

Workshop on Risks of Unconventional Shale Gas Development

National Research Council
500 Fifth St., N.W.
Washington DC
Room 100
May 30-31, 2013

AGENDA (as of 2013-05-31 15:45)

Thursday May 30

8:00 Breakfast

8:30 Introduction of the committee – *Paul C. Stern, National Research Council, committee study director*

Purposes of the project and workshop procedures

Presenter: Mitchell Small, Carnegie Mellon University, committee chair

Project aims to identify concerns about risks and about the ability to control them. Through the work of paper authors, it hopes to present summaries of the state of knowledge about some of the important concerns, with special attention to some concerns that have not yet received much analysis, and to identify issues needing more careful research, analysis, discussion, and policy attention. The purpose of the project is not to reach conclusions about shale gas development, but to provide an improved basis for reaching such conclusions.

[PPT](#)

9:00 Concerns About Shale Gas Risks among Interested and Affected Parties

Presenter: Thomas Webler, Social and Environmental Research Institute

Moderator: Mitchell Small

Presenter will describe the rationale, methods for, and results from the committee's efforts to elicit concerns about risks of unconventional shale gas development from a broad range of interested and potentially affected parties. Presentation will include a conceptual framework for grouping these concerns, a list of types of concerns that the effort identified, and information on the characteristics of respondents raising particular kinds of concerns. It will identify some significant concerns that have not received much analytical attention, including some that may not be addressed by the papers in this workshop. It will also compare the findings about concerns from this effort with the lists of concerns that have emerged from some other recent efforts.

[Abstract](#) [PPT](#)

9:30 **Discussion (Note: Discussion sessions will include comments from in-person and webcast participants, with responses from presenters, discussants, and moderators)**

10:00 Coffee Break

Presentations and Discussions of Risk Issues

10:15 Operational Risk Issues in Shale Gas Development

Presenter: Kris J. Nygaard, ExxonMobil Corporation

[Abstract](#) [PPT](#)

Moderator: Barbara Zielinska, Desert Research Institute, committee member

Discussants:

Mark Zoback, Stanford University

Meagan Mauter, Carnegie-Mellon University

Presenter will summarize knowledge about risks associated with operational practices in the industry, focusing especially on risks of potential shallow water aquifer contamination from the hydraulic fracturing process, of potential surface release and/or spill of chemicals and unplanned subsurface fluid migration, and of potential induced seismicity, considering both waste-water injection operations and hydraulic fracturing operations.

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11:15 **Discussion**

11:45 Break for lunch (on your own)

12:45 An Overview of the Risks of Shale Gas Exploration and Hydraulic Fracturing to Water Resources in the United States

Presenter: Avner Vengosh, Duke University

Moderator: Barbara Zielinska, Desert Research Institute, committee member

Discussant: Jean Philippe Nicot, University of Texas

This paper provides an overview of the risks of water contamination, discussing three issues related to these risks. The first is contamination of drinking water with fracking chemicals, deep formation waters, or stray gas, which is the most common of these forms of contamination. A second risk is possible natural pathways and hydraulic connection between deep underlying formations and shallow drinking water aquifers in which pressurized gas and brine can flow to shallow aquifers. The third risk is the disposal and/or accidental spill of flowback and produced waters, which are often highly saline and toxic and contain naturally occurring radioactivity.

[Abstract](#) [PPT](#)

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1:30 **Discussion**

2:00 Air Impacts of Gas Shale Extraction and Distribution

Presenter: Christopher W. Moore, Desert Research Institute

Moderator: Warner North, Northworks, committee member

Discussant: Gabrielle Petron, National Oceanic and Atmospheric Administration

Much attention has been focused on the implications of developing unconventional natural gas plays, particularly shale gas drilling via hydraulic fracturing (fracking) in the United States. One specific area of concern is the impact on air quality as a direct and indirect result of fracking. Direct impacts can include compressor engine exhausts (typically internal combustion engines), oil and condensate tank vents, production well fugitives, well drilling and hydraulic fracturing, natural gas processing and transmission fugitives, while indirect effects can include a rapid increase in large diesel truck traffic resulting in increased particulate and volatile compound emissions. Pollutants released from these activities can include methane, non-methane volatile organic compounds (VOCs), aromatic hydrocarbons, particulate matter, and other ozone precursors (nitrous oxides and carbon monoxide). In this paper, we will summarize the current state of knowledge on the air impacts of fracking from well development to production, explore potentially important gaps in that knowledge, and present ideas for future research.

[Abstract](#) [PPT](#)

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2:45 **Discussion**

3:15 Coffee Break

3:30 Public Health Risks in Shale Gas Development

Presenter: John Adgate, Colorado School of Public Health

Moderator: Warner North, Northworks, committee member

Discussants:

David Brown, Southwest Pennsylvania Environmental Health Project

Tiffany Bredfeldt, Texas Commission on Environmental Quality

This paper will discuss the range of public health hazards associated with unconventional shale gas development and quantitative and qualitative methods of assessing the risks. It will review the evidence on public health effects, including issues of attributing impacts, cost/benefit comparisons, uncertainties, and cumulative risk issues, and it will identify key uncertainties and research needs.

