DOE Natural Gas Program

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Good morning. Speaking for my organization, the Federal Energy Technology Center — FETC for short — I welcome you to the 1999 Oil and Gas Conference. The theme of this year's conference is "Technology Options for Producer Survival." During this conference, you will hear about the new and improved technologies that are evolving from DOE-sponsored R&D. We in DOE hope that you will find this information useful; we will consider this conference a success if your bottom line benefits because of the research that we are sponsoring.

In my paper, keeping with the theme of this conference, I'd like to share with you what we are doing to develop and transfer new technologies to domestic operators and the service industry — technologies that reduce the cost of finding and producing natural gas, technologies that ensure that the U.S. continues to have an affordable supply of clean-burning natural gas. I would also like to share with you DOE's vision of an integrated natural gas program, a program encompassing all aspects of natural gas: exploration and production, transport, storage, distribution, and use.

Let me start by describing my organization and how we contribute to natural gas technology development. FETC is a field office of the U.S. Department of Energy. We report to Bob Gee's Office, the Office of Fossil Energy. We conduct and manage R&D in cooperation with industry, academia, and our national labs. Most of our R&D supports the Office of Fossil Energy, although we do support other parts of the Department and other Federal agencies.

Among other things, FETC is responsible for implementing natural gas R&D programs for the Office of Fossil Energy. Our natural gas program has four major elements. In no particular order:

- The first element is a $9-million-per-year natural gas processing program. The goal of this element is two-fold: (1) to develop low-cost ways to convert natural gas to premium liquid fuels — these are natural-gas-to-liquids technologies — and (2) to upgrade low-quality gas to pipeline specifications.

- The second element is $1-million-per-year gas delivery and storage program. The goal is to enhance reliability of the natural gas infrastructure to ensure that it can meet the peak delivery requirements of market hubs, large central-station power plants, and distributed power plants.

- The third element is an $85-million-per-year gas utilization program. The goal is to develop high-efficiency, clean, gas-fueled power systems. We are developing fuel cell systems for the dispersed power market, and large gas turbine combined-cycle systems for the utility sector.

- The last element, of greatest interest to this conference, is DOE's $13-million-per-year gas

supply program. The goal is to reduce the cost of finding and producing natural gas.

In the technical sessions today and tomorrow, you will hear detailed presentations on the R&D activities underway in the gas supply program. Let me present the summary view of the major pieces of this program.

- We currently manage a dozen projects to assess our resources and reserves. These projects characterize geology, gas availability, trapping mechanisms, and specific reservoir geometry. Projects include developing gas atlases and databases, and conducting secondary gas recovery studies. Thus, we believe, these projects assist you in industry by providing you the information you need to better locate gas in new and existing fields.

  A success story in this area is the USGS project in Wyoming. We funded the USGS to estimate the basin-centered gas potential in the Big Horn Basin. This kind of information is an essential first step to stimulate investment in this basin. USGS estimated the basin contains more than 300 Tcf of undeveloped gas.

- The second research area is drilling, completion, and stimulation research. We manage about 20 projects in this area. These projects are leading the way toward faster, deeper, cheaper, and cleaner drilling and completion systems for difficult geological settings — the kind of reservoirs encountered in gas production. New technologies are very important for the deep high-pressure and high-temperature reservoirs.

  Maurer Engineering's drilling system is a success story that is still unfolding in this area. Mauer demonstrated a high-powered, slim-hole directional drilling system. The high-powered motors drilled through dolomitic formations at 48 ft/hr, compared with 23 ft/hr for conventional motors. These tests were conducted at the Catoosa test site near Tulsa.

- The third research area is low-permeability formations — the resource that will provide an increasing percentage of U.S. gas. We manage 10 projects that are characterizing the tight gas resources in the western United States, identifying ways to improve the success rate of finding gas, and developing cost-effective recovery options.

  In a major success story, Advanced Resources International (ARI) developed an integrated approach to locate the highly productive areas in low-permeability formations — the areas with an abundance of natural fractures. ARI used remote sensing and high-resolution aeromagnetic surveys to map deep basement rock. API estimates that wells drilled in the high productivity trends will have ultimate recoveries eight to ten times higher than wells drilled outside. Union Pacific Resources drilled a 1,750 ft horizontal well using API's methodology and confirmed the success of this approach. The Union Pacific well is in the Table Rock Field in Wyoming. The well depth was 15,000 ft — one of the deepest horizontal wells ever drilled in tight sandstone in the world.

In the natural gas supply program, we are just starting projects in two areas. One area is gas stripper wells. A Request for Proposals in on the street for techniques to revitalize gas stripper wells — where it makes economic sense.

The other new area in the gas supply program is methane hydrates. Actually, hydrate research really isn't new; we are moving back into it after an absence of several years. Methane hydrates are, potentially, an enormous resource — roughly 300 million Tcf of gas. Even if we can produce only a small fraction of it, we would have a several-hundred-year supply of natural gas. Hydrates are also a concern in global climate change scenarios. Small changes in ocean temperature could release large quantities of natural gas — a potent greenhouse gas.

Last week, we issued a *National Methane Hydrate Multi-Year R&D Program Plan*. It includes four technology areas: characterizing the methane hydrates resource; determining ways to produce methane from hydrates in the ocean and in Arctic regions; determining hydrate's role in the global carbon cycle; and addressing the petroleum industry's concerns about safety and sea floor stability — these are concerns when methane hydrates are present, or when they form, during the exploration, production, and transportation of conventional hydrocarbons.

