New Technology Needs To Produce Unconventional Gas

November 29, 2006

Valerie Jochen
Technical Director, Unconventional Gas

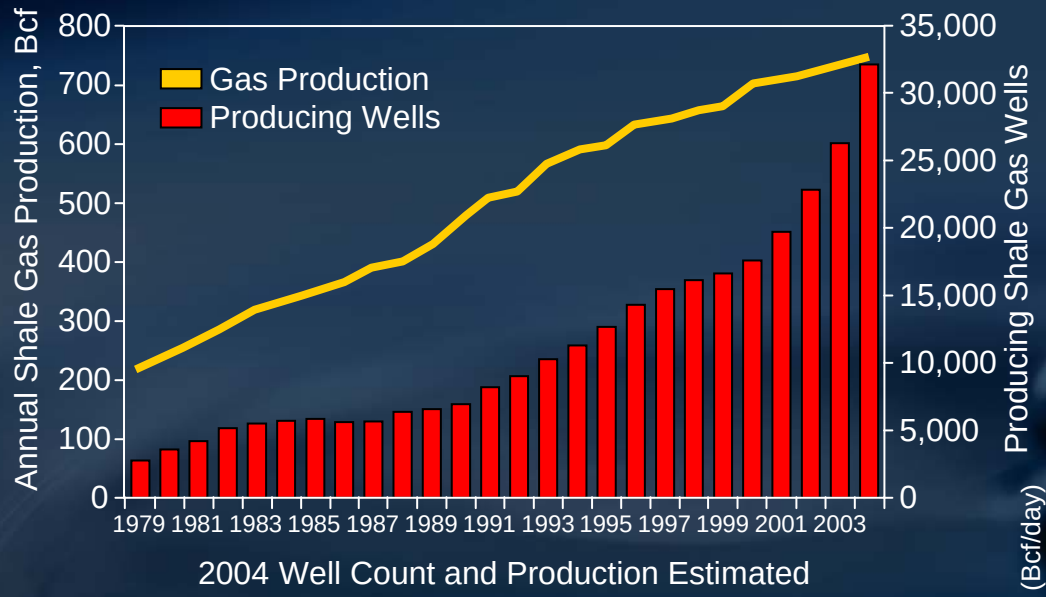
Clients Need Unconventional Reservoir Solution

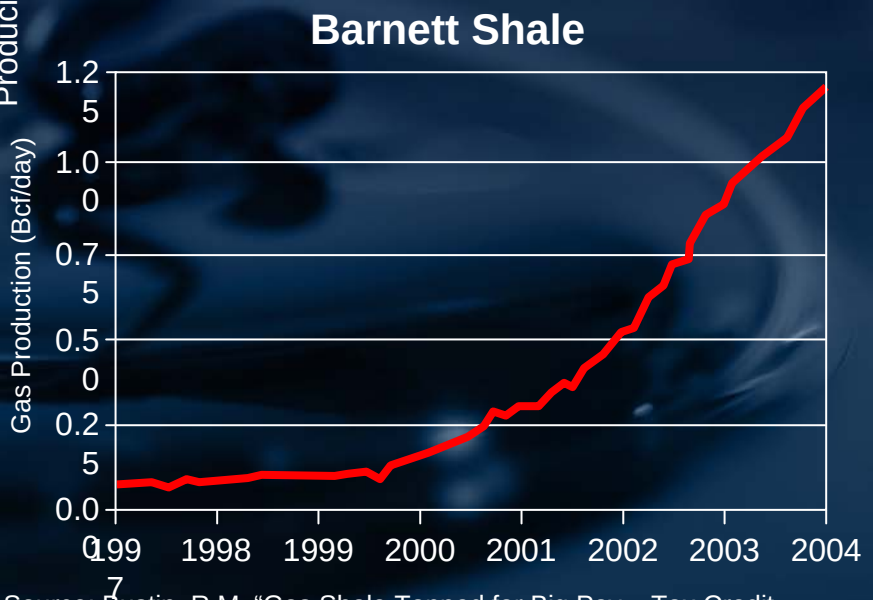
Our vision is to be our client's preferred supplier of Reservoir Evaluation and Production Enhancement services and solutions through the application of innovative Completion technologies and answer products.

Technology Application Drivers

- Increase Efficiency
- Strong focus on reservoir description
- Increase Field Recovery
- Maximize Production

Estimated Shale Gas Production and Total Producing Shale Wells in the U.S.





