HARVARD UNIVERSITY

JOHN F. KENNEDY SCHOOL OF GOVERNMENT

Environment and Natural Resources Program
Rapporteur's Report

Workshop on
Integrated Gasification Combined Cycle:
Financing and Deploying IGCC
Technology in This Decade

February 11, 2004

John F. Kennedy School of Government
Harvard University

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Acknowledgements

The Workshop on Integrated Gasification Combined Cycle technologies on Feb 11th was one of the most successful in recent years. Credit belongs to a number of people. First and foremost, we are deeply appreciative to William Rosenberg, the school's first Roy Family Fellow, who not only oversaw much of the research on which the workshop focused, but also was instrumental in identifying and inviting many of the participants. His ceaseless energy and commitment to the success of this event was instrumental in shaping the quality of the discussion. Bill was helped by Professor John Holdren and Kelly Gallagher, the Director of the school's Energy Technology and Innovation Project (ETIP), who offered suggestions and ideas throughout the planning process.

An event of this type requires the support of institutions and organizations both inside and outside Harvard. Ned Helme and the Center for Clean Air Policy and Jason Grumet and the National Commission on Energy Policy, as well as the Department of Energy were co-sponsors of the event. Within Harvard, the ETIP project (which is a joint effort of the Science and Technology Policy Program and the Environment and Natural Resources Program), and Center for Business and Government provided support and served as co-sponsors.

The logistics in planning the workshop itself was the responsibility of Jo-Ann Mahoney who did her usual amazing job. Ann Stewart and Tom Rutigliano helped synthesize the discussions and write this rapporteur's report.

Finally and most importantly, I would like to express our deep appreciation to the participants who took time from their busy lives to join us in the pre-Washington's birthday time frame, which is always one of the busiest times of the year.

The discussions at the workshop were off-the-record and thus this report purposely does not attribute any particular argument to any particular individual. In a workshop such as this one, there is no consensus; in fact the invitees were purposely selected from different sectors and were encouraged to be provocative and open. Hence none of the arguments in this report represent those of Harvard University, the Kennedy School or any individual participant.

Henry Lee

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Rapporteur's Report

Concerns about high natural gas prices, environmental emissions, economic growth and future coal production have catalyzed a growing interest in developing and deploying advanced coal gasification technologies both in the United States and abroad. On February 11, 2004, two of the Kennedy School's centers, the Belfer Center for Science and International Affairs and the Center for Business and Government, sponsored a workshop on the political and financial challenges to the deployment and commercialization of these technologies. The purpose of the workshop was to identify issues that require additional scrutiny and to build a policy foundation for the commercialization of Integrated Gasification Combined Cycle (IGCC) technologies for power production. Additional sponsors included the Environmental Protection Agency, the U.S. Department of Energy's National Energy Technology Laboratory, the Center for Clean Air Policy, and the National Commission on Energy Policy.

Attendees included senior officials from the energy industries, state regulators, federal officials, senior members of the NGO community and several experts from academia. This report summarizes the major issues and arguments put forth in each of the three panel discussions, a keynote presentation, and a luncheon speech. Since all statements made at the workshop are off-the-record, none of the remarks are directly attributed to any participant. This report is a general summary and does not cover all the issues discussed, but rather focuses on those of the greatest significance or greatest controversy. The arguments and positions described in this report do not necessarily reflect those of the John F. Kennedy School, the workshop sponsors, or any individual participant at the workshop.

Introduction: IGCC Challenges and Opportunities

The program began with an overview dividing this century's energy challenges into three categories: economic, environmental and national security. These will often be in tension with each other, and it is only through improved technologies that we'll be able to resolve these tensions. The toughest of these may be to provide the affordable, reliable supplies needed to expand and sustain prosperity in the US and throughout the world, without significantly increasing the threat of climate change.

Predicted growth in electricity needs and the long lifetimes of power plants gives this discussion urgency. The International Energy Agency forecasts that 700GW of new coal-fired capacity will be built globally by 2020. Given that power plants can remain in service for 50 years or more, the types of plant that are built over the next 15 years will

have effects well into the second half of the century. As one speaker put it, "the politicians of 2050 will not thank us because we deferred costs."

