

Session Notes from CCPI Workshop

This document contains summaries from the break-out sessions at the Clean Coal Power Initiative (CCPI) Workshop held on September 28, 2001 in Pittsburgh, Pennsylvania. The purpose of the sessions was to provide stakeholder input that will be considered by the DOE for the planning and implementation of the CCPI. Four break-out sessions were conducted that focused on the following areas: “Technology”, “Markets & Business”, “Regulatory”, and “Management”. A summary of each session followed by detailed discussion is provided in this document.

Technology

What Technologies Should be Addressed in RD&D Programs?

Lawrence A. Ruth, Facilitator

Electric system reliability is a key theme of the National Energy Policy. The CCPI is intended to help ensure reliability by increasing the competitiveness of coal-based power generation. The core R&D program encompasses technology advancements that will increase the reliability, efficiency, environmental performance, and economic competitiveness of coal-fired power generation to ensure this fuel’s continued role in the National energy mix. The purpose of this session is to gain industry’s perspective on important technology issues and portfolio options.

Executive Summary

The “Technology” breakout session was attended by over 50 participants and the session addressed suitable technology areas for the CCPI. The session focused on the four primary topics: (1) Technology Responses to Market Drivers, (2) Infrastructure Improvements, (3) Establishing a Technology Portfolio, and (4) Technology Management. Input from the session included the following:

- Emphasize short-term technology projects.
- In competitive deregulated environment, 50% cost share requirement is expected to drive projects that will be near-term and small scale.
- Suitable role is to advance a technology to a point that would support commercialization.
- Carbon dioxide was recognized as an important but was not seen as dominant within the 10 year CCPI period.
- Infrastructure projects were not seen as suitable role for the CCPI.

Detailed Discussion

This breakout session included a large but highly interactive group of stakeholders. Over two-thirds of the participants made comments to the group during the two-hour discussion period. The discussion was divided into four areas: technology responses to market drivers, infrastructure improvements, establishing a technology portfolio, and technology management. Views expressed were diverse but there were some common themes.

Technology - continued

There appeared to be a predominant view from stakeholders that CCPI should emphasize short-term technology projects; however, stakeholders recognized that long-term projects will also need to be considered. Project risk was a concern. Industry participants expressed the view that deregulation has changed the environment since the Clean Coal Technology program and the 50% cost share requirement is expected to drive projects to be near-term and small. Given the exchanges on project types and risk, a perspective emerged that CCPI projects should advance technologies upon which subsequent private investment would support commercial projects.

Important factors in the success of coal-fired generation in the future included the ability to produce 'cheap' electricity, to have flexible plant designs (e.g. fuel, size, load following), to achieve high reliability/availability, and to address the inaccurate public perception of coal through education. Carbon dioxide was recognized as an important concern that should be part of CCPI but was not seen as a topic that should dominate the 10-year CCPI demonstration program. Key technologies identified were, in general, near-term and reflected existing technology initiatives. Both combustion and gasification plants were of interest. The need to look at projects in the context of an integrated system was frequently cited. Infrastructure concerns should be considered in evaluating projects but funding of infrastructure projects was not seen as part of the CCPI program.

Technology Responses to Market Drivers

The session opened with a discussion of the most important factors necessary for the future success of coal-fired generation. Stakeholder opinion could be summarized in three words: cheap, clean, and flexible. Cheap means both low capital and operating and maintenance (O&M) costs relative to producing electricity by other methods, i.e., natural gas-fired generation. Clean means zero or near-zero emissions, including fugitive emissions. The public perception of coal as "dirty" needs to be changed. Although coal is dirty in the sense that it does contain substances that should not be released into the environment, the process in which the coal is used, and the products which are produced, can be, and must be clean. The trend is for fossil energy resources, including coal and natural gas, to be held to the same standards.

Flexibility was the most often mentioned factor required for coal's success. Coal technology must be flexible with respect to plant performance (e.g., load following) and size (not just central station plants; even small distributed generation applications should not be conceded to gas). Coal must also be flexible in the sense that it can be used to make other products, including a variety of clean "energy carriers." For example, coal-derived clean transportation fuels might replace oil imports in the future. Another possibility is for hydrogen produced from coal to be distributed to fuel cells or turbines located at the electricity consumers, providing a route for coal in distributed generation. Coal technology must be versatile. Co-firing of biomass or "waste" feedstocks can play an important role. Making chemicals, transportation fuels, or hydrogen from coal are other options.

Technology - continued

It was a minor surprise that efficiency was not mentioned as a coal success factor. Reasons given by stakeholders for this omission included the lack of an incentive to increase efficiency (one respondent stated that a one percent availability improvement is more important than a one percent efficiency improvement). Incentives need to be provided for power generators to increase efficiency.

The role of carbon management in CCPI was discussed. The view was expressed that the CCPI should emphasize demonstration projects and not be diluted with R&D projects. Since we already have a sequestration program, CCPI projects should complement work already underway. Several stakeholders expressed the view that we will have “serious” CO₂ constraints in place by 2050; we need to have technology ready by 2020 and we should start development now.

A number of views were expressed regarding timing of demonstrations of CO₂ management technology. Within a five-year time horizon, one view was that only high-efficiency technologies could be demonstrated; large-scale demonstrations of CO₂ capture and sequestration are 10-20 years out, and possibly more than 20 years. However, the view was also expressed that there are some current sites that can accept CO₂ and make for economically feasible projects. We should look for these “best-advantaged” sites where CO₂ can be profitable.

