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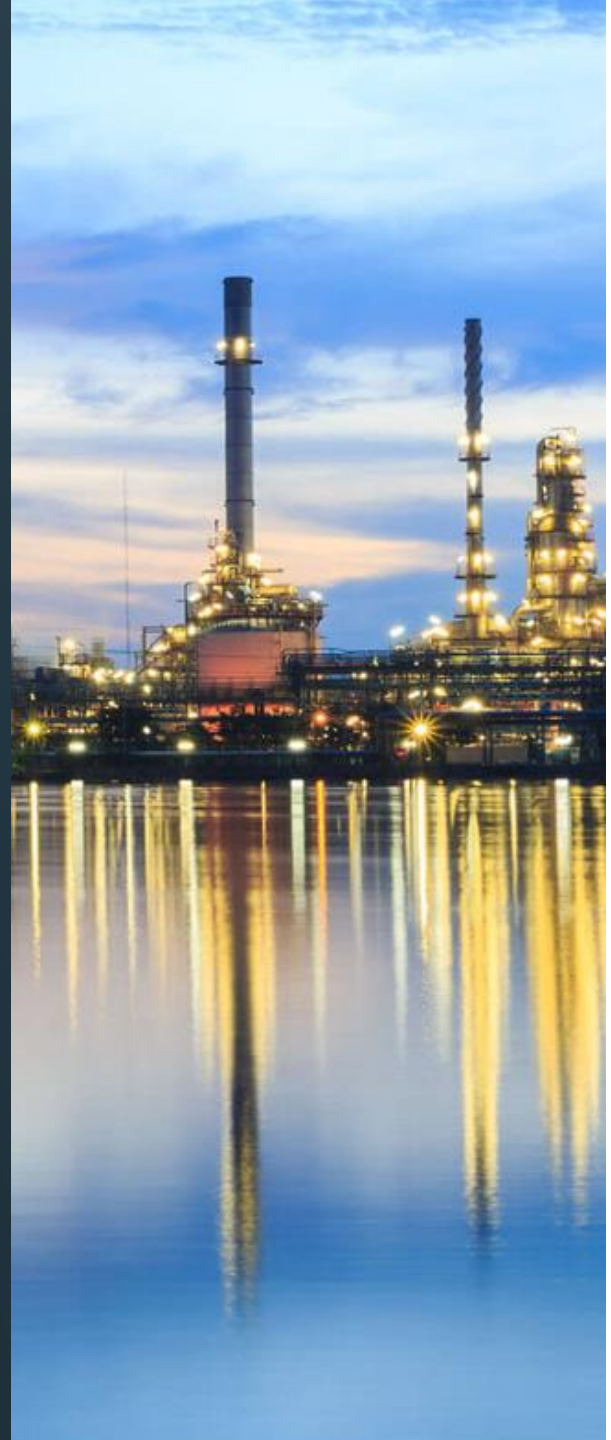

MIDWEST STATES

GASOLINE RVP – 1 PSI WAIVER STUDY

Report for

American Fuel & Petrochemical Manufacturers

February 24, 2023

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Helpful Acronyms and Definitions

BOB	"Blendstock for Oxygenate Blending" - gasoline product from refineries before ethanol is blended
CBOB	Conventional BOB (typically 8.8 psi RVP in summer) – includes 1 psi RVP waiver when blended with 10% ethanol
CPG	Cents per gallon
E10/E15	Gasoline blends composed of 10% and 15% ethanol, respectively. 10% to 15% blends of ethanol add roughly 1 psi to the RVP of gasoline.
HIGH RVP CBOB	Traditional summer CBOB (typically 8.8 psi RVP) includes 1 psi RVP waiver when blended with 10% ethanol
LOW RVP CBOB	CBOB (estimated 7.8 psi RVP in summer) with no RVP waiver when blended with ethanol
RBOB	Reformulated BOB – BOB with low RVP (typically 6.2 psi RVP) per local/regional requirements
EIA	The United States Energy Information Administration
EXTENDED COST MODEL	A model that sums all costs to meet a change in gasoline RVP for a specific refinery plus the logistics costs to deliver to market
EPA WAIVER OPT-OUT STATES	Seven Midwest states proposing to opt out of the EPA's 1 psi RVP waiver for gasoline during summer months: Iowa, Illinois, Minnesota, Nebraska, Ohio, South Dakota, and Wisconsin
LSR (ALSO C5, NATURAL GASOLINE)	Light Straight Run is a light, high RVP gasoline blendstock in a refinery which contains mixed butanes, pentanes (C5's), hexanes, and other light components. Natural Gasoline is a purchased component with similar qualities
MBPD	Thousand barrels per day
RVP	Reid Vapor Pressure is the specification for gasoline vapor pressure measured in pounds per square inch (psi)
RVP COST MODEL	The cost of adding or subtracting butane to meet gasoline RVP specifications
USGC	United States Gulf Coast, Large refinery hubs located in coastal Texas, Louisiana, and Mississippi

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Gasoline RVP – 1 psi Waiver Study

EXECUTIVE SUMMARY

Introduction

- As of December 14, 2022, seven states (Group A) had joined a petition to remove the existing 1 psi waiver for 10% ethanol summer gasoline in the 2023 summer ozone season. Missouri joined this group as of December 21, subsequent to this Study, and as a result, the impact of Missouri's inclusion is not considered in this analysis.

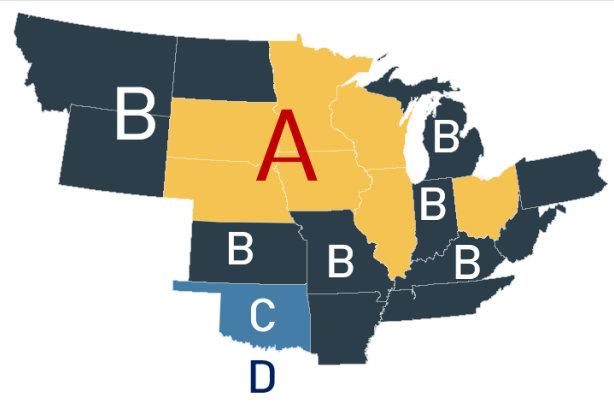
- Blending 10% ethanol into gasoline blendstock adds roughly 1 psi to the RVP. The U.S. EPA allows finished summer gasoline at a specification of 9 psi RVP to meet a 10 psi specification through a 1 psi waiver. Currently, this waiver allows refineries to produce 8.8 psi CBOB. Without the waiver, CBOB must be lowered to approximately 7.8 psi. This product is termed *"Low RVP CBOB"* in this report

- The removal of the 1 psi waiver in Group A also affects refined product costs and balances in other states grouped as follows:
  - Group B (Neighboring states) that Group A supplies to, receives from, or both
  - Group C (Oklahoma) which supplies Group A and Group B
  - Group D (Texas and Louisiana) that can ultimately provide "swing" supplies to Groups A, B, C

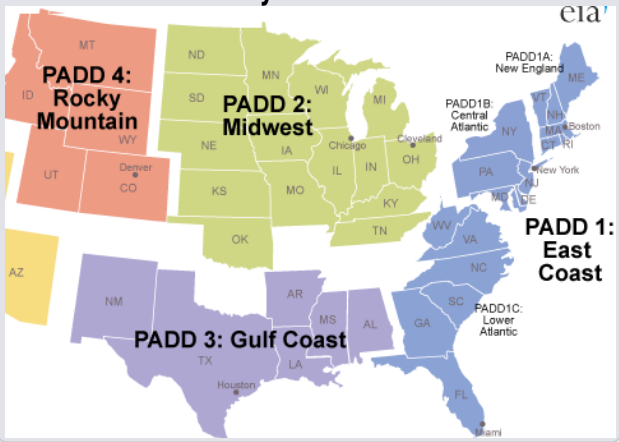
- This Study evaluates near-term (2023-24) and long-term (2025+) effects on:
  - Gasoline supply costs including costs for refiners to produce Low RVP CBOB and costs to store and distribute fuel in Groups A, B, C, and D (the "affected" states)
  - Other gasoline and diesel supply chain impacts

This Study presents costs derived from publicly sourced data, aggregated and anonymized individual surveys, and Baker & O'Brien's professional judgment. Each refinery is unique in its ability to refine products and will face different costs and market conditions that impact the ability to recover these costs.

Waiver in Group A (yellow) states impacts supply and costs in Regions B, C, D



Group A states are in PADD 2 as defined by the EIA



Market Indication of Supply Costs

PADD 2 refining complex has evolved to serve conventional gasoline markets under the 1 psi ethanol waiver

- Due to legacy RVP specifications in northern markets, maximum recovery and control of high RVP components is not necessary in many PADD 2 refineries
- Typical RVP cost model studies do not capture extended processing costs, especially at low RVP blends
  - Refineries with equipment designed for higher RVP blends cannot reach low RVP blends easily
- Evaluation of actual refiner and pipeline company capabilities and market RVP costs are critical
  - An urgent timeline does not allow sufficient time for companies to fully understand constraints
  - Pipeline companies and refining companies cannot readily segregate High and Low RVP CBOB products

Market evidence provides insight into the costs of RVP (using gasoline grade price differentials)

- Comparing spot prices of RBOB and CBOB in the Chicago gasoline market allows an apples-to-apples determination of RVP costs (see Appendix)
  - Summer RVP "cost" averaged 8.1 (~8) cpg per 1 psi in 2019 and 9.7 (~10) cpg per 1 psi during 2022
  - Generally, historical PADD 2 RVP costs are estimated at 8 to 10 cpg per psi for the calculation of Low RVP CBOB costs
- Other market evidence suggests elevated costs for supplying boutique fuels during PADD 2 market shortages (see Appendix)
  - RFG gasoline is currently excluded from 1 psi waiver – requires BOB with 6.2 psi RVP (RBOB); not fungible with CBOB
  - Retail RFG markets are much more susceptible to severe price increases during unpredictable supply shortages
  - Recent PADD 2 supply disruptions demonstrate a potential retail price differential spike in excess of 60 cpg
  - Reduction of PADD 2 CBOB production will increase potential for supply shortages

Summary of Supply Cost Impacts

- The Low RVP CBOB supply cost is assessed by considering three approaches.
  1. Typical **RVP cost model** that largely relies on the cost of butane rejection
  2. The **observed market price differentials** for different gasoline RVP grades in Chicago
  3. The range of costs based on each refinery's specific capabilities plus any infrastructure and logistics costs associated with bringing Low RVP CBOB from each refinery to the affected states ("**extended cost model**")
     - The broadest range of responses result in costs from 3 to 12 cpg.
  4. **Assessed near-term supply costs** consider all three approaches and take into account the supply/demand balances and market realities in the region
     - The assessed near-term supply costs range from 8 to 12 cpg with a total summer cost of $0.5 to $0.8 billion

Low RVP CBOB Supply Cost (above High RVP CBOB)

cents per gallon

RVP Cost Model	2019 / 2022 Observed Market Cost (Chicago)	Extended Cost Model Near Term (Range)	Assessed Cost Near Term
2 - 10	8 - 10	3 - 12	8 - 12

- The spot market price of Low RVP CBOB in the affected states is expected to reflect additional costs for refineries to produce Low RVP CBOB as well as additional costs associated with storing and distributing the product

This Study presents costs derived from publicly sourced data, aggregated and anonymized individual surveys, and Baker & O'Brien's professional judgment. Each refinery is unique in its ability to refine products and will face different costs and market conditions that impact the ability to recover these costs.

