Backward Through the Value Chain

2016 Annual Meeting and Think Day
A CONVERSATION WITH DEB BYERS, PARTNER, EY
All Companies, 2009-2015:

Overall, companies have outspent cash flow.

Annual Waterfall: (All), (Multiple Items)

CEE producer benchmarks, 16 companies, SEC filings
Outspending has been a chronic problem...

$/BOE

CF from Operations
Capex

CEE producer benchmarks, 16 companies, SEC filings
...not new, not short term

Source: Company reports, Bernstein analysis, Bloomberg
Note: The production volume is an absolute measure and differs from quarter to quarter based on the number of companies included in the calculations
Two Permian Players: (1) Larger, repositioned...

Cost Stack with Return Equal to Capex ($/BOE)

- 3-Year MA FD Costs ($/BOE)
- Cash Costs ($/BOE)
- FD Return ($/BOE)

An Equivalent Barrel

- US NGL Production (MMB)
- US Oil and Liquids Production (MMB)
- US Gas Production (MMBOE)
- US Total Production (MMBOE)

Cash Flow Waterfall 2009-2015

CEE producer benchmarks, 16 companies, SEC filings
...and (2) smaller, historically focused

Cost Stack with Return Equal to Capex ($/BOE)

An Equivalent Barrel

Cash Flow Waterfall 2009-2015

CEE producer benchmarks, 16 companies, SEC filings
A Gas Specialist (BOE for comparison)

Cost Stack with Return Equal to Capex ($/BOE)

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<tr>
<th>Year</th>
<th>3-Year MA FD Costs ($/BOE)</th>
<th>Cash Costs ($/BOE)</th>
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Cost Stack with Return Equal to Capex ($/BOE)

Cash Flow Waterfall 2009-2015

CEE producer benchmarks, 16 companies, SEC filings
The Field Development Plan is key to rapidly detect deviations and implement course corrections.

Asset implements changes:
- Rig pace
- Completion crew
- Production plan
- Permit inventory
- Others

Reservoir to Production Workflow to support efficient field processes

Plan and schedule adjustment to reflect new learning / business environment

Typical Adjustment Cycles (examples):
- Monthly: Well sequence, rig moves
- Quarterly: Sub-surface assumptions, land access strategy, infrastructure decisions
- Semiannually: Commodity assumptions, supply contracts

Internal review (asset or Corporate) to assess proper course of action

Cross functional team reviews trends:
- Well performance
- Permitting trends
- Land access
- Tie-in cycle time
- Others

Control limit monitoring to detect possible variations by “exception”

Detection Response

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Many companies struggle to understand the true cost of ownership; lower commodity pricing levels have exposed data and system limitations.

**Field performance**
- IP
- EUR
- Hydrocarbon composition

**Direct field costs**
- Producing lease administration
- Drilling and Completion Costs
- Field labor
- Well Maintenance Costs - Material & Supply expenses
- Tax / royalties

**Shared field costs**
- Multi site contracts for direct field activities
- Infrastructure
- Water management

**Allocated administrative and structural costs**
- HSE
- Exploration Geoscience and data processing
- Regulatory compliance
- Finance / IT / HR
- Technical functions
- Marketing

**Examples of costs overlooked**
- Multi field cost and contracts (e.g. infrastructure, chemicals)
- Commitment paid by center (e.g. take or pay contract)
- Shared services at the field

**Example of inconsistent assumptions**
- Limited understanding of strategic optionality
- Disconnect with midstream economics
- Information gap for mature areas

*Ernst & Young, used with permission; CEE annotations*
HOCKEY STICKS WE HAVE KNOWN AND LOVED

A Heart Healthy Diet of Post-election Energy Views
Getting Traction Around “Up At Night”

2011-2015 Input
Frequency (2011-2015 totals)

- Regulatory burden on energy (enviro; Mexico [quality of reform framework]; exports)
- Commodity cycle inflicted by E&P
- Economic and geopolitical impact of low oil prices
- "Junk science" [integrity of science] and misinformation about energy
- Peace or no peace? [oil price]
- Sustainability of shale gas production
- Is LNG viable?
- No national policy to utilize resources; US energy policy is like owning a car in Cuba...
- Technology
- Sustainability of low NG prices. How deep; how long; with what effects; and with what...
- International trends: brink of complete change of how gas is priced on international
- Development of shale plays outside of US
- How can the political system in Mexico deal with such a poor investment strategy in...
- Energy environmental disaster
- Is natural gas production real?
- Will pipelines in the Marcellus be built?
- Mexico: can independents cope with doing business in Mexico?
- Cybersecurity in the energy sector
- Infrastructure bottlenecks
- Too much condensate and impact on light/heavy spreads
- Role of NGLs
- Future of oil by rail
- Will NG be used as a transportation fuel?
- How soon will Mexico become a net importer of crude and what are the Western...
Animal, Vegetable, Mineral?
Animal, Vegetable, Mineral?
How to get from here to there?

