



# North Dakota Refining Capacity Feasibility Study - Phase I Results

Williston Basin Petroleum  
Conference  
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WE BUILD CONFIDENCE

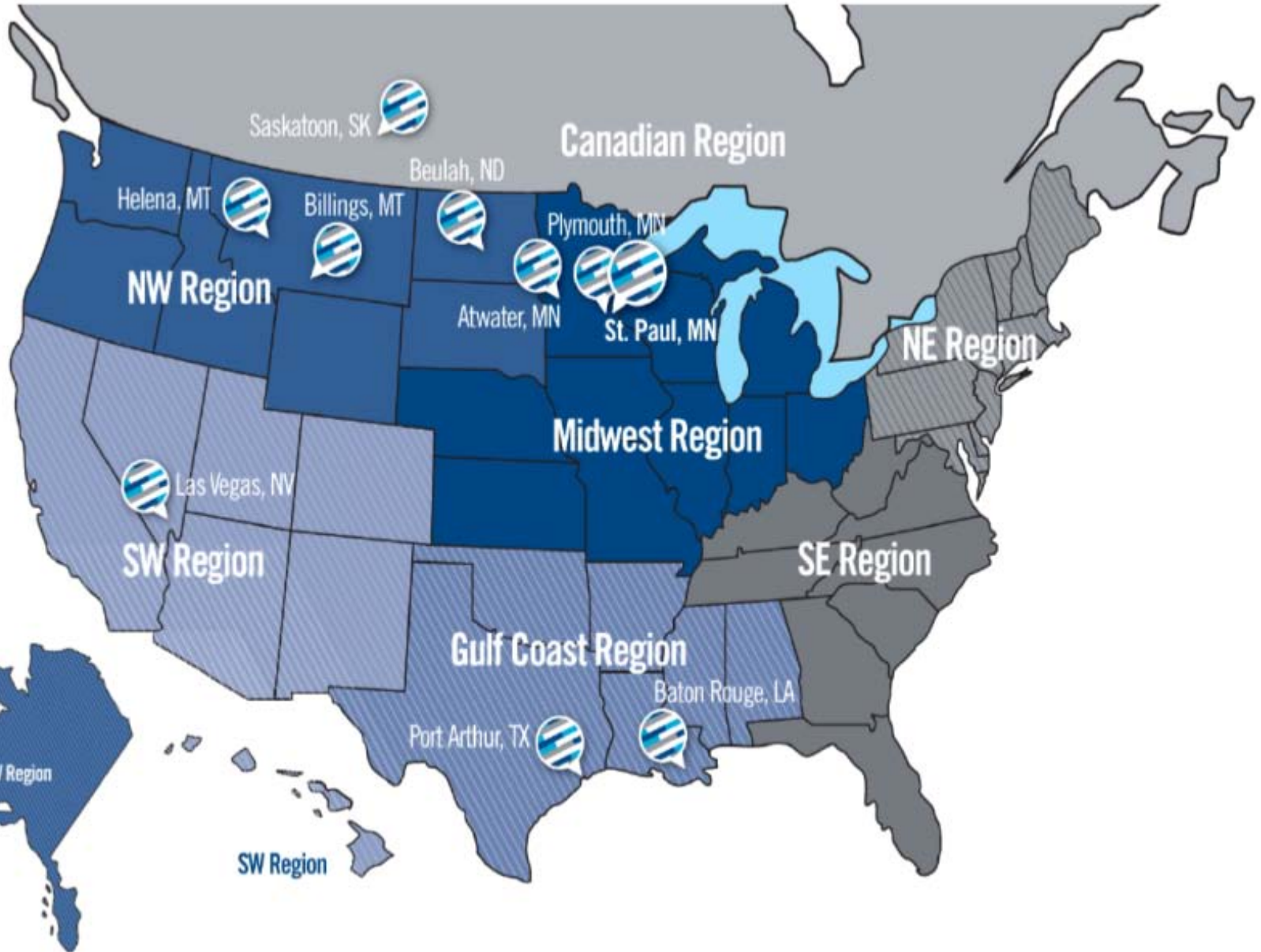
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# Who is Corval Group

- Founded in 1921
- Fully integrated Construction, Fabrication and Business Solutions group
- Expertise in:
  - Project development
  - Engineering
  - Technology application
  - Construction
  - Finance
  - Facilities Management

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# Corval Group Regions



# Delivering World Class Construction, Fabrication, and Solutions to Clients

## Partial List - Petrochemical Clients

- Flint Hills Resources
- Exxon Mobil
- Conoco-Phillips
- Dow Chemical
- Dow Corning
- Shell Motiva
- Valero Refining
- Sunoco
- El Paso Gas
- Petrobras
- Equistar Lyondell
- Kerr McGee / Gulf Marine
- Raytheon
- Shell Explorer
- TransOcean



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# Corval Team Strengths



Total Refinery  
Master Planning Capacity

Corval Group, Inc.  
Construction, Fabrication and Solutions

Purvin & Gertz  
Market Analysis and Logistics

Mustang Engineering  
Engineering & Construction  
Management

Feasibility Study

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# Purvin & Gertz: A Global Network to Serve Clients Worldwide



- Founded in 1947
- Independent firm owned by active consultants
- Consulting staff of Chemical Engineers/MBAs

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# Typical Purvin & Gertz Assignments



## MARKET ANALYSIS

## PROJECT-RELATED ASSIGNMENTS

Fundamental Industry Analysis  
Supply/Demand/Trade  
and Pricing

Subscription Services  
•Short-term  
•Long-term

Industry Studies  
• Canadian Oil Sands  
• China Petroleum  
• Russian Trade

Crude/Condensate  
Markets and Pricing

Market Studies for  
Downstream Projects

Refinery Feasibility  
•Configuration  
•Process  
•Economics

Independent Engineer  
•Technical Review  
•Market Study  
•Project Economics

Profit Improvement  
•Commercial Review  
•PIMS LP Analysis  
•Technical/Optimization

