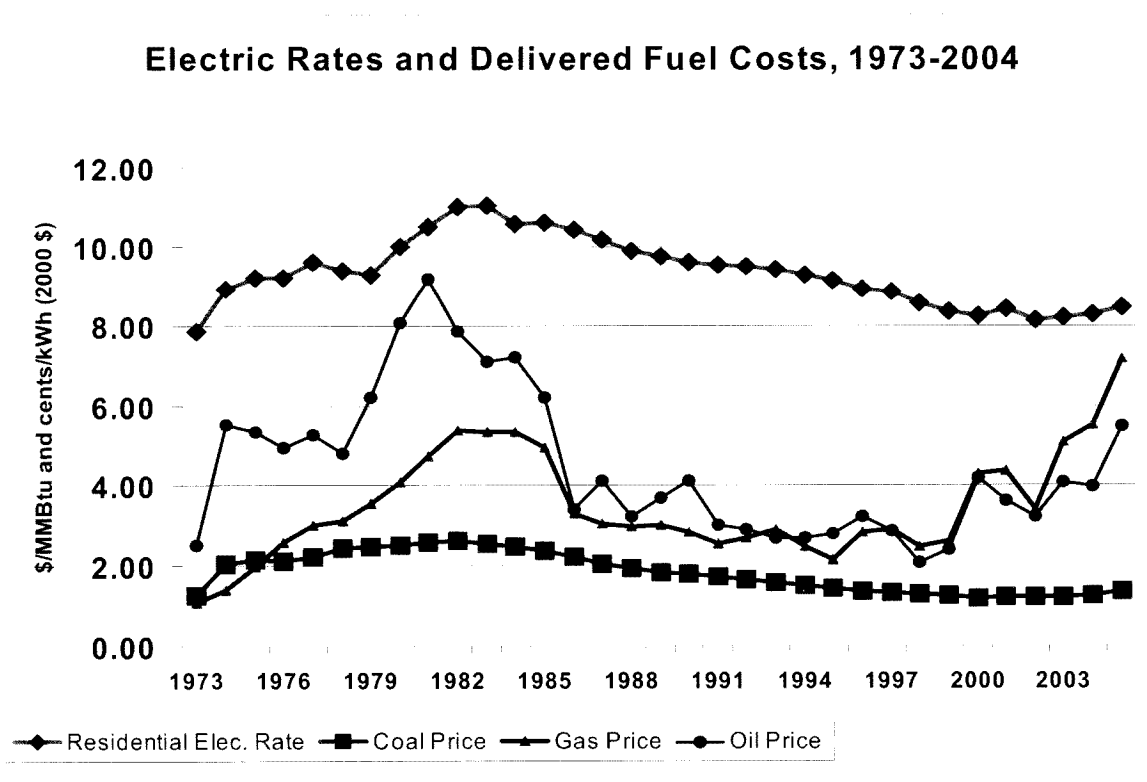


**FIGURE 1**  
**RESIDENTIAL ELECTRIC AND DELIVERED FUEL COSTS**  
**TO ELECTRIC POWER COMPANIES, 1973-2005**



Source: U.S. Dept. of Energy, Energy Information Administration, *Monthly Energy Review* March 2006, Table 9.9, <http://www.eia.doe.gov/emeu/mer/prices.html>. GDP Implicit Price Deflator based on U.S. Dept. of Commerce data, as reported in U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2004*, DOE/EIA-0384(2004), Appendix D, Table D-1, page 373, "Population and U.S. Gross Domestic Product, Selected Years, 1949-2004", August 2005, <http://www.eia.doe.gov/emeu/aer/pdf/aer.pdf>.

TABLE 2

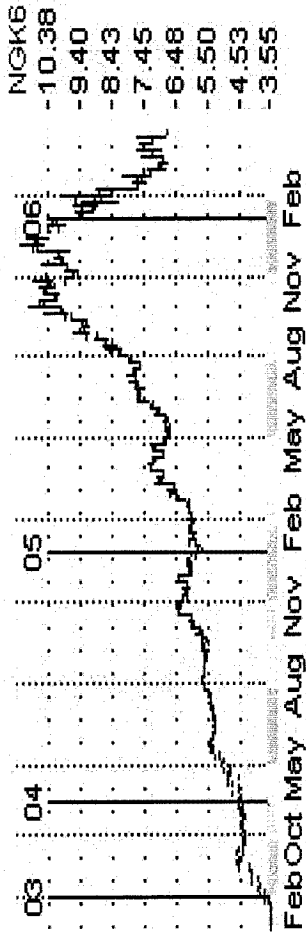
## CHANGES IN RESIDENTIAL ELECTRIC AND FOSSIL FUEL PRICES, 1973-2005

Year	Annual Changes (2000\$, cents/kWh or \$/MMBtu)				Annual Percentage Change over Previous Year			
	Ave. Residential Electric Price	Coal	Petroleum	Natural Gas	Ave. Residential Electric Price	Coal	Petroleum	Natural Gas
1973	--	--	--	--	--	--	--	--
1974	1.08	0.770	2.989	0.327	0.14	0.606	1.190	0.308
1975	0.28	0.100	-0.177	0.591	0.03	0.049	-0.032	0.426
1976	-0.01	-0.032	-0.373	0.594	0.00	-0.015	-0.070	0.300
1977	0.39	0.105	0.310	0.447	0.04	0.050	0.063	0.174
1978	-0.19	0.224	-0.472	0.088	-0.02	0.101	-0.090	0.029
1979	-0.11	0.031	1.412	0.422	-0.01	0.013	0.295	0.136
1980	0.71	0.030	1.851	0.539	0.08	0.012	0.299	0.153
1981	0.50	0.092	1.125	0.676	0.05	0.037	0.140	0.166
1982	0.51	0.034	-1.330	0.637	0.05	0.013	-0.145	0.134
1983	0.04	-0.086	-0.749	-0.054	0.00	-0.033	-0.096	-0.010
1984	-0.47	-0.080	0.091	-0.002	-0.04	-0.032	0.013	0.000
1985	0.03	-0.096	-0.995	-0.385	0.00	-0.039	-0.138	-0.072
1986	-0.19	-0.148	-2.772	-1.641	-0.02	-0.063	-0.448	-0.332
1987	-0.24	-0.159	0.693	-0.239	-0.02	-0.072	0.203	-0.073
1988	-0.30	-0.121	-0.891	-0.071	-0.03	-0.059	-0.217	-0.023
1989	-0.14	-0.097	0.461	0.008	-0.01	-0.050	0.143	0.003
1990	-0.14	-0.056	0.427	-0.153	-0.01	-0.031	0.116	-0.051
1991	-0.08	-0.070	-1.117	-0.295	-0.01	-0.039	-0.272	-0.104
1992	-0.02	-0.079	-0.082	0.145	0.00	-0.046	-0.027	0.057
1993	-0.09	-0.067	-0.225	0.202	-0.01	-0.041	-0.077	0.075
1994	-0.13	-0.066	0.000	-0.426	-0.01	-0.042	0.000	-0.147
1995	-0.16	-0.070	0.101	-0.317	-0.02	-0.047	0.038	-0.128
1996	-0.21	-0.058	0.438	0.660	-0.02	-0.040	0.157	0.306
1997	-0.07	-0.039	-0.363	0.079	-0.01	-0.029	-0.113	0.028
1998	-0.27	-0.036	-0.766	-0.425	-0.03	-0.027	-0.268	-0.147
1999	-0.22	-0.055	0.315	0.162	-0.03	-0.043	0.151	0.066
2000	-0.10	-0.042	1.769	1.672	-0.01	-0.034	0.734	0.636
2001	0.19	0.003	-0.573	0.079	0.02	0.003	-0.137	0.018
2002	-0.30	-0.002	-0.398	-0.961	-0.04	-0.002	-0.110	-0.219
2003	0.08	0.007	0.876	1.665	0.01	0.006	0.273	0.487
2004	0.08	0.049	-0.121	0.421	0.01	0.041	-0.030	0.083
2005	0.18	0.119	1.533	1.640	0.02	0.095	0.387	0.298
Standard Deviation:	0.32	0.16	1.08	0.67	3.7%	11.6%	30.0%	20.6%

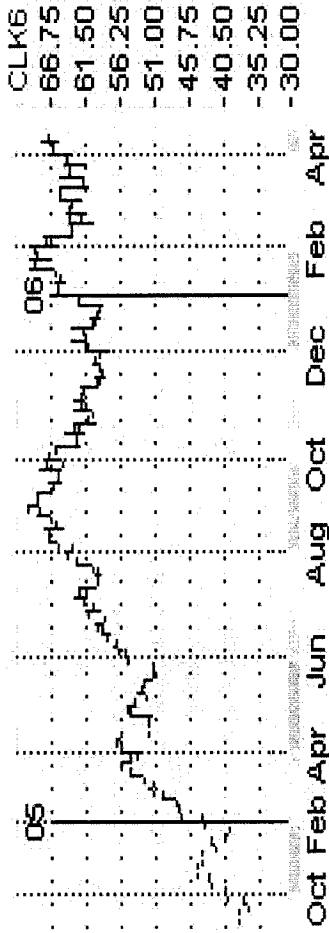
Source: Developed from Table 1, preceding, using data from U.S. Dept. of Energy, Energy Information Administration, *Monthly Energy Review March 2006*, Table 9.9, <http://www.eia.doe.gov/emeu/mer/prices.html>. GDP Implicit Price Deflator based on U.S. Dept. of Commerce data, as reported in U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2004*, DOE/EIA-0384(2004), Appendix D, Table D-1, page 373, "Population and U.S. Gross Domestic Product, Selected Years, 1949-2004", August 2005; <http://www.eia.doe.gov/emeu/aer/pdf/aer.pdf>.

**FIGURE 2**  
**FLUCTUATIONS IN OIL AND NATURAL GAS FUTURES PRICES**

Natural Gas Futures: 4/13/2006 Session Contract Detail for May 6 (U.S. \$/MMBtu)



Light Sweet Crude Oil Futures: 4/13/2006 Session Contract Detail for May 6 (U.S. \$/barrel)



Source: Data and charts from New York Mercantile Exchange, April 14, 2006, <http://www.nymex.com/>.

TABLE 3

## AEO 2006 FORECAST OF ELECTRIC POWER SECTOR FOSSIL FUEL COSTS, 2003-2030

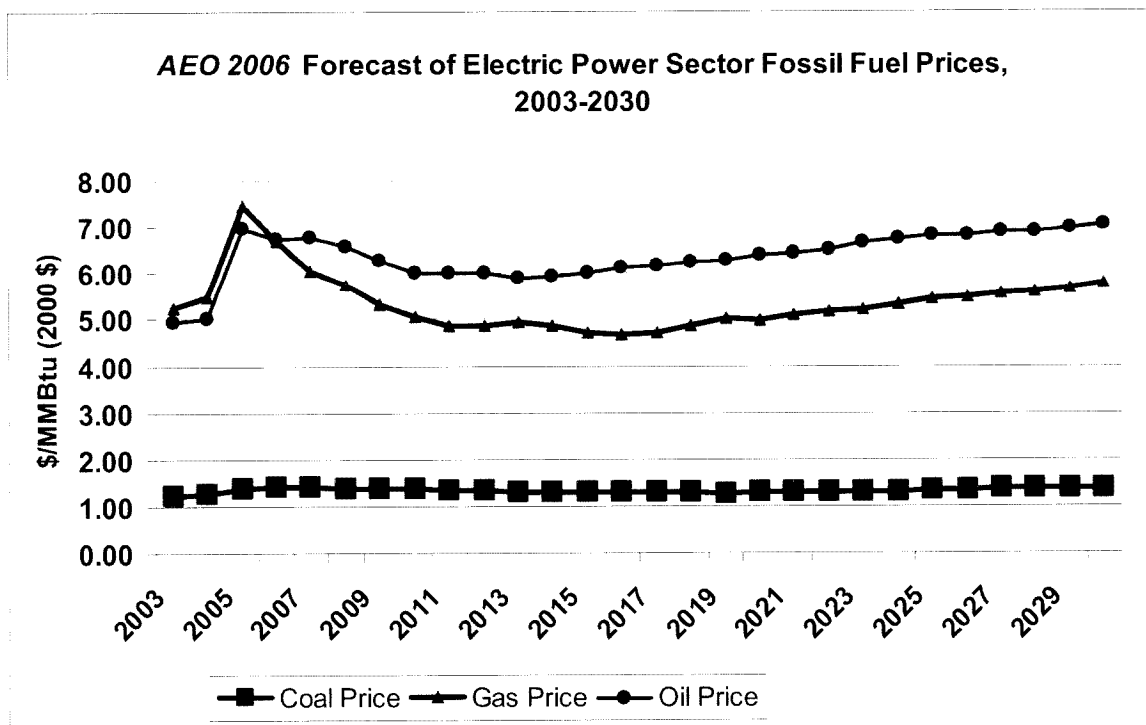
Ref. Case Forecasts, 2004 Dollars per MMBtu