Four elements of the current electricity generation environment stand out as particularly important to any discussion of potential IGCC deployment:

- **Need for a diversified generation portfolio.** In the past decade, American firms have invested in approximately 200GW of natural gas capacity, roughly one-third of which is now for sale at distressed prices. In the wake of this boom and bust, regulators and other policy makers are concerned the over-reliance on one fuel—natural gas—may be a problem, and are embracing a mix of fuels, including coal. Wide availability and price stability will continue to make coal an attractive option, both in the United States and in large developing countries such as China and India.
- **Climate change.** There was broad agreement among most participants that people will live in a carbon-constrained future. Adjusting to this reality will require expanding the list of carbon-free energy supplies; the various limitations of nuclear power and renewables creates a need for advanced fossil fuel technologies with lower CO_2 emissions. Although carbon sequestration capacity is not part of the current generation of IGCC plants, the ability to add it at a later date is an important part of the technology's attractiveness.
- **Difficult capital markets.** Fallout from Enron and large numbers of distressed gas facilities have badly burned investors in recent years. According to a recent S&P report, the average bond rating of electric utilities has declined from A to BBB, and 40% of the companies are on a negative credit watch. These market conditions will make it difficult or impossible to finance expensive plants based on technology regarded as commercially immature, especially if regulators are unwilling to allow investors to earn returns consummate with the risks.
- **Lack of federal energy policy.** Absent federal guidance, utilities and regulators must make decisions without a clear idea of what the future energy picture will be. Lack of clarity about fuel supplies and environmental regulations emerged as obstacles to investment in generating capacity. From an environmental perspective, IGCC is more likely to be accepted in the context of a comprehensive climate change policy than as a series of individual plants. As several participants pointed out, neither coal gasification nor any other technology will be a 'silver bullet' to solve all our energy problems; without a comprehensive national policy, it will be difficult or impossible to decide the correct role for IGCC.

Current Status of IGCC

An advanced clean coal technology which is ready for commercial deployment, IGCC has the advantages of easing pressure on natural gas supplies, reducing conventional pollutants (SO_x, NO_x, mercury and particulates) well beyond the levels attainable by the best available pulverized-coal technology, and the ability to produce hydrogen and other useful chemical products. IGCC also has the advantage of being able to concentrate its

CO_2 emissions into a relatively pure stream, which makes it a good candidate for integration with CO_2 sequestering technology, if and when that technology becomes available.

Scale and lack of standardization contribute to the perception of IGCC as a commercially immature technology. Currently operating IGCC pilot plants are mostly in the 250-300MW (net) range—the very new 342 MW plant at Negishi, Japan is the largest operating facility. Scaling to the 500MW and larger sizes required by commercial power plants presents a technical challenge. This challenge is exacerbated by the fact that IGCC is not available as an off-the-shelf package with a standardized design and performance guarantees. In participants' views, the lack of firms willing to build IGCC facilities on a turnkey basis places too much of the technology risk on the project sponsor, inhibiting development.

One participant put 85% whole-plant availability—that is, the plant is available to produce electricity 85% of the time—as the threshold for commercial investors. Achieving this level of availability has remained a challenge for the power generation industry: with the exception of the Negishi facility, which started operation in June 2003, no IGCC electric power plant has achieved 85% availability over a one-year period.

Participants with experience operating coal gasification plants for chemical production responded that, over the last 20 years, gasification has matured into a reliable technology. Early coal gasification plants were used to produce chemical feedstocks for further processing; if they had been used to fuel a gas turbine, total power generation would be roughly 160MW. These plants initially suffered relatively high forced outage rates, but subsequent experience has raised the gasifier's availability to 98-99%. This level of reliability was achieved by adding spares of key components, especially the coal gasifier itself. Typically, the gasifier (the part of the plant that actually converts coal to gas products) is less reliable than the downstream components (other chemical processes, or gas turbines in a power facility). Adding a spare gasifier ensures high availability of gas output and adds greater operational flexibility to accept various fuels. Operators in the chemical industry believe that adding spares may be a more cost effective way to solve reliability concerns than purchasing performance warranties on a plant.

Beyond lack of operating history, other factors may contribute to the perception of IGCC as a risky technology. One issue participants pointed out is that gasification is a chemical process, which is not readily understood or operated by the combustion-based power industry. It was suggested that there is a culture of 'boiling water' in the power industry that makes operators reluctant to invest in plants based on more complex chemical processes (although modern coal plants have large chemical scrubbers to reduce SO_2 and NO_x emissions). Major gasification plants in the United States are operated by the oil companies, which led some participants to believe that oil-coal industry linkages will be useful for commercializing IGCC.

