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HUNTON& WILLIAMS

Risk Factor Questionnaire for
Coal Power Plants with Carbon Capture & Storage (CCS)

The attached questionnaire is designed to identify the most important challenges business leaders, investors, government officials, and other stakeholders expect to face in the development and commercial use of early commercial CCS plants using coal and/or petcoke for power generation – some plants using gasification (IGCC) might also produce fuel or chemicals as side products. "Co-production" is not done from combustion plants. A risk-based analysis is often useful in identifying serious barriers to wider commercial use of new technologies and systems. Such analysis also aids in structuring mechanisms and incentives for addressing critical risks. A similar analysis was conducted with EPRI's CoalFleet for IGCC in 2004 and 2005 and for Co-Production plants in 2006.

Econergy in the CCS Alliance aims to receive completed questionnaires independently and to compile questionnaire results *in aggregated form* for discussion. All participants will receive the summary results.

Since we last conducted this exercise in summer 2005 for IGCC, several significant developments have occurred:

- After the hurricane disasters of 2004-2005 wholesale natural gas prices spiked to above $12; they remain at elevated levels (in $6-$10 range) for futures contracts through December 2012. And, LNG capacity is delayed.
- While they leveled off during 2005-2006 and declined somewhat in 2007, coal prices (even PRB) rose markedly to a new plateau during 2004 due to transportation constraints. Prices continue to vary by region and coal type.
- Domestic oil and gas production continues to face constraints. Gas sources from Canada are not expanding.
- EPRI continues to make progress in its effort ("CoalFleet") to develop better data on IGCC cost and system standardization. This affects evaluation of costs from engineering firms and vendors for co-production also. Nevertheless, plant costs continue to rise, increasing more than 30%-50%, or more, since 2004.
- With the Democrats winning control of Congress in November 2006 the prospects for climate legislation with CCS requirements are greatly elevated. Many observers expect carbon regulations after 2009. Terms vary.
- The EPA offered a new draft rule on CCS within UIC (underground injection) regulations (SDWA) in July 2008.
- While a number of coal plants have been delayed, both gasification and high efficiency combustion are in play.
- States are increasingly active on GHG containment, forging new regional policies (e.g. New England, CA).
- Financing groups have renewed interest in power and energy deals, since restructuring of merchant power firms. Interest rates are at historic lows, though credit markets have experienced widespread turmoil in 2008.

The questionnaire identifies a range of risks that may affect coal power and energy projects. If industry and government policymakers are armed with a better understanding about the relative importance of these risks, they can craft better policies and incentives to address the issues most difficult to manage for a wider set of plants.

Please note: The risk rating involves two aspects of each risk: (A) the probability that a particular risk event will materialize, by 2012, and then (B) the severity of impact from such an event. The product (A x B) yields a combined rating for each of the risks.

Your Name: _____ **Title**: _____
Organization: _____ **Email:** _____
Company Revenues (circle one): <$10M $10–$100M $100–$1B >$1B

Market segments your organization is active in (check any that apply):

__Utility/IPP __Energy __Engineering/EPC __Tech. Vendor __Gov't. Agency __State
__Finance / Investment Other: _____

Additional comments (answer after completing risk rankings on next page):

_____
_____

Return completed form to Econergy by email to adpaterson@gmail.com, or fax it to 202-822-4986.

COAL PLANT QUESTIONNAIRE WITH MODIFICATIONS FOR CCS

Please rate each of the following risk areas from 1 to 5 in BOTH Column A *and* in Column B:

Column A **= *Probability:*** *Likelihood of occurrence that the risk will be realized (1 to 5)*
Column B **= *Impact:*** *Impact of consequences if risk event occurs (1 to 5)*
High probability/High impact (5)=Poses a serious threat or impact for success of a commercial project.
Low probability/Low impact (1) = Low probability (or is being addressed); or low impact if it occurs.

For example, a particular risk could be viewed as a very low probability event (1), but pose a severe impact if it occurred (5); or have both a high likelihood (5) and a very high consequence or impact (5).

