Environmental Concerns Related to Shale Gas Production

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It's Not Just Fracking

- Impacts result from accidents and inadequate regulation along the entire exploration, production and distribution process
- Bottom Line: some places must be off-limits; everywhere else, must be limited and subject to stringent regulation

Environmental Impacts

Air
Water
Land
Community

Air Pollution

- Vehicles
- Construction
- Engines
- Pits
- Flaring
- Condensate Tanks
- Dehydrators
- Venting
- Fugitive Emissions
- Gas processing
- Compression
- Land Application

Air Contaminants

- Volatile Organic Compounds (VOCs)
  - BTEX (Benzene, Toluene, Ethylbenzene, Xylene), hexane, acrolein, acetaldehyde, formaldehyde, methanol, triethylene glycol, hydraulic fracturing chemicals (?)
- NOx
- Ozone (Smog)
  - Created through interaction of VOCs and NOx
- Particulate Matter
- Hydrogen Sulfide
- Greenhouse Gases

Water Pollution

- Storm water runoff
- Storage pits and ponds
- Spills
- Pipelines
- Tanks
- Wellheads
- Hydraulic fracturing

Water Contaminants

- Sediment
- Drilling fluid/''mud''
- Hydrocarbons
- Produced Water
  - Hydrocarbons, dissolved or soluble organics, treatment chemicals, produced solids, scales, bacteria, metals, high or low pH, sulfates, Naturally Occurring Radioactive Material (NORM)
- Hydraulic Fracturing Fluid

Land Pollution

- Storage pits
- Evaporation ponds
- Spills
- Pipelines
- Tanks
- Wellheads

(Drilling fluid splashing past the liner, Dimock, PA, Spring 2009)

Land Contaminants

- Drilling fluid/”mud”
- Drill cuttings
- Hydrocarbons
- Produced water
- Hydraulic fracturing fluid

Community Impacts

- Noise
- Traffic
- Accidents
- Crime
- Community character alteration
- Scale and pace of development

Hydraulic Fracturing - Chemicals

- Limited requirement for disclosure of chemicals to regulatory bodies or the public
- Many cannot be linked to a CAS, are listed by generic names, or are listed as "proprietary"
- Of known chemicals, it is estimated that at least 50% are toxic

Other Hydraulic Fracturing Concerns

- Lack of pre-drilling hydrogeologic assessment
- Lack of pre-drilling baseline water monitoring
- Scant use of tracers
- Lack of post-drilling confirmation

Exemptions from Federal Regulation

- Comprehensive Environmental Response, Compensation, and Liability Act
- Resource Conservation and Recovery Act
- Safe Drinking Water Act
- Clean Water Act
- Clean Air Act
- National Environmental Policy Act
- Toxic Release Inventory under the Emergency Planning and Community Right-to-Know Act

Solutions

Regulation and Technology

Technological Solutions

- Reduced Emission Completions, aka "Green Completions"
  - Limit venting and flaring
- Reducing, recycling, reusing waste and toxic substances
- Use of non-toxic or "green" substitutes for drilling mud and fracturing fluids
- Closed-loop pitless drilling
- Preventive maintenance and leak prevention
- Well clustering, centralized operations
- Pre- and post-drilling hydrogeologic assessment, tracers

Results of "Green" Solutions

- Substantial cost savings can be realized
- The EPA's Natural Gas STAR Program
  - Payback can come anywhere from less than a year to 10 years
  - Costs range from $0-$10,000 with many solutions costing less than $1000
- "Green" fracturing fluids have been shown to be both effective and economical
  - Alternatively, studies have shown that wells fractured only with water (no chemical additives) performed equal to or better than wells using chemical additives
- After initial investment, closed-loop drilling systems have been found to be cost-effective and even profitable
  - Dramatically reduces waste and therefore handling costs, maximizes ability to reuse and recycle drilling and fracturing fluids, substantially decreases incidence of spills and related clean-up costs
- Preventative maintenance to prevent leaks and spills is economical and successful

Regulations

- State and Federal regulations should be regularly updated to include best practices and incorporate the results of new scientific studies
- State regulations are inconsistent and inadequate
  - New WY regulations require full disclosure of hydraulic fracturing chemicals – all other state and federal regulations should be updated to this same standard
- Loopholes in federal regulations must be closed
- Community impacts?

Scientific Studies

- EPA hydraulic fracturing study
  - Must be full life-cycle
- Further study is needed into the potential health effects of oil and gas drilling
- Further study is needed into reduced-impact drilling and completion methods
- Incidents of suspected pollution from oil and gas drilling operations, including hydraulic fracturing, must be thoroughly studied
- Thorough scientific studies must be completed before oil and gas production is allowed into new or environmentally sensitive areas

Europe Can Lead

- Good models exist for off-shore
  - E.g., OSPAR environmental testing for chemicals discharged into marine environment during drilling and production
- Can and should create good models for on-shore

Thank you.