Source: Bustin, R.M. "Gas Shale Tapped for Big Pay – Tax Credit Ignited Development", AAPG Explorer, Vol. 26, No. 2, Feb. 2005, p. 30.

Shale Gas Evaluation Needs

Delineation of shale gas beds

Quantify gas

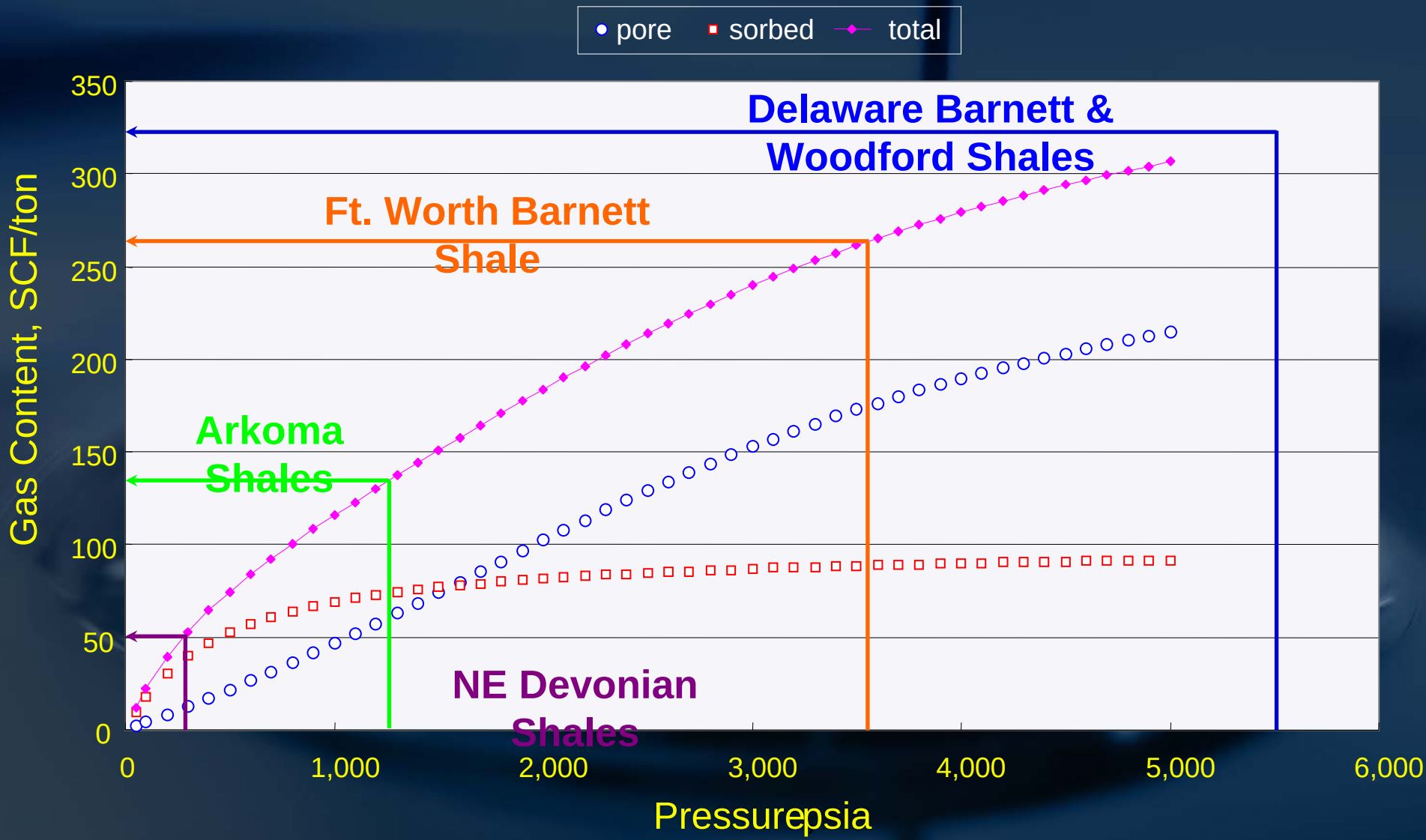
- Adsorbed
- Free

Producibility

- Matrix permeability
- Amount and type of fractures
- System permeability
- Pressure

