



Carbon Capture and Sequestration (CCS) Role –play Scenario

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CPI Today: The Need for New Generation



- ◆ *CPI is committed to providing reliable, affordable, and sustainable electricity to our customers*
- ◆ *CPI will need to add several additional baseload generating units in our region over the next decade*
- ◆ *CPI has a history of environmental compliance*
- ◆ *CPI believes that CCS technology will be required on future fossil-fueled units*
- ◆ *CPI will continue to focus on coal for baseload generation **and support our local, coal-based economy***

Site Selection & Evaluation Process

- ◆ ***Where is the best CPI site to demonstrate CCS***
 - ◆ ***Site Study Team Established***
 - ◆ ***Representatives from CPI***
 - ◆ ***Third Party Consultant (CTI) retained for study***
 - ◆ ***Seismic data***
 - ◆ ***Data well***
 - ◆ ***Environmental sampling***
 - ◆ ***Community context and likely acceptability***
 - ◆ ***Potential Sites Identified***
 - ◆ ***CPI existing plants sites***
 - ◆ ***10 sites identified for evaluation***
 - ◆ ***Fatal Flaw Analysis to narrow list***
 - ◆ ***Developed Ranking Criteria***
 - ◆ ***Economics***
 - ◆ ***Environmental impact***
 - ◆ ***Risk***
 - ◆ ***Public acceptance 3 sites made it to the short list***



Site selection results

- ◆ **Top Site (Physical, environmental & sequestration attributes)**
 - ◆ **CPI Greentown Plant site**
 - ◆ **1970's 600 MW Pulverized Coal unit**
 - ◆ **Supercritical steam conditions**
 - ◆ **Double reheat 1,000 DGF / 1,000 DGF**
 - ◆ **ESP to reduce Particulates**
 - ◆ **99% efficient**
 - ◆ **Retrofitted with SCR to reduce NOx**
 - ◆ **\$150/kw**
 - ◆ **90% efficient (went from 0.7 to 0.07 lb/mmBtu)**
 - ◆ **Retrofitted with wet FGD to reduce SO₂**
 - ◆ **\$450/kw**
 - ◆ **98% efficient (went from 7.5 to 0.10 lb/mmBtu)**
 - ◆ **Reduced mercury emissions**
 - ◆ **80% efficient (Co-benefit of SCR and WFGD)**



CO₂ Capture



- ◆ **CO₂ capture in flue gas difficult:**
 - ◆ **Low CO₂ partial pressure - physical solvents are impractical**
 - ◆ **A large amount of steam is required to regenerate the amine (strip the CO₂ from the “carbon getter”) – large efficiency penalty**
 - ◆ **Amines (MEA or MDEA) applicable – but overall system becomes expensive**
 - ◆ **More work is needed on CO₂ capture technology & cost from flue gas in PC applications**

- ◆ **Recent work indicates significant impact on cost of electricity to implement CO₂ capture and sequestration:**

- ◆ **Price adder will depend on the extent of CO₂ capture**
 - ◆ **Expect 90% removal efficiency**
 - ◆ **From 205 to 20.5 lb/mmBtu**
 - ◆ **Emission reduction of 3,600,000 Tons/year**

Generating Technology Options: Cost of Electricity w/ and w/o CCS @ CPI Greentown



	Greentown Unit 1 Existing PC Supercritical w/o CCS	Retrofit PC Supercritical w/ 90% CCS Adjustments	Retrofit PC Supercritical w/ 90% CCS Totals		
Capacity, MW net	600	(150)	450		
Generation kwh @ 85% CF	4,500,000,000	(1,100,000,000)	3,400,000,000		
CO2 Tons / Year	4,260,000	(3,740,000)	416,000		
Fuel	\$71 Million			\$71 Million	\$0.021/kwh
O&M	\$30 Million	\$5 Million	\$1/Ton	\$35 Million	\$0.010/kwh
Capital cost \$2006	\$400 Million SCR/WFGD	\$400 Million CO2		\$800 Million	
Capital Carrying Cost	\$50 Million	\$50 Million	\$14/Ton	\$100 Million	\$0.030/kwh
CO2 Transportation		\$30 Million	\$8/Ton	\$30 Million	\$0.009/kwh
CO2 Sequestration/mmv		\$37 Million	\$10/Ton	\$37 Million	\$0.011/kwh
Total Cost	\$151 Million	\$123 Million	\$33/Ton	\$274 Million	
Cost of Electricity	\$0.034/kwh				\$0.082/kwh

Please contact us



- For questions or more information, contact me at 999-888-777, Dancison@cpi.net
- If you have questions about the overall project, want to provide input or wish to be put on a mailing list, please contact:
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