Finally, the structure of the electricity industry may present challenges. The future of IGCC may by in poly-generation facilities that manufacture chemicals, electricity, and, in

the longer term, hydrogen. Some commented that the regulated power industry is not structured adequately to reward the risk-taking inherent in such facilities, especially if it has to return some of the benefits to ratepayers. The inability of the power generators to 'capture the upside' emerged as a key barrier to increased investment in IGCC.

Despite the above, participants were in general agreement about the benefits and technical feasibility of IGCC. However, it was also agreed that until some number of plants accumulate a few years of successful operating experience, regulators and financial markets would not regard IGCC as a commercially mature, low-risk technology. IGCC is also more expensive than traditional pulverized coal (PC) technology. Various speakers put the cost of IGCC at anywhere between $1200 and $1700 per kW. At that cost, an IGCC plant is $100 to $300 per kW more expensive than traditional pulverized coal (PC) technology. Until measures are in place to allow investors to gain returns from the environmental benefits of IGCC vis-à-vis PC, this added cost will inhibit its development.

The Three Party Covenant Proposal

Against this background, the 3 Party Covenant was proposed as an innovative financing scheme to stimulate investment in and demonstrate commercialization of IGCC technology. The goal of the proposal is to induce investors and/or electric utility companies to finance an initial fleet of 6 to 12 commercial scale (estimated at 550MW) IGCC plants. The objectives of the plan are to provide access to capital at favorable rates; tolerate technology risks; and produce electricity at competitive prices.

The essence of the 3 Party Covenant proposal[1] is to reduce the cost of capital by changing the debt/equity ratio in the financing and improving debt rating to AAA, thereby lowering interest rates. This is accomplished by shifting portions of the project risk to ratepayers (via the PUCs) and to taxpayers (via the federal government). The 3 Party Covenant proposes a three party deal between the federal government, state regulators, and private equity investors to fund the construction of an IGCC plant. The project would be financed by a combination of debt and equity, with the federal government guaranteeing the debt up to 80% of total project cost, and private investors providing the remaining 20% as equity.

State regulators would guarantee cost recovery and an adequate return on investment through utility rate mechanisms. This would substantially reduce the risk to the federal guarantee. Under the proposal, the PUC would conduct a detailed pre-approval review of the proposed plant, and establish cost-of-capital rates for the life of the project. As construction progresses, the PUC will periodically (quarterly or semi-annually) review progress and expenditures, and will allow the plant owner to recover approved costs through the rate base. In regulated states, this would be through direct rate increases to consumers; in deregulated states, it may be through a non-bypassable wire charge.

[1] Full details can be found in William G. Rosenberg, Dwight C. Alpern, and Michael R. Walker, *Financing IGCC – 3 Party Covenant,* available through the BCSIA web site at http://bcsia.ksg.harvard.edu/publication.cfm?program=CORE&ctype=paper&item_id=436

The 3 Party Covenant proposal was presented to function in both regulated and deregulated states. Passing risk on to ratepayers will be easier in states with traditional electric regulation than in those that have undergone deregulation. One participant also pointed out that under current capital market conditions it will be difficult to find financing for plants in deregulated states. States with a sizable coal industry and policies to promote coal consumption are good candidates, as are states with precedents for the type of detailed PUC oversight envisioned in the plan.

The proponents argued the proposal addressed the difficulties in financing IGCC plants, ensuring the following:

- The federal guarantee and state utility rate structure absorb much of the technology and startup risks, allowing the equity investors to be satisfied with a lower return than they would otherwise demand.
- The federal guarantee allows the project to borrow at a lower interest rate. A typical Midwest utility has a BBB credit rating, which corresponds to approximately a 6.5% interest rate on long-term loans. In contrast, the federal government has a AAA credit rating, and is able to borrow at a long-term rate of approximately 5.5%. (Interest rates as of January 2004.) Federal guarantees should allow 3 Party Covenant projects to borrow at close to the same rate as the federal government.
- Because the federal government would guarantee loans up to 80% of the project cost, the amount of relatively expensive equity funding is reduced to 20%. This means that for about 25% of the amount financed, the cost of capital is reduced from 18.6% (the pre-tax return on equity) to 5.5%.