Forecast Year	Distillate Fuel	Residual Fuel	Petroleum Total, Ave.	Natural Gas	Steam Coal	Fossil Fuel Ave.	Distillate Fuel	Residual Fuel	Petroleum Total, Ave.	Natural Gas	Steam Coal	Fossil Fuel Ave.
2003	6.65	4.90	5.35	5.66	1.33	2.35	6.14	4.53	4.94	5.23	1.23	2.17
2004	9.23	4.76	5.43	5.92	1.36	2.46	8.52	4.39	5.02	5.47	1.26	2.27
2005	9.71	6.98	7.53	8.09	1.50	3.05	8.97	6.45	6.96	7.47	1.38	2.82
2006	10.61	6.55	7.29	7.24	1.53	2.85	9.81	6.05	6.73	6.69	1.41	2.63
2007	10.06	6.57	7.33	6.54	1.51	2.67	9.30	6.07	6.77	6.04	1.40	2.47
2008	9.80	6.35	7.11	6.22	1.50	2.60	9.06	5.86	6.56	5.75	1.38	2.40
2009	9.38	5.99	6.78	5.77	1.47	2.46	8.66	5.53	6.26	5.33	1.36	2.27
2010	9.04	5.70	6.50	5.46	1.48	2.41	8.35	5.27	6.01	5.05	1.37	2.22
2011	9.04	5.72	6.51	5.26	1.45	2.37	8.35	5.29	6.02	4.86	1.34	2.19
2012	9.16	5.71	6.51	5.24	1.44	2.39	8.47	5.28	6.01	4.84	1.33	2.21
2013	8.85	5.65	6.39	5.36	1.43	2.44	8.18	5.22	5.90	4.95	1.32	2.26
2014	8.98	5.67	6.43	5.28	1.41	2.44	8.30	5.23	5.94	4.88	1.31	2.25
2015	9.02	5.72	6.52	5.08	1.40	2.41	8.34	5.28	6.02	4.69	1.30	2.23
2016	9.23	5.78	6.64	5.06	1.40	2.41	8.53	5.34	6.13	4.68	1.29	2.23
2017	9.23	5.83	6.69	5.10	1.39	2.41	8.53	5.39	6.18	4.72	1.28	2.23
2018	9.43	5.86	6.76	5.26	1.39	2.44	8.72	5.41	6.24	4.86	1.28	2.26
2019	9.48	5.90	6.79	5.41	1.39	2.48	8.76	5.45	6.27	5.00	1.28	2.29
2020	9.62	6.02	6.91	5.40	1.39	2.46	8.89	5.56	6.38	4.99	1.29	2.28
2021	9.67	6.06	6.95	5.52	1.40	2.48	8.94	5.60	6.42	5.10	1.29	2.29
2022	9.85	6.14	7.06	5.59	1.40	2.48	9.10	5.68	6.53	5.17	1.30	2.29
2023	9.92	6.27	7.21	5.65	1.41	2.48	9.17	5.80	6.66	5.22	1.31	2.29
2024	9.99	6.36	7.30	5.76	1.43	2.49	9.23	5.87	6.74	5.32	1.32	2.30
2025	10.05	6.43	7.37	5.87	1.44	2.50	9.29	5.94	6.81	5.42	1.33	2.31
2026	10.12	6.47	7.39	5.93	1.46	2.51	9.35	5.98	6.83	5.48	1.35	2.31
2027	10.14	6.54	7.44	6.02	1.47	2.50	9.37	6.04	6.87	5.56	1.36	2.31
2028	10.19	6.56	7.47	6.06	1.49	2.49	9.42	6.06	6.90	5.60	1.37	2.30
2029	10.21	6.63	7.52	6.12	1.50	2.47	9.44	6.12	6.95	5.66	1.39	2.29
2030	10.28	6.73	7.61	6.26	1.51	2.49	9.50	6.22	7.03	5.78	1.39	2.30
Annual Growth, 2004-2030	0.4%	1.3%	1.3%	0.2%	0.4%	0.0%	0.4%	1.3%	1.3%	0.2%	0.4%	0.0%

Source: U.S. Dept. of Energy, Energy Information Administration, *Annual Energy Outlook 2006*, DOE/EIA-0383(2006), February 2006, Year-by-Year Reference Case Tables, Table 3, <http://www.eia.doe.gov/oiat/aeo/aeoref.tab.html>. Prices converted from 2004 dollars to 2000 dollars by dividing by a GDP Implicit Price Deflator of 1.08237, based on U.S. Dept. of Commerce data, as reported in U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2004*, DOE/EIA-0384(2004), Appendix D, Table D-1, page 373, "Population and U.S. Gross Domestic Product, Selected Years, 1949-2004," August 2005, <http://www.eia.doe.gov/emeu/aer/pdf/aer.pdf>.



**FIGURE 3**  
**AE0 2006 FORECAST OF ELECTRIC POWER SECTOR**  
**FOSSIL FUEL COSTS, 2003-2030**  
 (\$/MMBtu, real 2000\$)



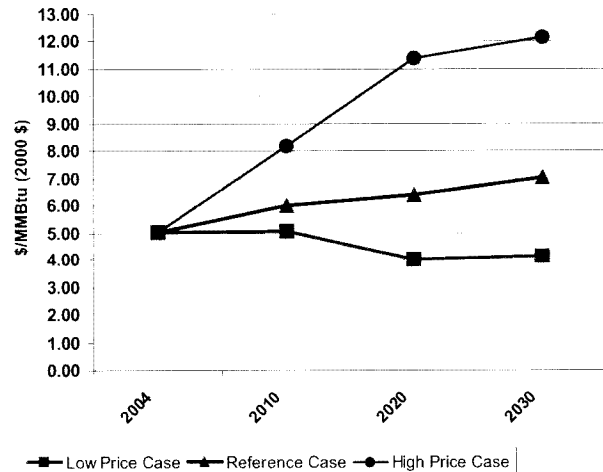
Source: Developed from data in Table 3. Data from U.S. Dept. of Energy, Energy Information Administration, *Annual Energy Outlook 2006*, DOE/EIA-0383(2006), February 2006, Year-by-Year Reference Case Tables, Table 3, [http://www.eia.doe.gov/oiaf/aeo/aeoref\\_tab.html](http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html). Prices converted from 2004 dollars to 2000 dollars by dividing by a GDP Implicit Price Deflator of 1.08237, based on U.S. Dept. of Commerce data, as reported in U.S. Department of Energy, Energy Information

**FIGURE 4**  
**AEO 2006 RANGE OF PRICE FORECASTS FOR FOSSIL FUEL**  
**DELIVERED TO THE ELECTRIC POWER SECTOR**  
**(2000 \$/MMBtu)**

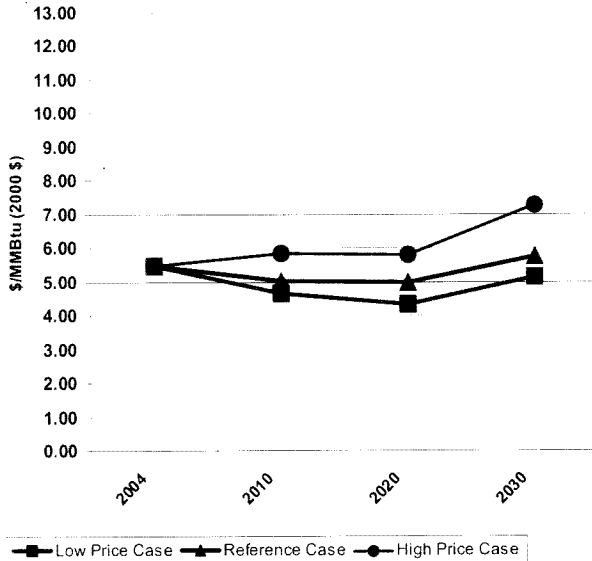
**AEO 2006 Price Case Forecasts  
for the Electric Power Sector**

		Price (2000\$/MMBtu)			
		2004	2010	2020	2030
Petroleum	Low	\$ 5.02	\$ 5.05	\$ 4.00	\$ 4.13
	Reference	\$ 5.02	\$ 6.01	\$ 6.38	\$ 7.03
	High	\$ 5.02	\$ 8.19	\$ 11.38	\$ 12.16
Natural Gas	Low	\$ 5.47	\$ 4.67	\$ 4.32	\$ 5.14
	Reference	\$ 5.47	\$ 5.04	\$ 4.99	\$ 5.78
	High	\$ 5.47	\$ 5.85	\$ 5.80	\$ 7.29
Coal	Low	\$ 1.26	\$ 1.35	\$ 1.23	\$ 1.28
	Reference	\$ 1.26	\$ 1.37	\$ 1.28	\$ 1.40
	High	\$ 1.26	\$ 1.39	\$ 1.38	\$ 1.49

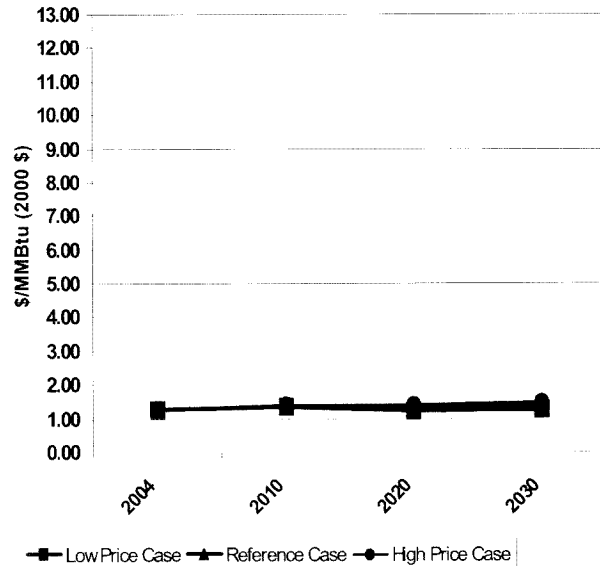
**AEO 2006 Price Forecasts of Petroleum  
Delivered to the Electric Power Sector**



**AEO 2006 Price Forecasts of Natural Gas  
Delivered to the Electric Power Sector**



**AEO 2006 Price Forecasts of Coal  
Delivered to the Electric Power Sector**



Source: U.S. Dept. of Energy, Energy Information Administration, *Annual Energy Outlook 2006*, DOE/EIA-0383(2006), February 2006, Table C-3, [http://www.eia.doe.gov/oiaf/aeo/pdf/0383\(2006\).pdf](http://www.eia.doe.gov/oiaf/aeo/pdf/0383(2006).pdf). Prices converted from 2004 dollars to 2000 dollars by dividing by a GDP Implicit Price Deflator of 1.08237.

