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Session 1—Gas Hydrates

Session II—Gas Shale

Session III—Coal-Bed Methane and Oil Shale

Session IV—Tight Gas Sands
Driving down from Pittsburgh, Pennsylvania to Morgantown, West Virginia this week, on a clear November night, I could spot three drilling rigs working in a distance of thirty miles of highway. Given that hills of Appalachia tend to hide a lot of activity, this is astounding. I would hazard a guess that each of these rigs were targeting a resource (Marcellus Shale) that twenty-five years ago I had not given a second of thought about for one of my former employers, for when I was working on the eastern overthrust.

As stated by the late Nobel Laureate Richard Smalley, providing for our world's future energy and resource needs is one of the great challenges of this century. Increasing world populations (6.5 billion now, topping out at 9 billion in 2075) justly demand higher standards of living that require more access to energy. At the same time, increased energy demand will need to be accompanied by less pollution, especially emissions greenhouse gases. Sufficient energy is critical to our industrial, cultural, and health infrastructure, including agriculture, transportation, information technology, communication and many of the essentials that our civilization takes for granted.

The United States is a member of the Organization for Economic Co-operation and Development (OECD), which consists of the 30 wealthiest countries in the world (mean income over $33,000 per year in 2006). I usually refer to this as the rich boys club. The population of OECD countries number about one billion people and, on average, each year each individual consumes 217 million BTUs (10.8 tons of coal or 374 barrels of oil equivalent). On a per capita basis this is about 59 pounds of coal or about a barrel of oil per day. OECD countries represent only 17% of the world's population, but we consume 51% of the world's energy.

China, India, most of Latin America, and the rest of Asia have been industrializing with astonishing speed, yet their total energy consumption is only now beginning to increase rapidly. The per-capita annual energy consumption of the 83% of humanity with average incomes under $33,000 was 8.5 million BTUs per person, barely 4% of the average of the wealthiest countries—approximately 1.5 pints of oil or 2.25 pounds of coal equivalent per person per day. Numerous studies show that per capita annual consumption of about 100 million BTUs is necessary to provide barely minimal living standards in which infant mortality rates begin to decrease and approach 20 per thousand, and female life expectancies at birth begin to exceed 70 years. (For example, see Vaclav Smil, Energy at the Crossroads, 2003.) If the per capita energy consumption in the developing world were increased to only 50% of that presently consumed by the citizens of industrialized nations, and if everyone in the prosperous
industrialized nations were to conserve down to that same level - that is, if everyone on earth used only 100 million BTUs of energy per year - energy production worldwide still would have to increase by more than 40% to 650+ quadrillion BTUs of energy (QBTU’s) compared to present worldwide production of approximately 460 QBTUs. This is a tremendous challenge that can only be met by increasing our ability to tap resources that were previously unobtainable.

Energy, economy, and security are inextricably linked. Secure supplies of energy are a depleting resource subject to short-term disruption by political events. Energy resources must be constantly replenished through discovery of new resources and application of new technologies. However, attention should not be solely focused on conventional sources for oil and gas. Unconventional resources potentially could ensure supply of low-cost fuel well into the 21st century. An array of unconventional energy sources such as heavy oils, tar sands, oil shale and gas hydrates, as well as conventional, deeper ocean hydrocarbon resources, are being brought into play. Technological advances have opened up oil and natural gas resources that were previously unobtainable, including deep-water areas (depths >305 m) coal-bed methane, and gas in shale, that do not readily release their gas to wells. New unconventional resources such as oil shale and gas hydrates are poised to be delivered from theoretical resource to potential resource. The United States, as validated by history, has been the world leader in the development of technological solutions in many spheres of human endeavor and is leading the way again in developing and deploying the appropriate energy technologies to transform unconventional resources into conventional reserves.

In the opening keynote address, from Scott Tinker and Eric Potter of the Texas Bureau stress unconventional resources are positioned to provide a key source of energy as alternative, non-fossil energy sources are developed at commercial scale. They stress that unconventional reservoirs are predominantly in “primary” production phase. Similar to conventional oil and gas fields in the 1940’s and 1950’s, only a small percentage of the total global in-place unconventional resource base has been produced. There remains much to learn about unconventional resource systems and further research and development is required. This theme is reiterated in many of the papers that follow.

We have a series of five great papers on gas hydrates, which present formidable technological challenges, but provide a potentially vast global resource to meet mid- and long-term energy demands. A series of field programs in the last decade, in conjunction with experimental studies and numerical simulation, show that it should be possible to extract the most favorable gas hydrates with existing technologies. There may be 20 quadrillion cubic meters of methane trapped within global deposits. Twenty five percent of this resource is
enough natural gas to supply the United States at current levels for more than 7,500 years.

Seven papers address the hot gas shale plays in multiple basins across the United States and the world. New technologies are unlocking substantial amounts of shale gas. As a result according to the Potential Gas Committee (June 18, 2009), the nation’s estimated gas reserves have surged an unprecedented 35 percent to 1,836 trillion cubic feet. Much of this increase is attributed to reevaluation of shale-gas plays in the Appalachian basin and in the Mid-Continent, Gulf Coast, and Rocky Mountain areas. Tapping this previously inaccessible resource is in full swing in the United States and is spreading to the rest of the world, raising hopes of a huge expansion in global reserves. One recent study cited in the New York Times (October 10, 2009, page A1) calculates that the recoverable shale gas outside of North America could turn out to be equivalent to 211 years worth of natural gas consumption in the United States at the present level of demand, and maybe as much as 690 years. In 2008, marketed US natural gas production was at its highest level in since 1974. In 2009, we may see an all time US record in marketed gas production. It is pretty clear that it is unconventional production that is providing the production boost.

In day two of the conference, we continue the theme of turning unconventional resources into conventional reserves and providing the energy for the future. Twelve papers cover coal-bed methane and tight gas and oil shale. Today tight gas makes up a significant portion of the nation's natural gas resource base, with the Energy Information Administration (EIA, January 2009) estimating that 309.58 Tcf of technically recoverable tight natural gas exists in the U.S. In 2008 according to the EIA, coal-bed methane production from basin across the US reached almost 2 TCF while were reserves approached 21 TCF. In oil shale there may be 1.2 trillion to 1.8 trillion barrels locked in the shale formations that underlie a vast region stretching from western Colorado to eastern Utah to southern Wyoming. Not all of that oil is recoverable, but by some of estimates, 800 billion barrels might be. That’s more than three ‘Saudi Arabias’ worth of oil and enough to serve current U.S. demand for a century.

In summary, whether or not unconventional natural gas and oil production will grow in the future will depend on price, technology, and access. We have little control of two of these components, but conferences such as the 29th Annual Gulf Coast Section SEPM Foundation Bob F. Perkins Research Conference: Unconventional Resources: Making the Unconventional Conventional can help to advance the technology.

I am only the convener of the conference and would like to stress that this was a team effort. First I express my gratitude to the authors of the papers presented during the conference. They have produced an informative statement of the promise and technical challenges of transforming our unconventional
resources into marketed energy. Their ideas will be of
great value to their peers all around the industry.

My thanks to the Trustees of the Foundation and
Norman Rosen, who advanced the idea of the sympos-
sium focused on unconventional resources. Norm
provided continuous encouragement (gentle nagging),
and the final editing of the papers that make up the vol-
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for the abstracts and published volume.

Tim Carr
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