Fact-Based Regulation for Environmental Protection in Shale Gas Development

NACWA 2012 P3 Workshop

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Why Shale Gas?

- Shale gas increasingly important as energy source worldwide – now 1/3 of gas resource in U.S.
- Concerns for environmental effects (hydraulic fracturing) must be addressed with effective, fact-based regulations and controls.
- Some of the claims about shale gas development effects may be overstated or not based on good science.

Shale Gas Occurrences in the U.S.

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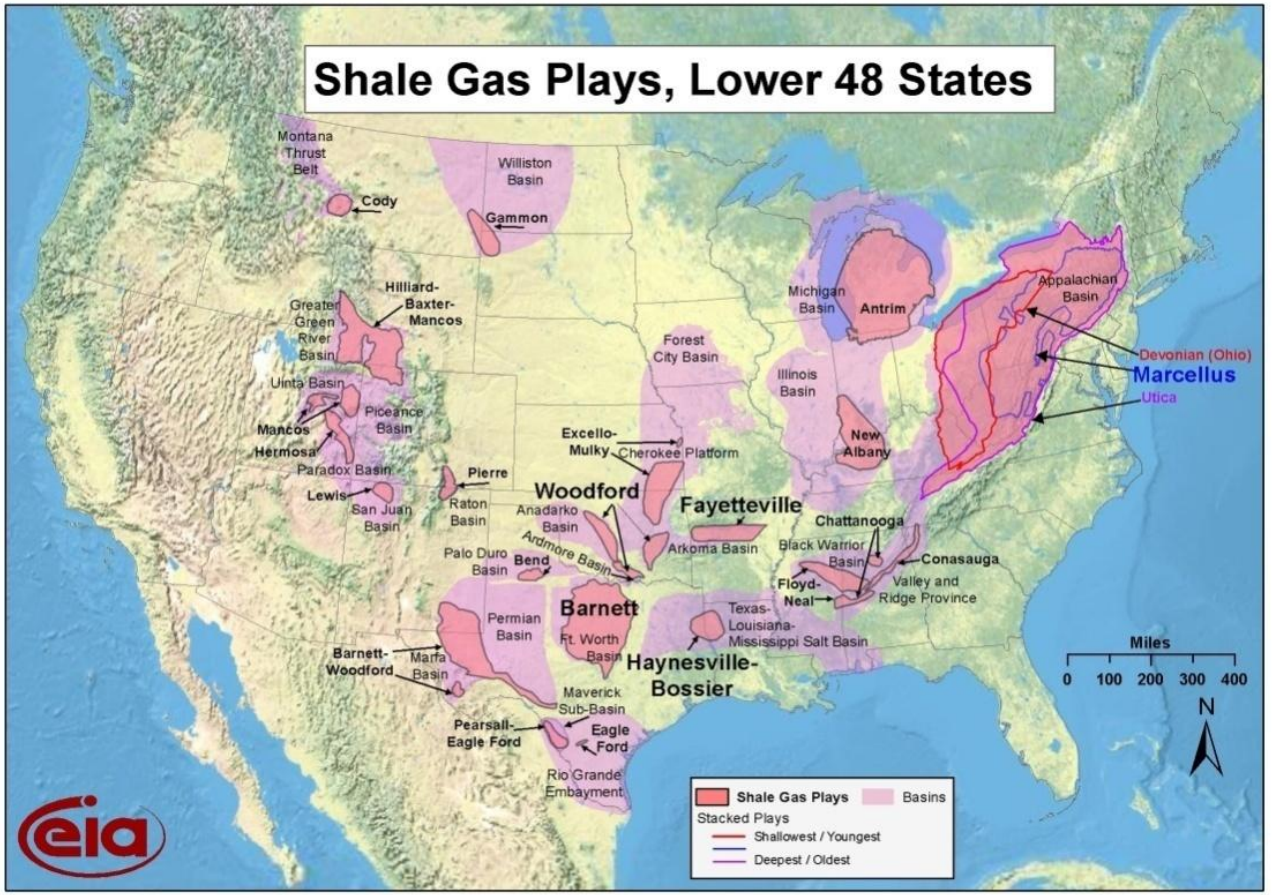

Source: Energy Information Administration based on data from various published studies.
Updated: March 10, 2010

Source: U.S. EPA Draft Plan

Shale Gas: The Changing Picture

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- Current resource estimate: 862 Tcf
- Doubled from 2010 to 2011
- Annual production 4.8 TCF in 2010
- Increased 5-fold from 2006 to 2010
- Currently 23% of natural gas production
- Expected to increase to 46% by 2035
- By almost any measure a “game changer”