**EXHIBIT**  
**APPLICANTS'**  
**EXHIBIT 31-F**

# TABLE 4(A)

## PETROLEUM PRICE FORECASTS TO ELECTRIC GENERATORS

### FROM *ANNUAL ENERGY OUTLOOK*, 1982-2006 (2000 \$/MMBtu)

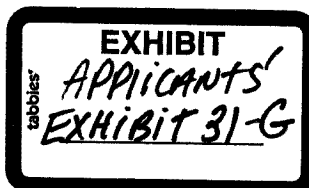
#### 1. Petroleum forecast prices in real \$ per MMBtu, using \$ base year as given in that year's AEO

Source	Table/Page	Year \$	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030
AEO 1982	Table A 5.1, Page 141	1982	\$ 4.55	\$ 6.75								
AEO 1983	Table A5, Page 194	1983	\$ 4.05	\$ 5.53	\$ 7.59							
AEO 1984	Table A5, Page 209	1984	\$ 4.48	\$ 5.15	\$ 6.58							
AEO 1985	Table A3, Page 49	1985	\$ 4.61	\$ 4.85	\$ 5.30							
AEO 1986	Table A3, Page 33	1986		\$ 2.79	\$ 4.33	\$ 5.48						
AEO 1987	Table A3, Page 35	1987		\$ 3.02	\$ 3.72	\$ 5.00						
AEO 1988	not published (see note)	1988		\$ 2.87	\$ 3.77	\$ 5.01						
AEO 1989	Table A3, Page 47	1988		\$ 2.62	\$ 3.70	\$ 4.84						
AEO 1990	Table A2, Page 41	1989		\$ 2.75	\$ 3.48	\$ 4.70	\$ 5.54	\$ 6.21				
AEO 1991	Table A3, Page 46	1990			\$ 4.36	\$ 4.62	\$ 5.43	\$ 6.00				
AEO 1992	Table A3, Page 66	1990			\$ 3.84	\$ 4.76	\$ 5.43	\$ 6.17				
AEO 1993	Table A3, Page 84	1991			\$ 3.58	\$ 4.05	\$ 4.61	\$ 5.36				
AEO 1994	Table A3, Page 58	1992				\$ 3.58	\$ 4.39	\$ 4.94				
AEO 1995	Table A3, Page 76	1993				\$ 2.91	\$ 3.33	\$ 3.78				
AEO 1996	Table A3, Pages 78-79	1994				\$ 3.27	\$ 3.68	\$ 4.04	\$ 4.38			
AEO 1997	Table A3, Page 100	1995				\$ 3.09	\$ 3.35	\$ 3.59	\$ 3.52			
AEO 1998	Table A3, Page 104	1996				\$ 3.21	\$ 3.57	\$ 3.84	\$ 4.00	\$ 4.21		
AEO 1999	Table A3, Page 116	1997				\$ 2.32	\$ 3.29	\$ 3.89	\$ 4.05	\$ 4.33		
AEO 2000	Table A3, Page 121	1998					\$ 3.23	\$ 3.28	\$ 3.40	\$ 3.54		
AEO 2001	Table A3, Page 131	1999					\$ 3.70	\$ 4.11	\$ 4.27	\$ 4.35		
AEO 2002	Table A3, Page 129	2000					\$ 3.80	\$ 3.97	\$ 4.14	\$ 4.27		
AEO 2003	Table A3, Page 123	2001					\$ 4.13	\$ 4.27	\$ 4.43	\$ 4.60	\$ 4.98	
AEO 2004	Table A3, Page 137	2002						\$ 4.21	\$ 4.54	\$ 4.67	\$ 4.88	
AEO 2005	Table A3, Page 143	2003						\$ 4.55	\$ 4.77	\$ 5.10	\$ 5.42	
AEO 2006	Table A3, Page 137	2004						\$ 6.50	\$ 6.52	\$ 6.91	\$ 7.37	\$ 7.61

#### 2. Petroleum forecast prices in real \$ per MMBtu, using year 2000 dollars

Source	Table/Page	Implicit Price Deflator	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030
AEO 1982	Table A 5.1, Page 141	0.6273	\$ 7.25	\$ 10.76								
AEO 1983	Table A5, Page 194	0.6521	\$ 6.21	\$ 8.48	\$ 11.64							
AEO 1984	Table A5, Page 209	0.6766	\$ 6.62	\$ 7.61	\$ 9.73							
AEO 1985	Table A3, Page 49	0.6971	\$ 6.61	\$ 6.96	\$ 7.60							
AEO 1986	Table A3, Page 33	0.7125		\$ 3.92	\$ 6.08	\$ 7.69						
AEO 1987	Table A3, Page 35	0.7320		\$ 4.13	\$ 5.08	\$ 6.83						
AEO 1988	not published (see note)	0.7569		\$ 3.79	\$ 4.99	\$ 6.61						
AEO 1989	Table A3, Page 47	0.7569		\$ 3.46	\$ 4.89	\$ 6.39						
AEO 1990	Table A2, Page 41	0.7856		\$ 3.50	\$ 4.43	\$ 5.98	\$ 7.05	\$ 7.91				
AEO 1991	Table A3, Page 46	0.8159			\$ 5.34	\$ 5.66	\$ 6.66	\$ 7.35				
AEO 1992	Table A3, Page 66	0.8159			\$ 4.71	\$ 5.83	\$ 6.66	\$ 7.56				
AEO 1993	Table A3, Page 84	0.8444			\$ 4.24	\$ 4.80	\$ 5.46	\$ 6.35				
AEO 1994	Table A3, Page 58	0.8639				\$ 4.14	\$ 5.08	\$ 5.72				
AEO 1995	Table A3, Page 76	0.8838				\$ 3.29	\$ 3.77	\$ 4.28				
AEO 1996	Table A3, Pages 78-79	0.9026				\$ 3.62	\$ 4.08	\$ 4.48	\$ 4.85			
AEO 1997	Table A3, Page 100	0.9211				\$ 3.35	\$ 3.64	\$ 3.90	\$ 3.82			
AEO 1998	Table A3, Page 104	0.9385				\$ 3.42	\$ 3.80	\$ 4.09	\$ 4.26	\$ 4.49		
AEO 1999	Table A3, Page 116	0.9541				\$ 2.43	\$ 3.45	\$ 4.08	\$ 4.24	\$ 4.54		
AEO 2000	Table A3, Page 121	0.9647					\$ 3.35	\$ 3.40	\$ 3.52	\$ 3.67		
AEO 2001	Table A3, Page 131	0.9787					\$ 3.78	\$ 4.20	\$ 4.36	\$ 4.44		
AEO 2002	Table A3, Page 129	1.0000					\$ 3.80	\$ 3.97	\$ 4.14	\$ 4.27		
AEO 2003	Table A3, Page 123	1.0240					\$ 4.03	\$ 4.17	\$ 4.33	\$ 4.49	\$ 4.86	
AEO 2004	Table A3, Page 137	1.0409						\$ 4.04	\$ 4.36	\$ 4.49	\$ 4.69	
AEO 2005	Table A3, Page 143	1.0600						\$ 4.29	\$ 4.50	\$ 4.81	\$ 5.11	
AEO 2006	Table A3, Page 137	1.0824						\$ 6.01	\$ 6.02	\$ 6.38	\$ 6.81	\$ 7.03

Source: U.S. Dept. of Energy, Energy Information Administration, *Annual Energy Outlook*, yearly publications, 1982 through 2006. Reference Case Tables' prices converted from various year dollars to 2000 dollars by dividing by a GDP Implicit Price Deflator, based on U.S. Dept. of Commerce data, as reported in U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2004*, DOE/EIA-0384(2004), Appendix D, Table D-1, page 373, "Population and U.S. Gross Domestic Product, Selected Years, 1949-2004," August 2005, <http://www.eia.doe.gov/emeu/aer/pdf/aer.pdf>. AEO 1988 was not published; values shown here are the averages (real) of the 1987 and 1989 AEO. 1982 Petroleum prices calculated as volume-weighted averages of distillate, low-sulfur resid, and high-sulfur resid. for 1990, only heavy oil prices were forecast for electric power.



# **TABLE 4(B)** **NATURAL GAS PRICE FORECASTS TO ELECTRIC GENERATORS** **FROM *ANNUAL ENERGY OUTLOOK*, 1982-2006 (2000 \$/MMBtu)**

## **1. Natural gas forecast prices in real \$ per MMBtu, using \$ base year as given in that year's AEO**

Source	Table/Page	Year	\$	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030							
AEO 1982	Table A.5.1, Page 141	1982	\$	5.54	\$	7.19														
AEO 1983	Table A5, Page 194	1983	\$	3.44	\$	4.49	\$	7.05												
AEO 1984	Table A5, Page 209	1984	\$	3.59	\$	4.35	\$	5.89												
AEO 1985	Table A3, Page 49	1985	\$	3.87	\$	3.85	\$	4.96												
AEO 1986	Table A3, Page 33	1986			\$	2.75	\$	4.43	\$	5.71										
AEO 1987	Table A3, Page 35	1987			\$	2.45	\$	3.30	\$	4.54										
AEO 1988	not published (see note)	1988			\$	2.39	\$	3.26	\$	4.43										
AEO 1989	Table A3, Page 47	1988			\$	2.25	\$	3.10	\$	4.16										
AEO 1990	Table A2, Page 41	1989			\$	2.39	\$	2.90	\$	3.83	\$	4.92	\$	6.00						
AEO 1991	Table A3, Page 46	1990					\$	2.72	\$	3.17	\$	4.59	\$	5.48						
AEO 1992	Table A3, Page 66	1990					\$	2.51	\$	3.27	\$	4.39	\$	5.44						
AEO 1993	Table A3, Page 84	1991				\$	2.60	\$	3.18	\$	4.13	\$	4.47							
AEO 1994	Table A3, Page 58	1992						\$	2.92	\$	3.51	\$	4.08							
AEO 1995	Table A3, Page 76	1993						\$	2.59	\$	3.38	\$	3.73							
AEO 1996	Table A3, Pages 78-79	1994						\$	2.19	\$	2.26	\$	2.44	\$	2.95					
AEO 1997	Table A3, Page 100	1995						\$	2.19	\$	2.28	\$	2.32	\$	2.47					
AEO 1998	Table A3, Page 104	1996						\$	2.48	\$	2.63	\$	2.84	\$	2.98	\$	3.15			
AEO 1999	Table A3, Page 116	1997						\$	2.62	\$	2.94	\$	3.08	\$	3.17	\$	3.24			
AEO 2000	Table A3, Page 121	1998								\$	2.79	\$	3.08	\$	3.21	\$	3.33			
AEO 2001	Table A3, Page 131	1999								\$	2.88	\$	3.03	\$	3.24	\$	3.59			
AEO 2002	Table A3, Page 129	2000								\$	3.19	\$	3.38	\$	3.65	\$	3.87			
AEO 2003	Table A3, Page 123	2001							\$	3.27	\$	3.79	\$	4.14	\$	4.30	\$	4.60		
AEO 2004	Table A3, Page 137	2002									\$	4.04	\$	4.78	\$	4.85	\$	4.92		
AEO 2005	Table A3, Page 143	2003									\$	4.27	\$	4.81	\$	5.20	\$	5.44		
AEO 2006	Table A3, Page 137	2004									\$	5.46	\$	5.08	\$	5.40	\$	5.87	\$	6.26

## **2. Natural gas forecast prices in real \$ per MMBtu, using year 2000 dollars**

		<u>Implicit</u> <u>Price</u> <u>Deflator</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>	<u>2030</u>
<u>Source</u>	<u>Table/Page</u>											
AEO 1982	Table A.5.1, Page 141	0.6273	\$ 8.83	\$ 11.46								
AEO 1983	Table A5, Page 194	0.6521	\$ 5.28	\$ 6.89	\$ 10.81							
AEO 1984	Table A5, Page 209	0.6766	\$ 5.31	\$ 6.43	\$ 8.71							
AEO 1985	Table A3, Page 49	0.6971	\$ 5.55	\$ 5.52	\$ 7.11							
AEO 1986	Table A3, Page 33	0.7125		\$ 3.86	\$ 6.22	\$ 8.01						
AEO 1987	Table A3, Page 35	0.7320		\$ 3.35	\$ 4.51	\$ 6.20						
AEO 1988	not published (see note)	0.7569		\$ 3.16	\$ 4.30	\$ 5.85						
AEO 1989	Table A3, Page 47	0.7569		\$ 2.97	\$ 4.10	\$ 5.50						
AEO 1990	Table A2, Page 41	0.7856		\$ 3.04	\$ 3.69	\$ 4.88	\$ 6.26	\$ 7.64				
AEO 1991	Table A3, Page 46	0.8159			\$ 3.33	\$ 3.89	\$ 5.63	\$ 6.72				
AEO 1992	Table A3, Page 66	0.8159			\$ 3.08	\$ 4.01	\$ 5.38	\$ 6.67				
AEO 1993	Table A3, Page 84	0.8444			\$ 3.08	\$ 3.77	\$ 4.89	\$ 5.29				
AEO 1994	Table A3, Page 58	0.8639				\$ 3.38	\$ 4.06	\$ 4.72				
AEO 1995	Table A3, Page 76	0.8838				\$ 2.93	\$ 3.82	\$ 4.22				
AEO 1996	Table A3, Pages 78-79	0.9026				\$ 2.43	\$ 2.50	\$ 2.70	\$ 3.27			
AEO 1997	Table A3, Page 100	0.9211				\$ 2.38	\$ 2.48	\$ 2.52	\$ 2.68			
AEO 1998	Table A3, Page 104	0.9385				\$ 2.64	\$ 2.80	\$ 3.03	\$ 3.18	\$ 3.36		
AEO 1999	Table A3, Page 116	0.9541				\$ 2.75	\$ 3.08	\$ 3.23	\$ 3.32	\$ 3.40		
AEO 2000	Table A3, Page 121	0.9647					\$ 2.89	\$ 3.19	\$ 3.33	\$ 3.45		
AEO 2001	Table A3, Page 131	0.9787					\$ 2.94	\$ 3.10	\$ 3.31	\$ 3.67		
AEO 2002	Table A3, Page 129	1.0000					\$ 3.19	\$ 3.38	\$ 3.65	\$ 3.87		
AEO 2003	Table A3, Page 123	1.0240					\$ 3.19	\$ 3.70	\$ 4.04	\$ 4.20	\$ 4.49	
AEO 2004	Table A3, Page 137	1.0409						\$ 3.88	\$ 4.59	\$ 4.66	\$ 4.73	
AEO 2005	Table A3, Page 143	1.0600						\$ 4.03	\$ 4.54	\$ 4.91	\$ 5.13	
AEO 2006	Table A3, Page 137	1.0824						\$ 5.04	\$ 4.69	\$ 4.99	\$ 5.42	\$ 5.78

Source: U.S. Dept. of Energy, Energy Information Administration, *Annual Energy Outlook*, yearly publications, 1982 through 2006. Reference Case Tables' prices converted from various year dollars to 2000 dollars by dividing by a GDP Implicit Price Deflator, based on U.S. Dept. of Commerce data, as reported in U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2004*, DOE/EIA-0384(2004), Appendix D, Table D-1, page 373, "Population and U.S. Gross Domestic Product, Selected Years, 1949-2004," August 2005, <http://www.eia.doe.gov/emeu/aer/pdf/aer.pdf>. AEO 1988 was not published; values shown here are the averages (real) of the 1987 and 1989 AEO.