Typical RVP Cost Model vs. Extended Cost Model

The Study compares two approaches for calculating additional refiners' supply costs for Low RVP CBOB (over High RVP CBOB)

1. A typical RVP cost model relies largely on the cost of butane rejection
   - Estimated RVP costs using 2019 PRISM model for individual refineries, arm's length/desk top analysis
   - Excess butane is rejected and sold with zero operating costs or constraints
   - Ignores that, below 9.0 psi, some refineries cannot remove adequate butane
   - If butane rejection by itself was adequate, refiners' production costs approach 3 cpg
2. An extended cost model accounts for other costs, such as LSR removal, blendstock purchases, production cuts, infrastructure costs, and distribution costs in addition to butane rejection costs
   - Other extended costs were developed from refinery-specific surveys
   - The near-term total additional costs for supplying Low RVP CBOB in the affected states ranges between 3 and 12 cpg for individual refineries

The Study considers two time-frames for refineries and midstream companies:

1. Summers 2023/24: A near term requirement would not allow enough time to implement modifications to optimize and lower costs of compliance
2. Summer 2025: Long term policies allow at least two years to implement capital modifications which may include:
   - Additional fractionation and storage of butane and LSR
   - Logistics assets (tanks, pipes, etc.) that allow production, storage, and distribution of additional gasoline grades

Range of Costs of Producing and Distributing Low RVP CBOB, cpg

	RVP Model [1] 2022Q3		Extended Cost Model [2] Near term		Extended Cost Model [2] Long term		Pipeline Systems Long Term [3]	
Group	Low	High	Low	High	Low	High	Low	High
A	2	10	3	12	3	11	0	2
B	2	3	3	12	3	8	0	2
C	2	3	5	10	3	8	0	2
D	2	2	4	4	4	4	0	2

(1) For each refinery, PRISM assumes efficient fractionation, stream flexibility, and logistics capabilities (similar to other refinery production models)

(2) Costs include refinery-operation adjustments, downgrades, fractionation, refinery storage, and component logistics. In some cases, costs include lower CDU runs

(3) Midstream companies will pass through amoritzed capital costs only in the long term

The Study reveals shortcomings of a typical RVP cost model only

1. Typical RVP models assume "ideal" operation and "average" properties
2. Typical RVP models do not consider refinery-specific capabilities and the constraints on infrastructure and distribution downstream from the refinery
3. Surveyed costs significantly exceeded butane rejection costs

This Study presents costs derived from publicly sourced data, aggregated and anonymized individual surveys, and Baker & O'Brien's professional judgment. Each refinery is unique in its ability to refine products and will face different costs and market conditions that impact the ability to recover these costs.

Supply Cost Estimates

The assessed total cost to supply (produce, store, and distribute) Low RVP CBOB is expected to range from 8-12 cpg in the near term over current High RVP CBOB price with variations for individual suppliers[1]

- Based on current operating conditions, marginal costs of production, and distribution costs; does not include capital investments
  - Calculated using an extended cost analysis which includes responses from surveyed refiners and historical market RVP costs
  - Significant volumes from marginal cost suppliers will be required to fulfill the market demand
- Some refineries must reduce crude oil throughput to manage high RVP blending components that can no longer be blended into gasoline
  - Diesel production is reduced at refineries with throughput reductions
- A two-week unplanned supply disruption could raise estimated average summer consumer costs by as much as 5 cpg

The total incremental cost to supply Low RVP CBOB is between $0.5 billion to $1.1 billion per year

- Costs include EIA estimated volumes of CBOB consumption for 185 days during summer gasoline sales
  - $0.5 - $0.8 billion assumes an expected higher supply cost for Low RVP CBOB of 8 - 12 cpg absent any supply disruptions
  - Supply disruptions would push supply cost higher - $1.1 billion assumes a two-week summer shortage and consumer price spike in PADD 2. (*See Appendix for details)*

Studies that ignore actual constraints and use only typical RVP cost models will underestimate actual costs

- These models typically assume butanes and other high RVP components are separated prior to blending. Some refineries have never installed equipment to remove light components prior to blending.
- Such capabilities are largely limited to refineries that produce significant volumes of RFG and low RVP fuels

[1] Each refinery is unique in its ability to refine products and will face different costs and market conditions that impact the ability to recover these costs

Capital Cost Estimates

Surveyed refinery respondents indicated that investments are required to enable more efficient production of Low RVP CBOB

- Necessary investments differ widely, but may include new fractionation, tanks, and piping
- Two of these refineries indicated investments could not be justified and may not produce Low RVP CBOB

Surveyed refinery respondents provided preliminary capital cost (CAPEX) estimates

- Typical preliminary capital cost estimates per refinery are $50 to $75 million
- Amortized refinery investment capital cost per gallon of Low RVP CBOB is 0 to 2 cpg

Capital investments at refineries, pipelines, and terminals will take two or more years to implement

- Sizeable capital projects typically require two years from management approval until final implementation
- In addition to the two-year capital project timing, refiners and pipeline operators are hesitant to pre-invest due to the uncertainty regarding changes to RVP specifications or extension of the 1 psi waiver to E15 gasoline blends
- Prior to spending capital, pipeline operators require commitments regarding volumes, qualities, and markets served to formulate optimal capital investment plans

Potential Gasoline Supply Reductions

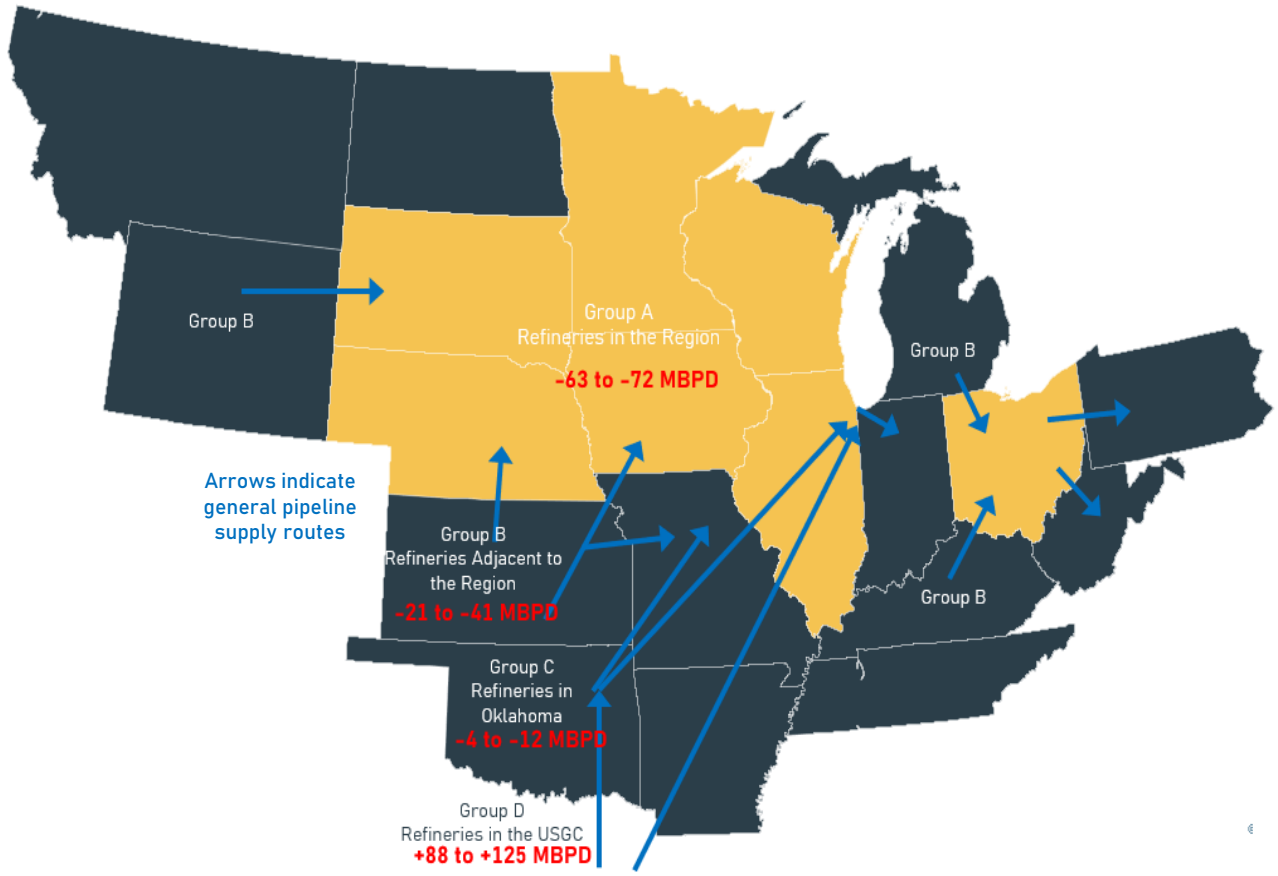
Reduced supply and risk of shortages

Less refined products production in Groups A, B, C

Reduction of CBOB and Distillates Production (mb/d)		
Group	**Reduced CBOB Volume**	**Reduced Distillate Volume**
A	**63 - 72**	**12 - 20**
B	**21 - 41**	**6 - 10**
C	**4 - 12**	**2 - 3**
Additional from D	**88 - 125**	**20 - 33**

- Replacement supply must come from Group D
  - Logistics limitations north of Texas
  - Only one RVP product north of Kansas in 2023-24
  - Limited pipeline capacity (often "full" in summer)
- Loss of system "robustness" especially in 2023-24
  - Additional "Low RVP" grade reduces fungibility
  - More frequent and longer supply disruptions
    - Higher risk of price spikes and shortages

CBOB and distillates short-fall in Groups A, B, C must be supplied from Group D



Overall Supply Impacts

Currently, 40% of the gasoline market in PADD 2 is CBOB sold into 1 psi waiver markets

- Summer CBOB (at 8.8 psi) is highly fungible – produced, stored, and transported throughout the region
- PADD 2 refining and distribution networks have evolved to efficiently supply 8.8 RVP CBOB
  - Current ability to adapt to "normal" supply/demand swings
  - Current ability to respond to planned and unplanned supply interruptions (e.g., refinery outages)

Several respondents noted that two RVP CBOB grades are significantly less fungible than one current grade

- Nebraska, Iowa, South Dakota, and southern Wisconsin do not have refineries
  - Many remote areas rely on one pipeline source
- Refinery and pipeline constraints limit supply options for Low RVP CBOB
  - High RVP CBOB cannot be moved to Low RVP CBOB markets
  - More expensive Low RVP CBOB could be supplied into high RVP CBOB markets if needed
    - Due to logistics constraints, some High RVP CBOB areas will only be supplied with Low RVP CBOB, especially in the first two years

Estimated reduction of gasoline supplies in and into Group A states is up to 125,000 bpd, diesel reduced up to 33,000 bpd.

