Comments on the Marcellus Shale Safe Drilling Initiative "Best Practices" Report

The comments below are submitted by the Marcellus Shale Committee of the Deep Creek Lake Property Owners' Association (POA). These comments are organized as:

- Selective section-by-section comments on recommended best practices
- Broader comments which identify related issues and activities viewed as important to development of the August 2014 final report.

These comments are not explicitly prioritized. However, we note that those who treasure the rural character and scenic beauty of the Deep Creek Lake (DCL) area have particular concerns about "industrialization" as well as environmental and health impacts (traffic, noise, visual/physical profile, etc.).

The general view of the committee is that the MDE/DNR report---and the UMD-CES Appalachian Laboratory report which provided a valuable foundation---are generally comprehensive and represent substantial progress toward a robust set of best practices. These are viewed as deserving the "gold standard" characterization in several areas.

However, there is of course no such thing as "zero" risk. This begs the question of how to address the levels of risk remaining once best practices are adopted and then to determine whether the remaining risk levels are acceptable (or not), given also a view of the potential gains. We applaud the fact that the state agencies have recently committed to executing a structured risk analysis as part of the Safe Drilling Initiative. This topic is discussed further in the broader comments below.

Section-by-Section Comments

Despite some relevant engineering expertise/experience within the Committee, we are surely not the experts. But, we offer these comments for consideration. Some of the comments below identify best practices found in other sources. Other comments summarize our understanding of recent scientific and empirical studies, identifying their possible implications on best practices (e.g., setback distances). More specifically, the comments below---and some in our discussion of broader considerations--- reference studies by Duke University, the University of Texas (Arlington), and the DOE National Energy Technology Laboratory (NETL); they are offered in the spirit of assuring that the ultimately-adopted best practices take advantage of emerging scientific evidence to the maximum extent practicable.

<u>III – Comprehensive Gas Development Plans (CGDP's)</u>

- It would appear useful, during both CGDP development and review, to consider the tradeoffs between trucking of water and use of water pipelines (e.g., traffic vs. land disturbance impacts)
- Regarding the 2% maximum surface development for "high value watersheds", it would be useful to clarify how multiple CGDP's impacting the same watershed would be handled.
- The Shale gas Development Toolbox initiative is applauded.

IV- Location Restrictions and Setbacks

In general, we recommend inclusion---in the table and/or the accompanying text---of the rationale for the specified setbacks. Some appear arbitrary.

More specifically, there was concern voiced, during the 9 July Garret College session, about the proposed setback distance between a borehole and a private well (1.000 ft.), this contrasted to a proposed greater separation for public wells or surface water intakes (2,000 ft.). We recommend that this difference be reconsidered or explicitly rationalized. And, note that Section V, p. 21, implies that a private well within 2,500 ft. is a potential issue. Surely there should be one, consistent setback specified.

Beyond consistent and explicit logic within the report, there is the important topic of reflecting recent scientific study results regarding possible well contamination. Specifically, a recent Duke University study found---in summary--- that wells within 1 km (~3300 ft.) of gas wells exhibited substantially higher levels of dissolved methane (X6) than those more distant. The detected levels are viewed as unacceptable from a health standpoint. This suggests serious consideration of increasing the well setbacks distance to the observed threshold of 3,300 feet. (The Duke study sampled 141 wells in PA). At a minimum, the ultimately-recommended setbacks should be rationalized against this empirical data.

It is understood that reasonable setback requirements cannot cover all possible “contingencies”. For instance, we understand that the vertical drilling process itself can---dependent upon geology--- create fractures which can run long distances and create pathways for methane to reach aquifers/wells. This strikes us as among the “threats” that should be identified and calibrated, based on the best data and experience available. This would logically be part of a “risk analysis”.

“Noise” is viewed as a potentially significant industrialization issue. We are having difficulty rationalizing the largely noise-driven setbacks appearing in this section with the noise discussion in Section VI.M. For instance, the setback table specifies 1,000 ft. between an occupied building and a compressor station, while Section VI.M seems to call for at least 3,000 ft. unless the only engine/motor source is electric. Something to be changed or explained? Are we misreading?