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# **TABLE 4(C)** **COAL PRICE FORECASTS TO ELECTRIC GENERATORS** **FROM ANNUAL ENERGY OUTLOOK, 1982-2006 (2000 \$/MMBtu)**

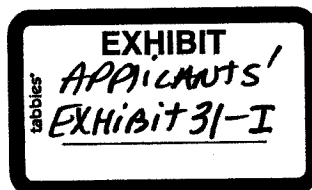
## **1. Coal forecast prices in real \$ per MMBtu, using \$ base year as given in that year's AEO**

Source	Table/Page	Year	\$	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030
AEO 1982	Table A.5.1, Page 141	1982	\$	1.74	\$ 1.86								
AEO 1983	Table A5, Page 194	1983	\$	1.82	\$ 1.90	\$ 2.13							
AEO 1984	Table A5, Page 209	1984	\$	1.83	\$ 1.92	\$ 2.05							
AEO 1985	Table A3, Page 49	1985	\$	1.68	\$ 1.75	\$ 1.83							
AEO 1986	Table A3, Page 33	1986			\$ 1.67	\$ 1.82	\$ 1.88						
AEO 1987	Table A3, Page 35	1987			\$ 1.56	\$ 1.71	\$ 1.89						
AEO 1988	not published (see note)	1988			\$ 1.58	\$ 1.69	\$ 1.82						
AEO 1989	Table A3, Page 47	1988			\$ 1.54	\$ 1.61	\$ 1.68						
AEO 1990	Table A2, Page 41	1989			\$ 1.47	\$ 1.59	\$ 1.66	\$ 1.76	\$ 1.86				
AEO 1991	Table A3, Page 46	1990				\$ 1.66	\$ 1.79	\$ 1.94	\$ 2.09				
AEO 1992	Table A3, Page 66	1990				\$ 1.59	\$ 1.74	\$ 1.86	\$ 2.00				
AEO 1993	Table A3, Page 84	1991				\$ 1.51	\$ 1.64	\$ 1.73	\$ 1.89				
AEO 1994	Table A3, Page 58	1992					\$ 1.63	\$ 1.70	\$ 1.92				
AEO 1995	Table A3, Page 76	1993					\$ 1.39	\$ 1.45	\$ 1.50				
AEO 1996	Table A3, Pages 78-79	1994					\$ 1.26	\$ 1.29	\$ 1.26	\$ 1.28			
AEO 1997	Table A3, Page 100	1995					\$ 1.29	\$ 1.24	\$ 1.20	\$ 1.11			
AEO 1998	Table A3, Page 104	1996					\$ 1.20	\$ 1.14	\$ 1.09	\$ 1.03	\$ 0.97		
AEO 1999	Table A3, Page 116	1997					\$ 1.19	\$ 1.14	\$ 1.06	\$ 0.99	\$ 0.93		
AEO 2000	Table A3, Page 121	1998						\$ 1.11	\$ 1.07	\$ 1.03	\$ 0.98		
AEO 2001	Table A3, Page 131	1999						\$ 1.13	\$ 1.05	\$ 1.01	\$ 0.98		
AEO 2002	Table A3, Page 129	2000						\$ 1.13	\$ 1.05	\$ 1.01	\$ 0.97		
AEO 2003	Table A3, Page 123	2001						\$ 1.22	\$ 1.17	\$ 1.15	\$ 1.12	\$ 1.10	
AEO 2004	Table A3, Page 137	2002							\$ 1.22	\$ 1.20	\$ 1.17	\$ 1.18	
AEO 2005	Table A3, Page 143	2003							\$ 1.25	\$ 1.23	\$ 1.25	\$ 1.31	
AEO 2006	Table A3, Page 137	2004							\$ 1.48	\$ 1.40	\$ 1.39	\$ 1.44	\$ 1.51

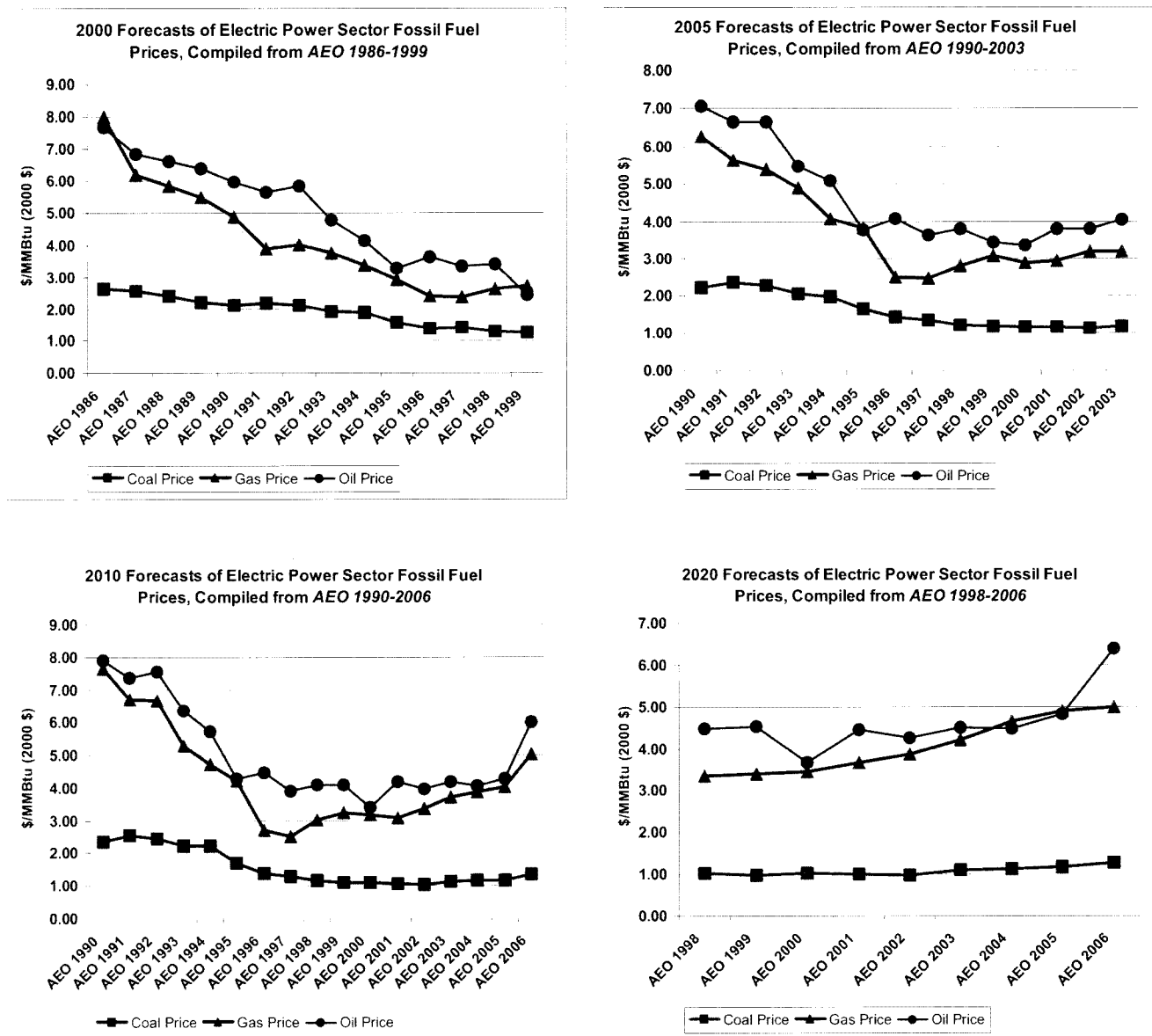
## **2. Coal forecast prices in real \$ per MMBtu, using year 2000 dollars**

Source	Table/Page	Implicit Price Deflator	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030
AEO 1982	Table A.5.1, Page 141	0.6273	\$ 2.77	\$ 2.97								
AEO 1983	Table A5, Page 194	0.6521	\$ 2.79	\$ 2.91	\$ 3.27							
AEO 1984	Table A5, Page 209	0.6766	\$ 2.70	\$ 2.84	\$ 3.03							
AEO 1985	Table A3, Page 49	0.6971	\$ 2.41	\$ 2.51	\$ 2.63							
AEO 1986	Table A3, Page 33	0.7125		\$ 2.34	\$ 2.55	\$ 2.64						
AEO 1987	Table A3, Page 35	0.7320		\$ 2.13	\$ 2.34	\$ 2.58						
AEO 1988	not published (see note)	0.7569		\$ 2.08	\$ 2.23	\$ 2.40						
AEO 1989	Table A3, Page 47	0.7569		\$ 2.03	\$ 2.13	\$ 2.22						
AEO 1990	Table A2, Page 41	0.7856		\$ 1.87	\$ 2.02	\$ 2.11	\$ 2.24	\$ 2.37				
AEO 1991	Table A3, Page 46	0.8159			\$ 2.03	\$ 2.19	\$ 2.38	\$ 2.56				
AEO 1992	Table A3, Page 66	0.8159			\$ 1.95	\$ 2.13	\$ 2.28	\$ 2.45				
AEO 1993	Table A3, Page 84	0.8444			\$ 1.79	\$ 1.94	\$ 2.05	\$ 2.24				
AEO 1994	Table A3, Page 58	0.8639				\$ 1.89	\$ 1.97	\$ 2.22				
AEO 1995	Table A3, Page 76	0.8838				\$ 1.57	\$ 1.64	\$ 1.70				
AEO 1996	Table A3, Pages 78-79	0.9026				\$ 1.40	\$ 1.43	\$ 1.40	\$ 1.42			
AEO 1997	Table A3, Page 100	0.9211				\$ 1.40	\$ 1.35	\$ 1.30	\$ 1.21			
AEO 1998	Table A3, Page 104	0.9385				\$ 1.28	\$ 1.21	\$ 1.16	\$ 1.10	\$ 1.03		
AEO 1999	Table A3, Page 116	0.9541				\$ 1.25	\$ 1.19	\$ 1.11	\$ 1.04	\$ 0.97		
AEO 2000	Table A3, Page 121	0.9647					\$ 1.15	\$ 1.11	\$ 1.07	\$ 1.02		
AEO 2001	Table A3, Page 131	0.9787					\$ 1.15	\$ 1.07	\$ 1.03	\$ 1.00		
AEO 2002	Table A3, Page 129	1.0000					\$ 1.13	\$ 1.05	\$ 1.01	\$ 0.97		
AEO 2003	Table A3, Page 123	1.0240					\$ 1.19	\$ 1.14	\$ 1.12	\$ 1.09	\$ 1.07	
AEO 2004	Table A3, Page 137	1.0409						\$ 1.17	\$ 1.15	\$ 1.12	\$ 1.13	
AEO 2005	Table A3, Page 143	1.0600						\$ 1.18	\$ 1.16	\$ 1.18	\$ 1.24	
AEO 2006	Table A3, Page 137	1.0824						\$ 1.37	\$ 1.29	\$ 1.28	\$ 1.33	\$ 1.40

Source: U.S. Dept. of Energy, Energy Information Administration, *Annual Energy Outlook*, yearly publications, 1982 through 2006. Reference Case Tables' prices converted from various year dollars to 2000 dollars by dividing by a GDP Implicit Price Deflator, based on U.S. Dept. of Commerce data, as reported in U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2004*, DOE/EIA-0384(2004), Appendix D, Table D-1, page 373, "Population and U.S. Gross Domestic Product, Selected Years, 1949-2004," August 2005, <http://www.eia.doe.gov/emeu/aer/pdf/aer.pdf>. AEO 1988 was not published; values shown here are the averages (real) of the 1987 and 1989 AEO.



