Tapping America's Energy Potential Through Research and Development

Witnesses:

**Anthony Cugini**  
Director, National Energy Technology Laboratory, Department of Energy  

**David Martineau**  
Chairman, Texas Independent Producers and Royalty Owners Association  

**Daniel Hill**  
Interim Department Head, Professor of Petroleum Engineering, Texas A&M University  

**Michael Hagood**  
Director of Program Development, Energy and Environment Science and Technology, Idaho National Laboratory

Subcommittee Members Present:

Andy Harris, Chairman (R-MD)  
Brad Miller, Ranking Member (D-NC)  
Jerry McNerney (D-CA)  
Dana Rohrabacher (R-CA)  
David Curson (D-MI)

Full Committee Members Presents:  
Chairman Ralph Hall (R-TX)

On November 30, 2012, the House Committee on Science, Space and Technology Subcommittee on Energy and Environment held a hearing to receive testimony on research needs and priorities relating to unconventional oil and natural gas resources as well as on the Tapping America’s Energy Potential Through Research and Development Act of 2012 (H.R. 6603).

Due to developments in horizontal drilling and hydraulic fracturing technologies, the U.S. is now producing oil and natural gas at a faster rate than any other region in the world. As a result, the U.S. is currently on a path to surpass Saudi Arabia as the world’s top producer of oil by 2020, according to the International Energy Agency and Citigroup. H.R. 6603 would authorize $111 million for the Department of Energy (DOE) to conduct research and development (R&D) on oil shale energy extraction as well as for reducing environmental impacts such as water use.

In his opening statement Energy and Environment Subcommittee Chairman Andy Harris (R-MD), said, “Tapping America’s unconventional oil and gas resources will... provide sorely needed stimulation of our economy, restore our manufacturing sector and create high-paying middle class jobs.” Harris continued, “Citigroup predicts the cumulative impact of new oil and gas production could create as many as 3.6 million new jobs by 2020.” Harris blamed politics for preventing the U.S. from realizing the benefits of developing unconventional fossil fuel resources.

In his opening statement, Chairman of the full House Science, Space and Technology Committee and sponsor of H.R. 6603, Ralph Hall (R-TX), said, “In 2010, unconventional natural gas development alone supported over a million jobs in this country, and this number is expected to more than double by 2035.” He described H.R. 6603 as “bipartisan legislation,” which “promotes the development of oil shale instead of restricting it, and ensures we maximize the benefits of our unconventional oil and gas resources.” An important aspect of the bill is supporting, “R&D to minimize water use and maximize efficiency in shale oil and gas operations.”. The bill “complements” the Section 999 of the Energy Policy Act, which created a “very successful”
unconventional oil and gas R&D program, the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Program, within the Department of Energy. Hall entered a letter endorsing H.R. 6603 into the record from the American Geosciences Institute (AGI).

Ranking Member Brad Miller (D-NC) began his opening statement by saying, “Hydraulic fracturing is the combination of technologies developed by federally-funded research.” Miller stated that Democrats will “likely” support this bill in a vote, noting that, “the section of Chairman Hall’s legislation on ‘produced water’ is almost identical to legislation passed by the Democratic majority in the last Congress.” Miller expressed his hopes that this bill be part of an “all-of-the-above” energy approach instead of “hunting fossil fuels to extinction” without developing renewable sources to replace them.

Anthony Cugini, Director of the National Energy Technology Laboratory for DOE, began his testimony by stating that the growth in natural gas production in 2011 was “the largest year-over-year volumetric increase in history.” Oil production has grown as well due to development in technology and “overall, oil imports have been falling since 2005, and our dependence on imported oil declined from 57 percent in 2008 to 45 percent in 2011—the lowest level since 1995.” Cugini stated that unconventional resources including carbon dioxide enhanced oil recovery, heavy oil, oil shale, and natural gas resources including methane hydrates as well as residual oil zones have the “potential” to further “reduce U.S. reliance on foreign oil,” and support the “president’s all-of-the-above energy strategy.”

Residual oil zones (ROZs), oil shale, heavy oil, oil sands and shale oil alone comprise of “3,000 billion barrels of liquid hydrocarbons,” said Cugini. He continued, “Even if one were to assume that only 10 percent of this oil could be recovered economically, it would mean a significant increase in the Nation’s domestic energy supply.” While “unconventional resources are much larger in volume than are our conventional resources stores,” these resources “generally exist in more geologically complex settings or in more remote or environmentally sensitive areas and require more intensive production methods.” Therefore, “developing our unconventional oil and natural gas resources in an environmentally sustainable and safe manner will require new technologies.” Cugini concluded, “DOE has demonstrated its ability to engage industry and academia to perform research that can help catalyze the development and application of these new technologies.”

