From: MARK_EVANS@oxy.com
To: Aimee_Wilson/R6/USEPA/US@EPA
Cc: Chris_Krishna@oxy.com; keil@flash.net
Subject: FW: CCS Costs
Date: 11/09/2012 07:33 AM
Attachments: PIPELINE_COST_ESTIMATE_6_CO2 Product Export.pdf
CO2 Pipeline.docx

Aimee,

The total capital cost of the OxyChem NGL project excluding CCS is estimated to be $530,000,000. The estimated capital cost of CCS for the Oxy project would be $300,000,000 which includes $167,000,000 for pipeline construction (see attached pipeline cost estimate), $63,000,000 for pump station construction (see attached CO2 Pipeline document), and $70,000,000 for construction of amine capture and compression equipment. The estimated annual operating and power expenses of the CO2 transportation pipeline is $15,200,000 (see attached CO2 Pipeline document). The additional equipment needed to capture CO2 would result in increased emissions of NOx, VOC, and other pollutants due to increased energy inputs requirements. An additional 118 MM Btu/Hr of energy input would be needed to strip CO2 from the amine solvent. This would increase NOx emissions by 5.2 tons per year based on an emissions rate of 0.01 lbs NOx/MM Btu, and would increase VOC emissions by 6.2 tons per year based an emission rate of 0.012 lbs VOC/MM Btu. Please call or respond if you have questions.

Mark

Mark R. Evans
Environmental Manager
OxyChem Ingleside
(361)776-6169

From: Wilson.Aimee@epamail.epa.gov [mailto:Wilson.Aimee@epamail.epa.gov]
Sent: Friday, October 26, 2012 2:47 PM
To: Evans, Mark
Subject: CCS Costs

Can you give me some more information on the CCS costs? How does the cost compare to the total project costs? Do you have a detailed cost analysis? Would the additional equipment needed increase the emissions of NOx or VOCs? If so, by how much?

Please take a look at the BACT analysis in the Statement of Basis for Enterprise and Energy Transfer Lone Star to get an idea of the type of information we need to eliminate CCS.

http://www.epa.gov/earth1r6/6pd/air/pd-r/ghg/enterprise-sob.pdf

http://www.epa.gov/earth1r6/6pd/air/pd-r/ghg/etp-sob.pdf

Thanks,
Aimee

6” Ingleside to Freeport CO2 Line

Denbury Resources owns a 325-mile, 20” CO2 pipeline known as the Green Pipeline that begins in Baton Rouge, Louisiana and ends near Freeport Texas. It is used to provide CO2 for enhanced oil recovery to their Oyster Bayou and Hastings Fields. It is the closest CO2 injection point that I could find to Corpus Christi, Texas.

Oxy’s Fractionator project is located approximately 180 miles from the Green Pipeline. Due to this distance, a 6” pipeline is required. The pipeline route follows various existing pipeline routes from Ingleside, through Markham, and ending near Freeport, Texas at the Green Pipeline (See Attached Map).

The 6”pipeline will be designed and operated to comply with all Texas Railroad Commission requirements.

It will be constructed from carbon steel line pipe so the CO2 will have to be completely free of water to prevent the formation of carbonic acid. The MAOP of the pipeline will be 2220 psig. Minimum operating pressure will be 1200psig. All valves and fittings must be capable of extreme temperature change in case a leak occurs.

Ten electric drive pump stations are required at 20mi intervals. Each station will have 2 500hp electric drive pump assemblies and will occupy 10 acres of land.

Construction techniques will be similar to those for a high pressure natural gas pipeline.

Total cost for the 6” pipeline will be $167,000,000 (See Attached Estimate).

Total cost of pump stations will be $62,500,000 broken down as $2500/hp x 2.5 for installation times 10 stations.

Annual power expenses will be $6,000,000/yr at $.07/kw and 75% efficiency.

Annual Operating expenses will be $9,200,000/yr at 4% of installed cost.


Sugar Land
Missouri City
League City
Texas City
Galveston
Victoria
Corpus Christi

INGLESIDE FRACTIONATOR PROJECT

BUDGETARY COST ESTIMATE
6" Carbon Dioxide Export Lines
ONSHORE PIPELINE AND METER STATIONS
PREPARED BY DARKHORSE ENGINEERING CONSULTANTS, LLC
04/17/12