Production prediction

Importance of Gas Location



Shale Fracturing Summary

Viable Shale Play

- Appropriate Petrophysics
- Conducive to Completions

Fracturing Strategies

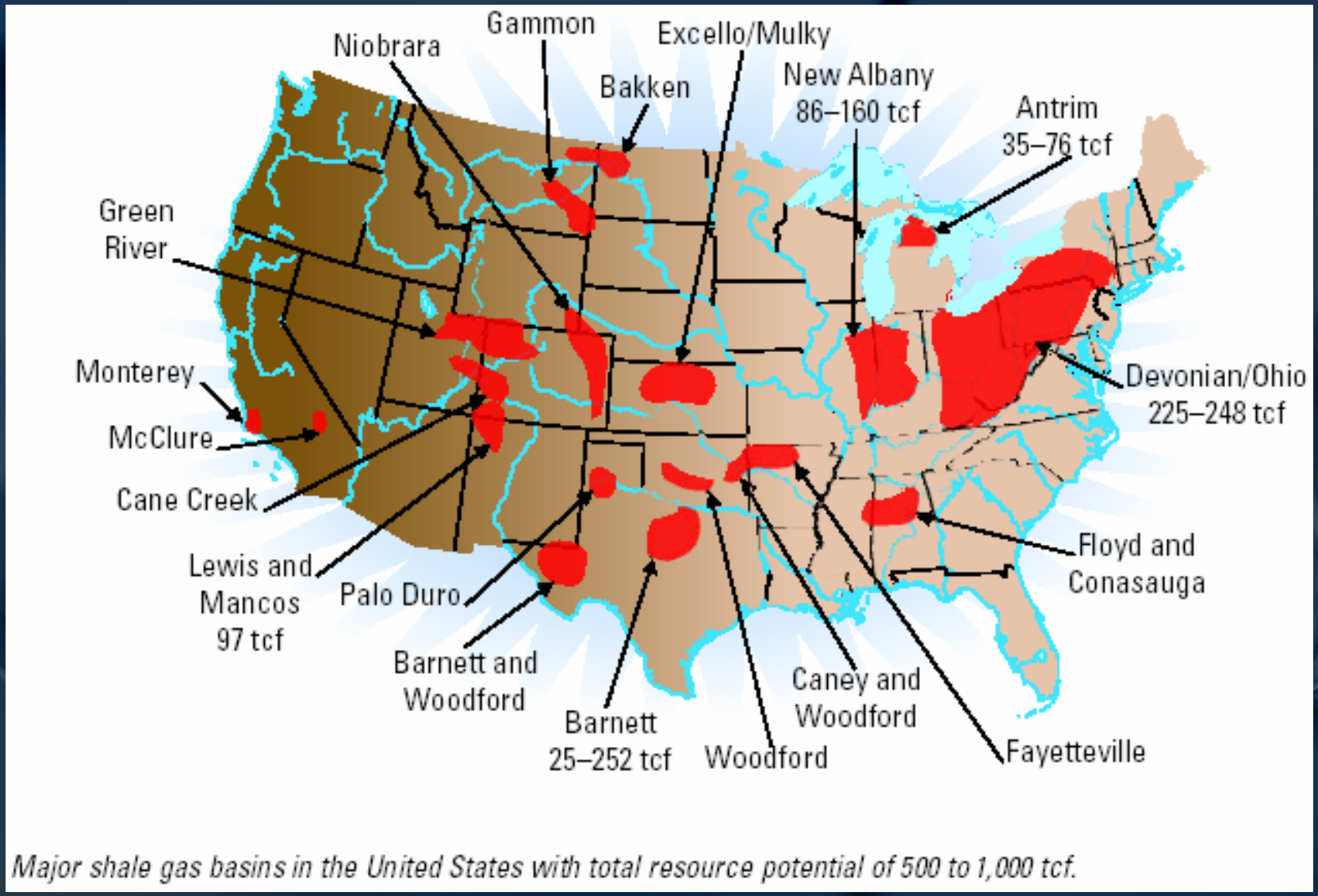
- Fracture Azimuth
- Multiple Stimulations
- Some Frac Conductivity
- Likely Complex
- What we do Matters

