

TRAINING COURSES

Shale Gas Resource Development

Available to EGI Corporate Associate Members

Instructors:

Ian Walton, Ph.D.
Senior Research Scientist

John McLennan, Ph.D.
Senior Research Scientist,
USTAR Associate Professor
Chemical Engineering

Course Structure

1 ½ days theory

½ day discussion & further
developments

Participants

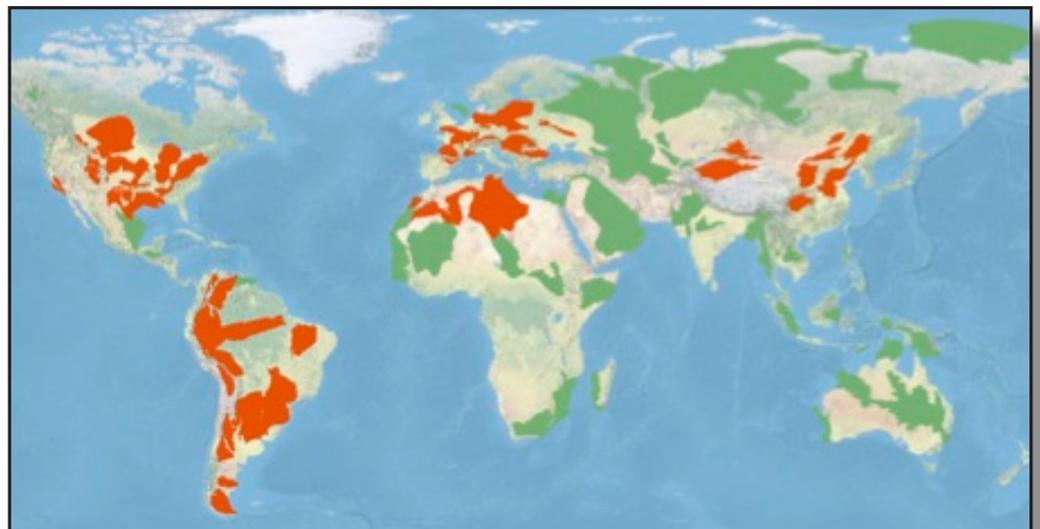
10-15 people

Duration

2 days

OVERVIEW

The course will provide a concise summary of the many different facets of shale gas development, ranging from resource identification and assessment, through production analysis and completion and stimulation technology, to environmental concerns. Throughout the course emphasis will be placed on describing and understanding the features of shale gas reservoirs that distinguish them from conventional gas reservoirs. This multi-disciplinary approach requires participants to think beyond their own specialties and to apply lessons learned from conventional resource development, while at the same time recognizing the need to develop new paradigms where needed.



TARGET AUDIENCE

This course is suitable for a wide range of scientists and engineers who wish to enhance their understanding of the special issues related to shale gas resource development and to place their own expertise in a wider context.

