

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY
SUBCOMMITTEE ON ENVIRONMENT**

HEARING CHARTER

Review of Federal Hydraulic Fracturing Research Activities

Friday, April 26, 2013
9:30 a.m. – 11:30 a.m.
2318 Rayburn House Office Building

PURPOSE

On Friday, April 26, at 9:30 a.m. in Room 2318 of the Rayburn House Office Building, the Subcommittee on Energy and the Subcommittee on Environment of the Committee on Science, Space and Technology will hold a hearing entitled *Review of Federal Hydraulic Fracturing Research Activities*. The purpose of this hearing is to review agencies' hydraulic fracturing-related efforts, with a primary focus on examining progress under Executive Order 13605 and the associated interagency Memorandum of Understanding (MOU) and steering committee.

WITNESS LIST

- **Dr. Kevin Teichmann**, Senior Science Advisor, Office of Research and Development, Environmental Protection Agency
- **Mr. Guido DeHoratiis**, Acting Deputy Assistant Secretary for Oil and Gas, Office of Fossil Energy, Department of Energy
- **Dr. David Russ**, Regional Executive, Northeast Area, U.S. Geological Survey
- **Dr. Robin Ikeda**, Acting Director, Agency for Toxic Substances and Disease Registry, Department of Health and Human Services

BACKGROUND

On April 13, 2012, President Obama issued Executive Order 13605, which mandated the creation of a “high-level, interagency working group to facilitate coordinated Administration policy efforts to support safe and responsible unconventional natural gas development.”¹ The stated intent of this effort was to “coordinate the efforts of Federal agencies responsible for

¹President Barack Obama, “Executive Order—Supporting Safe and Responsible Development of Unconventional Domestic Natural Gas Resources,” April 13, 2012. Accessible at: <http://www.whitehouse.gov/the-press-office/2012/04/13/executive-order-supporting-safe-and-responsible-development-unconvention>

overseeing the safe and responsible development of unconventional domestic natural gas resources.”² The Executive Order required the interagency working group include representatives from nine different agencies and four offices of the White House, to support the safe and responsible production of domestic unconventional oil and gas.³

The group is tasked with coordinating agency policy activities and sharing scientific, environmental, and related technical and economic information. The group is also to engage in long-term planning and coordination among the appropriate Federal entities with respect to research, resource assessment, and infrastructure developments, and is required to consult with other agencies and offices as appropriate.

Multi-Agency Collaboration on Unconventional Oil and Gas Research

To execute the Executive Order, the Environmental Protection Agency, Department of Interior (DOI) and Department of Energy (DOE) signed a Memorandum of Understanding (MOU) in which the respective agencies agree to develop a multi-agency program directed toward a focused, collaborative interagency effort to address high priority challenges associated with unconventional shale gas and tight oil resources. The interagency program is also to address and respond to the White House’s 2011 “Blueprint for a Secure Energy Future”⁴ and recommendations made by the Secretary of Energy Advisory Board Subcommittee on Natural Gas.⁵

The agencies will identify research priorities and collaborate to sponsor work that improves understanding of the impacts related to development of our unconventional resources. The collaboration is intended to focus each Agency on its area of core competency, foster collaboration on research topics as appropriate, and bring coordination and consistency to the annual budget process. The core competencies are as follows:

- DOE: wellbore integrity, flow, and control; green technologies; systems engineering, imaging, and materials
- USGS: resource assessment; hydrology and geology; land use, wildlife, and ecological impact
- EPA: air monitoring; environment and human health risk; water quality

The three agencies established a Steering Committee and announced its membership in May 2012. According to the MOU, a research plan was required to be published “within 9 months of

²President Barack Obama, “Executive Order—Supporting Safe and Responsible Development of Unconventional Domestic Natural Gas Resources,” April 13, 2012. Accessible at: <http://www.whitehouse.gov/the-press-office/2012/04/13/executive-order-supporting-safe-and-responsible-development-unconvention>

³ The 9 Agencies included in the Executive Order are the Departments of Defense, Interior, Agriculture, Commerce, Health and Human Services, Transportation, Energy, Homeland Security, and the Environmental Protection Agency. The 4 offices of the White House are the Council on Environmental Quality, Office of Science and Technology Policy, Office of Management and Budget, and the National Economic Council.

