Developing North Carolina Shale Gas
Lessons Learned from the Marcellus and Utica Shale Plays

March 29, 2012

Introduction / Welcome

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Partner
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Learning from the Marcellus Shale – Successes and Challenges

Overview

- Legislation and Regulation
- Education
- Community Relations
- Operations
- Additional Challenges and Opportunities
Legislation and Regulation

Be Realistic: Pick Your Battles
- Severance Tax
- Impact Fee
- Regulation/Permitting
- Inspection/Safety

What is Important from Legislation/Regulation?
- Consistency
- Clarity
- Reasonableness
- Single Regulator

Education
- Misinformation Abounds
- Be Proactive and Calm
- Pictures/Visual
- Gain Allies
  - Academia
  - Local leaders
  - Politicians
  - Newspapers
Community Relations

Buy Local
- Banking
- Supplies
- Food
- Employment
- Truck Registrations

Impact Correction
- Land/Trees
- Roads

Community Relations (cont.)

Good Neighbor
- Fire Trucks
- Computers for Schools
- Tours
- Community Days
- Training
Operations

Good Neighbor
- Trucks (hours of service)
- Noise/Dust
- Visits/Tours
- Listen
- Repair
- Fire Department/Police Notifications

Additional Challenges
- Energized Plaintiffs’ Bar
- Lease Contests
  - “All” terms attacked
  - Lack of established law can be problematic
- Over-Loaded Regulators
  - Slowdowns
  - Poor Decisions
  - Ability to be Proactive and not Reactive is Compromised
- Government-Owned Assets – How and On What Terms?
- Downstream Opportunities are the Real Key
Developing North Carolina Shale Gas
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The North Carolina Shale:
Regulations and Resources

Stanford Baird
Partner
K&L Gates, Raleigh

Overview

- The North American Shale Gas Boom
  - Hydraulic Fracturing
  - Horizontal Drilling
- North Carolina’s Potential Shale Resource
- Current Regulatory Regime
- Regulatory Issues for Resolution
The North American Shale Gas Boom

- Vast Increases in Shale Gas Production
  - New Reserves Identified
  - Improved Technologies
    - Hydraulic Fracturing
    - Horizontal Drilling
- Major Shale Gas Plays in the U.S.
  - Marcellus
  - Fayetteville
  - Haynesville
  - Barnett
  - Bakken
North Carolina's Potential Shale Gas Resource

Source: North Carolina Department of Environment and Natural Resources 2012
North Carolina’s Potential Shale Gas Resource

- 2009 – North Carolina Geological Survey
  - Information Circular 36: *Natural Gas and Oil in North Carolina*
- Very Limited Geological Information
  - Total Triassic basin formation – 785,000 acres
  - Sanford sub-basin – 59,000 acres
North Carolina’s Potential Shale Gas Resource

- Shale formations found 2,100 feet to 6,000 feet below ground
- Cumnock Formation
- Maximum thickness of 800 feet, averaging 180 to 540 feet

Source: North Carolina Department of Environment and Natural Resources 2012
North Carolina’s Potential Shale Gas Resource

- 1998 - Two shut-in wells developed in Sanford sub-basin
  - Simpson #1 – 250 psi
  - Butler #3 – 900 psi
- Some indications of wet gas
- March 2011 shale gas barbecue in Lee County

North Carolina’s Potential Shale Gas Resource

- 2010-2011 NCGS Report to USGS
- 2012 USGS Report Expected
- DENR Draft Report, dated March 16, 2012
  - estimated “technically recoverable gas” per well in Sanford Sub-Basin and 20% actual recovery rate
- 4.2 Billion cfg “technically recoverable gas” per well
- 840 Million cfg actually recoverable per well
- Using 60 acre spacing, 983 wells, 826 Billion cfg
- Using 160 acre spacing, 369 wells, 309 Billion cfg
Current Regulatory Regime

- Current Oil and Gas Statute and Regulations
  - originally enacted in 1945

- Oil and Gas Conservation Act
  - N.C. Gen. Stat. chapter 113, article 27

- Horizontal Drilling – Currently Not Allowed
  - N.C. Gen. Stat. §113-393(d) and 15A N.C.A.C. 5D.0107(e)
  - No vertical deviation of more than 3 degrees “between bottom of the hole and the top of the hole” unless exception is granted

Current Regulatory Regime

- Hydraulic Fracturing – Currently Not Allowed
  - 15A N.C.A.C. 2C.0209(b) – No person shall construct, use or operate a Class II well to “inject fluids” for “enhanced recovery of oil or natural gas.”

