NATIONAL ENERGY TECHNOLOGY LABORATORY

Updated Costs (June 2011 Basis) for Selected Bituminous Baseline Cases

August 2012

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U.S. DEPARTMENT OF ENERGY

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Final Report

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Exhibits

Acronyms and Abbreviations

BB	Bituminous Baseline
Btu	British thermal units
CE	Chemical Engineering
CCS	Carbon capture and sequestration
CO_2	Carbon dioxide
COE	Cost of electricity
CTS	CO_2 transport and storage
ESPA	Energy Sector Planning and Analysis
GEE	General Electric Energy
GJ	Gigajoule
Gt	Gigatonne
gpm	Gallons per minute
HHV	Higher heating value
hr	Hour
IGCC	Integrated gasification combined cycle
IRROE	Internal rate of return on equity
Kg	Kilogram
km	kilometer
kW	Kilowatt
Lb	Pound
m^3	Cubic meter
mi	Mile
MVA	Monitoring, verification and accounting
NETL	National Energy Technology Laboratory
PC	Pulverized Coal
SC	Supercritical
SCR	Selective catalytic reduction
TASC	Total as-spent cost
TOC	Total overnight cost
T&S	Transport and storage
TS&M	Transport, storage and monitoring
°C	Degrees Celsius
°F	Degrees Fahrenheit

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1 Introduction

The latest series of baseline reports prepared for NETL was begun in 2004, and the report commonly referred to as the Bituminous Baseline Report ("Cost and Performance Baseline for Fossil Energy Plants, Volume 1: Bituminous Coal and Natural Gas to Electricity") was first published in May 2007. The initial issue of the Bituminous Baseline Report used a cost basis of January 2007 dollars. The report was subsequently updated in August 2007 and again in November 2010. The cost basis was updated to June 2007 dollars in the November 2010 issue. Recently, the capital and O&M costs for selected cases were re-estimated using a cost basis of June 2011 dollars. The eight cases that are the subject of this report include:

- Case 1 – GEE IGCC without CO_2 capture
- Case 2 – GEE IGCC with CO_2 capture
- Case 9 – Subcritical PC without CO_2 capture
- Case 10 – Subcritical PC with CO_2 capture
- Case 11 – Supercritical PC without CO_2 capture
- Case 12 – Supercritical PC with CO_2 capture
- Case 13 – Natural gas combined cycle without CO_2 capture
- Case 14 – Natural gas combined cycle with CO_2 capture

The Total Overnight Cost (TOC) and first year Cost of Electricity (COE) are summarized in Exhibit 1-1. The previous values (2007 dollar cost basis) are included for reference and the values with and without CO_2 sequestration costs are shown for the capture cases. The difference in sequestration costs reflects a change in methodology in addition to the escalation incurred from 2007 to 2011. The new approach is described in more detail below.

The increase in TOC from 2007 to 2011 averaged about 20 percent. The COE for the coal cases increased approximately 37 percent. The increase in COE for the natural gas cases was small since the increase in COE associated with the increased TOC was nearly offset by a fuel cost reduction.

Exhibit 1-1 Summary of results using new and old cost basis

Case	TOC, MM$	TOC, $/kW	COE (w/o TS&M), $/MWh	COE (w/TS&M), $/MWh
June 2011 Cost Basis				
1	1,847	2,969	101.16	N/A
2	2,220	4,086	133.07	141.47
9	1,331	2,420	82.27	N/A
10	2,441	4,438	142.04	152.85
11	1,348	2,452	80.95	N/A
12	2,415	4,391	137.28	147.27
13	495	891	59.59	N/A
14	872	1,842	86.58	90.43
June 2007 Cost Basis				
1	1,522	2,447	76.28	N/A
2	1,811	3,334	100.39	105.57
9	1,098	1,996	59.40	N/A
10	1,985	3,610	103.80	109.58
11	1,113	2,024	58.91	N/A
12	1,964	3,570	100.94	106.53
13	398	718	58.90	N/A
14	709	1,497	82.72	85.89

The balance of this report includes the following: the factors that impact cost escalation are discussed in Section 2; the new T&S methodology is described in Section 3; the capital and O&M costs for each case are compiled in Section 4; and a summary of the new cost results including costs of CO_2 captured and avoided is provided in Section 5.

2 Cost Escalation Factors

Escalation factors for the various cost elements were developed using a number of sources including: the Chemical Engineering (CE) Plant Cost Index, recent vendor quotations for similar equipment and materials, monthly mill pricing updates for structural steel, cost trending input from vendors, and published wage rate information. In general the CE Index tends to trend slightly lower than costs developed using other sources. This can be due to several reasons including specific equipment design/sizing parameters and market conditions. In particular the index value for construction labor and engineering services was not used here because it almost always trends at a much lower rate than other sources employed. The resulting escalation averaged about 20 percent across accounts with modest variations caused by the distribution of labor, materials and equipment costs as well as the equipment type.

Equipment accounts that don't follow the general cost escalation trend are described below:

- Case 1, Account 4.6 (Soot Recovery & SARU): The original estimate (2007 dollars) had an incorrect value that was fixed prior to escalating the account making the escalation appear to be greater than reality.
- Cases 1 and 2, Account 5A.6 (Blowback Gas Systems): The GEE gasifier does not use candle filters and therefore no blowback gas system is required. This account was inadvertently included in the previous estimate, but has been eliminated in the current version.
- Cases 1, 2, 13 and 14, Account 7.1 (Heat Recovery Steam Generator): The HRSG costs were re-calibrated using a series of more recent quotes that were also closer in size to the baseline cases.
- Cases 1, 2, 13 and 14, Account 8.3 (Condenser and Auxiliaries): The condenser costs were re-calibrated using a series of more recent quotes that were also closer in size to the baseline cases.
- Cases 1, 2, 13 and 14, Account 8.4 (Steam Piping): The steam piping costs were re-calibrated using a series of more recent quotes that were also closer in size to the baseline cases.
- Cases 1, 2, 13 and 14, Account 9.1 (Cooling Towers): The cooling tower costs were re-calibrated using a series of more recent quotes that were also closer in size to the baseline cases.
- Cases 1 and 2: The consumables were generally escalated using the index for producer prices for industrial chemicals (per IHS Global Insight, Inc., and reported in Chemical Engineering). However, the Selexol solvent cost also included revised pricing from more recent quotes.
- Cases 9, 10, 11, 12, 13 and 14: The consumables were generally escalated using the index for producer prices for industrial chemicals (per IHS Global Insight, Inc., and reported in Chemical Engineering). However, the ammonia cost also included revised pricing from more recent quotes.

- Cases 2, 10, 12 and 14, Account 5B.1 (CO_2 Compression and Drying): The CO_2 compressor costs were re-calibrated using a more recent quote in addition to the general cost escalation.
- All Cases, Account 11.8 (Main Power Transformers): The main power transformer cost was re-calibrated using a more recent quote in addition to the general cost escalation.

In the PC cases the boiler and steam turbine costs were simply escalated because no newer quotes were available.

3 Updated Transport and Storage Cost Methodology

The cost of CO_2 transport and storage (T&S) in a deep well saline formation is estimated using the FE/NETL CO_2 Transport and Storage (CTS-Saline) Cost Model. Additional detail on development of these costs is available in the Quality Guidelines for Energy System Studies (QGESS) on Carbon Dioxide Transport and Storage Costs in NETL Studies (2012).

T&S costs are reported as first-year costs in \$/tonne of CO_2, increasing at a nominal rate of 3 percent per year, consistent with the assumed general inflation rate. From the perspective of the CO_2 source (e.g., a power plant or other energy conversion facility), these costs are treated as a disposal cost for each tonne of CO_2 captured during the assumed 30-year operational period. From the pipeline and storage site's perspective, this cost represents the required revenue stream across the 30-year operational period to cover all costs and provide the required internal rate of return on equity (IRROE). All costs are reported in 2011 dollars.

Transport costs are based on a generic 100 km (62 mi) dedicated pipeline. High pressure (2,200 psig) CO_2 is provided at the plant gate of the energy conversion facility and CO_2 exits the pipeline terminus at a pressure of 1,200 psig, remaining in a supercritical phase. The pipeline diameter was sized for this to be achieved without the need for recompression stages along the pipeline length. Costs for additional compression that may be required for injection in a particular formation is included as part of storage costs. Transport costs are estimated to be \$3.65/tonne CO_2.

Storage costs are based on the CTS-Saline Cost Model. This model provides detailed cost estimates for the injection and monitoring of CO_2 under U.S. Environmental Protection Agency regulations for Class VI injection wells as well as monitoring and reporting requirements under Subpart RR of the Greenhouse Gas Reporting Rule.

Inputs to the CTS-Saline Cost Model that have a significant influence on cost include financial parameters, the timelines for the various stages of storage and important activities occurring in each stage. The financial parameters include:

- Debt to equity ratio: 45%/55%
- Nominal interest rate on debt: 5.5%/year
- Nominal IRROE: 12%
- Escalation rate: 3%
- Financial responsibility requirements for post-injection site care and site closure are met by pre-funding a modified trust fund over the period of injection operations
- Project contingency factor of 15% and process contingency factor of 20%

In the CTS-Saline Cost Model, the sequestration process is divided into six stages. The timelines and important activities impacting costs for these stages are as follows:

- Regional evaluation and initial site selection: 1 year
- Site characterization: 3 years; four sites undergo site characterization with one successful site selected; pore space rights are leased
- Permitting: 2 years; drill, test and complete injection wells

- Operations: 30 years; installation of buildings, surface equipment, monitoring wells and other monitoring equipment; comply with permit requirements; fund modified trust fund to cover financial responsibility requirements for post-injection site care and site closure
- Post-injection site care and site closure: 50 years; continue monitoring, verification and accounting (MVA) per permit; costs are covered by storage site operator's trust fund
- Long-term stewardship: (This stage is not explicitly included in the model.) The possible financial implication of long-term stewardship is included in the model as a state-sponsored trust fund that the storage operator pays into during operations

Due to the variances in the geologic formations that make up saline formations across the U.S., region-specific storage and monitoring costs are developed to correspond to the plant locations used in NETL techno-economic studies of energy conversion facilities. Results from the CTS-Saline Cost Model for storage and monitoring costs were aligned with the NETL studies by taking four generic plant locations and overlaying them with possible sequestration basins from the cost model resulting in the following pairings:

- Midwest plant location – Illinois Basin
- Texas plant location – East Texas Basin
- North Dakota plant location – Williston Basin
- Montana plant location – Powder River Basin

CO_2 storage supply-cost curves were developed for each of the four basins of interest with the resulting cost for each basin at 25 gigatonnes (Gt) of potential storage shown in Exhibit 3-1. Choosing this point on the supply-cost curves provides a conservative estimate of the storage cost since many decades, if not more than a century, will pass before 25 Gt of CO_2 is stored in any of the four individual basins. For example, 25 Gt of storage would be sufficient for 125 GW of coal power with 90 percent CO_2 capture operating over 30 years.

The far right column of Exhibit 3-1 shows the total T&S costs now used in NETL system studies for each plant location.

Exhibit 3-1 CO_2 Transport and Storage Costs

Plant Location	Basin	Transport (2011$/tonne)	Storage Cost at 25 Gt (2011$/tonne)	T&S Value for System Studies[1] (2011$/tonne)
Midwest	Illinois	3.65	5.75	10
Texas	East Texas		6.06	10
North Dakota	Williston		10.96	15
Montana	Powder River		17.86	22

[1]*The sum of transport and storage costs is rounded up to the nearest whole dollar*

4 Capital and O&M Cost Tables

The updated capital cost and O&M cost tables are contained in this section. In addition to the capital cost escalation, the following updates were included:

- Fuel costs were updated to June 2011 values according to the Quality Guidelines for Energy System Studies, "Fuel Prices for Selected Feedstocks in NETL Studies." The current fuel costs are $2.94/MMBtu for Illinois No. 6 bituminous coal and $6.13/MMBtu for natural gas in the Midwest.
- The CO_2 transport and storage (T&S) costs were estimated at $10/tonne CO_2 sequestered. This value is representative of a Midwest location as described in Section 3.

A table comparing the change in unit cost of fuel and major consumables is shown in Exhibit 4-1.

Exhibit 4-1 Comparison of fuel and consumable unit costs

	June 2007 Cost Basis	June 2011 Cost Basis
Illinois No. 6 Coal, $/MMBtu	1.64	2.94
Illinois No. 6 Coal, $/ton	38.18	68.60
Natural Gas, $/MMBtu	6.55	6.13
Water Treatment Chemicals, $/lb	0.17	0.27
Selexol Solvent, $/gal	13.40	36.79
Activated Carbon, $/lb	1.05	1.63
MEA Solvent, $/ton	2,250	3,482
NaOH, $/ton	434	671
H_2SO_4, $/ton	139	215
Limestone, $/ton	21.63	33.48
Ammonia (19% NH_3), $/ton	130	330

Exhibit 4-2 Case 1 capital and owner's costs

	Client:	USDOE/NETL							Report Date	2011-Oct-17	
	Project:	Bituminous Baseline Study									
	TOTAL PLANT COST SUMMARY										
	Case:	Case 1	GEE Radiant IGCC w/o CO2								
	Plant Size:	622.1	MW,net	Estimate Type:	Conceptual		Cost Base (Jun)	2011	($x1000)		
Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies	TOTAL PLANT COST		
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
1.0	COAL & SORBENT HANDLING										
1.1	Coal Receive & Unload	$4,435	$0	$2,137	$0	$6,572	$571	$0	$1,429	$8,572	$14
1.2	Coal Stackout & Reclaim	$5,731	$0	$1,370	$0	$7,101	$603	$0	$1,541	$9,244	$15
1.3	Coal Conveyors & Yd Crush	$5,328	$0	$1,356	$0	$6,684	$568	$0	$1,450	$8,703	$14
1.4	Other Coal Handling	$1,394	$0	$314	$0	$1,708	$145	$0	$370	$2,223	$4
1.5	Sorbent Receive & Unload	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.6	Sorbent Stackout & Reclaim	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.7	Sorbent Conveyors	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.8	Other Sorbent Handling	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.9	Coal & Sorbent Hnd.Foundations	$0	$2,961	$7,739	$0	$10,701	$1,017	$0	$2,344	$14,061	$23
	SUBTOTAL 1.	**$16,887**	**$2,961**	**$12,917**	**$0**	**$32,765**	**$2,904**	**$0**	**$7,134**	**$42,803**	**$69**
2.0	COAL & SORBENT PREP & FEED										
2.1	Coal Crushing & Drying	w/ 2.3	$0	w/ 2.3	$0	$0	$0	$0	$0	$0	$0
2.2	Prepared Coal Storage & Feed	$1,891	$454	$292	$0	$2,638	$218	$0	$571	$3,427	$6
2.3	Slurry Prep & Feed	$25,812	$0	$11,252	$0	$37,064	$3,270	$1,853	$8,437	$50,625	$81
2.4	Misc.Coal Prep & Feed	$1,040	$760	$2,238	$0	$4,037	$361	$0	$880	$5,278	$8
2.5	Sorbent Prep Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.6	Sorbent Storage & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.7	Sorbent Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.8	Booster Air Supply System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.9	Coal & Sorbent Feed Foundation	$0	$3,814	$3,273	$0	$7,087	$658	$0	$1,549	$9,294	$15
	SUBTOTAL 2.	**$28,743**	**$5,028**	**$17,055**	**$0**	**$50,826**	**$4,507**	**$1,853**	**$11,437**	**$68,624**	**$110**
3.0	FEEDWATER & MISC. BOP SYSTEMS										
3.1	Feedwater System	$3,474	$5,996	$3,144	$0	$12,614	$1,140	$0	$2,751	$16,505	$27
3.2	Water Makeup & Pretreating	$755	$78	$415	$0	$1,248	$115	$0	$409	$1,773	$3
3.3	Other Feedwater Subsystems	$1,953	$646	$577	$0	$3,176	$274	$0	$690	$4,140	$7
3.4	Service Water Systems	$442	$881	$3,036	$0	$4,359	$414	$0	$1,432	$6,205	$10
3.5	Other Boiler Plant Systems	$2,381	$889	$2,189	$0	$5,459	$497	$0	$1,191	$7,148	$11
3.6	FO Supply Sys & Nat Gas	$380	$718	$665	$0	$1,764	$166	$0	$386	$2,315	$4
3.7	Waste Treatment Equipment	$1,022	$0	$633	$0	$1,655	$159	$0	$544	$2,359	$4
3.8	Misc. Power Plant Equipment	$1,277	$170	$664	$0	$2,111	$201	$0	$694	$3,006	$5
	SUBTOTAL 3.	**$11,684**	**$9,379**	**$11,323**	**$0**	**$32,386**	**$2,967**	**$0**	**$8,097**	**$43,451**	**$70**
4.0	GASIFIER & ACCESSORIES										
4.1	Syngas Cooler Gasifier System (GE)	$136,779	$0	$75,333	$0	$212,112	$19,109	$29,509	$39,951	$300,682	$483
4.2	Syngas Cooler (w/ Gasifier - $)	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.3	ASU/Oxidant Compression	$195,451	$0	w/equip.	$0	$195,451	$18,263	$0	$21,371	$235,086	$378
4.4	Scrubber & Low Temperature Cooling	$7,080	$5,763	$5,957	$0	$18,800	$1,760	$0	$4,112	$24,671	$40
4.5	Black Water & Sour Gas Section	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.6	Soot Recovery & SARU	$2,159	$1,025	$2,013	$0	$5,197	$488	$0	$1,137	$6,823	$11
4.8	Major Component Rigging	w/4.1&4.2	$0	w/4.1&4.2	$0	$0	$0	$0	$0	$0	$0
4.9	Gasification Foundations	$0	$7,429	$6,482	$0	$13,911	$1,293	$0	$3,801	$19,005	$31
	SUBTOTAL 4.	**$341,469**	**$14,218**	**$89,784**	**$0**	**$445,472**	**$40,913**	**$29,509**	**$70,373**	**$586,267**	**$942**

Exhibit 4-2 Case 1 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies	TOTAL PLANT COST		
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
5A	GAS CLEANUP & PIPING										
5A.1	Single Stage Selexol	$50,584	$0	$42,628	$0	$93,212	$8,795	$0	$20,401	$122,408	$197
5A.2	Elemental Sulfur Plant	$12,121	$2,363	$15,532	$0	$30,015	$2,851	$0	$6,573	$39,439	$63
5A.3	Mercury Removal	$1,274	$0	$963	$0	$2,237	$211	$112	$512	$3,072	$5
5A.4	COS Hydrolysis	$4,309	$0	$5,589	$0	$9,898	$940	$0	$2,168	$13,006	$21
5A.5	Particulate Removal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.6	Blowback Gas Systems	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.7	Fuel Gas Piping	$0	$882	$577	$0	$1,459	$127	$0	$317	$1,903	$3
5A.9	HGCU Foundations	$0	$1,269	$855	$0	$2,124	$196	$0	$696	$3,017	$5
	SUBTOTAL 5A.	**$68,289**	**$4,513**	**$66,144**	**$0**	**$138,946**	**$13,120**	**$112**	**$30,668**	**$182,845**	**$294**
5B	CO2 REMOVAL & COMPRESSION										
5B.1	CO2 Removal System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5B.2	CO2 Compression & Drying	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 5B.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
6.0	COMBUSTION TURBINE/ACCESSORIES										
6.1	Combustion Turbine Generator	$104,200	$0	$7,506	$0	$111,706	$10,304	$5,585	$12,760	$140,356	$226
6.2	Syngas Expander	$7,146	$0	$981	$0	$8,126	$752	$0	$1,332	$10,210	$16
6.3	Compressed Air Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.9	Combustion Turbine Foundations	$0	$1,016	$1,175	$0	$2,191	$205	$0	$719	$3,115	$5
	SUBTOTAL 6.	**$111,346**	**$1,016**	**$9,662**	**$0**	**$122,024**	**$11,261**	**$5,585**	**$14,810**	**$153,681**	**$247**
7.0	HRSG, DUCTING & STACK										
7.1	Heat Recovery Steam Generator	$31,080	$0	$6,019	$0	$37,099	$3,441	$0	$4,054	$44,594	$72
7.2	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.3	Ductwork	$0	$2,079	$1,457	$0	$3,537	$301	$0	$767	$4,605	$7
7.4	Stack	$4,013	$0	$1,497	$0	$5,510	$514	$0	$602	$6,626	$11
7.9	HRSG,Duct & Stack Foundations	$0	$764	$767	$0	$1,531	$143	$0	$502	$2,175	$3
	SUBTOTAL 7.	**$35,093**	**$2,843**	**$9,740**	**$0**	**$47,676**	**$4,399**	**$0**	**$5,926**	**$58,001**	**$93**
8.0	STEAM TURBINE GENERATOR										
8.1	Steam TG & Accessories	$38,070	$0	$5,979	$0	$44,049	$3,879	$0	$4,793	$52,721	$85
8.2	Turbine Plant Auxiliaries	$243	$0	$554	$0	$798	$76	$0	$87	$961	$2
8.3	Condenser & Auxiliaries	$3,300	$0	$1,776	$0	$5,076	$476	$0	$555	$6,107	$10
8.4	Steam Piping	$15,350	$0	$6,657	$0	$22,006	$1,683	$0	$5,922	$29,612	$48
8.9	TG Foundations	$0	$1,147	$2,027	$0	$3,174	$299	$0	$1,042	$4,515	$7
	SUBTOTAL 8.	**$56,963**	**$1,147**	**$16,993**	**$0**	**$75,103**	**$6,414**	**$0**	**$12,400**	**$93,917**	**$151**
9.0	COOLING WATER SYSTEM										
9.1	Cooling Towers	$4,180	$0	$1,270	$0	$5,450	$508	$0	$894	$6,851	$11
9.2	Circulating Water Pumps	$2,012	$0	$146	$0	$2,158	$184	$0	$351	$2,694	$4
9.3	Circ.Water System Auxiliaries	$177	$0	$25	$0	$202	$19	$0	$33	$254	$0
9.4	Circ.Water Piping	$0	$7,847	$1,901	$0	$9,747	$817	$0	$2,113	$12,678	$20
9.5	Make-up Water System	$427	$0	$587	$0	$1,014	$94	$0	$222	$1,330	$2
9.6	Component Cooling Water Sys	$897	$1,073	$737	$0	$2,707	$242	$0	$590	$3,538	$6
9.9	Circ.Water System Foundations	$0	$2,576	$4,576	$0	$7,152	$675	$0	$2,348	$10,175	$16
	SUBTOTAL 9.	**$7,693**	**$11,495**	**$9,242**	**$0**	**$28,431**	**$2,538**	**$0**	**$6,550**	**$37,519**	**$60**

