

## Pre-Event Assignment

(Credit for 1 workshop will be given for completing this assignment)

**Advisors:** 1. Confirm completion of each section. 2. Sign your initials in the PRE-EVENT column of the student sign-up sheet.

**Students:** Complete *BEFORE* the trip and submit to your advisor to receive credit for the pre-event assignments.

### I. WEBQUEST: New Mexico Oil and Gas Association



Home	NMOGA Blog	Member Info	About Us	Become a Member	Statistics and Production	For Students
Oil & Gas Jobs	Video Gallery	Safety Resources	Resource Guide	Good Neighbor Program	Energy NM Podcast	

NMOGA and its members have offered a unique and awesome opportunity to MESA students! They have provided the funds and other resources to fully sponsor a bus filled with MESA students from each MESA region. They will pay for the bus, your hotel, meals, as well as, providing tours and workshops to introduce you to their industry. Take a moment to get to know your hosts by browsing their website, and don't forget to say "THANK YOU" sincerely and often to your generous hosts!

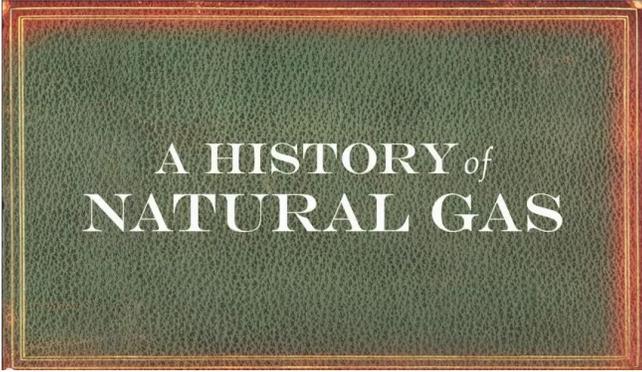
**INSTRUCTIONS:** Divide into pairs (or threes) and search the New Mexico Oil and Gas Association Website for answers to the following questions (15 minutes) - <http://www.nmoga.org/>

1. *About Us* tab - **What is the Mission of NMOGA?**
2. *For Student* tab - **Skim each of the pages under the "For Student" tab and then take the "Fossil Fuels Quiz" at the end. How did you do? \_\_\_\_\_ %**
3. *For Student* tab – under **Glossary of Terms**, skim the various oil and gas industry careers, processes, materials and concepts. **30 second QUICK WRITE:** Without pausing, quickly write down anything you don't understand or raises questions. Use your quick write to come up with a question you would like to ask one of the professionals you will meet on this trip.
4. *Resource Guide* tab - **Skim over the categories and sub categories of businesses and services involved in the New Mexico oil and gas industry. Click on several subcategories to find out how many specific companies are listed. For example, under the category "Business and Financial Services", when I click on the subcategory "Insurance" there are 41 different companies listed. What subcategories surprised you the most to see associated with the oil and gas industry?**

## II. VIDEO AND DISCUSSION: A History of Natural Gas

### INTRODUCTION TO THE VIDEO:

<https://www.youtube.com/watch?v=BXi14Dr0Cj4&index=1&list=PL07C7906CC61B3C06> **A History of Natural Gas -**



Natural gas has enormous potential as a versatile energy source. While it's had a history of powering electric generators and heating stove tops, natural gas is growing in use as an efficient fuel that also powers cars and trucks. But what exactly is natural gas? Watch this video to learn more about the history of this clean, affordable, abundant, American fuel and the high-tech process used to retrieve it. **Time 11:58 minutes**

**INSTRUCTIONS:** Divide into pairs (or threes) to complete the following statements as you watch the video (15 minutes). Discuss the bonus question as a group to

**further your understanding of natural gas production (15 minutes).**

What is Natural Gas?

1. Natural gas is a naturally occurring \_\_\_\_\_ mostly made up of \_\_\_\_\_ gas or  $\text{CH}_4$ ; its purity makes it an environmentally friendly fuel because when it burns it leaves no residue to react with \_\_\_\_\_ to form smog.

How Natural Gas is Formed

2. Natural gas began as microscopic plants and animals living in the ocean; they absorbed energy from the sun which was stored as \_\_\_\_\_ molecules in their bodies.
3. \_\_\_\_\_ and \_\_\_\_\_ transformed the bio matter into natural gas.