⁴ The White House, *Blueprint for a Secure Energy Future*, March 30, 2011. Accessible at: http://www.whitehouse.gov/sites/default/files/blueprint_secure_energy_future.pdf

⁵ Secretary of Energy Advisory Board Shale Gas Production Subcommittee, *Second Ninety Day Report*, November 18, 2011. Accessible at: http://www.shalegas.energy.gov/resources/111811_final_report.pdf

formation” of the Steering Committee—however, the resulting January 2013 deadline was missed. A formal research plan is yet to be released. Additionally, in January EPA’s Science Advisor informally announced that the Department of Health and Human Services would be joining the Steering Committee.⁶ While there has been no formal announcement or confirmation that HHS has joined the steering committee, the Agency does conduct hydraulic fracturing research initiatives in various areas, particularly within the Agency for Toxic Substances and Disease Control Registry.

To this end, the President’s Fiscal Year (FY) 2013 budget request allocated \$38 million among DOE (\$12 million), EPA (\$8 million) and DOI’s U.S. Geological Survey (USGS) (\$18 million) to carry out the interagency initiative.

The President’s FY 2014 budget request includes funding to continue this initiative. However, the budget requests did not include additional details regarding the steering committee research plan, which has not yet been released.

- DOE requests \$12 million for the interagency collaboration. DOE’s total request for Natural Gas Technologies was \$17 million for FY 2014, the same as the FY 2013 request.
- USGS requests \$18.6 million to support the interagency collaboration in FY 2014.⁷
- EPA requests \$8 million in FY 2014 to “expand work with DOE and the USGS under a memorandum of agreement on hydraulic fracturing research which will analyze the potential impacts of hydraulic fracturing on air, ecosystem and water quality.”⁸ This is to be managed primarily by the Office of Research and Development.

Additional Reading:

- Executive Order, Supporting Safe and Responsible Development of Unconventional Domestic Natural Gas Resources, April 13, 2012. Accessible at: www.whitehouse.gov/the-press-office/2012/04/13/executive-order-supporting-safe-and-responsible-development-unconvention
- Memorandum on Multi-Agency Collaboration on Unconventional Oil and Gas Research, DOE, DOI, EPA, April 13, 2012. Accessible at: <http://www.doi.gov/news/pressreleases/loader.cfm?csModule=security/getfile&pageid=289759>
- Multi-Agency Collaboration on Unconventional Oil and Gas Research. Presentation accessible at: http://unconventional.energy.gov/pdf/Multi-Agency_ResearchPlanPresent.pdf

⁶ Agencies Expand Fracking Research Panel To Add HHS, Weigh GHG Impacts, Inside EPA, January 14, 2013. Accessible at: <http://insideepa.com/201301142421426/EPA-Daily-News/Daily-News/agencies-expand-fracking-research-panel-to-add-hhs-weigh-ghg-impacts/menu-id-95.html>

⁷ U.S. Geological Survey, *President’s 2014 USGS Budget Proposal Strengthens Science*, April 10, 2013. Accessible at: <http://www.usgs.gov/newsroom/article.asp?ID=3556&from=rss#.UWwvS8pLkXg>

⁸ Environmental Protection Agency. FY 2014 EPA Budget in Brief, P. 21. Accessible at: <http://www2.epa.gov/planandbudget/fy2014#budget>



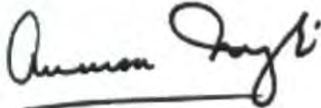
APR 13 2012


MEMORANDUM


TO: Assistant Secretaries, National Laboratories
Department of Energy

Assistant Secretaries, Bureau Directors
Department of the Interior

Assistant Administrators, Regional Administrators
Environmental Protection Agency