Exhibit 4-2 Case 1 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies	TOTAL PLANT COST		
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
10.0	ASH/SPENT SORBENT HANDLING SYS										
10.1	Slag Dewatering & Cooling	$14,251	$7,859	$15,855	$0	$37,965	$3,574	$0	$4,154	$45,693	$73
10.2	Gasifier Ash Depressurization	w/10.1	w/10.1	w/10.1	$0	$0	$0	$0	$0	$0	$0
10.3	Cleanup Ash Depressurization	w/10.1	w/10.1	w/10.1	$0	$0	$0	$0	$0	$0	$0
10.4	High Temperature Ash Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.5	Other Ash Recovery Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.6	Ash Storage Silos	$693	$0	$749	$0	$1,442	$137	$0	$237	$1,816	$3
10.7	Ash Transport & Feed Equipment	$954	$0	$223	$0	$1,177	$105	$0	$192	$1,474	$2
10.8	Misc. Ash Handling Equipment	$1,436	$1,760	$522	$0	$3,718	$344	$0	$609	$4,671	$8
10.9	Ash/Spent Sorbent Foundation	$0	$58	$76	$0	$135	$13	$0	$44	$192	$0
	SUBTOTAL 10.	**$17,335**	**$9,676**	**$17,426**	**$0**	**$44,437**	**$4,172**	**$0**	**$5,237**	**$53,846**	**$87**
11.0	ACCESSORY ELECTRIC PLANT										
11.1	Generator Equipment	$1,165	$0	$1,134	$0	$2,299	$213	$0	$251	$2,764	$4
11.2	Station Service Equipment	$4,600	$0	$423	$0	$5,023	$462	$0	$548	$6,033	$10
11.3	Switchgear & Motor Control	$8,490	$0	$1,578	$0	$10,068	$931	$0	$1,650	$12,649	$20
11.4	Conduit & Cable Tray	$0	$4,314	$13,297	$0	$17,610	$1,641	$0	$4,813	$24,064	$39
11.5	Wire & Cable	$0	$8,317	$5,060	$0	$13,377	$908	$0	$3,571	$17,856	$29
11.6	Protective Equipment	$0	$805	$2,988	$0	$3,793	$364	$0	$624	$4,781	$8
11.7	Standby Equipment	$276	$0	$275	$0	$552	$52	$0	$91	$695	$1
11.8	Main Power Transformers	$18,242	$0	$175	$0	$18,417	$1,394	$0	$2,972	$22,783	$37
11.9	Electrical Foundations	$0	$183	$498	$0	$680	$64	$0	$223	$968	$2
	SUBTOTAL 11.	**$32,773**	**$13,618**	**$25,428**	**$0**	**$71,819**	**$6,031**	**$0**	**$14,743**	**$92,592**	**$149**
12.0	INSTRUMENTATION & CONTROL										
12.1	IGCC Control Equipment	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
12.2	Combustion Turbine Control	w/6.1	$0	w/6.1	$0	$0	$0	$0	$0	$0	$0
12.3	Steam Turbine Control	w/8.1	$0	w/8.1	$0	$0	$0	$0	$0	$0	$0
12.4	Other Major Component Control	$1,187	$0	$809	$0	$1,996	$187	$100	$342	$2,625	$4
12.5	Signal Processing Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.6	Control Boards,Panels & Racks	$273	$0	$178	$0	$451	$42	$23	$103	$619	$1
12.7	Computer & Accessories	$6,333	$0	$207	$0	$6,539	$599	$327	$747	$8,212	$13
12.8	Instrument Wiring & Tubing	$0	$2,438	$4,614	$0	$7,052	$571	$353	$1,994	$9,969	$16
12.9	Other I & C Equipment	$4,233	$0	$2,097	$0	$6,330	$591	$317	$1,086	$8,324	$13
	SUBTOTAL 12.	**$12,026**	**$2,438**	**$7,906**	**$0**	**$22,369**	**$1,991**	**$1,118**	**$4,272**	**$29,750**	**$48**

Exhibit 4-2 Case 1 capital and owner's costs (continued)

Acct No.	Item/Description	Equipment Cost	Material Cost	Labor Direct	Labor Indirect	Bare Erected Cost $	Eng'g CM H.O.& Fee	Contingencies Process	TOTAL PLANT COST Project	$	$/kW
13.0	IMPROVEMENTS TO SITE										
13.1	Site Preparation	$0	$118	$2,689	$0	$2,807	$274	$0	$924	$4,005	$6
13.2	Site Improvements	$0	$2,103	$2,973	$0	$5,077	$504	$0	$1,674	$7,254	$12
13.3	Site Facilities	$3,769	$0	$4,231	$0	$8,000	$796	$0	$2,639	$11,434	$18
	SUBTOTAL 13.	**$3,769**	**$2,222**	**$9,893**	**$0**	**$15,884**	**$1,573**	**$0**	**$5,237**	**$22,693**	**$36**
14.0	BUILDINGS & STRUCTURES										
14.1	Combustion Turbine Area	$0	$317	$179	$0	$496	$43	$0	$108	$647	$1
14.2	Steam Turbine Building	$0	$2,930	$4,172	$0	$7,102	$640	$0	$1,161	$8,903	$14
14.3	Administration Building	$0	$1,013	$734	$0	$1,747	$152	$0	$285	$2,184	$4
14.4	Circulation Water Pumphouse	$0	$200	$106	$0	$305	$26	$0	$50	$381	$1
14.5	Water Treatment Buildings	$0	$621	$605	$0	$1,226	$108	$0	$200	$1,535	$2
14.6	Machine Shop	$0	$518	$354	$0	$873	$76	$0	$142	$1,091	$2
14.7	Warehouse	$0	$837	$540	$0	$1,377	$119	$0	$224	$1,721	$3
14.8	Other Buildings & Structures	$0	$501	$390	$0	$891	$78	$0	$194	$1,163	$2
14.9	Waste Treating Building & Str.	$0	$1,121	$2,140	$0	$3,261	$298	$0	$712	$4,270	$7
	SUBTOTAL 14.	**$0**	**$8,058**	**$9,221**	**$0**	**$17,278**	**$1,540**	**$0**	**$3,076**	**$21,894**	**$35**
	TOTAL COST	**$744,070**	**$88,612**	**$312,734**	**$0**	**$1,145,416**	**$104,330**	**$38,178**	**$199,959**	**$1,487,884**	**$2,392**
	Owner's Costs										
	Preproduction Costs										
	6 Months All Labor									$14,611	$23
	1 Month Maintenance Materials									$3,332	$5
	1 Month Non-fuel Consumables									$438	$1
	1 Month Waste Disposal									$471	$1
	25% of 1 Months Fuel Cost at 100% CF									$2,923	$5
	2% of TPC									$29,758	$48
	Total									**$51,532**	**$83**
	Inventory Capital										
	60 day supply of fuel and consumables at 100% CF									$23,910	$38
	0.5% of TPC (spare parts)									$7,439	$12
	Total									**$31,350**	**$50**
	Initial Cost for Catalyst and Chemicals									$12,171	$20
	Land									$900	$1
	Other Owner's Costs									$223,183	$359
	Financing Costs									$40,173	$65
	Total Overnight Costs (TOC)									**$1,847,192**	**$2,969**
	TASC Multiplier							(IOU, high-risk, 35 year)		1.140	
	Total As-Spent Cost (TASC)									**$2,105,799**	**$3,385**

Exhibit 4-3 Case 1 O&M costs

INITIAL & ANNUAL O&M EXPENSES					Cost Base (Jun):	2011
Case 1 - GEE Radiant 640MW IGCC w/o CO2					Heat Rate-net (Btu/kWh):	8,756
					MWe-net:	622
					Capacity Factor (%):	80
OPERATING & MAINTENANCE LABOR						
Operating Labor						
Operating Labor Rate (base):	39.70	$/hour				
Operating Labor Burden:	30.00	% of base				
Labor O-H Charge Rate:	25.00	% of labor				
Operating Labor Requirements(O.J.)per Shift:	1 unit/mod.		Total Plant			
Skilled Operator	2.0		2.0			
Operator	9.0		9.0			
Foreman	1.0		1.0			
Lab Tech's, etc.	3.0		3.0			
TOTAL-O.J.'s	15.0		15.0			
					Annual Cost $	Annual Unit Cost $/kW-net
Annual Operating Labor Cost					$6,781,554	$10.902
Maintenance Labor Cost					$16,596,147	$26.680
Administrative & Support Labor					$5,844,425	$9.395
Property Taxes and Insurance					$29,757,674	$47.838
TOTAL FIXED OPERATING COSTS					**$58,979,801**	**$94.815**
VARIABLE OPERATING COSTS						
						$/kWh-net
Maintenance Material Cost					**$31,985,668**	**$0.00734**
Consumables	Consumption Initial Fill	Consumption /Day	Unit Cost	Initial Fill Cost		
Water (/1000 gallons)	0	3,409	1.67	**$0**	**$1,666,439**	**$0.00038**
Chemicals						
MU & WT Chem. (lbs)	0	20,311	0.27	$0	$1,588,505	$0.00036
Carbon (Mercury Removal) (lb)	54,833	75	1.63	$89,117	$35,647	$0.00001
COS Catalyst (m3)	422	0.29	3,751.70	$1,583,048	$316,610	$0.00007
Water Gas Shift Catalyst (ft3)	0	0	771.99	$0	$0	$0.00000
Selexol Solution (gal)	285,358	45	36.79	$10,498,674	$483,183	$0.00011
SCR Catalyst (m3)	0	0	0.00	$0	$0	$0.00000
Ammonia (19% NH3) (ton)	0	0	0.00	$0	$0	$0.00000
Claus Catalyst (ft3)	w/equip.	1.94	203.15	$0	$115,176	$0.00003
Subtotal Chemicals				**$12,170,838**	**$2,539,121**	**$0.00058**
Other						
Supplemental Fuel (MBtu)	0	0	0.00	$0	$0	$0.00000
Gases, N2 etc. (/100scf)	0	0	0.00	$0	$0	$0.00000
L.P. Steam (/1000 pounds)	0	0	0.00	$0	$0	$0.00000
Subtotal Other				**$0**	**$0**	**$0.00000**
Waste Disposal						
Spent Mercury Catalyst (lb.)	0	75	0.65	$0	$14,259	$0.00000
Flyash (ton)	0	0	0.00	$0	$0	$0.00000
Slag (ton)	0	615	25.11	$0	$4,507,216	$0.00103
Subtotal-Waste Disposal				**$0**	**$4,521,475**	**$0.00104**
By-products & Emissions						
Sulfur (tons)	0	140	0.00	$0	$0	$0.00000
Subtotal By-Products				**$0**	**$0**	**$0.00000**
TOTAL VARIABLE OPERATING COSTS				**$12,170,838**	**$40,712,702**	**$0.00934**
Fuel (ton)	0	5,603	68.60	**$0**	**$112,231,098**	**$0.02575**

Exhibit 4-4 Case 2 Capital and owner's costs

	Client:	USDOE/NETL							Report Date:	2011-Oct-17	
	Project:	Bituminous Baseline Study									
	TOTAL PLANT COST SUMMARY										
	Case:	Case 2	GEE Radiant 550MW IGCC w/ CO2								
	Plant Size:	543.3	MW,net	Estimate Type:	Conceptual			Cost Base (Jun)	2011	($x1000)	
Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
1.0	COAL & SORBENT HANDLING										
1.1	Coal Receive & Unload	$4,552	$0	$2,194	$0	$6,746	$586	$0	$1,467	$8,799	$16
1.2	Coal Stackout & Reclaim	$5,883	$0	$1,407	$0	$7,289	$619	$0	$1,582	$9,489	$17
1.3	Coal Conveyors & Yd Crush	$5,469	$0	$1,392	$0	$6,861	$583	$0	$1,489	$8,933	$16
1.4	Other Coal Handling	$1,431	$0	$322	$0	$1,753	$149	$0	$380	$2,282	$4
1.5	Sorbent Receive & Unload	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.6	Sorbent Stackout & Reclaim	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.7	Sorbent Conveyors	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.8	Other Sorbent Handling	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.9	Coal & Sorbent Hnd.Foundations	$0	$3,040	$7,944	$0	$10,984	$1,044	$0	$2,406	$14,434	$27
	SUBTOTAL 1.	**$17,335**	**$3,040**	**$13,259**	**$0**	**$33,633**	**$2,981**	**$0**	**$7,323**	**$43,937**	**$81**
2.0	COAL & SORBENT PREP & FEED										
2.1	Coal Crushing & Drying	w/2.3	$0	w/2.3	$0	$0	$0	$0	$0	$0	$0
2.2	Prepared Coal Storage & Feed	$1,944	$467	$301	$0	$2,712	$224	$0	$587	$3,524	$6
2.3	Slurry Prep & Feed	$26,551	$0	$11,574	$0	$38,125	$3,363	$1,906	$8,679	$52,074	$96
2.4	Misc.Coal Prep & Feed	$1,069	$781	$2,301	$0	$4,151	$371	$0	$904	$5,427	$10
2.5	Sorbent Prep Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.6	Sorbent Storage & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.7	Sorbent Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.8	Booster Air Supply System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.9	Coal & Sorbent Feed Foundation	$0	$3,922	$3,365	$0	$7,287	$677	$0	$1,593	$9,557	$18
	SUBTOTAL 2.	**$29,565**	**$5,170**	**$17,541**	**$0**	**$52,275**	**$4,636**	**$1,906**	**$11,763**	**$70,581**	**$130**
3.0	FEEDWATER & MISC. BOP SYSTEMS										
3.1	Feedwater System	$3,402	$5,871	$3,078	$0	$12,350	$1,116	$0	$2,693	$16,159	$30
3.2	Water Makeup & Pretreating	$874	$90	$480	$0	$1,445	$133	$0	$473	$2,051	$4
3.3	Other Feedwater Subsystems	$1,912	$632	$565	$0	$3,109	$268	$0	$676	$4,053	$7
3.4	Service Water Systems	$511	$1,019	$3,513	$0	$5,043	$479	$0	$1,657	$7,179	$13
3.5	Other Boiler Plant Systems	$2,754	$1,029	$2,533	$0	$6,317	$575	$0	$1,378	$8,271	$15
3.6	FO Supply Sys & Nat Gas	$380	$718	$665	$0	$1,764	$166	$0	$386	$2,315	$4
3.7	Waste Treatment Equipment	$1,182	$0	$732	$0	$1,915	$184	$0	$630	$2,729	$5
3.8	Misc. Power Plant Equipment	$1,326	$177	$689	$0	$2,192	$209	$0	$720	$3,122	$6
	SUBTOTAL 3.	**$12,342**	**$9,537**	**$12,256**	**$0**	**$34,135**	**$3,132**	**$0**	**$8,613**	**$45,880**	**$84**
4.0	GASIFIER & ACCESSORIES										
4.1	Syngas Cooler Gasifier System	$140,247	$0	$77,259	$0	$217,505	$19,596	$30,249	$40,970	$308,320	$568
4.2	Syngas Cooler (w/ Gasifier - $)	w/4.1	$0	w/ 4.1	$0	$0	$0	$0	$0	$0	$0
4.3	ASU/Oxidant Compression	$234,789	$0	w/equip.	$0	$234,789	$21,939	$0	$25,673	$282,400	$520
4.4	Scrubber & Low Temperature Cooling	$7,292	$5,935	$6,136	$0	$19,363	$1,812	$0	$4,235	$25,411	$47
4.5	Black Water & Sour Gas Section	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.6	Soot Recovery & SARU	$2,224	$1,056	$2,073	$0	$5,353	$503	$0	$1,171	$7,027	$13
4.8	Major Component Rigging	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.9	Gasification Foundations	$0	$7,429	$6,482	$0	$13,911	$1,293	$0	$3,801	$19,005	$35
	SUBTOTAL 4.	**$384,551**	**$14,421**	**$91,949**	**$0**	**$490,922**	**$45,143**	**$30,249**	**$75,850**	**$642,163**	**$1,182**

Exhibit 4-4 Case 2 Capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
5A	GAS CLEANUP & PIPING										
5A.1	Double Stage Selexol	$89,360	$0	$75,307	$0	$164,667	$15,537	$32,933	$42,627	$255,765	$471
5A.2	Elemental Sulfur Plant	$12,451	$2,427	$15,955	$0	$30,833	$2,928	$0	$6,752	$40,513	$75
5A.3	Mercury Removal	$1,659	$0	$1,254	$0	$2,913	$274	$146	$667	$3,999	$7
5A.4	Shift Reactors	$11,566	$0	$4,624	$0	$16,190	$1,513	$0	$3,540	$21,243	$39
5A.5	Particulate Removal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.6	Blowback Gas Systems	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.7	Fuel Gas Piping	$0	$812	$531	$0	$1,344	$117	$0	$292	$1,753	$3
5A.9	HGCU Foundations	$0	$735	$495	$0	$1,231	$114	$0	$403	$1,748	$3
	SUBTOTAL 5A.	**$115,036**	**$3,974**	**$98,166**	**$0**	**$217,177**	**$20,483**	**$33,079**	**$54,282**	**$325,021**	**$598**
5B	CO2 COMPRESSION										
5B.1	CO2 Removal System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5B.2	CO2 Compression & Drying	$37,921	$0	$13,398	$0	$51,319	$4,788	$0	$11,221	$67,328	$124
	SUBTOTAL 5B.	**$37,921**	**$0**	**$13,398**	**$0**	**$51,319**	**$4,788**	**$0**	**$11,221**	**$67,328**	**$124**
6.0	COMBUSTION TURBINE/ACCESSORIES										
6.1	Combustion Turbine Generator	$111,210	$0	$7,881	$0	$119,091	$10,985	$11,909	$14,199	$156,184	$287
6.2	Syngas Expander	$6,690	$0	$918	$0	$7,608	$704	$0	$1,247	$9,559	$18
6.3	Compressed Air Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.9	Combustion Turbine Foundations	$0	$1,016	$1,175	$0	$2,191	$205	$0	$719	$3,115	$6
	SUBTOTAL 6.	**$117,900**	**$1,016**	**$9,975**	**$0**	**$128,891**	**$11,894**	**$11,909**	**$16,164**	**$168,858**	**$311**
7.0	HRSG, DUCTING & STACK										
7.1	Heat Recovery Steam Generator	$29,560	$0	$5,723	$0	$35,283	$3,273	$0	$3,856	$42,412	$78
7.2	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.3	Ductwork	$0	$2,109	$1,478	$0	$3,587	$305	$0	$778	$4,671	$9
7.4	Stack	$4,070	$0	$1,519	$0	$5,589	$522	$0	$611	$6,721	$12
7.9	HRSG, Duct & Stack Foundations	$0	$775	$778	$0	$1,553	$145	$0	$509	$2,207	$4
	SUBTOTAL 7.	**$33,630**	**$2,884**	**$9,498**	**$0**	**$46,012**	**$4,244**	**$0**	**$5,754**	**$56,010**	**$103**
8.0	STEAM TURBINE GENERATOR										
8.1	Steam TG & Accessories	$36,590	$0	$5,756	$0	$42,346	$3,730	$0	$4,608	$50,683	$93
8.2	Turbine Plant Auxiliaries	$235	$0	$535	$0	$770	$74	$0	$84	$929	$2
8.3	Condenser & Auxiliaries	$3,280	$0	$1,716	$0	$4,996	$468	$0	$546	$6,010	$11
8.4	Steam Piping	$15,064	$0	$6,533	$0	$21,597	$1,652	$0	$5,812	$29,061	$53
8.9	TG Foundations	$0	$1,108	$1,958	$0	$3,066	$289	$0	$1,007	$4,362	$8
	SUBTOTAL 8.	**$55,169**	**$1,108**	**$16,498**	**$0**	**$72,775**	**$6,213**	**$0**	**$12,057**	**$91,045**	**$168**
9.0	COOLING WATER SYSTEM										
9.1	Cooling Towers	$4,470	$0	$1,350	$0	$5,820	$542	$0	$954	$7,316	$13
9.2	Circulating Water Pumps	$2,150	$0	$161	$0	$2,311	$197	$0	$376	$2,884	$5
9.3	Circ.Water System Auxiliaries	$187	$0	$27	$0	$214	$20	$0	$35	$269	$0
9.4	Circ.Water Piping	$0	$8,304	$2,012	$0	$10,316	$865	$0	$2,236	$13,417	$25
9.5	Make-up Water System	$483	$0	$664	$0	$1,147	$106	$0	$251	$1,504	$3
9.6	Component Cooling Water Sys	$949	$1,136	$780	$0	$2,865	$256	$0	$624	$3,745	$7
9.9	Circ.Water System Foundations	$0	$2,725	$4,842	$0	$7,567	$714	$0	$2,484	$10,766	$20
	SUBTOTAL 9.	**$8,240**	**$12,165**	**$9,835**	**$0**	**$30,240**	**$2,700**	**$0**	**$6,961**	**$39,900**	**$73**

