2019 ARMA HFC Workshop
Efficient Energy: Observations, Monitoring, & Diagnostics
June 27, 2019 | New York
HYDRAULIC FRACTURING COMMUNITY

• **550+** members from 30+ countries
  238 organization: 76 universities, 24 national labs, 55 energy operators, 83 service providers

• **Monthly e-newsletter**
  Member activities, HF meetings, technology spotlights, job postings

• **Annual Workshops**
  • 2016: Initiation, Propagation, and Closure
  • 2017: Physics and Model Benchmark
  • 2018: Value of HF Technologies
  • 2019: Observation, Monitoring, Diagnostics

Demography of HFC

- **193** Universities
- **156** National Labs
- **155** Energy Operators
- **46** Service Providers
# ARMA Technical Committee on Hydraulic Fracturing

## Mission Statement

- Investigate and advance fundamental physics
- Promote environmentally responsible practices

## Committee Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
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<tr>
<td>Gang Han (Chair)</td>
<td>Aramco Services Company</td>
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<td>John McLennan (co-Chair)</td>
<td>University of Utah</td>
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<td>Joe Morris (co-Chair)</td>
<td>Lawrence Livermore National Lab</td>
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<td>Mark Zoback</td>
<td>Stanford University</td>
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<td>Mukul Sharma</td>
<td>University of Texas at Austin</td>
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<td>Ahmad Ghassemi</td>
<td>Oklahoma University</td>
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<td>Maurice Dusseault</td>
<td>University of Waterloo</td>
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<td>Sid Green</td>
<td>Enhanced Production, Inc.</td>
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<td>Mike Smith</td>
<td>Premier Oilfield Group</td>
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<td>Derek Elsworth</td>
<td>Pennsylvania State University</td>
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<td>Doug Blankenship</td>
<td>Sandia National Lab</td>
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<td>David Cramer</td>
<td>ConocoPhillips</td>
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<tr>
<td>Herbert Einstein</td>
<td>Massachusetts Institute of Technology</td>
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<td>Kirk Bartko</td>
<td>Saudi Aramco</td>
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<td>Branko Damjanac</td>
<td>Itasca</td>
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<td>Abdelwahab Nofal</td>
<td>ADNOC</td>
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<td>Andrew Bunger</td>
<td>University of Pittsburgh</td>
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WHAT WE CAN “SEE” FROM HYDRAULIC FRACTURING

• Most Expensive Workshop (> $300MM)

• Six Mine-back or Core-through Field Projects, Lab Observations
  MWX in Colorado, HFTS in Permian Basin, EGS COLLAB in South Dakota, MSEEL in West Virginia, FORGE in Utah, COP in Eagle Ford

• Twelve Operators
  Shell, Pioneer, Occidental Petroleum, ConocoPhillips, Total, ExxonMobil, Japan Oil, Gas, and Metals National Corporation, Petroleum Development Oman, Saudi Aramco, British Petroleum, Chevron, and Apache

• First-time have beers
ORGANIZING COMMITTEE

Kent Perry – Gas Technology Institute
John McLennan – University of Utah
Robert Hurt – Pioneer Natural Resources
Alexei Savitski – Shell
Ivan Gil – BP
Seth Busetti – Aramco
Shugang Wang – Chevron

Doug Blankenship – Sandia National Lab
Joe Morris – Lawrence Livermore National Lab
Ahmed Alawi – Saudi Aramco
Shekhar Gosavi – ExxonMobil
David Cramer – ConocoPhillips
James Kessler – OXY
Mojtaba Shahri – Apache Corporation
TECHNICAL AGENDA

• 7:45 – 9:55 Mine-Back and Core-Through Experiments
  Chairs: Ken Perry (GTI), Joe Morris (LLNL)

• 10:10 – 12:00 Field and Lab Observations
  Chairs: Doug Blankenship (SNL), Ahmed Alawi (SAO)

• 12:00 – 12:50 Lunch
  Keynote: A New Technique & Field Results for Quantifying Pressure Interference in Permian Basin Wolfcamp Horizontal Shale Wells, Kyle Scott, Pioneer National Resources

• 12:50 – 15:00 Fracture Monitoring and Diagnostics I
  Chairs: Alexei Savitski (Shell), Ivan Gil (BP)

• 15:15 – 17:25 Diagnostics II: Pressure and Production Responses
  Chairs: Robert Hurt (PXD), Holger Meier (XOM)

• 17:25 – 17:40 Closing Mark: Reality Check

• 17:40 – 19:00 Social Networking