FROM: Arun Majumdar, Acting Under Secretary of Energy
Department of Energy 

David J. Hayes, Deputy Secretary
Department of the Interior 

Bob Perciasepe, Deputy Administrator
Environmental Protection Agency 

SUBJECT: Multi-Agency Collaboration on Unconventional Oil and Gas Research

OVERVIEW: In March 2011, the White House released a “Blueprint for a Secure Energy Future” (Blueprint) - a comprehensive plan to reduce America's oil dependence, save consumers money, and make our country the leader in clean energy industries. The Blueprint supports the responsible development of the Nation’s oil and natural gas, with the specific goals of promoting safe practices and reducing energy imports. The Department of Energy (DOE), the Department of the Interior (DOI), and the Environmental Protection Agency (EPA) each will have a critical role to play in this mission.¹

To this end, the DOE, DOI, and EPA will develop a multi-agency program directed toward a focused collaborative Federal interagency effort to address the highest priority challenges associated with safely and prudently developing unconventional shale gas and tight oil resources. The goal of this program will focus on timely, policy relevant science directed to research topics where collaboration among the three Agencies can be most effectively and efficiently conducted to provide results and technologies that support sound policy decisions by state and Federal agencies responsible for ensuring the prudent development of energy sources while protecting human health and the environment. This program responds to the Blueprint and to relevant recommendations of the Secretary of Energy Advisory Board Subcommittee on Natural Gas.²

¹ The 31 March 2011 *White House Blueprint for a Secure Energy Future* instructed the Federal Government to “conduct research to examine the impacts of fracking on water resources,” directing the EPA and DOE to sponsor research ...”

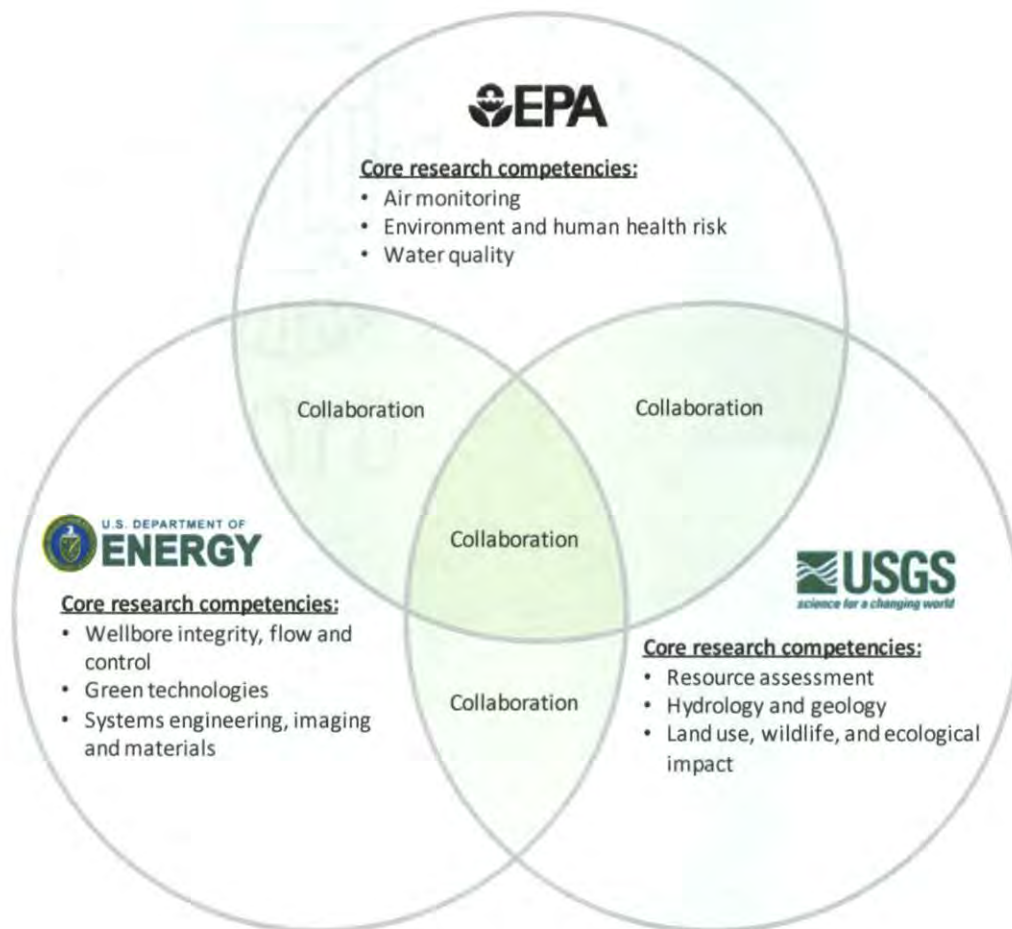
² The Secretary of Energy Advisory Board recommended that “the federal government has a role especially in basic R&D, environment protection, and safety” and recommends that the DOE, DOI and EPA “all have mission responsibility that justify a continuing, tailored, Federal R&D effort.” http://www.shalegas.energy.gov/resources/081811_90_day_report_final.pdf

