World Shale Resources
Historic and Projected U.S. Natural Gas Production by Source

Figure 1. U.S. Natural Gas Production by Source (Historic and Projected)

Shale Gas Plays in the U.S.
480,000 Miles of Existing Natural Gas and HL Pipelines In-Place Facilitating Shale Production
Most U.S. Unconventional Shale Resources Occur in States With Existing Conventional Oil and Gas Regulatory Frameworks In-Place
• 1889 - Natural gas first produced in Arkansas
• 1921 - Oil discovered in southern Arkansas
• Today - Arkansas ranks as the 8th leading natural gas producing state & 18th among oil producing states
• 25 Arkansas Counties - oil or natural gas production
• 5 counties - encompass Arkansas shale play
Natural Gas Production Information

- **Production Information:**
  - 2006 – less 200 bcf. 2013 - over 1 tcf. Approximately 90% from the Fayetteville Shale, 10% from the Arkoma Basin.

- **AR - consume approx 250 bcf per year.**

- **# of Gas wells in Arkansas:**
  - 2013 9787

- **# of Producing Wells in FS:**
  - 2006 165
  - 2007 574
  - 2008 1290
  - 2009 2138
  - 2010 3033
  - 2011 3835
  - 2012 4406
  - 2013 5022
Fayetteville Shale Production Area

4800+ wells (since 2005)
500 new wells completed annually
Approx. 48,000 wells drilled since 1925

Fort Smith
- 4,100 wells
- 100 (50) Ops.

Little Rock
- 4,800+ wells
- 3 (3) Ops.

El Dorado
- 7,200 wells
- 350 (107) Ops.
2800 Miles Of Gathering Pipeline
Issues of Concern

- Water Use and Contamination
- Chemical Disclosure
- Seismic Activity
State Water Plan Documents Current Water Use, Future Needs and Amount of Available Water for Energy Use

Statewide Water Use:
10,750 million gallons/day

Gas Operations Water Use:
10 million gallons/day (600 Wells/year)
(Less than 0.001%)

66% Surface Water
33% Ground Water
70% Surface Water
30% Recycle/Reused Water

Gas Operations Use
Less than 0.03 % of State’s Total Water Runoff Volume

State regulations: only 25% of excess run-off available for use

Source: Arkansas Water Plan and AOGC estimates
ANRC Non-Riparian Permits
Status of Natural Gas Industry Applications/Permits- (October 2013)
Multiple well pad showing reserve pit as component of the AOGC Rule B-17 authorized water storage, recycle and re-use system
Prepared in cooperation with (in alphabetical order) the Arkansas Natural Resources Commission, Arkansas Oil and Gas Commission, Duke University, Faulkner County, Shirley Community Development Corporation, and the University of Arkansas at Fayetteville, and the U.S. Geological Survey Groundwater Resources Program

Shallow Groundwater Quality and Geochemistry in the Fayetteville Shale Gas-Production Area, North-Central Arkansas, 2011

Scientific Investigations Report 2012–5273
**Wells Permitted with Intent of Fracture Stimulation**

Only wells subject to General Rule B-19 are contained in the file. The well records consist of the Form 2 – Drilling Permit Application and Form 3A - Well Fracture Stimulation Report. Well files not yet containing a Form 3A have not yet been fracture stimulated. A well file designated as “Amended” indicates the original permit application has been amended and the copy shown is the amended Form 2.

<table>
<thead>
<tr>
<th>Companies Performing Fracture Treatments</th>
<th>Form 1</th>
<th>Chemical List</th>
<th>Form 37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calfrac Well Services Corp. - Denver, CO</td>
<td>Form1</td>
<td>Chemical List</td>
<td>Form 37</td>
</tr>
<tr>
<td>Schlumberger Technology Corporation - Sugarland, TX</td>
<td>Form1</td>
<td>Chemical List</td>
<td>Form 37</td>
</tr>
<tr>
<td>Multi-Chem Group, LLC - San Angelo, TX</td>
<td>Form1</td>
<td>Chemical List</td>
<td>Form 37</td>
</tr>
<tr>
<td>Cudd Pumping Services, Inc. - Houston, TX</td>
<td>Form1</td>
<td>Chemical List</td>
<td>Form 37</td>
</tr>
<tr>
<td>Halliburton Energy Services, Inc. - Houston, TX</td>
<td>Form1</td>
<td>Chemical List</td>
<td>Form 37</td>
</tr>
<tr>
<td>Weatherford Artificial Lift Systems, Inc. - Houston, TX</td>
<td>Form1</td>
<td>Chemical List</td>
<td>Form 37</td>
</tr>
<tr>
<td>Superior Well Services, Inc - Indiana, PA</td>
<td>Form1</td>
<td>Chemical List</td>
<td>Form 37</td>
</tr>
<tr>
<td>Baker Hughes Oilfield Operations, Inc. - Houston, TX</td>
<td>Form1</td>
<td>Chemical List</td>
<td>Form 37</td>
</tr>
<tr>
<td>Gore Nitrogen Pumping Service, LLC - Seiling, OK</td>
<td>Form1</td>
<td>Chemical List</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Rule B-19**

- Form 1 - Required Registration for Performing Fracture Stimulation
- Form 2 - Permit Form Required to Perform Fracture Treatment
- Form 3A - Well Fracture Stimulation Report
- Form 37 - Request for Trade Secret Exemption
### Master Fracturing Chemical List - Arkansas