  - 15A N.C.A.C. 2C.0213(e)(1) – “Pressure at the well head shall be limited to a maximum which will ensure that the pressure in the injection zone does not initiate new fractures or propagate existing fractures in the injection zone, initiate fractures in the confining zone, or cause the migration of injected or formation fluids outside the injection zone or area.”
Current Regulatory Regime

- Rule of Capture vs. Correlative Rights
- Limitation of Production/Allocation
  State may limit production to protect correlative rights or “whenever the total amount of oil and/or gas which all of the pools in the state can produce, exceeds the amount reasonably required to meet market demand.”
  15A N.C.A.C. 5D.0111(a) & (c)

Current Regulatory Regime

- Drilling Permits Required
- Pooling – voluntary and involuntary
  - N.C. Gen. Stat. §113-393; 15A N.C.A.C. 5D.0106(e)
- Severance Tax Authority
  - N.C. Gen. Stat. §113-387
  - One half mill ($0.0005) per 1,000cfg
  - Very low rate compared to other states with severance taxes
  - Can only be used to pay costs and expenses to administer the Oil & Gas Conservation Act
The Story So Far

- Session Law 2011-276 required shale gas study
- STRONGER Regulatory Review and Report
- Public Hearings March 20 and March 27, 2012
- Final Report due by May 1, 2012
- General Assembly reconvenes in May 2012

Regulatory Issues for Resolution

- Development of Oil and Gas Regulatory Program
  - Repeal of existing prohibitions
  - Pre-Drilling assessments
  - Well construction standards
  - Wastewater and solid waste management
  - Siting requirements
  - Water supply and water withdrawal issues
  - Injection fluid disclosures
- Jurisdiction Over Regulatory Program
  - DENR, Environmental Management Commission, or Mining Commission – or -
  - New regulatory entity
Regulatory Issues for Resolution

- State and Local Government Allocation of Authority
  - State permitting system/local permitting system
  - Land use regulations, zoning, special use permits
  - Local control v. uniform process
  - Preemption issues
- Revenue Generation
  - State and local government allocation of revenue
  - Directed uses of revenue
- Topics for Further Study
Introduction & Background
Hydraulic Fracturing Method

Regulation of Hydraulic Fracturing
Primarily a state responsibility

State Review of Oil and Natural Gas Environmental Regulations (STRONGER)
- Illinois 1996
- Indiana 2005
- Michigan 2003
- New York 1994
- North Carolina 2012
- Ohio 2011
- Pennsylvania 2010
U.S. EPA Initiatives

Ongoing Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources

UIC Class II permitting guidance being developed for hydraulic fracturing activities that use diesel fuels in fracturing fluids

Shale gas effluent limitation guideline – EPA intends to issue pre-treatment standards for produced water from flowback operations

Proposed Rule for O&G New Source Performance Standards and National Emissions Standards for Hazardous Air Pollutants

- Requests by environmental organizations for EPA to act on a variety of regulatory fronts

The Pennsylvania Experience
Water Supply

Up to 3 to 5 million gallons of water used for each well completion

Return flow often reused, but significant freshwater needed

Experience to date with Marcellus Shale suggests, from an overall perspective, that water requirements for shale development are comparatively modest, but concerns regarding –

- Impacts to small local streams
- Cumulative impacts of many withdrawals in a watershed
- Maintaining a baseline low flow (seasonal impacts)
- Invasive species control
Susquehanna River Basin Commission Experience

Natural gas well pad locations through Q2 2011:

- Average daily withdrawal from docketed sources – 7.25 MGD
- Average daily consumptive use – 9.99 MGD
**SRBC approach to regulating water use in shale gas development**