**FIGURE 5**  
**FLUCTUATIONS IN OIL AND NATURAL GAS FUTURES PRICES**

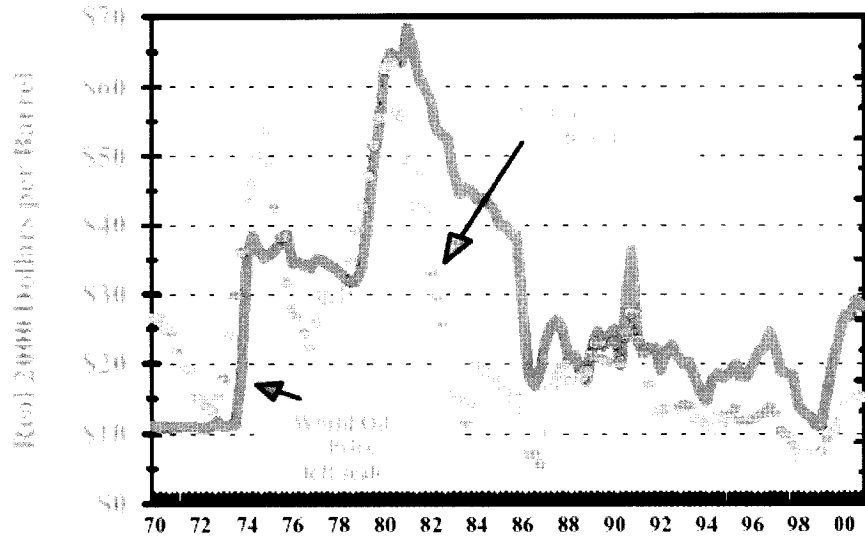


Source: U.S. Dept. of Energy, Energy Information Administration, *Annual Energy Outlook*, yearly publications, 1982 through 2006. Reference Case Tables' prices converted from various year dollars to 2000 dollars by dividing by a GDP Implicit Price Deflator, based on U.S. Dept. of Commerce data, as reported in U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2004*, DOE/EIA-0384(2004), Appendix D, Table D-1, page 373, "Population and U.S. Gross Domestic Product, Selected Years, 1949-2004," August 2005, <http://www.eia.doe.gov/emeu/acr/pdf/acr.pdf>. AEO 1988 was not published; values shown here are the averages (real) of the 1987 and 1989 AEO. 1982 Petroleum prices calculated as volume-weighted averages of distillate, low-sulfur resid, and high-sulfur resid. For 1990, only heavy oil prices were forecast for electric power.

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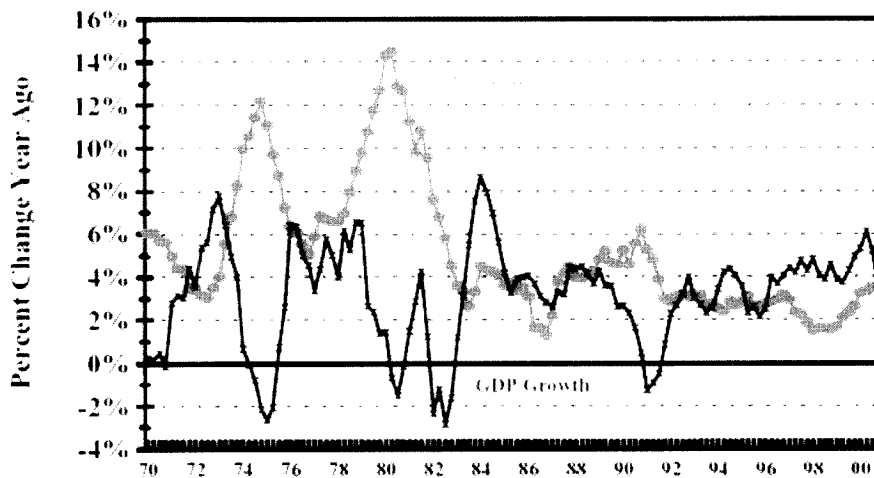
**FIGURE 6**  
**RELATIONSHIPS AMONG HISTORICAL WORLD OIL PRICES,**  
**INFLATION RATES, AND GDP GROWTH**

**MOVEMENTS IN WORLD OIL PRICE AND INFLATION:**



Sources:  
 CPI: Bureau of Labor Statistics at <http://stats.bls.gov/cpihome.htm>  
 World Oil Price: Refiner Acquisition Cost for Imported Oil: Energy Information Administration,  
 Monthly Energy Review at <http://www.eia.doe.gov/mer/contents.html>

**MOVEMENTS IN INFLATION AND GDP GROWTH:**



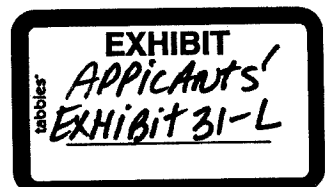
Sources:  
 CPI: Bureau of Labor Statistics at <http://stats.bls.gov/cpihome.htm>  
 GDP: Bureau of Economic Analysis at <http://www.bea.doe.gov/bea/data/stabs.htm>

Source: U.S. Department of Energy, Energy Information Administration, "Energy Price Impacts on the U.S. Economy," April 2001, Figures 4 and 5, [http://www.eia.doe.gov/oiaf/economy/energy\\_price.pdf](http://www.eia.doe.gov/oiaf/economy/energy_price.pdf).

**TABLE 5**  
**AVERAGE PER-HOUSEHOLD ENERGY CONSUMPTION, 2001**  
**(MMBtu per household)**

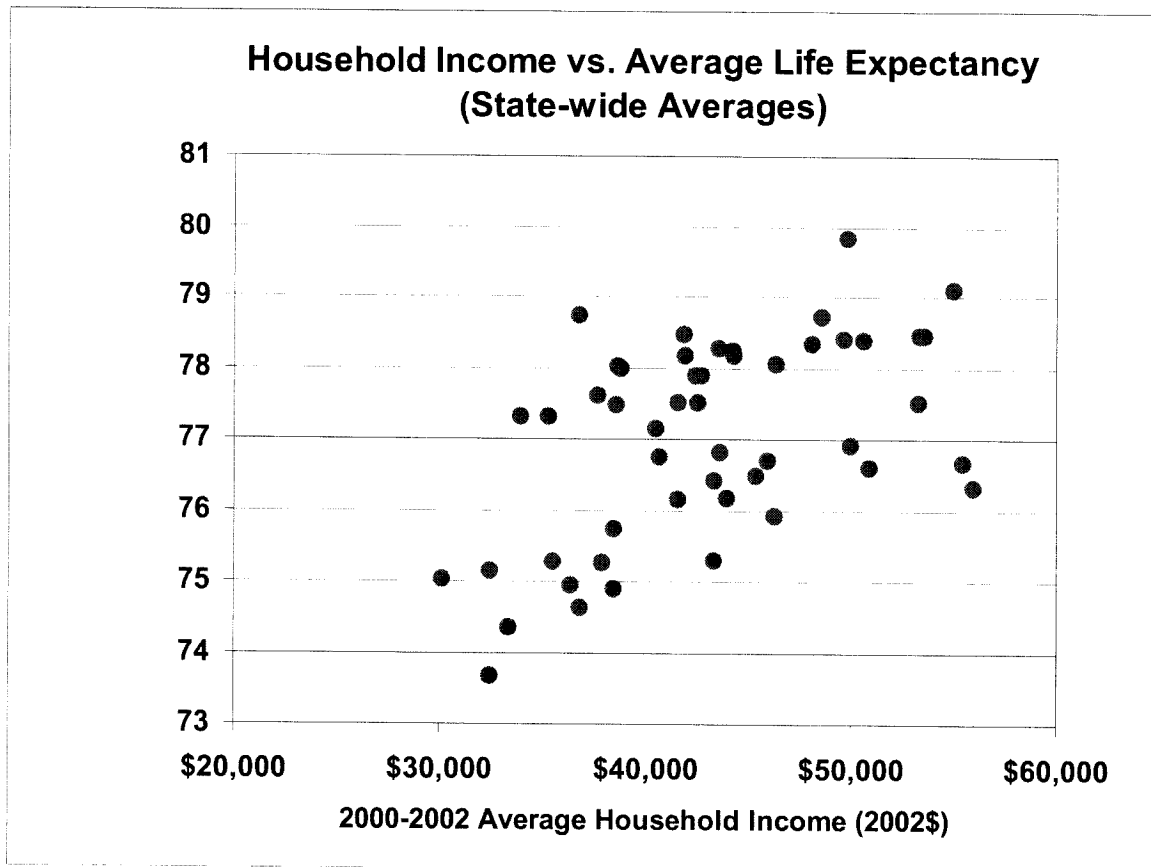
<u>State</u>	<u>Census Region</u>	<u>Net Energy</u>	<u>Electricity</u>	<u>Non-electric Energy</u>		
				<u>Total Non-electric</u>	<u>Nat.Gas &amp; Petroleum</u>	<u>Other</u>
Alabama	ESC	83.2	47.5	35.7	32.8	2.9
Alaska	PAC	141.4	24.7	116.7	108.3	8.4
Arizona	MTN	63.0	39.5	23.5	18.4	5.2
Arkansas	WSC	86.0	43.2	42.8	40.3	2.4
California	PAC	68.9	21.3	47.5	43.5	4.1
Colorado	MTN	102.2	26.3	75.8	71.5	4.4
Connecticut	NE	125.3	29.3	96.0	90.9	5.0
Delaware	SA	95.7	36.4	59.3	55.6	3.7
District of Columbia	SA	77.5	20.7	56.7	52.7	4.0
Florida	SA	55.3	46.2	9.1	4.2	4.9
Georgia	SA	88.5	44.5	44.0	40.4	3.6
Hawaii	PAC	28.1	20.6	7.5	4.7	2.8
Idaho	MTN	95.5	43.6	51.9	48.0	4.1
Illinois	ENC	122.8	28.9	94.0	91.7	2.3
Indiana	ENC	107.7	38.9	68.8	66.2	2.6
Iowa	WNC	107.3	34.0	73.3	69.2	4.1
Kansas	WNC	107.0	35.9	71.1	67.7	3.4
Kentucky	ESC	88.0	45.4	42.6	39.2	3.4
Louisiana	WSC	80.1	47.1	33.0	31.0	2.0
Maine	NE	113.1	24.6	88.5	83.6	4.9
Maryland	SA	94.9	37.6	57.2	53.4	3.8
Massachusetts	NE	122.4	23.2	99.1	94.3	4.9
Michigan	ENC	126.0	25.7	100.4	98.0	2.3
Minnesota	WNC	110.1	31.4	78.6	75.0	3.6
Mississippi	ESC	88.3	48.5	39.8	36.9	2.9
Missouri	WNC	106.6	41.5	65.1	61.4	3.6
Montana	MTN	96.0	32.0	64.0	60.2	4.1
Nebraska	WNC	117.1	40.2	76.9	73.4	3.5
Nevada	MTN	84.6	37.9	46.8	42.3	4.5
New Hampshire	NE	103.8	23.3	80.6	75.5	4.7
New Jersey	MA	112.8	25.9	86.8	84.4	2.4
New Mexico	MTN	86.5	21.5	65.0	60.5	4.4
New York	MA	110.8	19.5	91.4	81.8	9.5
North Carolina	SA	78.6	43.4	35.2	31.6	3.7
North Dakota	WNC	117.0	40.7	76.3	71.9	4.4
Ohio	ENC	109.2	33.4	75.8	73.5	2.3
Oklahoma	WSC	95.1	44.1	51.0	49.2	1.8
Oregon	PAC	79.5	40.4	39.0	33.2	5.8
Pennsylvania	MA	108.8	29.9	78.9	76.1	2.8
Rhode Island	NE	117.2	20.8	96.4	91.7	4.8
South Carolina	SA	72.6	47.2	25.4	21.8	3.6
South Dakota	WNC	99.7	37.1	62.6	59.0	3.6
Tennessee	ESC	86.9	50.6	36.3	33.2	3.1
Texas	WSC	80.0	47.9	32.1	30.9	1.2
Utah	MTN	111.6	28.9	82.8	78.6	4.1
Vermont	NE	108.7	23.2	85.4	81.1	4.7
Virginia	SA	88.7	42.9	45.8	41.9	3.9
Washington	PAC	91.4	43.2	48.3	42.9	5.4
West Virginia	SA	95.2	39.3	55.9	52.0	3.6
Wisconsin	ENC	103.3	29.5	73.8	71.4	2.4
Wyoming	MTN	100.9	32.3	68.6	63.3	5.3
<b>United States</b>		<b>93.3</b>	<b>34.8</b>	<b>58.5</b>	<b>54.7</b>	<b>3.8</b>

Source: Residential energy consumption data from Energy Information Administration, "State Data: Table S4: Residential Sector Energy Consumption Estimates, 2001," [http://www.eia.doe.gov/emeu/states/sep\\_sum/html/sum\\_btus\\_res.html](http://www.eia.doe.gov/emeu/states/sep_sum/html/sum_btus_res.html). Household data from U.S. Bureau of the Census, "Annual Estimates of Housing Units for the United States and States: April 1, 2000 to July 1, 2004," Publication HU-EST2004-01. at <http://www.census.gov/housing/tables/HU-EST2004-01.xls>.