#### Basic Fluids

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Schlumberger</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Schlumberger</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additive Name</th>
<th>Additive Description</th>
<th>Additive Name</th>
<th>Additive Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A204</td>
<td>Corrosion Inhibitor</td>
<td>JS80</td>
<td>Gelling Agent</td>
</tr>
<tr>
<td>2203</td>
<td>Bactericide</td>
<td>L034</td>
<td>Iron Control</td>
</tr>
<tr>
<td>368</td>
<td>Breaker</td>
<td>S06</td>
<td>Clay Stabilizer</td>
</tr>
<tr>
<td>505</td>
<td>Friction Reducer</td>
<td>S09</td>
<td>Clay (Moraine)</td>
</tr>
<tr>
<td>2316</td>
<td>breaker</td>
<td>S055</td>
<td>10/20 Mesh Sand</td>
</tr>
<tr>
<td>D167</td>
<td>Foaming Agent</td>
<td>S022</td>
<td>10/20 Mesh Sand</td>
</tr>
<tr>
<td>3285</td>
<td>breaker</td>
<td>S024</td>
<td>10/20 Mesh Sand</td>
</tr>
<tr>
<td>3A32</td>
<td>breaker</td>
<td>S124</td>
<td>001 Mesh Sand</td>
</tr>
<tr>
<td>3A32</td>
<td>breaker</td>
<td>JS200</td>
<td>Bleed Controlled Proppant</td>
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<tr>
<td>水013</td>
<td>breaker</td>
<td>JS600</td>
<td>Bleed Controlled Proppant</td>
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<tr>
<td>S100</td>
<td>breaker</td>
<td>X1857</td>
<td>Propant</td>
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<td>breaker</td>
<td>X1000</td>
<td>Proprietary</td>
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<tr>
<td>S100</td>
<td>breaker</td>
<td>X1000</td>
<td>Proprietary</td>
</tr>
<tr>
<td>S100</td>
<td>breaker</td>
<td>X1000</td>
<td>Proprietary</td>
</tr>
</tbody>
</table>

#### Chemical Constituents

<table>
<thead>
<tr>
<th>CAS Number</th>
<th>Chemical Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>10835-52-6</td>
<td>Calcium Chloride</td>
</tr>
<tr>
<td>28974-37-6</td>
<td></td>
</tr>
</tbody>
</table>

#### Additional Information

- Some additives may be supplied by local operators. Without this detail, a complete list is not applicable.
## ARKANSAS OIL AND GAS

### FORM 3A
WELL FRACTURE STIMULATION REPORT

<table>
<thead>
<tr>
<th>Date of Work</th>
<th>12/01/2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Job</td>
<td>Fracture Stimulation</td>
</tr>
<tr>
<td>Company</td>
<td>XYZ Petroleum Co</td>
</tr>
<tr>
<td>Location</td>
<td>Jones County, AR</td>
</tr>
<tr>
<td>WATCH</td>
<td>4567</td>
</tr>
</tbody>
</table>

### Section 1: Treatment Interval and Completion Details

<table>
<thead>
<tr>
<th>Interval Treated</th>
<th>Start Date/Time</th>
<th>End Date/Time</th>
<th>Volume of Fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 ft - 2000 ft</td>
<td>10:00 AM</td>
<td>12:00 PM</td>
<td>3000 gallons</td>
</tr>
<tr>
<td>2000 ft - 3000 ft</td>
<td>12:00 PM</td>
<td>2:00 PM</td>
<td>2500 gallons</td>
</tr>
<tr>
<td>3000 ft - 4000 ft</td>
<td>2:00 PM</td>
<td>4:00 PM</td>
<td>2000 gallons</td>
</tr>
</tbody>
</table>

### Section 2: List of Chemicals Used and Their Volume

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Volume Used (gallons)</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>3000</td>
<td>75%</td>
</tr>
<tr>
<td>Acid</td>
<td>1000</td>
<td>25%</td>
</tr>
<tr>
<td>Crosslinker</td>
<td>500</td>
<td>12.5%</td>
</tr>
</tbody>
</table>

### Section 3: Certification

Certified: John Doe, Manager of XYZ Petroleum Co.

Date: 12/01/2023
Disposal Well
Moratorium area/
Seismic Permit
Conditions
outside
Moratorium area
Number of events per year:
- 2010 = 624
- 2011 = 724
- 2012 = 8
- 2013 = 2
- Total: 1,358 (>M1.0)

~ 200 = M≥2.5
~ 40 = M≥3.0
4 = M≥4.0

Guy-Greenbrier Earthquake Swarm

SRE and Clara SWD Wells Shut Down
March 4, 2011

SRE and Clara SWD Wells Go Online
July 7 & August 10, 2010, respectively

Deep Six and Trammel SWD Wells Shut Down
July 25, 2011

SRE SWD Well Plugged and Abandoned Late September, 2011

THE UNIVERSITY OF MEMPHIS
Center for Earthquake Research and Information
The largest recorded seismic event generates the same amount of energy as would be released when dropping a gallon of milk from chest high to the floor.
Permanent Disposal Well Moratorium Area

Deep Fault Trend
Major Increase in Economic Activity

From 2008 to 2011, total economic activity of more than $18.5 billion was generated as a result of Fayetteville Shale activities in the state.
Oil & Natural Gas = Arkansas Jobs

Estimated employment of

over 33,000 total jobs

supported by oil and natural gas production throughout the state.
More Income for Arkansas Families

From 2008 to 2011 more than $1.2 billion of mineral leases and royalty payments were made by production companies to mineral owners residing in all 75 Arkansas counties.
More Property Tax Revenue for Schools

Overall, from 2008 to 2011, almost $2.0 billion in state and local taxes from permit fees and severance, property, income, sales, and other taxes were collected as a result of Fayetteville Shale activities.
Increase in Arkansas’ Tax Revenue

• $1.3 million in natural gas severance tax payments in 2008

• Since 2009 over $280 million collected in natural gas severance taxes
QUESTIONS ?