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*Disclosures on page 30*

November 12, 2009
Commodities (before peak)

**CRUDE OIL**

**NATURAL GAS**

**COAL**

**WHEAT**

**US DOLLAR**

**GOLD**
Commodities (to current)

- **CRUDE OIL**
- **NATURAL GAS**
- **COAL**
- **WHEAT**
- **US DOLLAR**
- **GOLD**
"That's mathematics, son. You can argue with me, but you can't argue with figures."

Foghorn Leghorn
Shalemania

- Long Term - ample gas supply
  - Need fewer rigs in fewer places
  - Shales will grow
  - Everywhere else declines

- Near Term - declines kicking in
  - Current rig count unsustainable...too low
  - 2010 - activity pick-up...but service pricing?

- Crude oil
  - The Rod Tidwell of energy “You’re loving me now!”
  - Lots of desire to “get oily”...but harder to accomplish
"I can hardly remember how I built my bankroll, but I can’t stop thinking about the way I lost it."  Mike....Rounders
US Major Producing Basins

32 separate production regions…including the 6 major shale plays

“According to the map we’ve only gone 4 inches.”
Harry...Dumb and Dumber

Source: TPH Estimates
TPH Natural Gas Wellhead Supply Model

**Data Gathering**
- Define basin area
- Pull historical production data from HPDI
- Review data and analyze vintage performance

**Model Development**
- Construct base & new well models
- Develop theoretical type curves
- Tie rig count to new production

**Calibration**
- Match new well type curve model to actual performance of wells completed in 2008
- History match the base wedge model to actual basin production

**Assembling the Parts**
- Aggregate base and new well models
- Check total history match

**Forecasting**
- Combine rig count projection with forward type curve and base decline models
- Run sensitivities

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**Base**

**New Wells**

**Forecast**

**Supply Model**

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Base + New Wells = Supply Model
Step I: Developing the Basin Type Curve

**Barnett Shale**

- Base production (12/07) includes ~8,400 wells with total production of 3.7 bcf/d
- 2008 activity: 185 rigs drilled 2,930 new wells, increasing production by 32% or 1.2 bcf/d

Source: Rig Count = Rig Data, Production History = HPDI and EIA, Forecast = TPH Estimates
Note: Wellhead production is wet gas
Step II: Quarterly Type Curve History Match

Barnett Shale: Q1'08 Type Curve Match

- Peak Rate = 1,550 mcf/d
- 1st Year Decline = -60%
- Hyperbolic factor = 1.5
- Final Decline = -5%
- EUR = 2,000 mmcf

Barnett Shale: Q2'08 Type Curve Match

- Peak Rate = 1,550 mcf/d
- 1st Year Decline = -60%
- Hyperbolic factor = 1.5
- Final Decline = -5%
- EUR = 2,000 mmcf

Barnett Shale: Q3'08 Type Curve Match

- Peak Rate = 1,450 mcf/d
- 1st Year Decline = -60%
- Hyperbolic factor = 1.5
- Final Decline = -5%
- EUR = 1,900 mmcf

Barnett Shale: Q4'08 Type Curve Match

- Peak Rate = 1,650 mcf/d
- 1st Year Decline = -60%
- Hyperbolic factor = 1.5
- Final Decline = -5%
- EUR = 2,100 mmcf

Variation in production characteristics from quarter to quarter is small

Source: Rig Count = Rig Data, Production History = HPDI and EIA, Forecast = TPH Estimates
Note: Wellhead production is wet gas
Step III: Understanding Base Decline

**Biggest factor in calibrating the Barnett is the base production decline**

- All wells completed prior to ‘08 used to calculate base decline
- Calibration requires balancing hyperbolic factor, curve fit of base production, and performance of new wells completed
- Assume: Hyperbolic factor for base production is the same as ‘08 new well groups. An important and realistic constraint for a ‘pure’ play region
- Regression modeling suggests a -33% base decline rate

Source: Rig Count = Rig Data, Production History = HPDI and EIA, Forecast = TPH Estimates
Note: Wellhead production is wet gas
Step IV: Calibrating Base Decline