- These volumes are similar to an outage at a large PADD 2 refinery
- Based on surveys of industry participants, there could be sufficient pipeline capacity to replace these reductions under stable summer supply conditions, however, further investigation is required to confirm
- Successful distribution of refined products across PADD 2 relies on consistent refinery production and pipeline operations. The reduction of fungible volumes of CBOB will certainly have more extreme consequences during an unplanned supply disruption such as a refinery outage. For example, local pricing could adjust to reflect higher trucking costs from more distant refineries and terminals

Other Supply Impacts

In 2024, Denver gasoline specifications will change from Conventional to RFG, which will impact Oklahoma, Kansas, and Colorado refineries and pipeline systems

- Refiners emphasized difficulties of supplying both Denver RBOB and Low RVP CBOB for Nebraska, Iowa, and other Northern PADD 2 markets without additional investments
- Some Kansas and Oklahoma refineries may not be able to supply Low RVP CBOB markets unless there are strong market signals that offset the expense of lower total production capacity

In the near term, pipelines and terminals will have limited capacity to segregate an additional grade of gasoline without investment

- These limitations could result in High RVP markets supplied with more expensive Low RVP CBOB
  - States not opting in may pay a higher price than they would under the current harmonized market
  - Examples may be areas in Indiana and Michigan currently supplied from Chicago, or areas of North Dakota, Kansas, and Missouri

Near-Term and Long-Term Implications

Near-term implications

Summers 2023/2024

- Many refineries will increase butane and LSR sales to contain RVP components in CBOB sales
- Some refiners may reduce crude runs in order to control the amount of high RVP gasoline components blended in the gasoline pool
- The Low RVP CBOB specification will reduce total CBOB production in PADD 2. Distillate production will also be lowered due to crude throughput cuts.
- Increased volumes of CBOB and distillate will likely be shipped from Gulf Coast refineries to the Midwest. Low RVP CBOB specifications will complicate logistics with lower total available stored volumes of CBOB.
- In some cases, refiners will need to secure additional transportation for allocating rejected light ends, via rail, truck, or pipeline, depending upon their location
- Some refiners will begin planning to spend CAPEX in fractionation, storage, distribution and transportation, in order to handle the rejected light ends from the gasoline pool

Long-term implications

Summer 2025 or later

- Although refiners and midstream companies will make incremental changes to optimize production and delivery of Low RVP CBOB, production will continue to be constrained by low RVP specifications and multiple products
- Some refiners and midstream operators will need to implement investments to secure long-term production of lower RVP CBOB. Such investments will include:
  - Adding tanks (storage) to balance light ends and new gasoline blend needs
  - Adding piping, pumps, and other equipment to accompany additional fractionation and storage
  - In some cases, refiners will need to secure additional transportation for allocating rejected light ends, via rail, truck or pipeline, depending upon their location
- Pipeline operators will add tanks, piping, and logistics capabilities to handle multiple grades

Gasoline RVP – 1 psi Waiver Study

METHODOLOGY, BACKGROUND AND APPROACH

Study Methodology

Baker & O'Brien was engaged by the American Fuel & Petrochemical Manufacturers (AFPM) association to assess the cost of producing conventional gasoline blendstock (CBOB) for gasoline without a 1 psi RVP waiver (Low RVP CBOB) for seven Midwest states (Opt-out States) during the summer months (the "Study").

The Study considered how the proposed specification change would impact gasoline production and distribution systems in several United States (U.S.) Midwest markets. To complete this Study, Baker & O'Brien modeled a robust and representative number of refineries supplying the petitioning states using our proprietary *PRISM* refinery simulator and database to quantify implications in terms of costs and operations to the refining system. We defined a "Base Case" which represented current summer specifications at 8.8 psi CBOB, and a "Study Case" which modeled typical changes required to produce 7.3 psi CBOB in March (needed for the RVP transition) and 7.8 psi CBOB during the rest of the season. This traditional approach relies largely on butane rejection to accomplish the RVP reduction. However, assessing only butane rejection was eventually deemed inadequate to capture full cost impacts. Due to the potentially unprecedented low RVP specification, some refineries cannot remove additional volumes of butane, and, therefore, require more costly measures to reduce RVP.

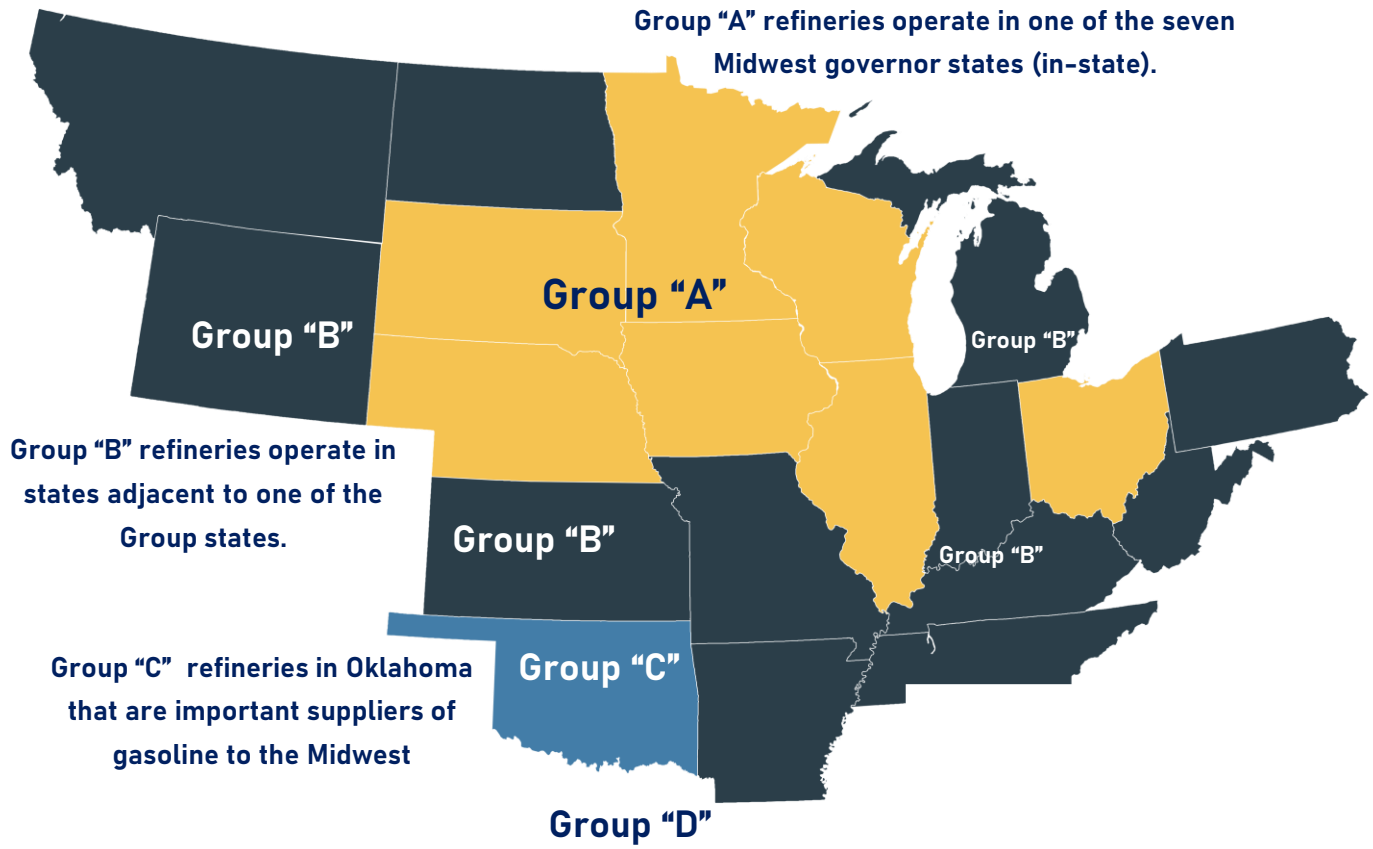
We surveyed key staff at representative refineries throughout the region in order to identify bottlenecks or implications that each asset would encounter when producing a lower RVP blend. As part of these surveys, we also obtained insight into commercial considerations, as well as storage and logistics conditions that would be impacted by the RVP change.

The Study's modeling and survey results are completely anonymous in nature. Readers of this report cannot identify which specific refineries were modeled or surveyed. All individual results and answers are strictly confidential The Study presents costs derived from publicly sourced data, aggregated and anonymized individual surveys, and Baker & O'Brien's professional judgment. Each refinery is unique in its ability to refine products and will face different costs and market conditions that impact the ability to recover these costs.

Background: CBOB Product Supply Groups

Seven Midwest governors are seeking to exclude their states (Group A) from the 1 psi RVP waiver applicable to 10% ethanol (E10) gasoline blends. The waiver exclusion could begin as early as the 2023 summer ozone season.

- It was necessary to consider gasoline production and balances not only in Group A states under consideration, but also on the overall market. Adjoining states import or export gasoline to Group A states through shared pipeline connections
- Baker & O'Brien classified the refineries to be considered into the geography-based categories displayed on this map



Background: Refiner Options for Reducing RVP

Reducing light components in refinery feed:

- Modifying crude slate (less optimal crudes)
- Reducing crude runs (less throughput)

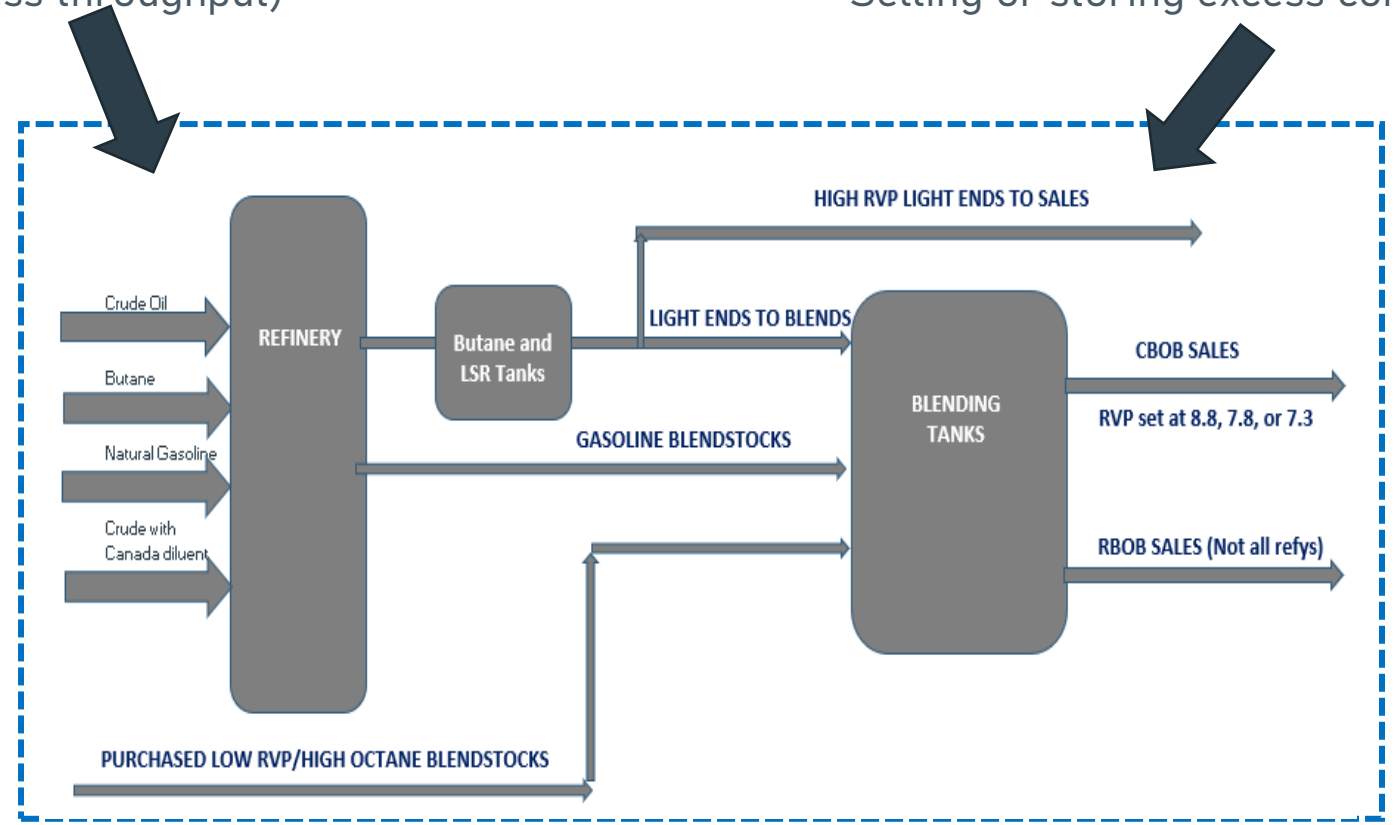
Reducing light components in the gasoline pool:

- Fractionation and extraction before blending
- Selling or storing excess components

Most refineries are configured to run specific crude types with limited capability for major crude slate changes