V – Plan for Each Well

pages 20-21 provide a comprehensive list of areas to be covered in an application. Will regulations provide “standards” for most of these, or are the approval criteria viewed as inherently case-by-case? Seems appropriate to also call for coverage of re-fracturing intervals as an indicator of potentially repetitive industrial activity. The Pittsburgh-based Center for Sustainable Shale Development (CSSD) has generated an interesting “performance standard” which calls for establishment of an “Area of Review (AOR)---which covers both the vertical and horizontal legs of the planned well”. Among other stipulations, the standard mandates “ a comprehensive characterization of subsurface geology, including a risk analysis’’ as related to “confining layers” preventing “adverse migration of fracturing fluid”. [SOURCE: CSSD

Performance Standards dated March 2013]. This "practice" is offered for consideration and relates to the controversy about possible migration of "bad stuff" to "good water" even from 6,000 to 8,000 foot depths. The CSSD emphasis on "a comprehensive characterization of subsurface geology, including a risk analysis" is re-enforced by results of two recent studies involving field measurements of potential impacts on wells/aquifers. On the "bad news" side, there is the Duke study summarized above which collected field data on methane leakage pathways much longer than often assumed. On the "good news" side, recent press releases have characterized preliminary results of an ongoing (not yet released) DOE NETL study, determining---for only one well with tracers injected into the fracking fluid---that potential contaminants did not reach even the 5,000 foot depth level when released at 8,000 feet as part of the fracking process.(Drinking water supplies are well above the 5,000 foot level). The point here is not to reach broader conclusions about risk to drinking water. Instead, we observe that both studies acknowledge that their results are dependent on the specifics of the geology. This suggests that the mandated plans for each well should be as specific as possible about required geological characterization. See a comment below on Section VI. M (Noise) which suggests that an analysis of noise impacts be part of the plan for each well/well pad.

VI –Engineering, Design, and Environmental Controls and Standards

A number of strong provisions are applauded, including handling of wastewater (e.g.,>90% recycled within closed-loop system), prevention of drill pad, etc. "leakage" (e.g., liners, impermeable berms), and blow-out prevention (redundancy).VI.A.5 – *Road Construction*---The discussion of road construction standards appears comprehensive. However, the topic of who pays for public road maintenance is not addressed. It may well be that there are plans to address this elsewhere (e.g., the Towson study of economics), but this and similar topics need to be covered at least in the final report.VI. F – *Casing and Cement* It seems clear that the engineering and design standards in this section are particularly crucial as related to drinking water quality. Well integrity is identified as a key factor in methane "leakage" into wells/aquifers (e.g., the Duke study referenced above). Well integrity surely relates also to hydraulic fluid escape before reaching the deep horizontal "leg". Further, non-trivial failure rates of 5% or greater can be found in articles/reports. Such failure rates are not comforting, though admittedly difficult to validate/calibrate. (E.g., New York Times article by Dr. Anthony Ingraffea.)Subsection 1---The specified safety margin of 1.2 seems small; a factor of 2.0 is viewed as more common. Regarding cement strength, shouldn't testing standards of 500 psi within 12 hours be specified? Require industry to specify the testing method? Subsection 2---The report specifies that the vertical casing extend below the "deepest known stratum bearing clear water" by a minimum of 100 vertical feet. This vertical distance seems small. Casings should extend at least below the brine level, and we've seen a study for the European Commission calling for a large distance of 600 meters (1,950 feet). Seems that some reconsideration is warranted and, as for setbacks, the rationale provided. Subsection 3---Seems that required action should be specified when a segmented radial cement bond log indicates a failure. (For instance, grout being inadvertently pumped into a void.)