EMAIL:
ContactEGI@egi.utah.edu

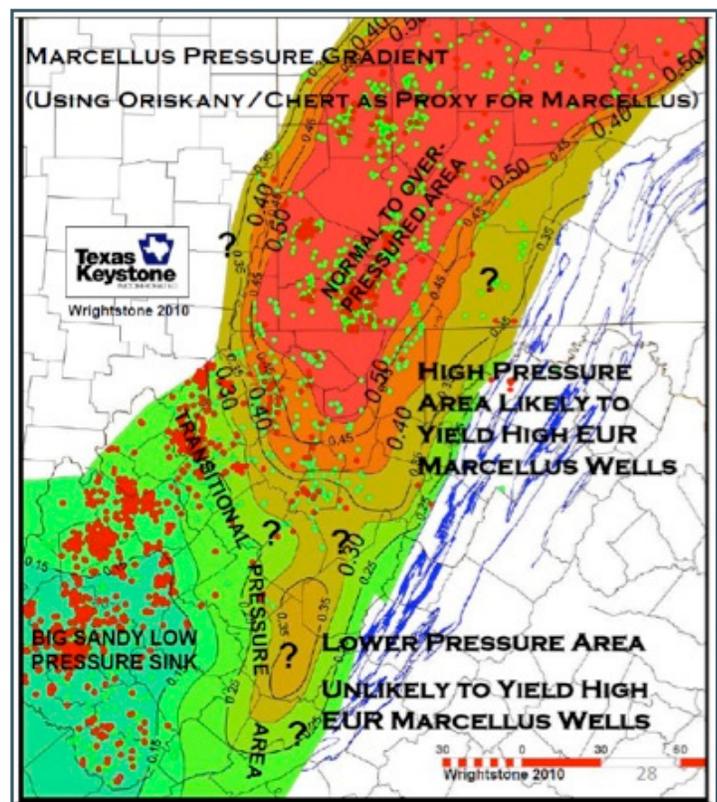
PHONE: (801) 585-3826

SESSION 1: SHALE GAS – UNCONVENTIONAL RESOURCE THEORY

1. Overview of gas shale development: history, geography and economics
2. Review of gas shale characteristics
3. What do we know and how do we know it? Measurements, logs, cores analysis
4. Data acquisition (micro seismic mapping, seismic, drilling)
5. Geological parameters (thickness, fracturing, mineralogy, etc)
6. Petrophysical properties: (porosity, permeability, saturation, gas-filled porosity)
7. Geomechanical properties (frac focus)
8. Gas in place: characteristics and measurement (canister gas, gas composition, thermogenic/biogenic gas, adsorption)
9. Core log integration and petrophysical models (log response, gas in place calculations)
10. Rock fluid compatibility (capillary STT, roller oven ST, fracture conductivity tests)
11. Influence of TOC and Ro
12. Core sampling and analysis - petrophysical, geochemical, geomechanical

SESSION 2: SHALE GAS RESERVOIR PRODUCTION

1. Reservoir fundamentals in shale gas (gas content, TOC, sorption, pressure, resources and reserves)
2. Production processes: coal bed methane, shale gas, tight gas
3. Role of natural fractures
4. Production Modeling and simulation: decline curve analysis, semi-analytic, numerical
5. Production analysis and interpretation: what are the production drivers?
6. Production metrics: decline rates, IP or EUR and IP, recovery factor
7. Lessons learned from data analysis
8. Other processes: Rock-fluid physics: desorption, imbibition, wettability
9. What makes a good shale well?



SESSION 3: SHALE GAS TECHNOLOGY

1. Completion and stimulation of shale gas reservoirs
2. Fracturing
 - Requirements: surface area, conductivity,
 - Techniques: number of stages, distance between stages, fluid efficiency, fluid and proppant type, characteristics and volume, estimated fracture orientation and how determined, treatment schedule including injection rates, pressures, fluid schedule and proppant loading, perforating
 - Fracture network complexity; importance, creation and where does the water go?
3. Fluids: fluid use and disposal, alternate frac fluids
4. Surface equipment

SESSION 4: ROUND TABLE

1. Concerns
2. Comments
3. Feedback
4. New projects

COURSE INTENSITY:

2 days

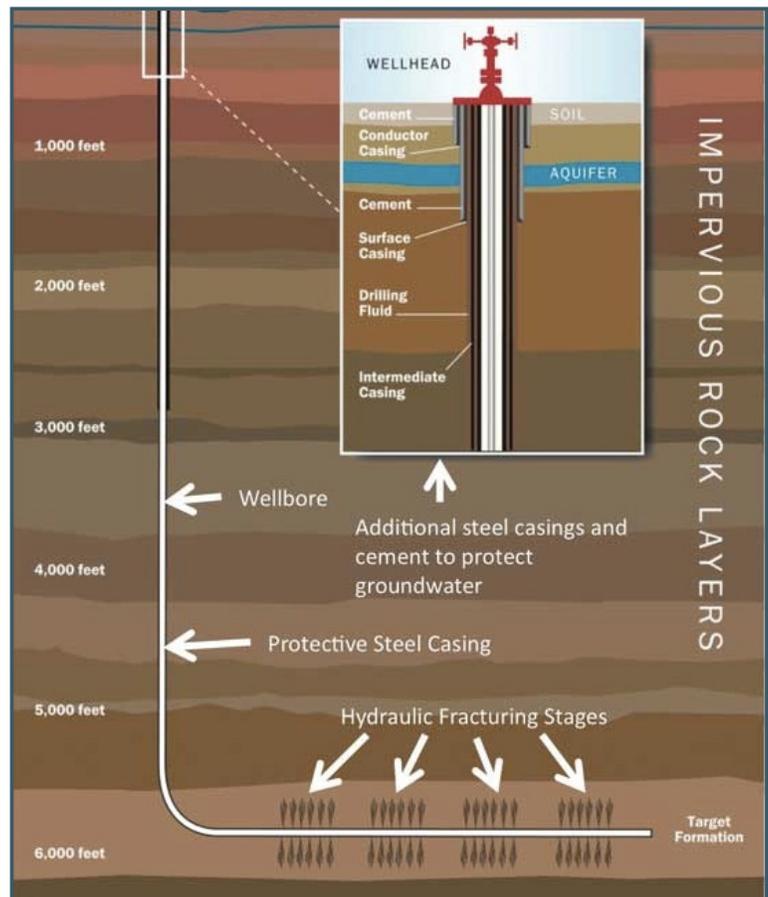
- 1 ½ days theory
- ½ day discussion

PARTICIPANTS:

10 to 15

LOCATION:

EGI's Salt Lake facilities or your location.



Kansas Geological Survey, Public Information Circular (PIC) 32



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Research Interests

- Unconventional gas production
- Rock-fluid interactions
- Near-wellbore geomechanics
- Fluid processes

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Ian Walton, PhD

SENIOR RESEARCH SCIENTIST

Ian holds a Ph.D. in Applied Mathematics from the University of Manchester and a B.Sc. in Mathematics from University College London. He has a total of 11 years academic experience between Imperial College London and the University of California, Los Angeles (UCLA) where he was a Visiting Professor.

Ian's 25 years of oil industry experience began with BP Research in Sunbury and then at various Schlumberger locations, including Schlumberger Cambridge Research, Dowell Tech Center, Tulsa, Perforating Research in Rosharon, Texas and, most recently, the Regional Technology Center for Unconventional Gas in Dallas.

He has published more than 70 papers and has been awarded eight patents. In 2015 Ian was selected as a Distinguished Lecturer by the Society of Petroleum Engineers for the 2016-2017 lecture series.

Professional Philosophy:

Unconventional Gas Production

By developing mathematical models of the production process, Ian has been able to provide fundamental insights into production mechanisms, identify the main production drivers, and relate those drivers to measurable formation, reservoir, and fluid parameters, and to specific completions practices. His recent work has focused on the role of induced and natural fractures in the production process and the distribution and flowback of pumped fracturing fluid. The models also facilitate history matching of production data and provide more accurate estimates of future production than do conventional techniques.

Rock-fluid interactions

The development of mathematical models has facilitated better understanding of processes such as imbibition and desorption that are important for shale gas production. Models have also been developed to interpret and enhance laboratory measurements of capillary pressure, permeability, relative permeability and porosity.

Near-wellbore Geomechanics

Ian has worked on the impact of rock properties on shaped charge perforating and the identification of optimal perforating systems for the generation of hydraulic fractures, specifically in multi-fractured horizontal wells. The near-wellbore fracture geometry for horizontal gas shale wells is a current focus.

Fluid Processes

Throughout his career, Ian has developed fluid mechanics models for many different oil field applications, whether they are in the wellbore (non-Newtonian and two-phase fluid pressure losses, pressure transients and sand transport) or in the reservoir itself.