Around 30% of refineries would potentially reduce runs to produce 1 psi lower CBOB

Other refineries could buy expensive blend stocks to soak up RVP



New fractionation requires investment

Component rejection creates transportation and storage challenges for excess butane and LSR at depressed prices

- New tanks
- Additional railcars, more trucking, or new pipelines

Study Approach – Refinery Surveys

Baker & O'Brien prepared a questionnaire (see Appendix) to capture insight regarding operational, commercial, and logistics considerations with specific questions pertaining to:

- Operating costs related to the lower RVP production
- Gasoline blending costs
- Crude throughput constraints
- Capital costs
- Logistics costs
- Light ends disposition costs
- Product flexibility

Midstream companies were surveyed with questions pertaining to:

- Logistics constraints for handling two different products
- Market supply scenarios
- Capital costs
- Response or transit time

Study Approach – Refinery Modeling

Used the Q3 2019 *PRISM* simulator for each of the surveyed refineries (See Appendix):

- *PRISM* is a typical RVP Cost model that assumes standard butane recovery and RVP values for gasoline components
- Third quarter of 2019 used to represent summer operations from a pre-Covid operating year
- RVP costs are calculated on both Q3 2019 and Q3 2022 refinery gate pricing basis
- Analysis is presented in a manner to preserve confidentiality and ensure antitrust compliance– absolute capacities and production figures are not stated in this report

Analytical approach

1. Gasoline blend components RVP unchanged, maintained to standard *PRISM* simulator assumption
2. Adjusted RBOB to 7.4 psi RVP RFG target or 6.2 psi RVP RBOB (standard began in the summer of 2021)
3. Developed four *PRISM* cases for each refinery responding to the survey
   - Base case summer month CBOB at 8.8 RVP and Low RVP CBOB at 7.8 RVP
   - March transition month base case CBOB at 8.3 CBOB and Low RVP CBOB at 7.3 RVP
4. RVP cost of production = (Base Case Variable Income – Low RVP CBOB Variable Income) / (Low RVP CBOB case volume)

Gasoline RVP – 1 psi Waiver Study

TYPICAL RVP COST MODEL RESULTS

Model Results – Typical RVP Cost Model

Baker & O'Brien's RVP cost model relies largely on the cost of butane rejection

(See Appendix)

- Estimated RVP costs using 2019 *PRISM* model for refineries, arm's length/desk top analysis
- Excess butane is rejected and sold with zero operating costs or logistics constraints
- In some refineries, natural gasoline purchases were reduced to contain high RVP components

Adjustment for 2022 Prices

- The 2022 summer month prices were applied to the volume results of the 2019 *PRISM* model runs
- 2020 and 2021 years were ignored due to the pandemic recovery
- 2022 costs were about 20% higher than 2019
- In summary, the Group A Low RVP CBOB costs, which were based largely on the cost of butane rejection, were roughly 3 cpg

Cost of Low RVP CBOB, cpg

	RVP Model [1]	
Group	2019 Q3 Avg	2022 Q3 Avg
A	2.5	3.2
B	1.9	2.3
C	2.0	1.9
D	1.7	2.2
Wtd Avg	2.3	2.7

(1) For each refinery, PRISM assumes efficient fractionation, stream flexibility, and logistics capabilities (similar to other refinery production models)

As explained in the Appendix, for comparison, the market reported RVP price premium for Chicago was:

- *8 cpg per psi in summer 2019*
- *10 cpg per psi in summer 2022*

Shortcomings of a typical RVP cost model only

- Some refineries cannot remove adequate amounts of butane to achieve RVP targets below 9.0 psi
- Many refineries were not designed to segregate adequate amounts of butane prior to blending tanks
- Typical RVP cost models assume "ideal" operation and "average" properties
- Does not capture refinery-specific capability and operations, such as LSR removal, additional logistics costs, CAPEX for fractionation or logistic investments

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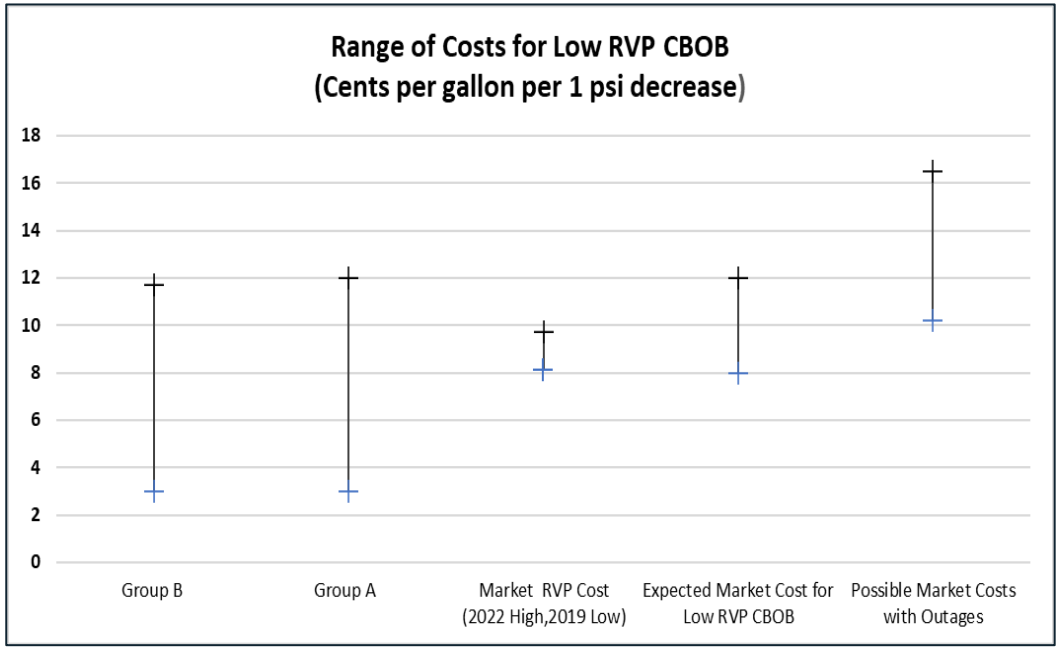
Gasoline RVP – 1 psi Waiver Study

MARKET OBSERVATIONS

Chicago Historical Market RVP Premium Applied to Low RVP CBOB

- The historical market costs of a 1 psi decrease in RVP was 8 cpg in 2019 and 10 cents per gallon in 2022 (Chicago basis), as explained in the Appendix
- Survey responses were generally aligned with the summer 2022 summer price drivers
- Accounting for different market pricing environments, the near- term market RVP cost range is expected to be 8 -12 cents per gallon
- Based on recent retail price spikes between RFG and conventional gasoline prices in PADD 2, consumers of Low RVP CBOB could face a similar spike that could disrupt supply for 2 weeks and add as much as 5 cents per gallon to the average price for the summer



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Potential Costs of Low RVP CBOB

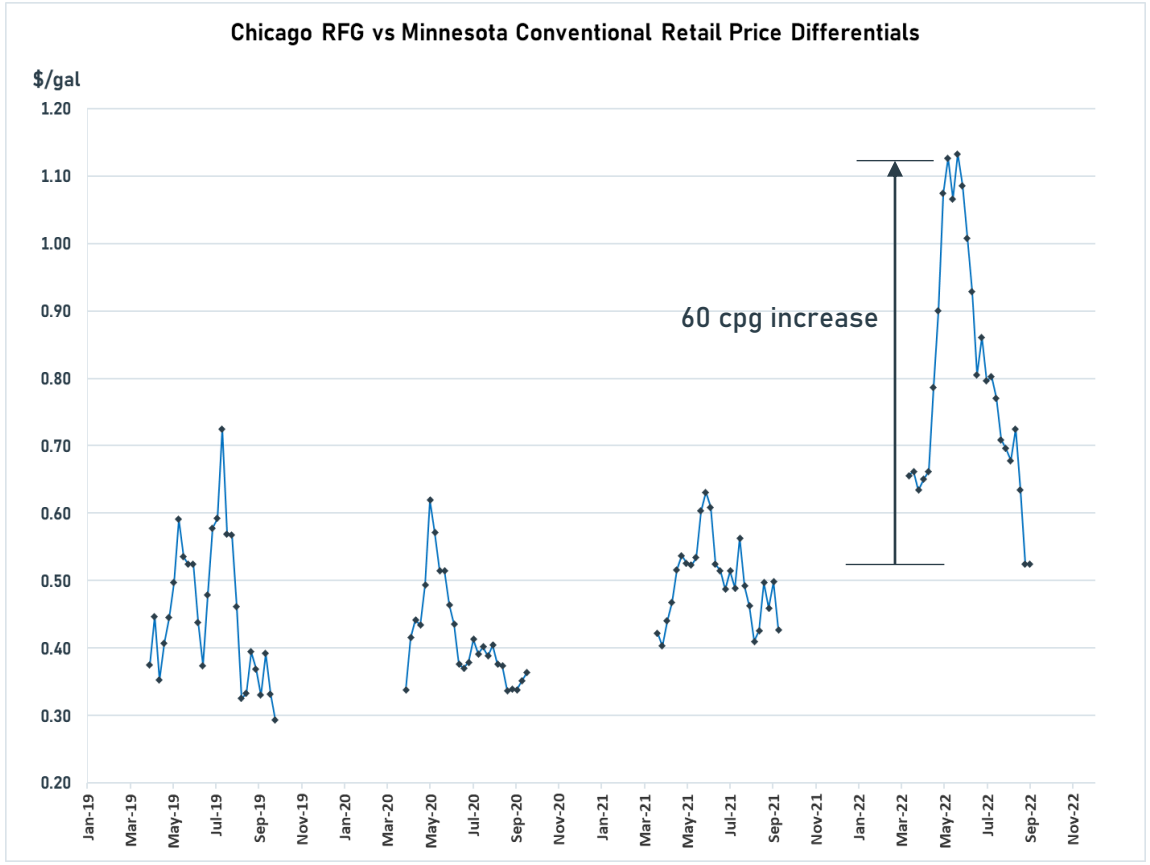
The total additional supply cost including storage and distribution of Low RVP CBOB is between $0.5 billion to $1.1 billion per year

- Costs based on EIA estimated volumes of CBOB consumption for 185 days during summer gasoline sales
  - $0.5 - $0.8 billion assumes an expected additional production and distribution costs for Low RVP CBOB of 8 - 12 cpg
  - Basis is 6.8 billion gallons of summer Low RVP CBOB Demand

Low RVP CBOB is not fungible and will likely be subject to isolated retail price spikes as observed historically in the RFG markets

- The adjacent chart of retail RFG/Conventional market differences demonstrates up to a 60 cpg spike in RFG markets over several weeks
- For the sake of example, a similar two-week summer shortage of Low RVP CBOB and a similar 60 cpg retail price spike within the Low RVP CBOB markets could equate to an average cost increase of as much as 5 cpg over a 185-day summer season
- This temporary price spike would increase the total summer incremental supply cost to $1.1 billion

Refer to Appendix for a more detailed methodology regarding retail RFG price spikes



Retail prices from the EIA

This Study presents costs derived from publicly sourced data, aggregated and anonymized individual surveys, and Baker & O'Brien's professional judgment. Each refinery is unique in its ability to refine products and will face different costs and market conditions that impact the ability to recover these costs.