There were a series of comments recommending a focus on gasification as a near-term approach to CO₂ management. However, there was also the view that people should not be pushed to include CO₂ management with gasification and that industry would not fund CO₂ management technology even with the Federal cost share. Finding new uses of CO₂ was mentioned as a possible topic for a project.

Although efficiency was not mentioned as a coal success factor (see above), it was stated that high efficiency is good and that it may be the only option to reduce CO₂ in the near term. Increased efficiency must be balanced against increased installed costs and on a possible decrease in plant reliability and availability. Ways to increase efficiency include better use of waste heat and use of high efficiency prime movers – turbines, fuel cells, and hybrid cycles. Avoidance of risk associated with any new high-efficiency technology was mentioned. Generators and banks are not likely to assume risks associated with new, “out-of-the-box” technologies that increase efficiency. Increasing efficiency by repowering existing plants is likely to be better accepted.

Other issues in the Technology Responses to Market Drivers area, including retrofits and repowering, brownfield/greenfield, reliability, and capacity, were discussed next. A comment was made that the level of funding (i.e., \$150 million in the first year) and anticipated structure of the program (no common theme) would favor small, near-term, retrofit projects. One

Technology - continued

participant suggested that the entire picture needs to be considered, i.e., mining to product, and that “low-hanging fruit,” such as coal preparation, should be addressed first as a potential route to increasing reliability and/or capacity. There were supporters of both gasification and combustion technology among this group of stakeholders.

Infrastructure Improvements

There seemed to be a feeling among stakeholders that infrastructure projects should not be funded through the CCPI. Although there are important infrastructure issues, they are distinct from generation issues. Coal technology should not have to compete with infrastructure improvements for funds. The electricity transmission system was given as an example; electricity from all sources, not just coal, uses transmission lines. Some stakeholders expressed the view that infrastructure issues might be addressed in the proposal evaluation process; perhaps, the offeror should be asked to address how the proposed project relates to infrastructure issues. The view was also expressed that the project developers and the market should determine where a project is located; location should not be included in the evaluation criteria.

Establishing a Technology Portfolio

A list of key technologies that impact coal’s competitiveness was developed. The technologies are given in the list below, in the order they were mentioned.

- co-production
- coal pretreatment- chemical methods to remove trace elements, make “better” feedstock
- oxygen production at low cost, high efficiency
- hot gas cleanup
- fuels cells compatible with coal-based systems
- integrated multi-pollutant control
- combustion technology/NOx reduction in combustion process
- syngas combustion in modern combustion turbines (materials compatibility, emissions)
- integrated plant optimization and control
- integrated sensors and control to support high availability; predictive maintenance
- advanced steam cycles, e.g., ultra-supercritical
- externally fired cycles using gas turbines
- dry, low-NOx gas turbine combustor for syngas
- gasification (lower cost, sulfur removal, NOx control)

There was a suggestion that a small fraction of CCPI funds should be used for high-risk, long-term technology demonstrations. These would be done on a relatively small scale to allow for more projects and to help balance risk.

Technology - continued

Most of the technologies identified reflected ongoing initiatives in the coal R&D program. Both combustion and gasification were mentioned as key technologies. Integration of emission controls and of plant control system components was frequently mentioned as appropriate areas for demonstration.

Performance targets were also discussed. A target of 0.25 lb/million Btu NO_x was mentioned for the combustion system (lower levels than this have already been achieved, at least in pilot-scale tests). Some thought that coal needs to be competitive with gas. Some believed that zero emissions was an appropriate long-range target.

Technology Management

Stakeholders were asked where government and industry should invest. Many expressed the view that projects with the highest chance of success should be selected. Factors that contribute towards success include a known project team with a proven track record and use of low-risk technologies. However, it was also stated that we need to learn something from the projects that are selected. Many held the view that CCPI projects should emphasize near-term technology.

Desirable characteristics of demonstration projects were discussed. Most thought appropriate projects would use technologies that were well beyond the laboratory scale. Some believed the projects would not have to be commercial, but others felt that demo projects should be capable of generating at least enough revenue to pay for O&M costs. A CCPI project was viewed to be the first “reference” plant and would demonstrate viability of the technology. Ideally, the demonstration would be followed by commercial projects. Appropriate projects could also include those that used a slip stream from a plant to demonstrate a key part of a process.

Markets and Business

What Draws Industry to be Involved in Demonstrations?

What Are the Key Factors in Achieving Commercial Success?

Thomas A. Sarkus, Facilitator

This session is designed to gain industry's perspective on structuring the marketing and business aspects of the CCPI. Its objective is to ensure that the CCPI will be shaped in a manner that will encourage industry participation.

Executive Summary

The "Markets & Business" breakout session was attended by approximately 37 participants. The goal for this session was to identify marketing & business barriers that might impact industry participation. The session addressed the following five related topics: 1) risk and incentives, 2) repayment, 3) teaming, 4) financing options for demonstration projects, and 5) industry participation (barriers/opportunities). Input from the session included the following:

- The government financial share should increase with increasing project/technology risks.
- Government cost sharing was viewed as critical component to successful CCPI.
- Although the need for repayment was understood, repayment should not be overemphasized to the detriment of good concepts.
- Teaming was deemed good idea relative to risk sharing; however, teaming requirements should not be overly prescriptive.
- CCPI should consider "split pool" (or dual track) developments for novel and conservative demonstration project proposals and adjust cost-share requirements accordingly.