Project review authority extended to all natural gas well development projects targeting the Marcellus or Utica Shales (Executive Director Determination 08-15-08)

- Approval of Commission required for surface water and groundwater withdrawals, regardless of amount
- Particular concern regarding cumulative impacts on stream flow; potential for passby flow conditions

Approval-by-rule (ABR) process developed for consumptive use (rulemaking effective 01-15-09)

- SRBC staff authorized to approve consumptive use (well pad) applications
- Requirements included for metering, daily use monitoring and quarterly reporting

**Wastewater Management**

Produced water contains high levels of TDS (salts)

- Streams have limited assimilative capacity
- Concerns regarding maintaining and protecting uses – particularly in high quality / special protection area

Other constituents: barium, strontium, NORM

Substantial water reuse ongoing – but practical limits from development life-cycle
Regulation of Wastewater

Produced water and drilling fluids are excluded from U.S. EPA definition of ‘hazardous waste’
- State requirements apply, e.g., PA residual waste rule

Direct discharge from well site prohibited by CWA regulation

Off-site discharge through POTW allowed by CWA but disfavored in many states – PA’s ‘voluntary ban’

Disposal via underground injection
- Class II wells regulated by USEPA pursuant to SDWA
- Program administered by states with primacy

EPA Clean Water Act Rules

Effluent limit guideline for the oil and gas extraction point source category, onshore subcategory:

“Except as provided … there shall be no discharge of waste water pollutants into navigable waters from any source associated with production, field exploration, drilling, well completion, or well treatment (i.e., produced water, drilling muds, drill cuttings, and produced sand).”

- 40 CFR § 435.32
EPA Solid Waste Disposal Act (RCRA) Rules

“Solid wastes which are not hazardous wastes. The following solid wastes are not hazardous wastes:

... (5) Drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil, natural gas or geothermal energy.”

-40 C.F.R. § 261.4(b)(5)

Treatment and reuse technology choices

Natural pond evaporation
Direct reuse for drilling & fracturing
Underground injection
Conventional treatment technologies
TDS reduction via reverse osmosis
TDS reduction via evaporation
TDS reduction via evaporation / crystallization
Groundwater Protection

Pre-drilling
- Survey of water supplies
- Notice to nearby water suppliers

Well Integrity
- Casing and cementing standards

Key Concern: Methane migration

Both PA & OH recently have adopted or proposed enhanced standards

Casing & Cementing

Provides for control of the well

Prevents migration of gas into fresh groundwater

Multiple strings of casing protect various intervals

Cement used to secure the wellbore and isolate fresh groundwater

Source: Marcellus Shale Coalition
**Vertical Separation**

Marcellus Shale
- Up to 9,000 feet deep in PA
- 3,000-5,000 feet deep in OH

Utica Shale
- As deep as 14,000 feet in PA
- 4,000-8,000 feet deep in OH

Potable groundwater generally well above 1,000 feet in depth

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**Groundwater Protection**

U.S. EPA Administrator Lisa Jackson:

“I'm not aware of any proven case where the fracking process itself has affected water.”

-U.S. House Oversight & Government Reform Committee, May 24, 2011
Conclusion from 2004 EPA Study

Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs

EPA also reviewed incidents of drinking water well contamination believed to be associated with hydraulic fracturing and found no confirmed cases that are linked to fracturing fluid injection into CBM wells or subsequent underground movement of fracturing fluids. Although thousands of CBM wells are fractured annually, EPA did not find confirmed evidence that drinking water wells have been contaminated by hydraulic fracturing fluid injection into CBM wells.

Safe Drinking Water Act – Underground Injection Control

“The term 'underground injection' –

(A) means the subsurface emplacement of fluids by well injection; and

(B) excludes –

(i) the underground injection of natural gas for purposes of storage; and

(ii) the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities.”

