

APPENDIX B: REGIONAL RESEARCH SURVEY RESULTS SUMMARY, AUGUST 2012

Overall Response Rate: 52 individual faculty and staff members responded to the survey

Question 1: Respondent Contact Information

Responding faculty and staff members represented the following institutions:

- Allegheny College
- Carnegie Mellon University
- Cornell University
- Drexel University
- Indiana University of Pennsylvania
- Ohio State University
- Ohio University
- Pennsylvania State University
- Robert Morris University
- Saint Vincent College
- Slippery Rock University
- Temple University
- University of Pittsburgh at Bradford
- University of Pittsburgh (Oakland)
- Waynesburg University
- Washington & Jefferson College
- Westminster College
- West Virginia University

Question 2: Are any faculty/staff at your institution currently engaged in research surrounding any aspect of shale gas development?

85% answered yes and 15% answered no.

Question 3: If not, why? Has your institution made a conscious decision not to work on shale gas issues (not a good fit with faculty interests, institution strengths, etc.)? Or are there barriers to your faculty becoming more involved in the shale arena? What are these barriers?

Respondents who reported no current shale gas research at their institution cited three barriers - lack of funding resources to perform research, lack of institutional interest in this type of research, and lack of ability to collaborate with industry and/or government.

Question 4 and 5 Combined: Question 4: If yes to Question 2, what research is currently being conducted or what research has been completed in the recent past related to shale gas development (project focus areas/title are sufficient detail)? If you are not the principal investigator for these projects, please consider providing a contact name/e-mail address for each research project. Additionally, we are particularly interested in learning of any water-related shale gas research that is currently being conducted at your institution. What specific projects are you undertaking in this regard?

Question 5: Additional space to discuss research activities if needed.

Respondents reported on (13) primary research areas and (90) subset research areas across their various institutions. The 13 areas included:

- Economics/finance and shale related activities – 15 subsets
- Effect of shale gas on regional water resources – 13 subsets
- Analyzing the physical and chemical properties of Marcellus Shale gas and water – 12 subsets
- Economic and social impacts of shale gas development – 12 subsets
- Wastewater management and Marcellus Shale development – 7 subsets
- The impact of shale gas activity on air emissions and air quality – 6 subsets
- Examining public policy and legal issues surrounding the emerging regional shale gas industry – 5 subsets
- Methods for finding leak detection at CO₂ geological sequestration sites – 5 subsets
- Educational activities and workshops regarding shale gas - 4 subsets
- Exploring shale gas utilization with regard to transportation – 3 subsets
- Geology/geosciences -3 Subsets
- Wildlife and forest impacts and the Marcellus Shale – 3 subsets
- Developing demonstration projects – 2 subsets

Question 6: Are you collaborating (or have you collaborated) with other colleges or universities on any shale research projects?

45% of respondents stated they are collaborating with (or have collaborated with) at least one other college or university on shale gas research. These partnerships are most often with other regional institutions, but national and even international collaboratives were reported.

Question 7: In what geographic territory(ies) has your shale gas research been focused?

- Pennsylvania – 81% of respondents performed shale gas research focused on Pennsylvania
- Marcellus region – 26%
- Marcellus/Utica region – 16%
- Ohio – 13%
- West Virginia – 10%

Question 8: What were the main challenges you encountered in implementing these research projects?

7% responded that they did not encounter any research challenges. 3% suggested that it is too early in their research to respond. Other respondents cited five main challenges encountered in implementing research projects:

- 38% cited funding challenges, specifically difficulty obtaining funding from unbiased sources, insufficient government support for research, and a lack of multi-year research support
- 35% cited data challenges including the general inability to obtain/access data and the specific lack of access to company/industry data
- 21% cited the challenge of identifying appropriate research priorities that would add value, locating other interested researchers and designing collaborations among institutions and industry/government
- 10% cited infrastructure/technical challenges, including limited analytical equipment, technical staff and administration support
- 10% cited political sensitivity challenges, including difficulty reaching agreements with industry about research protocols and about how to handle confidentiality issues

Question 9: Has it been difficult to prioritize your institution's involvement in various shale gas issues?