Detailed Discussion

This session discussed the following five related topics:

- a. Risk and incentives
- b. Repayment
- c. Teaming
- d. Financing options for demonstration projects
- e. Industry participation (barriers/opportunities)

The breakout session began by brief introduction and background on the topic by the facilitator and was followed by having the participants identify themselves, and their organizations. There were total of 37 people participating in the Markets and Business breakout session. The makeup of this group was 26 from industry (70%), 3 from academia (7%), and 8 from government agencies -- state and federal (13%). A list of participants is provided at the end of this report. While several DOE representatives attended this breakout session, they were observers with one exception (the facilitator). This report summarizes the comments and reflects the perspectives of the industry participants who engaged in a lively, spirited discussion.

Markets and Business - continued

Key Issues

While this breakout session focused on markets and business, education of the public on the attributes of coal and clean coal technologies was one of the first key issues identified. It was stated that absent public awareness and a positive public perception, little or nothing will get done and details such as program structure may become irrelevant. It was even posited that repayment funds could be channeled back into public perception activities as well as CCPI and RD&D.

Financing is another key topic. Several comments referred to consideration of split-or dual-track solicitations, and also to funding higher risk projects at a higher percentage of government cost sharing. Along this same line of reasoning, it was suggested that higher risk projects should carry less onerous repayment provisions (or even no repayment requirement at all). Separate funding of Phase zero (project definition) versus funding it together with Phase 1 (design), Phase 2 (construction), and Phase 3 (operations) received comments both pro and con.

Flexible funding mechanisms received a fair amount of discussion, although there did not appear to be an overwhelming consensus on any one route or technique. Risk pools, insurance, and DOE power purchase price guarantees all received mention, as did the need for some small (e.g., 5% to 10%) level of DOE financial assistance for getting post-demonstration commercial projects over the last hurdles to commercialization, again perhaps as a set-aside funding source.

Risk and Incentives

This topic involved discussions on a) types of risks (technology, project, regulatory, economics), b) risk management tools (investment and production tax credits, accelerated depreciation, cost sharing, loan guarantees), and c) government role (risk minimization). There was consensus that project risks and government support should go hand in hand. Higher project/technology risks call for a higher percentage of financial support [by the government]. The idea behind this was that government should take more of the [financial] burden for high risk projects than the lower risk projects. Other words, one way to reduce risk is appropriate cost sharing. An example with high political and economic risk could be projects that involved CO₂ removal and carbon sequestration.

Other types of risks were also discussed:

- Market dispatch (new deregulated environment).
- Public perception (need to educate public/need to sell new ideas - - if coal is dirty; there will not be any public support resulting to higher risks).
- Hedgeable risks (e.g., fuel risks by buying longer contracts, SO₂ and NO_x emission allowances, and even technology risks by getting grants). Non-hedgeable risk (e.g., availability, and CO₂).

The government role was emphasized as "risk minimization" by conducting and supporting high risks RD&D projects. It was noted that most utilities and related power energy companies could no longer afford R&D departments.

Markets and Business - continued

Discussions on the supplier vs. utility risk and rewards were carried out. Uncertainty still exists between utilities and equipment manufacturers. Utility representatives were concerned that historically utilities have assumed the biggest risk, but suppliers have received the rewards. Utilities are willing to do demonstration, but rewards should include at least the same rate of returns (ROR) as the lowest cost technology. Utilities are "players" as long as a ROR similar to the lowest cost technology is provided.

Additional comments on high risk projects included plants with sequestration: introduction of CO₂ sequestration in a 10 year program is confusing as the cost of sequestration is still very high, and no technology is/will be ready for demonstration and widespread deployment.

DOE should write the RFP for a flexible risk/reward level.

Per request from the facilitator, the following bullets [UNEDITED] list the comments provided by the participants regarding risks and incentives:

- I strongly believe the Government's optimum role with regard to risk is direct subsidy of the facility capital cost and also, possibly, the cost of the 2-3 year demo period. The evaluation and pricing of technology on project completion risk is always best placed in the hands of the party best able to do that-e.g., technology suppliers or ERC
- Do we need evolutionary or revolutionary technology advancements in order to meet U.S. Energy security goals of 2020? This answer dictates the necessary risk level.
- Supplier commercialization risk with little upside is a problem. I.e., no return on development project and future market still very competitive.
- Long term: Economic viability of the alternative coal technology
- Sufficient demonstration and niche application of the technology to build industry's confidence
- Reducing risk of first units, not just R&D, especially for such large coal systems. More leverage may be available via properly structured risk pools (stricter criteria). Otherwise, 50% becomes a floor vs. a ceiling on co-funding.
- Government needs mechanism for differentiating risk and thus percent of government contribution
- Longer term project (without near term return) don't make cut when industry declines where to spend development dollars
- Public perception of clean coal technology
- Intellectual property position to technology developed under a cost shared project
- Marketing to the Public: If the coal and electric utility industry do not market this beyond the business. As usual coal-fired power plant scenario the technology will not be broadly used (and that is the national goal)
- Rapid deployment of clean coal technology now! (else gas wins)
- Insure approved clean coal technology
- Use insurance industry underwriting and actuarial techniques.
- 100 Million coverage on 4 projects covered by a 100 Million DOE deposit vs. 4x100M=400M capex

