Appendix C

Detailed NEMS Assumptions for the CECA Competitive Case

Appendix C

Detailed NEMS Assumptions for the CECA Competitive Case

This appendix contains detailed tables providing the values for the assumptions discussed in Chapter 2. A brief discussion is also provided for each table. For more detailed information on what the values mean and how they are used, please refer to the NEMS electricity model documentation available on EIA's web site at http://www.eia.doe.gov/bookshelf/docs.html.

Cost of Capital

Table C1 gives the cost of capital values used in capacity expansion decisions. The capital costs for all new plants are assumed to be recovered over 20 years.

Table C1. Cost of Capital
(Percent)

Assumption	Utilities	Exempt Wholesale Generators
	CECA Reference Case	
Debt Fraction	0.49-0.661	0.65
Return on Debt	0.10	0.08
Return on Equity	0.10-0.142	0.16
	CECA Competitive Case	
Debt Fraction	0.49-0.661	0.60
Return on Debt	0.10	0.08
Return on Equity	0.10-0.142	0.18

Source: U.S. Department of Energy, *Supporting Analysis for the Comprehensive Electricity Competition Act*, DOE/PO-0059 (Washington, DC, May 1999).

Annual Renewable Portfolio Share Required

Table C2 gives the annual nonhydroelectric renewable portfolio standard requirement in the CECA Competitive case for the years 2000 to 2020. The shares used are equivalent to those used in the *Supporting Analysis*, which increase more rapidly between 2000 and 2005 than is required in the proposed Comprehensive Electricity Competition Act.

Table C2. Annual Nonhydroelectric Renewable Portfolio Share
(Percent)

Year	Share	Year	Share
2000	2.2	2006	6.1
2001	4.2	2007	6.4
2002	4.7	2008	6.7
2003	5.1	2009	7.1
2004	5.5	2010-2015	7.5
2005	5.8		

Source: U.S. Department of Energy, *Supporting Analysis for the Comprehensive Electricity Competition Act*, DOE/PO-0059 (Washington, DC, May 1999).

Plant Outage Improvements

Table C3 gives a description of the plant types. Table C4 shows the planned and forced outage rates, capacity credit and maximum capacity factors used for each plant type in the CECA Reference and Competitive cases.

Table C3. Plant Types

Plant Type	Plant Type Name
XL	Unscrubbed Coal Steam: Low Sulfur
XM	Unscrubbed Coal Steam: Medium Sulfur
XH	Unscrubbed Coal Steam: High Sulfur
SE	Existing Scrubbed Coal
SR	Retrofit Scrubbed Coal
PC	New Scrubbed Pulverized Coal
IG	Advanced Coal (IGCC)
IS	Advanced Coal with Sequestration
ST	Oil/Gas Steam
ET	Existing Turbine
CT	New Combustion Turbine
AT	New Advanced Turbine
EC	Existing Oil/Gas Combined Cycle
CC	New Combined Cycle
AC	New Advanced Combined Cycle
CS	New Advanced CC with Sequestration
FC	Fuel Cell
CN	Nuclear
AN	Advanced Nuclear
WD	Biomass / Wood
MS	Municipal Solid Waste

Source: U.S. Department of Energy, *Supporting Analysis for the Comprehensive Electricity Competition Act*, DOE/PO-0059 (Washington, DC, May 1999).

Table C4. Plant Outage Rates
(Percent)