If you would like to know more about the hydrate research program, fact sheets are available at the FETC display booth, or you can ask any of the FETC people here to send you a copy, or you can check our website — electronic versions of the plan will also be available soon.

The FY 1999 budget for methane hydrates research is modest: $500,000. To implement the methane hydrate plan, we will need a significant ramp up in funding. For FY 2000, the Administration requested $2 million for hydrates research. Congress seems to be very interested in the program; several hydrates research bills are pending. We are optimistic that Congress will provide the $2 million of funding, and they may increase it even further. The President's Council on Science & Technology recommended that a 10-year hydrate program be initiated with a total funding of $150 to $200 million.

Let me switch topics to an "integrated natural gas program." When we look at the total gas program funded by the Office of Fossil Energy, we already have R&D programs in natural gas supply, processing, delivery and storage, and utilization. So what would be gained by integrating these individual programs in an integrated natural gas program? Three major drivers are causing us to rethink our natural gas programs:

- The first driver is demand growth. The electric market represents the largest growth area for gas; gas use for power generation is expected to triple over the next 20 years. Total demand is expected to increase by almost 50 percent by 2015, with a total gas demand of 30 Tcf. Both estimates are for a business-as-usual scenario — no changes in current environmental policy.

- The second driver is increased recognition of the environmental qualities of natural gas. Natural gas produces roughly one-half the CO_2 emissions of coal. Here in Texas, the state legislature has recognized the environmental qualities of gas. When the state's electricity deregulation bill

was signed into law two weeks ago, it labeled gas a "green" fuel, and required that, come January, half of all new generation capacity installed in Texas must be gas-fired. With this legislation, Texas may have set a precedent for the 16 other states that have green power initiatives. If the Kyoto Protocol is implemented, the environmental qualities of natural gas will really come into play. Gas consumption could increase to 35 Tcf per year — a 60 percent increase.

- The third driver causing us to rethink our natural gas program is convergence of the gas and electric industries. Evidence of convergence abounds:

  - Some majors used to burn off much of the gas found with oil deposits. Now they are converting themselves to be gas giants as well, and many of them are embracing power generation. They are even thinking about getting into retail markets for the distribution of gas and electricity.

  - More than three-quarters of all new electricity-generating capacity in the United States is using gas.

  - According to a recent article in *The Economist*, the energy firm of the future may be one "that reaches from the wellhead all the way to the final destination, the customer."

  - And the company names on many of your business cards are different from a year ago as businesses merge and realign.

Recognizing these three drivers — sharply increased demand, environmental benefits, and convergence — the Office of Fossil Energy and FETC sponsored meetings in January and February of this year in Texas. The meeting examined the challenges facing the gas industry, and the implication of these challenges for DOE's gas R&D programs. We invited senior executives in the gas industry to the first meeting, and R&D managers in the gas industry to the second. For these meeting, we broadly defined the gas industry as producers, pipeline companies, distributors, and users. Meeting participants identified five broad issues facing the gas industry as it moves into the new millennium:

- The integrity of the gas delivery and storage infrastructure — maintaining it, protecting it, and expanding it — will be critical in meeting demand growth.

- Gas and electric industries will continue to converge as markets restructure. The telecommunications industry could also be part of this restructured market.

- Distributed generation — fuel cells, micro turbines, reciprocating engines — will change the patterns of energy supply and demand. We will need new technology to ensure reliable, low-cost power systems and networks.

- Regulatory policy needs to be more predictable to stabilize business strategies and encourage

technology investment.

- Government funding of public-benefit R&D will become even more critical. In the very competitive energy markets, private firms lose incentives for long-term public-benefit R&D.

Many of these issues can only be addressed if DOE's R&D programs better respond to the needs of an industry that is undergoing unprecedented change. To do this, we are moving toward integrated planning of the gas R&D programs. We believe integrated planning, coordinated with industry, will better identify R&D gaps — enabling us to more rapidly develop the technologies needed to fill those gaps. To make this integrated gas program work, we need two things:

- We need to increase the size of the natural gas supply R&D program. It needs to be consistent with the role that natural gas will play in providing clean, affordable, and dependable energy for our nation.

- We need to create a new natural gas infrastructure program to address the aging, existing infrastructure; the construction of new infrastructure; and the protection of this infrastructure from deliberate and natural threats.

Let me make a few concluding remarks. Natural gas is the bridging fuel that will lead to a fully sustainable energy future. Whatever that energy future is, we do not have that technology yet. Meanwhile, we have to depend on natural gas. Under a business-as-usual scenario, gas use will increase significantly; under a Kyoto scenario, gas use will grow dramatically!

For you, the gas production community, our job in the Government is to give you technology options to ensure that we continue to have an affordable supply of clean-burning natural gas. Our hope is that these technology options will also help ensure your survival. If you are not around, the U.S. does not have a gas supply.

As we move through the next two days, I invite your thoughts and insight on DOE's program — on what we are doing, on where we should be going. So you know who "we" is, it is the people in DOE — the people at HQ, NPTO, and FETC — who plan and manage the program and who also arranged this conference. Could I ask them all to stand for a second?

My challenge to my people at FETC is for each of you to come back with one idea that will make the program better. For you in industry, your ideas are critical to designing a rational program — one that meets your need to survive as a producer, one that meets the national need of having a reliable, affordable supply of a clean-burning fuel. Have a good conference.

Thank you.