Markets and Business - continued

- Projects that are near commercialization and need just a small subsidy are everybody else's projects. Projects that needed the most funding are mine
- Percentage of support should be proportional to risk. High Risk = High Percentage Support
- Need to be able to budget contingency funding and in order to manage funding, need opportunity to take contingency as profit for success
- Repayment has the potential of just reducing the level of subsidy to the project that by definition (i.e., first of a kind) needs support to go forward
- Equipment supplies need better incentives – no ability to make profit (waived fee), but much of the technical risk
- The project cannot get financing with a new technology. Equity financing difficult unless proven market for future projects. If the technology has a new competitive future how is the risk hedged
- U.S. model is tough - Deregulated market, high financial returns needed, complexity/permitting. U.S DOE need to help overcome these parameters as compared to international industry where better terms and subsidies exist.
- This risk may be overstated. It will work to some level of design redundancy. Back-up modes are typical
- Analyze the risk against no understating the project. Without the CPICOR project Geneva will go out of business because of coke decline and transportation costs of out of state raw materials.
- Technology Supplier Risk: Technology supplier is asked to supply guarantees on development technology. How do we initiate this need or risk?

Repayment

This topic involved discussions on a) repayment on demonstration projects vs. replications/deployments, b) repayment forgiveness - for success and failures, c) basis and methods of repayment, and d) repayment reporting to DOE. Discussions took place on all varieties of repayments - - from no repayment (forgiveness) to full repayment based on the success/failure of each individual project. Repayment was deemed to be politically necessary and the process was referred to as competitive process. Overall, repayment was seemed easier under the old "regulated" utility industry, and industry will no longer take any risks.

The idea of "risk pools" was discussed -- some from industry felt that project contingencies are more practical, and that there should be room for project participants to come back to DOE for more funding request. Others disagreed and mentioned that companies will always manage to complete the projects and there was no need for providing additional funding, except under the most extraordinary circumstances.

There was a notion that responses will be based on the solicitation, and it is the DOE's responsibility to establish a baseline for repayment and clearly define "repayment" based on project types. For example, for an IGCC demonstration (high cost, high risk, etc.) repayment may not be practical, while for developing a mercury control technology, repayment may be practical.

Markets and Business - continued

One way for repayment might be a royalty on sales, assuming technology is successful.

Government should not get any repayment - - it's role is to support RD&D. That is the only way to reach new goals. There are always the “less tangibles” such as benefits to the communities (cleaner air, jobs, etc.). DOE should work to define and quantify these better.

Per request from the facilitator, the following bullets [UNEDITED] list the comments provided by the participants regarding repayment:

- If there is no intellectual property or protection in the project then repayment is not appropriate.
- I don't understand why people complain about repayment on a successful technology. The Feds are investors. They should be a payback – ROI! The industry looks at a project for ROI, why can't government!!
- Higher percentage cost sharing, lower/no repayment (i.e., >60% cost share no repayment)
- Some provision for repayment is politically necessary
- The payback minimum requirement should be small so as not to stifle the development of the business
- Consortia proposing to the CCPI solicitation need to decide how to distribute the repayment proposal amongst them.
- What are good incentives to vendors to undertake CCT Project despite the risks? need to identify rewards better
- DOE hedge host's risks with a power call or more generally use government purchased derivatives to hedge industry risks
- Must have flexible repayment terms for a commercially reasonable portion of revenue stream.
- Need to address criticism of “corporate welfare” or NO ONE will have ANY funds because there won't be coal programs provided by Congress
- CCPI Program must provide the funds to hedge the risks which are perceived by a power plant developer to: a) not be able to be hedged because it is a new technology, b) would have significant impact on the return on investment
- Consider “Prepayment” like an insurance premium to provide a revolving fund for back end lack of performance. The government has more risk management tools than it thinks: Fuel from federal lands, treasury bonds, etc.
- 5% of Tech license is good. delete ½ % of equipment - - too complicated and too many parties involved
- DOE is free to negotiate more on individual project bases but is best to stay with 5% only.
- Repayment onto progressive users of equipment license fee, royalties, training fees, trials - why impact the host who has undertaken the risk
- Repayment & Incentives: a) Other performance factors, b) Water use minimization, c) By product utilization, d) Better than required air quality, credits, and e) Waste consumption (i.e., coal tailing)

Markets and Business - continued

Teaming

This topic involved discussions on a) single vs. multiple corporate project sponsors, b) government selection criteria/requirements, c) role and commitment of host site, d) implications on repayment, and e) intellectual property and patent rights. There seemed to be an overwhelming consensus that teaming is a "good idea," - - teaming shares risks. It was noted that companies must look outside their expertise for cross-fertilization for a winning proposal. However, it was emphasized that DOE should not prescribe/impose any teaming criteria. Companies know very well who they can/should team up with for a successful bid.