Plant Type	CECA Reference Case				CECA Competitive Case			
	Forced Outage Rate	Planned Outage Rate	Capacity Credit	Maximum Capacity Factor	Forced Outage Rate	Planned Outage Rate	Capacity Credit	Maximum Capacity Factor
XL	6.00	10.10	100.00	84.60	3.90	7.60	100.00	88.80
XM	6.00	10.10	100.00	84.60	3.90	7.60	100.00	88.80
XH	6.00	10.10	100.00	84.60	3.90	7.60	100.00	88.80
SE	6.00	10.10	100.00	84.60	3.90	7.60	100.00	88.80
SR	6.00	10.10	100.00	84.60	3.90	7.60	100.00	88.80
PC	6.00	10.10	100.00	84.60	3.90	7.60	100.00	88.80
IG	6.00	10.10	100.00	84.60	3.90	7.60	100.00	88.80
IS	6.00	10.10	100.00	84.60	3.90	7.60	100.00	88.80
ST	6.00	10.10	100.00	84.60	3.90	7.60	100.00	88.80
ET	3.60	4.10	100.00	92.40	3.60	4.10	100.00	92.40
CT	3.60	4.10	100.00	92.40	3.60	4.10	100.00	92.40
AT	3.60	4.10	100.00	92.40	3.60	4.10	100.00	92.40
EC	5.50	4.10	100.00	90.60	5.50	4.10	100.00	90.60
CC	5.50	4.10	100.00	90.60	5.50	4.10	100.00	90.60
AC	5.50	4.10	100.00	90.60	5.50	4.10	100.00	90.60
CS	5.50	4.10	100.00	90.60	5.50	4.10	100.00	90.60
FC	7.40	1.90	100.00	87.00	7.40	1.90	100.00	87.00
CN	8.20	11.50	100.00	80.00	8.20	11.50	100.00	80.00
AN	3.80	6.10	100.00	85.00	3.80	6.10	100.00	85.00
WD	0.00	8.20	80.00	80.00	0.00	8.20	80.00	80.00
MS	0.00	0.00	78.00	78.00	0.00	0.00	78.00	78.00

Source: U.S. Department of Energy, *Supporting Analysis for the Comprehensive Electricity Competition Act*, DOE/PO-0059 (Washington, DC, May 1999).

Plant Heatrate Improvements

Table C5 gives the assumed target heatrates from the *Supporting Analysis* used in the NEMS CECA Competitive case. In the *Supporting Analysis* each existing plant was assumed to improve toward the target for its plant group. The improvement occurs over the period 1998 to 2010. Each plant (or plant group) is assumed to improve by 60 percent of the difference between its current heatrate and its group target. To put these values in context, the current average heatrates for coal plants falling into the Coal Steam Pre-1965 category is 12,128 Btu per kilowatthour. As a result, the 10,300 Btu per kilowatthour target is 15 percent below the current average.

Table C5. Heatrate Targets
(Btu per Kilowatthour)

Plant Type (NEMS Acronym and Name)	Target Heatrate
COU: Coal Steam pre 1965	10,300
CSU: Coal Steam post-1965	9,500
CSC: Coal Steam with Scrubber	9,500
CNC: New Coal Steam	9,600
CAV: New Advanced Coal	9,600
CAS: New Advanced Coal with Sequestration	9,600
STO: Oil Steam	11,000
STG: Gas Steam	11,000
STX: Oil/Gas Steam	11,000
CTO: Oil Turbine	12,500
CTG: Gas Turbine	12,500
CTX: Oil/Gas Turbine	12,500
ACT: Advanced Turbine	12,500
CCO: Oil Combined Cycle	9,000
CCG: Gas Combined Cycle	9,000
CCX: Oil/Gas Combined Cycle	9,000
ACC: Advanced Combined Cycle	9,000
ACS: Advanced Combined Cycle With Sequestration	9,000
FCG: Fuel Cell	9,000

Source: U.S. Department of Energy, *Supporting Analysis for the Comprehensive Electricity Competition Act*, DOE/PO-0059 (Washington, DC, May 1999).

Plant Operations and Maintenance Cost Improvements

Table C6 gives the targets for fixed operation and maintenance costs from the *Supporting Analysis* that were used in the NEMS CECA Competitive case. The improvement occurs over the period 1998 to 2010. Each plant (or plant group) is assumed to improve by a percentage (given in the "Percent to Target" column below) of the difference between its current heatrate and its group target.

Table C6. Fixed Operations and Maintenance Cost
(1987 Dollars per Kilowatt per Year)

Plant Type (NEMS Acronym and Name)	Fixed O&M Target	Percent to Target
COU: Coal Steam pre 1965	12	75
CSU: Coal Steam post-1965	12	75
CSC: Coal Steam with Scrubber	12	75
CNC: New Coal Steam	12	75
CAV: New Advanced Coal	12	75
CAS: New Advanced Coal with Sequestration	12	75
STO: Oil Steam	6	50
STG: Gas Steam	6	50
STX: Oil/Gas Steam	6	50
CTO: Oil Turbine	2	50
CTG: Gas Turbine	2	50
CTX: Oil/Gas Turbine	2	50
ACT: Advanced Turbine	2	50
CCO: Oil Combined Cycle	4	90
CCG: Gas Combined Cycle	4	90
CCX: Oil/Gas Combined Cycle	4	90
ACC: Advanced Combined Cycle	4	90
ACS: Advanced Combined Cycle With Sequestration	4	90
FCG: Fuel Cell	4	90
CNU: Conventional Nuclear	50	75
ANC: Advanced Nuclear	50	75

Source: U.S. Department of Energy, *Supporting Analysis for the Comprehensive Electricity Competition Act*, DOE/PO-0059 (Washington, DC, May 1999).

