NATURAL GAS & NGL BUILD OUT

...shale changed everything
The Fundamentals...
Three distinct entities…
Three distinct entities...
Three distinct entities…

Producers

Raw Gas

Well Site Separation

Crude Oil
Three distinct entities...

- **Producers**
  - Raw Gas
  - Well Site Separation
  - Crude Oil

- **Midstream**: Gathering, Storage, Fractionation and Transportation
Three distinct entities...

Producers

- Raw Gas
  - Well Site Separation

- Natural Gas

- Producers
  - Crude Oil

Midstream: Gathering, Storage, Fractionation and Transportation

- Natural Gas Liquids
  - Cryogenic Gas Plant
    - $200 Million +

- NGL Fractionation Plant
  - $300 Million +

- Fuel
  - Pipelines
    - $160,000 per mile per inch of diameter

- Ethane
  - Fuel

- Propane
  - Butanes
  - Natural Gasoline
Three distinct entities…

**Important:**

- **Without a gas and NGL take away production is shut-in!**

- **95% of produced hydrocarbons on a Btu value to fuels.**

- **Only 2% of gas and 55% of NGLs by volume go to petchem**
Three distinct entities…

Producers

- Raw Gas
  - Well Site Separation
  - Crude Oil

Natural Gas

- Midstream: Gathering, Storage, Fractionation and Transportation
  - Pipelines ≈ $160,000 per mile per inch of diameter
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  - Cryogenic Gas Plant
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Three distinct entities…

**Producers**
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  - Natural Gas
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**Midstream: Gathering, Storage, Fractionation and Transportation**
- Fuel
- Natural Gas
- Propane
- Ethane
- Butanes
- Natural Gasoline
- Pipelines ≈ $160,000 per mile per inch of diameter

**Downstream: Refiners and Petrochemicals**
- Ammonia Plant $2.2 Billion +
- Methanol Plant $2.5 Billion +
- Propane Dehydrogenation Plant $2.0 Billion +
- Steam Cracking Plants $3.5 Billion
- Polyethylene - Petrochemicals
- Ethylene
- Polypropylene - Petrochemicals
- Derivative Plants $1.3 Billion +
- Naphtha
- Refinery $5 Billion +
- Propylene
- Fuel
- Crude Oil
- Propane
- Propylene
- Ethylene

**Pipelines**
- $160,000 per mile per inch of diameter
The History...
1981 – 2005

• Low oil and gas prices

• Decreasing US production
US Oil and Gas Pricing

- U.S. Natural Gas Wellhead Price $/Mcf
- Crude Oil - Spot WTI
1981 – 2005

- Low oil and gas prices
- Declining US production

• Increasing imports
1981 – 2005

- Low oil and gas prices
- Declining US production

• Midstream gas: inbound & to the NE

Major US Gas Trunk Lines
1981 – 2005

- Low oil and gas prices
- Decreasing US production
- Refiners buying SA

• Midstream oil: imported & inbound

Major US Oil Pipe Lines
2005 – 2009

- Prices increase
- Production increases

• Decreasing imports
US Oil and Gas Pricing

U.S. Natural Gas Wellhead Price $/Mcf

Crude Oil - Spot WTI
2005 – 2009
• Prices increase
• Production increases

• REX hits the Midwest and Haynesville hits Henry Hub...

Major US Gas Trunk Lines
Gas disassociates from crude
…and gas disassociates from crude.
2006 – 2015…

• Result...

• All production up
2009 – 2015…

- Crude oil production takes off…
2009 – 2015…

• Gas production continues to grow…!?
2009 – 2015…

• NGL production takes off…

Annual Production of Natural Gas Liquids (1,000 Bbl)

- East Coast (PADD 1)
- Midwest (PADD 2)
- Gulf Coast (PADD 3)
- Rocky Mountain (PADD 4)
Three distinct entities...

Producers

- Raw Gas
  - Well Site Separation
  - Natural Gas
  - Midstream: Gathering, Storage, Fractionation and Transportation
  - Crude Oil
- Natural Gas Liquids
  - NGL Fractionation Plant: $300 Million +
- Fuel

Midstream:

Cryogenic Gas Plant: $200 Million +

- Fuel
- Propane
- Ethane
- Butanes
- Natural Gasoline

Important:

- Without a takeaway for both gas and NGLs, production is shut-in...
2006 – 2015…

• Result…
  • All production up…
  • Associated wet gas produced
  • Gas drillers seek “liquid uplift”
  • The ethane situation…
  • Capital redeployes:
    • re-gasification becomes liquefaction
    • pipeline reversals
  • Pipeline new builds
  • Midstream build out
  • Downstream build out
  • New exports: C₂, C₃, C₄’s
The Money Trail...
Who wins? Loses?

- Midstream MLPs – 100B$ Capex
  - 44 M/U
  - 4 Texas NGL
  - Oil

Oops…
- Regasification
- Trunk Lines
- M/U ‘basis’ differentials
- The looming Henry Hub crisis
Who wins? Loses?

- LNG export – the 20 Bcf swing

Oops…

- LNG pricing
  - The Old World Model: ÷ 5
  - The US Toll Plus Model
    - $3 – $3.50 plus 115% HH
    - Competition: 38 goes to 44 Bcf
    - Platts J/KM at $7 down from $20 MMBtu

- The looming Henry Hub crisis
Who wins?

- Petrochemicals - 125B$ Capex

- Economics
  - Ammonia: CH₄ to NH₃
  - Methanol: CH₄ to CH₃OH
  - The Crackers: Ethane to ethylene: C₂H₆ to C₂H₄
  - 19 Mar 15 ethane – polyethylene spread: $0.62 per pound. Cash cost = $0.15 per pound!
The Crackers…

- World Scale CAPEX of $5B w/ derivative unit