Financing Commercial Projects with CCS

Critical Risks and Regulatory Issues

Commonwealth of Virginia Energy Symposium
The New Energy Future

Carbon Capture & Geologic Sequestration I & II

Lexington, Virginia
October 8, 2009

Scott J. Stone
CCS Alliance
Hunton & Williams LLP
Washington, DC
202-419-2160
sstone@hunton.com

Andrew D. Paterson
CCS Alliance
Washington, DC
619-807-3267
adpaterson@gmail.com

Dr. Maria Dubravka Pineda
Washington, DC
202-460-8269
mdpineda@gmail.com

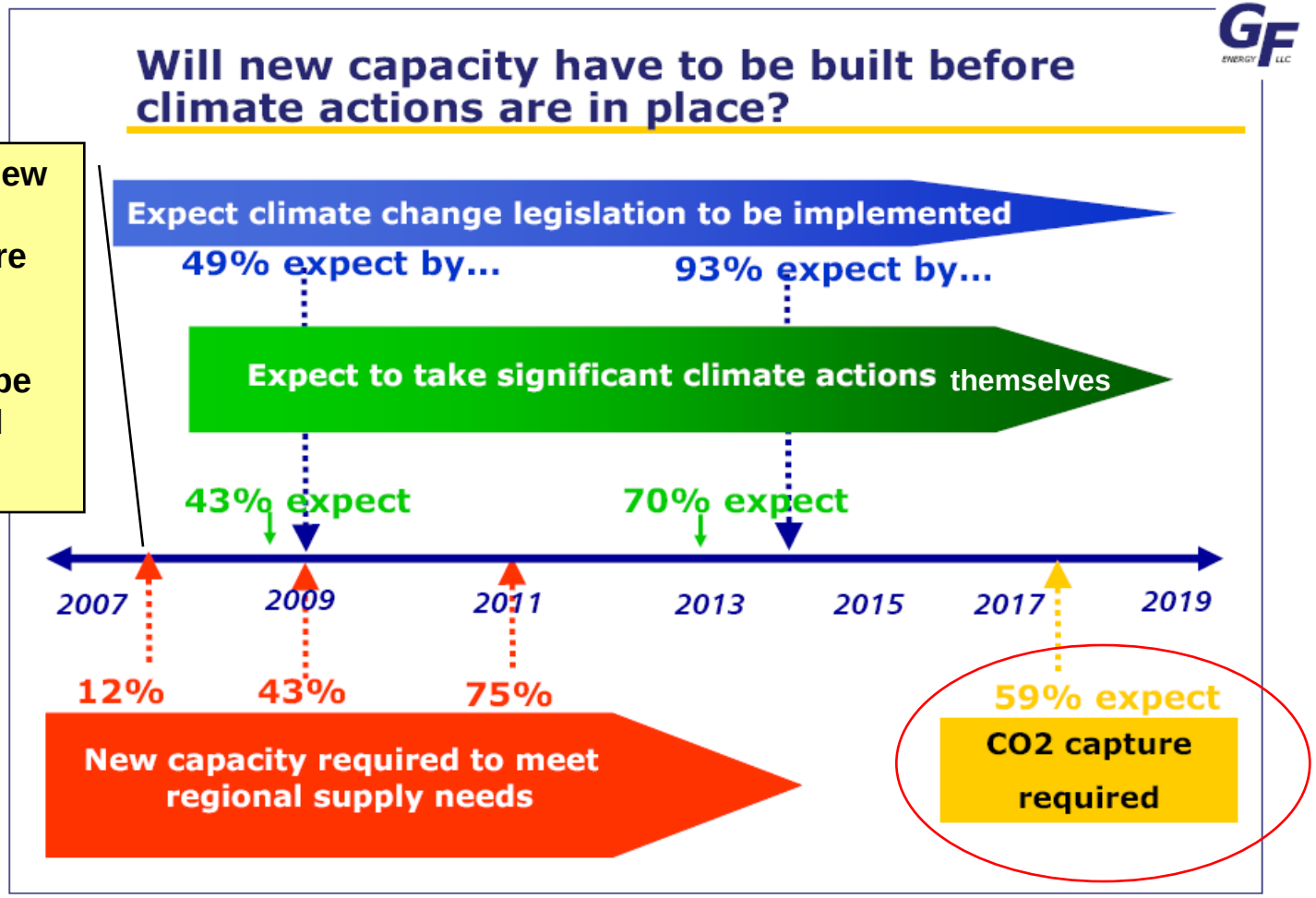
CCS Alliance

www.ccsalliance.net

- **What is the CCS Alliance?**
  - A coalition of entities sharing a common interest in removing impediments to the investment in and development of CCS.
  - The CCS Alliance is particularly focused regulatory requirements regarding financial assurance, site closure certification, post-closure monitoring, and long-term liability.
  - The CCS Alliance also seeks to address issues regarding the applicability of other federal environmental statutes, project and pipeline siting authority, subsurface property rights, and other issues.
- **Key objectives**
  - To define clearly the potential risks and responsibilities associated with the capture, transport, underground injection, and long-term storage of carbon dioxide.
  - To promote the development of policy at State and federal levels to address risk and liability issues appropriately.
- **Efforts and Accomplishments**
  - Conducted a comprehensive study of risk and legal liability issues, focusing on barriers posed by existing law and regulatory regimes to the commercial-scale deployment of CCS.
  - Submitted comments on proposed CCS-related regulatory regimes, including EPA's proposed rule for underground injection wells under the SDWA.
  - Communicated key issues regarding the treatment of legal liability issues under proposed climate change and energy legislation.
- **Primary Message**
  - Any legal or regulatory regime that imposes restrictions on carbon dioxide emissions must recognize the status and development of technical aspects of CCS, should be simple and clear, and should encourage CCS deployment.

Outlook on U.S. Carbon Policy Timing: Survey of Utility Execs (2007)

Challenge: New capacity is needed before federal legislation is expected to be resolved and litigated.

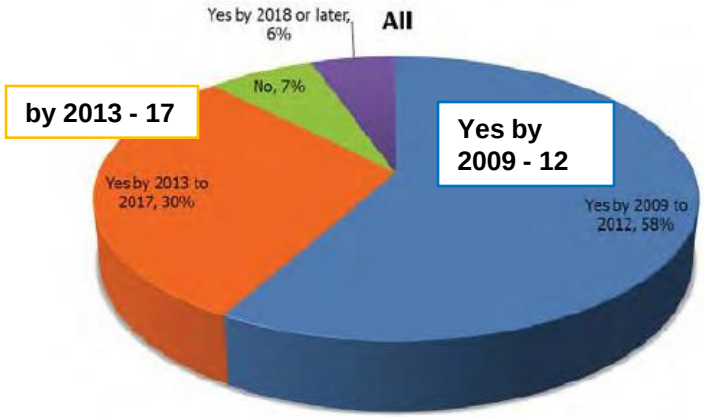


Source: Survey by GF Energy of Utility Executives in North America, April 2007

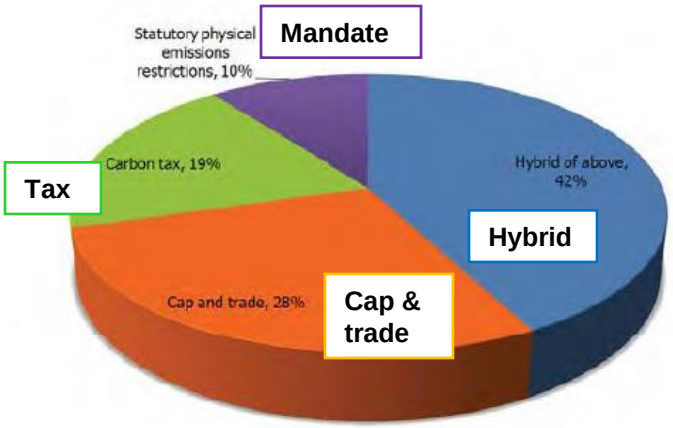
BV Survey of Utility Execs (2008)

Outlook on U.S. Carbon Policy:

Do you think that carbon legislation will be enacted at the national level?



In reference to carbon legislation, which would you prefer?



"Do you feel the United States can afford to comply with the environmental legislation that you believe will likely be passed, with 1 indicating that you feel that the country can least afford it and 5 that it can afford it."

