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Written Public Comment
Presented by the League of Women Voters of Pennsylvania
to
U.S. Environmental Protection Agency regarding
General Energy Company, LLC (PGE) PAS2D013BIND Proposal
to Issue a Final Underground Injection Control Permit
Grant Township, Pennsylvania Municipal Building, Marion Center, Pennsylvania
October 28, 2013

The League of Women Voters is most appreciative of this opportunity to raise concerns and questions as part of the planned discussion on the above injection well.

What we don't know about injection wells may in fact hurt us. While such wells are projected to be safe based on computer models, in reality, we do not know what the short and long-term consequences may be.[1] In the rush to extract natural gas from Marcellus Shale, the safe, effective treatment of related waste has not yet been fully explored. The draft permit in Indiana County would allow for the conversion of a gas production well into a brine disposal well. This would allow Pennsylvania General Energy Company, LLC (PGE) to inject fluids from oil and gas operations into the Huntersville Chert Formation to distances over a mile – 7532 feet deep. This region lies below both the Marcellus Shale and the Onondaga Limestone. According to a paper issued by the Society of Petroleum Engineers, *the Huntersville Chert is a dense, impure microcrystalline chert interbedded with silicified shale or mudrock. Due to its brittle nature, the Chert was fractured during deformation thus natural fractures are prevalent throughout the Chert. The Chert occurs primarily in the central part of the Appalachian Basin from McKean County, Pennsylvania south to Smyth County, Virginia.*[2] According to one of the references cited in this study, it is postulated that the highly fractured Chert is a poor cap rock. Since it allows gas to escape, it is a better gas reservoir than the Oriskany sandstone that lies below it.

While there is clearly a need for our Commonwealth to cope with the residue of the fracking process, is this the best way and is this site in Indiana County the best place? After reviewing the EPA's Statement of Basis for this Permit, we would like to share several concerns and questions

[1] http://www.scientificamerican.com/article.cfm?id=are-fracking-wastewater-wells-poisoning-ground-beneath-our-feet
[2] http://www.onepetro.org/mslib/app/Preview.do?paperNumber=00091419&societyCode=SPE

as we strive to protect and prevent the movement of fluids into underground sources of drinking water.

• Area of Review: While the applicant needs to consider any wells which penetrate the injection zone that is far below a mile from the surface, should these inventoried active and abandoned wells also include shallower oil wells, conventional and unconventional gas wells, test bores, and abandoned wells that are adjacent to the cased and uncased pipe? The escape of waste fluid from the proposed well would be expected to encounter any nearby boreholes, not merely those that extend all the way down to the injection zone.

Will there be any prohibition of future unconventional wells that may drill and frack the Utica Shale that is below this injection zone? Such bores could intercept disposed wastes in the Huntersville Chert. In fact, these unconventional drilling operations into the Utica Shale are consistent with Natural Gas Development found in the Comprehensive Land Use Plan, Indiana County, PA.[3]

It is interesting to note that the operator (PGE) considered a zone of endangered influence (ZEI) over the next decade to be one quarter mile beyond the injection well bore or 1420 feet. EPA modeling, however, extended the analysis to 100 feet beyond this distance. This would lead the public to believe that the current one-quarter mile "standard" utilized by industry (if PGE is representative of current practice) is inadequate. Is this the case?

• Underground Sources of Drinking Water (USDWs) – Casings are essential in safeguarding aquifers. It appears, however, that cement is not proposed to encompass the entire line. An 11 ¾ inch ground surface casing runs approximately 568 feet to an intermediate 8-5/8 inch casing that goes to a depth of 1539 feet. Then, the innermost casing starts from the bottom (approximately 7544 feet) and that 4 ½ inch string casing (assumed to be 4.5 inches wide—diameter---and not 4.5 inches long as stated in the description) is cemented back to a depth of 6850 feet. What protects the pipe from for the more than a mile - 5311 feet – between the bottom string casing and the intermediate casing? Will this increase the risk of the potential movement of fluids into the previously fracked intermediate strata and even the aquifer from degradation, structural collapse, or other forces? This "bare" uncemented area is less than 1000 feet— about three football fields---below the aquifer and extends only 700 feet above the injection site. Is this adequate? Without knowing the diameter of the pipe relative to the hole diameter at the bottom, it is also difficult to determine the actual thickness of the cement casing.