Mergers/Acquisitions  
•Asset Valuations  
•Due Diligence



# Purvin & Gertz

## Representative Recent Project Experience



### *Feasibility Studies*

- Canadian Refinery Development (2006-2009)
- Grassroots Refinery in Western Canada (2008)
- Central America Refinery Development (2005-2007)
- Gulf Coast Refinery Expansion Project Screening (2004)
- Alberta Refinery & Petrochemical Development (2003-2005)
- Refinery Upgrading Assessment (2004)
- Canadian Oil Sands Upgrader Project Review (2002-2003)
- European Grassroots Refinery Project (2002)
- Major Expansion Of Chinese Refinery (2002)
- Licensor Selection (2002)
- Caribbean Refinery Strategy Development (2001)
- Saudi Arabian Refinery Expansion Project (2001)
- Grassroots Projects In India & China (2001)
- Chinese Refining & Power Project Development (1997-2000)
- North American Refinery Upgrade Study (1998)

### *North Dakota Studies*

- Northern Tier Crude Price Analysis (2006)
  - ❖ Independent producer
- Northern Tier Refinery Screening (2006)
  - ❖ Private investment firm
- North Dakota Quality Bank Assistance (2007)
  - ❖ NDPC & NDOGRC

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# Who is Mustang?



- **Founded 1987 in Houston, Texas**
- **Joined Wood Group in 2000**
- **Business focus – Engineering and Project Management, and Construction Services for the petroleum, chemical, pharmaceutical and manufacturing industries worldwide**



**7,000 projects  
for over 350 clients**

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## Services Provided

- Process Design
- Feasibility Studies (Conceptual and Economic)
- Technology Consulting and Evaluation
- Front End Engineering Design Packages (FEED)
- Total Project Management (concept through start-up)
- Engineering / Design
- Procurement
- Inspection and Expediting
- Control / Automation
- Cost Estimates / Scheduling
- Construction Management
- In Plant Services

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## Recent Mustang Projects Similar to NDAREC

- Grassroots 400,000 BPD Refinery for Hyperion in South Dakota
  - Front end engineering for 400,000 BPSD grassroots refinery
  - Developed utility balance, plot plan, supplied emissions data for air permitting
  - Conceptualized storage requirements, and rail and truck loading
- Refinery Expansion Project for Confidential Client
  - Updated refinery block flow configuration for major crude slate change requiring addition of new process units
  - Involved evaluation for impacts of crude change to each processing unit and utilities system
  - Determined total installed cost estimate and operating cost for economic evaluation
- Grass Roots 250,000 BPD for Confidential Client
  - Worked with LP modeler to develop refinery configuration
  - Developed conceptual utility arrangements; prepared FEL-2 cost estimate
- Refinery Expansion Project CHS
  - Developed refinery block flow diagram for addition of a new delayed coker to the refinery
  - Involved unit by unit evaluation for changes in operation and product qualities
  - Progressed from initial concept development to detail engineering and construction

## About this Report

This report was prepared by the Consultants under a contract with NDAREC, which received federal grant funds for the study.

This document and the analysis, opinions and conclusions expressed in this report reflect the reasonable efforts of the Consultants and NDAREC using information available at the time of the oil refinery study and within the resources and timeframe available for this study. Those reviewing this document or other documents related to the oil refinery study should recognize the limitations of the study and understand that any predictions about the future are inherently uncertain due to events or combinations of events, including, without limitation, the actions of government or other entities or individuals. Neither the Consultants, nor NDAREC, or any of their employees, agents, task force members, advisory committee members, or any other representatives of these parties, make any express or implied warranties regarding the information, analysis, opinions, or conclusions contained in this document or other documents related to the oil refinery study, nor do they assume any legal liability or responsibility of any kind for the accuracy, completeness or usefulness of this document or the oil refinery study. No information contained in this document nor any other information released in conjunction with the oil refinery study shall be used in connection with any proxy, proxy statement or solicitation, prospectus, securities statement or similar document without the written consent of Consultants and NDAREC. Although this is a document available for use by the public, there are no intended third party beneficiaries of the agreement between Consultants and NDAREC for the performance of the oil refinery study.

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# Refining Capacity Feasibility Study

Phase I Study – 100,000 b/d, 50,000 b/d, 20,000 b/d

## 1. Marketing Study

- Transportation analysis (crude and refined product)
- Refined Product pricing (capacity is key factor)