**What if?????????????????????**

- China had not hosted the Olympics
- The Big Short had fizzled
- The “Arab Spring” had not sprung

[Graph showing oil price range from Feb-89 to Feb-16 with highlighted sections for Long Term Price Range, Pre-July 2004 and Current Price Range, OPEC $60 Target, September 2016.]
Animal, Vegetable, Mineral?
OPEC, We Hardly Knew Ye

China Exports - Total Oil Products, KBD
Our (U.S.) hockey stick?

Exports and Imports

Source: U.S. Energy Information Administration

www.api.org
Animal, Vegetable, Mineral?
Congress NEVER Likes to Make Laws

Pages in the Federal Register (1936 - 2015)

Does congressional law drafting lead to expanded regulatory rule-making because Congress is reluctant to take political decisions?

https://regulatorystudies.columbian.gwu.edu/reg-stats
Animal, Vegetable, Mineral?
It’s the Economy, Stupid

Figure 2: Share of Prime-Age Men Currently Not in the Labor Force Who Did Not Work Last Year


Animal, Vegetable, Mineral?
Future Generations
The End

MIDSTREAM, LNG, DOWNSTREAM
Breakeven Oil Price by Asset

Bernstein Research
The Attraction

"Cost of Supply"

High Cost Delivery to Atlantic Basin

High Cost Delivery to Pacific Basin

Super High Cost Delivery to Pacific Basin

High Cost Pacific (Liq. Sunk Cost)

Shipping

Liquefaction

Field to Terminal

Henry Hub

2011-14 Asia spot

2011-14 NBP

Japan 2010

December 2015 Landed Prices (Avg)

Chile (Atlantic LNG)

Current A-P Spot

Gazprom "Threat"

Gorgon Marginal Cost BE

Gorgon All-in Cost BE

Japan 2010

Current A-P Spot

Gazprom "Threat"
Cheap NGLs Aiding an Industrial Renaissance

U.S. Industrial Gas Demand Growth - CEE Reference Case

Texas Reference Case:
$26.5 billion; 0.8 BCFD demand add

Texas High Case:
$33 billion; 0.9 BCFD demand add

U.S. Reference Case:
83 Projects worth $65 billion;
2.3 BCFD demand add

U.S. High Case:
112 Projects worth $98 billion;
3.5 BCFD demand add

CEE industrial database and analysis,
www.beg.utexas.edu/energecon/thinkcorner
Appalachian production set to outstrip export capacity, after taking into account regional demand increases, including Cove Point LNG exports.

Appalachian gas export supply vs. transport capacity

- Export capacity at 90% utilization (adj. for demand)
- Export capacity at 80% utilization (adj. for demand)
- Appalachian production growth vs. 2015
- Out of region exports - 2015 (ave.)

2017: 13.7 Bcf/d
2018: 17.1 Bcf/d
2019: 21.4 Bcf/d
2020: 21.8 Bcf/d

Note: Export capacity based interstate pipeline capacity and incremental demand growth within the Appalachian/Northeast region.

Source: McKinsey team analysis
Infrastructure Remains Bottleneck Long-Term

Bentek Estimated ISD’s For Northeast Pipeline Expansions

- Mountain Valley Pipeline
- TGP Southwest Louisiana
- Transco Atlantic Sunrise
- NEXUS
- TETCO Access/Adair SW/Leb Extension
- Rover
- NFG Northern Access
- TETCO Gulf Markets Expansion 2
- Dominion Lebanon West II
- Dominion Clarington Project
- TETCO Gulf Markets Expansion I
- TCO Utica Access Project
- REX Zone 3 Capacity Enhancement
- Current Capacity/Max Production
- Northeast Production
- Scheduled ISDs for Expansions

S&P Global

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EXHIBIT 5: After years of takeaway constraints, the basin will be overbuilt until the early 2020s...during this time in the Southwest/Utica there will be more takeaway than there is production, allowing the differential to close.

Source: EIA, DI Desktop, Corporate reports, Bernstein analysis and estimates.
China and India Gas Demand (BCM), Domestic Gas Prices (MMBtu) and Japan LNG Prices (MMBtu)

Sources: BP SR 16; Sen, A. April 2015; Paltsev, S., et.al., July 2015
LNG (DGE) and Diesel Prices

http://www.afdc.energy.gov/fuels/fuel_comparison_chart.pdf