The proponents contend that these advantages would reduce the cost of capital enough to overcome the $100-$300/kWh cost premium between IGCC and PC. In a reference case (Table 1), this arrangement would reduce the average cost of capital from 11.9% to 8.1%, with a corresponding reduction in the cost of electricity to 3.84 cents/kWh, compared with 4.30 cents/kWh for a traditionally financed PC plant.

Table 1: Cost of Proposed vs. Traditional Financing

	Proposal	Traditional
Percentage Debt	80%	55%
Debt Interest Rate	5.5%	6.5%
Percent Equity	20%	45%
After-tax Equity Return	11.5%	11.5%
Tax Rate (Fed. and State)	38.2%	38.2%
Pre-tax Equity Return	18.6%	18.6%
Pre-tax Nominal WACC	**8.1%**	**11.9%**

The 3 Party Covenant proposal, they argued, offers benefits to all three participants. The federal government receives energy, national security, and environmental policy benefits in the form of reduced conventional emissions and establishing a technology path toward CO_2 sequestration, while increasing the role of coal in the national electricity mix. For the states, it promises lower emissions and lower, more stable electricity costs along with economic development. Importantly for coal-producing states, it also provides support for the coal industry and coal miners. The plant owners receive the benefit of a coal base-

load plant and the public relations benefit of investing in an environmental beneficial technology. The owners also receive a guaranteed return on their investment, and, because the federal government guarantees the loan, receive creditworthiness that IGCC projects would not be able to achieve on their own.

Table 2: Summary of 3 Party Covenant agreement

	Provides	Receives
Federal Government	AAA credit Low interest rate 80/20 capital structure	Energy/environmental benefits National security Low risk loan
State	Assured revenue stream Prudence review Reduce financial risk	Jobs (construction & mining) Cleaner air Competitive electricity prices Low cost financing
Owner	20% equity Leadership	Public relations benefits Assured equity return 80% non-recourse loan

Discussion and Comments

The discussion centered on 5 general questions: (1) Does the proposed 3 Party Covenant properly allocate risks and rewards? (2) Will the 3 Party Covenant attract investors to IGCC? (3) Is this sort of 'technology picking' the right way to do energy policy? (4) Is the objective of the program clean-kilowatt hours or information? and (5) What is the proper scope and duration of the proposed guarantees? The main arguments put forth under each question are presented in the following sections.

Risks and Rewards

Many participants focused their remarks on the proper allocation of financial risks and rewards, and whether the 3 Party Covenant proposal had struck the correct balance. The guarantees in the 3 Party Covenant have the effect of shifting much of the risk away from the utility and onto ratepayers and taxpayers. Once a plant expenditure is approved by the PUC, cost recovery could not be revoked, except in cases of fraud, concealment, gross mismanagement, or the like. The proposal anticipates that equipment manufacturers and the engineering and construction firm will provide guarantees to cover the technology and performance risks, but the 3 Party Covenant system would pass the majority of residual technology, startup, operation, and fuel cost risks on to ratepayers.

The federally guaranteed loans would be disbursed as the PUC approves project expenditures. Because repayment of the loans is guaranteed through the assured revenue stream, the federal government is essentially holding the residual political risks: only in the case where a PUC approved a cost, but subsequently did not allow recovery, would the federal loan guarantee become operative. In other words, the federal taxpayer would absorb the political risk of an inability or unwillingness of a state PUC to honor its historical commitments.

Participants nearly unanimously agreed that allocating a portion of the risk to the federal taxpayer is an improvement over a traditional financing arrangement. Since the environmental, fuel diversification, technological innovation and national security benefits of IGCC are not adequately rewarded by the market, traditional financing leaves investors with a disproportionately large share of the risks relative to the rewards they stand to earn. Overall, the redistribution of risks implicit in the 3 Party Covenant was seen by many as a step towards a more appropriate allocation.

It was suggested that commodifying the benefits of IGCC—e.g., through a carbon cap-and-trade arrangement—could be a more economically efficient way of balancing the risk-reward equation, but such an arrangement is politically unlikely in the near future. The 3 Party Covenant was accepted as a "best available politically feasible" solution to this problem, but it was noted that the proposal would benefit from a discussion of other possible methods.

