

**EPA Science Advisory Board
Hydraulic Fracturing Research Advisory Panel
Public Teleconference February 1, 2016
Oral Statement of Anthony Ingraffea**

I am Anthony Ingraffea, the Dwight C. Baum Professor Emeritus at Cornell University. I have followed the development of this EPA final report closely and participated in three of the workshops associated with it. I would first like to thank the EPA for its work under trying circumstances. It was clear from the beginning of the study's scoping activity that the oil/gas industry wanted to severely limit the project to potential impacts on drinking water from hydraulic fracturing alone. I applaud the EPA for resisting this pressure and defining and executing its study within the scope of the entire hydraulic fracturing water cycle.

My major criticism of the draft final report is that it currently fails to address problems of scale and spatial intensity in this complete water cycle. There have been over 3.5 million oil and gas wells developed in the U.S., and over a million of those were fracked long before public concern about "fracking" became manifest and the Congress mandated this study. Why the intense concern 70 years after the commercial application of fracking? I assert that the answer, not yet properly regarded in the draft report, is the approximately 70,000 shale gas and oil wells developed over the last 20 years, and especially the majority of those developed over the last decade. Why should there be so much concern over so few wells?

First, shale gas and oil wells redefine the scale of the problem: the total amount of water and chemicals used in fracking those 70,000 wells far exceeds the total amount used in the million conventional wells previously fracked. Concomitantly, the total amount of waste flowback and so-called produced water emanating from those 70,000 wells far exceeds the total from those previous million fracked wells. Consequently, one should expect that the risks and impacts associated with such prodigious volumes being handled over such a relatively short time period, and in such relatively small enclaves, would be elevated beyond those previously seen.

Second, the geology and geochemistry of shale require markedly increased well spatial intensity, typically 8 or more wells per square surface mile. Each well is a potential leak path of hydrocarbons to USDW, and our research has shown that the rate of leakage from faulty casing and cement jobs in modern shale gas wells is no better than historical leak rates. One should therefore expect large numbers of incidents of water well contamination within counties of intense shale hydrocarbon development.

Finally, I want to compliment the SAB for its insights and its courage in questioning the undefined use of the words "systemic" and "widespread" in the EPA's draft final report. Loss of wellbore integrity is inherently systemic, otherwise why would the industry continue to hold frequent national and international meetings on wellbore integrity? The EPA fracking and drinking water study currently concludes that there is no widespread impact of the fracking water cycle on drinking water. Yet, in Pennsylvania alone, there are over 1250 formal complaints by landowners (as shown in a database compiled by Public Herald, the only place the data is available online at <http://PublicFiles.org>) to its Department of Environmental Protection for

impact on their drinking water from the hydraulic fracturing complete water cycle: ask those thousands if “widespread” should apply at the county and state level.