Gasoline RVP – 1 psi Waiver Study

REFINERY AND MIDSTREAM OPERATORS' SURVEY RESULTS

Survey Results: Refinery Supply Cost Implications

- As expected, many of the surveyed refineries currently operate near a physical or economic limit for removing light ends from the summer gasoline pool
  - The RVP of gasoline blendstocks generally need to be under the gasoline RVP specification for effective blending (except butane and LSR); some PADD 2 refineries do not have ideal blendstock RVPs to meet the 7.8 psi CBOB specification
- Most refiners expressed the need to sell incremental high RVP streams in order to comply with 1 RVP lower CBOB. The removal of low-priced, high RVP components inherently raise the cost of producing Low RVP CBOB
  - Some of the surveyed refiners noted current physical limitations and therefore a need to implement an augmented mode of butane or LSR sales such as truck, rail or pipeline deliveries
  - Some of the surveyed refiners stated that Low RVP CBOB will move the annual butane balance from balanced to long (currently, many refineries are short butane in the winter and long butane in the summer and balanced on an annual basis)
- Production cuts - Some refiners may have to
  - Reduce gasoline sales overall
  - Reduce high octane gasoline production
  - Reduce crude unit utilization rates, thus lowering gasoline and distillates production
- Octane loss mitigation - Removal of high-octane butane reduces gasoline pool octane
  - All refiners surveyed already maximized alkylation unit throughput
  - Some refiners have the flexibility to increase reformer rate or severities, while others are already maximized
  - Some refiners may have to purchase high octane blendstocks, such as alkylate or toluene
- Some refiners may also need to invest in fractionation, piping, and storage

Survey Results: Midstream Operators' Input

- Baker & O'Brien surveyed multiple major pipeline and terminal operators who provide storage and transportation services to Midwest states
- Pipeline systems are optimized based on typical refinery production and distribution history
- Systems have limited ability to segregate Low and High RVP CBOB
  - Several pipeline segments will need to be dedicated to Low RVP CBOB exclusively
  - Terminals that continue to serve High RVP CBOB markets would not be available for Low RVP CBOB storage
  - This will create distribution inefficiencies and more volatility in supply and prices
  - Localized out of stock situations during refinery outages will be more likely and will require RVP waivers to allow high RVP CBOB to be supplied into Low RVP terminals
  - Pipeline transit from Group D refineries directly to Group A terminals is about 14 days, which corresponds to a two-week delayed response to an outage
  - Pipeline transit time from Group D refineries directly to the northern tier of Group A terminals is about 21 days
- Capital projects will take 18-24 months to implement after a final go-ahead decision
  - The final go-ahead decision cannot be made without input and commitments from the shippers and refiners. Issues include:
    - How much of each grade of CBOB will be supplied and to which markets?
    - Will CBOB currently distributed to any of the potential low RVP CBOB states be diverted to states that will remain 9.0 psi markets?
  - If Congress approves a national ethanol 1 psi waiver for E15, then investments to accommodate both Low and High RVP grades of CBOB would be unnecessary
    - Therefore, refining and pipeline companies will likely defer Low RVP CBOB-related final capital investment decisions until clarity is achieved regarding a possible national extension of the ethanol 1 psi waiver for E15

Survey Results: March RVP Transition Summary

Seasonally, the PADD 2 gasoline market will transition from high RVP winter grades to lower RVP summer grades in March

The pipelines manage this by requiring a lower summer RVP than the specification requires in March to ensure product quality – the pipeline surveys indicated that 7.3 psi would be required

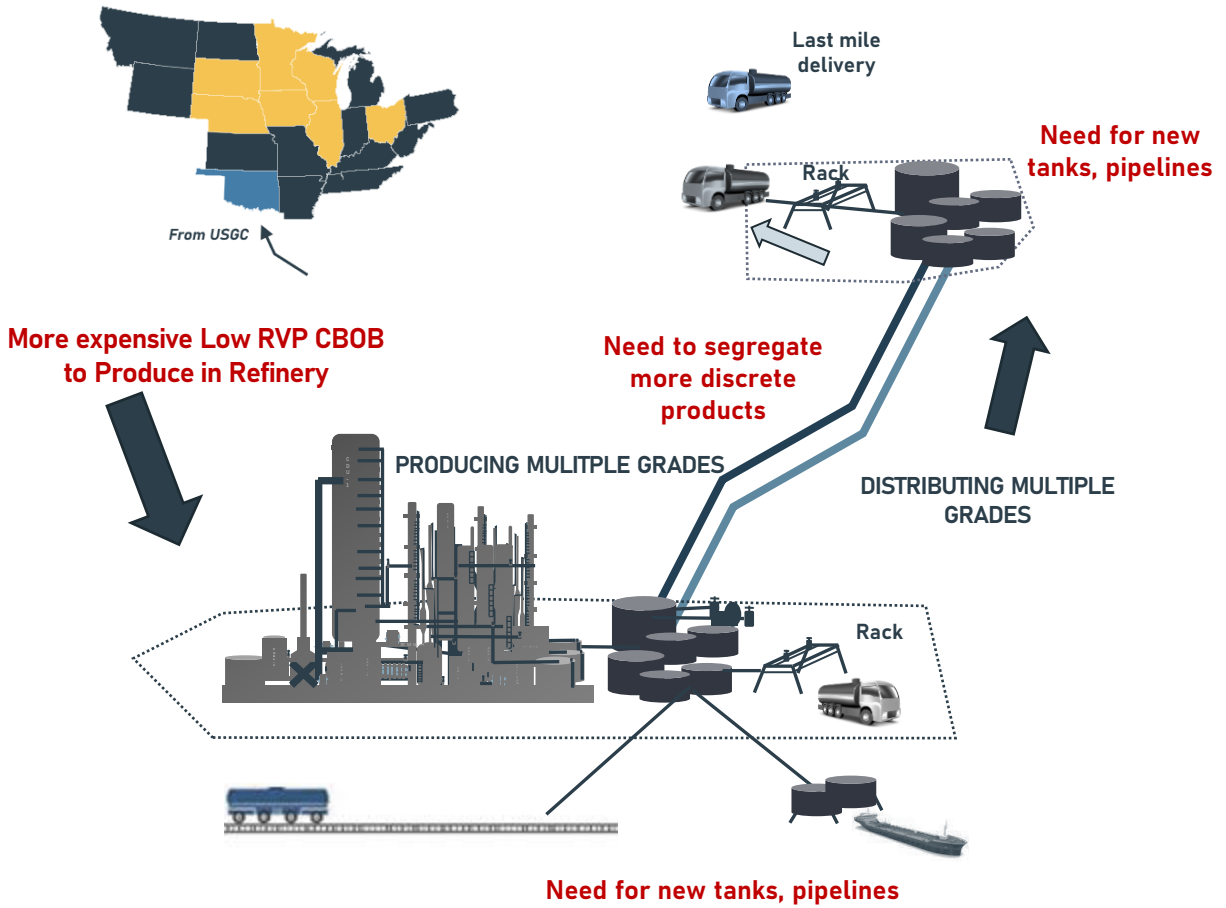
The *PRISM* study suggested an additional 0.3 to 0.5 cpg of costs could be incurred during the transition period

None of the refinery survey respondents evaluated the 7.3 psi transition case

- Most respondents indicated that the transition month could be handled using similar production adjustments as for the entire summer, however, they intend to use more severe operational adjustments with existing equipment (e.g., remove even more LSR than in the summer)
- A small number of respondents indicated that the 7.3 psi transition month would present extreme challenges, but these same refineries are unlikely to produce Low RVP CBOB

Survey Results: Logistics Implications and Costs

Logistics Implications



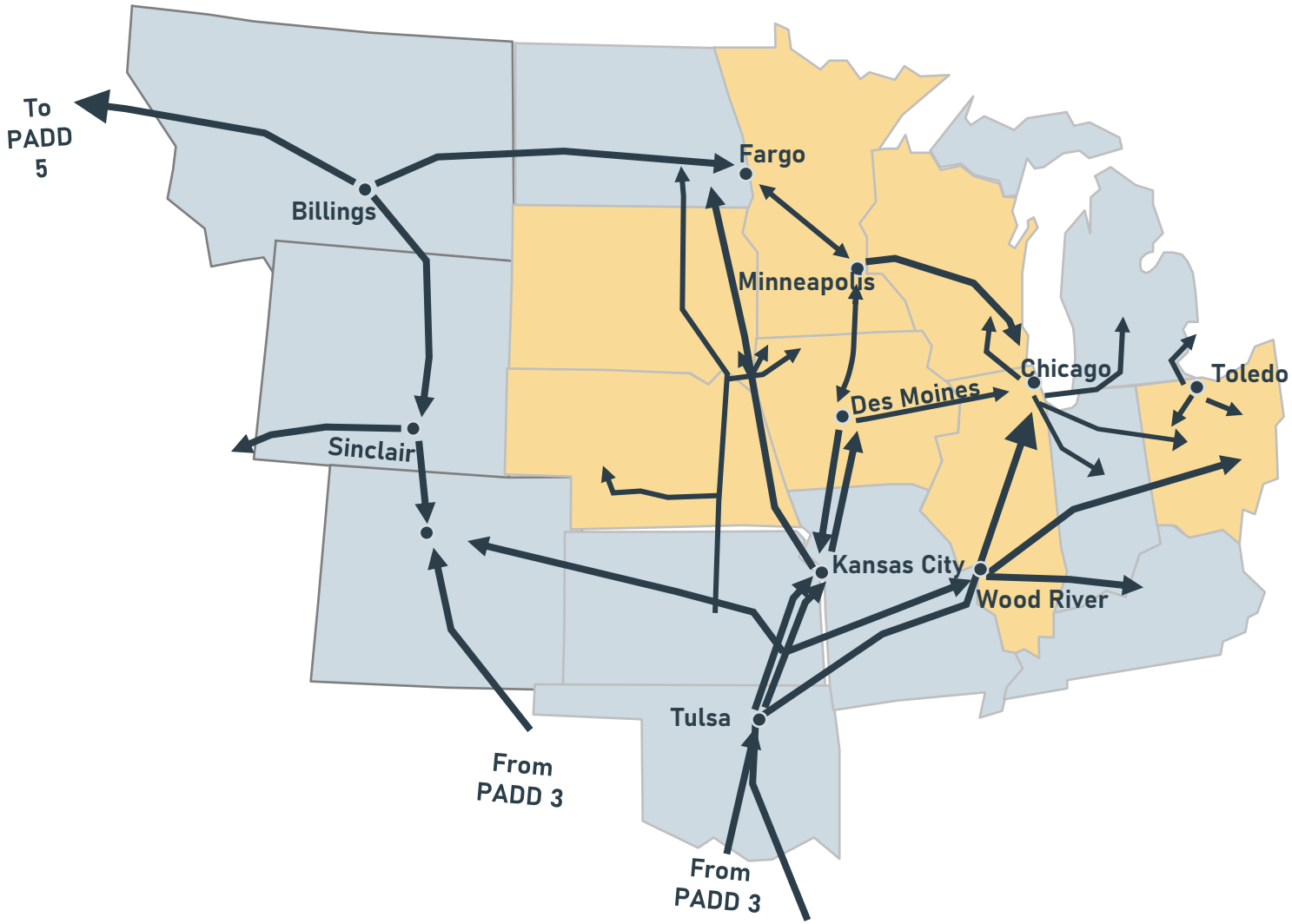
- Some refiners indicated a need for more tanks, fractionation, and additional piping to produce an additional gasoline grade
  - The costs of tanks were estimated at $7 – $10 million each
  - Typical refinery costs total between $50 to $75 million
- Some refiners require logistics investments, such as dock or rail facilities
- Pipeline operations will require smaller batches of multiple discrete products requiring new tanks, pipes, and other logistics investments
- To avoid cross-contamination, some pipeline operations will forgo shipments of High RVP CBOB and only ship higher cost Low RVP CBOB
- The consensus of the time frame required for capital investments is at least two years
- As some Group A and B refiners will need to reduce crude unit utilization rates, decreases in product supply will be back-filled from Groups C and D
- Denver will convert from Conventional to RFG in 2024, which will further constrain Kansas refineries and midstream assets