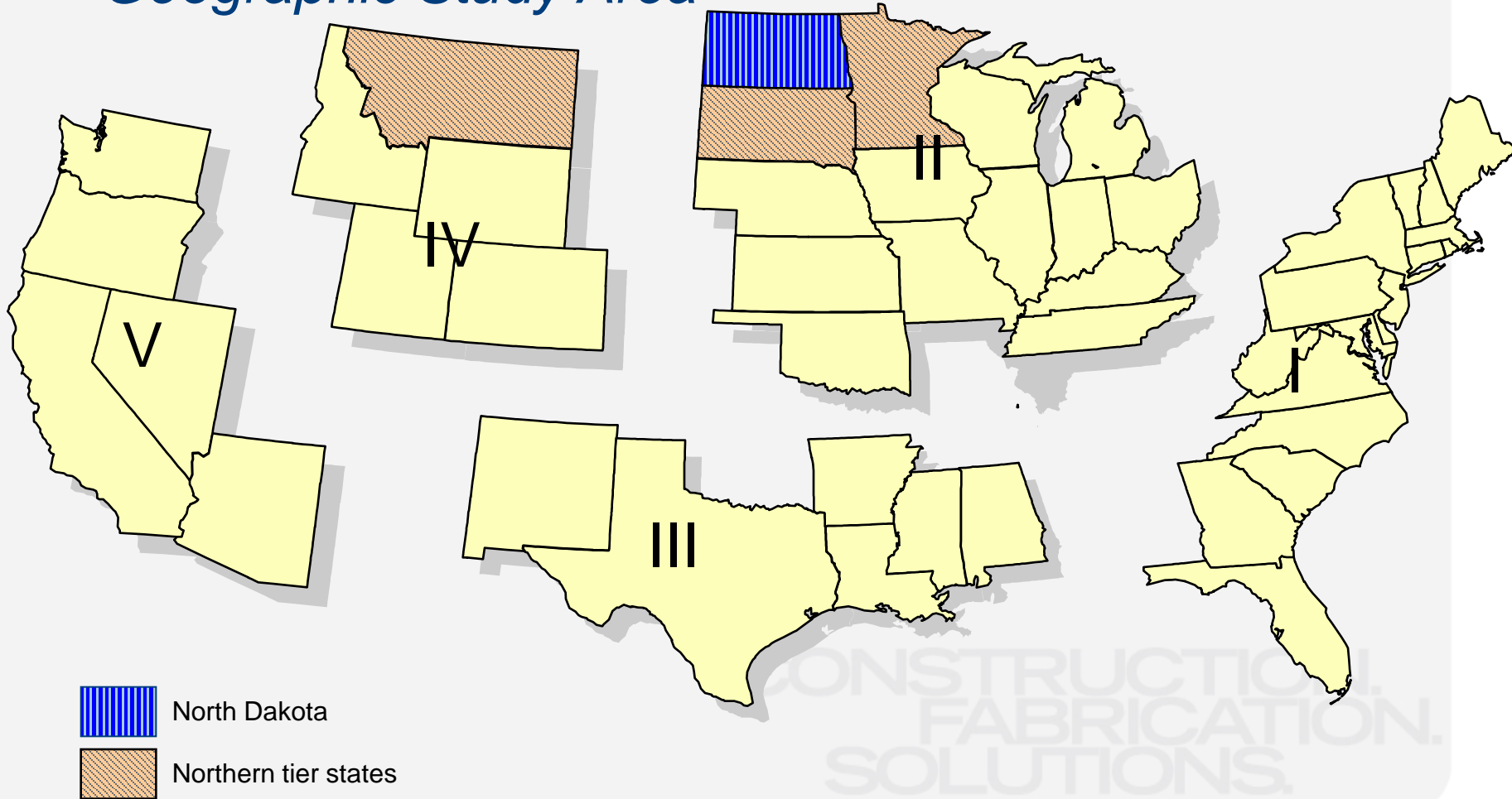
## 2. Crude Oil

- Availability and Pricing forecasts

## 3. Partnerships

# Light Refined Product Market Analysis

## *Geographic Study Area*



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# PADD II Light Refined Product Balance

*Thousand Barrels per Day*

	Gasoline	Total Diesel	Jet / Kero
<b>Supply</b>			
Production	1,937	987	209
Imports	1	5	0
Net Receipts	593	249	74
Adjustments	21	0	0
<b>Total</b>	<b>2,552</b>	<b>1,241</b>	<b>283</b>
<b>Disposition</b>			
Demand	2,544	1,222	275
Exports	19	12	9
Stock Change	-13	7	-2
<b>Total</b>	<b>2,550</b>	<b>1,241</b>	<b>282</b>

Source: DOE Petroleum Supply Annual 2008

- PADD II is large proportion of overall US demand.
- PADD II depends on supply of products from other regions, primarily PADD III.

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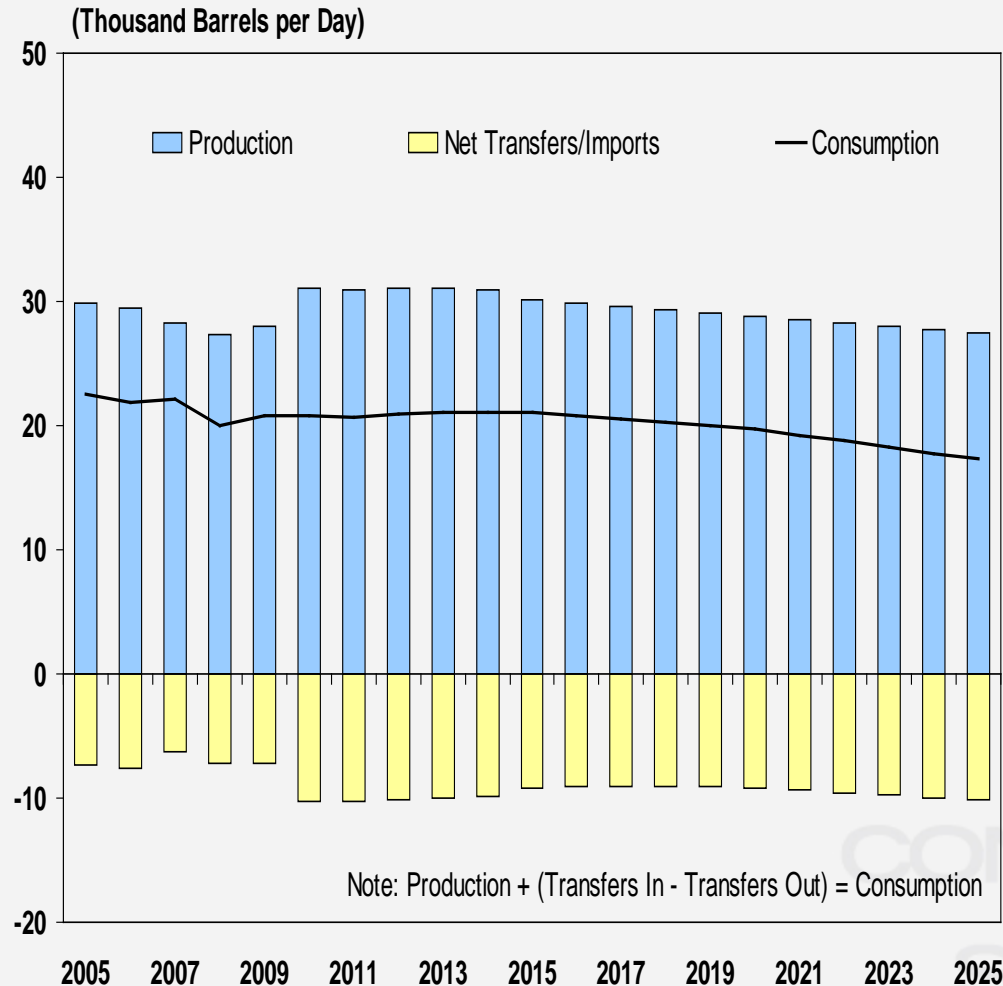
## PADD II Gasoline and Diesel Outlook