**FIGURE 7**  
**HOUSEHOLD INCOME VS. AVERAGE LIFE EXPECTANCY**  
**(STATE-WIDE AVERAGES)**



**Sources:**

**Median Household Income:** U.S. Census Bureau, *Current Population Survey, 2001, 2002, and 2003 Annual Social and Economic Supplements*, Last Revised: May 13, 2004, <http://www.census.gov/hhes/income/income02/statemhi.html>. (Income in 2002 dollars.)

**Life Expectancy:** U.S. Census Bureau, Population Division, *Interim State Population Projections, 2005*, "Table 2: Average Life Expectancy at Birth by State for 2000 and Ratio of Estimates and Projections of Deaths: 2001 to 2003," Internet Release Date: April 21, 2005,

**TABLE 6 (part 1 of 2)**  
**MEDIAN 2003 HOUSEHOLD INCOME FOR COUNTIES SERVED BY BIG STONE II**

State	County	Companies Serving	Median Household Income (2003\$)	% of U.S. Income
<b>United States</b>			<b>\$43,318</b>	<b>100.00%</b>
<b>Minnesota (ranked #7 among states)</b>			<b>\$50,750</b>	<b>117.16%</b>
	Becker	GRE, MRE, OTPC	\$38,766	89.49%
	Beltrami	GRE, OTPC	\$35,108	81.05%
	Big Stone	GRE, OTPC, MRE	\$33,003	76.19%
	Brown	CMMP, GRE	\$42,997	99.26%
	Cass	GRE, OTPC	\$37,800	87.26%
	Chippewa	CMMP, GRE, OTPC	\$38,296	88.41%
	Chisago	GRE, SMMP	\$58,543	135.15%
	Clay	GRE, MRE, OTPC	\$41,285	95.31%
	Clearwater	GRE, OTPC	\$32,504	75.04%
	Cook	GRE, SMMP	\$38,633	89.18%
	Cottonwood	CMMP, GRE, MRE	\$35,967	83.03%
	Dodge	CMMP, GRE, SMMP	\$54,603	126.05%
	Douglas	GRE, MRE, OTPC	\$41,908	96.75%
	Faribault	CMMP, GRE, SMMP	\$37,467	86.49%
	Goodhue	CMMP, GRE	\$50,356	116.25%
	Grant	GRE, MRE, OTPC	\$37,199	85.87%
	Jackson	CMMP, GRE, MRE	\$39,102	90.27%
	Kanabec	GRE, SMMP	\$40,974	94.59%
	Kandiyohi	CMMP, GRE, OTPC	\$41,726	96.32%
	Lac qui Parle	GRE, MRE, OTPC	\$34,271	79.11%
	Le Sueur	GRE, SMMP	\$48,139	111.13%
	Lincoln	GRE, HCP, OTPC	\$33,418	77.15%
	Lyon	GRE, HCP, MRE, OTPC	\$41,155	95.01%
	Martin	GRE, HCP, SMMP	\$38,632	89.18%
	McLeod	CMMP, GRE, MRE	\$47,633	109.96%
	Meeker	GRE, SMMP	\$43,308	99.98%
	Mille Lacs	GRE, SMMP	\$39,532	91.26%
	Nicollet	GRE, SMMP	\$46,307	106.90%
	Nobles	GRE, MRE	\$38,237	88.27%
	Olmsted	GRE, SMMP	\$56,721	130.94%
	Otter Tail	GRE, MRE, OTPC	\$37,420	86.38%
	Pope	GRE, OTPC	\$38,563	89.02%
	Redwood	GRE, OTPC, SMMP	\$38,288	88.39%
	Renville	CMMP, GRE	\$39,304	90.73%
	Rock	GRE, MRE	\$40,025	92.40%
	Scott	GRE, SMMP	\$74,001	170.83%
	Stearns	GRE, MRE	\$45,644	105.37%
	Steele	GRE, SMMP	\$48,614	112.23%
	Stevens	GRE, OTPC	\$39,422	91.01%
	Swift	GRE, MRE, OTPC	\$35,543	82.05%
	Todd	GRE, MRE	\$33,659	77.70%
	Wabasha	GRE, SMMP	\$45,028	103.95%
	Wadena	GRE, MRE	\$32,188	74.31%
	Waseca	CMMP, GRE, SMMP	\$43,567	100.57%
	Watsonwan	GRE, HCP, MRE	\$37,014	85.45%
	Wilkin	GRE, MRE, OTPC	\$41,702	96.27%
	Wright	CMMP, GRE	\$60,253	139.09%
	Yellow Medicine	GRE, OTPC	\$36,200	83.57%

**TABLE 6 (part 2 of 2)**  
**MEDIAN 2003 HOUSEHOLD INCOME FOR COUNTIES SERVED BY BIG STONE II**

State	County	Companies Serving	Median Household Income (2003\$)	% of U.S. Income
<b>United States</b>			<b>\$43,318</b>	<b>100.00%</b>
<b>Iowa (ranked #29 among states)</b>			<b>\$42,278</b>	<b>97.60%</b>
	Plymouth	HCP, MRE	\$45,349	104.69%
<b>North Dakota (ranked #39 among states)</b>			<b>\$38,223</b>	<b>88.24%</b>
	Barnes	MRE, OTPC	\$36,372	83.97%
	Burleigh	MDU, OTPC	\$45,634	105.35%
	Dickey	MDU, OTPC	\$33,951	78.38%
	Grand Forks	MRE, OTPC	\$38,686	89.31%
	Kidder	MDU, OTPC	\$28,562	65.94%
	Logan	MDU, OTPC	\$30,857	71.23%
	McLean	MRE, OTPC	\$36,744	84.82%
	Mountrail	MDU, OTPC	\$32,138	74.19%
	Nelson	MRE, OTPC	\$32,365	74.71%
	Pembina	MRE, OTPC	\$39,001	90.03%
	Renville	MDU, OTPC	\$40,359	93.17%
	Traill	MRE, OTPC	\$40,902	94.42%
<b>South Dakota (ranked #40 among states)</b>			<b>\$38,008</b>	<b>87.74%</b>
	Brookings	HCP, MRE, OTPC	\$37,835	87.34%
	Clay	HCP, MRE	\$30,168	69.64%
	Codington	MRE, OTPC	\$39,577	91.36%
	Corson	HCP, OTPC	\$22,683	52.36%
	Grant	MRE, OTPC	\$36,656	84.62%
	Hamlin	HCP, OTPC	\$36,838	85.04%
	Lake	HCP, OTPC	\$38,349	88.53%
	Marshall	HCP, OTPC	\$32,393	74.78%
	Moody	HCP, MRE, OTPC	\$38,055	87.85%

Source: Tabulated from U.S. Census Bureau, *Small Area Income & Poverty Estimates (SAIPE)*:  
*Median household income, in dollars, 2003*, <http://www.census.gov/hhes/www/saie/county.html>.  
 Staff of Otter Tail Power Company identified the counties with communities to be served by Big  
 Stone II.

Code to Company names: CMMP=Central Minnesota Municipal Power, GRE=Great River  
 Energy, HCP=Heartland Consumers Power, MRE=Missouri River Energy, MDU=Montana-  
 Dakota Utilities, OTPC=Otter Tail Power Company, SMMP=Southern Minnesota Municipal  
 Power.

**ANNEX B**

**RESUME OF DANIEL E. KLEIN**



# Twenty-First Strategies

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# RESUME

## DANIEL E. KLEIN

### EDUCATION

1975	M.B.A., Graduate School of Business, Stanford University
1973	S.B., Urban Studies, Massachusetts Institute of Technology

### EXPERIENCE

Daniel E. Klein, President of Twenty-First Strategies, has over 30 years of consulting experience in energy, environmental, and economic analysis. For many years a Senior Vice President and Director of ICF Resources Incorporated, he founded Twenty-First Strategies in 1995 to offer energy and environmental consulting services to energy companies, government agencies, and others.

Over the course of his consulting career, Mr. Klein has conducted hundreds of projects related to energy and environmental concerns, energy markets, electric utility fuel use, coal supply, transportation, and antitrust issues. His work in recent years has focused primarily on climate change, electric power, and related issues, both on policy issues from the government side as well as strategies for the private sector. Mr. Klein earned a Bachelor's degree from MIT and an MBA from the Stanford Graduate School of Business. Selected examples of his recent work include the following:

#### Environmental Policy and Analysis

- ***Global Climate Change and Electric Utilities.*** Mr. Klein has directed efforts with electric utilities and government agencies to develop data and methods for assessing and planning for potential climate change initiatives. These efforts include developing new analytic frameworks for estimating potential impacts on electric power systems, and evaluating risk mitigation strategies. He directed efforts to assist the Administration develop and implement portions of the Climate Change Action Plan in the 1990s, and is continuing a variety of analytic efforts related to the Global Climate Change Initiative. In the electric utility/DOE Climate Challenge program, he was responsible for recruiting new member utilities and for helping measure and report on progress made. He is presently working with electric utilities and others to identify and implement voluntary programs to reduce greenhouse gas emissions as part of their efforts under the Power Partners<sup>SM</sup> program.
- ***Environmental Externalities.*** Mr. Klein has directed several efforts supporting the U.S. Department of Energy in matters related to the use of environmental externalities. For DOE's Fossil Energy office, he directed an assessment of the socioeconomic impacts associated with potential rate increases that may result from the inclusion of externalities in electric power resource planning. He has provided internal critiques and analytic support to efforts to use the damage function approach for quantifying externalities. Working with private sector groups, he has developed a framework for evaluating mortality implications stemming from income effects of changes in power costs, and has used this framework in testimony.
- ***Carbon Sequestration.*** Mr. Klein has provided numerous support efforts to DOE's Carbon Sequestration Program since its inception. He has co-authored over 20 papers and conference presentations communicating the potential for carbon sequestration and DOE's activities in this area. He has additionally co-authored several book chapters and industry journal articles on the

topic. He assisted DOE in its review of the recent draft IPCC Special Report on Carbon Dioxide Capture and Storage. He developed, compiled, and maintains what has become the most comprehensive database of carbon sequestration R&D activities available, and made this available via the Internet at <http://carbonsequestration.us>.

- ***Clean Air Act Analyses.*** In numerous studies for public and private sector clients, Mr. Klein has analyzed the impacts of acid rain mitigation proposals, New Source Performance Standards, NO<sub>x</sub> restrictions, and several other Clean Air Act issues on the electricity, coal, transportation, and labor markets. He developed state-of-the-art approaches for estimating impacts on electric utilities, coal mining, and transportation industries.
- ***Climate Change Mitigation Strategy in Eastern Europe.*** Mr. Klein led the U.S. portion of a multinational team to create a climate change strategy for the city of Donetsk, Ukraine. Under funding provided by U.S. Agency for International Development, Twenty-First Strategies partnered with the Ecology and Environment Department of the Donetsk City Council and the U.S.-based Center for Clean Air Policy. The project developed a GHG inventory for the city of Donetsk, and identified potential GHG mitigation activities and the associated cost and effectiveness.
- ***Utility Coal Combustion By-Products.*** Mr. Klein has analyzed issues related to disposal practices and potential standards for electric utility ash and sludge wastes. These efforts have included estimating past and future waste disposal volumes, identifying current regulatory requirements, and evaluating the costs and other potential impacts of alternative waste management practices. Working with the American Coal Ash Association, Utility Solid Waste Action Group, and others, he has directed studies and made conference presentations concerning beneficial use of coal combustion by-products and associated reductions in greenhouse gas emissions.
- ***Environmental Aspects of Coal Mining and Transportation.*** Mr. Klein has led numerous studies of the impacts of strip mining regulations, fugitive dust limits for surface coal mining, federal coal leasing policies, environmental impacts of rail deregulation, and related issues.
- ***Oil Spill Environmental Impacts.*** On behalf of several Alaskan Native Corporations, Mr. Klein directed litigation support efforts related to the Exxon VALDEZ oil spill. These efforts have included field and technical studies, economic impacts, and impacts on land values.