Barnett Shale

- Known data points: 12/07 production (start = 3.7 bcf/d) and 12/08 production (exit = 4.9 bcf/d)
- Layer in 2008 growth using 2,930 wells drilled and type curves
- Given the 1.5 b-factor, solve for implied base decline rate...in this case -33% for the Barnett

\[ \alpha = \text{decline in base production} \]

\[ R^2 = 0.98 \]

High confidence in production from new well “wedges”

Source: Rig Count = Rig Data, Production History = HPDI and EIA, Forecast = TPH Estimates
Note: Wellhead production is wet gas
US Wellhead Supply Forecast
[Barnett Shale]

- ‘09 exit rate down 0.6 bcf/d y/y
- Production bottoms mid-2011 at 4.0 bcf/d and stays relatively flat through 2013 as drilling balances field declines

Source: Rig Count = Rig Data, Production History = HPDI and EIA, Forecast = TPH Estimates
Note: Wellhead production is wet gas.
South Texas Scenario - Holding Rig Count Flat

- Declines already occurring in this basin
- ‘09 exit rate down 0.9 bcf/d y/y
- ‘10 exit rate down 0.6 bcf/d y/y
- This a mature basin!

You don’t need to be thinking immortality -- you need to be thinking hit the 7 iron!

Romeo Posar: Tin Cup

Source: Rig Count = Rig Data, Production History = HPDI and EIA, Forecast = TPH Estimates
Note: Wellhead production is wet gas
What Does it Mean?

Current

- Rig count unsustainably low
  - 2010 production declines 10%...2011 an additional 5%
  - Gas Prices need to rise to entice more drilling
- Gas Production is falling...now!

Longer Term

- Fewer rigs in fewer places
  - 1500 total rigs in 2011...compared to 2350 peak in 2008
  - Marginal cost of supply matters...$6.5/mcf medium/long term
- Asset values (service and E&P) will reflect growth and non-growth areas (i.e, GOM analogy)
Step 3 - Add Non-Shales (Our Base Case)

- ~1,500 total rigs long term
- 2010 rig count build (peaking at 1,640 rigs)
- Pullback (~120 rigs) in 2011 as market is oversupplied
- Shift to unconventional (shale) drilling is key

Only ~1,500 rigs needed to balance market longer term...shales and non-shales
Shales - Fueling The Engine Of Growth

**Shale gas 12/08**
- Production = 8 bcf/d (12% of US)
- Rig Count = 357 rigs (18% of US)

**Shale gas 12/13**
- Production = 22 bcf/d (35% of US)
- Rig Count = 614 rigs (41% of US)

**Daily Gas Volumes, bcf/d**

<table>
<thead>
<tr>
<th>Shale Basin</th>
<th>12/08a</th>
<th>7/09e</th>
<th>12/13e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnett</td>
<td>5.0</td>
<td>4.7</td>
<td>5.5</td>
</tr>
<tr>
<td>Woodford</td>
<td>0.9</td>
<td>0.9</td>
<td>1.5</td>
</tr>
<tr>
<td>Fayetteville</td>
<td>1.3</td>
<td>1.5</td>
<td>2.8</td>
</tr>
<tr>
<td>Haynesville</td>
<td>0.2</td>
<td>1.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Marcellus</td>
<td>0.0</td>
<td>0.2</td>
<td>4.4</td>
</tr>
<tr>
<td>Eagle Ford</td>
<td>0.0</td>
<td>0.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Antrim</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7.8</td>
<td>8.7</td>
<td>21.5</td>
</tr>
</tbody>
</table>

The only thing better than one crawfish dinner is five crawfish dinners. Coach Red Beaulieu – The Waterboy
The US Recovery Will Not Look The Same

Source: RigData, TPH
Grouped basins together to examine regional supply dynamics.

Helped to insure that we were not modeling production that could not be physically delivered.