Exhibit 4-4 Case 2 Capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
10.0	ASH/SPENT SORBENT HANDLING SYS										
10.1	Slag Dewatering & Cooling	$14,630	$8,068	$16,277	$0	$38,975	$3,669	$0	$4,264	$46,909	$86
10.2	Gasifier Ash Depressurization	w/10.1	w/10.1	w/10.1	$0	$0	$0	$0	$0	$0	$0
10.3	Cleanup Ash Depressurization	w/10.1	w/10.1	w/10.1	$0	$0	$0	$0	$0	$0	$0
10.4	High Temperature Ash Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.5	Other Ash Recovery Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.6	Ash Storage Silos	$710	$0	$767	$0	$1,476	$140	$0	$242	$1,859	$3
10.7	Ash Transport & Feed Equipment	$977	$0	$228	$0	$1,205	$107	$0	$197	$1,509	$3
10.8	Misc. Ash Handling Equipment	$1,470	$1,801	$534	$0	$3,806	$353	$0	$624	$4,782	$9
10.9	Ash/Spent Sorbent Foundation	$0	$60	$78	$0	$138	$13	$0	$45	$196	$0
	SUBTOTAL 10.	**$17,787**	**$9,928**	**$17,885**	**$0**	**$45,600**	**$4,282**	**$0**	**$5,373**	**$55,254**	**$102**
11.0	ACCESSORY ELECTRIC PLANT										
11.1	Generator Equipment	$1,152	$0	$1,122	$0	$2,274	$211	$0	$249	$2,734	$5
11.2	Station Service Equipment	$5,512	$0	$507	$0	$6,019	$553	$0	$657	$7,229	$13
11.3	Switchgear & Motor Control	$10,173	$0	$1,891	$0	$12,064	$1,116	$0	$1,977	$15,157	$28
11.4	Conduit & Cable Tray	$0	$5,169	$15,934	$0	$21,103	$1,967	$0	$5,767	$28,836	$53
11.5	Wire & Cable	$0	$9,966	$6,063	$0	$16,030	$1,088	$0	$4,279	$21,397	$39
11.6	Protective Equipment	$0	$805	$2,988	$0	$3,793	$364	$0	$624	$4,781	$9
11.7	Standby Equipment	$274	$0	$273	$0	$547	$52	$0	$90	$688	$1
11.8	Main Power Transformers	$20,126	$0	$172	$0	$20,299	$1,536	$0	$3,275	$25,110	$46
11.9	Electrical Foundations	$0	$180	$491	$0	$672	$64	$0	$221	$956	$2
	SUBTOTAL 11.	**$37,238**	**$16,120**	**$29,442**	**$0**	**$82,800**	**$6,951**	**$0**	**$17,139**	**$106,889**	**$197**
12.0	INSTRUMENTATION & CONTROL										
12.1	IGCC Control Equipment	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
12.2	Combustion Turbine Control	w/6.1	$0	w/6.1	$0	$0	$0	$0	$0	$0	$0
12.3	Steam Turbine Control	w/8.1	$0	w/8.1	$0	$0	$0	$0	$0	$0	$0
12.4	Other Major Component Control	$1,321	$0	$900	$0	$2,221	$208	$111	$381	$2,921	$5
12.5	Signal Processing Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.6	Control Boards,Panels & Racks	$304	$0	$199	$0	$502	$47	$25	$115	$689	$1
12.7	Computer & Accessories	$7,046	$0	$230	$0	$7,276	$667	$364	$831	$9,138	$17
12.8	Instrument Wiring & Tubing	$0	$2,712	$5,134	$0	$7,847	$635	$392	$2,219	$11,093	$20
12.9	Other I & C Equipment	$4,710	$0	$2,334	$0	$7,044	$658	$352	$1,208	$9,262	$17
	SUBTOTAL 12.	**$13,381**	**$2,712**	**$8,797**	**$0**	**$24,890**	**$2,215**	**$1,245**	**$4,753**	**$33,103**	**$61**

Exhibit 4-4 Case 2 Capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
13.0	IMPROVEMENTS TO SITE										
13.1	Site Preparation	$0	$123	$2,798	$0	$2,921	$285	$0	$962	$4,168	$8
13.2	Site Improvements	$0	$2,189	$3,095	$0	$5,284	$524	$0	$1,742	$7,550	$14
13.3	Site Facilities	$3,923	$0	$4,403	$0	$8,326	$828	$0	$2,746	$11,900	$22
	SUBTOTAL 13.	**$3,923**	**$2,312**	**$10,296**	**$0**	**$16,531**	**$1,637**	**$0**	**$5,450**	**$23,618**	**$43**
14.0	BUILDINGS & STRUCTURES										
14.1	Combustion Turbine Area	$0	$317	$179	$0	$496	$43	$0	$108	$647	$1
14.2	Steam Turbine Building	$0	$2,848	$4,055	$0	$6,903	$622	$0	$1,129	$8,653	$16
14.3	Administration Building	$0	$1,057	$766	$0	$1,823	$159	$0	$297	$2,279	$4
14.4	Circulation Water Pumphouse	$0	$198	$105	$0	$303	$26	$0	$49	$379	$1
14.5	Water Treatment Buildings	$0	$718	$700	$0	$1,419	$125	$0	$232	$1,776	$3
14.6	Machine Shop	$0	$541	$370	$0	$911	$79	$0	$149	$1,139	$2
14.7	Warehouse	$0	$873	$563	$0	$1,437	$125	$0	$234	$1,796	$3
14.8	Other Buildings & Structures	$0	$523	$407	$0	$930	$81	$0	$202	$1,214	$2
14.9	Waste Treating Building & Str.	$0	$1,169	$2,233	$0	$3,403	$311	$0	$743	$4,456	$8
	SUBTOTAL 14.	**$0**	**$8,246**	**$9,379**	**$0**	**$17,625**	**$1,571**	**$0**	**$3,142**	**$22,338**	**$41**
	TOTAL COST	**$884,018**	**$92,633**	**$368,172**	**$0**	**$1,344,824**	**$122,868**	**$78,388**	**$245,847**	**$1,791,927**	**$3,299**
	Owner's Costs										
	Preproduction Costs										
	6 Months All Labor									$16,212	$30
	1 Month Maintenance Materials									$3,661	$7
	1 Month Non-fuel Consumables									$641	$1
	1 Month Waste Disposal									$492	$1
	25% of 1 Months Fuel Cost at 100% CF									$3,049	$6
	2% of TPC									$35,839	$66
	Total									**$59,892**	**$110**
	Inventory Capital										
	60 day supply of fuel and consumables at 100% CF									$25,244	$46
	0.5% of TPC (spare parts)									$8,960	$16
	Total									**$34,204**	**$63**
	Initial Cost for Catalyst and Chemicals									$15,934	$29
	Land									$900	$2
	Other Owner's Costs									$268,789	$495
	Financing Costs									$48,382	$89
	Total Overnight Costs (TOC)									**$2,220,028**	**$4,086**
	TASC Multiplier							(IOU, high-risk, 35 year)		1.140	
	Total As-Spent Cost (TASC)									**$2,530,832**	**$4,658**

Exhibit 4-5 Case 2 O&M costs

INITIAL & ANNUAL O&M EXPENSES					Cost Base (Jun):	2011
Case 2 - GEE Radiant 550MW IGCC w/ CO2					Heat Rate-net (Btu/kWh):	10,458
					MWe-net:	543
					Capacity Factor (%):	80
OPERATING & MAINTENANCE LABOR						
Operating Labor						
Operating Labor Rate (base):	39.70 $/hour					
Operating Labor Burden:	30.00 % of base					
Labor O-H Charge Rate:	25.00 % of labor					
			Total			
Operating Labor Requirements(O.J.)pe	1 unit/mod.		Plant			
Skilled Operator	2.0		2.0			
Operator	10.0		10.0			
Foreman	1.0		1.0			
Lab Tech's, etc.	3.0		3.0			
TOTAL-O.J.'s	16.0		16.0			
					Annual Cost	Annual Unit Cost
					$	$/kW-net
Annual Operating Labor Cost					$7,233,658	$13.316
Maintenance Labor Cost					$18,705,024	$34.432
Administrative & Support Labor					$6,484,670	$11.937
Property Taxes and Insurance					$35,838,534	$65.971
TOTAL FIXED OPERATING COSTS					**$68,261,886**	**$125.655**
VARIABLE OPERATING COSTS						
						$/kWh-net
Maintenance Material Cost					**$35,141,270**	**$0.00923**
Consumables	Consumption		Unit	Initial Fill		
	Initial Fill	/Day	Cost	Cost		
Water (/1000 gallons)	0	4,187	1.67	**$0**	**$2,046,534**	**$0.00054**
Chemicals						
MU & WT Chem. (lbs)	0	24,944	0.27	$0	$1,950,825	$0.00051
Carbon (Mercury Removal) (lb)	79,786	109	1.63	$129,671	$51,869	$0.00001
COS Catalyst (m3)	0	0	3,751.70	$0	$0	$0.00000
Water Gas Shift Catalyst (ft3)	6,246	4.28	771.99	$4,822,078	$964,416	$0.00025
Selexol Solution (gal)	298,502	95	36.79	$10,982,258	$1,020,455	$0.00027
SCR Catalyst (m3)	0	0	0.00	$0	$0	$0.00000
Ammonia (19% NH3) (ton)	0	0	0.00	$0	$0	$0.00000
Claus Catalyst (ft3)	w/equip	2.01	203.15	$0	$119,488	$0.00003
Subtotal-Chemicals				**$15,934,007**	**$4,107,052**	**$0.00108**
Other						
Supplemental Fuel (MBtu)	0	0	0.00	$0	$0	$0.00000
Gases, N2 etc. (/100scf)	0	0	0.00	$0	$0	$0.00000
L.P. Steam (/1000 pounds)	0	0	0.00	$0	$0	$0.00000
Subtotal-Other				**$0**	**$0**	**$0.00000**
Waste Disposal						
Spent Mercury Catalyst (lb.)	0	109	0.65	$0	$20,747	$0.00001
Flyash (ton)	0	0	0.00	$0	$0	$0.00000
Slag (ton)	0	641	25.11	$0	$4,701,344	$0.00123
Subtotal Waste Disposal				**$0**	**$4,722,091**	**$0.00124**
By-products & Emissions	0	0	0.00		$0	$0.00000
Sulfur (ton)	0	146	0.00	$0	$0	$0.00000
Subtotal By-products				**$0**	**$0**	**$0.00000**
TOTAL VARIABLE OPERATING COSTS				**$15,934,007**	**$46,016,948**	**$0.01209**
Fuel (ton)	0	5,844	68.60	**$0**	**$117,064,944**	**$0.03075**

Exhibit 4-6 Case 9 capital and owner's costs

	Client:	USDOE/NETL							Report Date:	2012-Jun-12	
	Project:	Bituminous Baseline Study									
	TOTAL PLANT COST SUMMARY										
	Case:	Case 9	1x550 MWnet SubCritical PC								
	Plant Size:	550.1	MW,net	Estimate Type:			Cost Base (Jun)		2011	($x1000)	
Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
1	COAL & SORBENT HANDLING										
1.1	Coal Receive & Unload	$4,258	$0	$1,918	$0	$6,177	$535	$0	$1,007	$7,719	$14
1.2	Coal Stackout & Reclaim	$5,503	$0	$1,230	$0	$6,733	$570	$0	$1,096	$8,399	$15
1.3	Coal Conveyors	$5,117	$0	$1,217	$0	$6,333	$537	$0	$1,031	$7,901	$14
1.4	Other Coal Handling	$1,339	$0	$282	$0	$1,620	$137	$0	$264	$2,021	$4
1.5	Sorbent Receive & Unload	$171	$0	$51	$0	$221	$19	$0	$36	$276	$1
1.6	Sorbent Stackout & Reclaim	$2,755	$0	$498	$0	$3,253	$274	$0	$529	$4,056	$7
1.7	Sorbent Conveyors	$983	$213	$238	$0	$1,434	$120	$0	$233	$1,787	$3
1.8	Other Sorbent Handling	$594	$140	$307	$0	$1,041	$89	$0	$169	$1,299	$2
1.9	Coal & Sorbent Hnd.Foundations	$0	$4,935	$6,507	$0	$11,442	$1,073	$0	$1,877	$14,393	$26
	SUBTOTAL 1.	**$20,719**	**$5,288**	**$12,247**	**$0**	**$38,254**	**$3,355**	**$0**	**$6,241**	**$47,851**	**$87**
2	COAL & SORBENT PREP & FEED										
2.1	Coal Crushing & Drying	$2,445	$0	$470	$0	$2,915	$246	$0	$474	$3,636	$7
2.2	Coal Conveyor to Storage	$6,261	$0	$1,348	$0	$7,609	$644	$0	$1,238	$9,491	$17
2.3	Coal Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.4	Misc.Coal Prep & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.5	Sorbent Prep Equipment	$4,682	$203	$959	$0	$5,843	$492	$0	$950	$7,286	$13
2.6	Sorbent Storage & Feed	$564	$0	$213	$0	$777	$67	$0	$127	$971	$2
2.7	Sorbent Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.8	Booster Air Supply System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.9	Coal & Sorbent Feed Foundation	$0	$571	$501	$0	$1,073	$100	$0	$176	$1,348	$2
	SUBTOTAL 2.	**$13,952**	**$774**	**$3,491**	**$0**	**$18,218**	**$1,549**	**$0**	**$2,965**	**$22,732**	**$41**
3	FEEDWATER & MISC. BOP SYSTEMS										
3.1	Feedwater System	$19,500	$0	$6,718	$0	$26,218	$2,245	$0	$4,270	$32,733	$60
3.2	Water Makeup & Pretreating	$5,788	$0	$1,831	$0	$7,619	$696	$0	$1,663	$9,978	$18
3.3	Other Feedwater Subsystems	$6,555	$0	$2,691	$0	$9,246	$795	$0	$1,506	$11,547	$21
3.4	Service Water Systems	$1,159	$0	$607	$0	$1,766	$159	$0	$385	$2,309	$4
3.5	Other Boiler Plant Systems	$7,825	$0	$7,398	$0	$15,223	$1,385	$0	$2,491	$19,099	$35
3.6	FO Supply Sys & Nat Gas	$328	$0	$383	$0	$710	$64	$0	$116	$890	$2
3.7	Waste Treatment Equipment	$3,797	$0	$2,198	$0	$5,996	$577	$0	$1,315	$7,887	$14
3.8	Misc. Equip.(cranes,AirComp.,Comm.)	$3,210	$0	$993	$0	$4,203	$400	$0	$921	$5,523	$10
	SUBTOTAL 3.	**$48,162**	**$0**	**$22,819**	**$0**	**$70,981**	**$6,320**	**$0**	**$12,666**	**$89,967**	**$164**
4	PC BOILER & ACCESSORIES										
4.1	PC Boiler & Accessories	$158,957	$0	$103,808	$0	$262,765	$25,303	$0	$28,807	$316,875	$576
4.2	SCR (w/4.1)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.3	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.4	Boiler BoP (w/ ID Fans)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.5	Primary Air System	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.6	Secondary Air System	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.8	Major Component Rigging	$0	w/4.1	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.9	Boiler Foundations	$0	w/14.1	w/14.1	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 4.	**$158,957**	**$0**	**$103,808**	**$0**	**$262,765**	**$25,303**	**$0**	**$28,807**	**$316,875**	**$576**

Exhibit 4-6 Case 9 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
5	FLUE GAS CLEANUP										
5.1	Absorber Vessels & Accessories	$70,355	$0	$15,042	$0	$85,398	$7,928	$0	$9,333	$102,658	$187
5.2	Other FGD	$3,671	$0	$4,132	$0	$7,804	$739	$0	$854	$9,397	$17
5.3	Bag House & Accessories	$19,882	$0	$12,531	$0	$32,413	$3,046	$0	$3,546	$39,005	$71
5.4	Other Particulate Removal Materials	$1,345	$0	$1,430	$0	$2,775	$263	$0	$304	$3,342	$6
5.5	Gypsum Dewatering System	$5,766	$0	$973	$0	$6,738	$624	$0	$736	$8,099	$15
5.6	Mercury Removal System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5.9	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 5.	**$101,020**	**$0**	**$34,108**	**$0**	**$135,128**	**$12,600**	**$0**	**$14,773**	**$162,502**	**$295**
5B	CO_2 REMOVAL & COMPRESSION										
5B.1	CO_2 Removal System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5B.2	CO_2 Compression & Drying	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 5B.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
6	COMBUSTION TURBINE/ACCESSORIES										
6.1	Combustion Turbine Generator	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
6.2	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.3	Compressed Air Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.9	Combustion Turbine Foundations	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 6.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
7	HRSG, DUCTING & STACK										
7.1	Heat Recovery Steam Generator	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
7.2	HRSG Accessories	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.3	Ductwork	$11,086	$0	$6,998	$0	$18,084	$1,528	$0	$2,942	$22,553	$41
7.4	Stack	$11,025	$0	$6,407	$0	$17,431	$1,636	$0	$1,907	$20,974	$38
7.9	Duct & Stack Foundations	$0	$1,202	$1,427	$0	$2,629	$246	$0	$575	$3,450	$6
	SUBTOTAL 7.	**$22,111**	**$1,202**	**$14,832**	**$0**	**$38,144**	**$3,410**	**$0**	**$5,423**	**$46,977**	**$85**
8	STEAM TURBINE GENERATOR										
8.1	Steam TG & Accessories	$64,429	$0	$7,474	$0	$71,902	$6,308	$0	$7,821	$86,031	$156
8.2	Turbine Plant Auxiliaries	$420	$0	$893	$0	$1,312	$125	$0	$144	$1,582	$3
8.3	Condenser & Auxiliaries	$8,741	$0	$2,747	$0	$11,488	$1,070	$0	$1,256	$13,814	$25
8.4	Steam Piping	$21,266	$0	$9,448	$0	$30,714	$2,354	$0	$4,960	$38,028	$69
8.9	TG Foundations	$0	$1,251	$2,066	$0	$3,317	$313	$0	$726	$4,356	$8
	SUBTOTAL 8.	**$94,855**	**$1,251**	**$22,628**	**$0**	**$118,734**	**$10,170**	**$0**	**$14,907**	**$143,811**	**$261**
9	COOLING WATER SYSTEM										
9.1	Cooling Towers	$11,793	$0	$3,647	$0	$15,440	$1,438	$0	$1,688	$18,566	$34
9.2	Circulating Water Pumps	$2,356	$0	$154	$0	$2,509	$214	$0	$272	$2,995	$5
9.3	Circ.Water System Auxiliaries	$640	$0	$85	$0	$725	$67	$0	$79	$871	$2
9.4	Circ.Water Piping	$0	$5,395	$4,885	$0	$10,280	$910	$0	$1,678	$12,868	$23
9.5	Make-up Water System	$575	$0	$739	$0	$1,315	$121	$0	$215	$1,652	$3
9.6	Component Cooling Water Sys	$522	$0	$401	$0	$923	$84	$0	$151	$1,158	$2
9.9	Circ.Water System Foundations & Structures	$0	$2,863	$4,755	$0	$7,618	$718	$0	$1,667	$10,003	$18
	SUBTOTAL 9.	**$15,886**	**$8,258**	**$14,666**	**$0**	**$38,810**	**$3,552**	**$0**	**$5,752**	**$48,114**	**$87**