Interagency Collaboration

The DOE, DOI, and EPA will identify research priorities and collaborate to sponsor research that improves our understanding of the impacts of developing our Nation's unconventional oil and gas resources and ensure the safe and prudent development of these resources. Through enhanced cooperation, the Agencies will maximize the quality and relevance of this research, enhance synergies between the Agencies' areas of expertise, and eliminate redundancy. The Agencies remain responsible for implementing their own authorities and internal priority-setting processes.

The goals of this interagency collaboration are as follows:

1. Focus each Agency on its area of core competency. Each Agency has a different combination of experiences, research strengths, personnel, resources, and mission mandates leading to complementary research core competencies.



The Venn diagram summarizes the core research competencies of each of the three Agencies. Further details can be found in the appendix to this memorandum.

2. Collaborate on research topics as appropriate. While each Agency will focus on its areas of core research competency, there will be tasks for which the combined capabilities of more than one Agency will be necessary to address a particular research topic.

An example of collaboration is research on water use for hydraulic fracturing, in which the EPA focuses on the impacts and effectiveness of current technology, DOE focuses on improvements that future technological innovations may yield, and USGS focuses on stream gage and groundwater monitoring to determine water availability, use, and groundwater flow modeling. Another example is the ongoing prospective case study in the Marcellus Shale that the three Agencies are currently collaborating on in support of the EPA's congressionally mandated study on hydraulic fracturing. Where practical and advisable, efforts will be made among the Agencies to apply common and/or consistent monitoring, sampling, and analytical protocols. These and other topic areas are represented by the green areas in the Venn diagram and will be further defined in the research plan discussed in the section below.

3. Bring coordination and consistency to the annual budget process. Effective research requires a sustained, well-planned effort. The three Agencies will work to ensure that the annual budget process is part of a coordinated multi-year effort with targeted results.

Forming the Partnership

The three Agencies will take the following steps:

Interagency management structure: The three Agencies will create a Steering Committee to coordinate the Agencies' activities for unconventional oil and gas research. Each Agency will contribute two members to the Steering Committee: one member focused on policy and one member focused on research and technology. The Office of Science and Technology Policy (OSTP) will also provide a member to serve on the Steering Committee. The lead agency of the Steering Committee will rotate annually among the three Agencies in alphabetical order: DOE, DOI, EPA. The Steering Committee will provide leadership, coordinate the activities of the three participating Agencies, and reach out to other relevant Federal, state and local organizations.

Formalizing a research plan: Within 9 months of formation, the Steering Committee will publish a formal multi-year Research Plan that will:

- a. analyze and synthesize the state of knowledge of unconventional oil and gas research to assist in identifying and prioritizing new research directions;
- b. identify, categorize, and prioritize research topics relevant to the safety and environmental sustainability of unconventional oil and natural gas exploration and production;
- c. identify gaps in available data and appropriate activities to address these topics;
- d. identify research milestones and deliverables;
- e. describe steps to promote transparency and maximize stakeholder participation and notification;
- f. establish specific mechanisms for cooperative relationships among the three member Agencies in planning and conducting research and reviewing the results; and
- g. determine future plans, goals and objectives.