Transmission and Distribution Service Cost Improvements

Table C7 provides the factors used to adjust transmission and distribution services to match the cost improvements assumed in the *Supporting Analysis.* These factors were incorporated in the NEMS CECA Competitive case.

Table C7. Transmission and Distribution Service Cost Adjustment Factors

Year	Transmission	Distribution
2000	1.000	1.000
2001	0.993	0.985
2002	0.985	0.971
2003	0.978	0.956
2004	0.971	0.942
2005	0.963	0.928
2006	0.956	0.914
2007	0.949	0.901
2008	0.942	0.888
2009	0.935	0.875
2010-2015	0.928	0.862

Source: U.S. Department of Energy, *Supporting Analysis for the Comprehensive Electricity Competition Act*, DOE/PO-0059 (Washington, DC, May 1999).

Demand Reductions From Energy Efficiency Investments

Table C8 provides the electricity demand reductions assumed in the *Supporting Analysis* and incorporated in the NEMS CECA Competitive case. These result from investments in energy efficiency using the CECA Federal Public Benefits Fund.

Table C8. Energy Efficiency Demand Savings
(Billion Kilowatthours)

Year	Residential Sector	Commercial Sector	Industrial Sector	Total
2000	2.9	4.5	3.2	**10.7**
2001	6.1	9.4	6.7	**22.2**
2002	9.4	14.3	10.1	**33.7**
2003	12.6	19.1	13.6	**45.2**
2004	15.8	24.0	17.0	**56.8**
2005	19.0	28.9	20.5	**68.3**
2006	23.0	35.8	25.3	**84.1**
2007	27.1	42.7	30.1	**99.8**
2008	31.2	49.6	34.9	**115.6**
2009	35.2	56.5	39.7	**131.4**
2010	39.3	63.4	44.5	**147.2**
2011	39.9	64.3	45.0	**149.2**
2012	40.6	65.1	45.5	**151.1**
2013	41.2	66.0	46.0	**153.1**
2014	41.8	66.8	46.5	**155.1**
2015	42.4	67.7	47.0	**157.1**

Source: U.S. Department of Energy, *Supporting Analysis for the Comprehensive Electricity Competition Act*, DOE/PO-0059 (Washington, DC, May 1999).

Cogeneration

Tables C9 and C10 provide the incremental cogeneration assumed in the *Supporting Analysis* and incorporated in the NEMS CECA Competitive case.

Table C9. Incremental Commercial Sector Cogeneration
(Billion Kilowatthours)

Fuel	2000	2005	2010	2015
Natural Gas	0.4	4.1	24.1	27.9
Distillate	0.1	0.7	3.9	4.5
Residual Oil	0.0	0.0	0.0	0.0
LPG	0.0	0.0	0.0	0.0
Coal	0.2	1.6	9.3	10.8
MSW	0.1	0.5	2.9	3.4
Total	**0.7**	**6.8**	**40.2**	**46.6**

Source: U.S. Department of Energy, *Supporting Analysis for the Comprehensive Electricity Competition Act*, DOE/PO-0059 (Washington, DC, May 1999).

Table C10. Incremental Industrial Sector Cogeneration
(Billion Kilowatthours)

Type	2000	2005	2010	2015
Sales to Grid	0.6	4.8	11.7	14.9
Own Use	3.1	23.9	58.0	74.6
Total	**3.7**	**28.8**	**69.7**	**89.5**

Note: All incremental industrial sector cogeneration is assumed to be gas fired.
Source: U.S. Department of Energy, *Supporting Analysis for the Comprehensive Electricity Competition Act*, DOE/PO-0059 (Washington, DC, May 1999).

Appendix D

NEMS/EMM Model Changes From *AEO99*