In his testimony, David Martineau, Chairman of the Texas Independent Producers and Royalty Owners Association (TIPRO) and member of the American Association of Petroleum Geologists (AAPG), described H.R. 6603 as a “step in the right direction.” He praised the areas of research outlined in the bill which “could produce significant results,” including hydraulic fracturing; development of improved proppants; water minimization, management, re-use and alternatives; improved modeling of formations; and energy efficiency in exploration and production. In his testimony, Martineau described three aspects of this research, hydraulic fracturing, water management, and understanding the subsurface.

Regarding hydraulic fracturing, areas of research which would reduce the “number of wellbores required, resulting in a reduction in well sites, water usage, emissions, traffic, noise, dust and other factors, all while increasing oil and gas recovery per well” include “focusing on the subsurface processes involved with fracturing, including modeling of the process, microseismic assessment, emissions, water usage and other research.” As to water management, “the volume of water used in hydraulic fracturing represents less than 1 percent of all water consumed in the state of Texas.” However, “research and development are needed to address mitigation of the volumes of fresh water required for hydraulic fracturing; significant volumes of water produced from oil and gas shale wells and associated concerns as to its composition; the development of technology to process water – converting the industry’s large waste stream into a new, useful product; and assuring the ability to safely dispose of water in the subsurface by geologic characterization of potential disposal zones which vary across the country –geologic basin to geologic basin.”

For understanding the subsurface, “Flow of fluids, gas, oil, water, through very low permeability formations, particularly oil and gas shales, is not well understood.” Martineau continued, “By increasing our understanding of subsurface geologic conditions, we can make progress toward effectively answering questions regarding economic recovery and environmental safety,” as well as “increase recovery efficiency.” In addition, Martineau highlighted historic federal research in oil and natural gas development. Martineau offered recommendations on tax provisions for independent oil and natural gas producers as well as the regulatory burdens on producers.
In his testimony, Dan Hill, Interim Department Head of Petroleum Engineering at Texas A&M University, discussed how unconventional energy has “changed the U.S. energy game” how this occurred, and whether this growth is “sustainable.” Hill pointed out that due to increased production from shale formations, natural gas from these resources now comprises over 30 percent of U.S. supply. Hill states that this is “great news” as “natural gas is the cleanest burning fossil fuel, it yields the least CO2 and it is low cost, thanks to newfound abundance in conventional reservoirs.” Hill stated, “Oil production from the Bakken formation in North Dakota is now close to 500,000 barrels per day (bpd) and is projected to break at “1 to 2 million bpd.” Hill explained that technological improvements are still needed and major challenges include developing “ways to lessen the environmental impacts of hydraulic fracturing operations” and “the development of lower cost hydraulic fracturing techniques.”

Advances in unconventional exploration and production will require, “further development in technology, and the trained engineers and geoscientists needed for continued growth.” Hill said, “Perhaps most important is the role that Department of Energy funding for unconventional oil and gas research will have on the training of engineers and geoscientists needed to sustain growth in unconventional oil and gas development.” Hill emphasized that the because of “booming” demand for petroleum engineers, Texas A&M University is “receiving unprecedented demand for places in our graduate program.” Hill explained, “To attract and retain high quality graduate students, a university has to offer financial aid, and this is usually in the form of a research assistantship funded by an external grant.” Hill concluded, “The research funding provides universities through the proposed Department of Energy research program will help support the graduate students who will become the future technology leaders of our country.”

In his testimony, Michael Hagood, Director of Program Development of Energy and Environment Science and Technology at Idaho National Laboratory, provided background information on oil shale resources, discussed how production relates to U.S. security goals, discussed advancements and research needed, and provided comments on H.R. 6603. On the size of U.S. oil shale resources compared to usage, “U.S. usage is approximately 6.8 billion barrels (of oil) in 2011” and is “projected to be 7.3 billion barrels per year in 2035,” said Hagood. He stated, “Estimates from recent U.S. Geological Survey studies indicate that between Colorado, Utah and Wyoming, nearly four trillion barrels of oil are estimated to be in place.” Hagood pointed out that “most of this resource is located on federal lands.” In addition, “development of an oil and shale industry will also result in increases in tax and royalty payments to federal and state government for oil production on their lands and contribute to the U.S. gross domestic product.” Hagood pointed out that not only can the shale industry decrease dependence on imports, but would “reduce the risks associated with potential supply disruptions.”

Hagood urged for “aggressive R&D” and noted, “Advancements of novel concepts and new approaches requires significant investment in long-term, high-risk R&D to reach proof-of-concept stages of development.” Hagood continued, “Similarly, applied R&D is needed to develop and prove technology at bench or field scale prior to demonstration at a commercial scale.” As to research topics for federal R&D, Hagood suggested, “increasing the energy return on investment, fracture mechanics and heat transfer for enhancing recovery, materials performance in high-temperature subsurface environments, real-time subsurface process monitoring, water use reduction and post-retort subsurface environmental impact mitigation.”