- PADD II gasoline demand begins to decline by 2015
- Reflects mandated vehicle efficiency improvements
- Reflects ethanol growth
- This trend mirrors overall U.S. demand projections
- PADD II diesel demand is projected to grow in line with underlying economic growth.
- Consistent with Energy Information Administration (EIA) and U.S. Department of Energy (DOE) trends

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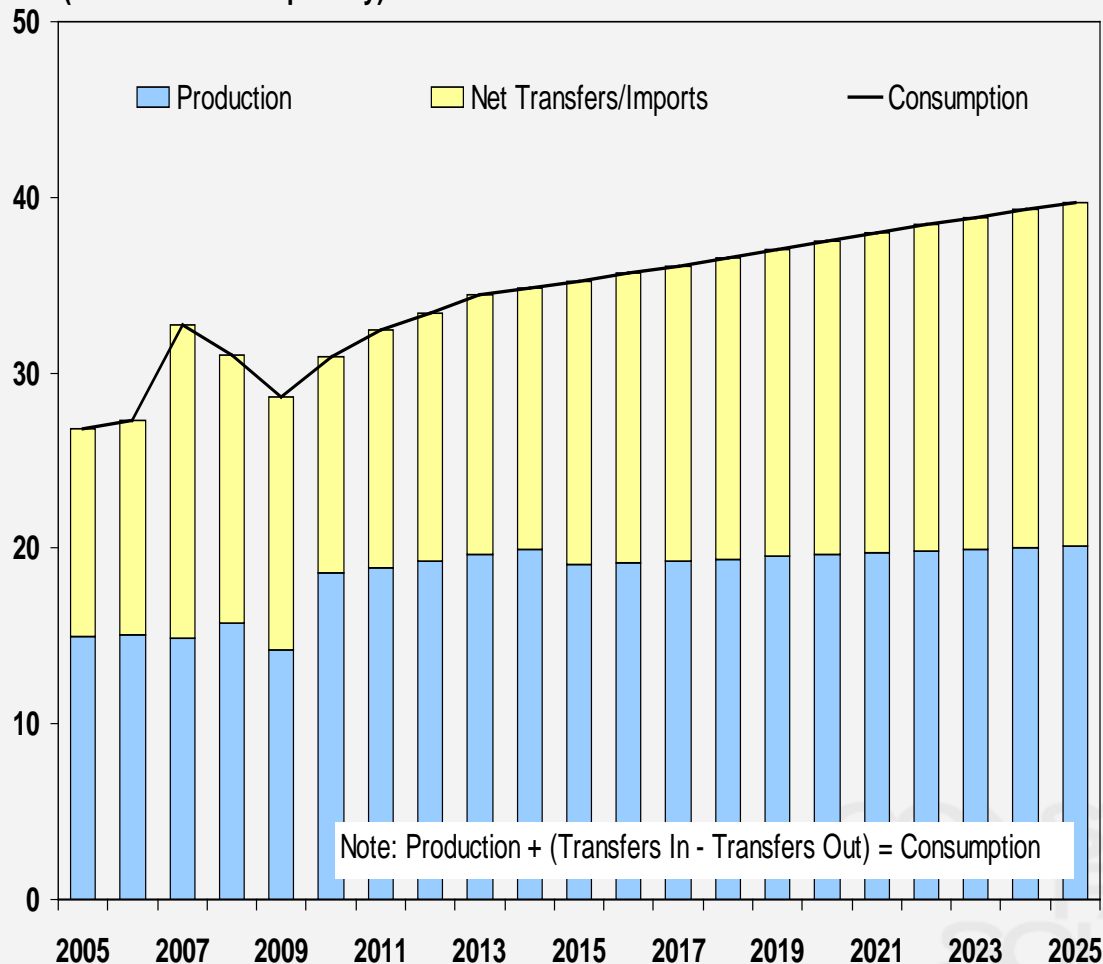
# North Dakota Gasoline Balance



- North Dakota’s demand for light refined products represent a small fraction of the overall PADD II total.
- North Dakota is a conventional gasoline market with some ethanol blending.
- Excludes ethanol
- Product transfers are essential to North Dakota’s refined product balance
  - The market balances on net transfers out of the state

# North Dakota Diesel Balance

(Thousand Barrels per Day)