All Is Not Created Equal

It *Might Be* Just Like the Barnett

But then, *It Might Not*

Treasure Map



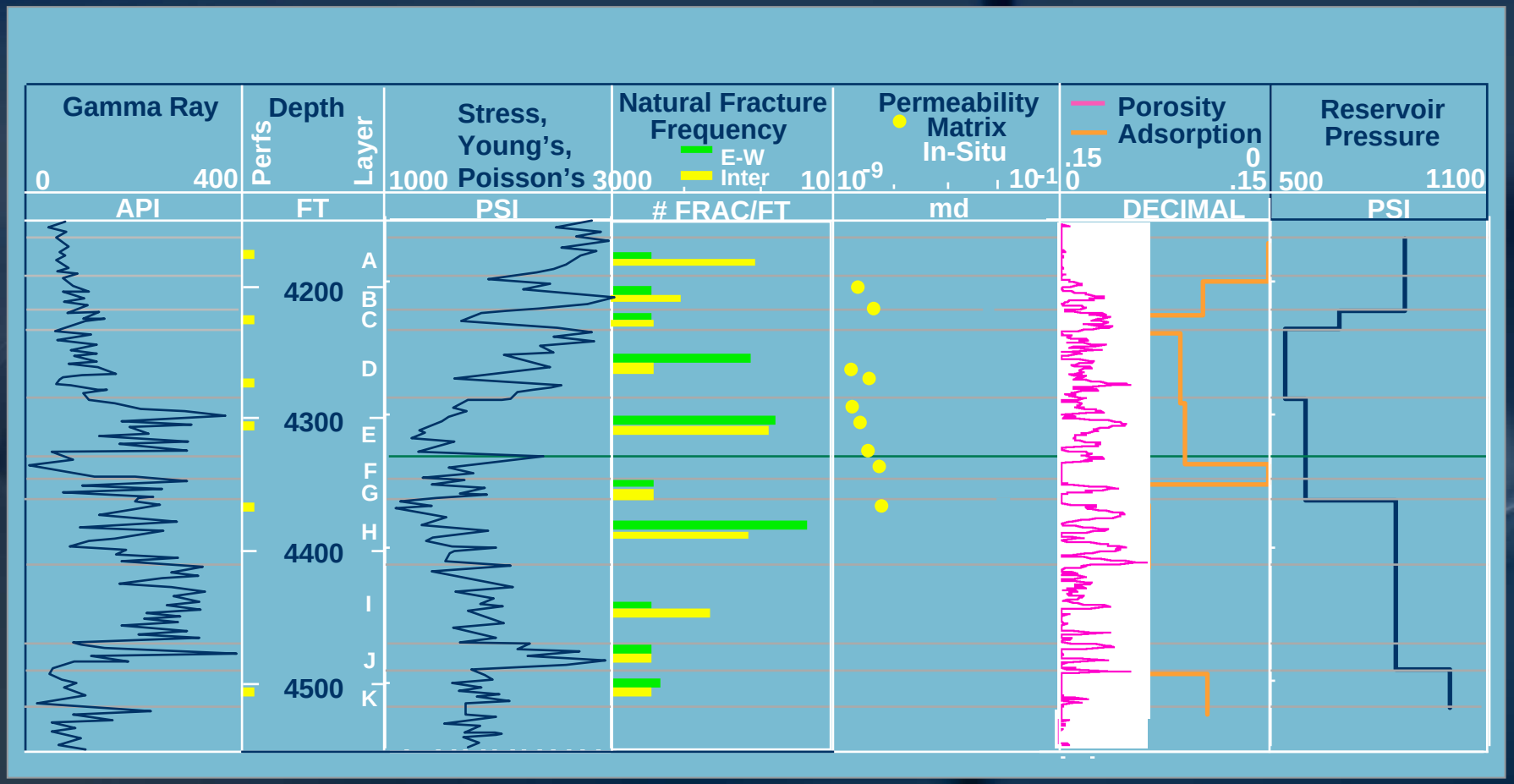
Major shale gas basins in the United States with total resource potential of 500 to 1,000 tcf.