Casings are both a short and long-term risk since cement is subject to degradation. The age of the existing well to be converted is not stated. Given this conversion of an existing natural gas well, initial improper cementing could result in some failure during the first decade. Because, over time, all casings will fail,[4] it is imperative to maintain monitoring of operations over time so corrective action and plugging occurs to prevent pollution of our underground water supplies. Ongoing EPA oversight is essential.

• Injection and Confining Zones: The limitation of the permit to a 76-feet interval (7620 feet – 7544 feet) in this area of Huntersville Chert is perplexing. If there are no faults or fractures in the area of review, as claimed in the geologic and seismic review, where will the fluid go? If the

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[3] http://www.countyofindiana.org/plan/Where We Live Posters/Natural Gas Development Poster.pdf

[4] http://oilprice.com/Energy/Energy-General/Shale-Gas-Casing-and-Cementation-Will-Fail-but-When.html

chert is dense and brittle, yet lets gas escape, it must be full of fractures as noted earlier. Will the injection of fluids cause further fractures and faults into which the brine will flow? What is the anticipated total volume of fluid that such a zone will contain? Will the waste material ultimately extend outward from the well bore farther than the modeled 1420 feet? What is the anticipated life of this well at the maximum rate of 30,000 barrels per month?

• Maximum Injection Pressure: High pressures, although monitored, can be problematic. This is particularly true when pipe tolerances may be inadequate to withstand pressures of about 7,000 psi for the life of a well. Just what is the design pressure for such a pipe? Will the pressure of the waste fluid increase or decrease from the projected 7,000 psi over time? Can the public have confidence in the integrity of the injection well given that EPA "expects" that the pressure limitations will meet the regulatory criteria? On what is this expectation based? Is consideration given to both the compressive and tensile strength of the pipe? How thick is the pipe? What standards, if any, is it required to meet?

• Geologic and Seismic Review: The League applauds the EPA for considering seismicity, given the myriad of reports regarding the development of earthquakes near injection sites across the country for the past several years.[5] In addition to many articles that cite tremors from Texas and Arkansas to Ohio, the July 2013 Scientific American piece "Injection Wells Spawn Powerful Earthquakes" gives one pause to ponder.[6] Such seismic activity not only creates surface disturbances but also increases the potential of migration of toxic materials into our aquifers. What considerations lead the EPA to state that the probability of injection induced seismicity to be low at this site, given data showing correlations in other parts of the country?

Although Indiana County has not been the epicenter of such seismic activities based on evidence provided to the EPA, the tremors from the August 23, 2011 magnitude 5.2 quake centered in Virginia resulted in rattling this very area. Students at Indiana University of Pennsylvania even evacuated their buildings.[7] Was this information included in your data to the "present?" What would seismic activity of such magnitude do to the integrity of the proposed injection well and its casing? Are tremors of this nature sufficient to dislodge any of the cement or create cracks? Given the high pressures of 7,000 psi, even small fractures could result in the escape of large quantities of waste up the borehole that could put water supplies in jeopardy. Are the construction standards for cement withstanding "significant amounts" of pressure greater than 7,000 psi after seismic events?

It appears that on EPA's request, PGE provided fracture simulation data that included an instantaneous shut-in pressure (ISIP). The EPA then placed pressure limits in the draft permit to the surface and bottom hole pressures to prevent new or further expansion of "existing" fractures. Where are these existing fractures? Are they in the area of the uncased pipe? The "shut-in" device would hopefully prevent or limit problems in the event of an incident. Does this work to plug the entire bore, plug the top, or "squeeze" the pipe to prevent fluid from migrating upward? Have modifications been made in the effectiveness of such devices since the 2010 BP