### **Economic and Market Analysis and Forecasting**

- ***Energy Market Forecasting.*** For 20 years, Mr. Klein directed major portions of ICF Resources' extensive efforts in forecasting short- and long-term conditions in the fuel and power markets. He developed forecasting methodologies and related data bases, developed and enhanced ICF's Coal and Electric Utilities Model, and designed its successor models. These models and methodologies were used in dozens of market and strategic studies for private clients and policy analyses for the public sector.
- ***Antitrust Market Analysis.*** In major antitrust cases, Mr. Klein has served as an expert witness in the identification of relevant coal and transportation markets. In work with the Department of Justice and major coal companies, he tested and implemented new market delineation techniques based upon demand cross-elasticities; this work currently serves as the basis for Department of Justice policy. Mr. Klein has also testified as a witness before the ICC on issues regarding railroad transportation markets, and in private antitrust cases.
- ***Energy and Mineral Appraisals.*** Rapid swings in energy and minerals markets over the past two decades have led to sharp changes in the value of reserves and producing operations. Appraisals have often been needed to set property values at different points in time for tax basis determination, prudence of procurement decisions, losses resulting from federal takings, property tax assessments,

and other purposes. Mr. Klein has led numerous projects relating to reconstructing appraisals appropriate to past market conditions and knowledge. These efforts have included oil, gas, coal, geothermal, and various metals and mineral properties.

## **Energy and Transportation Issues**

- ***Adequacy of Energy Data.*** Mr. Klein is a recognized expert on the use and misuse of coal and other energy data, particularly as they apply to modeling and forecasting efforts. He has developed new approaches toward incorporating disparate sources of information, and has been published at length on the pitfalls of using public data. For the Department of Justice, Mr. Klein directed the development of the coal reserve data base now used in DOJ's competition review procedures.
- ***Federal Coal Leasing Policies.*** In several studies for public and private sector clients, Mr. Klein has evaluated impacts of leasing moratoriums, approaches to determining levels of leasing, concepts of fair market value, impacts of diligence and royalty requirements, and many other aspects of this complex regulatory program. He testified as an expert witness before the Commission on Fair Market Value Policy for Federal Coal Leasing.
- ***Transportation Policy.*** Mr. Klein has led studies evaluating impacts of rail rate deregulation, economic and energy impacts of coal slurry pipelines, railroad leasing of federal coal, coal transportation costs for different modes, and many others. In efforts with DOE, he conducted studies of the effects of the Staggers Rail Act on coal and electricity markets. He has testified before the Interstate Commerce Commission on market dominance issues.
- ***Transportation Strategies.*** Mr. Klein has worked with shippers to formulate strategies for enhancing their competitive alternatives and improving their bargaining position. Working with carriers, law firms, investment bankers, and others, he has developed market forecasts of rail traffic and revenues, analyzed impacts of economic and legislative uncertainties, and helped to develop approaches for enhancing market share and contribution.

## **SELECTED PUBLICATIONS AND PRESENTATIONS**

- “Climate Vision, Power Partners<sup>SM</sup>, & GHG Activities for Public Power,” presented to the American Public Power Association seminar on “Climate Change: Making Community-Based Decisions in a Carbon-Constrained World,” Washington DC, Feb. 28, 2006.
- “New Developments in Carbon Capture and Storage” (co-authored with Sean Playsynski, DOE/NETL), presented at the 9th Electric Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson, Arizona, January 23-25, 2006.
- “Prospects for Participation of Methane Sectors in Emissions Trading Programs in California,” prepared for the Center for Clean Air Policy, October 2005, [http://www.climatechange.ca.gov/documents/2005-10-14\\_CCAP\\_REPORTS/CCAP\\_REPORT\\_METHANE.PDF](http://www.climatechange.ca.gov/documents/2005-10-14_CCAP_REPORTS/CCAP_REPORT_METHANE.PDF)
- “Suitability of Methane Sources for Greenhouse Gas Emissions Trading,” prepared for the Center for Clean Air Policy, Washington D.C. Draft report dated August 2005; report publication upcoming.
- “New Developments in DOE’s Carbon Sequestration Program” (co-authored with Robert L. Kane, DOE), presented at the 8th Electric Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson, Arizona, January 24-26, 2005.
- “Climate VISION Update: Policy Drivers for Climate Change and Energy Security” (co-authored with David Berg, DOE), presented at the 8th Electric Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson, Arizona, January 24-26, 2005.



- “CCP Use and Their Impact on Greenhouse Gases,” presented to American Coal Ash Association, Canadian Industries Recycling Coal Ash, Midwest Coal Ash Association, Dearborn, Michigan, June 8, 2004.
- “Climate VISION & the Administration’s Global Climate Change Initiative” (co-authored with David Berg, DOE), presented at the 7th Electric Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson, Arizona, January 20-22, 2004.
- “Estimating GHG Savings from Use of Coal Combustion Products: Methodology & Results for 2000-2001” (co-authored with James Roewer, Utilities Solid Waste Action Group (USWAG)), presented at the 7th Electric Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson, Arizona, January 20-22, 2004.
- “DOE’s Carbon Sequestration Program and New Directions for Meeting Global Climate Change Goals” (co-authored with Robert L. Kane, DOE), presented at Combustion Canada ’03, Vancouver, British Columbia, Canada, September 21-24, 2003.
- “Database of Carbon Sequestration R&D Projects in the U.S.” (co-authored with Robert L. Kane, DOE), presented at 2nd Annual Conference on Carbon Sequestration, May 5-8, 2003, Alexandria, Virginia.
- “Incorporating Mortality Reductions From Use of Low-Cost Power into Evaluations of Externality Proposals,” presented at the Valuing Externalities Workshop, U.S. Dept. of Energy National Energy Technology Laboratory, Alexandria VA, Feb. 20-21, 2003,  
<http://www.netl.doe.gov/publications/proceedings/03/valuing-ext/Klein.pdf>.
- “Mortality Reductions from Use of Low-Cost Coal-Fueled Power: An Analytical Framework,” presented at the 6th Electric Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson, Arizona, January 27-29, 2003.
- “DOE’s Carbon Sequestration Program and New Directions for Meeting Global Climate Change Goals” (co-authored with Robert L. Kane, DOE), presented at the 6th Electric Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson, Arizona, January 27-29, 2003.
- “Mortality Reductions from Use of Low-Cost Coal-Fueled Power: An Analytical Framework” (co-authored with Ralph L. Keeney, Duke University Fuqua School of Business), prepared for the Center for Energy and Economic Development, *et al.*, December 2002,  
<http://www.ccednet.org/kkhealth/index.asp>.
- “Carbon Sequestration: An Option for Mitigating Global Climate Change” (co-authored with Robert L. Kane, DOE), published as Chapter 6 in *Environmental Challenges and Greenhouse Gas Control for Fossil Fuel Utilization in the 21<sup>st</sup> Century*, edited by M. Mercedes Maroto-Valer, Chunshan Song, and Yee Soong, New York: Kluwer Academic/Plenum Publishers, 2002.
- “A Database of Carbon Sequestration R&D Projects in the U.S.” (co-authored with Robert L. Kane, DOE), presented at the 5th Electric Utilities Environmental Conference: Air Quality, Global Climate Change, Renewable Energy & Emergency Response, Tucson, Arizona, January 22-25, 2002.
- “Carbon Sequestration: An Option for Mitigating Global Climate Change” (co-authored with Robert L. Kane, DOE), published in *Chemical Engineering Progress*, June 2001, pp. 44-52.
- “Opportunities for Advancements in Chemical Processes in Carbon Sequestration and Climate Change Mitigation” (co-authored with Robert L. Kane, DOE), presented at the American Chemical Society 221<sup>st</sup> Annual Meeting, San Diego California, April 4, 2001.
- “Carbon Sequestration: A Third Pathway for Mitigating Global Climate Change” (co-authored with Robert L. Kane, DOE), presented at the Electric Utilities Environmental Conference, Tucson, Arizona, January 8-12, 2001.

- “CO<sub>2</sub> Sequestration: Expanding Our Options for Mitigating Global Climate Change” (co-authored with Robert L. Kane, DOE), presented at the 93rd Annual Meeting and Exhibition of the Air & Waste Management Association, Salt Lake City, Utah, June 2000.
- “Environmental Benefits of Fossil Energy Technologies and Importance for Future Carbon Mitigation Costs” (co-authored with Robert L. Kane, DOE), presented at Combustion Canada '99: Combustion and Global Climate Change, Canada's Challenges and Solutions, Calgary, Alberta, Canada, May 26-28, 1999.
- “CO<sub>2</sub> Sequestration: Opportunities and Challenges” (co-authored with Robert L. Kane, DOE, and Howard J. Herzog, MIT Energy Laboratory), presented at Combustion Canada '99: Combustion and Global Climate Change, Canada's Challenges and Solutions, Calgary, Alberta, Canada, May 26-28, 1999.
- “Climate Challenge Program: Lessons Learned and Prospects for the Future” (co-authored with Daniel R. Cleverdon, Cadmus Group Inc.), presented at Combustion Canada '99: Combustion and Global Climate Change, Canada's Challenges and Solutions, Calgary, Alberta, Canada, May 26-28, 1999.
- “Coal Mine Methane: Opportunities for Low-Cost Zero-GHG Power” (co-authored with Paul Teske, MCNIC Oil & Gas Co.), presented at Combustion Canada '99: Combustion and Global Climate Change, Canada's Challenges and Solutions, Calgary, Alberta, Canada, May 26-28, 1999.
- “Buyer vs. Seller Liability in International Emissions Trading,” presented at the CCAP International Emissions Trading Dialog Group, Toronto, Ontario, Canada, March 4, 1999.
- “Fossil Energy-Related Greenhouse Gas Control Strategies and Associated Environmental Benefits” (co-authored with Robert L. Kane, DOE), presented at the Electric Utilities Environmental Conference: Science, Regulations & Impacts of SO<sub>2</sub>, CO<sub>2</sub>, O<sub>3</sub>, NO<sub>x</sub> & Mercury, Tucson AZ, January 11-13, 1999.
- “Western Utilities' Outlook for Greenhouse Gas Emissions and Options for Achieving Reductions” (co-authored with Dr. Prabhu Dayal, Tucson Electric Power Co.), presented at the Electric Utilities Environmental Conference: Science, Regulations & Impacts of SO<sub>2</sub>, CO<sub>2</sub>, O<sub>3</sub>, NO<sub>x</sub> & Mercury, Tucson AZ, January 11-13, 1999.
- “Coal Mine Methane Capture in Southwestern Virginia” (co-authored with Paul Teske, MCNIC Oil & Gas Co.), presented at the Air & Waste Management Association's Second International Specialty Conference on Global Climate Change, Crystal City VA, October 13-16, 1999.
- “Global Climate Change: The Road to Kyoto,” (co-authored with C.V. Mathai, Arizona Public Service Co., and Nikhil Desai), published in EM Magazine, a publication of the Air & Waste Management Association, November 1997.
- “Managing the Climate Change Risks in a Restructuring Electric Utility Industry” (co-authored with Robert L. Kane, DOE), presented at the International Climate Change Conference & Technologies Exhibition, Baltimore MD, June 12-13, 1997.
- “Voluntary Programs to Reduce GHG Emissions: Cross-National Perspectives” (co-authored with Robert L. Kane, DOE), presented at the 90th Annual Meeting and Exhibition of the Air & Waste Management Association, Toronto, Ontario, Canada, June 8-13, 1997.
- “Coal Mine Methane: New Market Opportunities for Power and Gas Providers,” presented at the USEPA conference “Deregulation and New Coalbed Methane Opportunities,” Pittsburgh, PA, April 22, 1997.
- “Interactions Between Greenhouse Gas Policies and Acid Rain Control Strategies” (co-authored with Robert L. Kane and Larry Mansueti, DOE), presented at the Air & Waste Management Association's Acid Rain and Electric Utilities II Conference, Scottsdale, AZ, January 21-22, 1997.

