Supporting Information

A Techno-Economic Assessment of Hybrid Cooling Systems for Coal- and Natural-Gas-fired Power Plants with and without Carbon Capture and Storage

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The following supporting information provides additional tables that report the capital, operating and maintenance cost components of hybrid cooling systems, the fuel properties, and the major performance parameters of amine-based carbon capture systems in the IECM.

2 supporting pages and 5 supporting tables

Table S-1 Capital Cost Components of Wet Cooling Unit

Process Area Costs	Wet Cooling Unit Costs
Cooling tower structure	Process facilities capital
Circulation pumps	General facilities capital
Auxiliary systems	Engineering. & home office fees
Piping	Process contingency cost
Makeup water system	Project contingency cost
Component cooling water system	Interest charges
Foundation & structures	Royalty fees
Cooling tower structure	Preproduction (startup) cost
	Inventory capital
Process Facilities Capital (sum above)	Total Capital Requirement (sum above)

Table S-2 Operating and Maintenance Cost Components of Wet Cooling Unit

Variable Cost Component	Fixed Cost Component
Electricity	Operating labor
Water	Maintenance labor
	Maintenance material
	Admin. & support labor
Total Variable Cost (sum above)	Total O&M Cost (sum above)

Table S-3 Capital Cost Components of Dry Cooling Unit

Process Area Costs	Dry Cooling Unit Costs
Condenser structure	Process facilities capital
Steam duct support	General facilities capital
Electrical & control equipment	Engineering. & home office fees
Auxiliary cooling	Process contingency cost
Cleaning system	Project contingency cost
	Interest charges
	Royalty fees
	Preproduction (startup) cost
	Inventory capital
Process Facilities Capital (sum above)	Total Capital Requirement (sum above)

Table S-4 Fuel Properties in IECM Database

Coal Property*	Value	Natural Gas Property	Value
Higher heating value (kJ/kg)	2.71E+04	Higher heating value (kJ/kg)	5.23E+04
Composition (wt.%)		Composition (vol.%)	
carbon	63.75	methane	93.1
hydrogen	4.5	ethane	3.2
oxygen	6.88	propane	1.1
chlorine	0.29	carbon dioxide	1.0
sulfur	2.51	oxygen	0.0
nitrogen	1.25	nitrogen	1.6
ash	9.7	hydrogen sulfide	0.0
moisture	11.12		

***** The Illinois #6 coal in the IECM fuel database is used as the surrogate fuel for PC plants.

Table S-5 Major Performance Parameters of Amine-based Carbon Capture Systems in IECM

Parameter	Value
CO_2 removal efficiency (%)	90
Sorbent concentration (wt%)	30
Lean CO_2 loading (mol.CO_2/mol. solv.)	0.19
Liquid-to-gas ratio	3.06 (PC)/1.18(NGCC)
Regeneration heat requirement (kJ/kg CO_2)	3524 (PC)/3954(NGCC)
Heat-to-electricity efficiency (%)	18.7 (PC)/19.7(NGCC)
CO_2 product pressure (MPa)	13.8
CO_2 compression power use (kWh/tonne CO_2)	93
Cooling duty (t H_2O/t CO_2)	91(PC)/123(NGCC)