Rhonda Reda
Executive Director, OOGEEP

Ohio University
Voinovich School of Leadership and Public Affairs
“Workforce Development in Ohio Related to Oil and Gas Development”
Research, Land Owners, Guest Speaker, and Community Outreach Programs

Industry Safety and Firefighter Training

K – 12 Education Programs & Teacher Workshops

Workforce & Career Development

Scholarships, Science Fair & Scouting Programs
Current Energy Demands

- Crude Oil: 40 Quadrillion (40%)
- Natural Gas: 22 Quadrillion (23%)
- Coal: 23 Quadrillion (23%)
- Nuclear: 8 Quadrillion (8%)
- Hydropower: 3 Quadrillion (3%)
- Renewable: 3 Quadrillion (3%)

Current Energy Consumption: 100 Quadrillion BTU

Data Source: Energy Information Administration
Worldwide Energy Consumption:
100,000,000,000,000 (100 Quadrillion) BTU’s Each Year
Future Energy Demands

- Crude Oil: 48 Quadrillion (40%)
- Natural Gas: 24 Quadrillion (19%)
- Coal: 32 Quadrillion (26%)
- Nuclear: 10 Quadrillion (8%)
- Hydropower: 3 Quadrillion (2%)
- Renewable: 7 Quadrillion (5%)

2030 Energy Consumption Estimated at 124 Quadrillion BTUs

Quantity/ Percentage by Energy Source

Data Source: Energy Information Administration
Total Primary Energy Consumption - By Country

Historically, the U.S. has been the largest energy consumer, taking about $\frac{1}{5}$th of total global energy.
Oceanfront Property in Ohio?

385 Million Years Ago
How Petroleum and Natural Gas Were Formed

Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of sediment and rock. Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.

Today, we drill down through the layers of sedimentary rock to reach the rock formations that contain oil and gas deposits.
THE GREATEST LONG-RANGE FORECAST IN HISTORY...

I SEE OIL IN YOUR FUTURE...
Did a slow down in drilling mean a decline in production in 2015 and 2016?
Total Crude Oil Production

- 2011: 46,326
- 2012: 635,876
- 2013: 3,676,269
- 2014: 11,001,117
- 2015: 21,985,911

Conventional Oil

Shale Oil

Total Oil

Courtesy: ODNR
Total Natural Gas Production

- Conventional Gas
- Shale Gas
- Total Gas

Courtesy: ODNR

<table>
<thead>
<tr>
<th>Year</th>
<th>Conventional Gas</th>
<th>Shale Gas</th>
<th>Total Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>2,561,524</td>
<td>0</td>
<td>2,561,524</td>
</tr>
<tr>
<td>2012</td>
<td>12,831,292</td>
<td>0</td>
<td>12,831,292</td>
</tr>
<tr>
<td>2013</td>
<td>100,116,673</td>
<td>100,116,673</td>
<td>200,233,346</td>
</tr>
<tr>
<td>2014</td>
<td>453,053,944</td>
<td>953,887,763</td>
<td>1,406,941,707</td>
</tr>
<tr>
<td>2015</td>
<td>953,887,763</td>
<td>0</td>
<td>953,887,763</td>
</tr>
</tbody>
</table>
Are We Drilling More Wells Today?

Total Wells Drilled in Ohio: 275,000

Active Wells: 64,781

Total Wells Drilled (1983): 6,085

Total Wells Drilled (2014): 685
2011
64,000 Conventional
(Formations Other than Utica or Marcellus)

Crude Oil: 4.9 million barrels
Natural Gas: 73 billion cubic feet

2015
1,230 Unconventional Wells (Shale)

Crude Oil: 22 million barrels
Natural Gas: 954 billion cubic feet
1900s, Bremen, Fairfield County, OH
Exploration Technology
Drilling Technology

- Vertical Well
- Directional Well
- Horizontal Well
- Multi-lateral Complete Well

Layered Diagram:
- Potable Water Well
- Reservoir
  - Gas
  - Oil
  - Saline Water
- Seal
- Oil
- Voir
FYI – First Horizontal Well

- **Popular Mechanics Magazine**
- August 1941, Page 19
- “... that is exactly what is contemplated by a revolutionary production method called horizontal drilling. Oil is flowing by gravity out of the first horizontal oil well, drilled in OHIO.”
### What’s in the Ground

- **Crude Oil**
- **Natural Gas**
  - Methane aka “Dry Gas”
- **Natural Gas Liquids**
  - “Wet Gas” - Ethane, Propane, Butane, Isobutane, Pentane and Petanes Plus
- **Brine**