- “Climate Change, Voluntary Programs, and Risk Management in a Restructuring Industry” (co-authored with Robert L. Kane, DOE), presented at the International Association for Energy Economics 11th Annual North American Conference, Boston, Massachusetts, October 28, 1996.
- “United States Strategy for Mitigating Global Climate Change” (co-authored with Robert L. Kane, DOE), presented at the Third International Conference on Carbon Dioxide Removal, Boston, Massachusetts, September 9, 1996.
- “Climate Challenge: Relating Electric Utility Voluntary Actions to National Goals” (co-authored with Robert L. Kane, DOE), presented at the 89th Annual Meeting and Exhibition of the Air & Waste Management Association, Nashville, Tenn., June 23-28, 1996.
- “Meeting the Climate Change Challenge: Climate-Related Activities of the U.S. Department of Energy's Office of Fossil Energy” (co-authored with Robert L. Kane, DOE, and Steven Reich, ICF), presented at the 18th IAEE International Conference, Washington DC, July 5-8, 1995.
- “Trends in Greenhouse Gas Emissions in the U.S. and Potential Future Outlook” (co-authored with Robert L. Kane, DOE, and Steven Winkelman, ICF), presented at the 88th Annual Meeting and Exhibition of the Air & Waste Management Association, San Antonio, Texas, June 18-23, 1995.
- “The Challenge of Climate Change: A Progress Report on the Potential for Voluntary Industry-Government Partnerships to Reduce Greenhouse Gas Emissions” (co-authored with Robert L. Kane, DOE, and Nikhil Desai, ICF), presented at the 88th Annual Meeting and Exhibition of the Air & Waste Management Association, San Antonio, Texas, June 18-23, 1995.
- “Further Opportunities for Coal Combustion Byproducts to Reduce Greenhouse Gas Emissions” (co-authored with Samuel S. Tyson, ACAA, and Steven Winkelman, ICF), presented at the CCB Management and Use Workshop, Memphis, Tennessee, April 17-19, 1995.
- “Climate Change and New Opportunities for Coal Combustion Byproducts” (co-authored with Samuel S. Tyson, ACAA), presented at the 11th International Symposium on Use & Management of Coal Combustion Byproducts, Orlando, Florida, January 15-19, 1995.
- “Full Consideration of Externalities” (co-authored with David Kathan, ICF), presented to the NARUC - DOE Fifth National Integrated Resource Planning Conference, May 1994.
- “Greenhouse Gas Emission Reduction Options and Strategies” (co-authored with Robert L. Kane, DOE), presented to the Air & Waste Management Association International Specialty Conference on Global Climate Change: Science, Policy, and Mitigation Strategies, Phoenix, Arizona, April 1994.
- “The Dynamic Energy & Greenhouse Emission Evaluation System (DEGREES)” (co-authored with Ira H. Shavel, et. al.), presented to the 15th Annual North American Conference, International Association for Energy Economics, Seattle, Washington, October 1993.
- “Carbon Taxes and Carbon Limits Are Not the Same” (co-authored with Ira H. Shavel, David J. Doyle, and Jerry L. Golden), presented to the 15th Annual North American Conference, International Association for Energy Economics, Seattle, Washington, October 1993.
- “Impacts of Including Externalities in National Electric Utility Planning” (co-authored with David Kathan, ICF), presented to the 15th Annual North American Conference, International Association for Energy Economics, Seattle, Washington, October 1993.
- “Marketing Gas to Future Electricity Producers More Than Writing Purchase Orders” (co-authored with B. Venkateshwara, ICF), published in *Natural Gas*, July 1988.
- “New Competition for the Railroads,” published in *The Journal of Commerce*, May 1, 1986.

- “Lower Sulfur Coals as a Means of Reducing Sulfur Dioxide Emissions,” presented to the First International Conference on Acid Rain: Regulatory Aspects and Engineering Solutions, published in *Power Magazine*, Washington, D.C., March 1984.
- “Forecasting Employment Impacts of Acid Rain Control Programs,” presented to Resources for the Future Symposium, Washington, D.C., December 1983.
- “Adequacy of Low-Sulfur Coal Supplies for Meeting Acid Rain Requirements,” presented to the Air Pollution Control Association, 76th Annual Meeting and Exhibition, Atlanta, Georgia, June 1983.
- “The Outlook for Coal in the Next Twenty Years” (co-authored with C. Hoff Stauffer, Jr., ICF), presented to the Electric Power Research Institute Fuels Supply Seminar, Memphis, Tennessee, December 1981, published in *Selected Papers on Fuel Forecasting and Analysis*, EPRI EA-3015, May 1983.
- “Relationship of Coal and Oil Prices” (co-authored with C. Hoff Stauffer, Jr., ICF), December 1981, published in *Selected Papers on Fuel Forecasting and Analysis*, EPRI EA-3015, May 1983.
- “Effects of Resource Depletion on Future Coal Prices,” presented to the Electric Power Research Institute Fuels Supply Seminar, St. Louis, Missouri, October 1982, published in *Proceedings: Fuel Supply Seminars*, EPRI EA-2994, March 1983.
- “Coal Market Forecasts, the Clean Air Act, and Effects on Western Coal Production,” presented to the Western Interstate Energy Board, Santa Fe, New Mexico, May 1982.
- “National and Regional Coal Reserves Information for Planning and Policy: The Problems,” presented to the Electric Power Research Institute Workshop on Applied Coal Geoscience and the Electric Utilities, Austin, Texas, November 1981.
- “Coal Supply, Demand, and Transportation,” presented to the Coal Week/Energy Bureau Conference on Coal Transportation, Arlington, Virginia, October 1980.

## SELECTED REPORTS

- “Mortality Reductions from Use of Low-Cost Coal-Fueled Power: An Analytical Framework” (co-authored with Ralph L. Keeney, Research Professor, Duke University Fuqua School of Business), prepared for the Center for Energy and Economic Development, *et al.*, December 2002.
- “Suitability of Methane Sources for Emissions Trading,” prepared for the Center for Clean Air Policy, publication forthcoming.
- “Climate Challenge Program Report” (co-authored with Princeton Economic Research, Inc.), U.S. Department of Energy Publication DOE/FE-0355, December 1996.  
<http://www.eere.energy.gov/climatechallenge/progressreport/titlpg.htm>.
- “Increased Fly Ash Use Under the Climate Challenge Program: A Summary of Participation Accords Between the Electric Utilities and the U.S. Department of Energy,” prepared for American Coal Ash Association, January, 1996
- “Economic Impacts of Climate Change Policies on TVA,” submitted to the Tennessee Valley Authority, June 1993.
- “Coal Combustion Waste Management Study”, submitted to Department of Energy, Office of Fossil Energy, February, 1993.
- “Screening Analysis of H.R. 2663: ‘CO<sub>2</sub> Offsets Policy Efficiency Act of 1991’”, submitted to Department of Energy, Office of Fossil Energy, January 1992.
- “Assessment of Greenhouse Gas Emissions Policies of the Electric Utility Industry: Costs, Impacts, and Opportunities,” submitted to the Edison Electric Institute, January 1992.

“Low Sulfur Coal Markets: Past and Future,” submitted to the Alliance for Clean Energy, October 1987.

“Analysis of Issues Associated with Railroad Control of Coal,” submitted to Rocky Mountain Energy, May 1986.

“Analysis of Cost-Effective, Phased-In Reductions of Sulfur Dioxide Emissions,” submitted to the Alliance for Clean Energy, February 1984.

“The Effect on Producer Surplus of Increasing Coal Prices in Various Western Coal-Producing Regions,” submitted to the Department of Justice, February 1982.

“Potential Impacts of Overleasing and Underleasing of Federal Coal,” submitted to the U.S. Department of Energy, August 1981.

“An Examination of Lognormality of Coal Seam Thickness,” September 1980.

“Coal and Electric Utilities Model Documentation,” submitted to the Environmental Protection Agency, May 1980.

“Concepts and Issues in Discounted Cash Flow Analysis for Estimating Fair Market Value for Federal Coal,” submitted to the Department of Interior, April 1980.

“Coal Resource Information, Volume 3: Case Studies in Evaluating the Adequacy of Information,” submitted to the Electric Power Research Institute, EPRI EA-673 Vol. 3, March 1980.

“The Potential Energy and Economic Impacts of Coal Slurry Pipelines,” submitted to the Department of Energy, January 1980.

“Observations on Fair Market Value for Federal Coal Leases,” submitted to the Fair Market Value Task Force, Department of Interior, December 1979.

“The Demand for Western Coal and Its Sensitivity to Key Uncertainties,” submitted to the Departments of Interior and Energy, September 1978.

“Economic Considerations in Industrial Boiler Fuel Choice,” submitted to the Congressional Budget Office, June 1978.

“Energy and Economic Impacts of H.R. 13950 (Surface Mining Control and Reclamation Act of 1976),” submitted to the Council on Environmental Quality and U.S. EPA, September 1977.

## **EXPERT TESTIMONY**

Pre-Filed Rebuttal Testimony on behalf of the Center for Energy and Economic Development, regarding the human costs associated with the higher costs of replacement power, before the Public Utilities Commission of the State of California, Docket No. A.02-05-046, “Application of Southern California Edison Company (U 338-E) Regarding the Future Disposition of the Mohave Generating Station,” May 2003.

Supplemental Declaration on behalf of the UMWA Health and Retirement Funds analyzing low-volatile metallurgical coal markets and market power potential, before the U.S. District Court for the District of Columbia, Joseph P. Connors, Sr. et al. v. Island Creek Corp, Drummond Coal Co., et al., C.A. Nos. 87-1210-SSH and 87-1973-SSH, October 23, 1995.

Declaration and Deposition on behalf of UMWA Health and Retirement Funds regarding relationships between contribution rates to the Funds and coal market prices, and changes in U.S. coal industry structure, before the U.S. District Court for the District of Columbia, In re: United Mine Workers of America Employee Benefit Plans Litigation, Master File No. MDL 886, May-October, 1994.

Declaration on behalf of UMWA Health and Retirement Funds regarding relationships between contribution rates to the Funds and coal market prices, and changes in U.S. coal industry structure, before the

U.S. District Court for the District of Columbia, Joseph P. Connors, Sr. et al. v. Island Creek Corp, Drummond Coal Co., et al., C.A. Nos. 87-1210-SSH and 87-1973-SSH, March 16, 1994.

Testimony on behalf of the UMWA Health and Retirement Funds regarding trends in coal production, union market shares, and sensitivity to changes in union costs, before the U.S. District Court, Western District of Virginia, Lena Pearl McGlothlin et al. v. Joseph P. Connors et al., Civil Action No. 92-0022-A, April 1, 1992.

Declaration and Deposition on behalf of the UMWA Health and Retirement Funds regarding past trends and forecasts of coal production, productivity, and labor-hours for specific companies and for all UMWA mines, in the U.S. District Court for the District of Columbia, In Re: United Mine Workers of America Employee Benefit Plans Litigation, Multidistrict Litigation No. 886 CA. No. 88-0969-TH, February-March 1992.

Affidavits on behalf of Whitney Benefits Inc. relating to federal coal leasing, western coal markets, and royalty rates, before the United States Claims Court, Whitney Benefits Inc. and Peter Kiewit Sons' Co. v. United States of America, No. 499-83L, February-March, 1992.

Deposition on behalf of Chugach Alaska Corporation and subsidiaries regarding methodology and findings of coal property valuation, before the U.S. Bankruptcy Court for the District of Alaska, Case Nos. 91-00207-3-DMD through 91-00211-3-DMD, August 27, 1991.

Declarations on behalf of the UMWA Health and Retirement Funds regarding trends in coal markets, mining productivity, and union status, before the U.S. District Court for the District of Columbia, Civil Actions Nos. 89-1744 and 90-0674, March 1990 - January 1992.

Deposition on behalf of Kansas City Southern Industries relating to markets for coal transportation and to the competitive viability of coal slurry pipelines, ETSI Pipeline Project et al. v. Burlington Northern, Inc. et al., Civil Action Number B-84-979-CA, U.S. District Court for the Eastern District of Texas, Beaumont Division, November 29-30, 1988.

Testimony and Verified Statements before the Interstate Commerce Commission on behalf of Consolidated Rail Corporation, relating to railroad market dominance issues, I.C.C. No. 37931S, August-November 1987.

Testimony before the Commission on Fair Market Value Policy for Federal Coal Leasing, regarding valuation concepts for federal coal leasing, September 7, 1983.

Testimony and Verified Statement of behalf of Consolidated Edison Company of New York, Inc. before the State of New York Department of Environmental Conservation, regarding low sulfur coal reserves and production, UPA #20-81-0020 (Ravenswood Coal Conversion) and UPA #20-81-0009 (Arthur Kill Coal Conversion), January-February 1983.

Testimony and Deposition on behalf of Mead Corporation regarding metallurgical coal markets in the U.S., Mead Corporation v. Occidental Petroleum Corporation, Civil Action No. C-3-78-268, U.S. District Court for the Southern District of Ohio, November 1978.

Testimony before the U.S. Subcommittee on Public Lands and Resources of the Committee on Energy and Natural Resources, related to energy and economic impacts of the Surface Mining Control and Reclamation Act of 1976, May 11, 1977.

## **EMPLOYMENT HISTORY**

Twenty-First Strategies, LLC	President	1995-present
ICF Resources Incorporated	Senior Consultant	1995-1997
	Senior VP & Director	1988-1995
ICF Incorporated	Vice President	1980-1988

City of Palo Alto, California	Associate—Project Manager	1975-1980
Federal Energy Administration,	Operations Analyst	1974-1975
Office of Data Policy	Data Analyst	1974
Atlanta (GA) Board of Education	Systems Programmer	1970-1973