Per request from the facilitator, the following bullets [UNEDITED] list the comments provided by the participants regarding teaming:

- Look for commitment, financial, drivers cross fertilization of ideas, understanding of partners position
- Teaming is good & should be encouraged
- Teaming: Share risk/rewards/cost
- Members cannot have competing interest or roles: Technology, Demonstration, Commercial
- The best team is the one that best covers the needs of the proposed project in the most efficient & economical way
- Every good team needs a strong quarterback who has the support of the team members
- Proposals should be selected on merit, not who's who list.
- It could be possible for a small group to make a good proposal.
- Teams are good but not all the time.
- Need to identify propose of demos:
Response to meeting Legislative mandates-C.S. is appropriate. Company makes money by meeting market e.g., SO_x Stds
If national good, e.g., see about developing CO₂ technologies, no market, government pays

Financing

This topic involved discussions on a) cost-sharing percentages (typically 50% government share for demos), b) government guarantee (yearly vs. advanced appropriations), c) contribution type (in-kind, cash, etc.), and d) other (tiered cost-sharing based on novelty of demonstration). Discussions were focused on the level of cost sharing. One notion was that CCPI solicitations should modeled after the "split pool" solicitation (or dual track) to improve quality and have a clear way for supporting different proposals, carrying varying levels of risk. For example, novel and conservative proposals will get above 50% and below 50% cost sharing respectively - - revolutionary vs. evolutionary projects. DOE could then go for the best high-risk projects as well as the best high probability project. Other ideas/suggestions included tiered cost sharing along with a base program.

Markets and Business - continued

Representatives from small companies suggested that the CCPI demonstration program should include a "Phase Zero" -- proposals of \$100,000 or so, in order for small companies to be involved. In the same line of ideas, it was suggested that a committee should be put together to conduct feasibility studies and review the initial program.

Also, a thought from industry was offered to set aside funds (~\$10 million) for projects that are near commercialization. The idea is that in many occasions, companies need that one last lift before commercialization and this will be an excellent program to help them get over the last hurdle(s).

Per request from the facilitator, the following bullets [UNEDITED] list the comments provided by the participants regarding financing options for demonstration projects:

- Tiered cost sharing based on novelty
- Separate tracks for high risk
- On large projects (for CCPI) recommend not doing in distinct, separate phases. The challenge with separate phases is dealing with the timing and cycle of the government funding weakening (i.e., avoiding gaps in the how of the project)
- Must have enough funding for intended goal!
 - New Plant tech – 50% cost share: 200-250 M\$
 - Retrofit tech (HIPPS, etc.) – 100-150 M\$
 - Small Add-on (scrubbers, etc.) – 25-50 M\$
- Funding should be allocated to the fundamental phases of tech development
 - Feasibility and conceptual studies
 - Fundamental research
 - Host demonstration
- Provide for discretionary funding on demonstrating promising new technologies, which, if below a certain threshold, could be DOE funded at substantially higher percentages. Particularly for smaller companies who would be more aggressive in pursuing revolutionary technology, but have limited resources.
- Board terms are good (i.e., broader project goals), e.g., a) by-product utilization b) Total use of heat produces (~100% overall efficiency), c) Use of wastes as fuels = job creation
- Funding some phase 0's is important for building pipeline of better proposals- -\$50K - \$100K competitively bid with hosts involved in selection. 0.2% of \$2B could yield better bids

Industry participation/CCPI key issues

There was no time left for any detailed discussions on industry participation (barriers and opportunities to maximize industry involvement) and key issues, beyond those overlapping points mentioned under the previous discussion topics, but it was suggested for participants to provide written comments.

Per request from the facilitator, the following bullets [UNEDITED] list the comments provided by the participants regarding industry participation/CCPI key issues;

Markets and Business - continued

- We must have DOE support to finance and build clean coal technology (IGCC) projects
- Do not need to use President Bush's funding to invent new technology. Need broad implementation of what we have now
- Don't let gas win the race – ACT NOW!
- Idea – line up hosts before solicitations put on sheet
- Don't rob R&D or financial incentives to pay for CCPI
- Talk with other branches of government that are in the equation: BCM on coal sales, treasure on repayments and debt financing costs. Think beyond just DOE!
- It would help the program with regard to what is delivered for the taxpayer money if the solicitation has some flexibility for pet coke use (vs. only coal) if the technology demonstrated is fully applicable to coal. Doing this can reduce the federal incentive needed to motivate a project.
- To maximize industry participation there needs to be more time to respond to solicitations than the recent Power Plant Improvement Solicitations.
- Provide ways to help teaming from in areas of high impact
- Government off-take agreements at a minimum floor price(s) for co-production projects
- Need to clarify objectives regarding retrofits to existing plants vs. repowering vs. greenfield plants. This would help bidder to determine if effort to bid is prudent
- Recognition that the business model for the generation business is significantly different from previous demonstration programs - Will require a new model, new incentives
- Industry participation barriers: Uncertainty of deregulation b) Competitive profit focused mind set of merchant generation, c) Low cost gas alternative to coal gas
- SBIR problem: Statements to encourage “integrated” projects, especially including small business roles
- Commercial burners: a) For demo projects commercial as well as technical hurdles must be overcome, b) Need more focus on basic research to reduce technical hurdle from demo projects

Regulatory

How do Regulations Drive and Constrain RD&D and Deployments?

Thomas J. Feeley, Facilitator

Statutory structure, regulatory interpretation, implementing policy, and agency cultures define the regulatory climate that impacts technology development and deployment. These factors can directly or indirectly support or undermine this process. Reducing the cost of meeting environmental regulations is a primary driver in new technology development. Unstable regulatory environments and prescriptive statutes and regulations tend to restrict investment in technology development/deployment aspects of the CCPI.