Objectives of Characterization Methodology

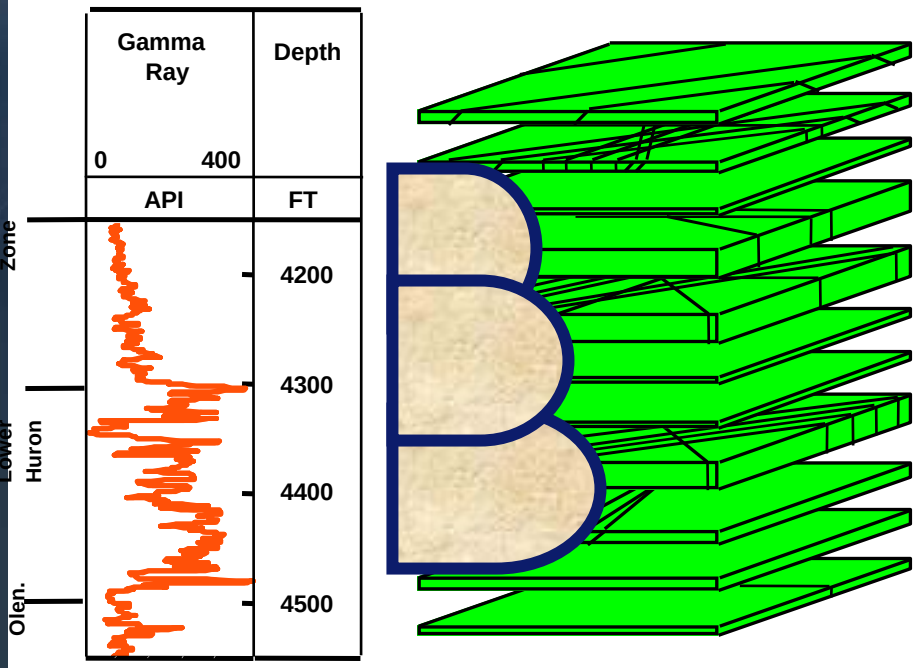
Develop integrated reservoir and stimulation models

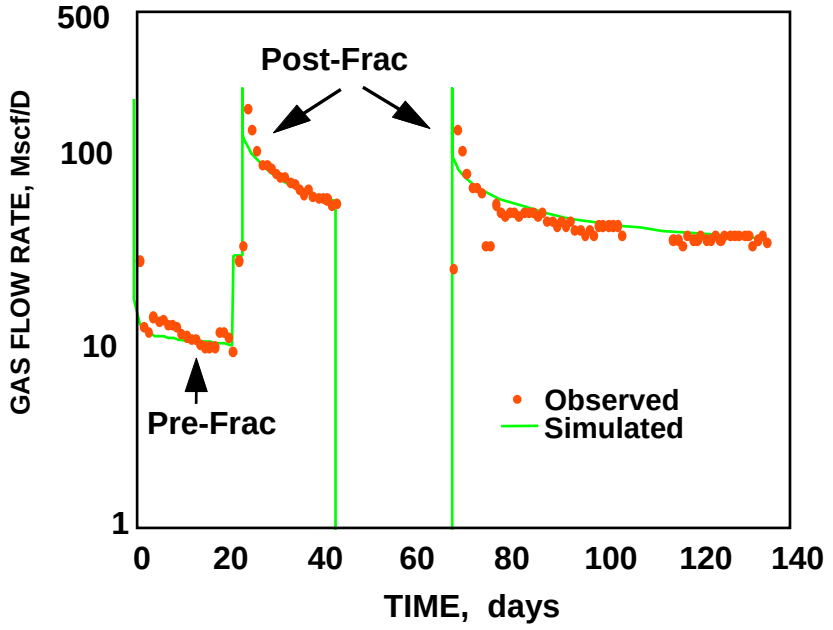
- Quantify storage and flow mechanisms
- Identify best completion intervals
- Determine if vertical or horizontals should be drilled
- Optimize stimulation design
- Optimize production practices
- Optimize well spacing
- Quantify reserves