IOU						
Answer Options	**1 Least Afford It**	**2**	**3**	**4**	**5 Can Afford It**	**Rating Average**
I feel:	20%	27%	23%	19%	10%	2.72

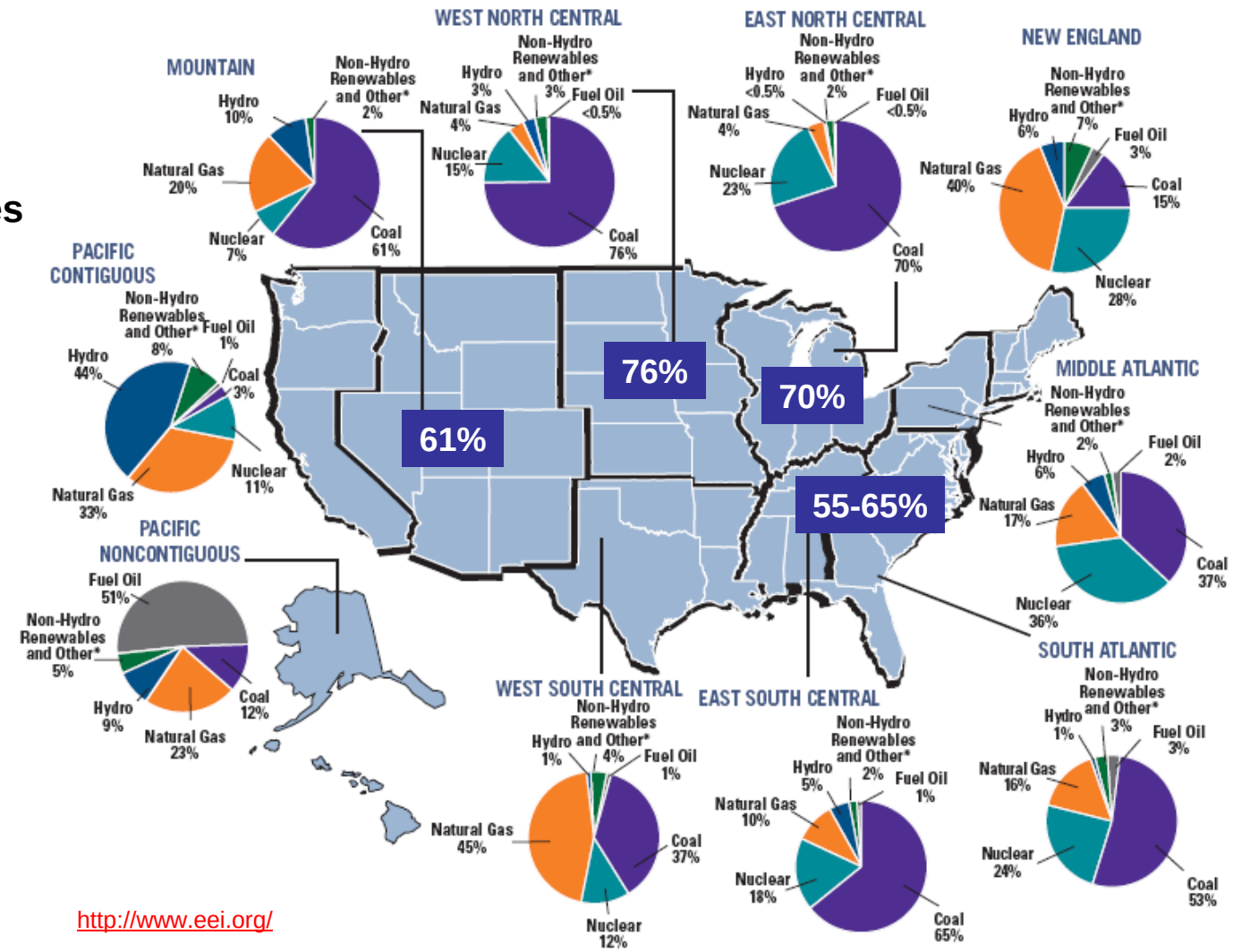
Muni						
Answer Options	**1 Least Afford It**	**2**	**3**	**4**	**5 Can Afford It**	**Rating Average**
I feel:	30%	26%	21%	13%	10%	2.4625

Source: 3rd Black & Veatch Strategic Directions Survey (2008)

Differing Electricity Mix by U.S. Region (EEI), 2005

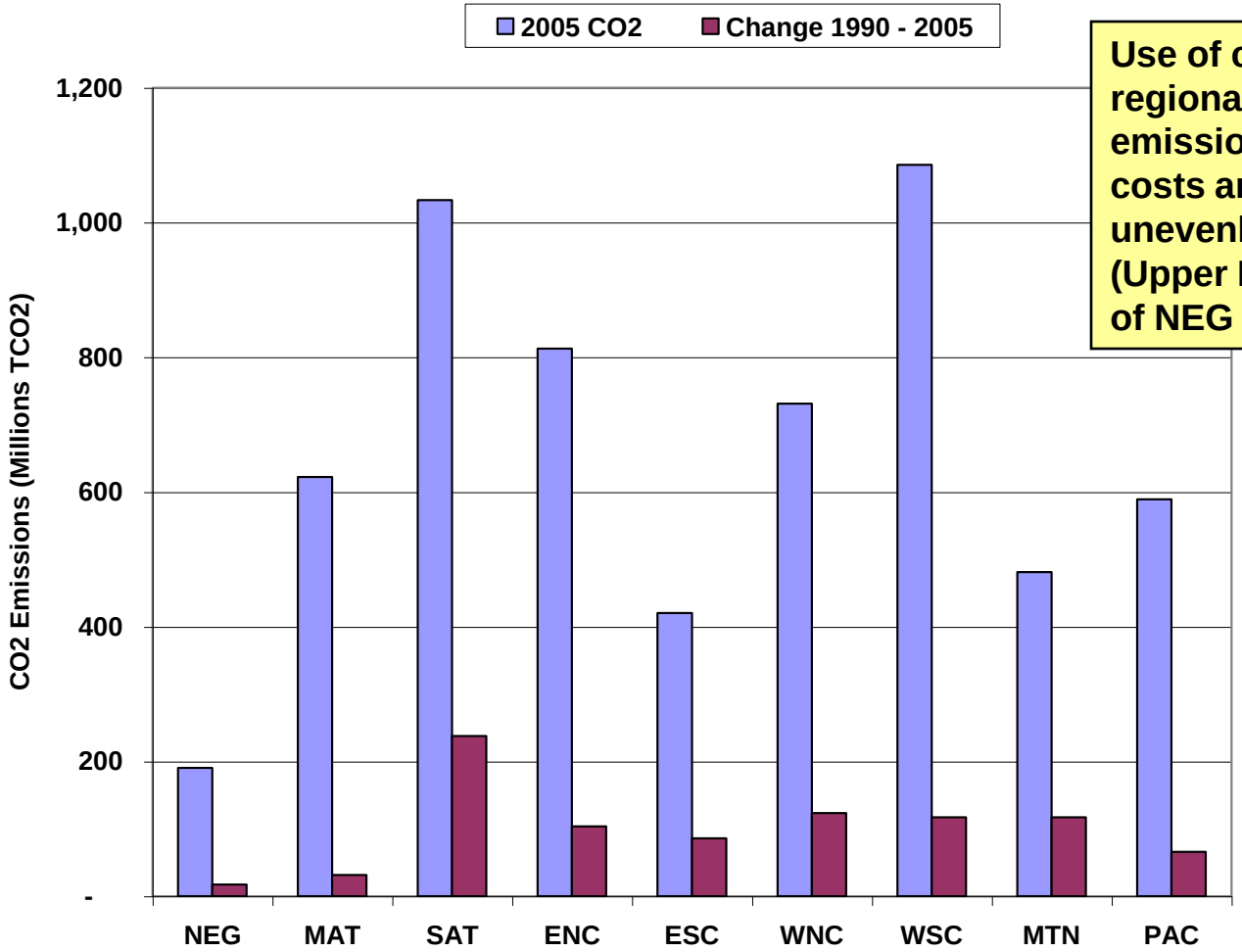
National averages mask very sharp regional differences on GHGs and electricity fuel sources.

Coal provides half of U.S. electricity, but much more in certain regions.



http://www.eei.org/

CO2 Emissions Vary Widely by Census Region… like Europe



Use of coal is very uneven regionally, as are CO2 emissions per capita, so costs and risks fall unevenly. CO2 in WNC (Upper Plains) is 10x that of NEG (New England).

	NEG	MAT	SAT	ENC	ESC	WNC	WSC	MTN	PAC
CO2 per capita ➔	6.4	41.5	22.1	27.4	22.1	67.7	25.4	9.5	11.4
Population ➔	29.75	14.99	46.69	29.67	19.04	10.80	42.67	50.91	51.89

Opening Quotes: Consensus to Move on CCS

"The vast majority of new power stations in China and India will be coal-fired; not *may* be coal-fired – will be. So, developing carbon capture and storage technology is not optional, it is literally of the essence."

Former UK Labour Prime Minister Tony Blair, Speaking in Tokyo ahead of the 2008 G8 Summit (June 2008) for *Breaking the Climate Deadlock: A Global Deal for a Low Carbon Future (Sir Nicolas Stern)*

"Carbon capture and storage (CCS) for coal-fired power plants is a critical technology if we are to achieve our environmental goals while continuing to use our abundant domestic coal resources. However, CCS storage capacity is not available everywhere, and the technology itself is not fully developed and ready for deployment. We believe CCS ultimately will prove to be one of the least-cost ways to reduce CO2, and we are actively involved in projects to advance the research."

Jim Rogers, President – Duke Energy, June 28, 2007 from Testimony to Senate Environment & Public Works
http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=96b0a903-32fc-47f8-9a36-b4ddd9805e2b

"We believe CCS can stimulate faster policy action and help fill the gap between what we need to do and what we have committed to do. …Using CO2 from coal plants for domestic EOR has three advantages: 1) it reduces oil imports and our trade deficit; 2) using old oil wells reduces the environmental burden of drilling new wells; and 3) oil or gas wells are a better place to put CO2 than into the atmosphere."

David Hawkins, NRDC at Gasification Technologies Conference, Oct. 2007

CCS Incentives in H.R. 2454/S.1733

- **Climate bills include multiple sources of funding for commercial-scale CCS.**
  - Distributes allowances to eligible CCS projects (more in Senate bill)
  - Creates industry-run corporation to fund other CCS projects ($1 billion/yr for 10 years).
  - Also establishes performance standards for new coal-fired power plants.
    - 50% reduction for new plants started after 2008, but depends on availability of CCS.
    - 65% reduction for new plants started after 2020.