Hagood advised that “the objective on an oil shale R&D program should be to provide solutions that help achieve specific production and environmental performance goals” and these goals should be both “near-term” and “far-sighted”. Hagood suggested investigating “application of hybrid energy systems approaches, including integrating renewable and/or nuclear energy into oil shale development schemes for achieving greater carbon efficiency and reducing environmental impact.” Hagood recommended understanding and addressing the “cumulative environmental and socioeconomic effects in the region” in “the context of competing needs” such as agricultural, municipal and industrial needs. Hagood emphasized that, “stakeholder engagement in an R&D program is very important” in order to have “greater impact.” In his conclusion, Hagood said, “DOE is a technical integrator that can bring together needed assets and expertise from both within and outside DOE including universities and industry, to provide a high-quality R&D program, and as well, act as a needed honest broker of technical information.”
Chairman Andy Harris (R-MD) asked if he understood correctly that using the reported estimates of oil shale resources, the U.S. has a 120 year supply based on current usage. Hagood confirmed that that was correct. Harris asked what nation has the most oil shale in the world, to which Hagood answered, the U.S. Harris asked Hill if the DOE budget currently supports oil shale research. Hill replied that it does not. Harris commented that subsidies for the fossil fuels industry supports domestic manufacturing.

Ranking Member Miller asked how federal research in hydraulic fracturing related technologies in the 1970s and 1980s is not considered picking winners and losers, which is the rhetoric used against supporting renewable energy. Cugini replied that the support in the 1970s and 1980s was for basic and early stage research and thus was not picking winners and losers. Miller asked why unconventional fossil fuels were federally funded, as they were in early, more uncertain stages of development when the argument used for “dismissing” renewables is that they are more uncertain while unconventional resources are a “slam dunk.”

Cugini answered that there are still some risk factors remaining in developing unconventional extraction and production technologies. While there is potential to access more resources than is currently economically available, it is not profitable with current technology to pursue. Therefore the federal government is needed to fund this technology, to allow more resources to become available with the current technology in the current economy.

Chairman Hall said states currently regulate hydraulic fracturing and asked Martineau for his insights on how hydraulic fracturing should be regulated. Martineau responded, saying every rock and state is different. Therefore the exact hydraulic fracturing method varies and subsequently one universal regulatory rule would not be effective. Hall commented that independents require support because they will assume larger risks in developing technologies before being bought by a larger company.

Representative Jerry McNerney (D-CA) said, “Most of my colleagues ...would be in favor of providing research dollars for development of energy resources” but asked that legislators supporting fossil fuel development also be as “receptive” to providing support for clean energy. McNerney brought up the Production Tax Credit, which provides subsidies for the wind industry, which is set to expire at the end of 2012. This would put 40,000 Americans out of work and send the wind industry overseas. McNerney stated that there is no argument that U.S. unconventional resources are “massive.”

McNerney discussed with Hill the energy input compared to output for unconventional resources. Unconventional resources have a higher energy input to output ratio than conventional resources and emit two to three times more carbon in the atmosphere per energy unit delivered. McNerney concluded. McNerney urged that the impact on the global environment be considered. He asked what the fossil fuel industry does to hire veterans and pointed out that the wind industry has the best record for hiring and training veterans. Martineau replied that there are veteran programs, and said they cannot find enough people to work in the fossil fuel field. McNerney asked that writing provisions for training and hiring veterans be included in H.R. 6603.

Representative Dana Rohrabacher (R-CA) stated that wind is an inefficient way of producing electricity in terms of cost and investing in the industry is “evaporating wealth” that could be used to raise the standard of living or providing programs for veterans. Rohrabacher asked what the American taxpayer is “getting out of” investing in an energy industry that makes billions. Hill replied that if the government wanted to patent the technology DOE develops, they could do that. He pointed out that this research is done for the general public benefit. Martineau added that decreasing prices for energy would benefit the public.

Representative David Curson (D-MI) said that if these technologies are now profitable to develop, it is the “responsibility” of the industry to pursue them. He suggested that the taxpayer should own the intellectual property that they are paying for. Curson stated that the three largest oil companies in America made 80 billion in 2011 while the rest of the economy was “struggling.” He asked why the government should pay for an industry that is making more than “nickels and dimes.” Hill responded that the research funding of this type mainly goes to universities for research, which supports training scientists and engineers.

Opening statements, witness testimonies and an archived webcast of the hearing can be found on the Committee web site.