

The North America Energy Resource Summit

Environmental Constraints to Development

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January 18, 2012

Environmental Challenges, Dangers & Opportunities Posed By Shale Gas Boom

1. Water Withdrawal
 - About 5 million gallons per well
2. Water Disposal
 - Reuse
 - Treatment
 - Deep well injection
3. Seismic Activity Associated With Deep Well Injection
 - Ohio regulatory closure
 - Arkansas regulatory closure

Environmental Challenges, Dangers & Opportunities Posed By Shale Gas Boom

4. Gas Migration

- Dimock
- Pavilion
- Duke University Study
- Penn State University Study

5. Methane Leakage – Lifecycle Carbon

- Howarth
- CMU, NETL, Worldwatch Institute, University of Maryland
- Cornell Second Paper
- Wigley Paper

Environmental Challenges, Dangers & Opportunities Posed By Shale Gas Boom

6. Public Lands

- State Forests
- Parks

7. Truck Traffic

- Truck Safety
- Road Damage
- Spills
- Emissions

Environmental Challenges, Dangers & Opportunities Posed By Shale Gas Boom

8. Air Emissions

- Wyoming
- EPA Proposed Rulemaking

9. Accidents, Spills, Leaks

- Culture of Safety

10. Groundwater Contamination

- Pavilion
- West Virginia

PA Enacted Six Rulemakings to Address Environmental Issues

1. Water Withdrawal Policy Enacted in 2008
 - Water Plan Requirement
 - Protective Standard for Approving Withdrawals

PA Enacted Six Rulemakings to Address Environmental Issues

2. Water Disposal Regulations Enacted August 2010
 - Requires Treatment of Drilling Wastewater for TDS to the DSWA Standard
 - Requires All Watersheds to Have TDS Below DSWA Concentration
 - Total Drilling Wastewater Discharged Less Now Than Before First Marcellus Well

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3. Modernize & Strengthen Drilling Regulations
 - Finalized February 2011
 - Design of Gas Wells
 - Materials
 - Construction
 - Testing
 - Monitoring

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4. Mandatory Disclosure of Chemicals
 - Rule Final in February 2011
 - Placed on DEP website since 2008

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5. 150 Foot Buffer Regulation From All Development For High Quality Streams
 - Rule Final in November 2010
 - 22,000 Miles of Streams
 - One-Quarter of All Streams

PA Enacted Six Rulemakings to Address Environmental Issues

6. Raised Permit to Drill Fee in 2008 to \$5,000 - \$10,000
 - Fee Had Been \$100 and Never Raised
 - All Funds Used to Hire Staff to Regulate Gas Drilling

Staffing

- PA Doubled Oil & Gas Staff
- Increased from 88 in September 2008 to 202 in January 2011
- Staffing Levels Vital to Effective Regulation

Enforcement

- 1,200 Violations Issued in 2010
- 1,100 Violations Issued in 2011

Air & Health Benefits of Gas Generation

- 50% of Carbon Compared to Coal
- Zero Mercury & Toxins
 - Gas Power Plants Comply With EPA Air Toxic Rule
- Zero Soot
- 100,000 Megawatts of Coal (Power Plants) 40 Plus years Old
- 40% of Coal Fleet Without Modern Pollution Controls