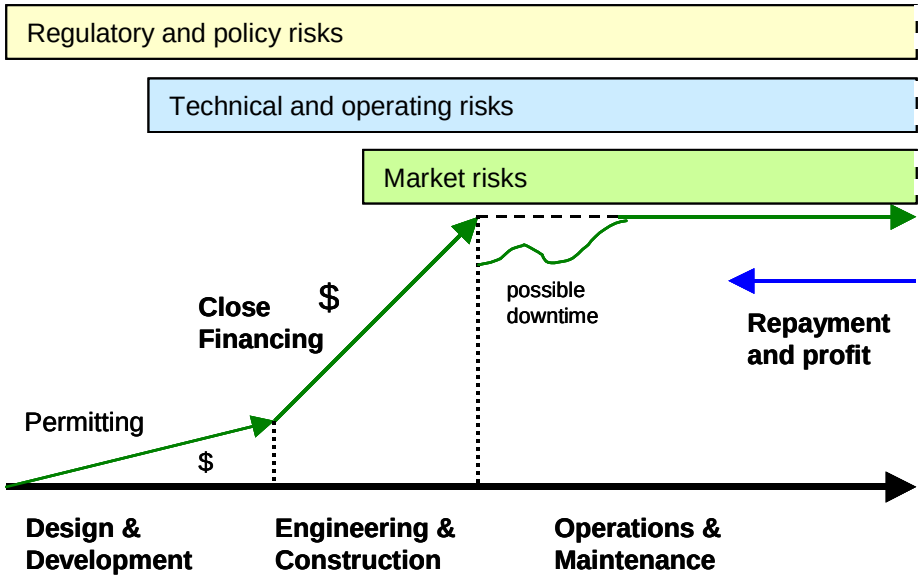
RATING A	RATING B	RISK CATEGORY "The likelihood and impact of…" (*YOUR* outlook to 2012)
A	B	**TECHNOLOGY & OPERATIONS** (*system and cost performance*) – "Rate the risk that…"
___	___	1*. Electricity cost is too high (for PUC or market) due to high new plant costs (even without CCS).
___	___	2*. Electricity cost is not competitive or acceptable to PUC due to high labor, operating costs.
___	___	3*. Excessive plant downtime will occur due to subsystem failures or technical problems (not CCS).
___	___	4*. Cost of basic materials (e.g., steel, cement, piping) runs higher, making new plant uneconomic.
___	___	5*. Contractor / vendor capacity remains seriously constrained raising new plant completion risk.
___	___	6*. Acute accidents occur, generating regulatory penalties or severely damaging a new plant.
		* *Note: To more clearly evaluate technical risks, #1-6 are questions framed without regard to CCS.*
___	___	7. Capital costs for carbon capture equipment (>50% capture) impair financing of a new plant.
___	___	8. Carbon capture equipment fails during operations, leading to excessive downtime and repairs.
___	___	9. The site for CCS could suffer a significant technical failure and more than minor leakage occurs.
___	___	10. EPC/vendor performance "wrap" (warranty) is not adequate for new plant feasibility with CCS.
___	___	11. Transportation of CO2 for CCS proves difficult logistically (e.g., transit path too long)
A	B	**REGULATORY & POLICY** (*governmental policy*) – "Rate the risk that…"
___	___	12. State-level air permitting process substantially delays construction, raising costs on a new plant.
___	___	13. Uncertainty on legislation / EPA carbon emission regulations hampers permitting on new plant.
___	___	14. Future carbon emission regulations become tighter after construction, leading to shutdowns.
___	___	15. Value of (eventual) carbon emission allowances does not adequately cover costs of CCS.
___	___	16. Regional, state policies fail to provide sufficient incentives to support plant economics with CCS.
___	___	17. Regional, state policies fail to provide sufficient clarity about CCS requirements and liability.
___	___	18. National policies lack sufficient incentives (loans, tax measures) for first-of-a-kind plants.
___	___	19. National policies (e.g., tax credits) lack sufficient incentives for sequestration of carbon.
___	___	20. Water use regulations are tightened, after siting, hindering construction or operation of plants.
A	B	**MARKET & FINANCE** (*dynamics of demand and supply*) – "Rate the risk that…"
___	___	21. Long-term demand for power, and/or plant products fails to grow as forecast, reducing revenue.
___	___	22. Coal transport / rail constraints will be aggravated, raising delivered costs of coal over time.
___	___	23. Current conventional coal plants are allowed to run longer, curbing demand for new plants.
___	___	24. Natural gas prices drift and stay lower (<$4/MBtu), making the plant with CCS uncompetitive.
___	___	25. Coal prices rise significantly, threatening competitiveness of power costs vs. natural gas.
___	___	26. Interest rates rise sufficiently (2008-2012) to jeopardize financing or economics for new plant(s).
___	___	27. Market rates or state PUC approved rates do not offer sufficient recovery of CCS costs.
___	___	28. Financing of new plant proves difficult (e.g., debt tenors too short, too much equity required).
___	___	29. Transmission congestion curbs plant revenues over time as grid upgrades lag load growth.
___	___	30. *Customers* of new plant suffer future financial strains and off-take commitments are breached.
___	___	31. EPA regulations on underground injection of CO2 and liability fail to offer clarity for financing.
___	___	32. Transport costs of CO2 become more costly after new plant is operating, threatening run time.
___	___	33. Revenues from the sale of CO2 (e.g., for EOR) are not adequate to cover costs of CCS.
___	___	34. Prospect of liability for long-term leakage of CO2 from CCS threatens new plant financing.