VI. J – *Air Emissions* The March 2013 CSSD standards appear to be particularly stringent in this area. For instance, their performance standard #10 quantifies "green completion" by calling for a methane "destruction efficiency" of 98%. Their performance standard #11 specifies what percentage of drill rig engines should comply with EPA Tier 4 emission standards by what year. Again, we are not experts; we are simply highlighting these "practices/standards" for whatever technical consideration is warranted. The well integrity issue noted above appears to be crucial here, too; casing leaks can allow methane to escape upward outside the pipe.

VI.M – Noise This appears to be an important but difficult issue, with standards and enforcement largely in the hands of local jurisdictions. However, Table VI-1 lays out state-level standards for noise levels at the "receiving end" for various classes of property. Wouldn't it be useful to calculate the implied setback distance from, say, active drilling rigs or compressor stations whose noise level at the source is surely known or readily measured?? Has this been done?? Is this the basis for Section IV setbacks though not explicit??Beyond specifying setbacks broadly based on state-level standards as above, one could (1) identify specific residential or commercial facilities around a particular proposed well/well pad, (2) specify maximum noise levels at these specific locations as part of the application for each well (per local standards), and (3) mandate that the plan for each well/well pad include an <u>analysis of how the standards will be met for the specific "noise sources" that are part of the industry application.</u> (Will the well plans include locations and design parameters of compressor stations as well as drilling rigs??)

<u>VII – Monitoring, Recordkeeping, and Recording</u>

The emphasis on systematic and comprehensive effort in these areas, and the specific requirement for a 2-year baseline monitoring period, are applauded. However, both the report (point B) and the 9 July presentation emphasize that the specifics of data collection, data analysis, and its application to compliance monitoring are to be developed later. Fine for the details, but a delineation of the fundamental parameters and methods would be in the interest of making the "practice" more complete and building public confidence.

<u>X – Implementing the Recommendations</u>

The helpful note to the reader indicates that a roadmap for implementing the best practice recommendations will be developed after the report is finalized. Will this roadmap be available by the time of the August 2014 final report or before? Will draft regulations---codifying the recommended best practices---be available as part of the final report??

<u>Appendix D – Marcellus Shale Constraint Analysis</u>

Very useful and interesting analysis in terms of illuminating some of the risk/benefit tradeoffs which will ultimately be in the hands of state-level decision-makers (i.e., constraints which reduce potential risks vs. the impacts on potential economic benefits). Can it be assumed that (1) this analysis will be updated as required for purposes of the best practices final report and (2) that the results on natural gas recovery will be factored into the Towson U. RESI economics effort?

<u>Appendix E – Marcellus Shale and Recreational and Aesthetic Resources in Western Maryland</u>

The more in-depth look at protecting the identified, vital public resources is applauded. The motivation to protect "recreational and aesthetic resources" of course applies to private land as well (e.g. the scenic beauty and rural character of the Deep Creek Lake area as treasured by our POA members and others). Having said that, it seems that there may be some positive synergy between the DNR effort described and the RESI study of community impacts/interests. Do study plans and schedules account for this?

Broader Comments

Identifying and assessing risks---We are impressed with the progress made on this topic since, for instance, the 9 July Garrett College session. Presentations and discussions at the 26 August Advisory Commission meeting evidenced, in our view:
A clear recognition of the need for some form of "risk analysis" to support the ultimate decision of whether deep shale gas recovery can be conducted "without unacceptable risk" (per the Governor's Executive Order).A state agency commitment to conducting such an analysis in a comprehensive and open way, recognizing resource and time constraints.Adoption of a practical methodology which involves systematic, structured analysis of risk in terms of "bad things" that could occur, their likelihood, and their consequences. (Impressed by Dr. Voe's presentation of a practical, apparently successfully-used methodology for complex situation with many uncertainties.)Recognition that, given the general lack of "statistically-significant" empirical evidence for many factors of interest, risk assessment results will generally be qualitative (e.g., high, medium, low)---not fully satisfying to some, but still a potentially valuable input to both state decision-making and to public understanding/trust.We hope that our understanding of what is being proposed is correct. We will of course follow the effort and, additionally, we offer to play whatever role is helpful in the spirit of the "substantive public engagement" point made during the meeting.