-SDWA § 1421(d)(1), 42 U.S.C. § 300h(d)(1), as amended 2005
New EPA Study Initiated in 2010

Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources

The overall purpose of this study is to understand the relationship between hydraulic fracturing and drinking water resources. More specifically, the study is designed to examine the conditions that may be associated with the potential contamination of drinking water resources, and to identify the factors that may lead to human exposure and risks. The scope of the proposed research includes the full lifecycle of water in hydraulic fracturing, from water acquisition through the mixing of chemicals and actual fracturing to the post-fracturing stage, including the management of flowback and produced water and its ultimate treatment and/or disposal. Figure 1 illustrates the hydraulic fracturing water lifecycle and the key research questions EPA will address through this study.

Air Quality Studies

Texas –

- “[T]he measured and estimated air pollution levels did not reach levels that have been observed to cause adverse health effects.”

Pennsylvania –

- “Results of limited ambient air sampling initiative did not identify concentrations of any compound that would likely trigger air-related health issues associated with Marcellus Shale drilling activities.”
Sources of Air Emissions

Engines
Storage Tanks
Processing & Dehydration Units
Generators
Vents
Flares

Regulation of Air Emissions

Federal permitting for ‘major’ sources (Title V)

Federal standards for certain processing and transmission and storage facilities
- Proposal pending to strengthen and expand

State permitting – often by general permit – of sources used in production or processing (e.g., engines, tanks, vents) at non-Title V facilities
- OH general permit finalized February 2012
- PA general permit changes pending
Source Determination

Comparing the rate of emission of criteria pollutants to applicable thresholds determines if a source is “major” – but, what is the “source”?

- Implicates NSR, PSD, Title V permitting

Per EPA regulation, facilities may be aggregated and considered a single source if located on contiguous or adjacent properties, under common control, and belong to a single major industrial grouping

- EPA Guidance (2009) – the ‘McCarthy Memo’
- PA Guidance (2011)

Site Development – E&S Control – Wetlands

Well pads
- Site construction standards – BMPs
- Temporary / permanent stabilization
- Site restoration
  - Issues of timing on multi-well pads

Pipeline water crossings – typically temporary impacts

Key concern in PA: protection of HQ / EV waters
**Municipal Regulation**

Local land use regulation – traditional zoning

Regulation of drilling, production, site development – preempted?

- One of the earliest (and continuing) areas of dispute in PA

Road maintenance & bonding

**The North Carolina Context**
Water Supply

Surface and groundwater withdrawals are not heavily regulated in NC . . . yet.

Existing Regulation of Withdrawals – Registration Only; No Permits

§ 143-215.22H. Registration of water withdrawals and transfers required.
(a) Any person who withdraws 100,000 gallons per day or more of water from the surface or groundwaters of the State or who transfers 100,000 gallons per day or more of water from one river basin to another shall register the withdrawal or transfer with the Commission. A person registering a water withdrawal or transfer shall provide the Commission with the following information:

1. The maximum daily amount of the water withdrawal or transfer expressed in thousands of gallons per day.
2. The location of the points of withdrawal and discharge and the capacity of each facility used to make the withdrawal or transfer.
3. The monthly average discharge expressed in thousands of gallons per day.
**Water Supply (Cont.)**

**Existing NC Tools to Regulate Water Withdrawals**

- **Interbasin Transfers** – Certificate required ≥ 2 MGD
  - Public meetings in source basin upstream of withdrawal, downstream of withdrawal, and receiving basin
  - Burdensome notice requirements, environmental impacts study, specific criteria for granting certificate

- **Capacity Use Areas** – Permit Required > 100,000 GPD
  - Central Coastal Plain Capacity Use Area
  - Eno River Voluntary Capacity Use Area

**NC Statutory Withdrawal Policy** - Against public policy if:
- withdrawal causes reversal of natural flow; AND
- substantial portions of water not returned after use

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**Regional Water Supply Concerns**

**Cape Fear River Basin Water Supply Plan**

**Chatham Group**

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33
Significant drought in central and western North Carolina

House Bill 2499 – The 2008 Drought Bill
- Strengthens existing law
- Increased water use reporting
- DENR water shortage emergency powers
- Water shortage response plans

Underground Injection

Currently, NC law prohibits the injection required for shale development. These requirements are stricter than federal UIC regulations:

15A N.C.A.C. 02C .0209 CLASSIFICATION OF INJECTION WELLS

(b) Class 2.
(1) This class applies to oil and gas production and storage related injection wells and includes wells which are used to inject fluids:
(A) which are brought to the surface in connection with conventional oil or natural gas production;
(B) for enhanced recovery of oil or natural gas; and
(C) for storage of hydrocarbons which are liquid at standard temperature and pressure.
(2) No person shall construct, use, or operate a well of this class for injection.
Wastewater Management

NC currently has a statutory ban on subsurface injection of wastewater through injection wells


... (b) The discharge of any wastes to the subsurface or groundwaters of the State by means of wells is prohibited.

A regulatory ban is also currently in place. See 15A N.C.A.C. 02C 0209(a) & (b)

Wastewater Management, cont’d

NPDES-authorized discharges

NPDES program prohibits direct discharge of wastewater from shale development

Indirect discharge through POTWs may be possible.
-- Management of concerns that POTWs might not treat high volume/low toxicity waste adequately
-- Local POTWs have constrained wastewater capacity
-- Big Buffalo Wastewater Treatment Plant (in Lee County) expanding to support growth
**Wastewater management, cont’d**

Land-based disposal, 15A N.C.A.C. 2T regulations

Some pre-treatment would be required prior to land application

NC DENR takes the position that, “Land-based disposal of wastewaters, produced waters and drilling wastes may be permissible under DENR’s land application and solid waste regulatory programs, but at this time no such activities have been permitted or are known to have occurred.”

NC DENR Draft Report recommends prohibition on land application for disposal of wastewater

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**Groundwater Protection**

North Carolina Shale is Relatively Shallow

Approximately 3,000 feet below ground surface

Formation is not uniform - max. 800 feet thick

![Diagram of Sanford Sud-Basin of the Deep River Basin](image)
Groundwater Protection

North Carolina Well Construction Act,
N.C. Gen. Stat. § 87-83 et seq.
Criteria and Standards for Injection Wells,
15A N.C.A.C. 2C.200 et seq.
Oil & Gas Drilling Regulations,
15A N.C.A.C. 5D.0101 et seq.
Oil & Gas Injection Wells Prohibited,
15A N.C.A.C. 2C.209(b)

Current Permit Requirements:
"No permit shall be granted for the injection of . . . any substance of a composition and concentration such that, if it were discharged to the land or waters of the state, would create a threat to human health or would otherwise render those waters unsuitable for their intended best usage." 15A N.C.A.C. 2C.0211(a)
"All freshwater strata shall be protected by suitable and sufficient casing and cement." 15A N.C.A.C. 5D.0107(b)

Updated Well Construction Standards, Inspection, and Monitoring Requirements Likely

No Pre-Drilling Surveys Currently Required
Site Development
Sedimentation and Erosion Control
Sedimentation Pollution Control Act, N.C. Gen. Stat. § 113A-50 et seq.

Mandatory Standards
- If disturbed area > 1 acre:
  - Approved plan required
  - Installation of erosion and sedimentation control devices to retain sediment on-site
- Regardless of the acreage disturbed:
  - Buffer zone along the margin of the watercourse
  - Angle for graded slopes
Site Development

Stormwater Management

Oil and Gas activities exempt from Clean Water Act NPDES regulations for construction activities

DENR recommends development of stormwater control regulations for oil and gas development activities

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Water Supply Watershed Issues

- Substantial amount of Sanford sub-basin is in water supply watershed
- For example, large portion of Lee County is classified as WS-IV for Cape Fear River and Deep River

Nutrient Sensitive Waters – Buffer and Stormwater Requirements

Wetlands Impacts:
- Section 404/401 Permitting Required
Air Emissions

No specific air emissions rules for oil and gas exploration and production in North Carolina

New EPA standards proposed that would apply to well development, including hydraulic fracturing, and production phase