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[5] http://www.sciencedaily.com/releases/2010/03/100310134158.htm
http://bssa.geoscienceworld.org/cgi/content/abstract/95/2/664
http://www.nytimes.com/2011/02/06/us/06earthquake.html
http://www.reuters.com/article/2012/03/09/us-energy-fracking-ohio-idUSBRE8281DX20120309
[6] http://www.scientificamerican.com/article.cfm?id=drilling-and-pumping-wells-spawn-powerful-earthquakes
[7] http://www.indianagazette.com/news/indiana-news/59-earthquake-rattles-east-coast.109848/

spill in the Gulf of Mexico? If the well is shut in, can it still be plugged effectively and permanently to prevent the escape of injected fluid wastes?

Finally, this section regarding geologic and seismic review contains several contradictions that need clarification. The first paragraph states that *EPA evaluated factors relevant to seismic activity such as the existence of any known faults and/or fractures.* The following paragraph states that the Permittee shall inject *only into a formation which is free of known open faults or fractures within the Area of Review.* In the same paragraph it is noted that the *Permittee submitted geologic information that indicates the absence of faults in the confining injection zone.* In the fifth paragraph, it states *EPA limited in the draft permit the surface injection pressure and the bottom hole injection pressure to a level lower than both the ISIP and the fracture pressure to prevent the initiation of new or the propagation of* ***existing fractures.*** What are the sizes, depths and distances from the well of these fractures? In the previous paragraph, it states *PGE identified in the Permit Application significant gas production in the vicinity of the proposed Injection Well (both shallow gas production at depths of approximately 3500 feet as well as deeper gas production at depths similar to the proposed injection zone).* Based on this information, the fractures related to these production wells seem to exist in the vicinity of the well at depths where the conveying pipe lacks cement casing and where waste fluids will be discharged. Does the cited report "Induced Seismicity Potential in Energy Technologies" speak the reduced pore pressure as a potential liability in the migration of fluids?

•**Injection Fluid:** Although the injection fluid is technically considered to be nonhazardous, it is laudable that the injection fluid with be sampled to provide a comparative base in the event of ground water contamination. However, if we do not know the composition of the fluids, it would seem prudent to add tracers to the wastes as a means to determine sources of potential future contamination to our waters. Tracers, special chemical markers injected with the wastes, would allow the EPA to more effectively investigate any accidental leaks or spills, rectify currently unanticipated problems, and gather data useful in future decision making. The list of parameters specified in the permit that require monitoring to determine the nature and composition of the injected fluid is limited. Will the EPA expand this list to include toxic chemicals known to be in the composition of fracking fluids?

Given the recent Duke study about brine from Marcellus Shale wells, will the waste fluid also be assessed for its radioactivity?[8] This study was actually based in Indiana County where the sediment of our streams has already been assessed as exceeding thresholds for safety. Other investigations in Ohio[9] revealed the level of radium in wastes from Marcellus shale is very, very high. One sample of brine from 2009 was 3,609 times more radioactive than a federal safety limit for drinking water and 300 times higher than a Nuclear Regulatory Commission limit for industrial discharges to water. U.S. Geological Survey in 2 011 found that brine from Marcellus shale wells was generally three times more polluted than brine from conventional wells. With the reuse of wastewater for fracking more wells, the salt and radioactive materials become ever more concentrated. The walls of a tank trunk do not thwart radioactive risks. Such hazards are not readily dissipated in cases of accidental spills.

Testing, Monitoring and Reporting Requirements: Oversight as specified is commended. However, according to Carl Weller, a former EPA inspector, unscrupulous operators can

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[8] *http://www.nicholas.duke.edu/news/radioactive-shale-gas-contaminants-found-at-wastewater-discharge-site*