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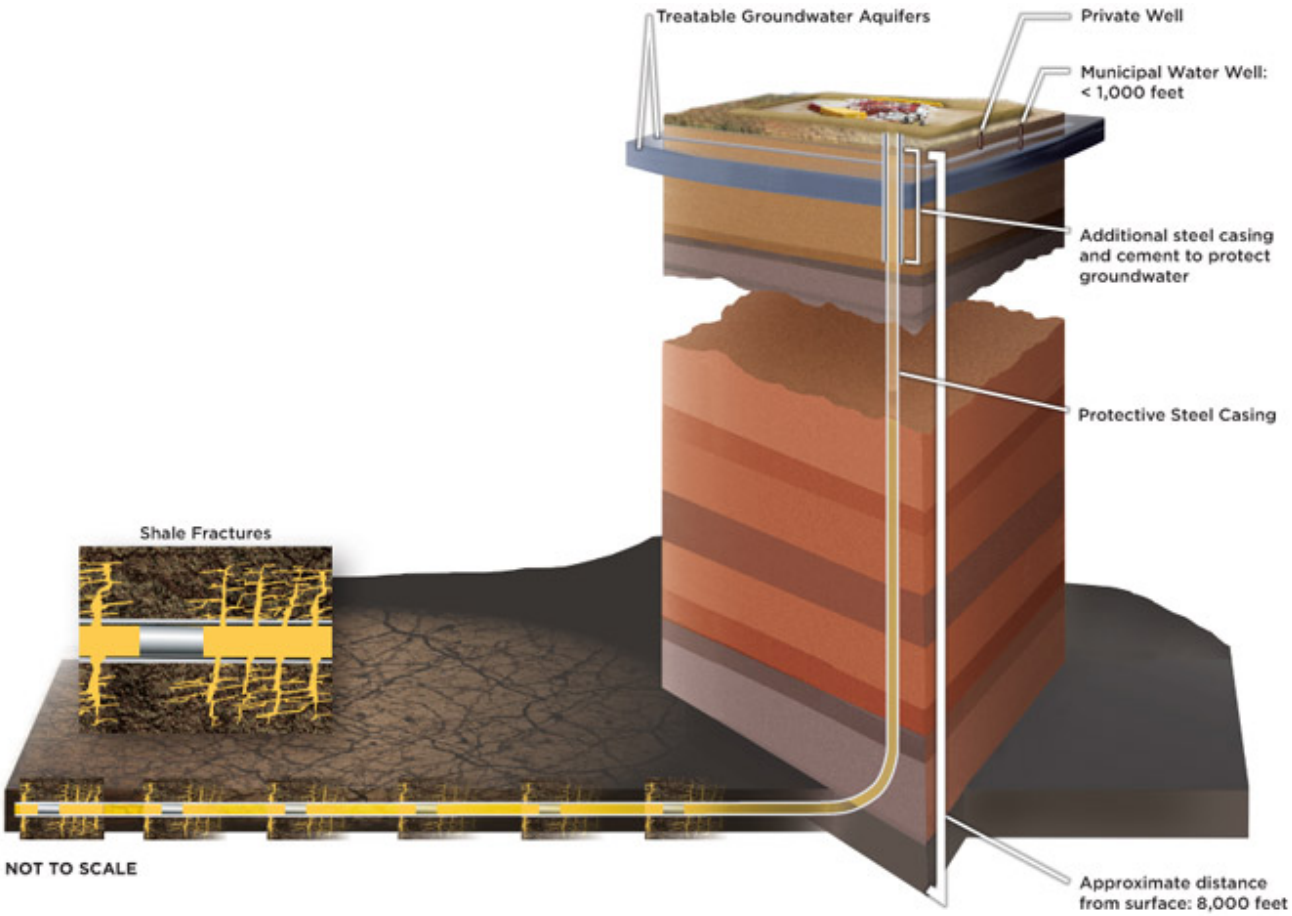
Shale Gas Operations