Where Natural Gas is Found

4. Natural gas migrates upward through tiny \_\_\_\_\_ and \_\_\_\_\_ in the rock until it is trapped under impermeable layers of rock, often shale or clay.

First Uses of Natural Gas

5. Natural gas was mostly used to fuel lamps because there was no pipeline network to \_\_\_\_\_ large amounts of gas over long distances. Robert Bunsen invented a burner that mixed air with natural gas, the \_\_\_\_\_ burner that showed how natural gas could be used for \_\_\_\_\_ and \_\_\_\_\_.



Student Name \_\_\_\_\_



School Name and City \_\_\_\_\_, \_\_\_\_\_

### Transporting Natural Gas

6. When cities began converting their street lamps to electricity after the 1890's, gas producers needed to look for new markets. Since transportation was still an issue and large-scale production viewed as too costly, much of the gas was burned off by \_\_\_\_\_ at the wellhead.
7. Finally, improvements in \_\_\_\_\_, \_\_\_\_\_ techniques and \_\_\_\_\_ - making during World War II, opened the door to new markets and thousands of miles of pipelines were built in the 1950s and 60s.

### Technology Advances

8. Due to the difficulty in obtaining the gas in the tight rock formations, crude oil remained a more popular fuel until advances in drilling technology. Pioneered in the 1940s and refined in the 1970s, \_\_\_\_\_ drilling and hydraulic \_\_\_\_\_ of the rock (commonly referred to as fracking) have revolutionized the industry.
9. Modern drilling includes carefully prepared \_\_\_\_\_ that meets the \_\_\_\_\_ health and \_\_\_\_\_ standards are in place before any drilling can begin. Drilling requires a well-planned infrastructure, a variety of processes, and expert, well-trained \_\_\_\_\_ are used to bring natural gas to the surface.
10. Utilizing heavy duty industrial strength drill bits, a typical well is drilled in several stages with a \_\_\_\_\_ diameter bit, then successively \_\_\_\_\_ drill bits as the drilling advances. After drilling each portion of the well, nested steel protective \_\_\_\_\_ are cemented into place; protecting the \_\_\_\_\_ and maintaining the integrity of the well.
11. Before moving in the drilling rig, a large diameter hole is drilled for the first 50 to 80 feet; \_\_\_\_\_ casing is cemented in place to \_\_\_\_\_ the ground around it and \_\_\_\_\_ the well from most private \_\_\_\_\_ wells.
12. To protect the deep water zone, a second layer of steel casing called \_\_\_\_\_ casing is installed and cement is pumped through between the casing and well wall, isolating the well from the deepest private or municipal \_\_\_\_\_ wells.
13. A \_\_\_\_\_, a series of high pressure safety valves and seals, is installed to control the well pressure and prevent surface releases.
14. A small drilling assembly is passed down through the surface casing and continues drilling to the natural gas target area, as deep as \_\_\_\_\_ feet below the surface. The drilling method used below the surface casing, uses drilling mud, a non-hazardous mixture based on bentonite \_\_\_\_\_ or synthetic thickeners. The drilling mud lifts the rock cuttings to the surface, \_\_\_\_\_ the hole, cools the drill bit, and controls down hole \_\_\_\_\_.



Student Name \_\_\_\_\_



School Name and City \_\_\_\_\_, \_\_\_\_\_

15. As it nears the target, the drill bit assembly is removed and a special drill tool is installed to allow the drill bit to turn to a near \_\_\_\_\_ plane; it is reached and drilling continues through the shale target zone at lengths greater than \_\_\_\_\_ feet.
16. Once drilling is completed, the entire drill assembly is withdrawn to the surface, \_\_\_\_\_ casing is installed throughout the total length of the well. Depending on the regional geologic condition, cement is pumped to around the outside casing wall to 2500 feet above the shale *or* all the way to the surface. The cement creates a \_\_\_\_\_ so inside the production tube is the only way formation fluids (gas, water) can reach the surface.
17. There are \_\_\_\_\_ layers of protection between the production tube and the bedrock. Horizontal drilling provides more contact with the gas producing shale, so fewer wells are needed develop a gas field and multiple wells can be drilled from the same \_\_\_\_\_ site reducing the overall surface disturbance by \_\_\_\_\_ %. \_\_\_\_\_ is a technique that involves pumping \_\_\_\_\_ and \_\_\_\_\_ at high pressure into shale formations to fracture the shale. Once fractured, sand is used to hold the small cracks and fissures open releasing \_\_\_\_\_ and allowing it to move up the well to the surface
18. Discoveries of potential gas shale fields are made every year and the industry estimates that the US has a \_\_\_\_\_-year supply of natural gas.
19. \_\_\_\_\_ percent of the natural gas used in the US is produced within our own nation.