- **Climate bills <u>do not</u> directly address legal liability issues associated with CCS.**
  - Several Senate bills have provided for limited indemnity for a small number of early mover projects, but none have attempted to address liability issues at a comprehensive scale.

- ***Without more definitive action by Congress on liability issues, energy/power projects will face significant, if not insurmountable, barriers to secure financing for CCS.***

Risk Rating Results for CCS Deployment

- **Risk Ratings frame the challenge: Financing**
- **Approach & Methodology / Participants**
- **Risk ratings: Highs and Lows**
- **Summary Observations & Path Forward**

The severity of risk is gauged within a time horizon for the likelihood an event occurs times the impact (detriment) to the project (e.g., on assets and cash flows) for various risks:

<u>Within a Time Horizon</u>

Probability x Impact = Severity of Risk

Rating Respondents: Sophisticated on CCS Issues

Gasification Technologies Council
Conoco Phillips
GE
Siemens
Air Liquide
Chevron
Excelsior Energy
Warley Parsons
CH2M Hill
Burns & McDonnell
Potomac-Hudson Engineering
Oglethorpe Energy
Eastman Chemical
e3Gasification
ZeroGen (Australia)
Arkansas Electric Coop Corp.
National Rural Electric Coop Assoc.
Minnkota Power Coop
Pace Energy Consultants
IEA GHG R&D Programme (London)
Hensley Energy
EPRI
World Coal Institute (WCI)
ICO2N (Canada)
Natural Resources Defense Council
World Resources Institute
Imperial College of London
MIT
U.S. Dept. of Energy (Fossil Energy)
New Energy Finance

Risks ➔ Mitigation Approaches ➔ Actions Needed

CCS Alliance Scope:

I) Risk Study for CCS Deployment (coal power plants or energy projects with CCS)

II) Legal research on critical issues, risks and formulation of mitigation options

A) Commercial Risk Analysis

Risk Type	Key Risks
1) Tech-CCS	Capital cost with CCS too high
2) Reg-CCS	State rules on CCS not clear
3) …	
4) …	

Analysis based on Interviews of key actors:
(results of Risk Study)

Category	30 Respondents (Q#) Specific Risk	25 point scale Rated Severity	Relative Value
ALL (34 Qs)	Overall Average	10.2	Average
Tech - CCS	7. Capital costs for carbon capture equipment (>50% capture) impair financing of a new plant.	17.1	High
Policy	18. National policies lack sufficient incentives (loans, tax measures) for first-of-a-kind plants.	16.2	High
Policy - CCS	13. Uncertainty about EPA carbon emission regulations and CCS hampers permitting on new plant.	15.9	High
Policy - CCS	19. National policies (e.g., tax credits) lack sufficient incentives for sequestration of carbon.	15.6	High
Policy - CCS	17. Regional, state policies fail to provide sufficient clarity about CCS requirements and liability.	15.2	High
Policy - CCS	15. Value of (eventual) carbon emission allowances does not adequately cover costs of CCS.	13.9	Above Avg.
Market-CCS	31. EPA regulations on underground injection of CO2 and liability fail to offer clarity for financing.	13.4	Above Avg.
Market-CCS	34. Prospect of liability for long-term leakage of CO2 from CCS threatens new plant financing.	13.3	Above Avg.
Market	28. Financing of new plant proves difficult (e.g., debt tenors too short, more equity required).	13.3	Above Avg.
Market-CCS	33. Revenues from the sale of CO2 (e.g., for EOR) are not adequate to cover costs of CCS.	12.9	Above Avg.
Policy - CCS	16. Regional, state policies fail to provide sufficient incentives to support plant economics with CCS.	12.9	Above Avg.
Market-CCS	27. Market rates or state PUC approved rates do not offer sufficient recovery of CCS costs.	12.8	Above Avg.
Market	23. Current conventional coal plants are allowed to run longer, curbing demand for new plants.	9.7	Average
Tech - CCS	9. The site for CCS could suffer a significant technical failure and more than minor leakage occurs.	7.3	Below Avg
Tech - CCS	11. Transportation of CO2 for CCS proves difficult logistically (e.g., transit path too long)	7.0	Below Avg
Market-CCS	32. Transport costs of CO2 become more costly after new plant is operating, threatening run time.	6.1	Low
Market	24. Natural gas prices drift and stay lower (<$4/MBtu), making the plant with CCS uncompetitive.	5.3	Low

B) Mitigation Mechanisms

Government

- Loan guarantees
- Grants (by DOE, etc.)
- Tax subsidies
- Injection regulations
- Permitting approaches
- Carbon emission rules
- Federal "Energy Bank"
- LT purchase contracts

Industry / Investors

- Insurance / bonding
- Engineering backups
- Long-term contracts
- Site review, feasibility
- Collateral, backup supply

C) Government Actions needed for Mitigation

(Match actions with mechanisms)

Near-term / Long-term

- Appropriations
- Legislation
- Tax bill
- Regulation
- Agency action
- Executive order
- Reserves (e.g., SPRO)
- Others

Approach to Commercial Risk Framework

Energy Project Development Timeline → **Risk Analysis of Project Development Stages** → **Rating and Ranking of Risks by Stages** → **Evaluation, Application of Risk Mitigation Mechanisms**

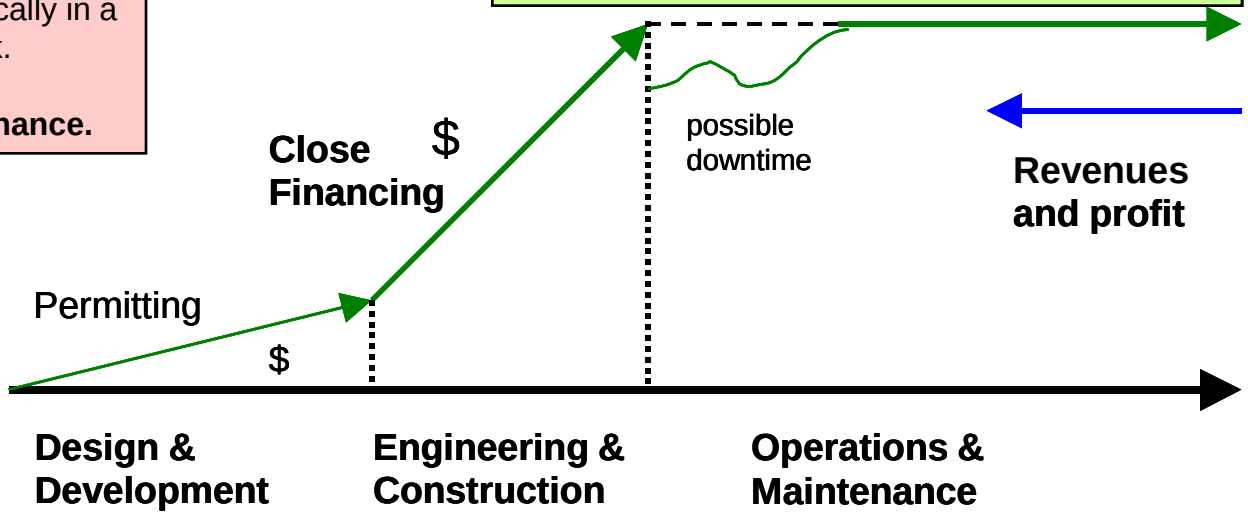
Regulatory and policy risks

Technical and operating risks

Market risks

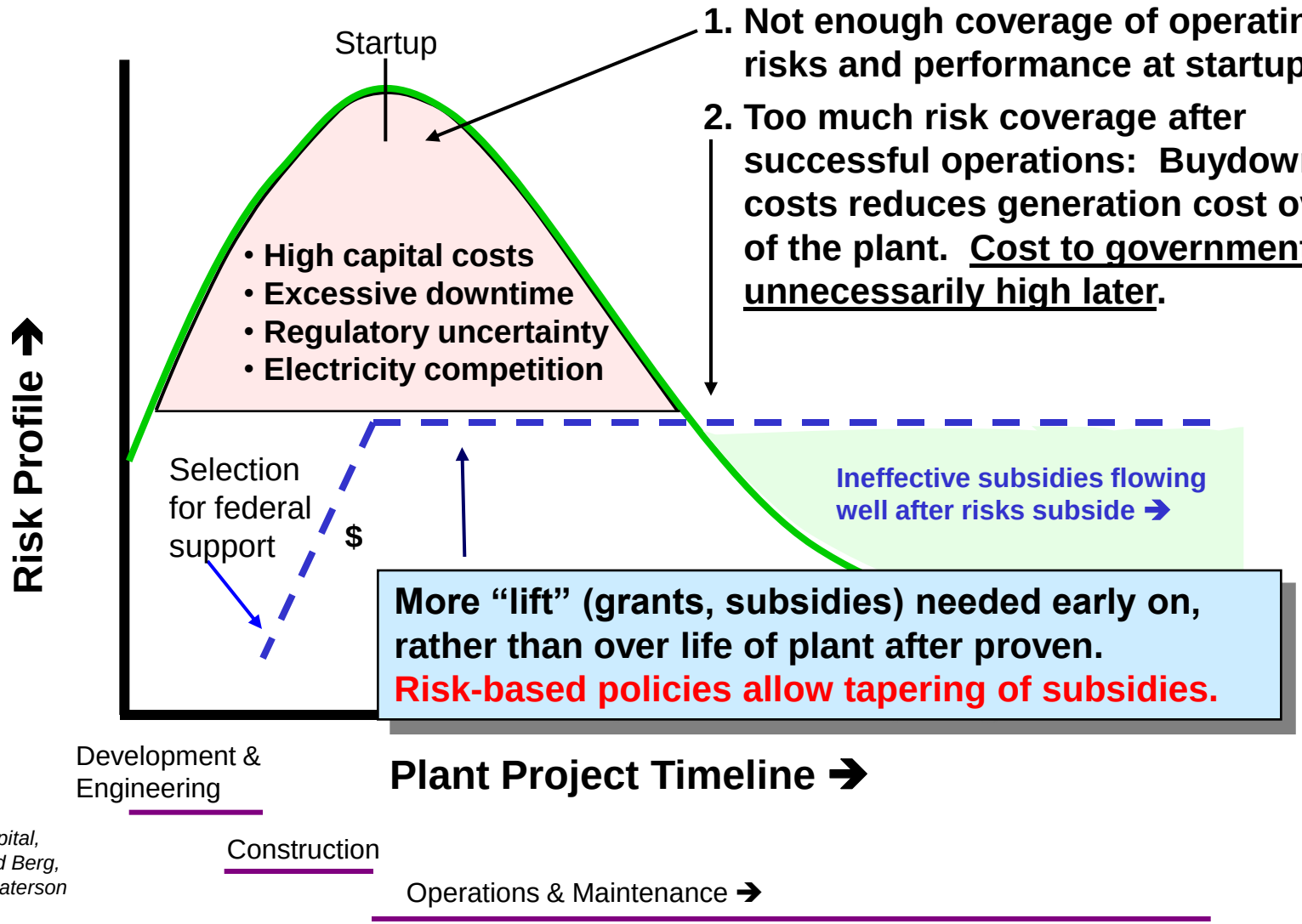
Fossil projects with CCS cannot complete financing without a comprehensive commercial risk analysis by creditors, typically in a project finance framework.

