THE OUTLOOK FOR THE LNG MARKET

February 27, 2020
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THE BOOK IS FINALLY HERE! (JULY 2016)
AT ISSUE

- MARKET HAS CHANGED
- WAS STABLE, STEADY AND PROFITABLE
  - NOT A REAL MARKET
  - BUT NOT WITHOUT RISKS
- NOW MERCHANT SELLERS
  - MORE COMPETITION
  - MANY MORE BUYERS
- POLITICAL RISK REMAINS/GROWING
- PRICE RISK NEW, SERIOUS
THE GOOD NEWS

- DEMAND POTENTIAL IS ENORMOUS
  - GAS IS CLEANEST FOSSIL FUEL
  - BILLIONS HAVE NO ACCESS TO RELIABLE POWER/COMMERCIAL ENERGY
  - HUGE AMOUNTS OF COAL CONSUMED FOR POWER
  - BUT PRICE MATTERS

- RESOURCE IS ENORMOUS
  - EVEN WITHOUT U.S. SHALE
  - PRODUCTION COSTS CHEAP
  - MOST REQUIRES EXPENSIVE TRANSPORT
THE GOOD OLD LNG DAYS

- FEW ACTORS (BUYERS OR SUPPLIERS)
- LONG-TERM CONTRACTS
  - HIGH TAKE OR PAY
- PRICE INDEXED TO CRUDE OIL
- DESTINATION RESTRICTIONS
- SPOT MARKET ALL BUT NON-EXISTENT
- MINIMAL COMPETITION
- OIL PRICE THE MAIN RISK
- BUT:
  - DEMAND RESTRICTED BY HIGH PRICES
  - MANY PROJECTS HAD LENGTHY DELAYS
EXTRAVAGANT FAILURES

- NORTH STAR/SIBERIA
- ALASKAN NORTH SLOPE
- ALGERIA-US
- DOME PETROLEUM
- ENRON-DABHOL
IRRATIONAL EXUBERANCE

- CAUSES:
  - DESIRE TO DO SOMETHING
  - HIGH PRICES/EXPECTED HIGH PRICES
- OVERBUILDING
  - 1970S ERA EXPORT PLANS
  - US REGASIFICATION BOOM IN 2000S
- BLIND OPTIMISM
  - ENRON DABHOL PROJECT
- RECENTLY: HIGH ASIAN LNG PRICES, LOW US GAS PRICES
WHAT DRIVES SPENDING?

SOURCE: U.S. ENERGY INFORMATION ADMINISTRATION.
THINGS THAT DIDN’T WORK THEN

BUT DO NOW

- ARCTIC/SIBERIAN LNG
- FLOATING LNG PLANTS
- FLOATING STORAGE AND REGASIFICATION UNITS
- MEGA-PROJECTS (SOMETIMES)
- N. AMERICAN EXPORTS
NOW

- MANY BUYERS, SELLERS
  - SMALL-SCALE SALES CAN ADD UP
- MORE SPOT SALES
- LESS DESTINATION RESTRICTIONS
- DECREASING USE OF OIL PRICE INDEX
- DEMAND RISK GROWING
  - INCREASING SEASONAL IMPACT
- MORE GAS ON GAS COMPETITION
  - SPOT LNG
  - PIPELINE (ESPECIALLY RUSSIAN)
- MORE COMPETITION WITH CHEAP COAL (CHINA/INDIA)
PIPELINE GAS USUALLY NOT OIL PRICE INDEXED

Source: International Gas Union, Global Gas Report 2018
GOG IS GAS ON GAS PRICING
# PRICE COMPETITION WITH COAL IN CHINA

| Source: International Gas Union, Global Gas Report 2018 |

## US leveled cost of energy

<table>
<thead>
<tr>
<th>Gas²</th>
<th>Coal³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average LCOE ($/MWh)²</td>
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</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Investment</td>
<td>Refurb. and decom.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>13.2</td>
<td>0.1</td>
</tr>
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</table>

## China leveled cost of energy

<table>
<thead>
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<td>Average LCOE ($/MWh)²</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td>7.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
PRICE MATTERS!