**BONUS QUESTION: What are the three types of steel casing installed in a natural gas well? When/where are they installed and what is their function.**

Type of Steel Casing	When/Where Installed	Function
		Stabilizes the ground around the well and isolates well from most private water wells
	To the deepest freshwater aquifers, approximately 300-1000 feet below the surface	
Production Casing		Protects the integrity of the well and provides the path for the production fluids to move to the surface



Student Name \_\_\_\_\_

School Name and City \_\_\_\_\_, \_\_\_\_\_



### III. Discussing Hydraulic Fracturing Further

Watch this video together - **Animation of Hydraulic Fracturing** - Safe, cost-effective refinements in hydraulic fracturing (also known as fracking), horizontal drilling and other innovations now allow for the production of oil and natural gas from tight shale formations that previously were inaccessible. This video introduces the proven techniques used to extract resources from shale formations in a safe, environmentally responsible manner. **Time 6:37 minutes** Download from the event website at [www.nmmesa.org](http://www.nmmesa.org) or <https://www.youtube.com/watch?v=VY34PQUiwOQ&index=15&list=PL07C7906CC61B3C06>

Notes from the video	Top FIVE things everyone should know about horizontal drilling, fracking and other methods of extracting gas and oil from shale formations.

**Group Discussion – Take turns sharing your lists, ask questions and discuss.**



Student Name \_\_\_\_\_

School Name and City \_\_\_\_\_



<b>Post-Event Assignment</b>	
<p style="text-align: center;">(Credit for 1 leadership activity will be given for completing this assignment)</p> <p><b>Advisors:</b> 1. <u>Confirm</u> completion of each assignment. 2. <u>Sign</u> your initials in the Post-EVENT column of the student sign-up sheet. 3. <u>Submit</u> Student Sign-Up Sheet to Anita by <b>November 10 at 10 am</b> (<a href="mailto:anita@nmmesa.org">anita@nmmesa.org</a>) or FAX 877-464-6642</p>	<p><b>Students:</b> DUE to your advisor by Friday, November 7<sup>th</sup> to receive credit for the Post-event assignment.</p>
<p><b>Reflect:</b> 1 Minute QUICK WRITE: Without stopping or pausing, write down your impressions, feelings and experiences while attending the Oil and Gas Education Fair. What was the best? Worst? What did I learn? How am I going to use this experience in the future? (2-5 sentences)</p>	<p><input type="checkbox"/> <b>Advisors, verify completion by checking the box.</b></p>
<p><b>Share</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Share some ideas from your quick write. Collaborate with your advisor and other attendees to come up with a SINGLE announcement/press release in the style of a humorous TOP TEN list – answer the question “Why should students join MESA and attend the Oil and Gas fieldtrip next year?”</li> <li><input type="checkbox"/> Submit press release to the school newsletter/newspaper, local newspaper or have it read on the AM/PM announcements at school.</li> <li><input type="checkbox"/> Submit a copy of your TOP TEN LIST to John - <a href="mailto:jdavis@nmmesa.org">jdavis@nmmesa.org</a> (Be sure to include your high school name, city and an advisor’s name with your list).</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Advisors, verify completion by checking the box.</b></li> <li><input type="checkbox"/> Submitted to <a href="mailto:jdavis@nmmesa.org">jdavis@nmmesa.org</a></li> </ul>
<p><b>Document Your Achievement:</b> Add your attendance at the Oil and Gas Education Fair to your list of achievements on your resume.</p> <p>Example of a resume entry:</p> <p>Oil and Gas Education Fair. Sponsored by the New Mexico Oil and Gas Association (NMOGA) and NM MESA, Artesia, NM, October 28-29, 2014. High School students from around the state are invited to experience the Oil and Gas Industry firsthand through a two-day field trip that features company tours, workshops, presentations and culminating in an education fair. Students are exposed to different career options through access to professionals in the field and the institutes of higher education represented at the education fair.</p>	<p><input type="checkbox"/> <b>Advisors, verify completion by checking the box.</b></p>