Executive Summary

Approximately 20 participants attended the "Regulatory" breakout session. The purpose of this session was to solicit stakeholder perspectives on how regulations drive and/or constrain RD&D and deployment of new technologies. An underlying theme was the impact on corporate decisions from regulatory uncertainty. Input from the session included the following:

- Expressed concern about future environmental uncertainty and safe harbor issues.
- Expressed concern about unpredictability of New Source Performance Review as applied to potential CCPI projects.
- Financial risk from participants is critical due to utilities operating in deregulated and "soon-to-be deregulated" environments.
- Conversely, CO₂ related to global climate change was considered a potential driver for CCPI participation.

Detailed Discussion

Factors that can directly or indirectly affect technology development and deployment, such as statutory structure, regulatory interpretation, policy implementation, and agency cultures were to be addressed. A broad group discussion covering topics such as public needs and benefits, regulatory constraints, control technologies, by-product management, water usage, emissions trading, stability and certainty, and priorities and key issues for CCPI was recommended by the facilitator. Throughout this broad discussion, the facilitator continually refocused the working group on matters pertinent to the CCPI Program.

Several important conclusions relative to the CCPI were reached. A summary of the comments and insight provided by the group and general consensus follows.

Regulatory Uncertainty and Permitting Issues

Unstable regulatory environments and prescriptive statutes and regulations will tend to restrict investment in CCPI technology development/deployment. Regulatory uncertainty is a disincentive for technology development, in general, and in particular for CCPI participation, since there would be no guarantee that the developing technologies would prove to be adequate. Also, funding mechanisms require a more certain market. Certainty creates investment. A

Regulatory - continued

boom/bust cycle for technology development can be created when regulators do not provide clear direction to industry.

In general, phased in regulatory programs allow better technology development because there is greater incentive for progressive and innovative R&D. However, new technology developments and deployments can cause regulatory agencies a problem because they are not sure how to permit them.

Fuels changes, such as cofiring and use of opportunity fuels, also tends to complicate the permitting process since it may open up the permit and new modeling may be required. Community health questions can also become potential issues. Emissions regulations should be commensurate with fuel types (coal should not have to look like natural gas). Coal combustion systems are forced into a level of performance that requires large expenditures, increasing the risk. This is a barrier to investment. Therefore, industry should be able to choose the best technology for the fuel.

In general, regulations that are too prescriptive force the use of one technology, whereas, emissions trading introduces a whole raft of new technologies.

New Source Review Issues

The NSR program is very arcane and regulatory agencies interpret it differently. Although CCPI may increase power plant efficiency and even lower emissions, the threat of triggering New Source Review (NSR) will inhibit utility involvement in the CCPI. In general, NSR issues are preventing industry from realizing efficiency gains. If there is any possibility that NSR will be triggered by a CCPI Demonstration, especially if large amounts of money are invested, the Program may be unsuccessful because utilities will not take the risk. Any uncertainty will cause a "no go" decision.

An incentive that would enhance participation in CCPI, such as less cost share for industry, would help. The real driver for participation would be to establish an NSR exemption for those that participate. This exemption will be necessary to encourage industry to get involved. If the CCPI Program developed technologies that achieved very low emissions, however, NSR might be achieved anyway.

The U.S.EPA's Three Pollutant Control Program (3P)

This program may provide industry with some regulatory stability and certainty and give relief from NSR requirements in some cases. It may also prove to be a regulatory fix for NSR. MACT rule deadlines could be nullified under the 3p program.

The 3P proposal provides a stronger incentive for industry to be involved in CCPI. However, a lot of uncertainty exists in the mercury aspects of the program. Further, 3P emission caps are too tight, so it will be difficult to participate in a cap and trade program (there won't be anything to trade). This could cause many older plants to shut down. The 3P program would function best if

Regulatory - continued

it were phased in over a decade or so to allow time for innovative technologies to be developed and deployed.

Deregulation Issues

There was a perception that the CCPI would be most applicable and advantageous to existing assets. Deregulation issues predominately affect new electrical generating plants. Therefore, participation and interest in CCPI would be lessened and the Program won't be as effective. The level of risk from deregulation may inhibit investment in CCPI. Further, if CCPI develops too slowly, say five to six years, the market will change too drastically for the technologies to be relevant once the program is completed.

Regulatory Agency Involvement

Reducing the cost of meeting environmental regulations is a primary driver in new technology development. Therefore, regulators should be at the table with industry to negotiate the most appropriate ways to ensure timely and applicable technology development, especially with regards to CCPI. No regulators were present at this meeting but should have been involved.

DOE should be more involved with the regulators, providing a greater degree of guidance on rule development. One way would be for DOE to interact with the Environmental Council of the States (ECOS) regarding CCPI to solicit state agency input on approaches to the Program. Greater involvement with EPA would also be advantageous.

CO₂ Issues

CO₂ issues may prevent industry from participating in CCPI unless reduced CO₂ emissions are achieved through implementation of the CCPI Program. If CO₂ were not a part of CCPI, some industries would not get involved.

A cap and trade program should be an essential part of any regulatory program to reduce emissions. However, a cap on CO₂ that is too tight will keep industry from growing. If environmental regulations for CO₂ were more certain, it would provide a planning basis for industry to achieve anticipated regulations.

Combustion By-products and Multimedia Issues

CCPI should look at multimedia issues such as by-product collection and analyses, water issues, and calculate mass balances for all constituents. Multi-pollutant reductions are an issue and a good measure of overall environmental performance. Unexpected waste streams and potential enrichment in byproducts and waste streams should be considered.