Exhibit 4-6 Case 9 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
10	ASH/SPENT SORBENT HANDLING SYS										
10.1	Ash Coolers	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.2	Cyclone Ash Letdown	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.3	HGCU Ash Letdown	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.4	High Temperature Ash Piping	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.5	Other Ash Recovery Equipment	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.6	Ash Storage Silos	$738	$0	$2,257	$0	$2,995	$287	$0	$328	$3,611	$7
10.7	Ash Transport & Feed Equipment	$4,900	$0	$4,858	$0	$9,758	$899	$0	$1,066	$11,723	$21
10.8	Misc. Ash Handling Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.9	Ash/Spent Sorbent Foundation	$0	$167	$205	$0	$372	$35	$0	$81	$488	$1
	SUBTOTAL 10.	**$5,638**	**$167**	**$7,320**	**$0**	**$13,125**	**$1,221**	**$0**	**$1,475**	**$15,821**	**$29**
11	ACCESSORY ELECTRIC PLANT										
11.1	Generator Equipment	$1,948	$0	$311	$0	$2,259	$202	$0	$185	$2,646	$5
11.2	Station Service Equipment	$3,408	$0	$1,142	$0	$4,550	$423	$0	$373	$5,346	$10
11.3	Switchgear & Motor Control	$3,911	$0	$679	$0	$4,591	$424	$0	$502	$5,517	$10
11.4	Conduit & Cable Tray	$0	$2,682	$8,666	$0	$11,348	$1,059	$0	$1,861	$14,268	$26
11.5	Wire & Cable	$0	$5,107	$9,129	$0	$14,236	$1,143	$0	$2,307	$17,686	$32
11.6	Protective Equipment	$317	$0	$1,099	$0	$1,416	$136	$0	$155	$1,707	$3
11.7	Standby Equipment	$1,501	$0	$35	$0	$1,536	$141	$0	$168	$1,844	$3
11.8	Main Power Transformers	$9,993	$0	$206	$0	$10,200	$775	$0	$1,097	$12,072	$22
11.9	Electrical Foundations	$0	$360	$916	$0	$1,276	$121	$0	$279	$1,676	$3
	SUBTOTAL 11.	**$21,078**	**$8,149**	**$22,184**	**$0**	**$51,411**	**$4,424**	**$0**	**$6,927**	**$62,762**	**$114**
12	INSTRUMENTATION & CONTROL										
12.1	PC Control Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.2	Combustion Turbine Control	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
12.3	Steam Turbine Control	w/8.1	$0	w/8.1	$0	$0	$0	$0	$0	$0	$0
12.4	Other Major Component Control	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12.5	Signal Processing Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.6	Control Boards,Panels & Racks	$524	$0	$320	$0	$844	$79	$0	$138	$1,061	$2
12.7	Distributed Control System Equipment	$5,285	$0	$942	$0	$6,228	$575	$0	$680	$7,483	$14
12.8	Instrument Wiring & Tubing	$3,187	$0	$5,799	$0	$8,986	$728	$0	$1,457	$11,171	$20
12.9	Other I & C Equipment	$1,493	$0	$3,458	$0	$4,952	$473	$0	$542	$5,967	$11
	SUBTOTAL 12.	**$10,489**	**$0**	**$10,520**	**$0**	**$21,009**	**$1,855**	**$0**	**$2,818**	**$25,682**	**$47**

Exhibit 4-6 Case 9 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
13	IMPROVEMENTS TO SITE										
13.1	Site Preparation	$0	$56	$1,197	$0	$1,253	$122	$0	$275	$1,651	$3
13.2	Site Improvements	$0	$1,868	$2,468	$0	$4,336	$430	$0	$953	$5,720	$10
13.3	Site Facilities	$3,348	$0	$3,512	$0	$6,860	$683	$0	$1,508	$9,051	$16
	SUBTOTAL 13.	**$3,348**	**$1,924**	**$7,177**	**$0**	**$12,449**	**$1,235**	**$0**	**$2,737**	**$16,422**	**$30**
14	BUILDINGS & STRUCTURES										
14.1	Boiler Building	$0	$10,206	$8,969	$0	$19,175	$1,687	$0	$5,216	$26,078	$47
14.2	Turbine Building	$0	$14,749	$13,737	$0	$28,485	$2,513	$0	$7,750	$38,749	$70
14.3	Administration Building	$0	$703	$743	$0	$1,447	$128	$0	$394	$1,969	$4
14.4	Circulation Water Pumphouse	$0	$202	$160	$0	$362	$32	$0	$98	$492	$1
14.5	Water Treatment Buildings	$0	$722	$658	$0	$1,380	$122	$0	$375	$1,877	$3
14.6	Machine Shop	$0	$470	$316	$0	$786	$68	$0	$214	$1,068	$2
14.7	Warehouse	$0	$319	$320	$0	$638	$57	$0	$174	$869	$2
14.8	Other Buildings & Structures	$0	$260	$222	$0	$482	$42	$0	$131	$656	$1
14.9	Waste Treating Building & Str.	$0	$499	$1,513	$0	$2,011	$187	$0	$550	$2,748	$5
	SUBTOTAL 14.	**$0**	**$28,131**	**$26,637**	**$0**	**$54,767**	**$4,836**	**$0**	**$14,901**	**$74,504**	**$135**
	TOTAL COST	**$516,214**	**$55,144**	**$302,437**	**$0**	**$873,796**	**$79,833**	**$0**	**$120,392**	**$1,074,020**	**$1,953**
	Owner's Costs										
	Preproduction Costs										
	6 Months All Labor									$8,335	$15
	1 Month Maintenance Materials									$1,030	$2
	1 Month Non-fuel Consumables									$1,786	$3
	1 Month Waste Disposal									$389	$1
	25% of 1 Months Fuel Cost at 100% CF									$2,738	$5
	2% of TPC									$21,480	$39
	Total									**$35,759**	**$65**
	Inventory Capital										
60 day	supply of fuel and consumables at 100% CF									$25,041	$46
	0.5% of TPC (spare parts)									$5,370	$10
	Total									**$30,411**	**$55**
	Initial Cost for Catalyst and Chemicals									$0	$0
	Land									$900	$2
	Other Owner's Costs									$161,103	$293
	Financing Costs									$28,999	$53
	Total Overnight Costs (TOC)									**$1,331,191**	**$2,420**
	TASC Multiplier							(IOU, low-risk, 35 year)		1.134	
	Total As-Spent Cost (TASC)									**$1,509,571**	**$2,744**

Exhibit 4-7 Case 9 O&M costs

INITIAL & ANNUAL O&M EXPENSES					Cost Base (Jun):	2011
Case 9 - 1x550 MWnet SubCritical PC					Heat Rate-net (Btu/kWh):	9,276
					MWe-net:	550
					Capacity Factor (%):	85
OPERATING & MAINTENANCE LABOR						
Operating Labor						
Operating Labor Rate (base):	39.70	$/hour				
Operating Labor Burden:	30.00	% of base				
Labor O-H Charge Rate:	25.00	% of labor				
Operating Labor Requirements(O.J.)per Shi	1 unit/mod.		Total Plant			
Skilled Operator	2.0		2.0			
Operator	9.0		9.0			
Foreman	1.0		1.0			
Lab Tech's, etc.	2.0		2.0			
TOTAL-O.J.'s	14.0		14.0			
					Annual Cost	Annual Unit Cost
					$	$/kW-net
Annual Operating Labor Cost					$6,329,450	$11.507
Maintenance Labor Cost					$7,007,334	$12.739
Administrative & Support Labor					$3,334,196	$6.062
Property Taxes and Insurance					$21,480,398	$39.052
TOTAL FIXED OPERATING COSTS					**$38,151,378**	**$69.360**
VARIABLE OPERATING COSTS						
						$/kWh-net
Maintenance Material Cost					**$10,511,001**	**$0.00257**
Consumables	Consumption Initial Fill	Consumption /Day	Unit Cost	Initial Fill Cost		
Water (/1000 gallons)	0	4,245.12	1.67	**$0**	**$2,204,732**	**$0.00054**
Chemicals						
MU & WT Chem.(lbs)	0	20,549	0.27	$0	$1,707,570	$0.00042
Limestone (ton)	0	521	33.48	$0	$5,410,837	$0.00132
Carbon (Mercury Removal) (lb)	0	0	1.63	$0	$0	$0.00000
MEA Solvent (ton)	0	0	3,481.91	$0	$0	$0.00000
NaOH (tons)	0	0	671.16	$0	$0	$0.00000
H2SO4 (tons)	0	0	214.78	$0	$0	$0.00000
Corrosion Inhibitor	0	0	0.00	$0	$0	$0.00000
Activated Carbon (lb)	0	0	1.63	$0	$0	$0.00000
Ammonia (19% NH3) ton	0	78	330.00	$0	$7,973,549	$0.00195
Subtotal Chemicals				**$0**	**$15,091,955**	**$0.00368**
Other						
Supplemental Fuel (MBtu)	0	0	0.00	$0	$0	$0.00000
SCR Catalyst (m3)	w/equip.	0.33	8,938.80	$0	$917,168	$0.00022
Emission Penalties	0	0	0.00	$0	$0	$0.00000
Subtotal Other				**$0**	**$917,168**	**$0.00022**
Waste Disposal						
Fly Ash (ton)	0	407	25.11	$0	$3,171,856	$0.00077
Bottom Ash (ton)	0	102	25.11	$0	$792,964	$0.00019
Subtotal-Waste Disposal				**$0**	**$3,964,820**	**$0.00097**
By-products & Emissions						
Gypsum (tons)	0	811	0.00	$0	$0	$0.00000
Subtotal By-Products				**$0**	**$0**	**$0.00000**
TOTAL VARIABLE OPERATING COSTS				**$0**	**$32,689,676**	**$0.00798**
Fuel (ton)	0	5,248	68.60	**$0**	**$111,701,264**	**$0.02727**

Exhibit 4-8 Case 10 capital and owner's costs

	Client:	USDOE/NETL							Report Date:	2012-Jun-12	
	Project:	Bituminous Baseline Study									
	TOTAL PLANT COST SUMMARY										
	Case:	Case 10	1x550 MWnet SubCritical PC w/ CO2 Capture								
	Plant Size:	550.0	MW,net	Estimate Type:			Cost Base (Jun)		2011	($x1000)	
Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
1	COAL & SORBENT HANDLING										
1.1	Coal Receive & Unload	$5,260	$0	$2,370	$0	$7,630	$661	$0	$1,244	$9,535	$17
1.2	Coal Stackout & Reclaim	$6,798	$0	$1,519	$0	$8,317	$705	$0	$1,353	$10,375	$19
1.3	Coal Conveyors	$6,320	$0	$1,503	$0	$7,824	$664	$0	$1,273	$9,761	$18
1.4	Other Coal Handling	$1,654	$0	$348	$0	$2,001	$169	$0	$326	$2,496	$5
1.5	Sorbent Receive & Unload	$216	$0	$64	$0	$280	$24	$0	$46	$349	$1
1.6	Sorbent Stackout & Reclaim	$3,483	$0	$629	$0	$4,112	$346	$0	$669	$5,127	$9
1.7	Sorbent Conveyors	$1,243	$270	$301	$0	$1,813	$152	$0	$295	$2,259	$4
1.8	Other Sorbent Handling	$751	$177	$388	$0	$1,315	$113	$0	$214	$1,642	$3
1.9	Coal & Sorbent Hnd.Foundations	$0	$6,097	$8,038	$0	$14,135	$1,325	$0	$2,319	$17,779	$32
	SUBTOTAL 1.	**$25,724**	**$6,543**	**$15,160**	**$0**	**$47,427**	**$4,159**	**$0**	**$7,738**	**$59,325**	**$108**
2	COAL & SORBENT PREP & FEED										
2.1	Coal Crushing & Drying	$3,062	$0	$589	$0	$3,651	$308	$0	$594	$4,553	$8
2.2	Coal Conveyor to Storage	$7,840	$0	$1,688	$0	$9,528	$806	$0	$1,550	$11,885	$22
2.3	Coal Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.4	Misc.Coal Prep & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.5	Sorbent Prep Equipment	$5,941	$257	$1,217	$0	$7,415	$625	$0	$1,206	$9,245	$17
2.6	Sorbent Storage & Feed	$716	$0	$270	$0	$986	$85	$0	$161	$1,232	$2
2.7	Sorbent Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.8	Booster Air Supply System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.9	Coal & Sorbent Feed Foundation	$0	$725	$636	$0	$1,361	$127	$0	$223	$1,711	$3
	SUBTOTAL 2.	**$17,559**	**$982**	**$4,400**	**$0**	**$22,941**	**$1,951**	**$0**	**$3,734**	**$28,625**	**$52**
3	FEEDWATER & MISC. BOP SYSTEMS										
3.1	Feedwater System	$24,738	$0	$8,523	$0	$33,262	$2,849	$0	$5,417	$41,527	$76
3.2	Water Makeup & Pretreating	$9,142	$0	$2,892	$0	$12,034	$1,100	$0	$2,627	$15,760	$29
3.3	Other Feedwater Subsystems	$8,316	$0	$3,414	$0	$11,730	$1,008	$0	$1,911	$14,649	$27
3.4	Service Water Systems	$1,831	$0	$958	$0	$2,789	$250	$0	$608	$3,647	$7
3.5	Other Boiler Plant Systems	$10,104	$0	$9,553	$0	$19,656	$1,789	$0	$3,217	$24,662	$45
3.6	FO Supply Sys & Nat Gas	$357	$0	$417	$0	$773	$69	$0	$126	$969	$2
3.7	Waste Treatment Equipment	$5,998	$0	$3,472	$0	$9,470	$911	$0	$2,076	$12,457	$23
3.8	Misc. Equip.(cranes,AirComp.,Comm.)	$3,494	$0	$1,081	$0	$4,575	$435	$0	$1,002	$6,012	$11
	SUBTOTAL 3.	**$63,980**	**$0**	**$30,309**	**$0**	**$94,289**	**$8,411**	**$0**	**$16,983**	**$119,684**	**$218**
4	PC BOILER & ACCESSORIES										
4.1	PC Boiler & Accessories	$201,617	$0	$131,668	$0	$333,285	$32,094	$0	$36,538	$401,917	$731
4.2	SCR (w/4.1)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.3	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.4	Boiler BoP (w/ ID Fans)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.5	Primary Air System	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.6	Secondary Air System	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.8	Major Component Rigging	$0	w/4.1	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.9	Boiler Foundations	$0	w/14.1	w/14.1	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 4.	**$201,617**	**$0**	**$131,668**	**$0**	**$333,285**	**$32,094**	**$0**	**$36,538**	**$401,917**	**$731**

Exhibit 4-8 Case 10 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
5	FLUE GAS CLEANUP										
5.1	Absorber Vessels & Accessories	$90,067	$0	$19,257	$0	$109,324	$10,149	$0	$11,947	$131,421	$239
5.2	Other FGD	$4,700	$0	$5,290	$0	$9,990	$946	$0	$1,094	$12,030	$22
5.3	Bag House & Accessories	$26,018	$0	$16,398	$0	$42,416	$3,986	$0	$4,640	$51,042	$93
5.4	Other Particulate Removal Materials	$1,761	$0	$1,871	$0	$3,632	$344	$0	$398	$4,373	$8
5.5	Gypsum Dewatering System	$7,144	$0	$1,205	$0	$8,349	$774	$0	$912	$10,035	$18
5.6	Mercury Removal System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5.9	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 5.	**$129,690**	**$0**	**$44,022**	**$0**	**$173,711**	**$16,199**	**$0**	**$18,991**	**$208,902**	**$380**
5B	CO2 REMOVAL & COMPRESSION										
5B.1	CO2 Removal System	$263,358	$0	$79,417	$0	$342,775	$31,924	$68,555	$88,651	$531,906	$967
5B.2	CO2 Compression & Drying	$51,312	$0	$18,582	$0	$69,894	$6,522	$0	$15,283	$91,699	$167
	SUBTOTAL 5B.	**$314,670**	**$0**	**$97,999**	**$0**	**$412,669**	**$38,447**	**$68,555**	**$103,934**	**$623,605**	**$1,134**
6	COMBUSTION TURBINE/ACCESSORIES										
6.1	Combustion Turbine Generator	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
6.2	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.3	Compressed Air Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.9	Combustion Turbine Foundations	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 6.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
7	HRSG, DUCTING & STACK										
7.1	Heat Recovery Steam Generator	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
7.2	HRSG Accessories	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.3	Ductwork	$12,422	$0	$7,841	$0	$20,263	$1,712	$0	$3,296	$25,271	$46
7.4	Stack	$11,230	$0	$6,526	$0	$17,756	$1,667	$0	$1,942	$21,365	$39
7.9	Duct & Stack Foundations	$0	$1,224	$1,454	$0	$2,678	$251	$0	$586	$3,514	$6
	SUBTOTAL 7.	**$23,652**	**$1,224**	**$15,821**	**$0**	**$40,697**	**$3,629**	**$0**	**$5,824**	**$50,150**	**$91**
8	STEAM TURBINE GENERATOR										
8.1	Steam TG & Accessories	$71,266	$0	$8,267	$0	$79,533	$6,978	$0	$8,651	$95,161	$173
8.2	Turbine Plant Auxiliaries	$466	$0	$992	$0	$1,458	$139	$0	$160	$1,757	$3
8.3	Condenser & Auxiliaries	$7,418	$0	$3,051	$0	$10,470	$978	$0	$1,145	$12,593	$23
8.4	Steam Piping	$26,973	$0	$11,984	$0	$38,957	$2,986	$0	$6,291	$48,234	$88
8.9	TG Foundations	$0	$1,390	$2,295	$0	$3,684	$347	$0	$806	$4,838	$9
	SUBTOTAL 8.	**$106,123**	**$1,390**	**$26,588**	**$0**	**$134,101**	**$11,428**	**$0**	**$17,053**	**$162,582**	**$296**
9	COOLING WATER SYSTEM										
9.1	Cooling Towers	$20,085	$0	$6,212	$0	$26,297	$2,450	$0	$2,875	$31,622	$57
9.2	Circulating Water Pumps	$4,017	$0	$311	$0	$4,329	$369	$0	$470	$5,168	$9
9.3	Circ.Water System Auxiliaries	$1,012	$0	$134	$0	$1,146	$106	$0	$125	$1,377	$3
9.4	Circ.Water Piping	$0	$8,525	$7,720	$0	$16,244	$1,438	$0	$2,652	$20,335	$37
9.5	Make-up Water System	$847	$0	$1,088	$0	$1,935	$179	$0	$317	$2,430	$4
9.6	Component Cooling Water Sys	$825	$0	$633	$0	$1,458	$133	$0	$239	$1,830	$3
9.9	Circ.Water System Foundations& Structures	$0	$4,520	$7,505	$0	$12,025	$1,133	$0	$2,632	$15,790	$29
	SUBTOTAL 9.	**$26,786**	**$13,044**	**$23,603**	**$0**	**$63,434**	**$5,807**	**$0**	**$9,309**	**$78,550**	**$143**

Exhibit 4-8 Case 10 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
10	ASH/SPENT SORBENT HANDLING SYS										
10.1	Ash Coolers	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.2	Cyclone Ash Letdown	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.3	HGCU Ash Letdown	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.4	High Temperature Ash Piping	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.5	Other Ash Recovery Equipment	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.6	Ash Storage Silos	$891	$0	$2,727	$0	$3,619	$347	$0	$397	$4,363	$8
10.7	Ash Transport & Feed Equipment	$5,921	$0	$5,870	$0	$11,790	$1,086	$0	$1,288	$14,164	$26
10.8	Misc. Ash Handling Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.9	Ash/Spent Sorbent Foundation	$0	$201	$248	$0	$449	$42	$0	$98	$589	$1
	SUBTOTAL 10.	**$6,812**	**$201**	**$8,845**	**$0**	**$15,858**	**$1,475**	**$0**	**$1,782**	**$19,116**	**$35**
11	ACCESSORY ELECTRIC PLANT										
11.1	Generator Equipment	$2,119	$0	$339	$0	$2,457	$220	$0	$201	$2,878	$5
11.2	Station Service Equipment	$6,040	$0	$2,025	$0	$8,065	$750	$0	$661	$9,476	$17
11.3	Switchgear & Motor Control	$6,933	$0	$1,204	$0	$8,137	$752	$0	$889	$9,779	$18
11.4	Conduit & Cable Tray	$0	$4,754	$15,360	$0	$20,115	$1,877	$0	$3,299	$25,291	$46
11.5	Wire & Cable	$0	$9,053	$16,182	$0	$25,235	$2,027	$0	$4,089	$31,350	$57
11.6	Protective Equipment	$317	$0	$1,099	$0	$1,416	$136	$0	$155	$1,707	$3
11.7	Standby Equipment	$1,607	$0	$37	$0	$1,644	$151	$0	$180	$1,975	$4
11.8	Main Power Transformers	$13,779	$0	$228	$0	$14,007	$1,062	$0	$1,507	$16,576	$30
11.9	Electrical Foundations	$0	$398	$1,013	$0	$1,411	$133	$0	$309	$1,853	$3
	SUBTOTAL 11.	**$30,795**	**$14,205**	**$37,488**	**$0**	**$82,488**	**$7,109**	**$0**	**$11,289**	**$100,886**	**$183**
12	INSTRUMENTATION & CONTROL										
12.1	PC Control Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.2	Combustion Turbine Control	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
12.3	Steam Turbine Control	w/8.1	$0	w/8.1	$0	$0	$0	$0	$0	$0	$0
12.4	Other Major Component Control	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12.5	Signal Processing Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.6	Control Boards,Panels & Racks	$601	$0	$367	$0	$968	$91	$48	$166	$1,273	$2
12.7	Distributed Control System Equipment	$6,064	$0	$1,081	$0	$7,146	$660	$357	$816	$8,979	$16
12.8	Instrument Wiring & Tubing	$3,657	$0	$6,654	$0	$10,311	$835	$516	$1,749	$13,411	$24
12.9	Other I & C Equipment	$1,714	$0	$3,968	$0	$5,681	$543	$284	$651	$7,159	$13
	SUBTOTAL 12.	**$12,035**	**$0**	**$12,070**	**$0**	**$24,106**	**$2,129**	**$1,205**	**$3,382**	**$30,822**	**$56**