#### NGL Attribute Summary

<table>
<thead>
<tr>
<th>Natural Gas Liquid</th>
<th>Chemical Formula</th>
<th>Applications</th>
<th>End Use Products</th>
<th>Primary Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethane</td>
<td>C₂H₆</td>
<td>Ethylene for plastics production; petrochemical feedstock</td>
<td>Plastic bags; plastics; anti-freeze; detergent</td>
<td>Industrial</td>
</tr>
<tr>
<td>Propane</td>
<td>C₃H₈</td>
<td>Residential and commercial heating; cooking fuel; petrochemical feedstock</td>
<td>Home heating; small stoves and barbeques; LPG</td>
<td>Industrial, Residential, Commercial</td>
</tr>
<tr>
<td>Butane</td>
<td>C₄H₁₀</td>
<td>Petrochemical feedstock; blending with propane or gasoline</td>
<td>Synthetic rubber for tires; LPG; lighter fuel</td>
<td>Industrial, Transportation</td>
</tr>
<tr>
<td>Isobutane</td>
<td>C₄H₁₀</td>
<td>Refinery feedstock; petrochemical feedstock</td>
<td>Alkylate for gasoline; aerosols; refrigerant</td>
<td>Industrial</td>
</tr>
<tr>
<td>Pentane</td>
<td>C₅H₁₂</td>
<td>Natural gasoline; blowing agent for polystyrene foam</td>
<td>Gasoline; polystyrene; solvent</td>
<td>Transportation</td>
</tr>
<tr>
<td>Pentanes Plus*</td>
<td>Mix of C₅H₁₂ and heavier</td>
<td>Blending with vehicle fuel; exported for bitumen production in oil sands</td>
<td>Gasoline; ethanol blends; oil sands production</td>
<td>Transportation</td>
</tr>
</tbody>
</table>

**C** indicates carbon, **H** indicates hydrogen; Ethane contains two carbon atoms and six hydrogen atoms.

*Pentanes plus is also known as “natural gasoline.” Contains pentane and heavier hydrocarbons.
Midstream Infrastructure Critical

$BILLIONS DOLLARS
Major Factors Impacting Workforce Development Today?

- Aging and Retiring Existing Workforce
- Emphasis on the “Trades”
- Passing Drug Tests
Between 2011 and 2015, Ohio’s natural gas and crude oil industry will help create and support more than 204,520 jobs due to the leasing, royalties, exploration, drilling, production and pipeline construction activities for the Utica Shale within Ohio. The industry wages is projected to grow to more than $12 billion in annual salaries and personal income to Ohioans by 2015.

### Measure | 2011       | 2012       | 2013       | 2014       | 2015       |
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>4,614</td>
<td>22,297</td>
<td>102,924</td>
<td>178,088</td>
<td>204,520</td>
</tr>
<tr>
<td>Gross Regional Product (2010$)</td>
<td>$229,770,873</td>
<td>$1,140,187,970</td>
<td>$5,434,884,446</td>
<td>$10,037,403,159</td>
<td>$12,348,656,034</td>
</tr>
<tr>
<td>Wages by Place of Work</td>
<td>$185,120,071</td>
<td>$987,630,736</td>
<td>$4,941,863,716</td>
<td>$9,454,936,109</td>
<td>$12,044,578,347</td>
</tr>
</tbody>
</table>

Source: Ohio Department of Jobs and Family Services Quarterly Economic Trends for Ohio Oil and Gas Industry, April 2016:
199,188 Ohioans Employed in Ohio Oil and Gas Jobs
Workforce and Career Development

OIL AND GAS CAREERS IN OHIO SERIES

CAREER GUIDE

Please visit our website at www.oogeep.org/industry-workforce/careers/ for more information about each individual career.
Job Description:
Installs, maintains and troubleshoots mechanical equipment.

Typical Education:
Associate’s Degree

Education & Training Facilities:

C-TEC Career and Technical Education Centers
150 Price Road, Newark, Ohio 43056
740-354-2333 | 800-345-2832
www.c-tec.edu

Cuyahoga Valley Career Center
8001 Brookside Road, Brockville, Ohio 44141
440-626-4320
www.cvcworks.edu

Kent State University at Trumbull
4314 Mahoning Avenue NW, Warren, Ohio 44483
330-847-0871
www.kent.edu

Mid-East Career and Technology Centers
450 Richards Road, Zanesville, Ohio 43701
740-455-2111 | 800-332-7545
www.mideast.k12.oh.us

Stark State College
6200 Frank Avenue NW, North Canton, Ohio 44720
330-484-6170 | 800-79-STARK
www.stark.edu

The Career Center Washington County Career Center
21740 State Route 676, Marietta, Ohio 45750
740-373-2736
www.thecareercenter.net

Wayne County Schools Career Center
518 West Prospect Street, Smithville, Ohio 44677
330-669-7070
www.wayne-pv.k12.oh.us

Zane State College
1555 Newark Road, Zanesville, Ohio 43701
740-554-2501 | 800-686-8324
www.zane.edu

Ohio Oil and Gas Energy Education Program | www.oogeep.org | Twitter: @OOGEEP | facebook.com/oogeep | YouTube: OOGEEP1
Oil and Gas Careers in Ohio Videos
Ohio Oil and Gas Energy Education Foundation

2016 SCHOLARSHIP APPLICATION GUIDELINES

SCHOLARSHIP INFORMATION
- Applications are accepted between December 1, 2015 and March 1, 2016.
- Scholarship winners will be announced in April 2016.
- $1,000 annual scholarship may be renewed up to four years.
- If qualified, renewal application must be completed.
- Scholarships are limited to undergraduate studies.