DOE could play a role in third party verification of data collection and analyses. Groups such as ASTM that standardize methodologies could also be used. This approach would bring more validity to data collection and sampling /analyses methods that are developed in CCPI. Water use and conservation should also be studied, since this is becoming a broader geographic issue.

Regulatory - continued

Mercury Issues

CCPI would provide an opportunity for those participating to determine the impacts of Hg. For example, Hg enrichment in by-products, disposal options for the enriched waste, and the fate of Hg in air emissions would be advantageous to study.

Management

What Management Structure will Maximize Benefits to Nation?

Michael L. Eastman, Facilitator

This session focuses on the options for creating an effective management structure for the CCPI. Specifically, this session should discuss the options and opportunities for industry and stakeholder involvement in the conceptual planning and conduct of the CCPI.

Executive Summary

Approximately 20 participants attended the "Management" breakout session. The purpose of the session was to define and discuss issues for creating an effective management structure for the CCPI. The session focused on both the planning and implementation aspects of the program. Specifically, two major topic areas were discussed: (1) Industry & Association Involvement in Guideline Development, and (2) Program Implementation & Management Approaches. Outcomes from the session included the following.

- DOE should develop a definitive mission and set of objectives for CCPI that encompass near, mid, and long range program elements.
- CCPI should have flexibility to address R&D, and deployment issues in addition to demonstrations.
- DOE should lead the program development and include ample opportunity for external stakeholder concerns/input such as the CCPI workshop.
- Stakeholders should provide input to the timing and content of each solicitation in order to maximize their participation.
- External stakeholders expressed concern to avoid conflict of interests to ensure fair, open competition.
- DOE should manage CCPI including all aspects of proposal to awards activities.

Detailed Discussion

There were three major issues that evolved from the discussion of the planning phase for developing the CCPI program. The external members of this group clearly and nearly unanimously recommended that DOE develop a definitive mission and set of objectives for CCPI that encompassed near-, mid-, and long-range program elements. This would permit industry to assess where they could best fit and what types of projects they would be interested in developing under the CCPI umbrella. It was stated that many participants might not be willing to invest their money in a general unfocused program.

It was also recommended that the program encompass the three major development areas including R&D, demonstrations and deployment. They recommended an integrated model that could allow focus on any phase or a multitude of phases as a research activity progresses in time. Implicit in this, is an understanding and mitigation of technology risk along the "continuum" of energy technology development.

Management - continued

The third key planning issue was that DOE should lead the program development but that the external stakeholders should be significantly involved with DOE to develop missions goals, and program elements up to the point of developing solicitations. The consensus was that industry support and participation in the CCPI program would be greater with their participation.

For the Implementation Phase, two major points were identified.

Solicitations

Stakeholders should provide input to the timing and content of the solicitation in such a way that bidders could respond. External stakeholders, however, are concerned about conflicts of interest for their participation in the implementation phase. Their recommendation was to include limited stakeholder participation by those entities that would not directly participate in the R&D, demonstrations or deployment of technologies.

Program Implementation

DOE should manage the implementation phase including proposal preparation and selection of awards. A process for DOE performance evaluation internally and externally should be instituted to evaluate the success of the implementation phase including the solicitations, selections and conduct/results of projects. This process should not only evaluate success but also provide performance improvement guidance.

The following sections of this report is a record of the inputs provided during the Group discussions organized as they occurred, Brainstorming of Topics, Program Planning and Program Implementation;

Brainstorming Results

Topics:

Environmental Involvement	planning
Consortia Management Role (programmatic, planning, Implementation)	planning
Partnerships/Industries of Future model Advisory Group	planning
Program Budget Strategy – mechanism for multi-year budget	planning
Solicitation content and process issues	implement.
Timing of proposals-when in the cycle for submitting	implement
Reorganization of Government Management Process	planning
Role of commercial end user	planning
Non-government Involvement & Conflict of Interest	planning

Planning guides:

Roles of organizations	
Consortium	Partnerships
Trade Organizations	Federal Advisory committee

Management - continued

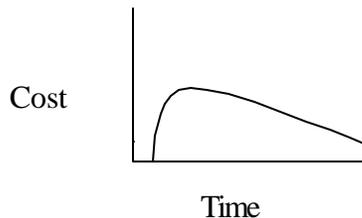
State	Environmental
Budget Strategy	
Reorganization of Government	
Conflict of Interest	
Statutory/regulatory constraints	
CCPI Mission	
Implementation Guides:	
Timing of proposals	
Solicitation content	
Role of stakeholder	

