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Total CCS System Annualized Cost

CCS System Component	Technology Cost ($/metric ton)	CO_2 Controlled (metric tons/yr) [4]	Total Annualized Cost
CO_2 Capture and Compression Facilities [1]	$114	2,050,368	$233,741,930
CO_2 Transport Facilities [2]	$0.73		$1,493,605
CO_2 Storage Facilities [3]	$0.56		$1,148,206
Total CCS System Annualized Cost	**$115**		**$236,383,740**

Notes
(1) CO_2 capture and compression facilities cost per default value for natural gas combined cycle units as published in the Report of the Interagency Task Force on Carbon Capture and Storage (August 2010), Section III.D.1
http://energy.gov/fe/services/advisory-committees/interagency-task-force-carbon-capture-and-storage
(2) CO_2 transport facility cost as calculated using DOE/NETL Quality Guidelines for Energy System Studies: "Carbon Dioxide Transport and Storage Costs in NETL Studies" (March 2013). Refer to CO2 Transport Facilities costs breakdown below
(3) CO_2 storage facilities cost as proposed in the Report of the Interagency Task Force on Carbon Capture and Storage (August 2010), Section III.C.4
(4) CO_2 Controlled = CO_2 Emissions per Unit * 2 Units * 90% Capture Efficiency
CO2 Controlled = 1,255,634 tons/ unit * 1 metric ton/1.10231 tons * 2 unit * 90% capture control = 2,050,368 metric tons

Proposed Plant Cost

Capital Cost w/o CCS	$888,000,000
Capital Recovery Factor	0.09
Annualized Capital Cost w/o CCS	**$83,820,918**

Notes:
(1) Vendor proposed capital cost
(2) Capital recovery factor is the ratio of a constant annuity to the present value of receiving that annuity for a given length of time. Using an interest rate, i, and a number of annuity received, n, the capital recovery factor is:

$$CRF = \frac{i * (1+i)^n}{(1+i)^n - 1}$$

i = 7%
n = 20

(3) Annualized Capital Cost w/o CCS = Total Capital Cost w/o CCS * Capital Recovery Factor

CO_2 TRANSPORT FACILITIES COSTS

Pipeline Capital Cost Breakdown

Pipeline Capital Cost [1]	
Materials	$1,414,578
Labor	$4,895,817
Miscellaneous	$1,564,012
Right of Way	$506,342
Other Capital Cost [2]	
CO_2 Surge Tank	$1,244,724
Pipeline Control System	$111,907
Total Capital Cost [3]	**$9,737,380**
Capital Recovery Factor [4]	0.09
Annualized Capital Cost ($/yr) [5]	**$919,140**

Notes:
(1) Pipeline capital cost (materials, labor, miscellaneous and righ of way) calculated as published on DOE/NETL Quality Guidelines for Energy System Studies: "Carbon Dioxide Transport and Storage Costs in NETL Studies" (March 2013).
Where:
Materials = $70,350 + $2.01 * L * (330.5 * D^2 + 686.7 * D + 26,960)
Labor = $371,850 + $2.01 * L * (343.2 * D^2 + 2,074 * D + 170,013)
Miscellaneous = $147,250 + $1.55 * L * (8,417 * D + 7,234)
Right of Way = $51,200 + $1.28 * L * (577 * D + 29,788)
Having:
Pipeline Length, L = 10 miles
Diameter, D = 10 inches
Several candidate storage reservoirs exist within 10 to 50 miles of the proposed project, though none have been confirmed to be viable for large scale CO_2 storage at this time. However, it was assumed for this analysis that a Pipeline Diameter based on existing CO_2 pipelines in the US with similar lenghts.

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(2) Other capital cost (CO_2 surge tank and pipeline control system) as published on DOE/NETL Quality Guidelines for Energy System Studies: "Carbon Dioxide Transport and Storage Costs in NETL Studies" (March 2013).
(3) Total Pipeline Capital Cost = Pipeline Capital Cost + Other Capital Cost
(4) Capital recovery factor is the ratio of a constant annuity to the present value of receiving that annuity for a given length of time. Using an interest rate, i, and a number of annuity received, n, the capital recovery factor is:

$$CRF = \frac{i * (1+i)^n}{(1+i)^n - 1}$$

i = 7%
n = 20

(5) Annualized Capital Cost = total Capital Cost * Capital Recovery Factor

Pipeline O&M Costs Breakdown

Fixed O&M ($/yr) [1]	$84,540
Power Cost ($/yr) [2]	$489,925
Annualized O&M Costs ($/yr) [3]	**$574,465**

Notes:
(1) Fixed O&M cost as published on DOE/NETL Quality Guidelines for Energy System Studies: "Carbon Dioxide Transport and Storage Costs in NETL Studies" (March 2013): $8,454/mile/yr
(2) Power Cost based on 1000 hp (1hp = 745.7 w) electric compressor and $0.075/kwh electricity cost
(3) Total Annual O&M Costs = Fixed O&M Costs + Power Cost

CO_2 Transport Facilities Costs

Total Annualized Costs ($/yr) [1]	$1,493,605
Total CO_2 to Control (metric tons/yr) [2]	2,050,368
Cost Effectiveness ($/metric tons) [3]	0.73

Notes:
(1) Total Annualized Costs = Annualized Capital Costs + Annualized O&M Costs
(2) 90% of CO_2 emissions for both units
(3) Cost Effectiveness = Total Annualized Costs / Total CO_2 to Control