Deployment = project finance.



Source: Scully Capital

First of a Kind Systems: High Risk Early

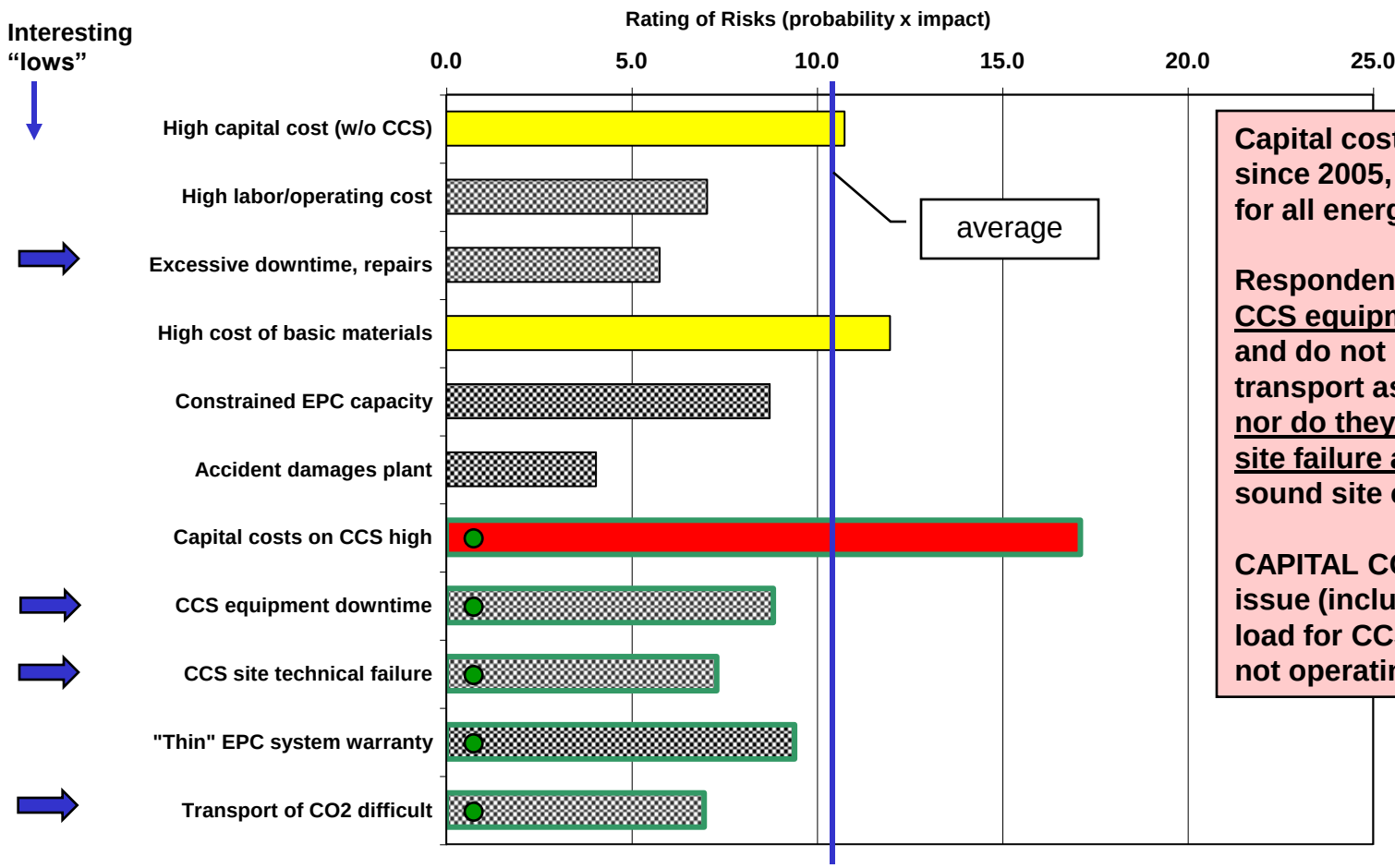


Source: Scully Capital, also David Berg, Andrew Paterson

Risk Ratings: TECHNICAL

Spring 2008

Deploying CCS creates a large drain on plant production, so capital costs run much higher.



30 respondents

Capital costs spiraled higher since 2005, but costs are up for all energy projects.

Respondents expect that <u>CCS equipment will work</u>, and do not see CO2 transport as a major issue, <u>nor do they see a storage site failure as likely</u> with sound site characterization.

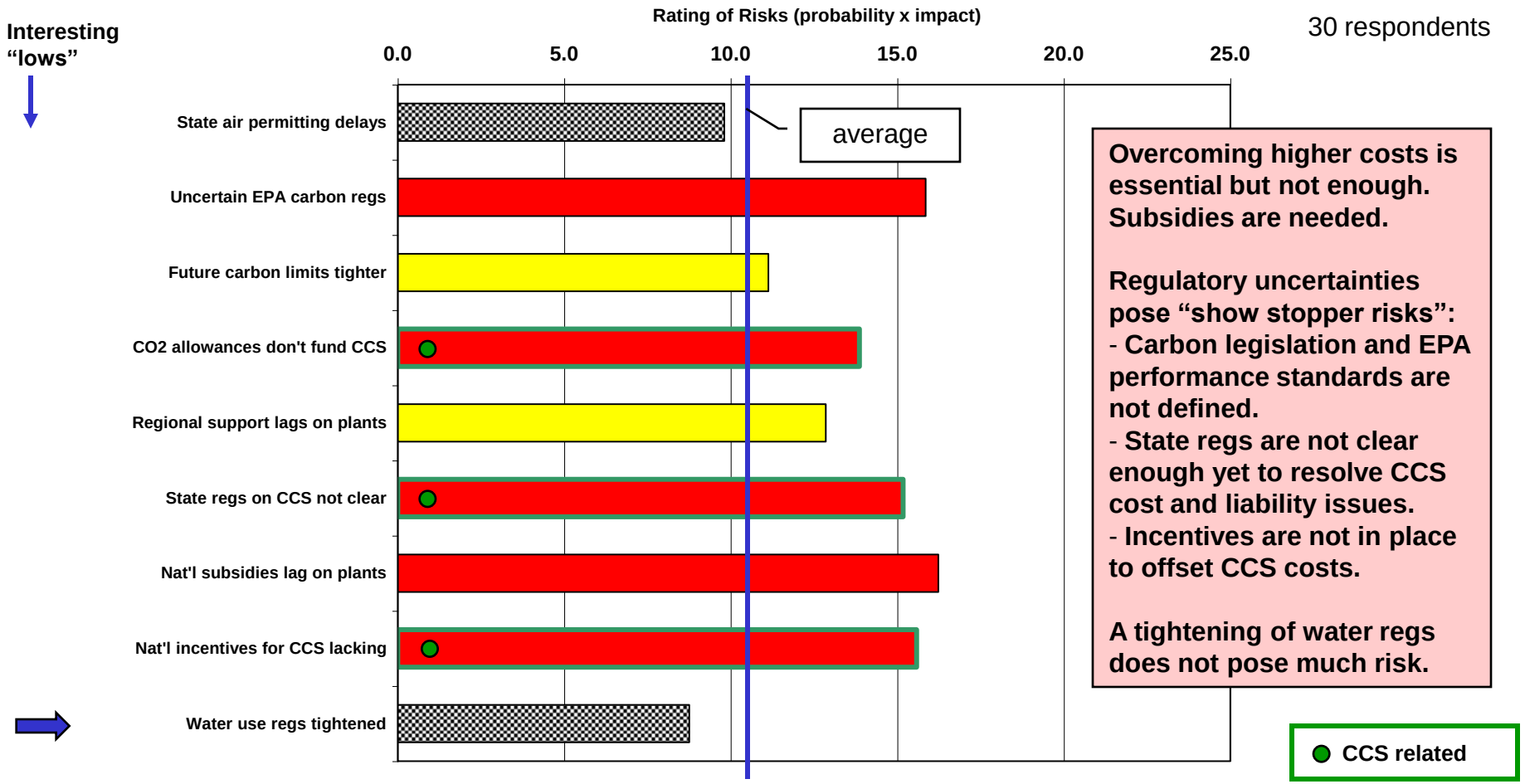
CAPITAL COST is the major issue (including parasitic load for CCS compression), not operating costs.