Source: Chesapeake Energy

An Example: Carrizo's 22-Well Pad at UT Arlington

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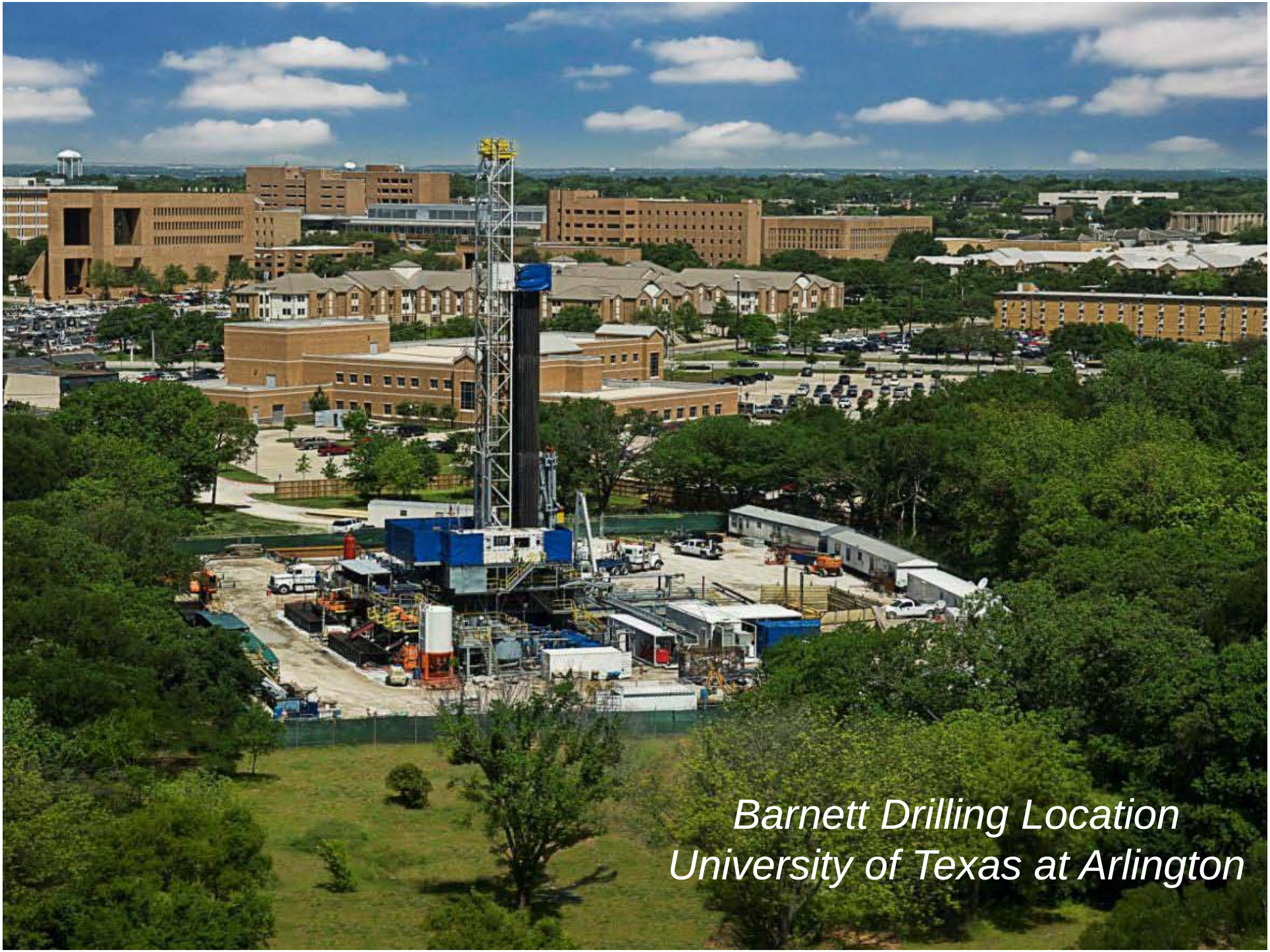
- According to Carrizo estimates:
  - Total drainage area of 1100 acres
  - EUR of 110 BCF over 25 years
  - 5 BCF per well
  - At $5/Mcf gas, $550 million in production revenue
  - Roughly $140 million to 1500 royalty owners
- UT Arlington has 391 acres, worth tens of millions in future royalties