- INTANGIBLES ARE RELEVANT
  - BUT OFTEN SECONDARY
- CLEAN ENERGY IS GREAT
  - BUT INDIA MOSTLY PREFERENCES CHEAP ENERGY
- DIVERSIFICATION MATTERS
  - BUT EUROPE HAS LONG HAD A HIGH DEPENDENCE ON RUSSIAN GAS
- QUESTIONS ALWAYS ARE:
  - HOW MUCH WILL PEOPLE PAY COMPARED TO MARKET PRICE?
  - CAN THAT CHANGE?
LNG STILL RELIES ON OIL PRICE INDEXING

Source: International Gas Union, Global Gas Report 2018
Crashing market share clearly explains the 1985 oil price collapse; but was not so obviously important in 1998 and 2014.
The 1998 oil price collapse occurred from a low price, suggesting it wouldn’t last in contrast to 1986 and 2014.
2014 OIL PRICE FORECASTS
(SPOT THE DRUNK)
PRICE FORECASTS 2004 / 2005

POLITICAL RISKS NOW

- Fracking or Flaring Bans
  - Export Ban
- Prices
  - More Markets, More Prices
  - Divergence from Market is Risky
- Coal Competition
  - China/India Especially
- Producing Government Misbehaves
  - Assassinates Defector
  - Starts Trade War
SHALE GAS AFTER FRACKING BAN (BCF/D)
# Shale with Conventional Drilling Rebound

<table>
<thead>
<tr>
<th></th>
<th>Shale Oil (mb/d)</th>
<th>Shale Gas (bcf/d)</th>
<th>NGLs (mb/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Jan-21</strong></td>
<td>9</td>
<td>75.9</td>
<td></td>
</tr>
<tr>
<td><strong>Jan-22</strong></td>
<td>4.2</td>
<td>45.8</td>
<td></td>
</tr>
<tr>
<td><strong>Dec-22</strong></td>
<td>2.1</td>
<td>30.1</td>
<td></td>
</tr>
<tr>
<td><strong>2019</strong></td>
<td>8.4</td>
<td>77.2</td>
<td>5.6</td>
</tr>
<tr>
<td><strong>2020</strong></td>
<td>9.2</td>
<td>79.4</td>
<td>6.2</td>
</tr>
<tr>
<td><strong>2021</strong></td>
<td>6.5</td>
<td>60.6</td>
<td>4.7</td>
</tr>
<tr>
<td><strong>2022</strong></td>
<td>3</td>
<td>37.3</td>
<td>2.9</td>
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</table>

Assuming switch to conventional drilling:

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<tr>
<td><strong>2021</strong></td>
<td>7.6</td>
<td>67.1</td>
<td>5.2</td>
</tr>
<tr>
<td><strong>2022</strong></td>
<td>6</td>
<td>43.8</td>
<td>3.4</td>
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With gas emphasis:

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<th>Shale Gas (bcf/d)</th>
<th>NGLs (mb/d)</th>
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<tr>
<td><strong>2021</strong></td>
<td>7</td>
<td>70.6</td>
<td>5.5</td>
</tr>
<tr>
<td><strong>2022</strong></td>
<td>4</td>
<td>57.3</td>
<td>4.4</td>
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</table>
IMPACT ON NATURAL GAS TRADE BALANCE