● **CCS related**

Risk Ratings: REGULATORY / POLICY

Spring 2008

Regulatory uncertainties (federal + state) about CCS costs and liability threaten financing.



Overcoming higher costs is essential but not enough. Subsidies are needed.

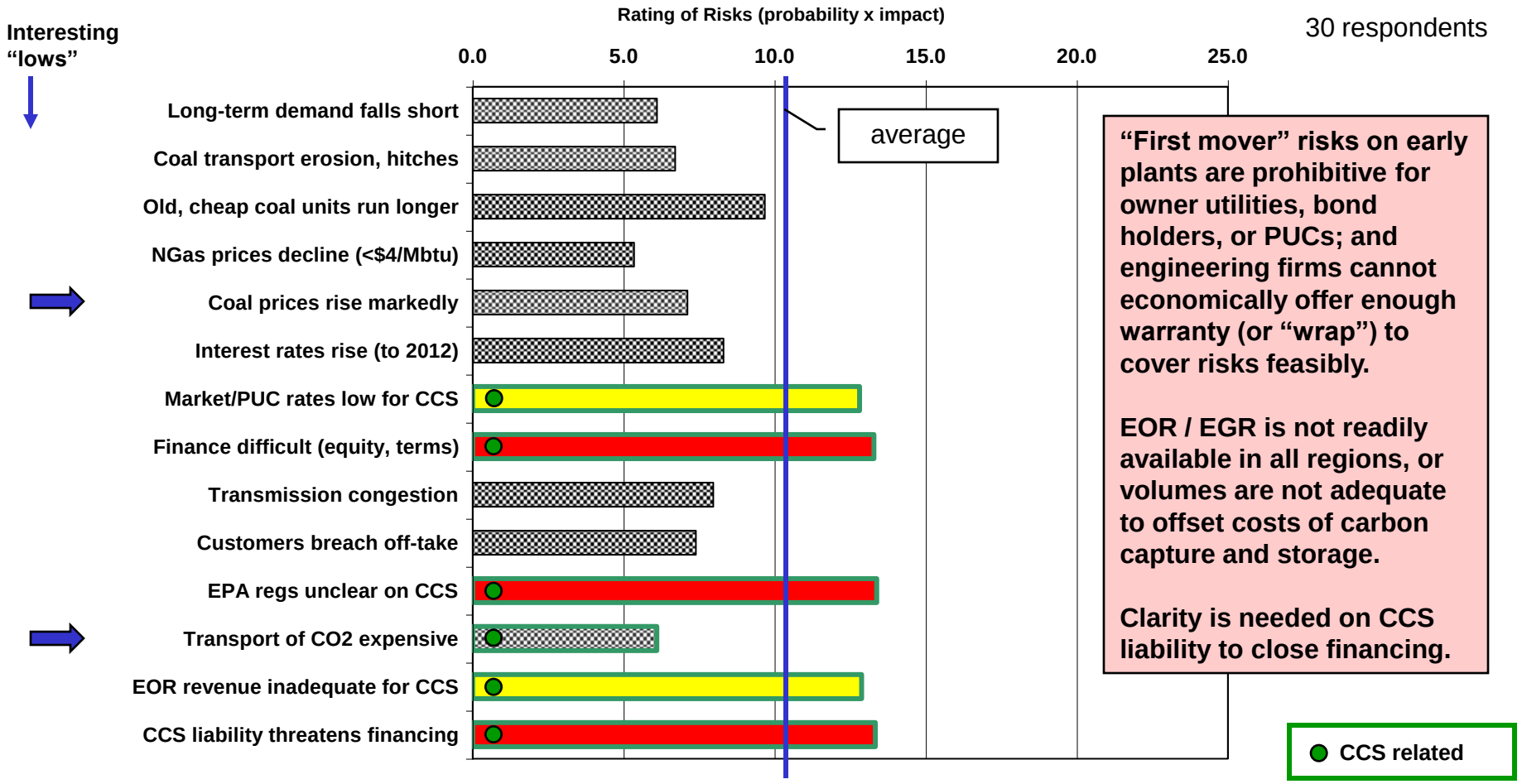
Regulatory uncertainties pose "show stopper risks":
- Carbon legislation and EPA performance standards are not defined.
- State regs are not clear enough yet to resolve CCS cost and liability issues.
- Incentives are not in place to offset CCS costs.

A tightening of water regs does not pose much risk.

Risk Ratings: MARKET

Spring 2008

Lack of subsidies and uncertainty about liability for CCS make financing very difficult.



"First mover" risks on early plants are prohibitive for owner utilities, bond holders, or PUCs; and engineering firms cannot economically offer enough warranty (or "wrap") to cover risks feasibly.

EOR / EGR is not readily available in all regions, or volumes are not adequate to offset costs of carbon capture and storage.

Clarity is needed on CCS liability to close financing.

Risk Ratings on CCS – Observations

- **Capital costs have run up since 2005, but costs are up for projects worldwide.**
- **Respondents expect that CCS equipment will work, and do not see CO2 transport as a major issue, nor do they see a CCS site failure as likely. CAPITAL COST for the plant with CCS is the key barrier, not variable costs.**
- **Subsidies are needed to overcome higher costs, but that is not enough.**
  (Subsidies could be paid for by injection fees on CO2, or user levies on coal)
- **Regulatory uncertainties pose "show stopper" risks for deployment of CCS:**
  - Carbon emission legislation and EPA regulatory rules on CCS are not defined.
  - State regulations are not clear enough yet to resolve CCS cost and liability issues.
  - Incentives (tax credits, loans, allowances) are not in place to offset higher CCS costs.
  - A tightening of water regulations does not pose much of a risk currently.
- **"First mover" risks are prohibitive for owner utilities, bondholders, or PUCs; and engineering firms cannot economically offer enough warranty (or "wrap") to cover risks. Few owners want to finance <u>early</u> CCS demos and plants.**
- **<u>EOR is not readily available in all regions</u>, or demand is not adequate to absorb costs and volumes needed for carbon capture and storage from power plants.**
- **Clarity is needed on CCS liability to close financing – perhaps a "showstopper".**
- **Increases in coal prices or interest rates were not rated high risks.**
- **Lower NGas prices (<$5) would pose competitive problems.**

Mechanisms for Mitigation of Critical Risks

Risk-based mechanisms entail less federal budget impact, covering more projects.

Mechanisms provide A) a subsidy or B) risk assumption:

A. Traditional "Cost-based" Mechanisms: Subsidies for higher cost technologies early

1. **Federal Grants** (e.g., DOE CCPI program)
2. **Investment tax credits / Accelerated depreciation**
3. **Unit tax credits** (e.g., production tax credits, or CCS tax credits)
4. **Rate subsidies** (allowances or feed-in tariffs)

B. Progressive "Risk-based" Mechanisms: Negotiated between public – private sector actors

1. **Loans or guarantees** (under Energy Policy Act 2005)
2. **Federal off-take contract / Capacity payments**
3. **State rate regulation** (available in about half the states)
4. **Dispatch preference**
5. **CCS Liability Regime at Federal level**

Risks vs. Mechanisms for Mitigation (X = helps cover risk)

Existing Mechanisms do NOT adequately mitigate critical risks. Subsidies are not enough.

Increasing Risk Coverage

Lead Actor	Mechanisms (vs. Critical Risks)	High Capital Costs with CCS	Uncertainty on Carbon Emission Cap & Regs	Unclear rules on CCS Injection	Lack of clarity on long-term CCS Liability	Electric prices (or rates set) too low for CCS costs
	Level of Risk ==>	High	High	High	High / Med	High / Med
	Existing Mechanisms (U.S.)					
	A) Subsidies					
Federal	Federal grants (DOE)	XXX				XX
Federal	Investment tax credits (capital subsidy)	XX				X
Federal	Unit tax credits (operating subsidy)	XX				X
State	State grants (e.g., for engineering)	XX		X		X
	B) Risk Assumption / Transfer					
Federal	Federal Loan Guarantee	XXX	XX		X	XX
State	Rate-basing or Dispatch Preference	XXX	XXX	XX		XX
Industry	Stockpiles; Backup supplies or systems	XX				
	Level of Risk Covered	Covered	Exposed	Exposed	**Showstopper!**	Adequate
	Action Needed (e.g., legislation)					
	A) Subsidies					
State	Additional collateral or Revolving funds	X				XX
Federal	Carbon allowances (traded with cap)	XX	XXX	XX		XXX
	B) Risk Assumption / Transfer					
Federal	Clear regulations on carbon emissions		XXX			
State	Clear rules on CCS and LT Liability			XXX	XXX	X
Industry	Insurance and Carbon Offsets			X	X	
Federal	Federal off-take contract or feed-in	XXX	XXX	X		XX
Industry	EPC Turnkey "wrap" or warranties		X			
	Level of Risk Covered	Covered	Adequate	Adequate	Negotiable	Adequate
		XXX = most coverage; XX = moderate coverage; X = a little coverage				

Path Forward: Risk Mitigation Mechanisms

Offset costs

Clarify rules

Address LT liability

Financing

- **Establish extent of private insurance capacity on CCS risks**
- **Utilize loan guarantees and tax credits to offset CCS costs**
- **Develop financial mechanisms and carbon offsets for risk transfer**

Regulations and State Actions

- **Track EPA UIC regulations for resolution of CCS liability issues**
- **Monitor state actions on CCS characterization and GHG rules**
- **Work with state PUCs willing to support plants with CCS in rates**

Federal Legislation

- **Garner financing for CCS demonstrations (e.g., fossil mil charge)**
- **Utilize results of CCS demonstrations to refine risk assessments**
- **Follow legislation on carbon emissions, allowances and incentives for reductions, including ultimate liability for CCS**

*Legal and Regulatory Principles**

- **A CCS liability regime should respond to identified risks:**
  - Owners and operators of injection sites should be liable for physical harms and response costs under a well-defined and predictable liability regime.
  - A CCS liability regime should provide appropriate incentive to others in the 'CCS chain' such as pipeline operators, generators, equipment manufacturers, and others to assure safe operation.
  - RCRA and CERCLA would not need to be applicable if liability regime ensures that entities will bear responsibility for their operations.
  - Private party liability would be limited to a discrete period (operations plus a post-closure period) supported by private risk management tools.
  - Federal government should assume all liability beyond post-closure period.