Article by Jack Smith, Fort Worth Star Telegram, 10/1/2010


Barnett Drilling Location
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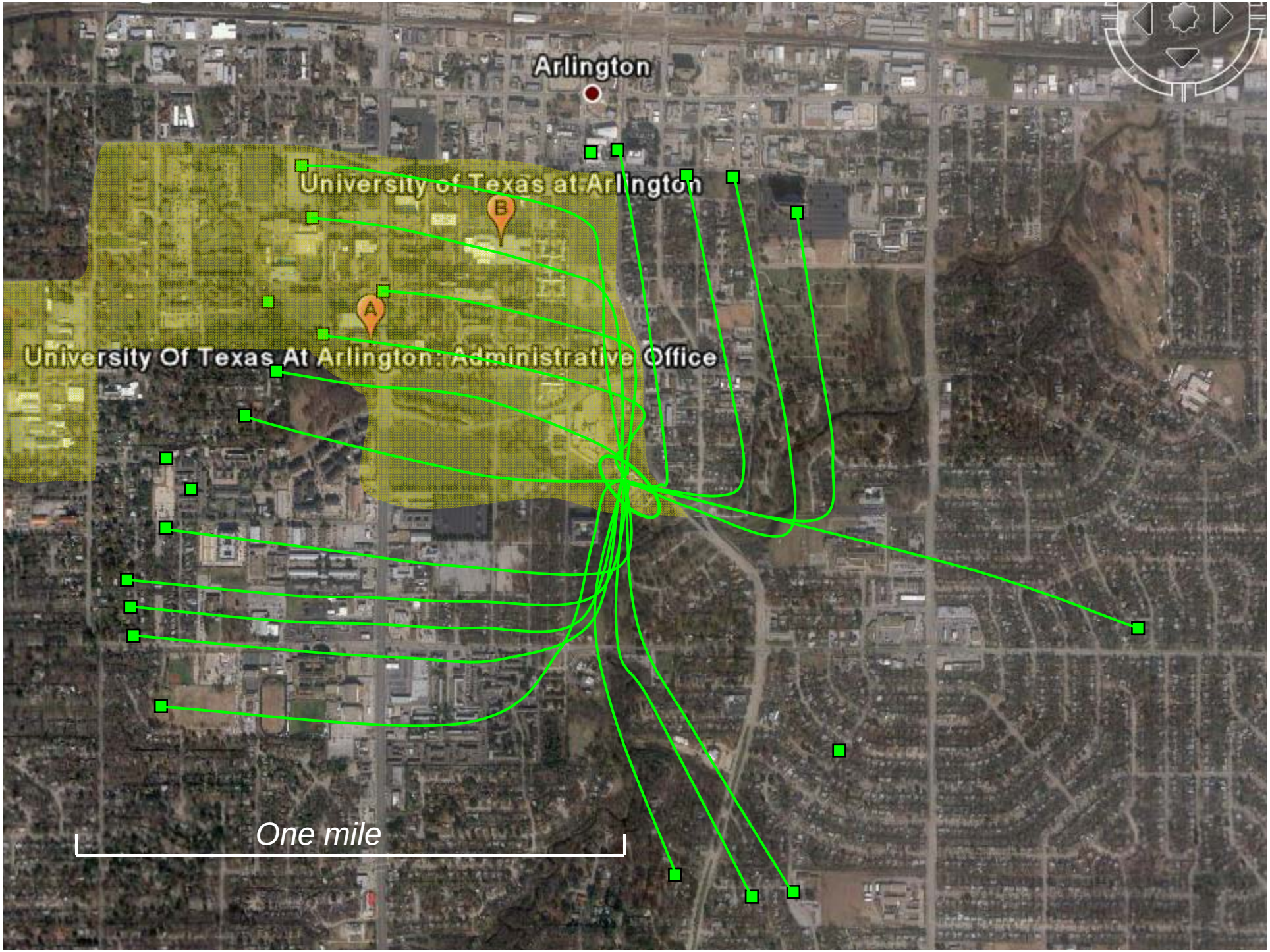
Arlington
University of Texas at Arlington
B
A
University Of Texas At Arlington: Administrative Office
One mile

Focus of the Energy Institute Initiative

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- Three major shale gas plays
  - Barnett
  - Haynesville
  - Marcellus
- Media coverage and public perception
- Environmental impacts
- Current regulations
- State enforcement

How Was the Initiative Performed?