[9] http://www.dispatch.com/content/stories/local/2012/09/03/gas-wellfj-waste-full-of-radium.html

manipulate pressure tests.[10] In fact, in 2007, a well operator in Kentucky installed a device to thwart tests done to discover leaks or cracks in deep underground injection wells. Without reliable mechanical integrity tests, regulators cannot determine if cement and well structures are intact and offer protection for drinking water. A case was filed against the Kentucky operator and heard in 2009. Would monitoring wells around the perimeter of this site by an independent agency be a prudent precaution? Such were used to confirm leakage from a deep well injection site in Ohio operated by the Aristech Chemical Corp. more than two decades ago?[11] Will there be required provisions that accompany the granting of this permit for the periodic, long-term, independent testing of water supplies in our area? This is essential information not only for our public health but also for the sustainability of agriculture, the largest industry in our Commonwealth. Clear evidence as to the long-term impact of such injection wells on water will benefit the operators of the sites, the regulators, and the property owners. Additionally, will reported data be made available to the public? Will this five-year cycle EPA review continue through perpetuity or just until well closure?

Plugging and Abandonment: Recent reports indicate that our Commonwealth has over 200,000 abandoned oil and gas wells.[12] Given this legacy, provisions for the closing of an injection well are vital. However, adjustments need to be provided in demonstrated financial responsibility over time to reflect inflation and the actual costs of plugging. Is the $60,000 requirement to demonstrate financial responsibility as specified in the permit adequate? Will the costs of plugging injection wells such as this be passed on to taxpayers? Are there other ways that this potential problem is addressed?

Expiration Date: The expectation noted for a five-year review should be formalized and mandated to safeguard public health and the environment. Will this review be open to public comment?

In addition to the injection well itself, the League of Women Voters is concerned with hazards related to the transport of fluid to the site. Accidents do happen. Will there be brine containment or storage facilities at the well site? Will vehicles be equipped with features to prevent accidental loss of liquids during transit? Is there a site-specific, comprehensive plan for spills as well as for detecting any future groundwater and surface water contamination? Emergency responders need both training and resources to handle unforeseen events with wastes from oil and gas operations. Avoidance of and preparation for potential polluting events are vital to public health and our environment. What provisions have been made by PGE to train local emergency responders in the event that spills occur?

The issue of transparency in Class II Injection wells that deal, by definition, with wastes from the oil and gas industry is an area of on-going concern. Since 1980, any substance that resulted from drilling – or "producing" – an oil or gas well has been redefined as "non-hazardous," regardless of its chemical makeup. This exception allows something like benzene from the fertilizer industry to be considered hazardous and a threat to health and underground water supplies.

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[10] http://www.propublica.org/article/trillion-gallon-loophole-lax-rules-for-drillers-that-inject-pollutants

[11] http://www.propublica.org/article/whiff-of-phenol-spells-trouble

[12] http://stateimpact.npr.org/pennsylvania/2012/11/13/npr-across-pa-abandoned-wells-litter-the-land/

However, benzene derived from wells for the oil and gas production is "non-hazardous."[13] The public needs to know what is going down the well. Without this knowledge, how can emergency teams deal with accidental spills or traffic accidents involving waste-carrying vehicles?

In closing, I would like to quote from the statewide position adopted after study and consensus:[14]

The League of Women Voters of Pennsylvania recognizes that natural gas extraction from Marcellus Shale is a finite resource and that its production significantly affects the environment and the economy of the Commonwealth.

The consensus of the League of Women Voters further addresses the need for adequate oversight and protection:

The League supports

• *the maximum protection of public health and the environment in all aspects of Marcellus Shale natural gas production, site restoration, and delivery to the customer, by requiring the use of best practices, and by promoting comprehensive regulation, communication, and adequate staffing across government agencies.*

The Environmental Protection Agency has a critical role in protecting human health and the environment. We trust that you will consider the emerging information about Class II injection wells, examine the specifics of this site, research evolving technologies to deal with such wastes,[15] reflect on the special exemptions enjoyed by the oil and gas industry, investigate cumulative impacts of such operations, and act in the public interest of those in Indiana County and throughout our Commonwealth. We hope our comments and those of others may serve to guide modifications to the final permit.

Thank you.

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[13] http://www.propublica.org/series/injection-wells

[14] See palwv.org.

[15] See *Water Management Addenda* found at http://www.palwv.org/Issues/Natural-Resources/Marcellus-Shale.asp