** The principles set forth in the following slides reflect the work and expertise of the CCS Alliance, but do not necessarily represent the positions of the CCS Alliance, its members, or Hunton & Williams LLP.*

Regulatory and Enforcement Structure

- **Single, Clear, and Reasonable:**
  - A single, clear and reasonable regulatory structure should be enacted, to be enforced by a single, experienced regulator where possible, though the regulator may differ depending on the State.
  - The Underground Injection Control program is a logical structure for much of the regulation that is required, but is not broad enough to cover all of the issues that may arise with CCS, and its liability and financial assurance requirements may not be suitable to the CCS context. The regulatory structure will need to address human health and environmental concerns beyond underground sources of drinking water.
  - The regulatory structure should acknowledge and provide clear means to efficiently resolve potentially conflicting public policy purposes. It is essential that policy rationally balance, for example, the value of reliable electric supply, maintenance of clean groundwater supplies, and avoidance of atmospheric CO2 emissions.
  - Congress should provide a regulatory structure that includes the UIC program and addresses other issues not covered by the UIC program.
  - Parties must keep the CO2 stream sufficiently void of impurities to maintain protection of human health and the environment and the integrity of CCS infrastructure, and to encourage public acceptance for deploying CCS technology.

Financial Responsibility

- **Scope and duration of financial responsibility:**
  - The financial responsibility period for parties involved in the CCS chain would include the operational period plus a 30-year closure period, which could be shortened at the permitting agency's discretion if the CO2 plume has sufficiently stabilized.
  - Congress should authorize a broad array of private sector risk management tools to permit maximum economic flexibility to achieve financial responsibility and quality risk management with the greatest efficiency for scarce resources. Those tools should include at a minimum surety bonds, insurance, demonstrations of corporate financial strength and corporate guarantees, and letters of credit.
  - A financial assurance regime should encourage risk management through the private sector and encourage economically efficient risk management.

Financial Responsibility, continued

- **Public sector role:**
  - Government should assume liability for all risks that occur beyond the 30-year closure period. There is not now, nor is there likely to be, a private market through which risks can be managed after operation and a reasonably defined post-closure period.
  - Government should consider providing, after careful study, a risk management layer in the event that liabilities are beyond the ability of the private sector to manage. This could address liabilities in excess of the private market's ability to manage risk during the operation phase, should careful study show that such a situation exists. If a government "excess" risk management layer is created, it must not preclude clear and transparent price signals about the risks and associated costs of CCS deployment.

Other Considerations

- **Regulatory Scope and Agency**
  - The regulatory agency for CCS should be consistent with the scope and purpose of the regulatory structure that is devised. The agency best able to apply expertise and appropriate resources to the approval and regulation of CCS projects should be the agency that does so.
  - In both devising a regulatory structure and assigning regulatory responsibility, policy makers must balance the goals of reducing CO2 emissions into the atmosphere; protecting human health and the environment; and promoting cost-efficient and reliable production of goods and services, such as electricity, which result in generation of carbon dioxide.
- **Revolving Funds**
  - Congress should authorize revolving funds as a financial assurance mechanism for use during the long-term liability phase after the operation and post-closure site responsibility period. The funding source, level, payment duration, and structure (including such features as operation by a private entity or pooling with other trust funds) should be left to the market or the fund regulator to establish. Such revolving funds might include a commutation feature for sites successfully closed for lower than expected cost.
  - Amounts paid into the fund should be suspended once the fund reaches a maximum dollar threshold. Collection of funds would resume if the fund balance falls below a minimum threshold.

Other Considerations, continued

- **Federal Siting Authority**
  - Federal siting authority, including eminent domain authority, should be available for CO2 pipelines for CCS. Congress should grant the FERC siting authority for CCS pipelines, similar to the siting authority it currently has for natural gas transmission facilities under Section 7 of the Natural Gas Act.
- **Property Rights**
  - The government must address the ability to gain broad access to geologic formations for CCS. State property ownership regimes vary. Surface owners may or may not own property below the surface to the center of the earth.
  - The safe sequestration of CO2 will not have any effect on the surface, but CCS injections will result in underground plumes that may stretch across many square miles under the property of multiple property owners. Property ownership issues have been resolved successfully in the context of enhanced oil recovery, but it should not be assumed that the same will be true for CCS, the injection areas for which are likely to be larger and thus more complex.
  - Eminent domain authority should be available for CCS because of its public benefit. The government should provide eminent domain authority or otherwise make possible appropriate access rights so that entities involved in CCS can gain rights to use geologic formations for CCS, conduct due diligence during site selection, address any potential pathways for leakage, and conduct monitoring during the operation and post-closure phases.

Summary Points for CCS Deployment

- CCS is not economic and subsidies will be needed for first plants.
- Some tools are in place, but legislation is needed to resolve uncertainties. Financing is key: **No financing = no CCS deployment.**
- Utility bond holders require certainty on CCS liability without indefinite, long-term exposure after injection. Private owners and insurance could manage first losses, states may want to share risks to encourage plants.
- With dependence on reliable coal-based electricity for 12 hrs a day, more in some U.S. regions, CCS is vital for progress on carbon emissions.
- The current pace of electricity demand and the rise and volatility of natural gas prices require that advanced coal plants be built now.
- Grants and tax credits are easy for industry to ask for, but are difficult for Congress to fully fund. Levies on coal may be needed; but those funds would need to be sequestered for coal projects.
- Risk-based policies (such as loan guarantees, or dispatch preference) can help stretch limited government funds across more projects.
- If risks are addressed through a mix of policies and demos, early plants could be built with CCS to demonstrate feasibility.

Background Material & Analysis

Mechanisms for Mitigation of Critical Risks

Mechanisms and incentives tend to take A) some form of subsidy or B) risk assumption:

A. Traditional "Cost-based" Mechanisms: Subsidies for higher cost technologies early

1. **Federal Grants:** traditional federal funding provided by appropriations and procurement (limited availability).
2. **Investment tax credits / Accelerated depreciation:** capital subsidies partially available under Section 48A&B. More helpful with early funding while risk is highest versus later production tax credits.
3. **Unit tax credits** (e.g., production tax credits, or CCS tax credits): Ensures that technology works before tax subsidy is provided, but does not shoulder much risk, which is borne early by plant owners. Can only be utilized to the degree income is earned. Many PUCs require pass through to rate payers.
4. **Rate subsidies (allowances or feed-in tariffs):** Similar to production tax credits, but comes in as revenue rather than tax benefit. Can be tailored better than federal tax credits to regional and local attributes.