Within 6 months of formation the Steering Committee will have a draft of the research plan prepared for public comment.

As part of establishing the research plan, the Steering Committee will solicit comments from the scientific community, public and relevant stakeholders and will hold periodic workshops for this purpose, as appropriate.

Ongoing collaboration: The Steering Committee, augmented by appropriate staff, will meet on a quarterly basis to discuss research efforts being conducted under the research plan, track key milestones, identify and address any implementation challenges, and ensure that work in the priority areas is carried out efficiently and effectively.

Initial engagement: The Steering Committee will hold its inaugural meeting within one month of the effective date of this memorandum. In this meeting, the three member Agencies will nominate members to serve on the Steering Committee, and will further refine as necessary the steps outlined in this memorandum.

Progress Report: The three Agencies will issue an annual public progress report in conjunction with the budget process providing an update on the status of research under way in the previous year, including significant findings, progress toward milestones set forth in the research plan, and any changes in research direction or focus planned for the following year.

Appendix: Agency Roles and Core Competencies

- Department of Energy

The DOE has research experience and capabilities in wellbore integrity, flow and control; green technologies; and complex systems, imaging, materials, earth science and engineering. Practices employed by companies engaging in exploration and production of shale gas evolve rapidly. An understanding of these technologies and practices is critical if the Federal Government is to accurately quantify the risks of these activities.

Wellbore integrity, flow and control: The DOE capabilities in this area include experience and expertise in quantifying, evaluating, and mitigating potential risks resulting from the production and development of the shale gas resources, to include multi-phase flow in wells and reservoirs, well control, casing, cementing, drilling fluids, and abandonment operations associated with drilling, completion, stimulation and production operations. The DOE has experience in evaluating seal-integrity and wellbore-integrity characteristics in the context of protection of groundwater.

Green technologies: The DOE has experience and expertise in the development of a wide range of new technologies and processes, to include innovations which reduce the environmental impact of exploration and production such as greener chemicals or additives used in shale gas development, flowback water treatment processes and water filtration technologies. Data from these research activities assists regulatory agencies in making a science-based cost-benefit analysis of requiring producers to adopt new technologies to mitigate environmental risks.

Systems engineering, imaging and materials: The DOE specializes in the development of complex, engineered systems, high-speed computing and predictive modeling, and has experience in quantifying and mitigating low-frequency, high-impact risks. This includes evaluating human factors which potentially contribute to failures. The DOE has developed and evaluated novel imaging technologies for areal magnetic surveys for the detection of unmarked abandoned wells, and for detecting and measuring fugitive methane emissions from exploration, production, and transportation facilities. The DOE also has experience in understanding of fundamental interactions caused during the drilling process, such as the equation of state research that investigates the relationship between pressure, temperature, and viscosity of multi-phase fluids at the high temperatures and pressures associated with deep drilling and hydraulic fracturing. The DOE's experience in engineered underground containment systems for CO₂ storage brings capabilities that are relevant to the challenges of safe shale gas production, such as evaluating cement-casing integrity in corrosive environment to characterize long-term wellbore integrity for CO₂ sequestration.

- Department of the Interior:

The United States Geological Survey (USGS) has research experience and capabilities in resource assessments; natural systems, geology, hydrology; and evaluation of effects on land use, wildlife and ecological systems.

Resource Assessment: The USGS conducts research and assessments of the undiscovered, technically recoverable oil and gas resources of the United States (exclusive of the Federal Outer Continental Shelf). The USGS assessments use a geology-based assessment methodology that characterizes the total petroleum system considering source rock richness, petrophysical properties, thermal maturation, petroleum generation, migration, and reservoir rock as important factors in evaluating the hydrocarbon accumulation. Assessments incorporate uncertainty, are fully risked, and are reported as statistical estimates of gas, oil, and natural hydrocarbon liquids content. They support analyses to determine those resources that are economically recoverable. These assessments play an important role in Federal policymaking and land management and also support decision making at tribal, state and local levels.

