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
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?
RECENT CONSENSUS VIEW

IEA JAPAN GAS PRICE FORECASTS 2019

ACTUAL  STATED POLICIES  SUSTAINABLE DEVT  CURRENT POLICIES
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>
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<tbody>
<tr>
<td>Jan-21</td>
<td>9</td>
<td>75.9</td>
<td></td>
</tr>
<tr>
<td>Jan-22</td>
<td>4.2</td>
<td>45.8</td>
<td></td>
</tr>
<tr>
<td>Dec-22</td>
<td>2.1</td>
<td>30.1</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>8.4</td>
<td>77.2</td>
<td>5.6</td>
</tr>
<tr>
<td>2020</td>
<td>9.2</td>
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<tr>
<td>2021</td>
<td>6.5</td>
<td>60.6</td>
<td>4.7</td>
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<tr>
<td>2022</td>
<td>3</td>
<td>37.3</td>
<td>2.9</td>
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<tr>
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<td>Assuming switch to conventional drilling</td>
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<tr>
<td>2021</td>
<td>7.6</td>
<td>67.1</td>
<td>5.2</td>
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<tr>
<td>2022</td>
<td>6</td>
<td>43.8</td>
<td>3.4</td>
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<tr>
<td></td>
<td>With gas emphasis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>7</td>
<td>70.6</td>
<td>5.5</td>
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<tr>
<td>2022</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>
</tr>
</thead>
<tbody>
<tr>
<td>Basic ban</td>
<td>2021 6.7 2022 8.5</td>
<td>2021 $15.6 2022 $15.6</td>
<td>2021 $2.1 2022 $25.9</td>
<td>2021 $6.4 2022 $19.2</td>
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<tr>
<td>Ban with shift to conventional drilling</td>
<td>2021 4.5 2022 8.5</td>
<td>2021 $15.6 2022 $15.6</td>
<td>2021 $1.3 2022 $30.7</td>
<td>2021 $4.0 2022 $36.0</td>
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<tr>
<td>Ban with emphasis on conventional gas</td>
<td>2021 3.2 2022 4.8</td>
<td>2021 $1.7 2022 $4.2</td>
<td>2021 $0.0 2022 $2.1</td>
<td>2021 $0.0 2022 $6.4</td>
</tr>
</tbody>
</table>

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