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1. Funding provided by Energy Institute
2. Engage interdisciplinary team members
3. Develop team member contributions – white papers. Outside review of papers.
4. Integrate individual contributions into a policymaker-oriented final report

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UT Austin: Campus-Wide Participation

- Jackson School of Geosciences
- UT Bureau of Economic Geology
- UT and Tulsa Schools of Law
- UT School of Communication
- Energy Institute
- Environmental Defense Fund

Initial Report: Future Editions Anticipated

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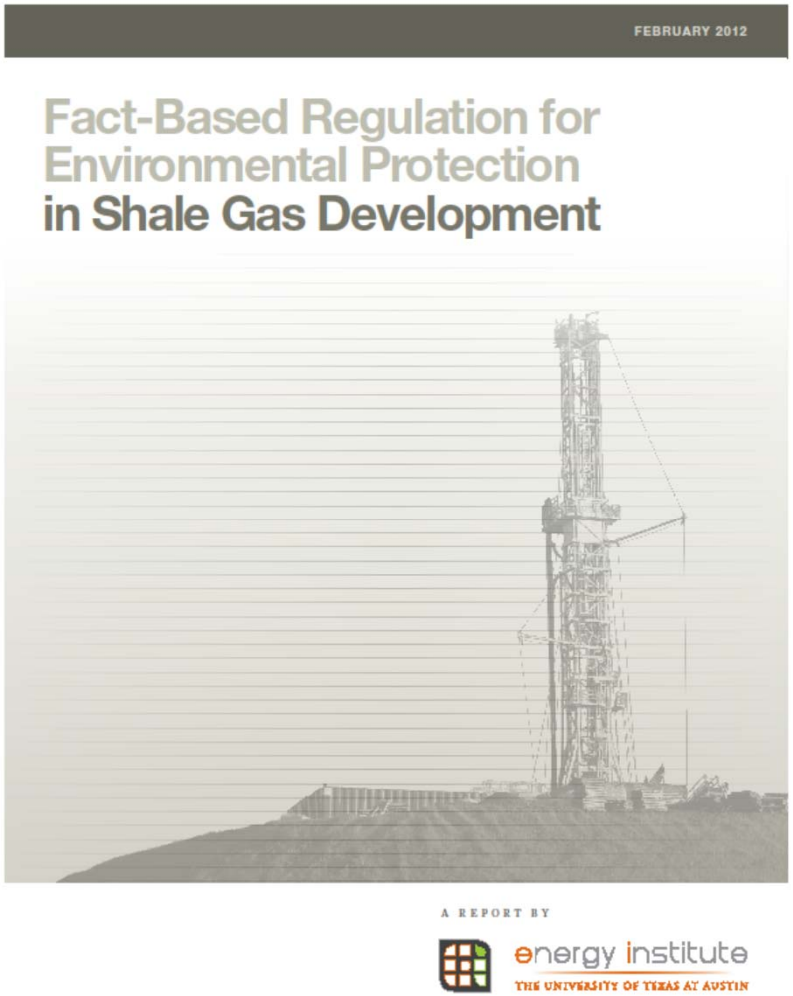

Four Parts

1. Media Coverage & Public Perception
2. Environmental Impacts
3. Federal and State Regulations
4. Regulatory Enforcement

Released: AAAS
Vancouver
February, 2012

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Part 1:Hydraulic Fracturing and the Media

- National Newspapers
- Local Newspapers
- National Television and Radio
- Local Television
- Online News

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Tone of Media Coverage

	Negative	Neutral	Positive
National Newspapers	64%	25%	12%
Local Newspapers	65%	23%	12%
National Television and Radio	64%	19%	18%
Local Television	70%	27%	3%
Online News	63%	30%	7%

Assessment of Public Perception

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- Online research method
- 1473 respondents
- 26 counties in Barnett Shale area
- About 75 questions
- Three areas surveyed
  - Attitude toward hydraulic fracturing
  - Knowledge of hydraulic fracturing
  - Media habits

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Public Perception Findings: Hydraulic Fracturing Attitudes

- Survey responses indicate that hydraulic fracturing is...
  - Valuable
  - Productive
  - Not foolish
  - Good
  - Beneficial
  - Positive
  - Somewhat helpful
  - Somewhat effective
  - Good for the economy
  - Important to the US economy
  - Important overall
- Responses also indicate that hydraulic fracturing is...
  - Bad for the environment
  - Unsafe

Part 2: Environmental Impact Evaluation

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- Review of technical literature
- Survey of online coverage
- Address all phases of shale gas life cycle
- Evaluate scientific basis for claims

Major Findings: Environmental Evaluation

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- Reports of groundwater contamination not unique to shale gas (conventional also)
- No evidence of aquifer contamination from HF chemicals
- Continued progress on disclosure needed for complete analysis (and reduce public concern)
- Most HF chemicals are widely used and are dispersed in the environment (e.g., house-hold cleaners, cosmetics)
- Chemical additives may pose higher risk in concen-trated form at surface before mixing than in HF