[Abstract](#) [PPT](#)

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4:30 **Discussion**

5:00 End of first day

Friday, May 31

Presentations and Discussions of Risk Issues (continued)

8:30 Ecological Risks of Shale Gas Development

Presenters: Zack Bowen and Aida Farag, U.S. Geological Survey

Moderator: Susan Tierney, Analysis Group, committee member

Discussant: Margaret Brittingham, Pennsylvania State University

[Abstract](#) [PPT](#)

[PPT](#)

9:15 **Discussion**

9:45 Implications of Shale Gas Development for Climate Change

Presenter: Richard Newell, Duke University

Moderator: Susan Tierney, Analysis Group, committee member

Discussant: Jason Bordoff, Center for Global Energy Policy, Columbia University

Various claims, some of them controversial, have been made about the effects of shale gas development on greenhouse gas emissions and climate change. Many of these claims have focused on the extent to which shale gas extraction will leak methane--a greenhouse gas many times more powerful than carbon dioxide--into the environment. Others have focused on the extent to which gas will replace coal in electricity generation. This paper will develop a conceptual framework for assessing the climate impacts of shale gas development and review and assess the evidence on various possible effects, including the commonly cited ones as well as other potential effects of shale gas development on greenhouse gas emissions that operate through national and global energy markets. These include the potential for gas to replace or delay adoption of renewable sources of energy and for low-cost gas to allow lower-income consumers to obtain energy services from gas that they had previously done without, thus increasing the size of energy markets. The paper will assess available estimates of such effects, including the gaps in data and understanding and the uncertainties in the estimates. It will offer judgments about which factors are likely to determine the net effect of shale gas development on greenhouse gas emissions and, to the extent available analyses allow, about what the net effect is likely to be.

[Abstract](#) [PPT](#)

10:30 **Discussion**

11:00 Coffee Break

11:15 Risks to Communities from Shale Gas Development

Presenter: Jeffrey Jacquet, South Dakota State University

Moderator: Bernard Goldstein, University of Pittsburgh, committee member

Discussant: Susan Christopherson, Cornell University

Although shale gas development can bring infusions of money, and sometimes jobs, to local communities, it has less-obvious downsides. The “energy boomtown” sociological literature from the 1970s and 1980s suggests that rapid industrialization associated with oil and gas development often results in overburdened municipal services, upended social and cultural patterns, and volatile economic growth at the local level. Emerging shale gas case studies in Wyoming, Pennsylvania, and Texas show a similar although nuanced picture of these concerns. Shale gas development can produce dramatically uneven distributions of costs and benefits, with the benefits accruing predominantly to land and business owners associated with the gas industry. Emerging data show deep divisions among residents in host communities as attitudes towards shale development and perceptions of impacts are polarized depending on financial gain and environmental worldview. Residents who perceive little benefit from shale development face heightened stress and decreased quality of life. Social-psychological studies have demonstrated that both residents and outsiders can come to associate industrialized communities with contamination, resulting in out-migration, declining amenity-led development, and decreased financial investment, all of which pose threats to the long term economic stability of these locales. The long-term community-level implications of these challenges are unclear; more research is needed into areas such as the social and economic effects of contamination stigma on communities, how wealth and property will be transferred to younger generations by the aging populations that overwhelmingly comprise non-metropolitan areas and the implications for the future of the communities, and the extended pace and scale of shale gas activity. Regulatory changes can help to mitigate growth management challenges, increase benefits to non-landowners, and support long-term economic stability, and research on community impacts can inform policy implementation. Limitations of available research include a predominantly case-based methodology that can limit generalizability of findings, and a lack of integration with environmental or health impact assessments.

[Abstract](#) [PPT](#)

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12:00 **Discussion, including identification of additional community risk concerns**

12:30 Break for lunch (on your own)

A Look at the Big Picture

1:30 Interactions Among Risks

Presenter: Alan Krupnick, Resources for the Future

Moderator: Robert Jackson, Duke University, committee member

Discussants:

Risks from unexpected events in complex systems, *Charles Perrow, Yale University*

Risks to trust and functioning in communities, *Roger Kasperson, Clark University*

[Abstract](#) [PPT](#)

[PPT](#)

The large-scale development of natural gas resources from deep shale formations has raised a host of concerns about risks to the environment and human health. The concerns of the general public, reflected in media coverage of this issue, may be due in part to the dearth of empirical evidence quantifying the scope, nature, and magnitude of environmental risks, as the physical and social science literatures regarding environmental risks are still very thin. This paper begins by describing a risk matrix that identifies 264 risk pathways linking shale gas development activities to environmental burdens and the media in which they appear. After briefly reviewing the literature on risks from shale gas development to air quality, surface water quality, groundwater, species habitat, and other

environmental endpoints, we describe high priority risks identified by an expert survey conducted by RFF, using these same 264 potential risk pathways. For the highest priority risks we note where uncertainties appear to be largest and where further study is especially needed. We then identify potential interactions -- ways in which multiple risk pathways may act synergistically to increase risks, or antagonistically to diminish risks. The paper then speculates on how risks from any pathway or combination of pathways relate to the scale of drilling activities in a given geographic region. Finally, we consider how risk mitigation strategies may address multiple risk pathways.

2:30 ***Discussion, including identification of additional big-picture issues***

3:00 Coffee Break

3:15 What have we learned from this workshop? Priorities for further study ([form](#))

Discussion of implications of the workshop – brief comments from participants to raise issues such as:

- Which risks appear to be of greatest significance? Which seem to be minor?
- Which important risks have not yet been discussed?
- Which of those that have been discussed are particularly in need of further analysis?

4:30 Comments from committee members and chair; a look forward to the second workshop

Committee members will give their initial impressions, as individuals, on such issues as:

- What have we learned from this workshop? Which important risks are particularly in need of further analysis?
- Which important risks may not be adequately reduced in the normal course of business in the industry? Which pose major challenges for governments?
- What are some of the key governance challenges?

5:00 End of workshop