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Dear Mr Deutsch et. al.

The National Energy Act of 2005 which created exemptions from the Safe Drinking Water Act, the Clean Air Act and other environmental protections for the public benefit must be reinstated for the hydraulic fracturing of natural gas. If this process cannot proceed within the protections for public health and safety, it should be returned to the drawing board.

However, as this is unlikely to happen in the current political environment, I have the following suggestions for improving the balance between private profits and public costs attributed to hydraulic fracturing of deep shale for natural gas production.

1. Protect farmland critical for food security. Marcellus shale formations in Pennsylvania fall beneath many agricultural assets identified by the American Farmland Trust. (1) In many of these communities, the gas drilling and associated industrial facilities are distributed in small installations at many locations. To conserve the amount of total land that must be disrupted to support the extraction and processing and distribution of natural gas, the industrial facilities should be centralized and consolidated, made to comply with air and water emission permits, and have appropriate monitoring and treatment of produced water. Having numerous smaller facilities distributed throughout the state destroys the rural character of the area, and increases the difficulty of monitoring and enforcement at numerous locations.

2. Protect critical land uses. Marcellus shale development should be subject to siting criteria that include prohibition in areas that would require the drilling to penetrate through groundwater tables, prohibition in areas that would destroy critical wildlife habitat, including division and subdivision of tracts set aside as public parks, refuges and wilderness preserves; and prohibition in areas where organic farming or sustainable agriculture is the principal land use. In all of these instances, hydraulic fracturing would permanently destroy the prevailing use of the land. A Pennsylvania DCNR analysis shows that no additional leasing involving surface disturbance can occur without significantly altering the ecological integrity and wild character of our state forest system. (2)ⁱ Precaution in protecting watershed, wilderness and food supplies is a critical need in the public interest of the citizens of the Commonwealth of Pennsylvania.

3. Establish siting criteria for industrial facilities in rural areas. Marcellus shale drilling and processing facilities should be subject to the same restrictions as apply to any industrial activity in proximity to residences, schools, public facilities, schools, or historical and cultural assets of a community. Distance setbacks, noise and air and water pollution abatement must be assured to the residents of communities from the imposition of industrial facilities in their midst. This

should not rest on the shoulders of individual land holders whose negotiating skills are not equivalent to corporate gas development interests.

4. Establish an escrow fund to provide for future clean-up. Marcellus shale development should be subject to a tax and license fees, some of which must be placed in escrow to provide for the future de-contamination of public water supplies. As the salinity of rivers and streams increases, as already evident in the Monongahela River, the water drawn from these rivers for public water supplies will need to be treated in ways not currently covered by existing operations. If stringent controls will not be placed on the industry to prevent contamination of ground water, wells and surface water supplies, then there must be a mechanism for public funds to be provided to clean up hydrocarbon and salt contamination in the future. It is the nature of the hydraulic fracturing process that the plume of contaminants underground may take a span of time to manifest under current detection systems. Models of concentrated salt solution behaviors in water tables has indications of contamination in the future as pipes penetrating the layers through groundwater above the shale formations will fail over time and lead to contamination in the future. (3) Extraction of the gas is expected to last for 20 to 50 years, at most, but the results of the contamination will be manifest gradually over 200 years from the present. It is a question of intergenerational justice to address the prevention of contamination, and to provide for cleaning the water.

Industry claims of groundwater protection from encasing the drilling pipes in concrete do not withstand the evidence of history. The oil industry events of the BP Deepwater Horizon oil spill in April 2010 that spilled millions of gallons of crude oil into the Gulf of Mexico at the mouth of the Mississippi River had similar confidence in protective technology.ⁱⁱ Now, reports of tritium contaminated water leaking from 45 of the 66 operating nuclear power plants in the U.S. offers more evidence of the failure of concrete encased pipes to leak over time. (4) In the Marcellus Shale operations, the pipes carry highly saline and known corrosive materials both in the fracturing fluid and in the produced water extracted from the depths. These materials will, certainly, be subject to failure as time proceeds.

There has been no successful remediation of contaminated groundwater. This is an absolute time for taking precaution to protect the public interest.

5. Require accountability for contamination. The industry must be required to take accountability for all materials deposited into the streams and watersheds from produced water. Closed system use with full removal of contaminants to safe drinking water standards must be practiced to prevent contamination of water supplies for people and all other living systems that depend on fresh water. Only 3% of the water on earth is fresh water. It must be conserved to prevent the need for purification processes at great public cost, loss of fertility of land due to increasing salinity, and cumulative toxicity to farm animals and affected flora and fauna in the area.

I urge the adoption of the Hydraulic Fracturing Accountability Act, as presented by Senator Casey in the 2010 Congress.

I also urge the adoption of national standards for siting criteria for hydraulic fracturing of natural gas shale deposits, as outlined here.

The national energy crisis will not be solved with frantic lurching after domestic fossil fuels to replace imported oil. We must turn the attention and American ingenuity to the task of living as a society within the carrying capacity of the Earth on a sustainable basis. We are burning coal, and natural gas and using nuclear fission to produce electricity through technology developed in the early 1900's. The Rankine cycle loses 66% of the fuel value to wasted heat, with only a third converted to electricity. (5) More of the value is lost in transmission of the electricity to users, and more again in the end use appliances and machinery. This archaic system must be updated to modern times with distributed systems, such as fuel cells, and renewable sourced technologies, which do not waste more than they use to do productive work. We also have an enormous loss of fuel value in the transportation sector. Fuels burned as gasoline or gasoline substitutes in the internal combustion engine use only 12% of the fuel value to move the vehicle forward.(6) All the rest is lost as friction or heat! These technologies of the horse and buggy days are still controlling our future plans for energy policy.

We must break the pattern of entrenched inefficiency built into the infrastructure of our economy. It is time to call common sense into play here. Stop the insane stampede to despoil everything that is natural and sustainable in the pursuit of a hollow promise of plentiful, cheap fuel. It is too dear to waste in archaic systems. Design for sustainability on a system integrated approach combining geothermal heat pumps, passive and active solar power, wind and a modest use of fossil fuels. Natural gas and other fossil fuels should only be used in efficient technologies that do not waste fuel value in gross combustion conversion processes. We will destroy the viability of our planet if we continue on the path we travel now. We must place a prime priority on protecting the life support system of all living things, including people: clean air, pure water, fertile soil and the biodiversity of the Earth.

These comments represent my own opinion, and do not represent the position of Chatham University, its President or any Member of the Board of Trustees.

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3. Michael Boufadel, Ph.D. "Long Term and Cumulative Assessment of the Impact of Marcellus Shale Drilling" Presentation at University of Pittsburgh Graduate School of Public Health. November 19, 2010

4. Jeff Donn. "AP IMPACT: Tritium leaks found at many nuke sites." June 21, 2011 . Associated Press

5. Lawrence Livermore national Laboratories. 2010 "U.S. Energy Use in 2009." Based on data from DOE/EIA-0384(2009) published August 2010

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