Marketing Bakken To The World
• Oil market conditions have shifted and the invisible hand continues to balance global oil supply and demand through economic arbitrage

• U.S. shale production is a key driver behind changes in domestic import/export behavior

• U.S. exported oil is the marginal source of supply to the global market. Demand growth is primarily occurring in the East

• Export arbitrage remains in its infancy and infrastructure in place needs to be added to facilitate the growth in these movements

• There are risks in logistics, price and quality in the export chain which must be recognized and managed
Market Condition: U.S. Production

- U.S. production is set to grow 1.5mmb/d and 0.7mmb/d in 2018 and 2019, respectively
  - Eagle Ford, Permian and Bakken, oil that is greater than 40 API and less than .5 sulfur, accounts for 80% of the production growth
- After the 2014/2015 sell off in price, producers have increased their hedges and there is a higher confidence in current production forecasts
  - 70% of 2018 Permian production hedges are in place, 2019 hedges continue to be added at current flat price levels

Sources: EIA, Genscape, CFTC
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Market Condition: Refining

- As refiners hit their maximum capacity and, given the current shale production profile, the marginal U.S. barrel must price to displace foreign sour or export in absence of significant refining expenditure
  - Refining optimization, or “creep”, has averaged +.240mbb/d Y/Y for the past six years
- Refineries welcomed positive margins over the last 18 months and reached historically high runs (17.75mmb/d) and usable capacity utilization (97%)
- Asian refiners have added 10mmb/d of capacity in the last 6 years. They have announced additions of 15mmb/d in the next 6 years
Market Condition: Imports

- Domestic production growth has incentivized price relationships to reduce imports to what is considered baseload requirements.
- The U.S. is reliant on foreign heavy to fill coker capacity but has pushed out the marginal foreign light-sour and light-sweet crude alternatives for domestic barrels.
- OPEC cuts have targeted U.S. destinations, adding to the general reduction in U.S. Imports.

Sources: Clipper Data, EIA
Market Condition: Exports

- Since the U.S. export ban was lifted in December of 2015, exports of predominantly light-sweet crude have quadrupled
  - 2016: 350mbd
  - 2017: 890mbd
  - 2018: 1338mbd
- U.S. benchmark WTI has priced at large discounts to Brent to move U.S. shale onto the water
  - Growth in the Permian Basin has pushed barrels to the water and is now the largest source of exports at over 700mbd
  - International interest in smaller streams like DJ Common and Bakken has grown substantially in the past year as operational efficiencies have improved quality control through the different segments of transportation

Gulf Coast Exports By API

Permian Basin Exports

Non-Permian Grade Exports
Todays Market

- Shale growth is material and infrastructure has been built to point to the Gulf Coast
- U.S. refining capacity is fully utilized with limited “creep”
- Imports have been reduced to baseload and exports are growing with production
- The marginal shale barrel, whether Bakken, Niobrara, Eagle Ford or Permian will need to clear into the global market
- Bakken is becoming a fungible barrel on the Gulf Coast with a dedicated line from the field via DAPL and a pathway via Cushing
Quality Incentive: Refining Yields

- The increase in light-sweet domestic production coincides with a policy push to deal with unattractive refining by-products and environmental emissions
  - IMO 2020 enforces a .5% sulfur limit for bunker consumption on all vessels
- Shale production has yields that are attractive to these changes in policy compared to other major global streams that are common in international refining slates

<table>
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<th>Distillation Yield %</th>
<th>LPG</th>
<th>SR Gas</th>
<th>Naptha</th>
<th>Jet</th>
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Quality Incentive: IMO 2020

USG HO/FO

Singapore GO/FO

USG HO/FO Forward Curve

Singapore GO/FO Forward Curve
Role of Global Arbitrage

- The role of arbitrage is to solve imbalances in supply and demand by moving oil around the world
- Economic exports should cover costs and risks but still be mutually beneficial to all parties involved
  - Higher net-back to producers
  - Increased thru-put for midstream operators
  - Acceptable return on risk and capital for arbitrage facilitator
  - Higher margin for end-user

*Crude oil in transit globally

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<th>Year</th>
<th>MB/Day</th>
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<td>2017</td>
<td>51,301</td>
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<td>2018</td>
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Source: Clipper Data
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Logistical Costs

- Nearly all of U.S. exports flow through the U.S.G.C. but logistical constraints remain in place
  - Export docks are draft restricted and generally load Aframax vessels only (500-600mb)
  - Some docks can light load Suezmax (700-800mb) if draft restrictions allow
  - Dock costs can vary based on demand and competition for windows with imports
- European bound cargoes tend to move on Aframax or Suezmax vessels
- Due to economies of scale, Very Large Crude Carriers or VLCC (2000mb) are used to deliver cargoes for long haul routes like Asia but require reverse lightering
  - A typical reverse lightering operation is a process where an Aframax loads at the dock and performs a ship-to-ship transfer with a VLCC in open waters
  - Adds ~70cpb to all export operations
- Projects are in the works to dredge ship channels and build out offshore SBMs to make exports more cost efficient