Development of a general permit may streamline future permitting

Shale resource in attainment areas for ozone (currently), PM, and SO2

Local Land Use Regulation

Very Important Issue for Local Governments

- Local impacts – local regulation?
- Dillon’s Rule – North Carolina is not strong “home rule” state
- Uniformity and consistency vs. local interests and traditional regulatory authority
- Possible preemption Issues
- Local authority limited to traditional land use role
- Possible revenue generation for local government
Questions?
MARCELLUS SHALE ECONOMIC DEVELOPMENT OPPORTUNITIES

Natural Gas Fundamentals

Three Industry Segments
- **Upstream**: bringing natural gas to the surface (drilling)
- **Midstream**: storing and transporting natural gas (pipelines, etc.)
- **Downstream**: selling and distributing natural gas (your supplier)

Types of Natural Gas
- **Dry Gas**: home, business heating and fueling
- **Wet Gas**: contains Natural Gas Liquids (NGLs); raw material for other products (polymers, paints, plastics, fertilizers, etc.)
Natural Gas Uses

- **Residential and Commercial**
  - Cooking, washing, drying, warming water, heating and air conditioning

- **Industrial**
  - Pulp and paper, metals, chemicals, stone, clay, glass, process foods, treat waste, incineration, drying, dehumidification, heating and cooling

- **Power Generation**
  - Electric utilities and independent producers increasingly using natural gas to provide energy for power plants because: lower capital costs, built faster, work more efficiently, emit less pollution than fossil fuel plants

- **Transportation**
  - Compressed natural gas (CNG) for smaller to mid-size vehicles and fleets
  - Liquefied natural gas (LNG) for mid-size to large vehicles and fleets
  - 12 Million CNG vehicles worldwide:
    - 2.7MM in Pakistan, 1.9MM in Iran and Argentina
    - 1.6MM in Brazil, only 125,000 in U.S.

Fuel cost is 50% less than gasoline and 30% less CO₂

PA’s History of Oil and Gas

Edwin Drake – Titusville, 1859

More than 350,000 oil and natural gas wells since

PA >60,000 active natural gas wells and ~20,000 active oil wells

A solid foundation for...
Shale Gas Revolution

Source: Energy Information Administration
Shale Gas Revolution Across the U.S.

Source: Energy Information Administration

Growth of Shale Gas

Source: Energy Information Administration Annual Energy Outlook, early release, January 2012
Marcellus Shale: Geographic Footprint

Deep geologic formation stretching over 95,000 square miles in parts of Ohio, West Virginia, Pennsylvania and New York
4,000-8,500 feet below ground surface
Between 50 and 200 feet thick
Potential to be the largest natural gas field in the U.S., second largest in the world behind South Pars/North Field off-shore in the Persian Gulf shared by Qatar and Iran
Estimated to hold more than 500 trillion cubic feet of natural gas (estimated value >$1 trillion)
Low permeability
Requires combination of horizontal drilling and hydraulic fracturing
Economic Benefits

Key Report Findings

Pennsylvania is self-sufficient in natural gas (net exporter)

2020 output levels (17 billion cubic feet per day) could make the Marcellus the single largest producing gas field in the U.S.

Marcellus could produce a quarter of U.S. natural gas by 2020

$1.6 billion in lease and bonus payments in 2010

<table>
<thead>
<tr>
<th>Economic Value Added</th>
<th>2011</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$12.8 billion</td>
<td>$20.2 billion</td>
</tr>
<tr>
<td>State/Local Taxes</td>
<td>$1.23 billion</td>
<td>$2 billion</td>
</tr>
<tr>
<td>Cumulative Employment</td>
<td>156,695</td>
<td>256,420</td>
</tr>
<tr>
<td>Wells Spudded</td>
<td>2,300</td>
<td>2,497</td>
</tr>
<tr>
<td>Output (bcfe/day)</td>
<td>3.5</td>
<td>17.5</td>
</tr>
</tbody>
</table>
Economic Benefits

City 7th fastest growing in nation

- 229,000 employees in Marcellus and related industries
- $76,036 average core industry wage $30,000 higher than PA average
- $63,155 average ancillary industry wage $17,000 higher than PA average
- 7 in 10 hires are from Pennsylvania; Confirmed by MSC member survey