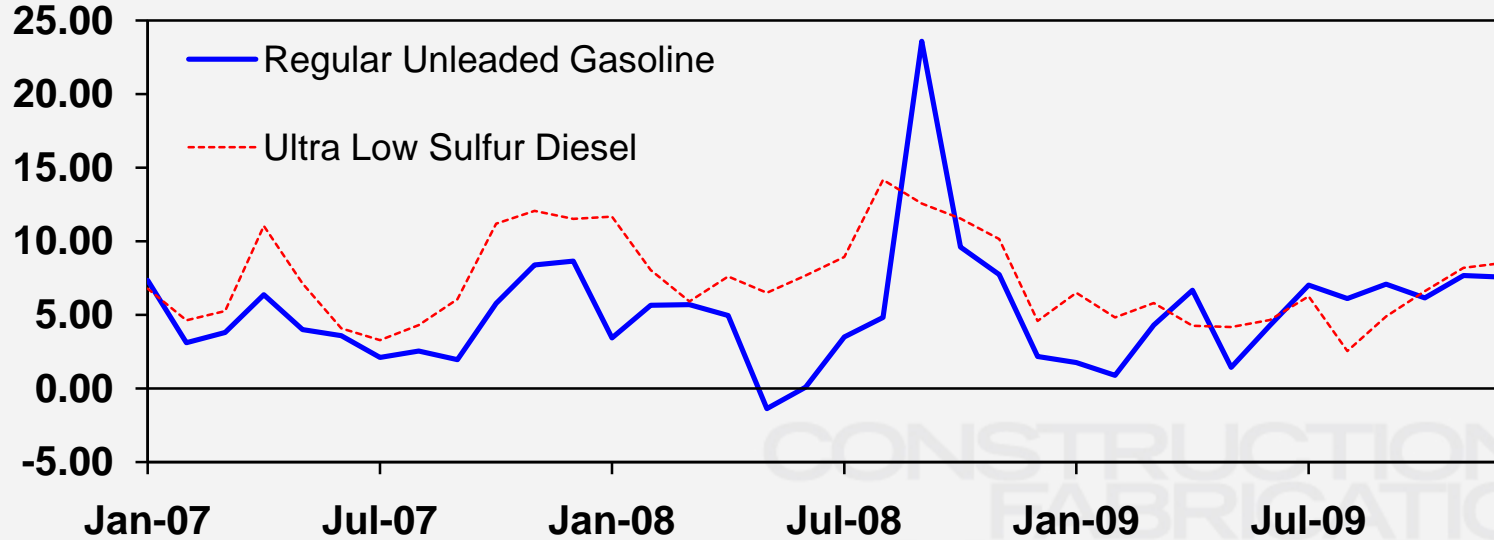


- The diesel market relies on increasing net transfers into North Dakota.
- Relative consumption of gasoline to diesel is lower than both the overall U.S. and PADD II markets because of the diesel consumption in the agriculture sector.

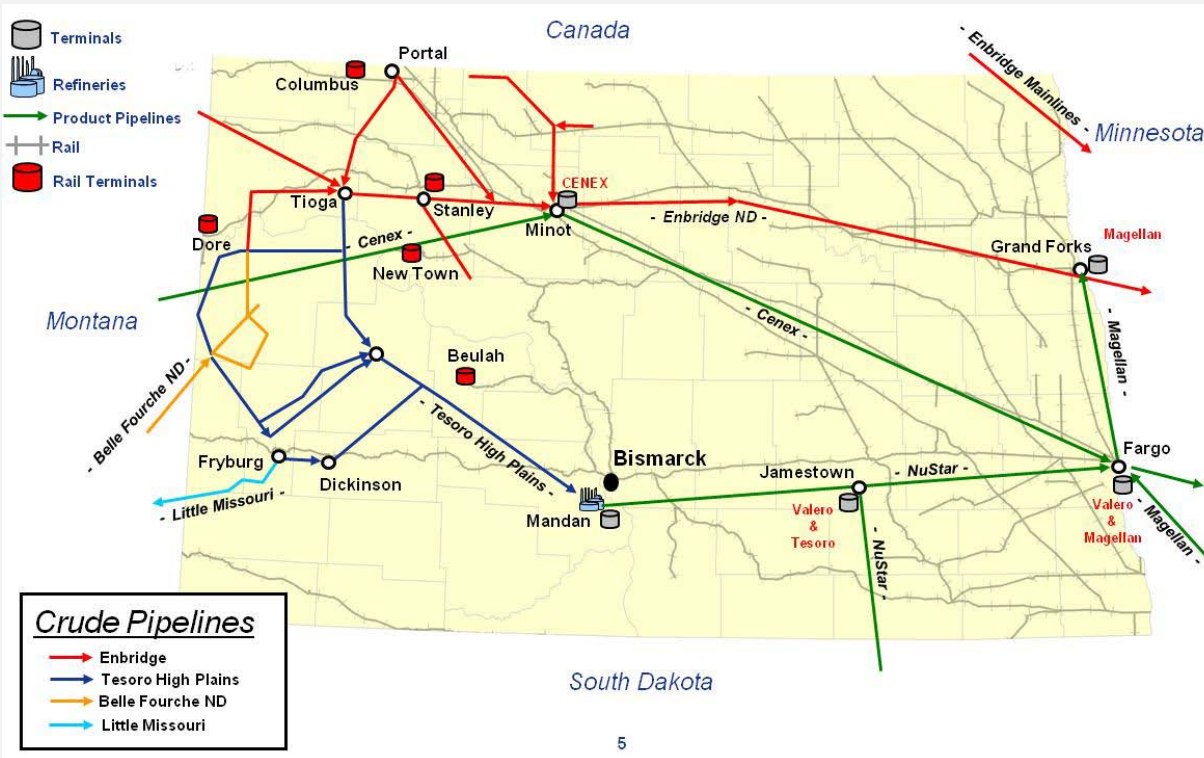
# North Dakota Product Pricing

- Due to dependence on transfers, product pricing in Minneapolis is related to U.S. Gulf Coast prices by transportation costs.
- Northern tier markets exhibit higher prices relative to Minneapolis.
- Prices approximate volumetric averages for North Dakota.