Exhibit 4-8 Case 10 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
13	IMPROVEMENTS TO SITE										
13.1	Site Preparation	$0	$63	$1,346	$0	$1,409	$137	$0	$309	$1,856	$3
13.2	Site Improvements	$0	$2,100	$2,775	$0	$4,875	$484	$0	$1,072	$6,431	$12
13.3	Site Facilities	$3,764	$0	$3,948	$0	$7,712	$767	$0	$1,696	$10,175	$18
	SUBTOTAL 13.	**$3,764**	**$2,164**	**$8,069**	**$0**	**$13,996**	**$1,389**	**$0**	**$3,077**	**$18,462**	**$34**
14	BUILDINGS & STRUCTURES										
14.1	Boiler Building	$0	$10,972	$9,643	$0	$20,615	$1,814	$0	$3,364	$25,793	$47
14.2	Turbine Building	$0	$16,078	$14,974	$0	$31,052	$2,740	$0	$5,069	$38,861	$71
14.3	Administration Building	$0	$775	$818	$0	$1,593	$141	$0	$260	$1,994	$4
14.4	Circulation Water Pumphouse	$0	$211	$168	$0	$379	$33	$0	$62	$474	$1
14.5	Water Treatment Buildings	$0	$1,140	$1,039	$0	$2,179	$192	$0	$356	$2,727	$5
14.6	Machine Shop	$0	$518	$348	$0	$866	$75	$0	$141	$1,082	$2
14.7	Warehouse	$0	$351	$352	$0	$703	$62	$0	$115	$880	$2
14.8	Other Buildings & Structures	$0	$287	$244	$0	$531	$47	$0	$87	$664	$1
14.9	Waste Treating Building & Str.	$0	$549	$1,665	$0	$2,215	$206	$0	$363	$2,784	$5
	SUBTOTAL 14.	**$0**	**$30,881**	**$29,251**	**$0**	**$60,133**	**$5,310**	**$0**	**$9,816**	**$75,259**	**$137**
	TOTAL COST	**$963,207**	**$70,634**	**$485,294**	**$0**	**$1,519,135**	**$139,537**	**$69,760**	**$249,452**	**$1,977,885**	**$3,596**
	Owner's Costs										
	Preproduction Costs										
	6 Months All Labor									$12,549	$23
	1 Month Maintenance Materials									$1,867	$3
	1 Month Non-fuel Consumables									$3,202	$6
	1 Month Waste Disposal									$547	$1
	25% of 1 Months Fuel Cost at 100% CF									$3,850	$7
	2% of TPC									$39,558	$72
	Total									**$61,572**	**$112**
	Inventory Capital										
	60 day supply of fuel and consumables at 100% CF									$36,379	$66
	0.5% of TPC (spare parts)									$9,889	$18
	Total									**$46,268**	**$84**
	Initial Cost for Catalyst and Chemicals									$4,187	$8
	Land									$900	$2
	Other Owner's Costs									$296,683	$539
	Financing Costs									$53,403	$97
	Total Overnight Costs (TOC)									**$2,440,898**	**$4,438**
	TASC Multiplier							(IOU, high-risk, 35 year)		1.140	
	Total As-Spent Cost (TASC)									**$2,782,624**	**$5,059**

Exhibit 4-9 Case 10 O&M costs

INITIAL & ANNUAL O&M EXPENSES					Cost Base (Jun):	2011
Case 10 - 1x550 MWnet SubCritical PC w/ CO2 Capture					Heat Rate-net (Btu/kWh):	13,044
					MWe-net:	550
					Capacity Factor (%):	85
OPERATING & MAINTENANCE LABOR						
Operating Labor						
Operating Labor Rate (base):	39.70	$/hour				
Operating Labor Burden:	30.00	% of base				
Labor O-H Charge Rate:	25.00	% of labor				
Operating Labor Requirements(O.J.)per Shift:	1 unit/mod.		Total Plant			
Skilled Operator	2.0		2.0			
Operator	11.3		11.3			
Foreman	1.0		1.0			
Lab Tech's, etc.	2.0		2.0			
TOTAL-O.J.'s	16.3		16.3			
					Annual Cost	Annual Unit Cost
					$	$/kW-net
Annual Operating Labor Cost					$7,384,208	$13.426
Maintenance Labor Cost					$12,694,314	$23.080
Administrative & Support Labor					$5,019,631	$9.126
Property Taxes and Insurance					$39,557,702	$71.922
TOTAL FIXED OPERATING COSTS					**$64,655,855**	**$117.554**
VARIABLE OPERATING COSTS						
						$/kWh-net
Maintenance Material Cost					**$19,041,471**	**$0.00465**
Consumables	Consumption Initial Fill	Consumption /Day	Unit Cost	Initial Fill Cost		
Water (/1000 gallons)	0	8,081	1.67	**$0**	**$4,197,067**	**$0.00102**
Chemicals						
MU & WT Chem.(lbs)	0	39,119	0.27	$0	$3,250,638	$0.00079
Limestone (ton)	0	751	33.48	$0	$7,805,051	$0.00191
Carbon (Mercury Removal) (lb)	0	0	1.63	$0	$0	$0.00000
MEA Solvent (ton)	1,117	1.58	3,481.91	$3,889,510	$1,710,963	$0.00042
NaOH (tons)	79	7.89	671.16	$52,960	$1,643,087	$0.00040
H2SO4 (tons)	75	7.53	214.78	$16,173	$501,756	$0.00012
Corrosion Inhibitor	0	0	0.00	$228,761	$10,893	$0.00000
Activated Carbon (lb)	0	1,892	1.63	$0	$953,987	$0.00023
Ammonia (19% NH3) ton	0	110	330.00	$0	$11,304,257	$0.00276
Subtotal Chemicals				**$4,187,404**	**$27,180,633**	**$0.00664**
Other						
Supplemental Fuel (MBtu)	0	0	0.00	$0	$0	$0.00000
SCR Catalyst (m3)	w/equip.	0.46	8,938.80	$0	$1,286,850	$0.00031
Emission Penalties	0	0	0.00	$0	$0	$0.00000
Subtotal Other				**$0**	**$1,286,850**	**$0.00031**
Waste Disposal						
Fly Ash (ton)	0	572	25.11	$0	$4,459,927	$0.00109
Bottom Ash (ton)	0	143	25.11	$0	$1,114,982	$0.00027
Subtotal-Waste Disposal				**$0**	**$5,574,909**	**$0.00136**
By-products & Emissions						
Gypsum (tons)	0	1,159	0.00	$0	$0	$0.00000
Subtotal By-Products				**$0**	**$0**	**$0.00000**
TOTAL VARIABLE OPERATING COSTS				**$4,187,404**	**$57,280,930**	**$0.01399**
Fuel (ton)	0	7,380	68.60	**$0**	**$157,063,965**	**$0.03835**

Exhibit 4-10 Case 11 capital and owner's costs

	Client:	USDOE/NETL							Report Date:	2012-Jun-12	
	Project:	Bituminous Baseline Study									
	TOTAL PLANT COST SUMMARY										
	Case:	Case 11	1x550 MWnet SuperCritical PC								
	Plant Size:	550.0	MW, net	Estimate Type:				Cost Base (Jun)	2011	($x1000)	
Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
1	COAL & SORBENT HANDLING										
1.1	Coal Receive & Unload	$4,088	$0	$1,842	$0	$5,930	$514	$0	$967	$7,410	$13
1.2	Coal Stackout & Reclaim	$5,283	$0	$1,181	$0	$6,464	$548	$0	$1,052	$8,063	$15
1.3	Coal Conveyors	$4,912	$0	$1,168	$0	$6,080	$516	$0	$989	$7,586	$14
1.4	Other Coal Handling	$1,285	$0	$270	$0	$1,555	$132	$0	$253	$1,940	$4
1.5	Sorbent Receive & Unload	$164	$0	$49	$0	$212	$18	$0	$35	$265	$0
1.6	Sorbent Stackout & Reclaim	$2,641	$0	$477	$0	$3,118	$263	$0	$507	$3,888	$7
1.7	Sorbent Conveyors	$942	$205	$228	$0	$1,375	$115	$0	$223	$1,713	$3
1.8	Other Sorbent Handling	$569	$134	$294	$0	$998	$85	$0	$162	$1,246	$2
1.9	Coal & Sorbent Hnd.Foundations	$0	$4,738	$6,247	$0	$10,985	$1,030	$0	$1,802	$13,817	$25
	SUBTOTAL 1.	**$19,885**	**$5,077**	**$11,756**	**$0**	**$36,718**	**$3,221**	**$0**	**$5,991**	**$45,929**	**$84**
2	COAL & SORBENT PREP & FEED										
2.1	Coal Crushing & Drying	$2,341	$0	$450	$0	$2,791	$236	$0	$454	$3,481	$6
2.2	Coal Conveyor to Storage	$5,995	$0	$1,291	$0	$7,286	$617	$0	$1,185	$9,088	$17
2.3	Coal Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.4	Misc.Coal Prep & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.5	Sorbent Prep Equipment	$4,486	$194	$919	$0	$5,599	$472	$0	$911	$6,981	$13
2.6	Sorbent Storage & Feed	$540	$0	$204	$0	$745	$64	$0	$121	$930	$2
2.7	Sorbent Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.8	Booster Air Supply System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.9	Coal & Sorbent Feed Foundation	$0	$547	$480	$0	$1,028	$96	$0	$168	$1,292	$2
	SUBTOTAL 2.	**$13,363**	**$742**	**$3,344**	**$0**	**$17,448**	**$1,483**	**$0**	**$2,840**	**$21,772**	**$40**
3	FEEDWATER & MISC. BOP SYSTEMS										
3.1	Feedwater System	$22,338	$0	$7,202	$0	$29,540	$2,524	$0	$4,810	$36,874	$67
3.2	Water Makeup & Pretreating	$5,434	$0	$1,719	$0	$7,152	$654	$0	$1,561	$9,367	$17
3.3	Other Feedwater Subsystems	$7,027	$0	$2,885	$0	$9,912	$852	$0	$1,615	$12,378	$23
3.4	Service Water Systems	$1,088	$0	$569	$0	$1,658	$149	$0	$361	$2,168	$4
3.5	Other Boiler Plant Systems	$8,511	$0	$8,046	$0	$16,557	$1,507	$0	$2,710	$20,773	$38
3.6	FO Supply Sys & Nat Gas	$327	$0	$382	$0	$709	$63	$0	$116	$888	$2
3.7	Waste Treatment Equipment	$3,565	$0	$2,064	$0	$5,628	$542	$0	$1,234	$7,404	$13
3.8	Misc. Equip.(cranes,AirComp.,Comm.)	$3,203	$0	$991	$0	$4,194	$399	$0	$919	$5,511	$10
	SUBTOTAL 3.	**$51,492**	**$0**	**$23,858**	**$0**	**$75,351**	**$6,689**	**$0**	**$13,325**	**$95,364**	**$173**
4	PC BOILER										
4.1	PC Boiler & Accessories	$185,402	$0	$105,641	$0	$291,043	$28,011	$0	$31,905	$350,959	$638
4.2	SCR (w/4.1)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.3	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.4	Boiler BoP (w/ ID Fans)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.5	Primary Air System	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.6	Secondary Air System	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.8	Major Component Rigging	$0	w/4.1	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.9	Boiler Foundations	$0	w/14.1	w/14.1	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 4.	**$185,402**	**$0**	**$105,641**	**$0**	**$291,043**	**$28,011**	**$0**	**$31,905**	**$350,959**	**$638**

Exhibit 4-10 Case 11 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
5	FLUE GAS CLEANUP	$0	$0	$0	$0	$0	$0	0%	$0	$0	$0
5.1	Absorber Vessels & Accessories	$66,871	$0	$14,297	$0	$81,168	$7,535	$0	$8,870	$97,574	$177
5.2	Other FGD	$3,490	$0	$3,927	$0	$7,417	$703	$0	$812	$8,932	$16
5.3	Bag House & Accessories	$18,833	$0	$11,870	$0	$30,703	$2,885	$0	$3,359	$36,947	$67
5.4	Other Particulate Removal Materials	$1,274	$0	$1,354	$0	$2,629	$249	$0	$288	$3,166	$6
5.5	Gypsum Dewatering System	$5,543	$0	$935	$0	$6,478	$600	$0	$708	$7,786	$14
5.6	Mercury Removal System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5.9	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 5.	**$96,010**	**$0**	**$32,384**	**$0**	**$128,395**	**$11,972**	**$0**	**$14,037**	**$154,404**	**$281**
5B	CO2 REMOVAL & COMPRESSION										
5B.1	CO2 Removal System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5B.2	CO2 Compression & Drying	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 5.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
6	COMBUSTION TURBINE/ACCESSORIES	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.1	Combustion Turbine Generator	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
6.2	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.3	Compressed Air Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.9	Combustion Turbine Foundations	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 6.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
7	HRSG, DUCTING & STACK										
7.1	Heat Recovery Steam Generator	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
7.2	HRSG Accessories	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.3	Ductwork	$10,572	$0	$6,673	$0	$17,246	$1,457	$0	$2,805	$21,508	$39
7.4	Stack	$10,513	$0	$6,110	$0	$16,623	$1,560	$0	$1,818	$20,002	$36
7.9	Duct & Stack Foundations	$0	$1,146	$1,361	$0	$2,507	$235	$0	$548	$3,290	$6
	SUBTOTAL 7.	**$21,086**	**$1,146**	**$14,144**	**$0**	**$36,376**	**$3,252**	**$0**	**$5,172**	**$44,799**	**$81**
8	STEAM TURBINE GENERATOR										
8.1	Steam TG & Accessories	$66,640	$0	$8,221	$0	$74,861	$6,572	$0	$8,143	$89,576	$163
8.2	Turbine Plant Auxiliaries	$418	$0	$890	$0	$1,309	$125	$0	$143	$1,577	$3
8.3	Condenser & Auxiliaries	$8,091	$0	$2,740	$0	$10,831	$1,010	$0	$1,184	$13,025	$24
8.4	Steam Piping	$21,119	$0	$9,383	$0	$30,503	$2,338	$0	$4,926	$37,766	$69
8.9	TG Foundations	$0	$1,248	$2,060	$0	$3,308	$312	$0	$724	$4,344	$8
	SUBTOTAL 8.	**$96,269**	**$1,248**	**$23,294**	**$0**	**$120,811**	**$10,357**	**$0**	**$15,121**	**$146,289**	**$266**
9	COOLING WATER SYSTEM										
9.1	Cooling Towers	$10,951	$0	$3,387	$0	$14,338	$1,336	$0	$1,567	$17,242	$31
9.2	Circulating Water Pumps	$2,187	$0	$138	$0	$2,325	$198	$0	$252	$2,775	$5
9.3	Circ.Water System Auxiliaries	$601	$0	$80	$0	$680	$63	$0	$74	$817	$1
9.4	Circ.Water Piping	$0	$5,062	$4,584	$0	$9,645	$854	$0	$1,575	$12,074	$22
9.5	Make-up Water System	$545	$0	$701	$0	$1,246	$115	$0	$204	$1,566	$3
9.6	Component Cooling Water Sys	$490	$0	$376	$0	$866	$79	$0	$142	$1,086	$2
9.9	Circ.Water System Foundations& Structures	$0	$2,687	$4,463	$0	$7,150	$674	$0	$1,565	$9,388	$17
	SUBTOTAL 9.	**$14,774**	**$7,749**	**$13,728**	**$0**	**$36,251**	**$3,318**	**$0**	**$5,380**	**$44,949**	**$82**

Exhibit 4-10 Case 11 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
10	ASH/SPENT SORBENT HANDLING SYS										
10.1	Ash Coolers	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.2	Cyclone Ash Letdown	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.3	HGCU Ash Letdown	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.4	High Temperature Ash Piping	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.5	Other Ash Recovery Equipment	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.6	Ash Storage Silos	$711	$0	$2,176	$0	$2,888	$277	$0	$316	$3,481	$6
10.7	Ash Transport & Feed Equipment	$4,725	$0	$4,684	$0	$9,408	$867	$0	$1,028	$11,303	$21
10.8	Misc. Ash Handling Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.9	Ash/Spent Sorbent Foundation	$0	$161	$198	$0	$358	$34	$0	$78	$470	$1
	SUBTOTAL 10.	**$5,436**	**$161**	**$7,058**	**$0**	**$12,654**	**$1,177**	**$0**	**$1,422**	**$15,254**	**$28**
11	ACCESSORY ELECTRIC PLANT										
11.1	Generator Equipment	$1,943	$0	$311	$0	$2,254	$202	$0	$184	$2,640	$5
11.2	Station Service Equipment	$3,314	$0	$1,111	$0	$4,424	$411	$0	$363	$5,198	$9
11.3	Switchgear & Motor Control	$3,803	$0	$661	$0	$4,464	$413	$0	$488	$5,364	$10
11.4	Conduit & Cable Tray	$0	$2,608	$8,426	$0	$11,034	$1,030	$0	$1,810	$13,874	$25
11.5	Wire & Cable	$0	$4,966	$8,877	$0	$13,843	$1,112	$0	$2,243	$17,198	$31
11.6	Protective Equipment	$306	$0	$1,063	$0	$1,370	$131	$0	$150	$1,652	$3
11.7	Standby Equipment	$1,498	$0	$35	$0	$1,533	$140	$0	$167	$1,841	$3
11.8	Main Power Transformers	$9,896	$0	$206	$0	$10,102	$767	$0	$1,087	$11,955	$22
11.9	Electrical Foundations	$0	$359	$913	$0	$1,272	$120	$0	$279	$1,671	$3
	SUBTOTAL 11.	**$20,761**	**$7,933**	**$21,603**	**$0**	**$50,297**	**$4,327**	**$0**	**$6,770**	**$61,394**	**$112**
12	INSTRUMENTATION & CONTROL										
12.1	PC Control Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.2	Combustion Turbine Control	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
12.3	Steam Turbine Control	w/8.1	$0	w/8.1	$0	$0	$0	$0	$0	$0	$0
12.4	Other Major Component Control	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12.5	Signal Processing Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.6	Control Boards,Panels & Racks	$528	$0	$323	$0	$851	$80	$0	$140	$1,070	$2
12.7	Distributed Control System Equipment	$5,331	$0	$951	$0	$6,281	$580	$0	$686	$7,548	$14
12.8	Instrument Wiring & Tubing	$3,214	$0	$5,849	$0	$9,063	$734	$0	$1,470	$11,267	$20
12.9	Other I & C Equipment	$1,506	$0	$3,488	$0	$4,994	$477	$0	$547	$6,018	$11
	SUBTOTAL 12.	**$10,579**	**$0**	**$10,610**	**$0**	**$21,190**	**$1,871**	**$0**	**$2,842**	**$25,903**	**$47**

Exhibit 4-10 Case 11 capital and owner's costs (continued)

Acct No.	Item/Description	Equipment Cost	Material Cost	Labor Direct	Labor Indirect	Bare Erected Cost $	Eng'g CM H.O.& Fee	Contingencies Process	Contingencies Project	TOTAL PLANT COST $	TOTAL PLANT COST $/kW
13	IMPROVEMENTS TO SITE										
13.1	Site Preparation	$0	$56	$1,195	$0	$1,251	$122	$0	$275	$1,648	$3
13.2	Site Improvements	$0	$1,865	$2,464	$0	$4,328	$430	$0	$952	$5,710	$10
13.3	Site Facilities	$3,342	$0	$3,506	$0	$6,847	$681	$0	$1,506	$9,035	$16
	SUBTOTAL 13.	**$3,342**	**$1,921**	**$7,164**	**$0**	**$12,427**	**$1,233**	**$0**	**$2,732**	**$16,392**	**$30**
14	BUILDINGS & STRUCTURES										
14.1	Boiler Building	$0	$9,922	$8,719	$0	$18,641	$1,640	$0	$3,042	$23,323	$42
14.2	Turbine Building	$0	$14,171	$13,198	$0	$27,369	$2,415	$0	$4,468	$34,251	$62
14.3	Administration Building	$0	$703	$742	$0	$1,445	$128	$0	$236	$1,809	$3
14.4	Circulation Water Pumphouse	$0	$201	$160	$0	$361	$32	$0	$59	$452	$1
14.5	Water Treatment Buildings	$0	$678	$618	$0	$1,295	$114	$0	$211	$1,621	$3
14.6	Machine Shop	$0	$470	$315	$0	$785	$68	$0	$128	$982	$2
14.7	Warehouse	$0	$318	$319	$0	$638	$56	$0	$104	$798	$1
14.8	Other Buildings & Structures	$0	$260	$221	$0	$482	$42	$0	$79	$602	$1
14.9	Waste Treating Building & Str.	$0	$498	$1,511	$0	$2,009	$187	$0	$329	$2,525	$5
	SUBTOTAL 14.	**$0**	**$27,220**	**$25,804**	**$0**	**$53,024**	**$4,683**	**$0**	**$8,656**	**$66,363**	**$121**
	TOTAL COST	**$538,399**	**$53,196**	**$300,389**	**$0**	**$891,984**	**$81,594**	**$0**	**$116,193**	**$1,089,771**	**$1,981**
	Owner's Costs										
	Preproduction Costs										
	6 Months All Labor									$8,517	$15
	1 Month Maintenance Materials									$1,073	$2
	1 Month Non-fuel Consumables									$1,670	$3
	1 Month Waste Disposal									$364	$1
	25% of 1 Months Fuel Cost at 100% CF									$2,564	$5
	2% of TPC									$21,795	$40
	Total									**$35,982**	**$65**
	Inventory Capital										
	60 day supply of fuel and consumables at 100% CF									$23,452	$43
	0.5% of TPC (spare parts)									$5,449	$10
	Total									**$28,901**	**$53**
	Initial Cost for Catalyst and Chemicals									$0	$0
	Land									$900	$2
	Other Owner's Costs									$163,466	$297
	Financing Costs									$29,424	$53
	Total Overnight Costs (TOC)									**$1,348,443**	**$2,452**
	TASC Multiplier							(IOU, low-risk, 35 year)		1.134	
	Total As-Spent Cost (TASC)									**$1,529,135**	**$2,780**