Turning to a couple of specifics from a DCL perspective, we again note that those who treasure the rural character and scenic beauty of the area have concerns about "industrialization" (noise, traffic, "view-shed" impacts, etc.). It is also noted that we would expect the Towson RESI study to identify such issues/stakeholder concerns. This all implies that (1) the Towson study should be a source of risk areas to be addressed, (2) that the risk analysis must address what could be called "soft" as opposed to "hard" risks (e.g., adverse "view-shed" impacts caused by deforestation vs., drinking water contamination linked to well casing failures), and (3) that the ultimate structuring of H/M/L risk levels will have to support deliberations about "acceptable to whom" (e.g., a DCL property owner vs. a Bittinger farmer's concern about lake "view-shed" impacts).

Required regulatory and compliance resources and expertise---The report notes the issue of building the required "capacity" to implement the proposed best practices regime, presumably including enforcement as well as development of regulations. "Capacity" clearly includes expertise/experience as well as numbers. Some of us have experience with government oversight of complicated projects, indicating a critical need for "industry-matching" expertise on the "government side of the table". This expertise could be provided in-house or contracted out, the latter option---apparently including contracting through the energy companies themselves---was noted during the 9 July session. Will the required resources, expertise as well as numbers, be laid out in the August 2014 final report and factored into the RESI study of economics?? Will the information provided indicate the role of contracting and any steps needed to assure that there is no inherent conflict of interest in contractor roles?

Returning to the best practices topic after completing other studies---It is assumed, based on the stakeholder interviews/discussions, that the RESI study of "community impacts" will address what we have been calling "industrialization" factors (traffic, noise, visual/physical footprint, etc.). It seems possible that these elements of the RESI study will suggest further or modified best practices.

Analogously, the planned study of public health could lead back to a consideration of additional or modified best practices. For instance, beyond the radioactive material issue addressed in the report, we understand that there may be other toxic substance issues that require special treatment. As an example, a University of Texas (Arlington) study identified unsafe levels of arsenic, selenium, and strontium when sampling 100 wells "near" drilling sites, noting carefully that the causes are uncertain (e.g., possibly pipe rust dislodged by drilling rather than fracking fluid contamination).

Do study plans and schedules allow for this "looping back" to best practices in time to influence the August 2014 final report??

Motivating the adoption of "better" technologies/method--- There are, of course, a number of relevant technologies being explored by industry and government entities (e.g., DOE labs) which offer increased "efficiencies" (gas recovery cost reductions) and/or "better outcomes" in terms of potential adverse impacts. As used here, the term "better" implies safer, quieter, cleaner, lower physical profile, etc. Examples include CO2 fracking (avoiding the flowback water issue), "valved" piping (incremental fracking in a way which reduces water requirements), new proppants (keeping fractures open longer), and advanced sensors to detect methane leakage into the atmosphere (supporting management of greenhouse gas emissions).

Clearly, improved efficiencies/lower recovery costs are the dominant (though not exclusive) industry interest. Given the view that mandating particular technology is neither appropriate nor necessarily productive, the question becomes how the adoption of "better" as well as more efficient technologies might be motivated. An option for consideration: require industry to discuss their plan for adoption of "better" technology as part of the CGDP's and/or the individual well applications.

Further, note that the technology and engineering practices employed can, of course, impact system reliability/integrity, another dimension of "better" if you will. These attributes, in turn, impact the likelihood of "bad things" occurring, a key factor in the kind of risk analysis discussed above. In that context, it is important to quantify system and component equipment reliability/integrity for both current and newer technologies. We've not found a significant data base addressing things like the probability of well casing failure, but industry surely has substantial knowledge and experience which can somehow be tapped. An initiative to do so would be a valuable component of the "risk analysis".