The most contentious aspect of the 3 Party Covenant risk allocation was whether it achieved the correct balance between state ratepayers and the federal government. Participants weighed in on both sides of the issue. Some argued that rate-basing the investment and assuring the revenue stream placed to heavy a burden on ratepayers, while others saw the federal guarantees as putting too much risk on taxpayers. Those who saw the risks to the PUCs as disproportionately great argued that:

- Many of the societal benefits of the proposal—improved technology, greater use of domestic fuels, potential climate change abatement, and better understanding of IGCC—are national, and should not be paid for by any particular state's ratepayers.
- Although a number of states direct their PUCs to facilitate clean coal technology and the use of local coal, some of the local benefits, especially economic development and air quality, may not fall under the statutory responsibility of the PUC. All participants agreed that these benefits are desirable, but some believed that it may not be appropriate for PUCs to expose their ratepayers to risks in order to achieve them. To the extent that states wish to pursue these goals, it may be better to expand the proposal to a four- or five-party covenant by getting state economic development offices or environmental agencies involved.
- The 3 Party Covenant envisions active PUC review before and during construction as one way of reducing ratepayers' risks. Some expressed concern that this type of review may be beyond regulators' technical capacities, and that they will have difficulty deciding which costs are appropriate and which are inappropriate. Regulators are familiar with combustion-fired power plants, and have experience dealing with fuel price risk, but construction and operation of a new technology is a different game, and regulators may not be as proficient at identifying and managing the associated risks.

- PUCs may be taking a double risk: if an approved IGCC projects fails, not only will the sponsoring PUC's ratepayers bear the cost of the failed plant, but they will have to pay purchase power costs to make up for lost generating capacity.

On the other side, those who saw the federal share of the risks as too large make the following points:

- Ratepayers in the sponsoring PUC would enjoy low cost financing that wouldn't otherwise be available. New generation capacity will have to be built anyway, and there would be tangible economic development benefits. It is appropriate for that PUC's ratepayers to pay for these benefits.
- Because cost of capital is 60-70% of the cost of producing kilowatt hours, the lower cost of capital offers ratepayers lower electricity costs.
- Regulators assume risk, especially fuel price risk, on behalf of their ratepayers every day. The risks here are not fundamentally different than those. As the recent gas-fired plant experience shows, no energy decision is risk free, and technology uncertainty should not be overweighed relative to fuel price uncertainty.
- The fuel diversification benefits of keeping coal in the fleet are not strictly national; ratepayers enjoy price and reliability benefits from a diverse fuel supply.
- The cost of the federal loan guarantees may be larger than expected. When the federal government makes a loan guarantee, it must place a fraction of the amount guaranteed into a loss reserve. The exact fraction required is based on the estimated probability that the loan will go into default. Since the government is essentially guaranteeing that the PUCs will not renege on their revenue commitment, the probability of default should be fairly low, and a total of perhaps 10% of the amount guaranteed would need to be placed in the loss reserve. However, this type of calculation may underestimate the true cost of the guarantee—a systematic failure, such as the one that hit the Savings and Loan industry, could end up costing the Treasury up to the full amount of the guarantees. The federal Treasury is currently guaranteeing approximately one trillion dollars in loans, and may understandably be reluctant to add a few billion more.

Despite some disagreement on this issue, it was agreed that the 3 Party Covenant was an excellent basis for discussion, and most felt that negotiations within its framework would be able to produce a deal acceptable to all parties. Beyond the state-federal risk sharing, several other concerns about the risk allocation emerged:

- The federal guarantee may create a moral hazard problem. In the words of one comment, the "loan guarantee is a way to make failure more comfortable, rather than performance more rewarding." Commentators who were worried by this problem suggested modifying the 3 Party Covenant to place more of

the completion risk on the project sponsor, and/or demand performance warranties from equipment manufacturers and engineering firms.

- The blanket guarantees envisioned by the proposal may cover too many of the project risks. The independent power industry takes great pains to divide project risks up in detail and allocate them to the party best able to understand and manage them. As it stands, the proposal would not allow this sort of detailed risk allocation. For example, it may be appropriate for ratepayers or taxpayers to bear some of the startup risk, but there might be plant operators who are better able to manage operational risks. One participant suggested that having the PUC commit to purchasing power from the plant at a specified price might be better in this regard than assured returns. A power purchase agreement would leave operators bearing the costs of poor performance (if the plant produces power at too high a cost for the agreed price to be profitable) and enjoying the rewards of superior performance. This type of arrangement could produce better incentives to manage the plant efficiently than a guaranteed return on the original investment would. However, it could also increase the risk to the federal guarantee and the budget impact of higher scoring costs.