Exhibit 4-11 Case 11 O&M costs

INITIAL & ANNUAL O&M EXPENSES					Cost Base (Jun):	2011
Case 11 - 1x550 MWnet SuperCritical PC					Heat Rate-net (Btu/kWh):	8,686
					MWe-net:	550
					Capacity Factor (%):	85
OPERATING & MAINTENANCE LABOR						
Operating Labor						
Operating Labor Rate (base):	39.70	$/hour				
Operating Labor Burden:	30.00	% of base				
Labor O-H Charge Rate:	25.00	% of labor				
Operating Labor Requirements(O.J.)per	1 unit/mod.		Total Plant			
Skilled Operator	2.0		2.0			
Operator	9.0		9.0			
Foreman	1.0		1.0			
Lab Tech's, etc.	2.0		2.0			
TOTAL-O.J.'s	14.0		14.0			
					Annual Cost	Annual Unit Cost
					$	$/kW-net
Annual Operating Labor Cost					$6,329,450	$11.508
Maintenance Labor Cost					$7,297,262	$13.267
Administrative & Support Labor					$3,406,678	$6.194
Property Taxes and Insurance					$21,795,421	$39.627
TOTAL FIXED OPERATING COSTS					**$38,828,811**	**$70.595**
VARIABLE OPERATING COSTS						
						$/kWh-net
Maintenance Material Cost					**$10,945,892**	**$0.00267**
Consumables	Consumption Initial Fill	/Day	Unit Cost	Initial Fill Cost		
Water (/1000 gallons)	0	3,884	1.67	**$0**	**$2,017,015**	**$0.00049**
Chemicals						
MU & WT Chem.(lbs)	0	18,799	0.27	$0	$1,562,183	$0.00038
Limestone (ton)	0	488	33.48	$0	$5,066,306	$0.00124
Carbon (Mercury Removal) (lb)	0	0.00	1.63	$0	$0	$0.00000
MEA Solvent (ton)	0	0	3,481.91	$0	$0	$0.00000
NaOH (tons)	0	0	671.16	$0	$0	$0.00000
H2SO4 (tons)	0	0	214.78	$0	$0	$0.00000
Corrosion Inhibitor	0	0	0.00	$0	$0	$0.00000
Activated Carbon (lb)	0	0.00	1.63	$0	$0	$0.00000
Ammonia (19% NH3) ton	0	73.52	330.00	$0	$7,527,571	$0.00184
Subtotal Chemicals				**$0**	**$14,156,060**	**$0.00346**
Other						
Supplemental Fuel (MBtu)	0	0	0.00	$0	$0	$0.00000
SCR Catalyst (m3)	w/equip.	0	8,938.80	$0	$857,054	$0.00021
Emission Penalties	0	0	0.00	$0	$0	$0.00000
Subtotal Other				**$0**	**$857,054**	**$0.00021**
Waste Disposal						
Fly Ash (ton)	0	381	25.11	$0	$2,969,890	$0.00073
Bottom Ash (ton)	0	95	25.11	$0	$742,473	$0.00018
Subtotal-Waste Disposal				**$0**	**$3,712,363**	**$0.00091**
By-products & Emissions						
Gypsum (tons)	0	759	0.00	$0	$0	$0.00000
Subtotal By-Products				**$0**	**$0**	**$0.00000**
TOTAL VARIABLE OPERATING COSTS				**$0**	**$31,688,385**	**$0.00774**
Fuel (ton)	0	4,914	68.60	**$0**	**$104,590,800**	**$0.02554**

Exhibit 4-12 Case 12 capital and owner's costs

	Client:	USDOE/NETL							Report Date:	2012-Jun-12	
	Project:	Bituminous Baseline Study									
	TOTAL PLANT COST SUMMARY										
	Case:	Case 12	1x550 MWnet SuperCritical PC w/ CO2 Capture								
	Plant Size:	550.0	MW, net	Estimate Type:				Cost Base (Jun)	2011	($x1000)	
Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
1	COAL & SORBENT HANDLING										
1.1	Coal Receive & Unload	$4,995	$0	$2,250	$0	$7,246	$628	$0	$1,181	$9,055	$16
1.2	Coal Stackout & Reclaim	$6,456	$0	$1,443	$0	$7,898	$669	$0	$1,285	$9,853	$18
1.3	Coal Conveyors	$6,002	$0	$1,427	$0	$7,430	$630	$0	$1,209	$9,269	$17
1.4	Other Coal Handling	$1,570	$0	$330	$0	$1,901	$161	$0	$309	$2,371	$4
1.5	Sorbent Receive & Unload	$204	$0	$61	$0	$264	$23	$0	$43	$330	$1
1.6	Sorbent Stackout & Reclaim	$3,288	$0	$594	$0	$3,883	$327	$0	$631	$4,841	$9
1.7	Sorbent Conveyors	$1,173	$255	$284	$0	$1,712	$143	$0	$278	$2,133	$4
1.8	Other Sorbent Handling	$709	$167	$367	$0	$1,242	$106	$0	$202	$1,551	$3
1.9	Coal & Sorbent Hnd.Foundations	$0	$5,790	$7,633	$0	$13,423	$1,259	$0	$2,202	$16,884	$31
	SUBTOTAL 1.	**$24,398**	**$6,211**	**$14,389**	**$0**	**$44,998**	**$3,946**	**$0**	**$7,342**	**$56,286**	**$102**
2	COAL & SORBENT PREP & FEED										
2.1	Coal Crushing & Drying	$2,898	$0	$557	$0	$3,455	$292	$0	$562	$4,309	$8
2.2	Coal Conveyor to Storage	$7,421	$0	$1,598	$0	$9,018	$763	$0	$1,467	$11,249	$20
2.3	Coal Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.4	Misc.Coal Prep & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.5	Sorbent Prep Equipment	$5,604	$243	$1,148	$0	$6,995	$589	$0	$1,138	$8,721	$16
2.6	Sorbent Storage & Feed	$675	$0	$255	$0	$930	$80	$0	$152	$1,162	$2
2.7	Sorbent Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.8	Booster Air Supply System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.9	Coal & Sorbent Feed Foundation	$0	$684	$600	$0	$1,284	$119	$0	$210	$1,614	$3
	SUBTOTAL 2.	**$16,598**	**$927**	**$4,158**	**$0**	**$21,683**	**$1,844**	**$0**	**$3,529**	**$27,055**	**$49**
3	FEEDWATER & MISC. BOP SYSTEMS										
3.1	Feedwater System	$27,420	$0	$8,841	$0	$36,261	$3,098	$0	$5,904	$45,263	$82
3.2	Water Makeup & Pretreating	$8,525	$0	$2,697	$0	$11,222	$1,025	$0	$2,449	$14,697	$27
3.3	Other Feedwater Subsystems	$8,626	$0	$3,541	$0	$12,167	$1,046	$0	$1,982	$15,194	$28
3.4	Service Water Systems	$1,707	$0	$893	$0	$2,601	$234	$0	$567	$3,401	$6
3.5	Other Boiler Plant Systems	$10,846	$0	$10,254	$0	$21,100	$1,920	$0	$3,453	$26,473	$48
3.6	FO Supply Sys & Nat Gas	$354	$0	$413	$0	$767	$69	$0	$125	$961	$2
3.7	Waste Treatment Equipment	$5,593	$0	$3,238	$0	$8,831	$850	$0	$1,936	$11,617	$21
3.8	Misc. Equip.(cranes,AirComp.,Comm.)	$3,464	$0	$1,072	$0	$4,536	$431	$0	$993	$5,960	$11
	SUBTOTAL 3.	**$66,534**	**$0**	**$30,948**	**$0**	**$97,483**	**$8,673**	**$0**	**$17,410**	**$123,565**	**$225**
4	PC BOILER										
4.1	PC Boiler & Accessories	$230,968	$0	$131,605	$0	$362,573	$34,895	$0	$39,747	$437,215	$795
4.2	SCR (w/4.1)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.3	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.4	Boiler BoP (w/ ID Fans)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.5	Primary Air System	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.6	Secondary Air System	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.8	Major Component Rigging	$0	w/4.1	w/4.1	$0	$0	$0	$0	$0	$0	$0
4.9	Boiler Foundations	$0	w/14.1	w/14.1	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 4.	**$230,968**	**$0**	**$131,605**	**$0**	**$362,573**	**$34,895**	**$0**	**$39,747**	**$437,215**	**$795**

Exhibit 4-12 Case 12 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
5	FLUE GAS CLEANUP										
5.1	Absorber Vessels & Accessories	$84,608	$0	$18,090	$0	$102,698	$9,534	$0	$11,223	$123,455	$224
5.2	Other FGD	$4,415	$0	$4,969	$0	$9,384	$889	$0	$1,027	$11,301	$21
5.3	Bag House & Accessories	$24,339	$0	$15,340	$0	$39,679	$3,729	$0	$4,341	$47,749	$87
5.4	Other Particulate Removal Materials	$1,647	$0	$1,750	$0	$3,398	$322	$0	$372	$4,091	$7
5.5	Gypsum Dewatering System	$6,779	$0	$1,144	$0	$7,923	$734	$0	$866	$9,522	$17
5.6	Mercury Removal System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5.9	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 5.	**$121,788**	**$0**	**$41,294**	**$0**	**$163,082**	**$15,208**	**$0**	**$17,829**	**$196,119**	**$357**
5B	CO2 REMOVAL & COMPRESSION										
5B.1	CO2 Removal System	$250,513	$0	$75,544	$0	$326,057	$30,367	$65,211	$84,327	$505,963	$920
5B.2	CO2 Compression & Drying	$48,646	$0	$18,072	$0	$66,717	$6,228	$0	$14,589	$87,534	$159
	SUBTOTAL 5.	**$299,159**	**$0**	**$93,615**	**$0**	**$392,774**	**$36,595**	**$65,211**	**$98,916**	**$593,497**	**$1,079**
6	COMBUSTION TURBINE/ACCESSORIES										
6.1	Combustion Turbine Generator	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
6.2	Open	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.3	Compressed Air Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.9	Combustion Turbine Foundations	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 6.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
7	HRSG, DUCTING & STACK										
7.1	Heat Recovery Steam Generator	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
7.2	HRSG Accessories	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.3	Ductwork	$11,169	$0	$7,050	$0	$18,219	$1,539	$0	$2,964	$22,722	$41
7.4	Stack	$10,097	$0	$5,868	$0	$15,965	$1,499	$0	$1,746	$19,210	$35
7.9	Duct & Stack Foundations	$0	$1,101	$1,307	$0	$2,408	$225	$0	$527	$3,159	$6
	SUBTOTAL 7.	**$21,266**	**$1,101**	**$14,225**	**$0**	**$36,592**	**$3,263**	**$0**	**$5,237**	**$45,092**	**$82**
8	STEAM TURBINE GENERATOR										
8.1	Steam TG & Accessories	$73,312	$0	$9,024	$0	$82,336	$7,228	$0	$8,956	$98,521	$179
8.2	Turbine Plant Auxiliaries	$461	$0	$981	$0	$1,442	$138	$0	$158	$1,738	$3
8.3	Condenser & Auxiliaries	$6,641	$0	$2,431	$0	$9,072	$847	$0	$992	$10,911	$20
8.4	Steam Piping	$28,525	$0	$12,674	$0	$41,199	$3,158	$0	$6,653	$51,010	$93
8.9	TG Foundations	$0	$1,375	$2,270	$0	$3,645	$343	$0	$798	$4,786	$9
	SUBTOTAL 8.	**$108,939**	**$1,375**	**$27,379**	**$0**	**$137,694**	**$11,714**	**$0**	**$17,557**	**$166,965**	**$304**
9	COOLING WATER SYSTEM										
9.1	Cooling Towers	$18,626	$0	$5,760	$0	$24,386	$2,272	$0	$2,666	$29,324	$53
9.2	Circulating Water Pumps	$3,730	$0	$297	$0	$4,026	$343	$0	$437	$4,807	$9
9.3	Circ.Water System Auxiliaries	$949	$0	$126	$0	$1,075	$99	$0	$117	$1,292	$2
9.4	Circ.Water Piping	$0	$7,999	$7,244	$0	$15,242	$1,349	$0	$2,489	$19,080	$35
9.5	Make-up Water System	$798	$0	$1,026	$0	$1,824	$168	$0	$299	$2,291	$4
9.6	Component Cooling Water Sys	$774	$0	$594	$0	$1,368	$125	$0	$224	$1,717	$3
9.9	Circ.Water System Foundations & Structures	$0	$4,237	$7,035	$0	$11,272	$1,062	$0	$2,467	$14,801	$27
	SUBTOTAL 9.	**$24,877**	**$12,235**	**$22,081**	**$0**	**$59,194**	**$5,419**	**$0**	**$8,699**	**$73,311**	**$133**

Exhibit 4-12 Case 12 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
10	ASH/SPENT SORBENT HANDLING SYS										
10.1	Ash Coolers	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.2	Cyclone Ash Letdown	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.3	HGCU Ash Letdown	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.4	High Temperature Ash Piping	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.5	Other Ash Recovery Equipment	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
10.6	Ash Storage Silos	$851	$0	$2,604	$0	$3,455	$332	$0	$379	$4,165	$8
10.7	Ash Transport & Feed Equipment	$5,653	$0	$5,604	$0	$11,257	$1,037	$0	$1,229	$13,524	$25
10.8	Misc. Ash Handling Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.9	Ash/Spent Sorbent Foundation	$0	$192	$236	$0	$429	$40	$0	$94	$563	$1
	SUBTOTAL 10.	**$6,504**	**$192**	**$8,445**	**$0**	**$15,141**	**$1,409**	**$0**	**$1,702**	**$18,252**	**$33**
11	ACCESSORY ELECTRIC PLANT										
11.1	Generator Equipment	$2,100	$0	$336	$0	$2,436	$218	$0	$199	$2,854	$5
11.2	Station Service Equipment	$5,816	$0	$1,950	$0	$7,766	$722	$0	$637	$9,125	$17
11.3	Switchgear & Motor Control	$6,676	$0	$1,160	$0	$7,836	$725	$0	$856	$9,416	$17
11.4	Conduit & Cable Tray	$0	$4,578	$14,791	$0	$19,369	$1,808	$0	$3,176	$24,353	$44
11.5	Wire & Cable	$0	$8,717	$15,582	$0	$24,299	$1,951	$0	$3,937	$30,187	$55
11.6	Protective Equipment	$306	$0	$1,063	$0	$1,370	$131	$0	$150	$1,652	$3
11.7	Standby Equipment	$1,596	$0	$37	$0	$1,633	$150	$0	$178	$1,961	$4
11.8	Main Power Transformers	$15,723	$0	$226	$0	$15,949	$1,209	$0	$1,716	$18,874	$34
11.9	Electrical Foundations	$0	$394	$1,002	$0	$1,396	$132	$0	$306	$1,834	$3
	SUBTOTAL 11.	**$32,218**	**$13,689**	**$36,147**	**$0**	**$82,053**	**$7,046**	**$0**	**$11,156**	**$100,255**	**$182**
12	INSTRUMENTATION & CONTROL										
12.1	PC Control Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.2	Combustion Turbine Control	N/A	$0	N/A	$0	$0	$0	$0	$0	$0	$0
12.3	Steam Turbine Control	w/8.1	$0	w/8.1	$0	$0	$0	$0	$0	$0	$0
12.4	Other Major Component Control	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12.5	Signal Processing Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.6	Control Boards,Panels & Racks	$605	$0	$370	$0	$975	$91	$49	$167	$1,282	$2
12.7	Distributed Control System Equipment	$6,110	$0	$1,090	$0	$7,199	$665	$360	$822	$9,046	$16
12.8	Instrument Wiring & Tubing	$3,684	$0	$6,704	$0	$10,388	$842	$519	$1,762	$13,511	$25
12.9	Other I & C Equipment	$1,726	$0	$3,997	$0	$5,724	$547	$286	$656	$7,213	$13
	SUBTOTAL 12.	**$12,125**	**$0**	**$12,161**	**$0**	**$24,286**	**$2,145**	**$1,214**	**$3,408**	**$31,053**	**$56**

Exhibit 4-12 Case 12 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
13	IMPROVEMENTS TO SITE										
13.1	Site Preparation	$0	$63	$1,336	$0	$1,399	$136	$0	$307	$1,843	$3
13.2	Site Improvements	$0	$2,085	$2,755	$0	$4,841	$480	$0	$1,064	$6,385	$12
13.3	Site Facilities	$3,737	$0	$3,921	$0	$7,658	$762	$0	$1,684	$10,104	$18
	SUBTOTAL 13.	**$3,737**	**$2,148**	**$8,012**	**$0**	**$13,898**	**$1,379**	**$0**	**$3,055**	**$18,332**	**$33**
14	BUILDINGS & STRUCTURES										
14.1	Boiler Building	$0	$10,604	$9,319	$0	$19,923	$1,753	$0	$3,251	$24,928	$45
14.2	Turbine Building	$0	$15,346	$14,292	$0	$29,638	$2,615	$0	$4,838	$37,091	$67
14.3	Administration Building	$0	$771	$814	$0	$1,585	$141	$0	$259	$1,985	$4
14.4	Circulation Water Pumphouse	$0	$210	$167	$0	$377	$33	$0	$62	$472	$1
14.5	Water Treatment Buildings	$0	$1,063	$969	$0	$2,032	$179	$0	$332	$2,543	$5
14.6	Machine Shop	$0	$515	$346	$0	$862	$75	$0	$140	$1,077	$2
14.7	Warehouse	$0	$349	$350	$0	$699	$62	$0	$114	$876	$2
14.8	Other Buildings & Structures	$0	$285	$243	$0	$528	$46	$0	$86	$661	$1
14.9	Waste Treating Building & Str.	$0	$547	$1,657	$0	$2,204	$205	$0	$361	$2,770	$5
	SUBTOTAL 14.	**$0**	**$29,691**	**$28,158**	**$0**	**$57,849**	**$5,109**	**$0**	**$9,444**	**$72,402**	**$132**
	TOTAL COST	**$969,114**	**$67,569**	**$472,617**	**$0**	**$1,509,300**	**$138,644**	**$66,426**	**$245,029**	**$1,959,399**	**$3,563**
	Owner's Costs										
	Preproduction Costs										
	6 Months All Labor									$12,556	$23
	1 Month Maintenance Materials									$1,869	$3
	1 Month Non-fuel Consumables									$2,931	$5
	1 Month Waste Disposal									$503	$1
	25% of 1 Months Fuel Cost at 100% CF									$3,542	$6
	2% of TPC									$39,188	$71
	Total									**$60,589**	**$110**
	Inventory Capital										
	60 day supply of fuel and consumables at 100% CF									$33,451	$61
	0.5% of TPC (spare parts)									$9,797	$18
	Total									**$43,248**	**$79**
	Initial Cost for Catalyst and Chemicals									$3,784	$7
	Land									$900	$2
	Other Owner's Costs									$293,910	$534
	Financing Costs									$52,904	$96
	Total Overnight Costs (TOC)									**$2,414,734**	**$4,391**
	TASC Multiplier							(IOU, high-risk, 35 year)		1.140	
	Total As-Spent Cost (TASC)									**$2,752,796**	**$5,005**