B. Progressive "Risk-based" Mechanisms: Negotiated between public – private sector actors

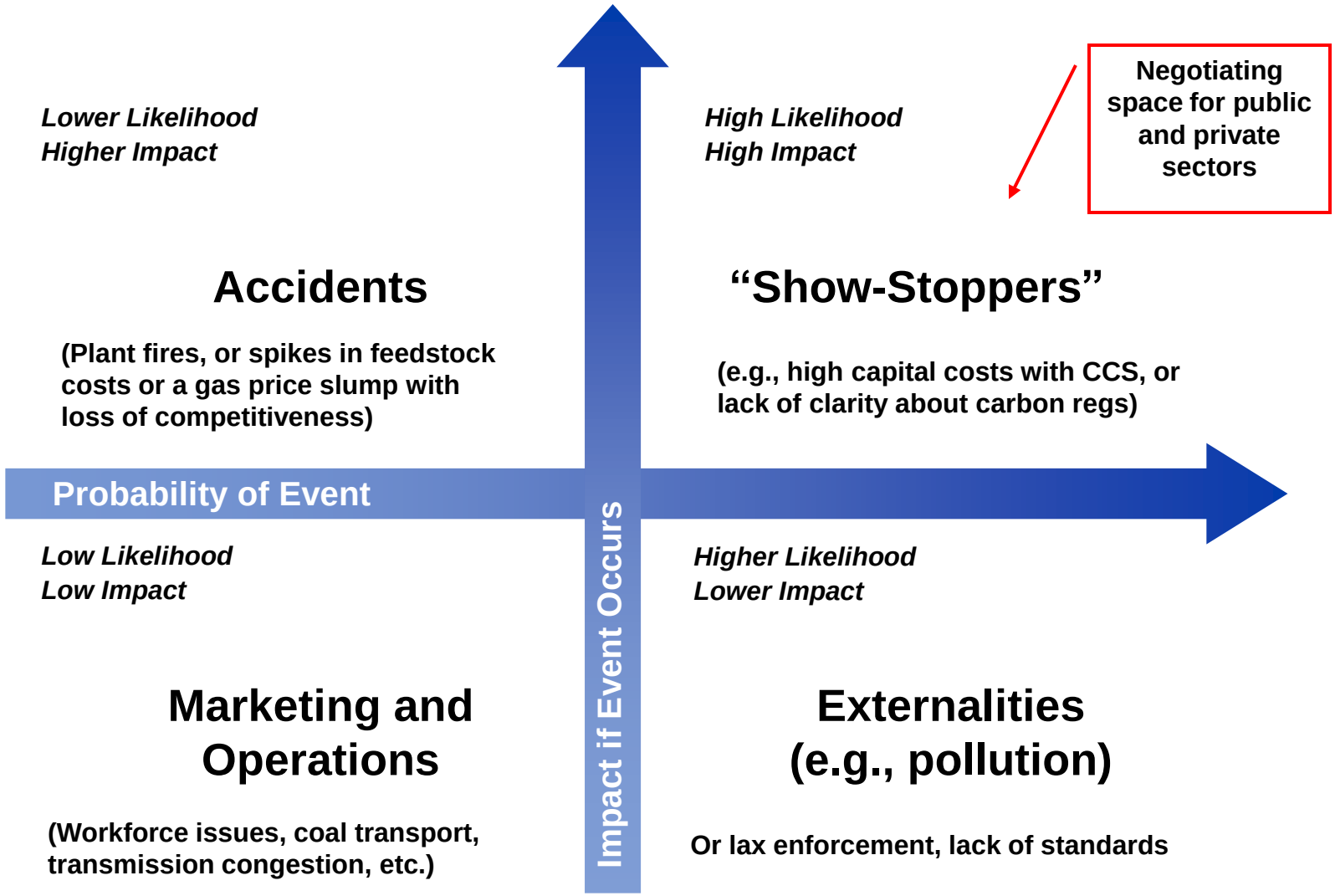
1. **Loans or guarantees:** Under EPAct 2005, DOE offers loan guarantees for first-of-a-kind plants. Improves capital structure by reducing equity and interest rates. Much less costly to federal budget than tax benefits.
2. **Federal off-take contract:** Federal off-take agreement can boost credit standing, provide revenue boost.
3. **State rate regulation:** Conventional rate regulation is preferred by lenders; enhances debt financing.
4. **Dispatch preference:** State could also grant dispatch preference to a baseload unit, but this would not cover technical downtime (repairs) or shutdowns for regulatory compliance issues (e.g., CO2 injection).
5. **CCS liability regime at Federal level:** To address "long-term, indefinite" liability for CO2 leakage, carbon offsets could be purchased, and a liability transfer could be negotiated between plant owners, states, insurers, and federal agencies. <u>No cost subsidy truly addresses indefinite long-term liability</u>.

Risk-based mechanisms may trigger less federal budget impact, covering more projects.

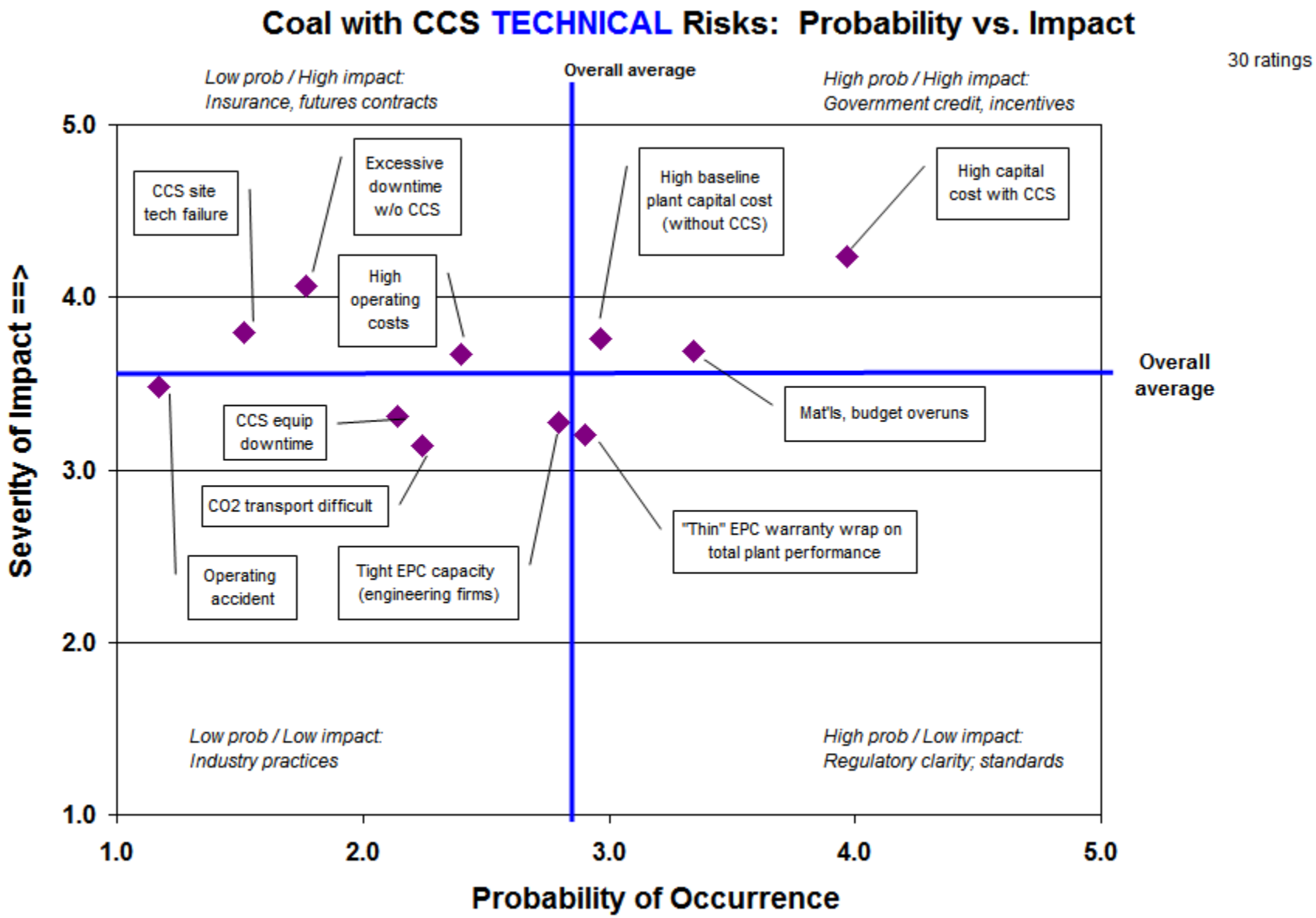
Critical Legislative and Regulatory Efforts Underway

- **EPA UIC Draft Rule for CO2 Injection (released for comment in July)**
- **EPA response to Mass. v. EPA: CO2 regulation under Clean Air Act**
- **Review of rulings after suspension of CAIR and Mercury Rule**
- **New Source Reviews (U.S. EPA)**
- **Carbon emission legislation in 2009-2010 (various proposals)**
- **State carbon emission legislation now (CA, WA, New England…)**
- **Ongoing EOR / EGR permitting (concentrated in Gulf Coast)**
- **Permits for CCS demonstration projects (regional partnerships)**
- **International deliberations on GHG limits which could bear on U.S.**
- **Credit agency reviews of GHG impact of energy investments (S&P, Fitch, Moody's, major banks)**