58% of individuals said that it had not been difficult to prioritize the institution's involvement in various shale gas issues. This appears largely due to faculty interests and capabilities driving each institution's involvement. Some respondents said it was difficult to define the institution's role without being labeled "pro" or "con" shale gas development. There are strong voices on both sides of the community, and the vision is to attempt to focus on education/information/science related to the topic without "picking a side."

Question 10: Has any of this research either been published in peer-reviewed journals or other formats? If so, please provide links to the published materials if you are able.

38% of individuals reported being published in peer-reviewed journals or other formats. 17% have research that is in progress/pending being published in peer-reviewed journals or other formats. Many faculty provided links to these papers.

Question 11: Have you used any of this research to inform the public, media, or policymakers about critical shale gas? Did you find community sharing to be useful and/or impactful? Have you encountered any difficulties in translating shale gas research for consumption by these groups?

59% responded that they have not used research to inform the public, media, or policymakers about critical shale gas issues.

20% of individuals responded 'yes', using research to inform the public has been impactful but also challenging. Respondents said that the challenges are due to strongly held opinions on both sides accompanied by a resistance to accept 'gray areas,' polarization of issues by media, the quality of commentary and research being published, and the lack of good data to share.

17% responded 'yes' they have used research to inform the public, which was impactful and not challenging. Respondents noted that forms of engagement, such as working with landowner groups, business leaders, and elected officials, can create fruitful dialogue and are leading to new branches of research.

Question 12: Do you believe that your institution has the capacity and/or untapped capabilities that would allow it to further engage in research around shale gas development if the right opportunity arose? If so, what type of research and activity priorities would be of most interest to you?

97% of respondents said 'yes' - their institution has capacity and/or untapped capabilities that would allow them to further engage in shale gas research. Specific untapped capabilities or areas of interest included the following:

- Advanced materials research
- Baseline monitoring of shale areas
- Community development issues
- Cumulative impact assessment frameworks
- Development of workforce educational courses
- Downstream process engineering
- Drilling and fracturing technologies
- Economic impact on communities
- Economic impact on energy sources
- Economic/environmental impact cost/benefit analyses
- Emissions monitoring
- Environmental impact study that is comprehensive
- Gas and liquids processing research
- GIS mapping
- Leadership of multi-institution shale gas consortia
- Local planning
- Logistical/engineering and financial interface
- Making Pennsylvania a pilot jurisdiction as it relates to public policy
- Opportunities for alternative water sources
- Public health impacts
- Public policy-related issues
- Research on alternative regulatory regimes
- Safety issues
- Upstream to downstream development aspects

- Wastewater management
- Water chemistry analysis
- Water treatment technology
- Well engineering

Question 13: What barriers have prevented this additional capacity/capability from being utilized?

- 75% said that there is a lack of financial support for research (federal, state and private sources)
- 22% said that there was limited time to pursue additional research projects
- 6% said that there was a lack of support at their college to help them
- Other responses included the following:
 - Finding appropriate collaborators to make a contribution to research support
 - Some research support is viewed as biased
 - Lack of industry partners/relationships
 - Lack of understanding on the engineering side of the research issues as to how useful economists, operations, and finance faculty can be in evaluating the policy issues
 - Lack of availability of PhD Students
 - Lack of knowledge of opportunities

Question 14: Are there other areas of research that you think would require attention, even if they are outside of your institution's interest areas?

Responses included:

- Atmospheric contamination from escaped methane, diesel ground operations, etc.
- Examine international exports of huge, cheap quantities of natural gas versus the import of huge, expensive quantities of oil
- Geologic research
- Long-term well integrity evaluations
- Pipeline effects on biodiversity
- Possible negative socioeconomic impacts of boom and bust economy
- Public health, specifically whether possible illnesses that could be associated with shale gas production are impacting health
- Revisiting existing oil and gas industry legal exemptions from state and federal environmental and safety regulations
- Technological issues that could lead to better ways to conduct the resource extraction
- The need for a data warehouse for energy information that houses, reviews, and makes available pertinent statistics and information to the public
- The potential for migration of fluids and gas from horizontal hydraulic fracturing to enter surface and groundwater
- Trading tariffs and supply/demand limitations
- Workforce development issues