Source: PA Department of Labor and Industry, January 2012
**Marcellus Shale**

- The Marcellus Shale geological formation is one of the largest unconventional natural gas reserves in the world:
  - Pittsburgh is the largest metro atop the Marcellus Shale
  - 95,000 square miles of approximately 60% of Pennsylvania’s land mass
  - Discovered, recoverable reserves projected at nearly 84 trillion cubic feet
  - In the Marcellus Shale play alone, an estimated 7,000+ wells will be drilled between 2011-2014
  - Prompted 100+ companies to expand their exploration, drilling or service operations in the Pittsburgh region since 2007

**Driven by Oil and Gas, Natural Resources was the Region’s Fastest Growing Industry during the Recession**

- Employment by Key Industry - mid-2007 to mid-2011

  - Source: BLS Census of Employment and Wages, Southwestern Pennsylvania
More than 30 Houston-based energy companies have already come to the region

- Allied Technology
- Allis-Chalmers Energy Inc.
- Baker Hughes Oilfield Operations
- BJ Services Co.
- Burleson Cooke, LLP
- Cabot Oil & Gas Corp.
- Carrizo Oil & Gas Inc.
- Complete Production Services Inc.
- Core Laboratories LP
- Crescent Directional Drilling
- Cudd Energy Services
- EOG Resources Inc.
- Express Energy Services LP
- Exterran Holdings, Inc.
- Flotek Industries, Inc.
- FMC Technologies Inc.
- Halliburton Energy Services
- Hunting Energy Service
- Key Energy Services Inc.
- Kinder Morgan Energy Partners
- Marathon Oil Co.
- National Oilwell Varco
- Royal Dutch Shell
- Schlumberger Limited
- Smith International
- Spectra Energy Corp.
- Stallion Oilfield Services
- Tennessee Gas Pipeline Co.
- Texas Eastern Transmission, LP
- TSI Flow Products, Inc.
- Universal Pegasus International
- Valerus Compression Services
- Weatherford U.S., LP
- Wilbros International

Community Revitalization and Jobs

Washington County was home to the first Marcellus well and the first horizontal well in Pennsylvania. The county boasts 160 wells drilled and 241 permits issued in 2011 – the most in Southwestern Pennsylvania.

- Pennsylvania Department of Environmental Protection

- Among large counties (75,000 or more employees), Washington County, PA had the third highest percent increase (4.3%) in employment in the nation between March 2010 and March 2011 according to the U.S. Bureau of Labor Statistics. "Most of the job growth there is tied to Marcellus Shale gas drilling."
  - Scott Fergus, Washington County Director of Administration, 9/30/11

- “There is no question that the development of the energy industry has become a significant economic generator in our County. . . . Not only are we the Energy Capital of the East but also can be called Jobland”.
  - Hartan Shober, Jr., Washington County Commissioner
Shale Economic Spectrum

Diverse Job Opportunities

Professional Functions Identified in MSC Survey

- Administrative: 11%
- Commercial: 1%
- Engineering and Construction: 24%
- Environmental Health & Safety: 3%
- Equipment Operations: 30%
- Geology: 2%
- Land: 4%
- Operations and Maintenance: 17%
- Purchasing: 1%
- Water Management: 4%
- Well Services: 1%
- Other: 2%

Source: Marcellus Shale Coalition Membership Survey, May 2011
Environmental Protection

- Employee Safety
- Public Safety
- Erosion and Sediment Control
- Waste Handling Disposal
- Well Density/Spacing
- Well Testing
- Floodplains
- Fluid Handling/Disposal
- Incident Reporting
- Wetlands
- Stream Crossings
- Threatened and Endangered Species
Consumer Benefits

Energy costs dropped by $633 million in 2010 (Penn State, July 2011)

Electricity rates drop by 50% (Bloomberg News, January 2012)

Residential gas and electric customers are saving $200 a year (Navigant Consulting, January 2012)

Major utilities serving Philadelphia area have reduced gas bills by 37% to 52% since 2008 (Philadelphia Inquirer, December 2011)