Exhibit 4-13 Case 12 O&M costs

INITIAL & ANNUAL O&M EXPENSES					Cost Base (Jun):	2011
Case 12 - 1x550 MWnet Super-Critical PC w/ CO2 Capture					Heat Rate-net (Btu/kWh):	12,002
					MWe-net:	550
					Capacity Factor (%):	85
OPERATING & MAINTENANCE LABOR						
Operating Labor						
Operating Labor Rate (base):	39.70	$/hour				
Operating Labor Burden:	30.00	% of base				
Labor O-H Charge Rate:	25.00	% of labor				
Operating Labor Requirements(O.J.)per Shift:	1 unit/mod.		Total Plant			
Skilled Operator	2.0		2.0			
Operator	11.3		11.3			
Foreman	1.0		1.0			
Lab Tech's, etc.	2.0		2.0			
TOTAL-O.J.'s	16.3		16.3			
					Annual Cost $	Annual Unit Cost $/kW-net
Annual Operating Labor Cost					$7,384,208	$13.427
Maintenance Labor Cost					$12,705,913	$23.103
Administrative & Support Labor					$5,022,530	$9.133
Property Taxes and Insurance					$39,024,956	$70.960
TOTAL FIXED OPERATING COSTS					**$64,137,607**	**$116.622**
VARIABLE OPERATING COSTS						
						$/kWh-net
Maintenance Material Cost					**$19,058,869**	**$0.00465**
Consumables	Consumption Initial Fill	/Day	Unit Cost	Initial Fill Cost		
Water(/1000 gallons)	0	7,324	1.67	**$0**	**$3,803,686**	**$0.00093**
Chemicals						
MU & WT Chem.(lbs)	0	35,452	0.27	$0	$2,945,963	$0.00072
Limestone (ton)	0	687	33.48	$0	$7,135,313	$0.00174
Carbon (Mercury Removal) lb	0	0.00	1.63	$0	$0	$0.00000
MEA Solvent (ton)	1,028	1	3,481.91	$3,578,512	$1,574,157	$0.00038
NaOH (tons)	73	7	671.16	$48,724	$1,511,672	$0.00037
H2SO4 (tons)	69	7	214.78	$14,880	$461,637	$0.00011
Corrosion Inhibitor	0	0	0.00	$142,156	$6,769	$0.00000
Activated Carbon (lb)	0	1,740.69	1.63	$0	$877,708	$0.00021
Ammonia (19% NH3) ton	0	102	330.00	$0	$10,400,390	$0.00254
Subtotal Chemicals				**$3,784,272**	**$24,913,611**	**$0.00608**
Other						
Supplemental Fuel (MBtu)	0	0	0.00	$0	$0	$0.00000
SCR Catalyst (m3)	w/equip.	0	8,938.80	$0	$1,183,917	$0.00029
Emission Penalties	0	0	0.00	$0	$0	$0.00000
Subtotal Other				**$0**	**$1,183,917**	**$0.00029**
Waste Disposal						
Fly Ash (ton)	0	527	25.11	$0	$4,103,318	$0.00100
Bottom Ash (ton)	0	132	25.11	$0	$1,025,830	$0.00025
Subtotal-Waste Disposal				**$0**	**$5,129,148**	**$0.00125**
By-products & Emissions						
Gypsum (tons)	0	1,062	0.00	$0	$0	$0.00000
Subtotal By-Products				**$0**	**$0**	**$0.00000**
TOTAL VARIABLE OPERATING COSTS				**$3,784,272**	**$54,089,231**	**$0.01321**
Fuel (ton)	0	6,790	68.60	**$0**	**$144,504,012**	**$0.03529**

Exhibit 4-14 Case 13 capital and owner's costs

	Client:	USDOE/NETL						Report Date:	2012-Jun-12	
	Project:	Bituminous Baseline Study								
	TOTAL PLANT COST SUMMARY									
	Case:	Case 13	1x555 MWnet 2x1 7FB NGCC							
	Plant Size:	555.1	MW,net	Estimate Type:			Cost Base (Jun)	2011	($x1000)	
Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
1	COAL & SORBENT HANDLING										
1.1	Coal Receive & Unload	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.2	Coal Stackout & Reclaim	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.3	Coal Conveyors & Yd Crush	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.4	Other Coal Handling	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.5	Sorbent Receive & Unload	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.6	Sorbent Stackout & Reclaim	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.7	Sorbent Conveyors	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.8	Other Sorbent Handling	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.9	Coal & Sorbent Hnd.Foundations	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 1.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
2	COAL & SORBENT PREP & FEED										
2.1	Coal Crushing & Drying	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.2	Prepared Coal Storage & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.3	Slurry Prep & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.4	Misc.Coal Prep & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.5	Sorbent Prep Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.6	Sorbent Storage & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.7	Sorbent Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.8	Booster Air Supply System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.9	Coal & Sorbent Feed Foundation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 2.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
3	FEEDWATER & MISC. BOP SYSTEMS										
3.1	Feedwater System	$2,910	$3,013	$2,461	$0	$8,384	$675	$0	$1,359	$10,417	$19
3.2	Water Makeup & Pretreating	$1,786	$185	$917	$0	$2,887	$238	$0	$625	$3,750	$7
3.3	Other Feedwater Subsystems	$1,363	$451	$376	$0	$2,190	$169	$0	$354	$2,713	$5
3.4	Service Water Systems	$216	$430	$1,385	$0	$2,031	$173	$0	$441	$2,645	$5
3.5	Other Boiler Plant Systems	$1,453	$543	$1,249	$0	$3,245	$264	$0	$526	$4,035	$7
3.6	Natural Gas, incl. pipeline	$17,682	$609	$527	$0	$18,817	$1,551	$0	$3,055	$23,424	$42
3.7	Waste Treatment Equipment	$624	$0	$361	$0	$985	$85	$0	$214	$1,284	$2
3.8	Misc. Equip.(cranes,AirComp.,Comm.)	$1,082	$144	$526	$0	$1,752	$150	$0	$380	$2,282	$4
	SUBTOTAL 3.	**$27,114**	**$5,374**	**$7,801**	**$0**	**$40,290**	**$3,305**	**$0**	**$6,954**	**$50,549**	**$91**
4	GASIFIER & ACCESSORIES										
4.1	Gasifier, Syngas Cooler & Auxiliaries	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.2	Syngas Cooling	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.3	ASU/Oxidant Compression	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.4	LT Heat Recovery & FG Saturation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.5	Misc. Gasification Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.6	Other Gasification Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.8	Major Component Rigging	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.9	Gasification Foundations	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 4.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Exhibit 4-14 Case 13 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
5A	GAS CLEANUP & PIPING										
5A.1	MDEA-LT AGR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.2	Elemental Sulfur Plant	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.3	Mercury Removal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.4	COS Hydrolysis	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.5	Blowback Gas Systems	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.6	Fuel Gas Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.9	HGCU Foundations	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 5.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
5B	CO2 REMOVAL & COMPRESSION										
5B.1	CO2 Removal System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5B.2	CO2 Compression & Drying	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 5.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
6	COMBUSTION TURBINE/ACCESSORIES										
6.1	Combustion Turbine Generator	$104,200	$0	$5,752	$0	$109,952	$9,079	$0	$11,903	$130,934	$236
6.2	Combustion Turbine Accessories	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.3	Compressed Air Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.9	Combustion Turbine Foundations	$0	$823	$890	$0	$1,714	$143	$0	$371	$2,228	$4
	SUBTOTAL 6.	**$104,200**	**$823**	**$6,642**	**$0**	**$111,666**	**$9,222**	**$0**	**$12,274**	**$133,162**	**$240**
7	HRSG, DUCTING & STACK										
7.1	Heat Recovery Steam Generator	$31,620	$0	$5,861	$0	$37,481	$3,114	$0	$4,060	$44,655	$80
7.2	SCR System	$1,498	$629	$878	$0	$3,005	$252	$0	$489	$3,745	$7
7.3	Ductwork	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.4	Stack	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.9	HRSG,Duct & Stack Foundations	$0	$491	$460	$0	$951	$79	$0	$206	$1,237	$2
	SUBTOTAL 7.	**$33,118**	**$1,120**	**$7,199**	**$0**	**$41,438**	**$3,445**	**$0**	**$4,754**	**$49,637**	**$89**
8	STEAM TURBINE GENERATOR										
8.1	Steam TG & Accessories	$31,410	$0	$4,616	$0	$36,026	$2,840	$0	$3,887	$42,752	$77
8.2	Turbine Plant Auxiliaries	$194	$0	$442	$0	$636	$54	$0	$69	$759	$1
8.3	Condenser & Auxiliaries	$2,680	$0	$1,323	$0	$4,003	$336	$0	$434	$4,773	$9
8.4	Steam Piping	$11,371	$0	$4,609	$0	$15,979	$1,089	$0	$2,560	$19,628	$35
8.9	TG Foundations	$0	$914	$1,510	$0	$2,424	$205	$0	$526	$3,154	$6
	SUBTOTAL 8.	**$45,655**	**$914**	**$12,499**	**$0**	**$59,068**	**$4,524**	**$0**	**$7,475**	**$71,067**	**$128**
9	COOLING WATER SYSTEM										
9.1	Cooling Towers	$2,740	$0	$830	$0	$3,570	$298	$0	$387	$4,255	$8
9.2	Circulating Water Pumps	$1,323	$0	$75	$0	$1,399	$107	$0	$151	$1,656	$3
9.3	Circ.Water System Auxiliaries	$112	$0	$15	$0	$127	$11	$0	$14	$151	$0
9.4	Circ.Water Piping	$0	$3,476	$787	$0	$4,263	$319	$0	$687	$5,269	$9
9.5	Make-up Water System	$285	$0	$366	$0	$650	$54	$0	$106	$810	$1
9.6	Component Cooling Water Sys	$224	$267	$172	$0	$663	$53	$0	$107	$823	$1
9.9	Circ.Water System Foundations	$0	$1,570	$2,607	$0	$4,176	$353	$0	$906	$5,435	$10
	SUBTOTAL 9.	**$4,684**	**$5,313**	**$4,851**	**$0**	**$14,847**	**$1,194**	**$0**	**$2,357**	**$18,398**	**$33**

Exhibit 4-14 Case 13 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
10	ASH/SPENT SORBENT HANDLING SYS										
10.1	Slag Dewatering & Cooling	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.2	Gasifier Ash Depressurization	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.3	Cleanup Ash Depressurization	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.4	High Temperature Ash Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.5	Other Ash Recovery Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.6	Ash Storage Silos	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.7	Ash Transport & Feed Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.8	Misc. Ash Handling Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.9	Ash/Spent Sorbent Foundation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 10.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
11	ACCESSORY ELECTRIC PLANT										
11.1	Generator Equipment	$4,948	$0	$2,927	$0	$7,874	$647	$0	$639	$9,160	$17
11.2	Station Service Equipment	$1,418	$0	$122	$0	$1,540	$127	$0	$125	$1,791	$3
11.3	Switchgear & Motor Control	$1,745	$0	$303	$0	$2,048	$170	$0	$222	$2,439	$4
11.4	Conduit & Cable Tray	$0	$912	$2,627	$0	$3,538	$295	$0	$575	$4,408	$8
11.5	Wire & Cable	$0	$2,930	$1,666	$0	$4,596	$276	$0	$731	$5,603	$10
11.6	Protective Equipment	$0	$661	$2,294	$0	$2,956	$254	$0	$321	$3,531	$6
11.7	Standby Equipment	$121	$0	$113	$0	$234	$20	$0	$25	$279	$1
11.8	Main Power Transformers	$11,295	$0	$174	$0	$11,469	$779	$0	$1,225	$13,473	$24
11.9	Electrical Foundations	$0	$150	$382	$0	$532	$45	$0	$115	$693	$1
	SUBTOTAL 11.	**$19,526**	**$4,653**	**$10,608**	**$0**	**$34,787**	**$2,612**	**$0**	**$3,978**	**$41,377**	**$75**
12	INSTRUMENTATION & CONTROL										
12.1	IGCC Control Equipment	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
12.2	Combustion Turbine Control	w/6.1	$0	w/6.1	$0	$0	$0	$0	$0	$0	$0
12.3	Steam Turbine Control	w/8.1	$0	w/8.1	$0	$0	$0	$0	$0	$0	$0
12.4	Other Major Component Control	$862	$0	$549	$0	$1,411	$118	$0	$229	$1,759	$3
12.5	Signal Processing Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.6	Control Boards,Panels & Racks	$258	$0	$157	$0	$415	$35	$0	$67	$517	$1
12.7	Computer & Accessories	$4,123	$0	$126	$0	$4,249	$349	$0	$460	$5,058	$9
12.8	Instrument Wiring & Tubing	$0	$767	$1,357	$0	$2,124	$153	$0	$342	$2,618	$5
12.9	Other I & C Equipment	$1,537	$0	$3,559	$0	$5,096	$436	$0	$553	$6,085	$11
	SUBTOTAL 12.	**$6,780**	**$767**	**$5,748**	**$0**	**$13,295**	**$1,091**	**$0**	**$1,651**	**$16,038**	**$29**

Exhibit 4-14 Case 13 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
13	IMPROVEMENTS TO SITE										
13.1	Site Preparation	$0	$104	$2,199	$0	$2,303	$201	$0	$501	$3,004	$5
13.2	Site Improvements	$0	$949	$1,254	$0	$2,203	$196	$0	$480	$2,878	$5
13.3	Site Facilities	$1,938	$0	$2,033	$0	$3,970	$354	$0	$865	$5,189	$9
	SUBTOTAL 13.	**$1,938**	**$1,053**	**$5,485**	**$0**	**$8,476**	**$751**	**$0**	**$1,845**	**$11,072**	**$20**
14	BUILDINGS & STRUCTURES										
14.1	Combustion Turbine Area	$0	$283	$149	$0	$432	$33	$0	$70	$535	$1
14.2	Steam Turbine Building	$0	$2,363	$3,144	$0	$5,507	$443	$0	$892	$6,842	$12
14.3	Administration Building	$0	$545	$369	$0	$914	$71	$0	$148	$1,132	$2
14.4	Circulation Water Pumphouse	$0	$182	$90	$0	$272	$21	$0	$44	$337	$1
14.5	Water Treatment Buildings	$0	$379	$345	$0	$724	$57	$0	$117	$899	$2
14.6	Machine Shop	$0	$472	$302	$0	$774	$60	$0	$125	$960	$2
14.7	Warehouse	$0	$305	$184	$0	$489	$38	$0	$79	$606	$1
14.8	Other Buildings & Structures	$0	$91	$66	$0	$158	$12	$0	$26	$196	$0
14.9	Waste Treating Building & Str.	$0	$357	$638	$0	$996	$81	$0	$162	$1,238	$2
	SUBTOTAL 14.	**$0**	**$4,978**	**$5,288**	**$0**	**$10,265**	**$817**	**$0**	**$1,662**	**$12,745**	**$23**
	TOTAL COST	**$243,015**	**$24,995**	**$66,122**	**$0**	**$334,131**	**$26,960**	**$0**	**$42,953**	**$404,045**	**$728**
	Owner's Costs										
	Preproduction Costs										
	6 Months All Labor									$3,384	$6
	1 Month Maintenance Materials									$464	$1
	1 Month Non-fuel Consumables									$250	$0
	1 Month Waste Disposal									$0	$0
	25% of 1 Months Fuel Cost at 100% CF									$4,221	$8
	2% of TPC									$8,081	$15
	Total									**$16,399**	**$30**
	Inventory Capital										
	60 day supply of consumables at 100% CF									$326	$1
	0.5% of TPC (spare parts)									$2,020	$4
	Total									**$2,346**	**$4**
	Initial Cost for Catalyst and Chemicals									$0	$0
	Land									$300	$1
	Other Owner's Costs									$60,607	$109
	Financing Costs									$10,909	$20
	Total Overnight Costs (TOC)									**$494,606**	**$891**
	TASC Multiplier							(IOU, low-risk, 33 year)		1.075	
	Total As-Spent Cost (TASC)									**$531,701**	**$958**

Exhibit 4-15 Case 13 O&M costs

INITIAL & ANNUAL O&M EXPENSES					Cost Base (Jun):	2011
Case 13 - 1x555 MWnet 2x1 7FB NGCC					Heat Rate-net (Btu/kWh):	6,798
					MWe-net:	555
					Capacity Factor (%):	85
OPERATING & MAINTENANCE LABOR						
Operating Labor						
Operating Labor Rate (base):	39.70	$/hour				
Operating Labor Burden:	30.00	% of base				
Labor O-H Charge Rate:	25.00	% of labor				
Operating Labor Requirements(O.J.)per	1 unit/mod.		Total Plant			
Skilled Operator	1.0		1.0			
Operator	2.0		2.0			
Foreman	1.0		1.0			
Lab Tech's, etc.	1.0		1.0			
TOTAL-O.J.'s	5.0		5.0			
					Annual Cost	Annual Unit Cost
					$	$/kW-net
Annual Operating Labor Cost					$2,260,518	$4.072
Maintenance Labor Cost					$3,153,226	$5.681
Administrative & Support Labor					$1,353,436	$2.438
Property Taxes and Insurance					$8,080,890	$14.558
TOTAL FIXED OPERATING COSTS					**$14,848,070**	**$26.749**
VARIABLE OPERATING COSTS						
						$/kWh-net
Maintenance Material Cost					**$4,729,839**	**$0.00114**
Consumables	Consumption Initial Fill	/Day	Unit Cost	Initial Fill Cost		
Water (/1000 gallons)	0.00	1700.64	1.67	**$0**	**$883,239**	**$0.00021**
Chemicals						
MU & WT Chem. (lbs)	0.00	10131.92	0.27	$0	$841,933	$0.00020
MEA Solvent (ton)	0.00	0.00	3481.91	$0	$0	$0.00000
Activated Carbon (lb)	0.00	0.00	1.63	$0	$0	$0.00000
Corrosion Inhibitor	0.00	0.00	0.00	$0	$0	$0.00000
SCR Catalyst (m3)	w/equip.	0.07	8938.80	$0	$200,587	$0.00005
Ammonia (19% NH3) ton	0.00	6.06	330.00	$0	$620,695	$0.00015
Subtotal Chemicals				**$0**	**$1,663,215**	**$0.00040**
Other						
Supplemental Fuel (MBtu)	0.00	0.00	0.00	$0	$0	$0.00000
Gases, N2 etc.(/100scf)	0.00	0.00	0.00	$0	$0	$0.00000
L.P. Steam (/1000 pounds)	0.00	0.00	0.00	$0	$0	$0.00000
Subtotal Other				**$0**	**$0**	**$0.00000**
Waste Disposal						
Flyash (ton)	0.00	0.00	0.00	$0	$0	$0.00000
Bottom Ash (ton)	0.00	0.00	0.00	$0	$0	$0.00000
Subtotal Waste Disposal				**$0**	**$0**	**$0.00000**
By-products						
Sulfur (tons)	0.00	0.00	0.00	$0	$0	$0.00000
Subtotal By-products				**$0**	**$0**	**$0.00000**
TOTAL VARIABLE OPERATING COSTS				**$0**	**$7,276,292**	**$0.00176**
Fuel (MMBtu)	0	90,562	6.13	**$0**	**$172,234,539**	**$0.04167**

Exhibit 4-16 Case 14 capital and owner's costs

	Client:	USDOE/NETL							Report Date:	2012-Jun-12	
	Project:	Bituminous Baseline Study									
	TOTAL PLANT COST SUMMARY										
	Case:	Case 14	1x475 MWnet 2x1 7FB NGCC w/ CO2 Capture								
	Plant Size:	473.6	MW,net	Estimate Type:			Cost Base (Jun)		2011	($x1000)	
Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
1	COAL & SORBENT HANDLING										
1.1	Coal Receive & Unload	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.2	Coal Stackout & Reclaim	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.3	Coal Conveyors & Yd Crush	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.4	Other Coal Handling	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.5	Sorbent Receive & Unload	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.6	Sorbent Stackout & Reclaim	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.7	Sorbent Conveyors	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.8	Other Sorbent Handling	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1.9	Coal & Sorbent Hnd.Foundations	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 1.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
2	COAL & SORBENT PREP & FEED										
2.1	Coal Crushing & Drying	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.2	Prepared Coal Storage & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.3	Slurry Prep & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.4	Misc.Coal Prep & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.5	Sorbent Prep Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.6	Sorbent Storage & Feed	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.7	Sorbent Injection System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.8	Booster Air Supply System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2.9	Coal & Sorbent Feed Foundation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 2.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
3	FEEDWATER & MISC. BOP SYSTEMS										
3.1	Feedwater System	$2,910	$3,013	$2,461	$0	$8,384	$675	$0	$1,359	$10,417	$22
3.2	Water Makeup & Pretreating	$2,586	$267	$1,328	$0	$4,181	$345	$0	$905	$5,432	$11
3.3	Other Feedwater Subsystems	$1,363	$451	$376	$0	$2,190	$169	$0	$354	$2,713	$6
3.4	Service Water Systems	$312	$623	$2,007	$0	$2,942	$250	$0	$638	$3,830	$8
3.5	Other Boiler Plant Systems	$2,104	$786	$1,809	$0	$4,699	$383	$0	$762	$5,844	$12
3.6	Natural Gas, incl. pipeline	$17,663	$574	$497	$0	$18,733	$1,544	$0	$3,042	$23,320	$49
3.7	Waste Treatment Equipment	$903	$0	$523	$0	$1,426	$123	$0	$310	$1,859	$4
3.8	Misc. Equip.(cranes,AirComp.,Comm.)	$1,096	$146	$533	$0	$1,776	$152	$0	$385	$2,313	$5
	SUBTOTAL 3.	**$28,939**	**$5,860**	**$9,532**	**$0**	**$44,331**	**$3,641**	**$0**	**$7,756**	**$55,728**	**$118**
4	GASIFIER & ACCESSORIES										
4.1	Gasifier, Syngas Cooler & Auxiliaries	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.2	Syngas Cooling	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.3	ASU/Oxidant Compression	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.4	LT Heat Recovery & FG Saturation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.5	Misc. Gasification Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.6	Other Gasification Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.8	Major Component Rigging	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.9	Gasification Foundations	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 4.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Exhibit 4-16 Case 14 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
5A	GAS CLEANUP & PIPING										
5A.1	MDEA-LT AGR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.2	Elemental Sulfur Plant	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.3	Mercury Removal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.4	COS Hydrolysis	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.5	Blowback Gas Systems	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.6	Fuel Gas Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5A.9	HGCU Foundations	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 5.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
5B	CO2 REMOVAL & COMPRESSION										
5B.1	CO2 Removal System	$129,456	$0	$39,010	$0	$168,466	$14,056	$33,693	$43,243	$259,459	$548
5B.2	CO2 Compression & Drying	$19,999	$0	$7,655	$0	$27,654	$2,313	$0	$5,993	$35,960	$76
	SUBTOTAL 5.	**$149,455**	**$0**	**$46,665**	**$0**	**$196,120**	**$16,370**	**$33,693**	**$49,237**	**$295,419**	**$624**
6	COMBUSTION TURBINE/ACCESSORIES										
6.1	Combustion Turbine Generator	$104,200	$0	$5,752	$0	$109,952	$9,079	$0	$11,903	$130,934	$276
6.2	Combustion Turbine Accessories	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.3	Compressed Air Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6.9	Combustion Turbine Foundations	$0	$823	$890	$0	$1,714	$143	$0	$371	$2,228	$5
	SUBTOTAL 6.	**$104,200**	**$823**	**$6,642**	**$0**	**$111,666**	**$9,222**	**$0**	**$12,274**	**$133,162**	**$281**
7	HRSG, DUCTING & STACK										
7.1	Heat Recovery Steam Generator	$30,130	$0	$5,580	$0	$35,710	$2,967	$0	$3,868	$42,544	$90
7.2	SCR System	$1,498	$629	$878	$0	$3,005	$252	$0	$489	$3,745	$8
7.3	Ductwork	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.4	Stack	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7.9	HRSG,Duct & Stack Foundations	$0	$393	$368	$0	$761	$63	$0	$165	$989	$2
	SUBTOTAL 7.	**$31,628**	**$1,022**	**$6,826**	**$0**	**$39,476**	**$3,282**	**$0**	**$4,521**	**$47,279**	**$100**
8	STEAM TURBINE GENERATOR										
8.1	Steam TG & Accessories	$24,610	$0	$4,149	$0	$28,759	$2,271	$0	$3,103	$34,133	$72
8.2	Turbine Plant Auxiliaries	$170	$0	$379	$0	$550	$47	$0	$60	$656	$1
8.3	Condenser & Auxiliaries	$1,560	$0	$1,057	$0	$2,617	$220	$0	$284	$3,121	$7
8.4	Steam Piping	$11,371	$0	$4,609	$0	$15,979	$1,089	$0	$2,560	$19,628	$41
8.9	TG Foundations	$0	$730	$1,206	$0	$1,936	$163	$0	$420	$2,519	$5
	SUBTOTAL 8.	**$37,711**	**$730**	**$11,398**	**$0**	**$49,840**	**$3,791**	**$0**	**$6,426**	**$60,057**	**$127**
9	COOLING WATER SYSTEM										
9.1	Cooling Towers	$4,290	$0	$1,300	$0	$5,590	$466	$0	$606	$6,662	$14
9.2	Circulating Water Pumps	$2,063	$0	$127	$0	$2,190	$167	$0	$236	$2,593	$5
9.3	Circ.Water System Auxiliaries	$164	$0	$22	$0	$185	$15	$0	$20	$221	$0
9.4	Circ.Water Piping	$0	$5,085	$1,151	$0	$6,236	$467	$0	$1,006	$7,709	$16
9.5	Make-up Water System	$389	$0	$500	$0	$889	$74	$0	$144	$1,107	$2
9.6	Component Cooling Water Sys	$327	$391	$251	$0	$969	$77	$0	$157	$1,204	$3
9.9	Circ.Water System Foundations	$0	$2,306	$3,829	$0	$6,135	$518	$0	$1,330	$7,983	$17
	SUBTOTAL 9.	**$7,233**	**$7,782**	**$7,180**	**$0**	**$22,195**	**$1,785**	**$0**	**$3,499**	**$27,478**	**$58**