Survey Results: Low RVP CBOB Subject to Price Spikes

- The creation of another specialty ("boutique") product (Low RVP CBOB) will require additional segregation and result in less fungible inventory to draw upon during supply disruptions
- Non-fungible boutique fuels are more prone to retail price spikes
  - Generally lower available inventory (total volume and days of supply)
  - Longer response times and fewer options for sourcing distant supplies
- Historical observations on RBOB (another boutique fuel) provide insight on possible market effects of Low RVP CBOB
  - Retail data from the EIA suggests that the summer average Chicago RFG premium to Minnesota conventional gasoline was 30- 40 cents per gallon higher in 2022 than in the previous three summers (refer to the Appendix for analysis)
    - Over 60 cents per gallon spikes observed over shorter periods
  - PADD 2 relies on transfers of RBOB from PADD 3, transfers were much lower in 2022 than previous years, possibly due to better export opportunities and a backwardated market (future price lower than prompt price)
- Similar to RBOB, Low RVP CBOB will not be fungible and PADD 2 will likely rely on transfers from PADD 3
  - Low RVP CBOB will likely face more frequent price spikes that will not be observed in fungible, high RVP CBOB markets
  - A summer price spike in PADD 2 due to a supply disruption could result in a significant 2 week increase in retail prices of 60 cents per gallon (similar to that observed with RBOB) which could raise the summer average retail price by as much as 5 cents per gallon

CBOB distribution Before the 1 RVP low transition

Currently, gasoline flows move up to PADD 2 markets from refiners in Kansas, Oklahoma and the USGC



9.0 RVP CBOB

Arrows indicate general pipeline routes

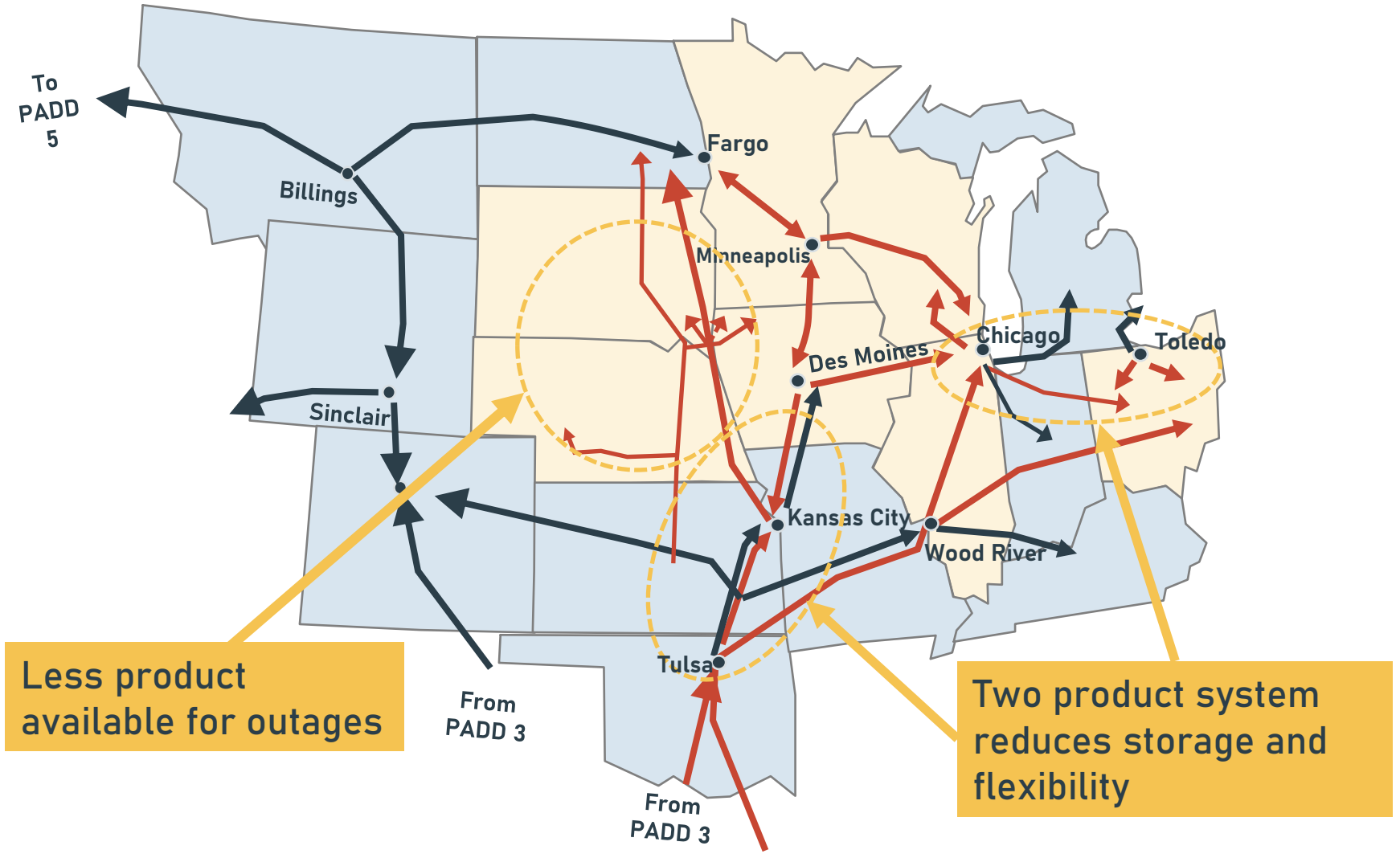
Possible CBOB Distribution After the 1 RVP Low Transition

Implementing the RVP waiver will mean several distribution assets will need to move completely to 7.8 RVP CBOB, which will effectively weaken operational response capacity for the entire distribution system

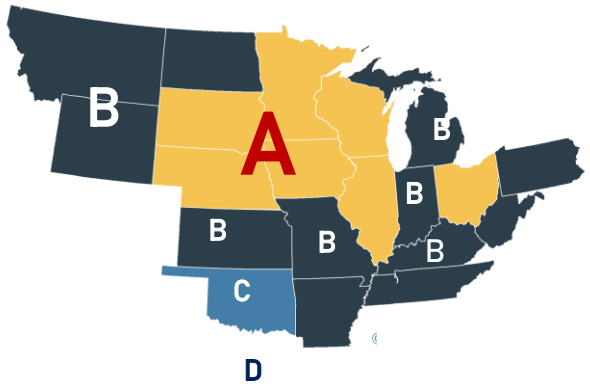
9.0 RVP CBOB

7.8 RVP CBOB

Arrows indicate general pipeline routes



Survey Results: Lower volume of CBOB production



Reduction of CBOB and Distillates Production (mb/d)		
Group	**Reduced CBOB Volume**	**Reduced Distillate Volume**
A	**63 - 72**	**12 - 20**
B	**21 - 41**	**6 - 10**
C	**4 - 12**	**2 - 3**
Additional from D	**88 - 125**	**20 - 33**

- Since PADD 2 refinery summer utilization is typically above 90%, there is no excess capacity to increase production
- Volumes are estimated through refinery surveys responses and analysis of volume supplies between Groups
- Reductions of Group A, B, and C product supplies will be made up from Group D. The only region with discretionary production volume is the USGC (for export markets)
- The allocation of volume from the USGC will likely come from multiple refineries and pipelines based on both costs and logistics
- Further volume demand analysis can be found in the Appendix.

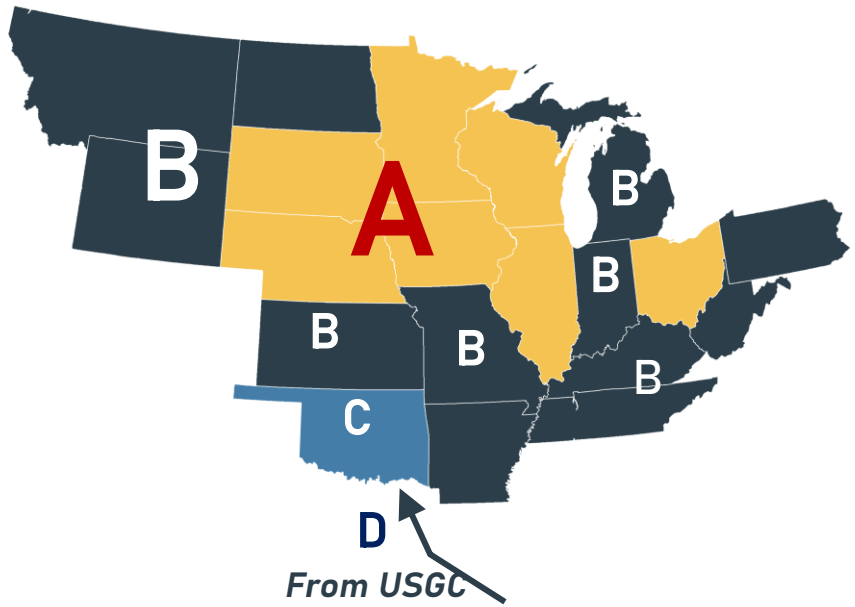
Survey Results: Refinery Capital Investments

- Multiple refineries indicated that capital investments would be necessary to either optimize or produce Low RVP CBOB
- Some refineries indicated very high capital costs and may not produce Low RVP CBOB as they primarily serve high RVP CBOB markets (about 85% of total gasoline production)
- The refineries that would invest capital have a total CBOB production rate of 339,000 B/D and indicated preliminary estimates for CAPEX of $125 million dollars. This total does not include higher costs from the refineries that will not invest.
- If each refinery produces at the 50% share of the Low RVP CBOB market
  - The five-year amortized cost of the capital investments (20% annual capital recovery) equates to 2 cpg of Low RVP CBOB produced
- Assumed investments will reduce long term Low RVP CBOB production costs by 2 to 3 cents per gallon

Gasoline RVP – 1 psi Waiver Study

EXTENDED COST MODEL RESULTS AND LOW RVP CBOB COST ASSESSMENT

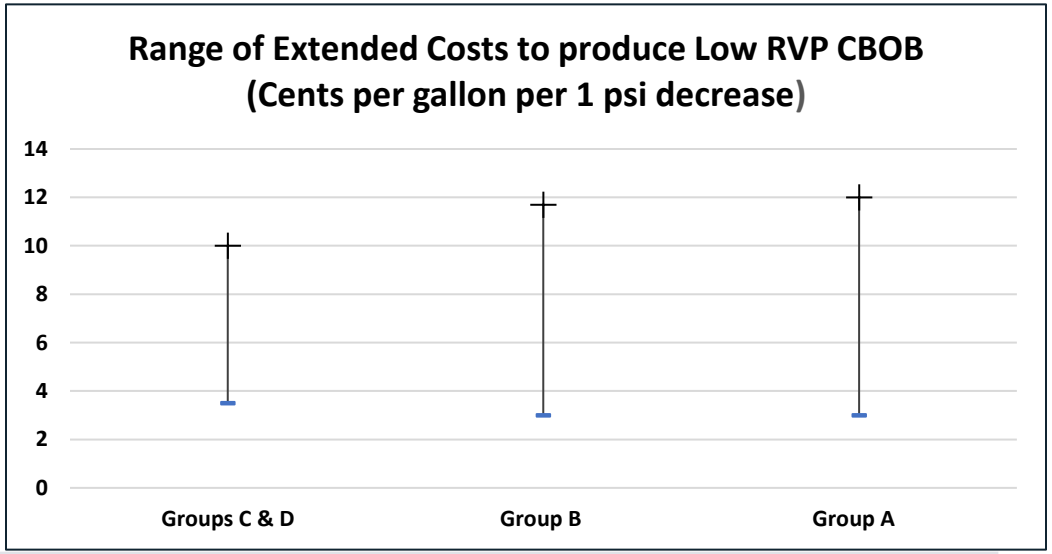
Extended Cost Model Results



Range of Costs of Producing Low RVP CBOB, cpg				
	Extended Cost Model [1]			
	Near Term		Long Term	
Group	Low	High	Low	High
A	3	12	3	11
B	3	12	3	8
C	5	10	3	8
D	4	4	4	4

(1) Costs include refinery-operation adjustments, downgrades, fractionation, refinery storage, and component logistics. In some cases, costs include lower CDU runs. Potential long term pipeline tariff increases have been excluded.