MINIMUM APPLICANT CRITERIA
- Must be a U.S. citizen.
- Must have a career goal in the crude oil and natural gas industry, or related energy field.
- Must be an OHIO resident OR a student attending, or planning to attend an accredited OHIO college, university, technical, or trade school.
- Must have and maintain a grade point average (G.P.A.) of 2.5 or higher.

SUBMISSION REQUIREMENTS
- Completion of two-page application, signed and dated.
- Two letters of recommendation from a teacher, employer or other mentor figure.
- Notes: Recommendations from family members are not acceptable.
- An essay consisting of no less than 350 words, and no more than 500 words, describing personal and career goals, academic achievements, extracurricular activities, awards, recognitions, community service, work history, financial needs, and personal or family influences. You should also describe how you would use your degree to help the oil and gas industry.
- Transcript, if applicable.
- ACT and/or SAT test scores, if applicable.

RETURN COMPLETED TWO-PAGE APPLICATION WITH ATTACHMENTS NO LATER THAN MARCH 1, 2016. Information received after this date will render the application incomplete and it will not be processed.

RETURN APPLICATION TO:
Ohio Oil and Gas Energy Education Foundation
Attn: Scholarship Awards
P.O. Box 248, Greenville, Ohio 45347-0248
Phone: (740) 587-0410 | Fax: (740) 587-0418
www.oogeep.org | scholarships@oogeep.org
Industry Safety Training

2016 INDUSTRY SAFETY TRAINING
1-DAY WORKSHOPS

TUESDAY, APRIL 26, 2016 OR WEDNESDAY, APRIL 27, 2016

WORKSHOP SESSIONS INCLUDE:
- Spill Response Techniques: A Practical Approach
- Update on ODNR Emergency Response Program
- There is an Elephant in the Room! Respecting Condensate
- H2S - Don’t Let it Get You “Down”
- Don’t Get Burned by Your Choice of FRIC!
- Keeping YOU Safe! Conducting Onsite Risk Assessments:
  Job Hazard Analysis (JHA), Job Safety Analysis (JSA) and Utilizing Hazard Identification Tools
- Breathe in and Hold it! Making the Most of Your 4 Gas Detector
- Capture That Spark! Grounding and Bonding When Working Around Hydrocarbons

SCHOENBRUNN CONFERENCE CENTER (LOWER LEVEL)
143 McDonald Drive NW, New Philadelphia, Ohio 44663

WEDNESDAY, MAY 25, 2016

2016 SPRING IADC RIG PASS WITH SAFELAND USA CERTIFICATION

SCHOENBRUNN CONFERENCE CENTER (LOWER LEVEL)
143 McDonald Drive NW, New Philadelphia, Ohio 44663

REGISTRATION IS LIMITED TO THE FIRST 50 PEOPLE - REGISTER EARLY!

Ohio Oil and Gas Energy Education Program
P.O. Box 187, Granville, Ohio 43023 | (740) 587-0410 | www.oogeep.org
THE FUTURE OF OIL AND GAS IN OHIO
2013 Ohio Natural Gas Consumption: 913 Billion cf
Residential and Power Generation: 458 Billion cf
Ohio Natural Gas Production:
2012: 86 Billion cf
2013: 167 Billion cf
2014: 510 billion cf
2015: 955 billion cf

Source: Energy Information Administration
How much is 1 Billion cf of Natural Gas?
Power 3,600 TV sets for a century!
Heat 24,315 homes for a year!
Travel across the United States 85,000 times!
Make 559 trips to the moon and back!
Historical Uses

— A NATURAL REMEDY —
FEELING GOOD, LOOKING GOOD

Shortly after the discovery of crude oil as an energy source, entrepreneurs recognized that crude oil could also be sold for medicinal purposes including rheumatism, sprains, bruises, burns, diarrhea, and other ailments. The crude oil based “cure-alls” were soon sold to the public as petroleum or “rock oil” — a natural remedy. Soon, crude oil began to play a more important role in people’s lives.

Robert Chesebrough (Chesebrough-Ponds) learned that he could turn the waxy crude oil substance, or paraffin, that clogged the crude oil wells, into Vaseline Petroleum Jelly. Chesebrough marketed Vaseline for leather treatment, balm for chapped hands and as a lubricant.

Miss Mabel Williams invented a new cosmetic “Lash Brow-Line” by heating petroleum jelly over an open flame to create a black residue. The product was later renamed mascara, and her new company Maybelline went on to redefine the cosmetics industry.
IF EVERYONE IS MOVING FORWARD TOGETHER, THEN SUCCESS TAKES CARE OF ITSELF

- Henry Ford
Rhonda Reda, Executive Director
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Twitter: @OOGEEP
YouTube: OOGEEP1