

**The Significance of Geology
With Respect to Resource
Plays and Horizontal
Drilling/Hydraulic Fracturing
Techniques**

If it's a resource play is one well location as good as another?

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- Decreasing depths, temperatures and pressures north=oil window
- Devon-Beach Grove 68H-1 E. Feliciana Ph. LA, IP 120 BOPD, 100 MCF/D, 30/64" CK; 950 psig
- Encana-Anderson 17H-1 Amite County, MS, IP=975 BOPD, 425 MCF/D, 15/64" CK; 2,119 psig
- Northern Avoyelles Ph. unitization

Lower Smackover Brown Dense Formation (gas-condensate, oil play)

- Deposited from Mexico to Florida panhandle extending offshore into the GOM basin
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What tools should I use to design my lateral and completion procedure?

Well logs

- Gamma ray-lithology, organic rich shales
- Density-porosity, hydrocarbon response, seismic tie
- Neutron-porosity, hydrocarbon type
- Sonic-porosity, seismic tie
- Micro log-existence of permeability

What tools should I use to design my lateral and completion procedure?

Cores-lithology, mineralogy, porosity, permeability, TOC, existence of naturally occurring fractures and storage rock

- 1. Conventional core**
- 2. Rotary sidewall cores**
- 3. Percussion sidewall cores**

Seismic

The ever increasing lateral length and the number of frac stages being pumped!

- Improved horizontal drilling technology, better understanding of the geology, improved mud technologies have allowed for longer horizontal lateral lengths
- Trend towards pumping more smaller frac stages
- Encana-Anderson 17H-1 TD 19,547' with a 7,300' horizontal lateral and 30 frac stages
- 2005 Encore-Joe Jackson 4-13H lateral length 1,650' and 3 frac stages

**The ever decreasing target interval. Can I
keep a 7,000' horizontal lateral in a 25'
target window?**

- **Minor variations in lithology are important**
- **Natural occurring fractures and/or storage rock to enhance productive capacity of source •**

How does subsurface geology impact designed lateral length or actual lateral length experienced?

- **Depth of target formation**
- **Strike and Dip of sub surface structure**
- **Natural stresses in formation that will enhance stimulation**
- **Existence of faulting**
- **Tectonic activity to enhance fracturing and productive capacity**

Do I need to acquire a 3-D survey?

- Knowledge of the geology of the basin
- Availability of sub-surface control in the basin being explored
- Existing 2-D seismic coverage

We are in the worst drought in 50 years and the State won't let me use groundwater for fracture supply fluid anymore!

- Hydraulic fracture stimulation requires massive amounts of water (3.5-5 mm gallons per well)
- Ever increasing concern among local, State and Federal (EPA) governmental agencies
- Re-cycling encouraged (recoveries in the 20% range)
- Haynesville alone over 2000 units x 7-8 wells per unit x 4 mm gallons per well=60 billion gallons of water

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- **Protection of USDW from fracture stimulation activities**
- **State of Louisiana “strongly encourages” the use of surface water for hydraulic**