Note: South Region includes GOM
Regional Breakdown: Central Region

US Wellhead Supply Forecast
[Central Region]

- Minimal production growth in ’08 while rig count increased 12%
- Significant 2010 volume declines (-1.6 bcf/d annual average)
- Cana Woodford / Granite Wash horizontal plays = Wild Cards...but unlikely to arrest regional decline

Source: Rig Count = Rig Data Onshore/Baker Hughes Offshore, Production History = HPDI and EIA, Forecast = TPH Estimates

Note: Wellhead production is wet gas. Rig count is total rig count gas/oil and onshore/offshore, as applicable.
Regional Breakdown: South Region

South region includes rollup of:

- **Shales**: Barnett, Fayetteville, Haynesville, Woodford, Eagle Ford
- **Legacy**: South Texas, East Texas, Arkoma North Louisiana, Gulf Coast
- **Offshore**: GOM Shelf and Deepwater

Historically, peak production ~30 bcf/d. We forecast region growing to 32 bcf/d by 2013.

Source: Rig Count = Rig Data Onshore/Baker Hughes Offshore, Production History = HPDI and EIA, Forecast = TPH Estimates

Note: Wellhead production is wet gas. Rig count is total rig count gas/oil and onshore/offshore, as applicable.
Regional Breakdown: Rockies Region

Production has grown significantly since 1999 (~6 bcf/d)
2008 rig count (+13%) outpaced production growth (+8%)
No need to ramp activity from 2010-2013
2% per year long-term decline

Source: Rig Count = Rig Data Onshore/Baker Hughes Offshore, Production History = HPDI and EIA, Forecast = TPH Estimates
Note: Wellhead production is wet gas. Rig count is total rig count gas/oil and onshore/offshore, as applicable.
Regional Breakdown: East Region

East region includes rollup of Marcellus, Appalachia conventional

- Marcellus ramp from ~0.2 bcf/d to 4.4 bcf/d by 2013
- 3 bcf/day of East Region supply growth more than offsets Rockies 1.6bcf/day decline

Source: Rig Count = Rig Data Onshore/Baker Hughes Offshore, Production History = HPDI and EIA, Forecast = TPH Estimates

Note: Wellhead production is wet gas. Rig count is total rig count gas/oil and onshore/offshore, as applicable.
Onshore Production - Is Declining

Declining is happening...NOW!
Revenge Of the Nerds!

- Horizontal Drilling
  - Proper Azimuth
  - Optimum Length
- Completion - Hydraulic Fracture...can’t boilerplate
  - Multiple Stages, Simultaneous Fracturing
  - Slickwater vs. Gelled Fracs
  - Regionally Specific
  - Surfactant, 100 mesh, proppant transport etc.
- Well Spacing - will drive ultimate recovery
  - Depends on Completions and Reservoir
  - Fracture Mapping with Micro-seismic helps
- Reservoir Modeling difficult
  - Natural fracture spacing/orientation
  - Isotherm, gas-in-place, free gas porosity

“No one will really be free until nerd persecution ends.”

Gilbert – Revenge of the Nerds
Wild Cards

- Shale Performance
- Officer and a Gentleman
  - “I got nowhere else to go”
- Gas Macro Variables
  - LNG
  - Renewables
  - Canada Imports
  - Demand
- High-Grading/Well efficiency
- Shut-Ins/Uncompleted Wells
- Infrastructure Build-Out
Natural Gas

- **Ample gas supply** in almost any demand scenario - long term
  - Shale gas

- 1 bcf/day net demand growth assumed

- Shale, Shale and more Shale

- **Fewer rigs** required (~1500)

- Lower equilibrium natural gas price
  - $7.50/ mcf in 2010 - lower rig count matters
  - $6.50/mcf in 2011 +

- Implications for all energy subsectors/stocks
North American Natural Gas Implications

- Expect “Have’s” and “Have Not’s” to emerge
- Shale, Shale and more Shale
- 2010 = strong; 2011= outlook dims
- Shale envy = consolidation
- Good trade; Mediocre Investment
- Focus on Being/Owning a “Have”
Don’t Believe $7.5/mcf gas in 2010?

Anything is Possible...Scoreboard!
Texas A&M 52...Texas Tech 30

Yeeeeeessssssssssssssssss!
Napoleon Dynamite
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