**Cost of CCS for an Ultra Supercritical (USC) Coal Plant Based on EIA 2020 Data**

**Cost for 650 MW Base Ultra Super Critical (USC) Coal Plant (NO CCS)**

Total Overnight Capital Cost = $3412/kW for Texas

($3412/kW)\*(1000 kW/MW)\*650 MW = $2.17 Billion

Plant Operating Factor: Assume 60% for New USC Plant

Capital Charge = $15,547,000 per month = $186.6E6/yr (20 yr life, 6% interest rate)

Generation = (650 MWh/h)\*(365 days/yr)\*(24hr/day)\*0.6 = 3.42E6 MWh/yr

Capital Charge = $186.6/3.42 = $54.56/MWh

Fixed O&M Costs = ($40.79/kW-yr)\*(1000 kW/MW)\*(yr/(365\*24 hr\*0.6)) = $7.76/MWh

Variable O&M = $4.52/MWh

Fuel = (8638 BTU/kWh)\*(1000 kWh/MWh)\*(MMBTU/1E6BTU)\*($4.00/MMBTU) = $34.55/MWh

Total Cost = $54.56 capital +$7.76 Fixed + $4.52 variable + $34.55 fuel = $101.39/MWh

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**Cost for 650 MW Base Ultra Super Critical (USC) Coal Plant (90% CCS)**

Total Overnight Capital Cost = $5642/kW for Texas

($5642/kW)\*(1000 kW/MW)\*650 MW = $3.67 Billion

Capacity Factor: Assume 60% for New USC Plant

Capital Charge = $26,293,000 per month = $315.5E6/yr (20 yr life, 6% interest rate)

Generation = (650 MWh/h)\*(365 days/yr)\*(24hr/day)\*0.6 = 3.42E6 MWh

Capital Charge = $315.5/3.42 = $92.25/MWh

Fixed O&M Costs = ($54.57/kW-yr)\*(1000 kW/MW)\*(yr/(365\*24 hr\*0.6)) = $10.38/MWh

Variable O&M = $11.03/MWh

Fuel = (12507 BTU/kWh)\*(1000 kWh/MWh)\*(MMBTU/1E6BTU)\*($4.00/MMBTU) = $50.03/MWh

Total Cost = $92.25 capital +$10.38 Fixed + $11.03 variable + $50.03 fuel = $163.69/MWh

Delta With 90% CCUS Vs. NO CCUS

With CCUS NO CCUS Delta

Capital $92.25 $54.56 $37.69

Fixed O&M $10.38 $7.76 $2.62

Variable O&M $11.03 $4.52 $6.51

Fuel $50.03 $34.55 $15.48

Sub Total $163.69 $79.53 $62.30/MWh

Per Slide 9 of R. K. Srivastava, EPA, Climate Change: Mitigation of Carbon Dioxide Emissions from Coal-fired Power Plants, Presentation to Zhejiang University Hangzhou, China, 11/2020.

Use 0.95 tons CO2/MWh for Supercritical coal

Note EIA uses 1.11 tons CO2/MWh for an average coal plant (not new Ultra SC plant)

Delta = ($62.30/MWh)/(0.95 tons CO2/MWh) = $65.58 /ton CO2

Add in for transportation + storage in Saline Formation in TX = $19.1/ton CO2

Total Cost for CCUS = $65.58 + $19.1 = $84.68/ton CO2 = $93.34/metric tonne CO2