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Revenue for Pennsylvania

<table>
<thead>
<tr>
<th>Paid by Marcellus Industry</th>
<th>Paid by Marcellus Industry</th>
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</thead>
<tbody>
<tr>
<td>Overall taxes since 2006$^1$</td>
<td>$1.1$ billion</td>
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<tr>
<td>State and local taxes in 2011$^2$</td>
<td>$1.23$ billion</td>
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<tr>
<td>Road construction investments since 2008$^3$</td>
<td>$411$ million</td>
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<tr>
<td>Royalty payments to state in 2011$^4$</td>
<td>$107$ million</td>
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<tr>
<td>Permitting and enforcement fees to increase DEP personnel</td>
<td>$11$ million</td>
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</tbody>
</table>

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1 – Pennsylvania Department of Revenue, May 2011
3 – Survey of Marcellus Shale Coalition Full Members
4 – Pennsylvania Department of Conservation and Natural resources
Act 13 – February 2012

Natural Gas Energy Development Program

- Enhanced environmental protection for the development of unconventional natural gas resources
- Well permits
- Transportation of wastewater fluids
- Well location
- Gathering lines
- Well site relocation
- Emergency response
- Protection of water supplier
- Hydraulic fracturing chemical disclosure
- Notification to public water system
- Air containment emissions
- Containment for unconventional wells
- Criminal and civil penalties

Collection and Distribution of an Impact Fee

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<th>Year</th>
<th>$0 – 2.25</th>
<th>$2.26 – 2.99</th>
<th>$3.00 – 4.99</th>
<th>$5 – 5.99</th>
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- Administration – PA Public Utility Commission
- Fee Distribution – 60% local, 40% state gas resource development and coordination
Municipal ordinances and zoning standards

- This Act supersedes all local ordinances purporting to regulate oil and gas operations
- Uniformity of local ordinances
- Administration/enforcement – PA Public Utility Commission
DENR Study Findings

- Need comprehensive regulatory program in effect before starting
- Industry can have significant impacts on local communities
- Economic benefits are unclear in part because of limited information on the resource
- More research is needed on groundwater, the shale gas resource
- Need to evaluate state's air toxics program and make sure it protects landowners who lease to oil and gas operators
- Appropriate level of severance tax and use of those revenues

DENR Study Recommendations

- Enhance existing oil and gas well construction standards
- Develop setback requirements and identify areas where oil and gas activities should be prohibited (watersheds, floodplains, stormwater programs (impervious surfaces) and protect neighbors (noise, etc.)
- Develop a state stormwater regulatory program for oil and gas drilling sites
- Develop specific standards for management of oil and gas wastes
- Data management system
  - GIS capabilities, store baseline water and air quality data, track production for royalties and severance taxes
DENR Study Recommendations

- Ensure state agencies and local first responders and industry are prepared to respond to a well blowout, chemical spill or other emergency
- Modernize our oil and gas regulatory program while preventing physical and economic waste of oil and gas resources
- Keep environmental permitting in DENR where it will benefit from the expertise of state geological staff and the ability to coordinate air, land, etc.
- Develop a coordinated permitting process
- Distribution of revenues from oil and gas excise taxes and fees

DENR Study Recommendations

- Identify source of funding for repair of roads
- Clarify the extent of local government regulatory authority (potential sharing authority)
- Research of environmental effects
- Research on potential economic impacts does not consider site prep, lease of land, extraction, production or transmission of gas
- Address liability for environmental contamination caused by exploration and development, particularly for groundwater contamination
- Public participation in development of standards
What Does the Legislature Need to Do Now?

- Send a clear message to companies looking at NC
- Take advantage of momentum from DENR Report and legislative interim committees
- Build a strong foundation

How Can They Do It?

- Change the laws that make it illegal?
  - Hydraulic Fracturing
  - Horizontal Drilling
- Moratorium on permits?
  - How long?
  - What needs to happen before the moratorium is lifted – and should those items be spelled out in statute?
- Regulatory structure?
  - Oil/gas board permitting v. DENR permitting?
- Severance taxes v. impact fees?
What Can the Legislature Actually Do?

- “Short” Session?
- Political Outlook
  - Election year
  - New Legislature?
  - New Governor and Executive Branch?