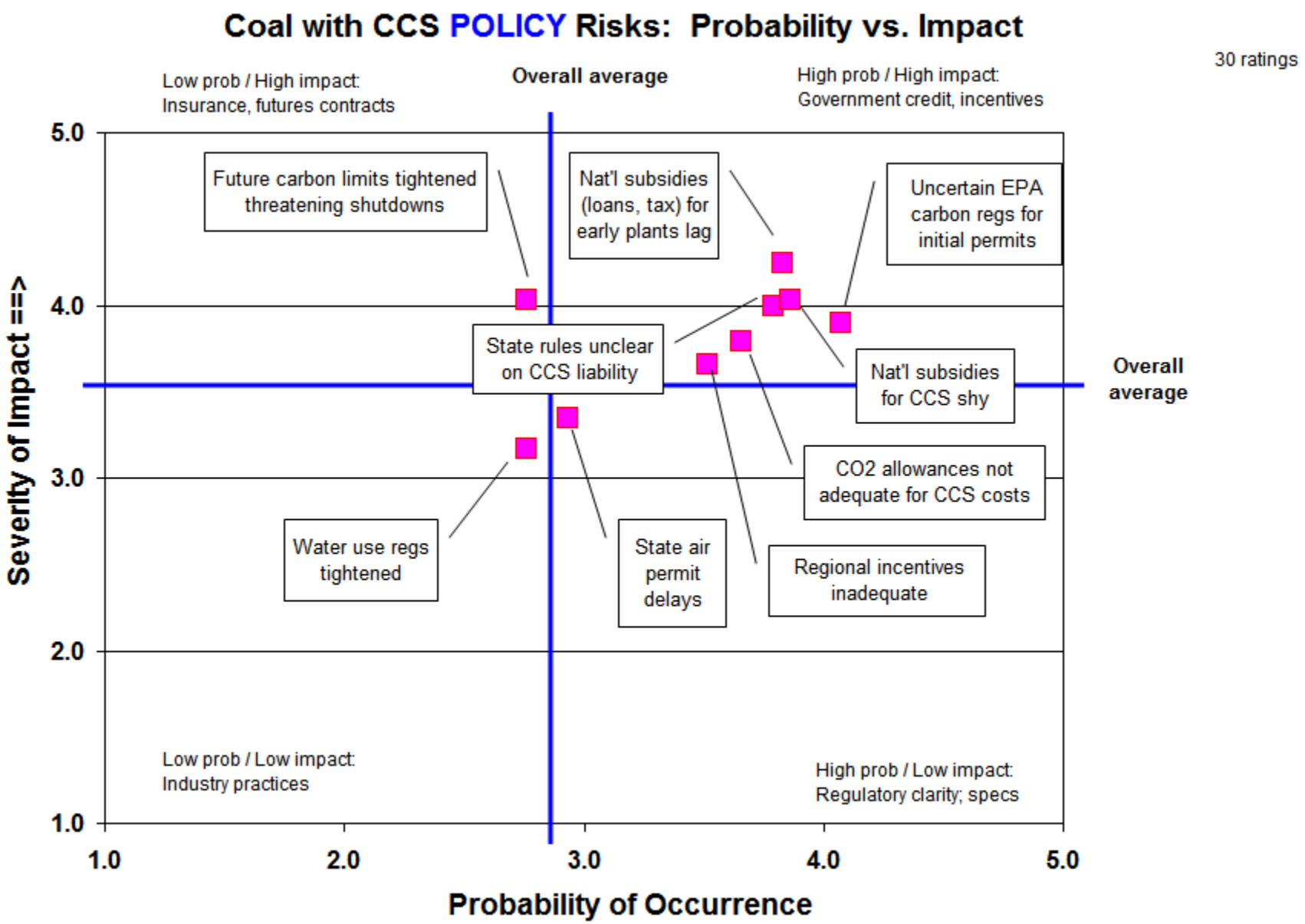
Plot of Risks: Probability vs. Impact Reveals Nature



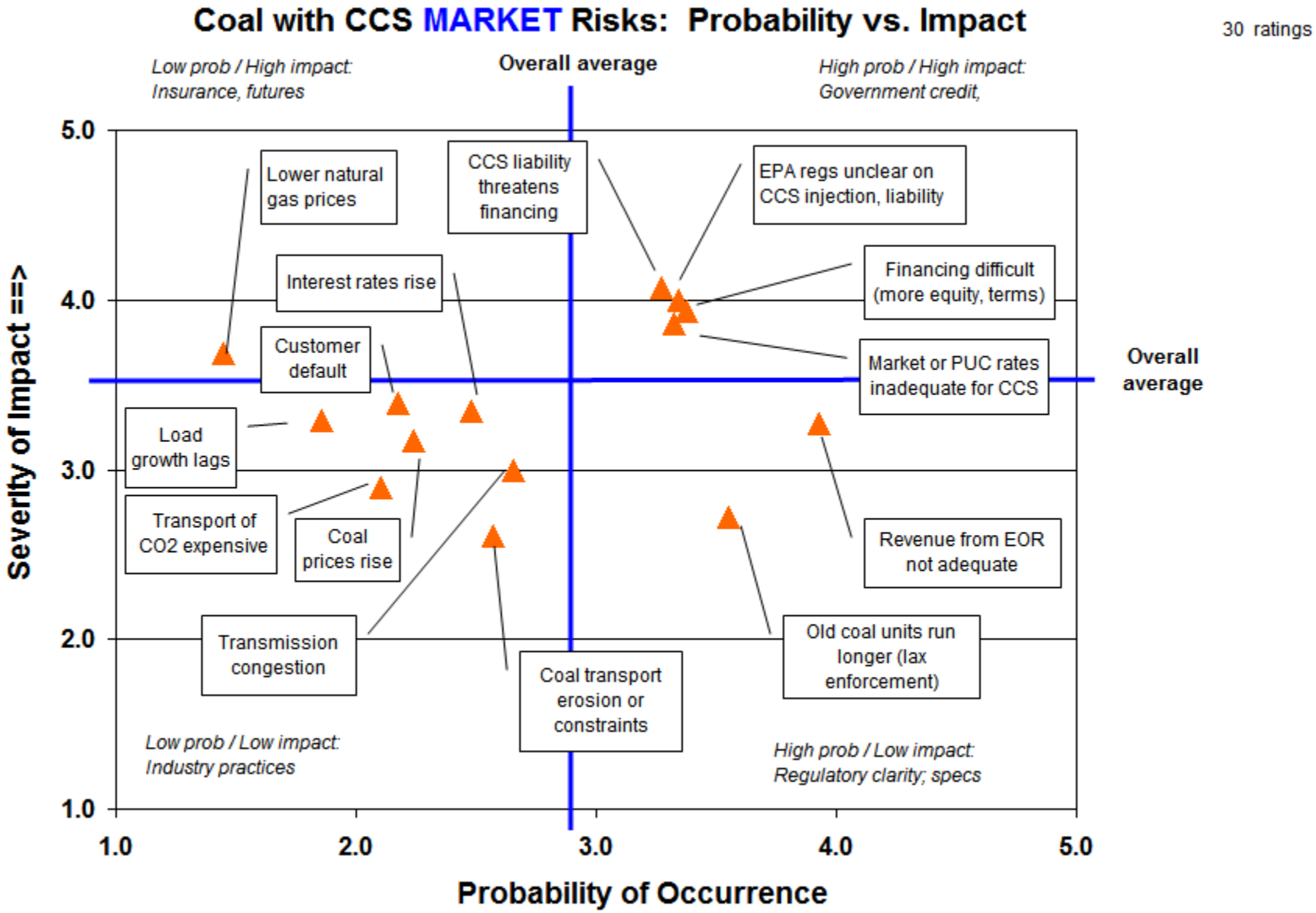
For Deployment of Coal-based Projects with CCS



For Deployment of Coal-based Projects with CCS



For Deployment of Coal-based Projects with CCS



For Deployment of Coal-based Projects with CCS

Risks ➔ Mitigation Approaches ➔ Actions Needed

Q#	Highest Risks	Comment	Outlook / Actions Needed
7	**Capital costs with CCS high**	Capital costs remain a major threat for first units. Engineering backlog is global. Revolving credit could assist "FEED".	DOE LGs and some tax credits are in place. Approp riations and a tax bill are needed for subsidies.
18	**Nat'l subsidies lag on plants**	DOE Loan Guarantees and some tax credits (Sec. 48 ITCs) are in place.	Appropriations, and a tax bill are needed from Congress
13	**Uncertain EPA carbon regs**	Uncertainty about EPA r egs on CCS injection and GHG curbs remain .	EPA UIC draft regs are out for comment . GHG legislation is much farther away.
19	**Nat'l incentives f or CCS lacking**	CCS is not economic; subsidies are essential , especially for first plants .	Demos of CCS must move ahead. DOE regional partnerships are useful.
17	**State regs on CCS not clear**	Sites for CCS will likely span multiple states , requiring cooperation .	"Fossil supply" states will likely take the lead on CCS policy as with EOR.
15	**CO2 allowances don't cover CCS costs**	Uncertainty about CO2 policy breeds a lack of confidence in allowances.	Carbon legislation must spell out allowances for CCS explicitly .
31	**Lack of clarity in EPA regs on CCS hinder finance**	Lenders need clarity on CCS rules. Regulated rates wi th CCS could help.	State rules on CCS would promote financing if long -term, no residual liability .
34	**CCS liability threatens financing**	Lack of resolution for "post -injection" liability on leakage freezes capital.	State rules help, but federal backing long - term would provide more resolution .
28	**Finance difficult (more equity, short tenors)**	Financing difficulties are symptomatic of other risks not being resolved.	State rules on CCS enable progress, and federal backing would help.
33	**EOR revenue inadequate fo r CCS**	With oil above $7 0, EOR is a financial boon, but volumes needed are low.	Federal assistance may be needed for CO2 pipelines and permitting.
16	**Regional support lags on plants**	States need to be engaged with Congress in designing approaches.	Risk-sharing between states and federal agencies is important.
27	**Market/PUC rates low for CCS**	Higher capital costs and economic losses with CCS give PUCs heartburn because of "rate shocks" to consumers.	Higher natural ga s prices keep coal in play; but PUCs need to pass through federal subsidies for CCS.

NETL: U.S. Coal Plant Additions… none with CCS

Current coal-fired projects in development reflect the potential for a surge in growth, but questions exist as to whether this is achievable. The 3,079 MW of new added capacity installed in the last three and a half years (800 MW per year) is only 11% of the 27,218 MW of progressing plants that are proposed to be operational by 2012.

Current Coal-Fired Capacity Projects

Table 1

		Number of Plants			Capacity (MW)		
	General Status	April 2009	June 2009	Net Change	April 2009	June 2009	Net Change
Progressing Projects	Under Construction	27	23	-4	16,054	14,622	-1,432
	Near Construction	6	4	-2	2,562	1,482	-1,080
	Permitted	9	9	0	3,317	3,317	0
	SUB TOTAL	42	36	-6	21,933	19,421	-2,512 (-11%)
Uncertain Potential and Timing	Announced (early stages of development)	44	47	+3	28,637	29,484	847 (+3%)
	TOTAL	86	83	-3	50,570	48,905	-1,665 (-3%)
	Operational this Period	-	4	+4	-	1,442	+1,442
	TOTAL (with Operational)			-4			-526(-1%)