**Unbranded North Dakota Average Rack - Minneapolis Rack  
(U.S. Cents per Gallon)**



# Infrastructure Analysis



- Facilities
  - Crude gathering and trunk lines
  - Refined product pipelines
  - Terminals
  - Rail facilities
- Recent and Potential Projects
  - ENDPL Phase 6
  - Bridger/Butte debottleneck
  - EOG unit train
  - Enbridge Portal reversal
  - Bridger Four Bears

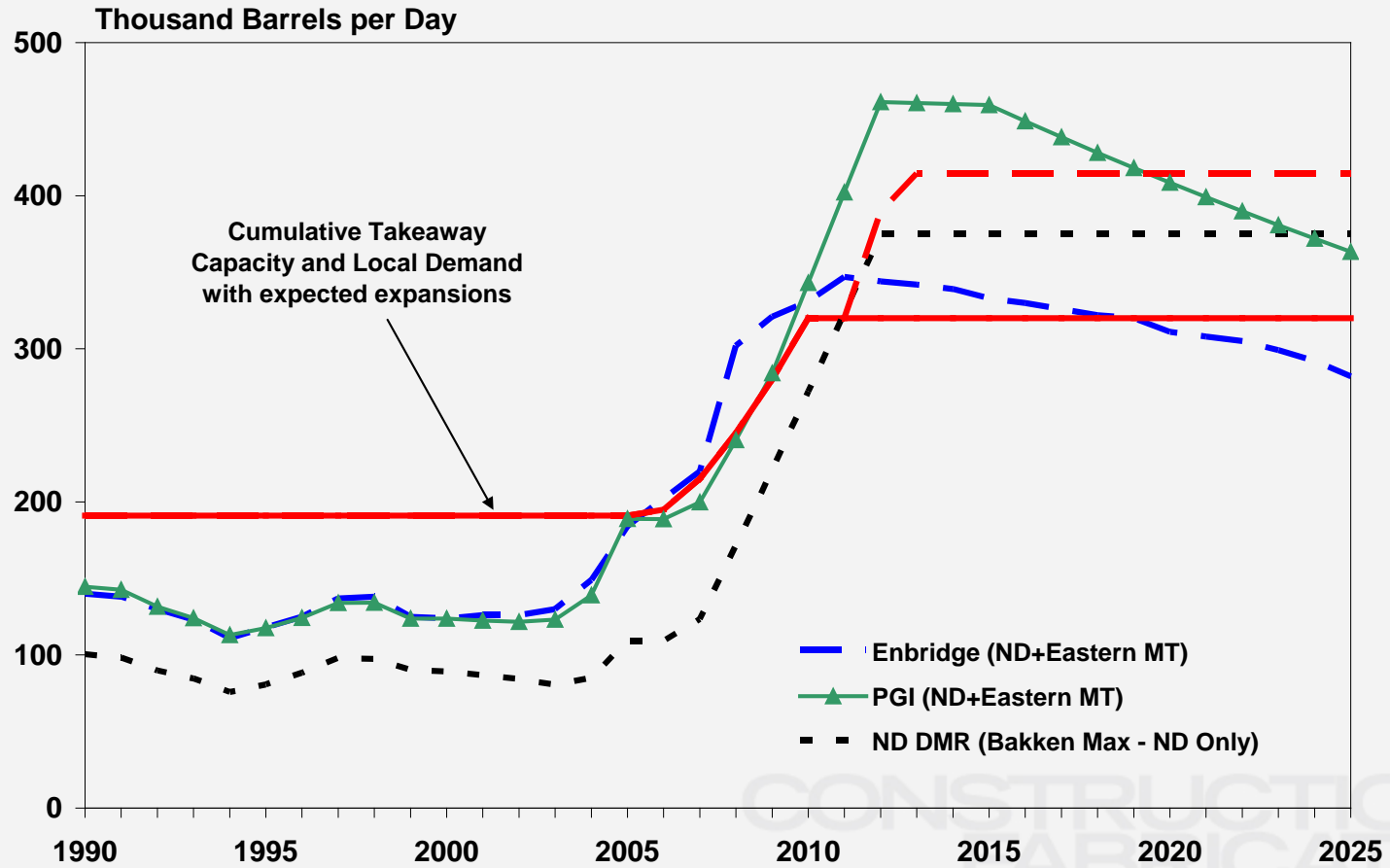
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# Crude Production

- Crude oil production is decreasing in most producing regions in the US, except in the Williston Basin.
- North Dakota production benefits from recent technology advancements.
  - Horizontal drilling
  - Multi-stage fracturing
- Crude from the Williston Basin will serve markets in North Dakota as well as other refining centers.
  - Pipeline capabilities must keep pace with production.
  - Rail transportation can supplement takeaway capacity.

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# Production – Williston Basin



# Market Modeling

## *Modeling Premises*

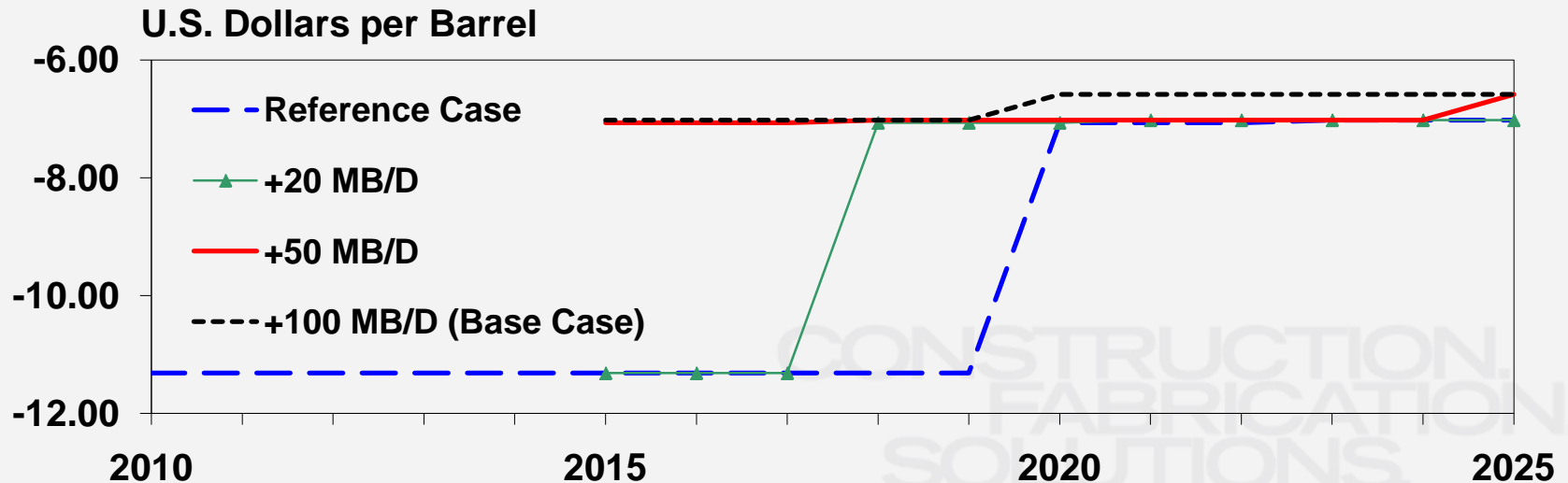
- Phase 1 Analysis – Evaluation of incremental addition of refinery capacity relative to a reference case of no capacity increase.
  - Process light sweet Bakken crude
  - Capacity cases: 100,000 (base), 50,000, and 20,000 B/D
  - Maximize finished gasoline, jet and diesel fuel.
  - Maximize light product yield consistent with demand forecasts.
  - Employ proven commercial technologies.
- Vacuum gas oil (VGO) hydrocracking configuration with no bottoms conversion
- Refining value and transportation adjustments determine the netback price for Bakken crude in North Dakota