Will the Three Party Covennant Attract Private Investors?

Neither the size nor the risk of IGCC plants is a complete disincentive to investors. The investment community is willing to fund large, risky projects, but only if they see potential returns that justify taking the risks. It is the inability to capture these upside returns that keeps private investment away from IGCC. This is partially due to the perception that regulators would be unwilling to set rates high enough to guarantee a rate of return consummate with the risk, and partially due to the fact that there is no way for investors to earn returns on positive externalities of the project (i.e., environmental or national security benefits).

Participants agreed that the 3 Party Covenant would go a long way towards making an IGCC fleet a reality, but were divided as to whether the proposal by itself would be able to achieve its goal of attracting private investment in IGCC plants. Some participants stated that the federal guarantee would be necessary but not sufficient for them to invest in a plant, while others stated that they would be willing to build such a plant under a 3 Party Covenant arrangement.

Those who felt the federal guarantee would be insufficient to attract investment were concerned about the reliability of the assured revenue stream. Investors were described as skeptical of the value of regulatory promises that guarantee returns over the life of a project—one participant noted that "I don't know a single [institutional investor] that does not have a nightmare story about something that happened to them with the public service commissions." Investors will not value the assured revenue stream as highly as a full faith and credit guarantee, and thus may not be willing to invest at the returns the PUC would grant them.

Unsurprisingly, participants who stated they would invest under a 3 Party Covenant were more trusting of the PUCs, and emphasized that this, like any other power generation project, will only be successful in the context of a good relationship between developers and regulators. There was also considerable uncertainty about the stringency of future environmental regulation and the probability of carbon limits. Since IGCC is the cleanest available coal technology, stricter environmental limits would give it an economic and regulatory advantage over PC facilities. Investors who believe future environmental restrictions are likely to be stricter felt that gaining operational familiarity with IGCC technology may put them in a better competitive position in the future. As one industry participant put it, developing clean technologies is "pure risk mitigation. We think the probability is growing that we will have to reduce emissions and the sooner we learn how, the better position we will be in if that becomes a reality."

One participant proposed a two-party deal between a public power utility and lenders as an alternative to the 3 Party Covenant. Such an arrangement would be simpler because the assured revenue guarantee would not have to be negotiated between the project sponsor and the PUC. Avoiding this guarantee may also reduce the state legislative changes necessary to approve the project. Since public power utilities generally have better credit ratings than investor owned utilities and can finance through tax-exempt bonds, the project would have a lower cost of capital. The responsibilities of a public power utility are different than an investor owned one: public utilities must maximize benefits to its customers, while private utilities must maximize returns to investors. To the extent that its customers benefit from the environmental advantages, a public utility might more legitimately pay a premium for clean power than an investor-driven private firm.

Several participants proposed that financially distressed gas plants could be acquired at a very low price and refueled for IGCC at a lower cost than a greenfield IGCC plant. Such a conversion would involve building a new coal gasifier to feed into the existing gas fueled generation equipment; this would require the gas plant to have adequate space and coal delivery capacity. Since the generation equipment accounts for 30 to 35 percent of the cost of an IGCC plant, and relatively new gas plants have recently sold for as little as $80 per kWH (less than 20% of their original cost), it may be possible to realize substantial savings through this approach. It is estimated that the equipment a IGCC plant has in common with a gas plant costs about $500 per kWH of capacity. Despite the cost savings, a 3 Party Covenant financing arrangement for an existing gas plant will require the same legislative authorization for a federal loan and a comparable state commission decision as a completely new plant.

Is 'technology picking' the right way to do energy policy?

