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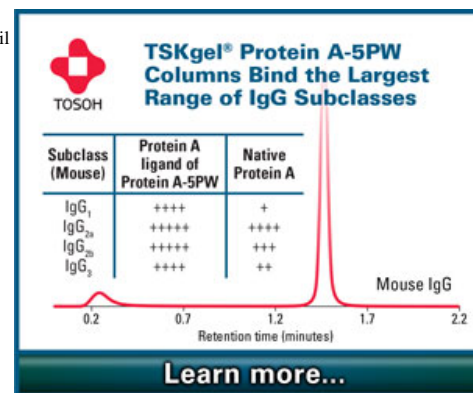
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## The LCGC Blog: 10 Things I Learned about Responsible Shale Energy Extraction

May 03, 2017 By Kevin A. Schug  
The LCGC Blog

As part of the Earth Day celebration in Dallas, Texas, last month, the Collaborative Laboratories for Environmental Analysis and Remediation (CLEAR) at U.T. Arlington hosted the first annual Responsible Shale Energy Extraction (RSEE) symposium ([www.shalescience.org](http://www.shalescience.org)). We had an exceptional range of speakers who conveyed all sides of the issue, including U.S. Secretary of Energy Rick Perry and atmospheric scientist Dr. Katherine Hayhoe from Texas Tech University, one of *Time's* top 100 most influential people. We had representatives from major oil producers, environmental groups, land management groups, water recycling service companies, and scientists conversant on many key issues related to unconventional oil and gas (UOG) extraction. Even though we have been very involved in this conversation for the past several years, several points stood out:

1. According to Scott Tinker of the University of Texas Bureau of Economic Geology (UT-BEG), despite the increasing availability of alternative energy sources, such as wind and solar, worldwide, 86% of energy is still generated by fossil fuels. Price, cost, technology, policy, and demand are all interacting variables that control the production and use of energy resources in different parts of the world.
2. According to Secretary Perry, if Texas were its own country, it would be the 12th-largest economy in the world. Although that is an interesting statistic, he also emphasized that despite its fossil-fuel-loving reputation, Texas is the largest wind-energy producer in the United States. I did some cursory research and found that the Texas wind power generation capacity is a little less than four times that of its nearest competitor, California. Yet, currently about 12–13% of Texas's energy comes from wind energy; 50% is from natural gas.
3. According to Katherine Hayhoe, 97% of scientists agree that there is sufficient evidence to indicate that man-made climate change is real. This situation must be addressed now, if we are to avoid some of the most severe consequences that will result from continued global warming. Interestingly, scientists have known since the 1890s that the release of additional gases from the burning of fossil fuels (then, predominantly coal) had the potential to increase planet warmth. Further, one billion people in developing nations across the world do not have access to fuels and are living in energy poverty—a situation that can only be addressed by the further development of alternative energy sources.



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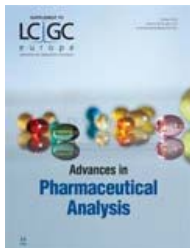
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UOG may be a bridge (and some very much dislike this moniker), but it is a bridge that needs to end sooner rather than later.

4. According to Anne Epstein from Texas Tech University, peer-reviewed studies have indicated a significant correlation between increased birth defects and the density of UOG operations in rural Colorado.
5. According to Paula Stigler-Granados from the University of Texas Health School of Public Health – San Antonio, health impacts on UOG workers, and societal impacts on the communities in which they reside during boom times, have not been adequately addressed. She warned that the UOG extraction industry should be more openly and clearly operating under the precautionary principle of risk management, which implies that if scientific consensus is lacking, then the burden should lie on the industry to prove their practices are safe.
6. According to leading geologists and seismology experts from the University of Texas Bureau of Economic Geology (UT-BEG), Peter Henning and Alexandros Savvaidis, and Southern Methodist University, Brian Stump, evidence very much suggests a linkage between the process of deep-well injection to discard UOG wastewater and increased seismicity. Major earthquake activity in Oklahoma has been the bigger story, but the Texas Railroad Commission has significantly reduced the number of injection well permits issued, and this action appears to be linked to a major reduction in earthquakes in Texas. The UT-BEG has established TexNet and the Center for Integrated Seismicity Research as a means to more closely and collaboratively monitor seismicity across the state ([www.beg.utexas.edu/cisr](http://www.beg.utexas.edu/cisr)). The experts state that there is very little evidence that the process of hydraulic stimulation itself has induced increased seismicity in Texas.
7. According to Scott Anderson of the Environmental Defense Fund, in terms of the potential for connections between wastewater recovered from UOG processes and it having deleterious interactions with water supplies, surface spills are more likely culprits than well-casing failures.
8. According to Richard Seline of AccelerateH2O, while Israel recycles and reuses 78% of their water, the United States only recycles 5%. In my opinion, water recycling in the U.S. must and will become a much more visible and necessary focus of research and development over the next 5–10 years. That said, there are currently 1.4 million Texans employed in the water and water technology sector, which is greater than the number employed in biotech.
9. According to John Durand of WaterBridge Resources, public–private partnerships for water reclamation and reuse, especially in more arid regions, such as west Texas, will be an increasingly important component of responsible shale energy extraction in the years to come. A partnership between Pioneer Resources and the city of Odessa was highlighted in one roundtable discussion as a model to emulate.

And for you separation scientists out there, Prof. Guido Verbeck of the University of North Texas spoke about “Earth-Based Separations,” and how the volatility, diffusion rates, and weather patterns can be used for sourcing detected air emissions. In fact, he spoke of a significant amount of research performed in collaboration with CLEAR in the Eagle Ford shale, where a hybrid electric car, equipped with a membrane inlet mass spectrometer was used to monitor BTEX (benzene, toluene, ethylbenzene, and xylene) emissions from UOG well-pad sites (1). Various new technologies are being introduced to help with monitoring of air, soil, and water that can be useful in the effort to help ensure responsible shale energy extraction.

This is just a snapshot of the wealth of information and views conveyed at the RSEE symposium. We are working now to post all of the presentations, so that all of the information can be shared with the public to increase understanding of the critical issues. There are some truly exceptional presentations in that collection. We want to thank all of those that participated in the presentations and discussions. The names

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include many more than those listed above. We would also like to thank the Cynthia and George Mitchell Foundation and Earth Day Texas for their support of the program. We plan to do it again next year, in hopes that this continuing dialogue can help better create a middle ground where opposing opinions can open honest discussions to increase knowledge, awareness, and the development and use of best practices in the UOG extraction industry.

## Reference

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Kevin A. Schug is a Full Professor and Shimadzu Distinguished Professor of Analytical Chemistry in the Department of Chemistry & Biochemistry at The University of Texas (UT) at Arlington. He joined the faculty at UT Arlington in 2005 after completing a Ph.D. in Chemistry at Virginia Tech under the direction of Prof. Harold M. McNair and a post-doctoral fellowship at the University of Vienna under Prof. Wolfgang Lindner. Research in the Schug group spans fundamental and applied areas of separation science and mass spectrometry. Schug was named the LCGC Emerging Leader in Chromatography in 2009, and most recently has been named the 2012 American Chemical Society Division of Analytical Chemistry Young Investigator in Separation Science awardee.

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