50. MAKIT; MAKER;
51. PROC MATRIX FW=8. FUZZ;
52. NOTE WORLD PRICE OF FOSSIL FUELS 1975-2075 OIL GAS;
53. FETCH Y DATA=ONE(KEEP=VAL31-VAL40);
54. COLNAME=YHAT;
55. MAKIT; MAKER;
56. PROC MATRIX FW=8. FUZZ;
57. NOTE WORLD PRICE OF FOSSIL FUELS 1975-2075 COAL;
58. FETCH Y DATA=ONE(KEEP=VAL41-VAL45);
59. COLNAME=YHAT;
60. MAKIT; MAKER;
61. PROC MATRIX FW=8. FUZZ;
62. NOTE ELECTRICITY COSTS FROM NUCLEAR AND SOLAR IN USA 1975-2075
63. NUCLEAR SOLAR;
64. FETCH Y DATA=ONE(KEEP=VAL46-VAL55);
65. COLNAME=YHAT;
66. MAKIT; MAKER;
67. PROC MATRIX FW=8. FUZZ;
68. NOTE GLOBAL ELECTRICITY OUTPUTS 1975-2075;
69. FETCH Y DATA=ONE(KEEP=VAL56-VAL60);
70. COLNAME=YHAT;
71. MAKIT; MAKER;
72. PROC MATRIX FW=8. FUZZ;
73. NOTE GLOBAL SHALE OIL AND BIOMASS PRODUCTION 1975-2075 SHALE OIL BIOMASS;
74. FETCH Y DATA=ONE(KEEP=VAL62-VAL65 VAL67-VAL70);
75. COLNAME=YHAT;
76. MAKIT; MAKER;
77. PROC MATRIX FW=8. FUZZ;
78. NOTE GLOBAL CONVENTIONAL FOSSIL FUELS PRODUCTION 1975-2075 OIL GAS;
79. FETCH Y DATA=ONE(KEEP=VAL71-VAL80);
80. COLNAME=YHAT;
81. MAKIT; MAKER;
82. PROC MATRIX FW=8. FUZZ;
83. NOTE GLOBAL CONVENTIONAL FOSSIL FUELS PRODUCTION 1975-2075 COAL;
84. FETCH Y DATA=ONE(KEEP=VAL81-VAL85);
85. COLNAME=YHAT;
86. MAKIT; MAKER;
87. PROC MATRIX FW=8. FUZZ;
88. NOTE GLOBAL PRIMARY NUCLEAR AND SOLAR PRODUCTION 1975-2075;
89. FETCH Y DATA=ONE(KEEP=VAL86-VAL95);
90. COLNAME=YHAT;
91. MAKIT; MAKER;

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7442. PROC UNIVARIATE ;
7443. VAR VAL1-VAL95;
7444. // EXEC SAS,OPTIONS=NONews,REGION=1024K
7445. //TRSN DD DSN=T.AZT24382.NCCC,UNIT=55UA,DISP=SHR
7446. OPTIONS LS=120;
7447. DATA ONE;
7448.   INFILE TRSN;
7449.   INPUT (PARM1-PARM79)(RB4.) (VAL1-VAL95)(RB8.);
7450.   KEEP PARM1-PARM79 VAL1-VAL95;
7451.   TITLE1 'CARBON MODEL';
7452.   PROC MEANS N MEAN STD MIN MAX CV; VAR PARM1-PARM79;
7453.   PROC PRINT; VAR PARM1-PARM79;

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