![U.S. Export Freight Rates](image-url)
Logistical Costs

- Demurrage rates can be volatile and delays at load or discharge port can add up quickly
  - Pipeline outages cause delays in batches landing at the dock leading to missed windows
  - Rough seas and fog keeps ships out at sea and delay lightering and port operations
  - Equipment issues can require repairs that may prevent charterers from hitting load or delivery windows (where penalties apply or prices change)
- Bulking volume when possible compresses time between lighters and mother vessel and reduces demurrage exposure
- Quantity losses increase as oil flows through different assets and oil-in does not equal oil-out
  - Pipeline Loss Allowance ~.02%
  - Measured losses on ships ~.25-.50%
Arbitrage corrects supply and demand imbalances but has to navigate regional price differences and their associated risks as natural pricing basis for the producer and end-user are different and can be volatile.

Markers are benchmarks that trade on a flat price basis and have a forward curve.

Near markers typically trade on a differential basis to a marker but still have a forward curve.

Smaller crude streams trade on a differential to markers or near markers but do not have a forward curve.
Price Risks

- Price relationships between markers tend to be volatile and correlations can break
  - Geopolitical – Price spike or collapse
  - Seasonality
  - Participant flow

- Near-markers, or major streams of local grades, price to their benchmarks and smaller, similar streams price off of these near markers that contain their own set of volatility drivers
  - Production outages
  - Takeaway constraints
  - Refinery maintenance
  - Weather

- Markers need to adjust to make oil flow effectively
Most non-U.S. export streams have infrastructure that was built to take one stream from wellhead to ship. U.S. assets have to manage quality at various touch points

- Only one dedicated single stream Bakken pipeline: DAPL (until it hits Beaumont)
- Other pipelines move barrels across different terminals with different grades over different tank bottoms

Initial attempts at quality control soured the international appetite for U.S. crude, especially DSW

- Quality management must be emphasized across the supply chain to prevent quality degradation
Bakken Arbitrage: To The Water

$3.75-7.85/bbl rate from Bakken field to Cushing on Pony Express

Bakken bought in the field vs Calendar Month Average (CMA) WTI

$7.51/bbl uncommitted rate from Bakken field to Nederland on DAPL/ETCOP

To get across the dock:
1. Pump over fee from terminal 15-30cpb
2. Fix dock window and dock fee 45-85cpb
3. Oil Spill Tax 0-9cpb
4. Fix lightering operations 200-300k/ship and steiging tank costs
5. Fix mooringship and account for demurrage during lightering operations

Bakken off Pony Express can get to the Gulf Coast on Marketlink or Seaway, tariffs range from 1.65-3.71

Lands in the Gulf Coast on a WTI CMA basis. Can either sell domestic (trade month or CMA) or export
## Bakken Arbitrage: Europe

### Itinerary

| Destination | Departure Date | Departure Time | Arrival Time | Days |
|-------------|----------------|----------------|--------------|------|---|
| NEDERLAND   | 04/18/2018     | 08:00          |              | 0.00 | 0 days |
|             |                |                |              |      |      |
| ROTTERDAM   | 05/03/2018     | 14:07          |              | 0.05 | 0.05 days |

### Voyage Summary

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### CF in Rotterdam Exposure

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<th>Value</th>
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<td>July Bakken Cargo</td>
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<tr>
<td>Sept Brent Pricing</td>
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<tr>
<td>OR</td>
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<tr>
<td>July 16-20 Dated Pricing</td>
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### 2yr WTI-Brent Volatility

- Standard Deviation
- 0.00 to 1.00

### Payment Terms

- Payment terms for U.S. crude is 20 days after delivery month and delivered in Europe is 10/15 days after discharge/NOR
- Later in the month of USG loading, the longer AR outstanding

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Bakken Arbitrage: Asia

Payment terms for U.S. crude is 20 days after delivery month and delivered in Asia is 15 days after discharge. Later in the month of USG loading, the longer AR outstanding.
Bakken Movements to Date

Bakken Exports To Date

Bakken Exports By Port

Bakken Exports By Ship Class

Bakken Export Destinations

Source: Clipper Data
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Conclusion

• Oil market participants will continue to respond to changes in market dynamics from shale growth to effectively and economically move oil to balance world supply and demand

• Transportation experience, strong balance sheet, risk appetite and global customer relationships are all critical to clear the marginal Bakken barrel to global markets

• Producers, midstream operators and arbitrage facilitators can all benefit from U.S. export growth but will need to work together to minimize inefficiencies and create acceptable returns on remaining risk for all parties