Several participants were uncomfortable with the focus on a particular technology inherent in the proposal and expressed a preference for some sort of technology-neutral approach. They felt that technology specific proposals have a poor track record, and that performance based policies do a better job at driving innovation and spurring industry to find best-cost solutions. Modifications were proposed to address this issue, including:

- Applying the 3 Party Covenant financing mechanism more widely, for example, to a commodified efficiency market, to renewables, or to biomass. Even more generally, 3 Party Covenant financing could be linked to performance requirements rather than IGCC technology. It was agreed that the 3 Party Covenant approach could be applied to other technologies. However, expanding the scope of the approach would make it more politically difficult and time-consuming to implement. Given the perceived urgency of constructing IGCC plants in this decade, some argued that that a pragmatic, 'get what we can do now done' approach was more appropriate.
- Using production tax credits (PTC) or direct subsidies to level the economic playing field. It was argued that a PTC approach would leave the completion risk on the industry, reducing the moral hazard problem. In response to this, one participant stated that PTCs would reduce the cost of building an IGCC, but would still not provide the assurances private investors would need to invest the required capital. It was also noted that PTCs would be much more costly to the federal budget than loan guarantees, and would reduce the credit rating of the federal guarantees, requiring a higher appropriation for the loss reserve.

In general response to these comments, it was also pointed out that the U.S. has a long history of promoting technology, including in electricity generation, and that as long as the 3 Party Covenant is viewed as an attempt to 'jump-start' the technology, rather than an open-ended subsidy, it is a legitimate policy instrument. Several participants pointed out examples—scrubbers, catalytic converters, fuel efficient automobiles—where policy drove down the cost of technology significantly, and suggested that the 3 Party Covenant proposal had similar potential.

Objective of the Proposal

Participants expressed some differences of opinion as to the specific aims of the proposal. Under the broad banner of moving IGCC towards commercialization, the goal of the 3 Party Covenant was variously described as clean kilowatts, information, creating an operating record to reduce the perceived immaturity of the technology, driving costs down, or creating an option for use as future climate policy evolves.

The answer to this question may be "all of the above." Given the long timescales of power projects, and the likely time frames of action on climate change, it may be that we can no longer afford the orderly paradigm of collecting information, assessing it, and then making policy decisions. The 3 Party Covenant proposal can be viewed as a type of parallel processing, simultaneously deploying clean power plants, commercializing the technology, and gaining operating information.

What is the proper scope and duration of the proposed guarantees?

Related to the objectives of the proposal is the question of how many plants should be covered by the 3 Party Covenant, and for how long the loan guarantees should stand. The general consensus was that the 3 Party Covenant should support IGCC until investors felt confident enough in the technology to finance projects through more traditional means.

Estimates as to how many plants this would require varied from 3 to 12. Several possibilities were suggested for the sequencing of the plants, ranging from getting as many as possible built in the near term to building in several waves of about 3 plants, with incremental technology improvements between each wave.

It was estimated that there is a $600 million authorization in the Energy Bill before Congress that could be used to support the 3 Party Covenant. If credit rating agencies consider the PUC revenue guarantees highly creditworthy, the probability of default could be around 10%, allowing $6 billion—or 12 plants worth—of loans to be guaranteed. If the PUCs do not make the revenue guarantees, or if credit agencies do not consider them highly creditworthy, the number of plants built would be lower.

Since most project risk lies in the initial construction and startup phases, some participants questioned if investors should enjoy the PUC and federal guarantees for the entire life of the plants. After IGCC plants have accumulated a number of years of operating experience, it should be considered a well-understood commercial technology, and not require any subsidy. Those who held this view suggested a variety of mechanisms to move towards more traditional financing as IGCC proves itself. Proposals included phasing out the federal guarantees after five or ten years, selling or refinancing the plants at some point, or transitioning from the assured revenue stream to a more standard power purchase agreement.

Concluding Remarks

Participants agreed that further development and commercialization of IGCC could have significant economic, national and homeland security, and environmental benefits. Across all sectors represented at the session, they expressed interest in pursuing the 3 Party Covenant as a framework for stimulating investment in these plants. Suggestions for further study and analysis centered on the following issues:

1. Improving our understanding of the types, size, and duration of the risks involved. Who should bear these risks, and who is willing to bear them? Does the proposed allocation of risks create the right incentive structure?

2. Better understanding the value of the benefits produced: what is the value of information? Of clean kilowatt hours? Of economic development? Just as importantly, how are these benefits distributed, and who should pay for them?

3. What is the nature of the energy problem IGCC is trying to solve: is it how to turn coal into electricity in a carbon constrained world, or does it go beyond electricity to a question of whether our gas fuels come from LNG or from coal? Is it a concern over lack of base load power, over lack of peaking power, or are we looking at a new type of combined electric-chemical plant that the industry doesn't know what to do with?

4. The possibility of repowering some of the existing natural gas fleet has great potential, and should be carefully examined.

Workshop on IGCC Development

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