Multi-layer Models Best Describe Unconventional Reservoirs

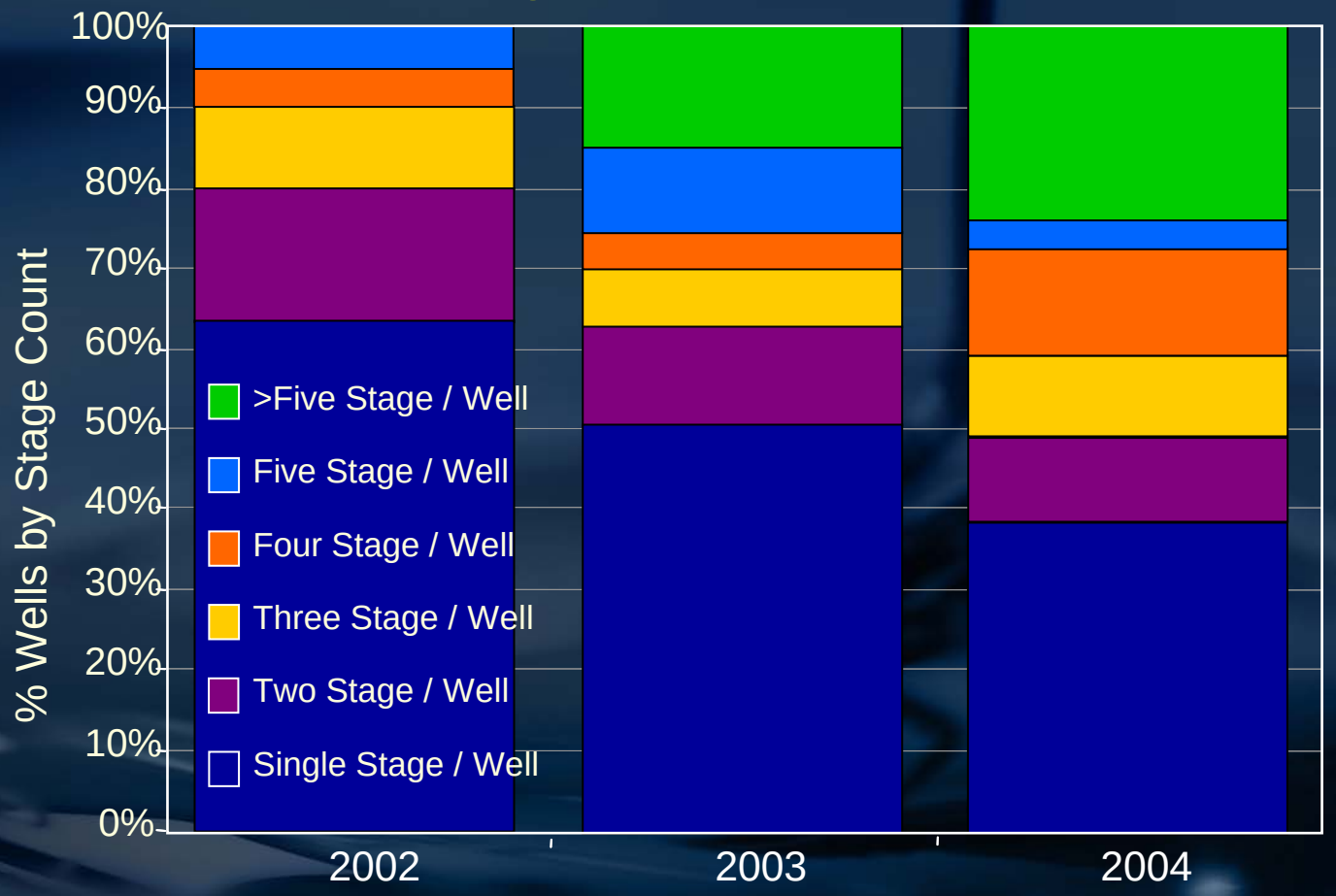


Layered Simulation Models Can Be Developed and Used Successfully for Completion Optimization





Growth in Frac Stages/Well



New completion process required to reduce by >50% the time to fracture multi-stage wells

- Fit for Purpose high efficiency equipment
- Completion technology

Evaluation Method

Determine key properties

- Gas in place and Deliverability
  - Matrix
  - Natural fractures
- Hydraulic fracture geometry

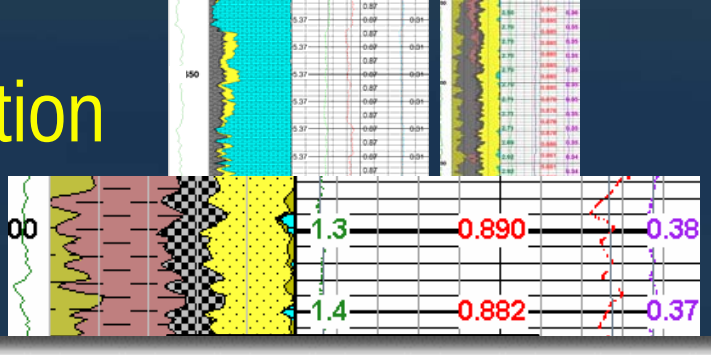
Develop calibrated models

Conclusions

Unconventional reservoirs are layered and require technical evaluations to determine appropriate:

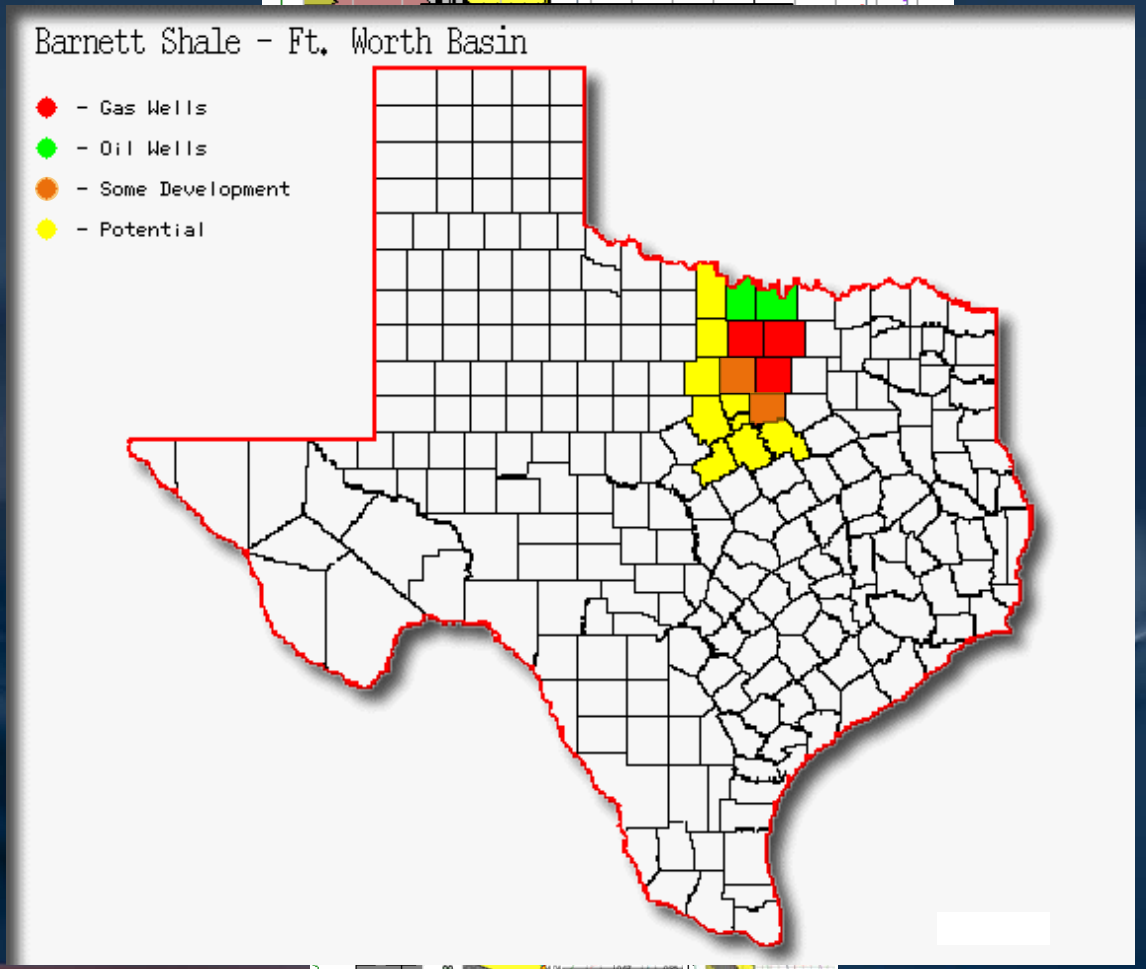
- Completion interval
- Productivity
- Stimulation design
- Production practices
- Facility design
- Well Spacing
- Reserves

Shale Gas Candidate Selection



Does Your Shale Have…

- ✓ Organics?
- ✓ Gas?
- ✓ Deep?
- ✓ Over Pressured?
- ✓ Thick?
- ✓ Bounding Carbonates?
- ✓ Benign Geology
- ✓ Natural Fractures?
- ✓ Low Effective Stress?
- ✓ High Quartz Volume?
- ✓ Low Clay Volume?
- ✓ Few Reactive Clays?



Unconventional Gas Technology Needs

Development of New Resources

- Assessment
- Basin-Scale studies
- Field-based testing

Reduced Development Costs

- Reservoir Characterization
- Production Prediction and Optimization
- Advanced Well Construction

Other Topics

- Environmental, Safety, and Land
- Manpower