- The extended cost model results in a range of costs based on each refinery's specific capabilities plus any infrastructure and logistics costs associated with bringing Low RVP CBOB from each refinery to the affected states
- The broadest range of responses result in costs from 3 to 12 cpg
- In the long-term, refiners will add capital investments, such as additional piping, manifolds, pumps, and tanks which are expected to lower their supply costs, but only by 0 to 4 cpg



This Study presents costs derived from publicly sourced data, aggregated and anonymized individual surveys, and Baker & O'Brien's professional judgment. Each refinery is unique in its ability to refine products and will face different costs and market conditions that impact the ability to recover these costs.

Low RVP CBOB Cost Assessment

- Based on surveys, interviews, and our analyses which include observed market costs and the extended cost model, we assess near-term supply cost increases of 8-12 cpg to comply with lower RVP CBOB production in the affected states. These results incorporate the following:
  - PADD 2 refineries typically operate at high summer utilization to fulfill market demand
  - The PADD 2 supply system is currently optimized for only one RVP product (High RVP CBOB)
  - The majority of the Low RVP CBOB production in Group A is estimated to cost at least 11 cpg more than High RVP CBOB
  - Normal operating conditions with no supply disruptions

This Study presents costs derived from publicly sourced data, aggregated and anonymized individual surveys, and Baker & O'Brien's professional judgment. Each refinery is unique in its ability to refine products and will face different costs and market conditions that impact the ability to recover these costs.

Gasoline RVP – 1 psi Waiver Study

APPENDIX

Appendix: United States Gasoline Emission Standards and RVP Impact

Overview

- National gasoline emission standards set by the federal Clean Air Act
- Allows states to adopt unique fuel programs intended to address local air quality issues (under a State Implementation Plan or SIP)
  - The EPA also refers to these state fuels as boutique fuels. Boutique fuels are not fungible with standard grades and present production and distribution challenges. In a sense, federal RFG is also a boutique fuel due to the limited number of RFG markets in PADD 2.
  - The initial 2006 list of state boutique fuels was extensive, with numerous regions adopting low (7.0, 7.2, & 7.8 standards) but now only 5 low RVP regions exist(1)
    - RVP of 7.8 psi: Clark and Floyd Counties, Indiana; 95 East Texas Counties
    - RVP of 7.0 psi: Lenawee, Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw and Wayne Counties Michigan: Jefferson and Shelby Counties, AL; El Paso County, TX
- The SIP-approved fuel programs of Maine, New York, Texas, and Vermont do not participate in the ethanol 1 psi ethanol waiver program.

(1) Source: EPA

Comparison of Summer Gasoline RVP Specifications (psi)

Fuel	Program	1 psi Ethanol Waiver?	Maximum RVP Retail	Maximum RVP Neat[1]
Reformulated	Federal	No	7.4	6.2
Conventional	Federal	Yes[3]	9.0/10.0	8.8
Conventional	Indiana SIP	Yes[3]	7.8/8.8	7.6
Conventional	TX SIP	No	7.8	6.6
Conventional	Detroit SIP	Yes[3]	7.0/8.0	6.8
Conventional	TX SIP	No	7.0	5.8
Conventional	Petitioned[2]	No	9.0	7.8

[1]Neat is either RBOB or CBOB, prior to ethanol blending.

[2]Petition of the 7 Midwest states to opt-out of the waiver.

[3]RVP standard before waiver / Retail RVP after 1 psi waiver

10% ethanol typically adds 1.2 psi to the finished gasoline RVP

Appendix: Refinery Survey Questions

A. Operating Costs
   1. Please describe the refinery's processes to remove light ends from gasoline streams
      a. What blending stream (or streams) set the minimum RVP?
      b. Are these processes currently limited in the summer?
      c. What are the dispositions of the light ends?
   2. Please describe the costs of removing the light ends to produce Low RVP CBOB.
      a. Do you have a rough estimate of these costs?

B. Gasoline Blending Costs
   1. Please describe the RVP blending limits for the refinery's gasoline pool.
   2. Please provide your typical blendstock RVP and octane qualities
   3. What would be the impact of Low RVP CBOB on gasoline blendstock purchases or sales?
   4. If necessary, could you increase naphtha reformer unit severity/throughput for additional octane?
   5. Could you increase alkylation unit throughput if necessary?
   6. Is the gasoline pool typically constrained by high temperature distillation (e.g., T90) or drivability specifications?
      a. If so, will further light ends removal
         i. Increase blend costs to mitigate high temperature distillation limits?
         ii. Require heavy components' sales or purchases of other blend stocks (if so, what type)?
         iii. Do you have a rough estimate of these costs?
   7. Please describe any additional purchased blendstocks (e.g., toluene by rail) that may be required to produce Low RVP CBOB.

C. Capital Costs
   1. Will the refinery require new or revamped equipment to produce Low RVP CBOB?
      a. Please describe the modifications.
      b. Do you have a rough estimate of these costs?

D. Logistics Costs
   1. To accommodate Low RVP CBOB, please describe additional handling requirements.
      a. A refinery may ship gasoline to states outside of the Region, which may require the refinery to co-produce two summer CBOB grades. Will the refinery completely replace 9.0 CBOB with Low RVP CBOB or will it need to produce both blends simultaneously or in batches?
   2. Will the refinery require new tanks or other logistics costs?
      a. If so, please describe.
      b. Do you have a rough estimate of these costs?

E. Light Ends Disposition Costs
   1. Please describe the current disposition of light ends, (e.g., rail Normal Butane to Conway, etc.)
   2. Please describe the expected volume and disposition of incremental light ends (e.g., rail Light Straight Run to Mont Belvieu) and typical costs to market.
   3. Is your refinery currently constrained on light component storage or export logistics?
   4. Does the refinery have other methods of using/consuming light blending components such as butane?

F. Product Flexibility
   1. Given the refinery's costs with a switch to Low RVP CBOB,
      a. Would your refinery decrease domestic gasoline sales and increase gasoline exports?
      b. Would your refinery decrease in-state Low RVP CBOB sales and increase out-of-state sales?
   2. What is the likelihood that the refinery will cease selling summer gasoline into the Region if Low RVP CBOB is required?

Appendix: Refinery Survey Response Methodology

TOPIC	SOURCE/METHODOLOGY
Refinery Surveys	Baker and O'Brien sent surveys to the majority of refineries in the Study Groups.
Survey Responses	Refineries representing 60% of the A, B & C study group's crude capacity responded. In addition to interviews, most refineries provided written answers to the Survey with indicative costs.
Interviews	Key topics included cost of production ranges with and without investments, possible crude run cuts, estimated volumes of lost gasoline, RVP of typical blendstocks, logistics and infrastructure needed for Low RVP CBOB, purchased high octane components, disposition of excess light ends, yield responses, and market price drivers. Where applicable, indicative estimates of capital investments were provided. The interview process confirmed that the refiners considered both prompt and long term conditions.
Low RVP Cost of Production	Based on each refiner's input, the expected short term and long term cost of production were summarized for each refinery. Before accepting refiners' initial cost assumptions, we discussed and evaluated the refiners' technical explanations and their responses to market price drivers. Where appropriate, we made adjustments for prompt and long term cost differences. If not articulated, we used the refiners' technical descriptions of operational and logistics modifications to estimate costs.
Lost Gasoline Production – Before Crude Rate Cuts	Many, but not all, refinery respondents indicated the potential loss of gasoline from producing Low RVP CBOB. Typically, the range was 5%–10% of current summer CBOB production, with some lower and some higher. For refiners not providing an estimate of the lost gasoline production, we used the surveyed cost of Low RVP CBOB and lost volumes to estimate potential lost gasoline volumes. Ranges are made from allowing 50%–100% of the Group B production to be impacted and 25%–100% of the Group C production.
Lost Production – Crude Cuts	We observed that some respondents indicated that crude rate reduction changes were likely, but were not considered at this time. Discussing further with the refiners, a 3%–5% crude rate reduction was assumed for refineries indicating that crude cuts were likely. This was used to estimate the lost gasoline from crude cuts (50% yield) and distillate (35–40% yield). No adjustments were made to the costs associated with the production of Low RVP CBOB.

Appendix: Baker & O'Brien *PRISM* Study Methodology

TOPIC	SOURCE/METHODOLOGY
***PRISM* Simulator**	Q3 2019 *PRISM* simulator database
Gasoline Blending	Standard *PRISM* gasoline blend component RVP assumptions. Adjusted RBOB to 7.4 psi RVP RFG target or 6.2 psi RVP RBOB
Refineries Modeled	Modeled each refinery responding to the survey with representation in each of the four study groups.
Base Cases	Two Base cases: 8.8 RVP CBOB for summer months, 8.3 RVP CBOB for March transition month
Low RVP CBOB cases	Two Low RVP CBOB Cases: 7.8 RVP CBOB for summer months, 7.3 RVP CBOB for March transition month
Cost of RVP Calculation	For summer and transition months: (Base case variable income – Low RVP CBOB variable income) / (Low RVP CBOB case volume)
Cost of RVP Pricing Basis	Calculated on both Q3 2019 & Q3 2022 *PRISM* refinery gate pricing basis
Group Results	Only reporting volume weighted average of the *PRISM* results for each refinery by Group and Overall for confidentiality

Appendix: Market RVP Costs Assessment Methodology

The EPA "Fuel Streamlining rule,"(1) finalized on December 4, 2020, simplified the RFG summer volatile organic compound (VOC) standard by replacing it with a 7.4 psi RVP standard for RFG

- Allows RBOB and CBOB prices to be used directly in the summer season to determine the market cost of RVP, with no VOC impacts
- After this rule was finalized, Platts introduced new product codes that indicate the RVP adjustment for 1 psi
- Prior to 2021, RBOB and CBOB prices can be used in the summer season to estimate the market cost of RVP but with possible impacts from the VOC standard

With the ethanol waiver, 9.0 psi RBOB has an effective RVP of 10.0 psi

- The delta RVP between CBOB and RBOB = 10–7.4 = 2.6

Market cost of RVP formula (prices in cents per gallon):

- (RBOB–CBOB) / 2.6 = Market RVP Cost in cents per gallon per psi

Note in the July 2022 example, the Chicago Market RVP costs are 3.3 cents per gallon above the USGC

Example Calculation - Market Cost of RVP (Cents per gallon)

	Jul-22
Platts Chicago RBOB	343.6
Platts Chicago CBOB	313.9
RBOB- CBOB, Chicago	29.7
Divide by Delta RVP	2.6
Market Cost of RVP, per psi	11.4

	Jul-22
Platts USGC RBOB	317.2
Platts USGC CBOB	296.3
RBOB- CBOB, USGC	21.0
Divide by Delta RVP	2.6
Market Cost of RVP, per psi	8.1
Platts USGC RVP Adjustment (1)	8.1

: (1) Platts" *USGC CBOB RVP Adjustment minus 1 psi cts/gal"*

(1) https://www.epa.gov/gasoline-standards/reformulated-gasoline

Appendix: Chicago Market RVP Costs – Fundamentals

The estimated Chicago Market cost of RVP was 8.1 cpg per psi in the summer of 2019 and 9.7 cpg per psi in summer of 2022

- In general, the range has been 8-10 cents per gallon per psi
- 2020 and 2021 are not evaluated due to the pandemic impacts

The market cost of RVP is linked to the economics of rejecting butanes from RBOB and natural gasoline from PBOB, which is the calculated cost