Geology and Hydrology: Understanding the stratigraphy, physical trapping mechanisms, petroleum geochemistry, and stress conditions of unconventional basin gas and oil-bearing formations is critical to determining local and regional variations in gas and oil abundance, composition, and quality that identify rock formation targets and guide operational plans for drilling and hydrofracturing, and for understanding and forecasting the composition of produced waters. The USGS expertise in earthquake seismology, geothermal systems, and geologic carbon sequestration is appropriate for induced seismicity evaluation. Down hole rock composition, native and flowback fluid composition, borehole temperature and pressure, and in situ stress levels are used to generate groundwater flow models and geochemical models that provide estimates of solute transport and rates and the potential fate of injected waters and their constituents. The USGS operates more than 7,700 of the Nation's surface water streamgages and groundwater monitoring wells each of which provide data critical for assessing and modeling water availability and water quality important to understanding water use, contaminant occurrences, flood hazards, and ecological flows. Cooperative agreements with state and local agencies provide additional data. Water quantity and quality are potentially affected by energy production activities. The USGS maintains an extensive, nationwide water monitoring capability and conducts assessments of surface and groundwater availability throughout the Nation, including both fresh and brackish groundwater resources.

Land Use, Wildlife, and Ecologic Impact: The USGS has diverse capabilities to evaluate potential impacts to biological resources and the water resources available to sustain them due to activities associated with shale gas and tight oil production. Landscape scale research is important to quantifying the response of key species and habitats to land disturbance, contaminants, and other potential impacts resulting from development of shale gas and tight oil resources and to develop best management practices to mitigate impacts. Remotely sensed airborne imagery is used to assess forest fragmentation and effects of shale gas activities on land use patterns, wetlands, and migratory bird populations. The USGS also assesses the effects of habitat change on key aquatic species including endangered species affected by hydrocarbon production.

- Environmental Protection Agency:

The EPA has research experience and capabilities across a wide range of scientific and technical disciplines that support the Agency's mission of protecting human health and safeguarding the environment. This includes core competencies in the areas of environmental and human health risk assessment, air quality, and water quality. The EPA has the unique ability to conduct research that spans the characterization of sources and emissions, to pollutant fate and transport, to ecosystem and human exposures, health effects and risk assessment, and to the prevention and management of environmental risks.

Environmental and Human Health Risk: The EPA has extensive capabilities to characterize the effects of contaminants and environmental stressors on ecosystem integrity and human health for air and water contaminants and mixtures associated with gas extraction practices. Ecological research capabilities that support risk assessments focus on evaluating potential physical, chemical, and biological changes to ecosystems, disruptions of ecological flows in headwater rivers, and impacts on terrestrial wildlife, stream macrobenthos, and fish. The Agency also has the expertise to evaluate landscape pattern changes in terms of available habitat and changes in vulnerability for rare or unique ecosystems. The EPA research capabilities that support human health risk assessments include conducting field measurements and other types of studies to characterize exposures, performing laboratory and computational toxicology studies for hazard identification and dose response assessments, and developing and applying risk assessment methods to evaluate human health risks posed by environmental contaminants.

Air Quality: The EPA possesses expertise in the measurement and modeling of air pollutants from sources related to all phases of gas extraction, processing, storage, and distribution. This includes using mobile and fixed air monitoring systems to estimate local, regional, and national exposures to air pollutants.

Water Quality: Groundwater protection research capabilities at the EPA include quantifying the effects of exploration and production activities on ground water quantity and quality, conducting subsurface hydrogeological and geochemical modeling, evaluating well integrity issues, and assessing the potential for releases to groundwater from wells or surface impoundments during drilling, completion, operation or post closure.