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# Crude Supply and Pricing Analysis

## *ND Sweet (field) Minus WTI, Cushing*

- Additional refining capacity will strengthen crude prices in the state.
- Prices are indicative of field prices in North Dakota
- Actual costs will vary pending specific locations of the refining capacity.

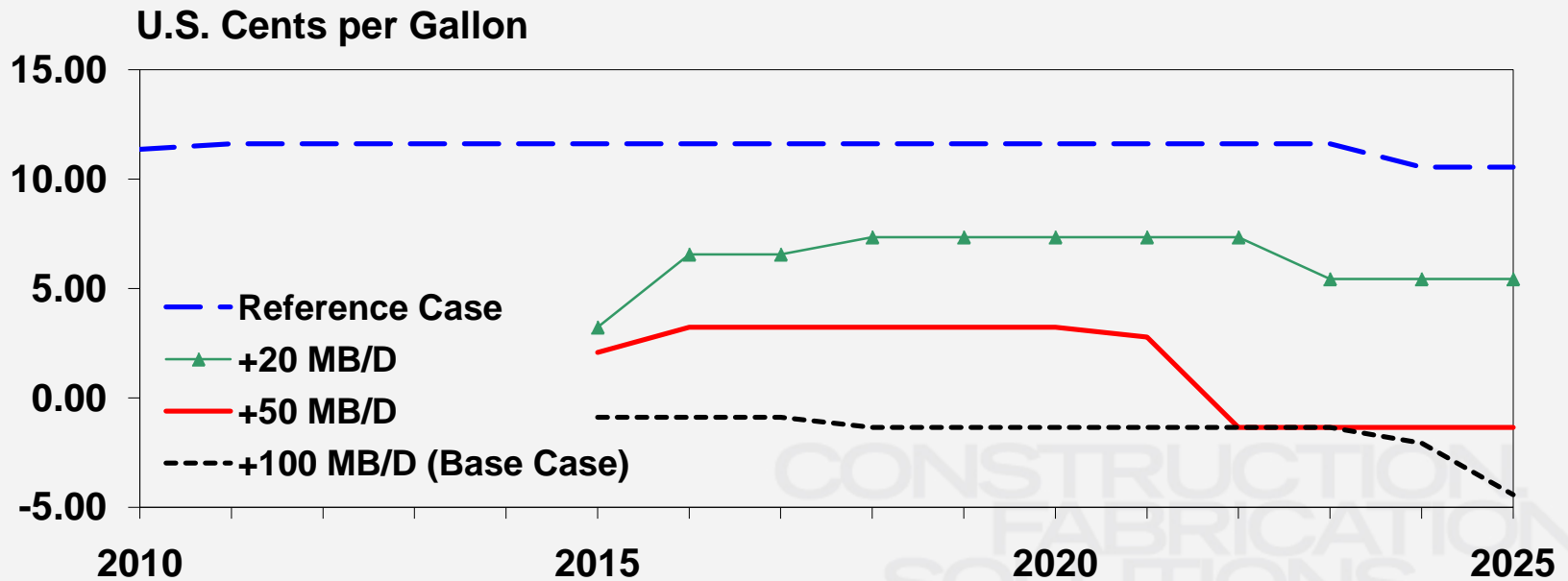




# Crude Supply and Pricing Analysis

## *Gasoline Differentials: ND Minus Gulf Coast*

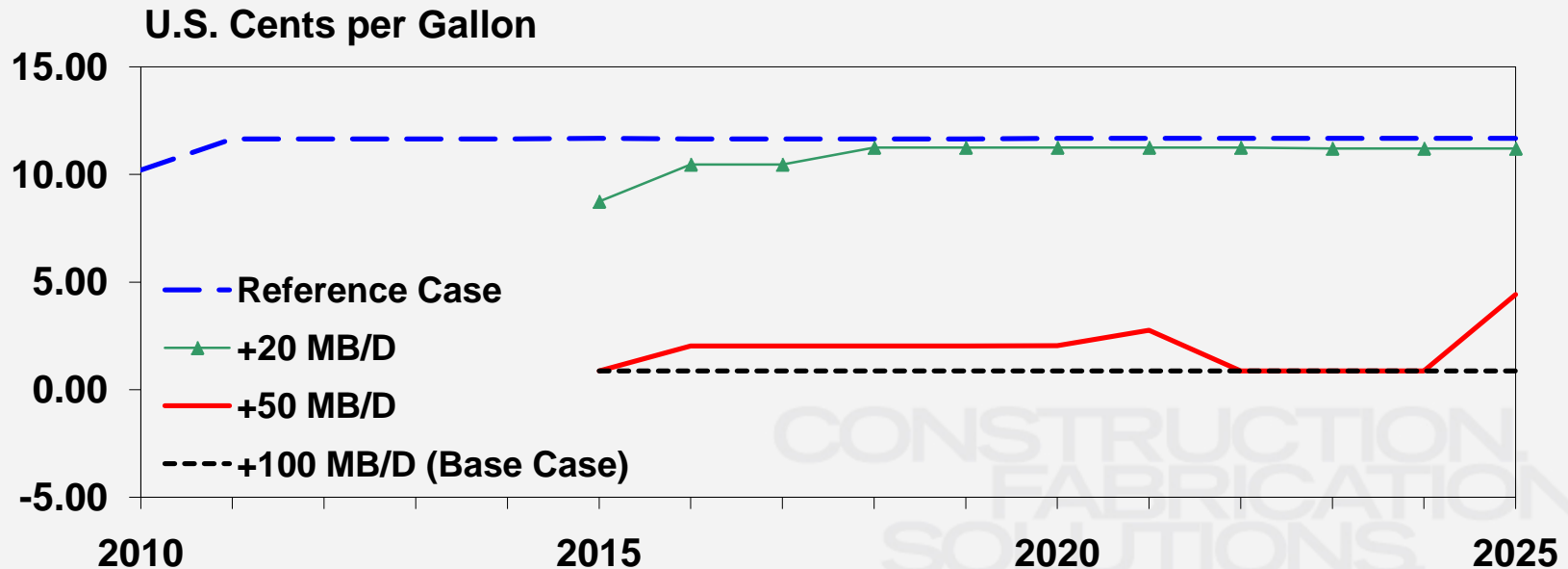
- Provides indicative prices at a generic location in North Dakota
- Additional refining capacity will weaken product pricing
- Impact varies with refinery capacity



# Crude Supply and Pricing Analysis

## Diesel Differentials: ND Minus Gulf Coast

- Provides indicative prices at a generic location in North Dakota
- Additional refining capacity will weaken product pricing
- Small impact from 20,000 B/D case

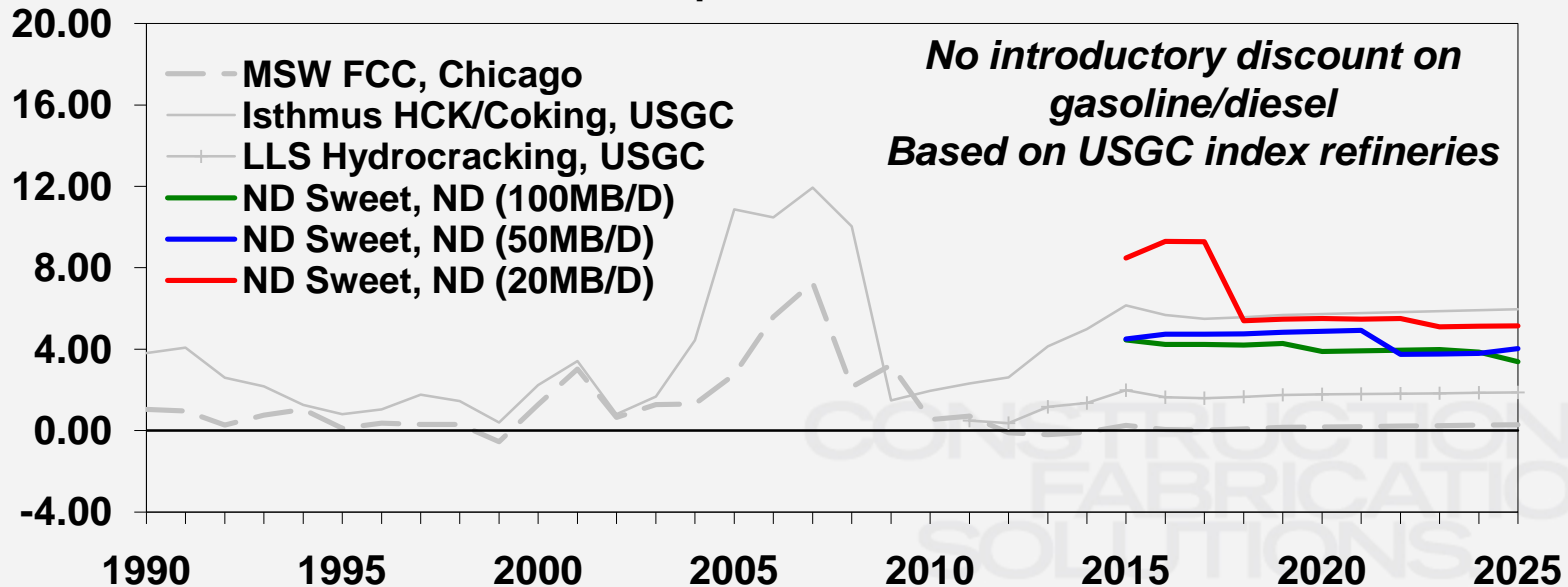


# Refining Margin Analysis

## *Net Refining Margin*

- Net refining margins are variable refining margin less fixed costs - no capital recovery.
- Net refining margins are forecast to be positive in all cases.
- Fixed costs per barrel decrease as project capacity increases.

**Forecast in 2009 U.S. Dollars per Barrel**



# Conclusions

- Crude
  - High potential for continued growth of supply
  - Pricing will be set by competition in markets outside of North Dakota
- Refined Products
  - Strong growth anticipated only for diesel demand
  - Incremental supply would impact transfers from south/east and could reduce current price premium
- Project Parameters
  - Configuration targeted maximum diesel production from light sweet North Dakota crude
- Economic Analysis
  - Specified refining capacity additions appear to achieve less than adequate capital recovery to support traditional project finance.
  - Additional refinery analysis recommended to refine alternative configurations and product slates to reduce capital requirements and potentially improve projected economics as part of Phase II