The Risk Rating Framework

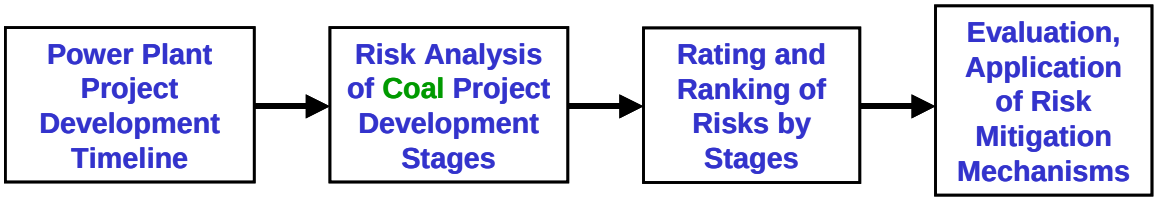
First of all it is important to clarify what the risk framework is not: it is not another form of "R&D roadmap" (or wishlist) or rating of technical priorities; it is not an environmental risk assessment. Nor is it a delineation of barriers, per se, though it can deepen an understanding of barriers to wider commercial use in industry. Instead, it is based on a straight-forward assessment of business risks in several dimensions based primarily on the investment group making the decision to buy / build a plant.

The risk-rating framework notes that business risks shift over the project timeline of the design, construction, permitting and operation of a power plant. For analysis the risks over the power project timeline are separated into three basic categories: A) system technology and operations, B) regulatory, and C) market risks. (Also see the questionnaire used in the appendix.)

Diagram of risks and power project timeline



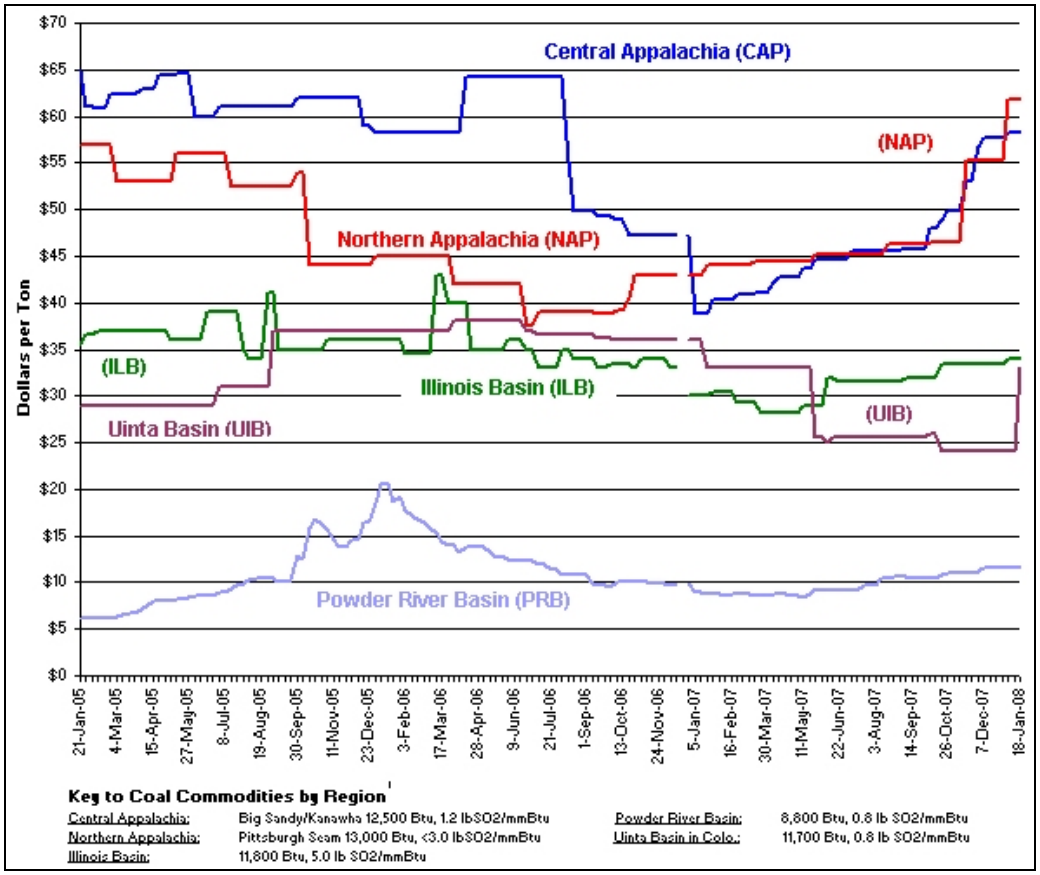
Based on the power project timeline then the rating of risks can be conducted by respondents over the stages of project development, and then ranked and evaluated for risk mitigation.



Risk ratings were completed in March 2004 by 33 participants who were asked to rate 29 business risks in three broad categories: technical, regulatory, and market risks. In 2005, many of the same participants and additional ones (a total of 50) were asked to rate the same 29 risks, plus two more were added for refinement. Participants were asked to rate both the probability of a particular risk event occurring, and the severity of the impact by the event on the commercial prospects of the clean coal unit. The product of the probability and severity then constitutes a risk rating. The two dimensions of these risks help better evaluate the nature of the risks, and possible remedies and "risk-based" government incentives for addressing the highest rated risks.

REFERENCES

EIA Coal Prices (2005 – 2007)



NYMEX Natural Gas (1990 – 2007)