ITEM NO.	DESCRIPTION	QUANTITY		UNIT RATE		COST
1.0	**MATERIALS**					
1.1	LINE PIPE API 5L X-42, ERW (6.625" X 0.375") CL 1 - .72 DE	900,000	ft	$30.00	/ft	$27,000,000
1.2	LINE PIPE API 5L X-42, ERW (6.625" X 0.500") CL 2 - .60 DE	49,611	ft	$35.00	/ft	$1,736,385
1.3			ft		/ft	$0
1.4			ft		/ft	$0
1.5	CORROSION COATING (14-16 mils FBE)	49,611	ft	$3.40	/ft	$168,677
1.6	ABRASION-RESISTANT COATING (40 mils)	0	ft	$7.00	/ft	$0
1.7	INDUCTION BENDS	20	ea.	$1,200	ea.	$24,000
1.8	12" MAINLINE VALVE ASSEMBLY	6	ea.	*$30,000*	ea.	*$180,000*
1.9	BAR TEES AND LATERAL VALVES	0	ea.	*$10,000*	ea.	*$0*
1.10	MISC. (FITTINGS, C.P., SIGNS, ETC.)	*$29,109,062*	basis	3%		*$873,272*
1.11	PIPE MILL INSPECTION	20	m-d	$700	/m-d	$14,000
1.12	VENDOR INSPECTION	10	m-d	$700	/m-d	$7,000
1.13	*PIPE FREIGHT*	949,611	ft	$1.50	/ft	*$1,424,417*
1.14	*FREIGHT-OTHER MATERIAL*	*$1,077,272*	basis	4.0%		*$43,091*
1.15	STATE SALES TAX	*$1,245,949*	basis	7.0%		*$87,216*
1.16	MATERIALS CONTINGENCY	*$31,558,058*	basis	10.0%		*$3,155,806*
	MATERIAL SUB-TOTAL					***$34,713,864***
2.0	**METER AND REGULATOR STATIONS**					
2.1	Inlet Meter Station	1	ea.	$1,000,000	ea.	$1,000,000
2.2	Launcher and Reciever Traps	2	ea.	$100,000	ea.	$200,000
2.3	Optional Pump Station	0	hp	$2,500	/hp	$0
2.4	Valve settings	6	ea.	$20,000	ea.	$120,000
2.5			ea.		ea.	$0
2.6			ea.		ea.	$0
	STATION SUB-TOTAL (ALL IN)					**$1,320,000**
3.0	**CONSTRUCTION**					
3.1	CONTRACTOR MOB AND DEMOB	1	ea.	150,000	ea.	$150,000
3.2	12-INCH UPLAND CONSTRUCTION (INCLUDES DRILL PULL	475,200	ft	$35	/ft	*$16,632,000*
3.3	12-INCH UPLAND CROPLAND CONSTRUCTION (DOUBLE D	475,200	ft	$45	/ft	*$21,384,000*
3.4	12-INCH PLANT CONSTRUCTION (Inside the Fence)	5,000	ft	$75	/ft	$375,000
3.5	12-INCH URBAN CONSTRUCTION	-	ft	$100	/ft	*$0*
3.6	HORIZONTAL DIRECTIONAL DRILL CROSSING	33,200	ft	$100	/ft	$3,320,000
3.7	UNCASED ROAD CROSSINGS	4,800	ft	$80	/ft	$384,000
3.8	MAINLINE VALVE STATION	6	ea	$30,000	ea	$180,000
3.9	ROW Cleanup and Restoration	950,400	ft	$3	ea	$2,851,200
3.10	HYDROSTATIC TEST CONTRACTOR MOB AND DEMOB	1	ea	$50,000	ea	$50,000
3.11	HYDRO, CLEAN, DRY TO -20 DEG. F & Pack	950,400	ft	$5.00	/ft	$4,752,000
3.12	RADIOGRAPHIC INSPECTION	547,391	in	$3	/in	$1,642,172
3.13	INSPECTION	*960*	m-d	$700	/m-d	*$672,000*
3.14	LABOR TAX	*$52,392,372*	basis	0%		*$0*
3.15	CONSTRUCTION CONTINGENCY	*$52,392,372*	basis	10%		*$5,239,237*
	CONSTRUCTION SUB-TOTAL					***$57,631,609***
4.0	**MISCELLANEOUS PIPELINE COST**					
4.1	RIGHT-OF-WAY ACQUISITION	950,400	ft	$600	/rod	$34,560,000
4.1	RIGHT-OF-WAY MITIGATION	950,400	ft	$50	/rod	$2,880,000
4.2	EXTRA WORK SPACE ACQUISITION (Access roads and yard	15	acre	$1,000	/acre	$15,000
4.3	ENGINEERING AND PROJECT MANAGEMENT	*$92,345,473*	basis	5%		*$4,617,274*
4.4	PERFORMANCE BOND	*$57,631,609*	basis	0%		*$0*
4.5	BUILDERS RISK INSURANCE	*$57,631,609*	basis	0%		*$0*
4.6	MISCELLANEOUS COST CONTINGENCY	*$42,072,274*	basis	10%		*$4,207,227*
	MISCELLANEOUS PIPELINE COST SUB-TOTAL					***$46,279,501***
5.0	**OTHER PROJECT COST**					
5.1	OXY INTERNAL COST	*$139,944,974*	basis	1%		$1,399,450
5.2	LINE PACK @ 1000psi	1,340,000	gal	$1.00	gal	$1,340,000
5.3	LEGAL FEES	*$139,944,974*	basis	2%		$2,798,899
5.4	PERMITTING FEES	*$139,944,974*	basis	1%		$1,399,450
5.5	ENVIRONMENTAL SERVICES	*$139,944,974*	basis	2%		$2,798,899
5.6	RIGHT-OF-WAY / REALATOR SERVICES	*$139,944,974*	basis	6%		$8,396,698
5.7	SCADA / FIBEROPTIC SYSTEM	0	ft	1	ea	$906,000
5.8	GEOTECHNICAL ANALYSIS (Deep at HDD's)	14	drills	$10,000	ea	$140,000
5.9	GEOTECHNICAL ANALYSIS (Shallow at bores and along ROW	100	bore	$400	ea	$40,000
5.10	AFUDC	12 MONTH	basis	7%		$5,707,847
5.11	OTHER PROJECT COST CONTINGENCY	$19,219,397	basis	10%		$1,921,940
	OTHER PROJECT COST SUB-TOTAL					**$21,141,337**
	****** PROJECT TOTAL ******					***$152,269,947***
	****** PROJECT CONTINGENCY******					***$14,524,210***
	****** PROJECT TOTAL W/ CONTINGENCY******					***$166,794,157***