Major Environmental Findings (continued)

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- Methane reports in water wells from natural sources in many cases (e.g., Marcellus)
- Claims of well impacts often involve natural constituents (e.g., Fe, Mn)
- May be mobilized by vibrations, other energy from drilling (methane also)
- Blowouts are rare occurrences but appear to be under-reported

Major Environmental Findings (continued)

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- Subsurface blowouts may lead to house explosions in rare cases (blowout preventers)
- Water requirements for HF are substantial (3 to 6 million gallons per well)
- Water consumption must be evaluated in comparison to other users and demands
- Consumption issues exacerbated by drought conditions

Major Environmental Findings (continued)

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- Primary air quality concern is for VOC emissions especially in non-attainment areas (smog/ozone precursor)
- Methane releases can be reduced by “green completions”
- Primary focus of health effects is on benzene and other VOCs; much research needed to validate claims

Focus on Flowback and Produced Water

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- After HF Completed, Pressure Is Reduced
  - Returned water includes flowback and produced (formation) water
  - 20-80% of HF fluid recovered in flowback
- Historical Disposal Methods
  - Barnett & Haynesville: Class II well injection
  - Marcellus: Discharge to treatment plants

Focus on Flowback and Produced Water

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- Recycle/Reuse: Preferred Management
  - Problem: treatment challenges
  - High TDS, solids (sand, silt), organic compounds, NORM, etc
  - Reduces water quality impact and water consumption
- EPA Pretreatment Standards for WWT Discharge
  - Announced in EGD Program Plan (10/2011)
  - Information gathering in 2012
  - Proposed rule expected in 2014

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Part 3: Regulation of Shale Gas Development

- Federal and state regulations addressed
- Full cycle of shale gas well construction included
- Sixteen states with current or pending shale gas production studied

Major Findings: Shale Gas Regulation

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- Few federal regulations are directed specifically at shale gas, but are pursuant to broader laws
- Many exemptions from federal regulations for oil and gas apply to shale gas
- Most regulatory authority lies with states

Major Regulation Findings (continued)

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- Majority of state regulations were written before shale gas development
- Regulatory updates have been done by many states
- But gaps remain in some states
  - Risks of surface spills
  - Well casing and cementing
  - Water withdrawal and use
  - Wastewater disposal

Major Regulation Findings (continued)

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- Recent regulatory focus on three concerns
  - Proper casing of shale gas wells
  - Disclosure of content of fracturing solution
  - Proper management of flowback and produced water
- More consistency among states for similar regulatory requirements is needed
- Organizations are in place to enhance state O&G regulations (e.g., GWPC, STRONGER)

Major Regulation Findings (continued)

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- Regulations should address all stages of shale gas development
- Regulations need to focus on highest priority issues
  - Greater emphasis needed on surface events - less on hydraulic fracturing risks
  - Attention to groundwater detracts from potentially higher risk of surface incidents
- Surface effects easier to identify
  - Less likely to detect subsurface effects without sampling (not common)
  - More baseline information needed on surface-water and groundwater quality

Part 4: State Regulation Violations

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- Examples from four states : LA, MI, NM, WY
- Types of violations
  - Well pad and access road construction
  - Site maintenance
  - Drilling (and potentially fracturing)
  - Fracturing-process related violations
  - Waste storage and disposal
  - Plugging and remediation
  - Procedural violations

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Shale Gas Violations

- Many of the effects noted occur in all types of oil and gas well development – not unique to shale gas
- Fractured wells may experience more incidents because of additional equipment on the site
- Many of the violations are procedural
  - Represent no environmental effects, or
  - Are minor with no environmental effects
  - Represent minor effects, such as small releases

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Violation Types

- Categories ranging from merely procedural to major environmental impact
  - 58% were procedural or having little or no impact
  - 42% indicated a major, substantial or minor effect
- Surface spills, improper disposal of oil and gas wastes, and problems with leaking pits or tanks
  - Relatively common violation
  - Can be prevented
- Most violations were from operations in common with conventional gas
  - Not shale gas specific

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Credits

Interdisciplinary approach to fact-based regulation

1. Media Coverage, Public Perception	Matt Eastin
2. Environmental Impacts	Ian Duncan
3. Regulation	Hannah Wiseman
4. Enforcement	Hannah Wiseman

Reports Available for Download at…

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http://www.energy.utexas.edu/