<table>
<thead>
<tr>
<th>Production Change Tcf/Yr</th>
<th>A) Production Drop</th>
<th>B) Lost Export Revenue</th>
<th>C) Higher Imports</th>
<th>D) Higher Import Prices</th>
<th>Import</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2021</td>
<td>2022</td>
<td>2021</td>
<td>2022</td>
<td>2021</td>
</tr>
<tr>
<td>Basic ban</td>
<td>6.7</td>
<td>8.5</td>
<td>$15.6</td>
<td>$15.6</td>
<td>$2.1</td>
</tr>
<tr>
<td>Ban with shift to conventional drilling</td>
<td>4.5</td>
<td>8.5</td>
<td>$15.6</td>
<td>$15.6</td>
<td>$1.3</td>
</tr>
<tr>
<td>Ban with emphasis on conventional gas</td>
<td>3.2</td>
<td>4.8</td>
<td>$1.7</td>
<td>$4.2</td>
<td>$0.0</td>
</tr>
</tbody>
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C) is assuming pipeline imports remain at $2.68. LNG imports at $8.

D) is assuming all imports are at $8.
NOT PERFECT SOLUTIONS

- Iron-clad contracts good
  - But things rust
- Good political relations
  - Politicians and governments change
- Monopoly customers
  - Subject to politics
- Cheap raw material is best
THE ROLE OF CONTRACTS

- PROVIDE SOME PROTECTION
- PROVIDE HIGH DEGREE OF CERTAINTY
  - DEPENDING ON MARKET CONDITIONS
- ALLOCATE RISKS
TAKE OR PAY CAN BACKFIRE
GOALS OF PRICING CLAUSES

- Stability (Buyers/Sellers)
- Certainty (Buyers More)
- Competitiveness (Buyers)
- Profitability (Sellers)
- Equity (Usually Sellers)
- Protection (Buyers and Sellers)
PRICING CLAUSES

- FIXED
  - WITH INFLATOR
- INDEXED
  - TO ANOTHER FUEL
    - COMPETITIVE OR SIMILAR
    - TO ANOTHER MARKET
- S-CURVE
- SPOT
PRICING CLAUSES

- FIXED {STABILITY, CERTAINTY}
  - WITH INFLATOR {PROFITABILITY}
- INDEXED
  - TO ANOTHER FUEL {COMPETITIVENESS, EQUITY, PROFITABILITY}
    - COMPETITIVE OR SIMILAR
    - TO ANOTHER MARKET
- S-CURVE {EQUITY, STABILITY}
- SPOT (COMPETITIVENESS)
COPING WITH PRICE RISK

BUYER:
- INDEX TO COMPETITION
  - NOT CRUDE OIL
- RE-OPENERS

SUPPLIER
- HAVE CHEAP GAS
  - GUARANTEED PURCHASE PRICES
- SELL TO MONOPOLIES
- RE-OPENERS (FOR FEED GAS)
SUPPLIERS:

- DIVERSIFY CUSTOMERS BY:
  - LOCATION
  - TYPE
  - COMPETING FUELS
- INCREMENTAL ADDITIONS BETTER THAN LARGE GREENFIELD
- LOCK IN BUYERS
  - BUT NOT TOO TIGHT
- BE FLEXIBLE
BUYERS

- DIVERSIFY SUPPLIERS
  - NO ONE IS COMPLETELY TRUSTWORTHY
  - COMPETITION GOOD FOR BUYERS
- KEEP PRICES COMPETITIVE
  - IF YOU CAN’T PASS THROUGH AND MAYBE IF YOU CAN
- MAINTAIN FLEXIBILITY
  - STORAGE
  - AVOID DESTINATION RESTRICTIONS
  - CONTRACT RE-OPENERS
AVOIDING IRRATIONAL EXUBERANCE

- RESIST TEMPTATION TO JUST DO SOMETHING
- DON’T INVEST BASED ON CURRENT PRICE
  - THEY FLUCTUATE
  - COMPETITIVE FUELS AS WELL
- DON’T EXPECT OTHERS TO DO WHAT YOU WANT
  - ESPECIALLY DON’T ASSUME NO PRICE COMPETITION
- THE IMPOSSIBLE KEEPS HAPPENING
  - US NATURAL GAS EXPORTS
  - OIL PRICES BELOW $100
- RELIANCE ON INTANGIBLES IS RISKY
MEASURE TWICE, CUT ONCE