Planning Discussion

- Near-mid-long range goals of CCPI; reference CURC roadmap
- CCPI emphasis should be on the short term (i.e. 5 years or less)
- Put more money out sooner rather than later to have more impact on near-term and long-lead items
- Takes 5 years to get substantive (large-scale) projects together (refers to need for Program Plan and proposal preparation time)
- Address CCPI mission first and then derive near, mid, long term goals; then industry can provide response to what the solicitation should address.
- Want to get money ASAP to spend on highest value projects
- Front-end load gets bigger payoff on projects
- DOE wants input on the range of scope - demos only? R&D to be included? [Discussion focused on demonstration phase].
- Feedback sought on the three-part structure: R&D, CCPI (demo), Incentives
- Ask industry what is wanted → drives program
- Program mission: How to structure program to expand coal use in U.S.; what are the barriers and how do we overcome them?
- Mitigation of the risk on coal technologies for industry is needed in order to get these technologies on line → more near-term deployment reduces risk
- Financiers want to know someone will backup the technology before involvement: Must be comfortable with the technology
- E.g., for IGCC we have 2 US demos (Wabash & Teco). Both have technical and financial risk. Two demos do not prove that coal-based gasification is commercial; may need multiple demos
- R & D may be required to support demo
- Financial community - on IGCC - not an issue of technical readiness, it is a question of competitiveness (financial readiness) and economics
- Question to group: How should environmental organizations be included in the planning?
- Responses: Public hearing(s) (series) as part of the process, outreach suggested to environmental community and suggest follow-up stakeholder meetings
- Environmental regulatory certainty needed before industry can know what technologies to invest in. Perhaps need to have closer relationship on the legislative level.

Management - continued

- CCPI should include R&D: Regarding how to structure this program - need strong industry influence - customer feed back and participation. Question is on how to do this.
- One utility has no interest in investment in CO₂ work; Is driven by business decisions. Another major utility agreed with low interest in CO₂.
- When the response to solicitations comes in, doesn't this tell us what the investment area of interest is?
- Response: No. Government sets a criteria – suggestion made to keep these criteria broad
- One way to handle the changes (in market, regulatory, policy) is via phases or rounds of solicitations on the changing emphasis and ground rules
- CURC has commented extensively to DOE via CURC Roadmap putting R&D and demos into perspective (short and long term)
- FE has to consider many roadmaps (or a series of roadmaps)
- Suggestion made : - Maybe look at program from HR-4 – performance oriented
- Should CCPI have a “process” approach or a menu approach (portfolio)
- Discuss what is the scope of R&D – define it. Some sort of R&D may be needed for commercialization (different from R&D for developing the technology)
- Can technology be assigned a learning curve going from R&D→Commercial over time



- Consortia approach to define program direction not implementation - can find areas on which industry agrees
 - But consortia may not fully reflect what the market needs and wants
- Industry decision making process/criteria on a project includes: financial criteria, site location, business structure of project
- DOE should be decision-maker on the program but should listen to external consortia.
- Program should be industry driven in planning process
- Have series of public meetings to get inputs
- Recommend developing a planning process (e.g., external advisory panel involvement in planning process but not in the proposal part) Include market research, preliminary plan.
- Suggestion made to look at DARPA approach – R&D → Weapons system. Also Governors Conference may be a vehicle to gather info from states and involvement of all stakeholders.
- Observation made that we have a highly fragmented stakeholder group with different interests. We may not be able satisfy all these diverse interests. DOE may have to come out with a strong statement of expected outcomes and see what comes back from industry.
- Try grouping stakeholders and target solicitation towards these stakeholders (policy oriented)
- Advisory group should address areas of common interests and drivers. Conflict of interest from stakeholders in planning – find a way that it will not to be a major issue?

Management - continued

- Real challenge for someone to be part of selection process and not be in conflict. What material issues exist? Competitive intelligence in the exchange of information
- Suggestion made: Reorganizing government at top level. Need to decouple energy policy from politics → via an Energy Commission → People appointed for life to establish long term energy policy

Implementation Discussion

- Issue: Central planning vs. free market - tight scope vs. wide open program (depends on legislation)
- DOE needs to define mission first - Define the goals and what year in which to achieve them.
- Should have a Multiyear CCPI
- Observation made that Program Plan will come too late to support the first solicitation
- Overall objective should be to have a broad plan
- Frame the 1st solicitation in context of a long term plan
- Use what has been done in way of roadmaps (CURC, EPRI, etc.) and Three-pollutant criteria as guides
- DOE needs to remain in selection role and disbursements of money
- Solicitation can't get around the Conflict of Interest if use consortia **DO NOT USE CONSORTIA IN THIS RESPECT**
- Use consortia (partnerships/teams) in bidding specific projects and suggest types of team participants.
- Cost-sharing and cost participation should involve end users (% of cost-share to be born by the end user)
- Not everyone believes that technology projects benefit the end-user vs. the developer/vendor
- Involvement of NGO's - Advisory Councils and Consortia?
- **STAY AWAY FROM FACAAA!!!** Enlist public comments from stakeholders via series of public meetings
- Some participants voiced opinion that they like the traditional Federal role in the solicitation and implementation process.
- Is there value in a "high"-level consortia? - Umbrella group to engage in the planning? Or maybe to start it?
- Downstream of planning process, DOE should be more prominent. High-level Consortia can provide recommendations for the solicitation. But it should be an open process for public review.
- Have a formal body (made up of stakeholders) to review and appraise DOE's program performance and performance of the projects. Have it be ongoing and continuing process. Use external stakeholders to do an independent review plus DOE should conduct a self-appraisal.
- Reiterated DARPA approach to review (Army Research Lab)
- Also look at NIST review process.
- State the Mission in CCPI in context of near, mid, long range goals and ideas that need to be defined

Management - continued

- The current R&D → demo, → deployment incentives, integrated model as presented by Bajura, in the morning session of the September 28 meeting, is acceptable
- Tech risk management curves in time frames and money moving forward should be continuously worked on
- Broad external stakeholder involvement (before solicitation) in Planning (to refine model, buy-in) should continue

******* End of Document *******