Exhibit 4-16 Case 14 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
10	ASH/SPENT SORBENT HANDLING SYS										
10.1	Slag Dewatering & Cooling	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.2	Gasifier Ash Depressurization	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.3	Cleanup Ash Depressurization	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.4	High Temperature Ash Piping	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.5	Other Ash Recovery Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.6	Ash Storage Silos	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.7	Ash Transport & Feed Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.8	Misc. Ash Handling Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10.9	Ash/Spent Sorbent Foundation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	SUBTOTAL 10.	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
11	ACCESSORY ELECTRIC PLANT										
11.1	Generator Equipment	$6,533	$0	$3,865	$0	$10,398	$854	$0	$844	$12,096	$26
11.2	Station Service Equipment	$2,323	$0	$200	$0	$2,523	$208	$0	$205	$2,936	$6
11.3	Switchgear & Motor Control	$2,859	$0	$497	$0	$3,356	$278	$0	$363	$3,997	$8
11.4	Conduit & Cable Tray	$0	$1,494	$4,304	$0	$5,798	$483	$0	$942	$7,224	$15
11.5	Wire & Cable	$0	$4,801	$2,730	$0	$7,531	$453	$0	$1,198	$9,182	$19
11.6	Protective Equipment	$0	$661	$2,294	$0	$2,956	$254	$0	$321	$3,531	$7
11.7	Standby Equipment	$115	$0	$107	$0	$223	$19	$0	$24	$266	$1
11.8	Main Power Transformers	$12,694	$0	$163	$0	$12,857	$873	$0	$1,373	$15,103	$32
11.9	Electrical Foundations	$0	$140	$356	$0	$496	$42	$0	$108	$646	$1
	SUBTOTAL 11.	**$24,526**	**$7,096**	**$14,516**	**$0**	**$46,138**	**$3,463**	**$0**	**$5,378**	**$54,979**	**$116**
12	INSTRUMENTATION & CONTROL										
12.1	IGCC Control Equipment	w/4.1	$0	w/4.1	$0	$0	$0	$0	$0	$0	$0
12.2	Combustion Turbine Control	w/6.1	$0	w/6.1	$0	$0	$0	$0	$0	$0	$0
12.3	Steam Turbine Control	w/8.1	$0	w/8.1	$0	$0	$0	$0	$0	$0	$0
12.4	Other Major Component Control	$936	$0	$596	$0	$1,532	$129	$77	$261	$1,997	$4
12.5	Signal Processing Equipment	w/12.7	$0	w/12.7	$0	$0	$0	$0	$0	$0	$0
12.6	Control Boards,Panels & Racks	$280	$0	$171	$0	$451	$38	$23	$77	$588	$1
12.7	Computer & Accessories	$4,475	$0	$137	$0	$4,612	$379	$231	$522	$5,743	$12
12.8	Instrument Wiring & Tubing	$0	$833	$1,473	$0	$2,306	$166	$115	$388	$2,975	$6
12.9	Other I & C Equipment	$1,668	$0	$3,863	$0	$5,531	$473	$277	$628	$6,909	$15
	SUBTOTAL 12.	**$7,359**	**$833**	**$6,239**	**$0**	**$14,431**	**$1,184**	**$722**	**$1,875**	**$18,212**	**$38**

Exhibit 4-16 Case 14 capital and owner's costs (continued)

Acct		Equipment	Material	Labor		Bare Erected	Eng'g CM	Contingencies		TOTAL PLANT COST	
No.	Item/Description	Cost	Cost	Direct	Indirect	Cost $	H.O.& Fee	Process	Project	$	$/kW
13	IMPROVEMENTS TO SITE										
13.1	Site Preparation	$0	$104	$2,202	$0	$2,306	$201	$0	$501	$3,008	$6
13.2	Site Improvements	$0	$950	$1,255	$0	$2,206	$196	$0	$480	$2,882	$6
13.3	Site Facilities	$1,940	$0	$2,035	$0	$3,976	$354	$0	$866	$5,196	$11
	SUBTOTAL 13.	**$1,940**	**$1,054**	**$5,493**	**$0**	**$8,487**	**$752**	**$0**	**$1,848**	**$11,087**	**$23**
14	BUILDINGS & STRUCTURES										
14.1	Combustion Turbine Area	$0	$283	$149	$0	$432	$33	$0	$70	$535	$1
14.2	Steam Turbine Building	$0	$1,964	$2,613	$0	$4,577	$368	$0	$742	$5,687	$12
14.3	Administration Building	$0	$553	$375	$0	$928	$72	$0	$150	$1,150	$2
14.4	Circulation Water Pumphouse	$0	$176	$87	$0	$263	$20	$0	$42	$326	$1
14.5	Water Treatment Buildings	$0	$549	$500	$0	$1,049	$83	$0	$170	$1,302	$3
14.6	Machine Shop	$0	$480	$307	$0	$787	$61	$0	$127	$975	$2
14.7	Warehouse	$0	$310	$187	$0	$497	$38	$0	$80	$616	$1
14.8	Other Buildings & Structures	$0	$93	$68	$0	$160	$13	$0	$26	$199	$0
14.9	Waste Treating Building & Str.	$0	$363	$648	$0	$1,011	$82	$0	$164	$1,258	$3
	SUBTOTAL 14.	**$0**	**$4,771**	**$4,934**	**$0**	**$9,705**	**$771**	**$0**	**$1,571**	**$12,048**	**$25**
	TOTAL COST	**$392,991**	**$29,971**	**$119,426**	**$0**	**$542,389**	**$44,261**	**$34,415**	**$94,385**	**$715,450**	**$1,511**
	Owner's Costs										
	Preproduction Costs										
	6 Months All Labor									$4,924	$10
	1 Month Maintenance Materials									$738	$2
	1 Month Non-fuel Consumables									$446	$1
	1 Month Waste Disposal									$0	$0
	25% of 1 Months Fuel Cost at 100% CF									$4,221	$9
	2% of TPC									$14,309	$30
	Total									**$24,638**	**$52**
	Inventory Capital										
	60 day supply of consumables at 100% CF									$599	$1
	0.5% of TPC (spare parts)									$3,577	$8
	Total									**$4,177**	**$9**
	Initial Cost for Catalyst and Chemicals									$1,247	$3
	Land									$300	$1
	Other Owner's Costs									$107,318	$227
	Financing Costs									$19,317	$41
	Total Overnight Costs (TOC)									**$872,447**	**$1,842**
	TASC Multiplier							(IOU, high-risk, 33 year)		1.078	
	Total As-Spent Cost (TASC)									**$940,497**	**$1,986**

Exhibit 4-17 Case 14 O&M costs

INITIAL & ANNUAL O&M EXPENSES					Cost Base (Jun):	2011
Case 14 - 1x475 MWnet 2x1 7FB NGCC w/ CO2 Capture					Heat Rate-net (Btu/kWh):	7,968
					MWe-net:	474
					Capacity Factor (%):	85
OPERATING & MAINTENANCE LABOR						
Operating Labor						
Operating Labor Rate (base):	39.70	$/hour				
Operating Labor Burden:	30.00	% of base				
Labor O-H Charge Rate:	25.00	% of labor				
Operating Labor Requirements(O.J.)per Shift:	1 unit/mod.		Total Plant			
Skilled Operator	1.0		1.0			
Operator	3.3		3.3			
Foreman	1.0		1.0			
Lab Tech's, etc.	1.0		1.0			
TOTAL-O.J.'s	6.3		6.3			
					Annual Cost $	Annual Unit Cost $/kW-net
Annual Operating Labor Cost					$2,861,816	$6.043
Maintenance Labor Cost					$5,016,493	$10.593
Administrative & Support Labor					$1,969,577	$4.159
Property Taxes and Insurance					$14,309,003	$30.215
TOTAL FIXED OPERATING COSTS					**$24,156,889**	**$51.010**
VARIABLE OPERATING COSTS						
						$/kWh-net
Maintenance Material Cost					**$7,524,739**	**$0.00213**
Consumables	Consumption Initial Fill	/Day	Unit Cost	Initial Fill Cost		
Water (/1000 gallons)	0.00	2,865.60	1.67	**$0**	**$1,488,269**	**$0.00042**
Chemicals						
MU & WT Chem.(lbs)	0.00	17,072.41	0.27	$0	$1,418,668	$0.00040
MEA Solvent (ton)	344.71	0.48	3,481.91	$1,200,254	$522,944	$0.00015
Activated Carbon (lb)	0.00	578.27	1.63	$0	$291,580	$0.00008
Corrosion Inhibitor	0.00	0.00	0.00	$47,225	$2,249	$0.00000
SCR Catalyst (m3)	w/equip.	0.07	8,938.80	$0	$200,587	$0.00006
Ammonia (19% NH3) (ton)	0.00	6.06	330.00	$0	$620,695	$0.00018
Subtotal Chemicals				**$1,247,479**	**$3,056,721**	**$0.00087**
Other						
Supplemental Fuel (MBtu)	0.00	0.00	0.00	$0	$0	$0.00000
Gases,N2 etc. (/100scf)	0.00	0.00	0.00	$0	$0	$0.00000
L.P. Steam (/1000 pounds)	0.00	0.00	0.00	$0	$0	$0.00000
Subtotal Other				**$0**	**$0**	**$0.00000**
Waste Disposal						
Flyash (ton)	0.00	0.00	0.00	$0	$0	$0.00000
Bottom Ash (ton)	0.00	0.00	0.00	$0	$0	$0.00000
Subtotal Waste Disposal				**$0**	**$0**	**$0.00000**
By-products						
Sulfur (tons)	0.00	0.00	0.00	$0	$0	$0.00000
Subtotal By-products				**$0**	**$0**	**$0.00000**
TOTAL VARIABLE OPERATING COSTS				**$1,247,479**	**$12,069,729**	**$0.00342**
Fuel (MMBtu)	0	90,562	6.13	**$0**	**$172,233,257**	**$0.04884**

5 Summary of Results

The TOC, COE, CO_2 capture, and CO_2 avoided costs are summarized in Exhibit 5-1 for Cases 1, 2, 9, 10, 11, 12, 13 and 14. The previous values (2007 dollar cost basis) are included for reference and the values with and without T&S are shown for the capture cases. The difference in T&S costs reflects the change in methodology and is currently based on a value of $10/tonne CO_2.

The 2011 COE by cost component is shown in Exhibit 5-2. The COE increase from 2007 to 2011 averages 37 percent for the coal based technologies and 3 percent for the two natural gas based technologies. The cost differences are attributed to the following:

- An increase in the capital component of COE of 20-24 percent for all technologies and fuel types.
- An increase in the fixed O&M cost component of COE of approximately 20 percent for all technologies and fuel types. Labor costs increased by about 15 percent, and the fixed O&M costs are also strongly aligned with the capital costs, thus the similar increase.
- An increase in the variable O&M cost component of 28-35 percent for the IGCC and NGCC cases and 52-55 percent for the PC cases. The higher PC variable O&M cost increase is due primarily to the large increase in ammonia unit cost relative to 2007 (a factor of 2.5).
- An increase in the fuel component of COE of 80 percent for the coal based cases and a decrease of 3 percent for natural gas based cases.
- An increase in the T&S component of COE of 62-86 percent for coal-based capture cases and 20 percent for the natural gas based capture case. The differences result from escalation and the new T&S methodology that assumes a cost of $10/tonne CO_2.

The decrease in fuel cost largely offsets the increase in the other COE components for the NGCC cases, resulting in only a small increase in the 2011 COE. The large increase in coal cost adds to the other COE cost component increases, resulting in the 30-40 percent increase in the 2011 COE.

The CO_2 capture and avoided costs are shown in Exhibit 5-3 for each of the capture cases. The CO_2 capture cost and the avoided cost using the analogous technology as the reference case both reflect the relative increases in COE of the non-capture and capture cases from 2007 to 2011. To illustrate, the cost difference between the IGCC capture and non-capture cases in 2007 dollars was $29.29/MWh and in 2011 dollars was $40.32/MWh. This 38 percent increase in cost differential is reflected in the 38 percent increase in CO_2 capture and avoided (analogous technology reference case). The cost of CO_2 avoided using the SC PC non-capture reference case exhibits a similar trend except for the NGCC capture case. The SC PC non-capture reference case experienced a nearly 40 percent COE increase from 2007 to 2011 dollars, but the NGCC capture case experienced only a 4 percent increase (mostly due to the lower fuel cost). The result is a significantly lower cost of CO_2 avoided ($12/tonne) for NGCC when comparing to the SC PC non-capture reference.

Exhibit 5-1 Summary of results using June 2011 cost basis

Case	TOC, MM$	TOC, $/kW	COE (w/o TS&M), $/MWh	COE (w/TS&M), $/MWh	CO_2 Captured Cost, $/tonne	CO_2 Avoided Cost, $/tonne (Like Tech. Ref.)	CO_2 Avoided Cost, $/tonne (SC PC Ref.)
June 2011 Cost Basis							
1	1,847	2,969	101.16	N/A	N/A	N/A	N/A
2	2,220	4,086	133.07	141.47	48.0	58.6	85.4
9	1,331	2,420	82.27	N/A	N/A	N/A	N/A
10	2,441	4,438	142.04	152.85	65.3	95.9	105.5
11	1,348	2,452	80.95	N/A	N/A	N/A	N/A
12	2,415	4,391	137.28	147.27	66.4	95.9	95.9
13	495	891	59.59	N/A	N/A	N/A	N/A
14	872	1,842	86.58	90.43	80.2	95.8	12.5
June 2007 Cost Basis							
1	1,522	2,447	76.28	N/A	N/A	N/A	N/A
2	1,811	3,334	100.39	105.57	34.8	42.5	65.9
9	1,098	1,996	59.40	N/A	N/A	N/A	N/A
10	1,985	3,610	103.80	109.58	46.3	68.2	74.4
11	1,113	2,024	58.91	N/A	N/A	N/A	N/A
12	1,964	3,570	100.94	106.53	47.7	68.9	68.9
13	398	718	58.90	N/A	N/A	N/A	N/A
14	709	1,497	82.72	85.89	70.2	83.8	35.5

Exhibit 5-2 COE by cost component

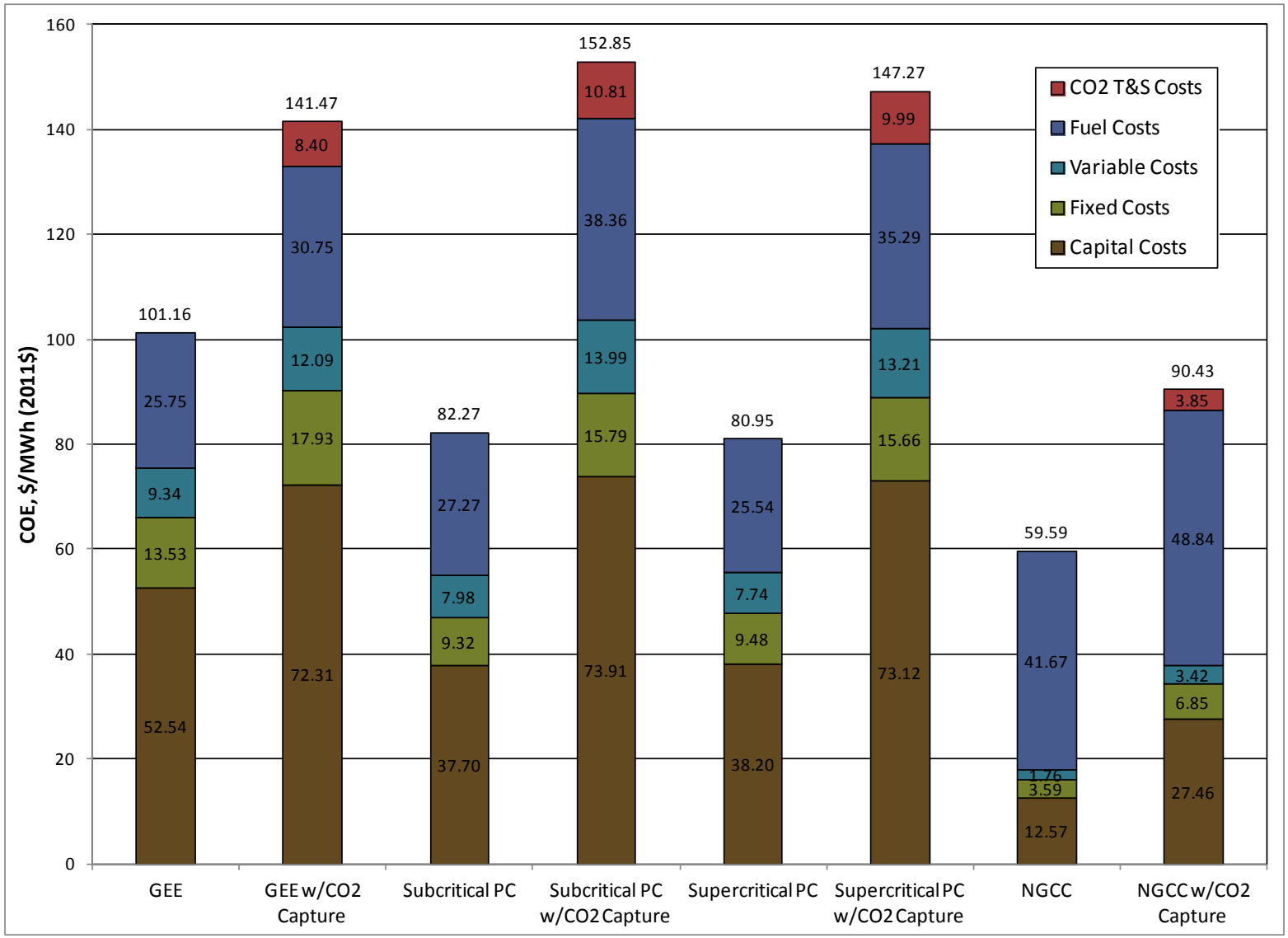

Exhibit 5-3 First year CO_2 capture and avoided costs