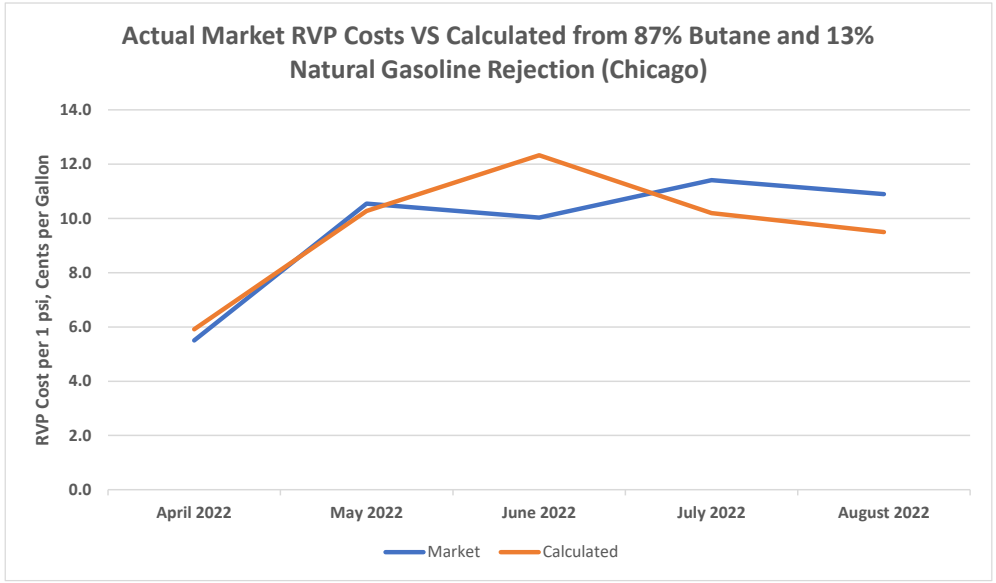
- Natural gasoline is a market pricing proxy for refinery produced light naphtha

During summer months, 87% of the Chicago market RVP cost has been, on average, explained by butane rejection costs, and 13% has been explained by natural gasoline rejection (the calculated cost trend shown)

Chicago Market RVP Costs (1)
(cents per gallon per 1 psi decrease)

	2019	2022
April	6.9	5.5
May	10.0	10.5
June	10.6	10.0
July	8.4	11.4
August	4.5	10.9
Average	8.1	9.7

Notes: (1) Chicago (RBOB-CBOB)/ (2.6)



(1) https://www.epa.gov/gasoline-standards/reformulated-gasoline

Appendix: Lost Gasoline and Diesel Volume Methodology

Reduced CBOB Production – Before Crude Cuts

- Remaining refineries not surveyed given the same % loss as its Group
- Existing *PRISM* database used to source CBOB production and crude rates for the remaining refineries not surveyed

Reduced CBOB Production – From Crude Cuts

- Surveyed refineries estimates from *PRISM* crude runs, using a 5% High /3% Low crude rate reduction and a yield of 50% gasoline and 40% diesel
- Remaining refineries assumed that the same percentage (% surveyed in the adjacent table) would likely reduce crude runs under the same yield assumptions as above

Total Lost Distillate from Crude Cuts

- Based on the yield assumptions, the total volume is simply the reduced gasoline production from crude cuts multiplied by (40% distillate / 50% gasoline)
- Total reduction in distillate is calculated: (42 MB/D of gasoline reduction) x 40/50 = 33 MB/D in the high case

Reduced CBOB Production - Before Crude Cuts

	% Loss	High MB/D	Low MB/D
Group A	6.2%	47	47
Group B	4.7%	28	13
Group C	5.0%	9	2
Total		84	62

Reduced CBOB Production - From Crude Cuts

	High MB/D	Low MB/D
Group A	26	16
Group B	13	8
Group C	3	2
Total	41	26

Total Potential Reduced CBOB Production

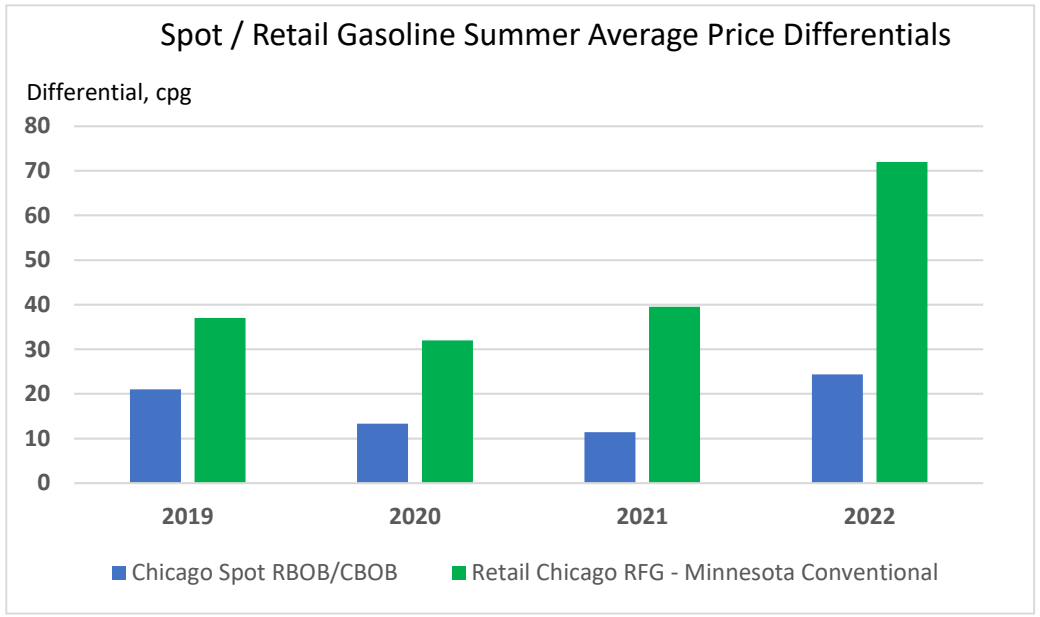
	High Total MB/D	Low Total MB/D
Group A	72	63
Group B	41	21
Group C	12	4
Total	125	88

Appendix: Total Supply Cost of Low RVP CBOB Methodology

TOPIC	SOURCE/METHODOLOGY
State Gasoline Demand	Used 2019 Summer Basis, from EIA Prime Supplier sales of Finished Gasoline by state
RFG Demand by State	Used 2019 Summer Basis, from EIA Prime Supplier sales of Reformulated Finished Gasoline by state
Conventional Gasoline Demand By State	Calculated by subtracting the RFG Finished gasoline sales from the Finished Gasoline sales by state
Ethanol Deduction	10% ethanol assumed in the Finished gasoline
CBOB Demand by state	Finished Conventional Gasoline x 90%
Estimated Summer CBOB Demand, by State MB/D	Ohio -321; Minnesota - 152; Wisconsin - 113; Illinois - 109; Iowa - 77; Nebraska - 56, and South Dakota - 31. 860 MB/D Total
Number of Summer Days	Based on survey discussions, 185 days have been assumed for the summer gasoline season.
Summer Demand, Gallons	185 days * 860,000 B/D * 42 gallons per barrel = 6.68 billion gallons
Total cost increase based on 8-12 cpg total supply cost increase for Low RVP CBOB[1]	Total Supply Cost Increase = 8 -12 cents per gallon. If the costs were passed on to the consumer, it would result in an additional consumer cost of (8-12) * Dollars/100 cents * 6.8 billion gallons =$0.5 - $0.8 Billion.

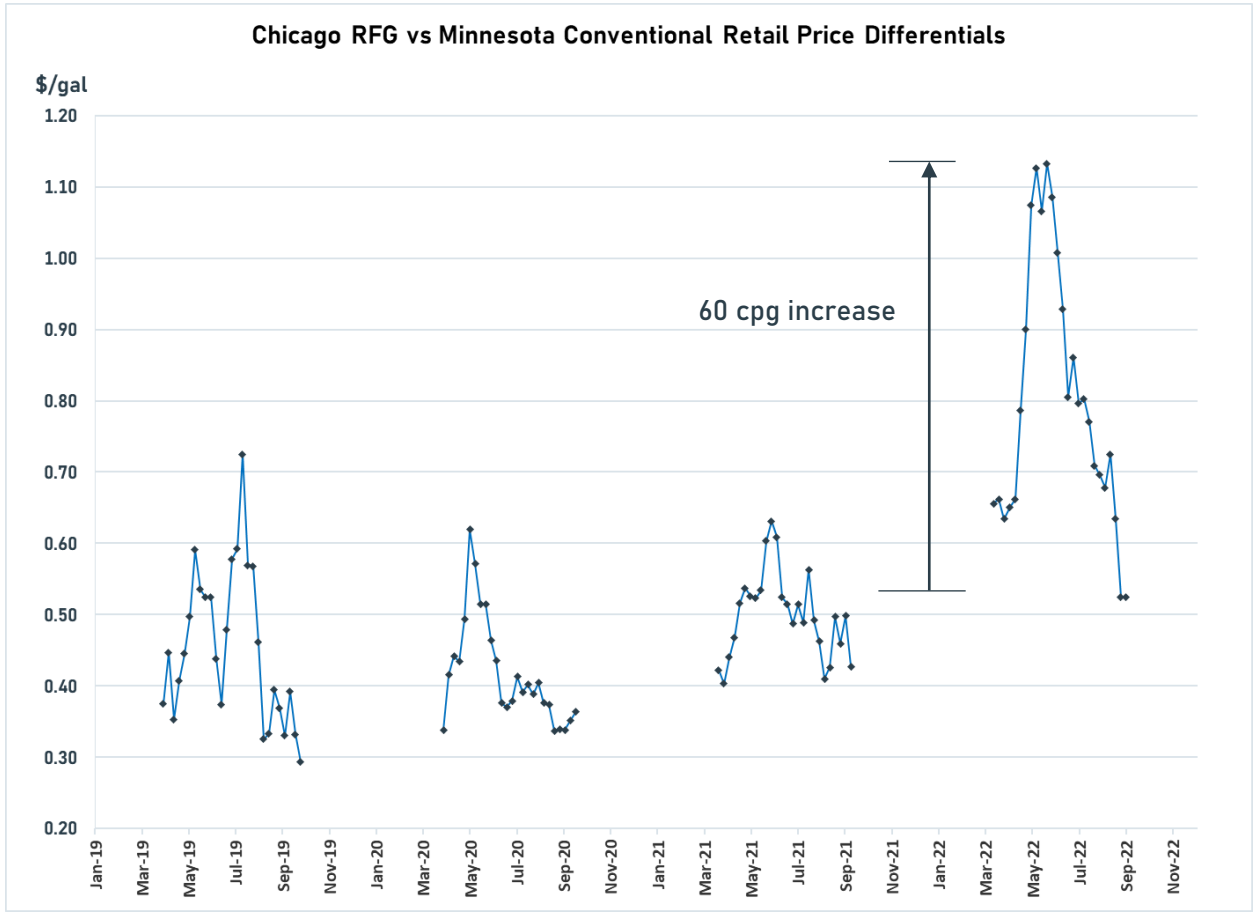
[1] Each refinery is unique in its ability to refine products and will face different costs and market conditions that impact the ability to recover these costs

Appendix: Retail RFG prices spikes are an example of boutique fuel price volatility



Top figure: Prior to 2022, spot Chicago RBOB/CBOB differentials ranged from 10-20 cents per gallon ; At the retail level, after adjusting for differences in state gasoline taxes, the Chicago RFG / Minnesota Conventional differential ranged from 30- 40 cents per gallon. The average retail price of RFG relative to conventional spiked in 2022

Adjacent Figure: In 2022, the retail price of RFG relative to conventional gasoline spiked to very high levels, short term peaks are 60 cents per gallon higher than earlier years



Retail prices from the EIA[1]

Spot Prices are Platts averages

(1) https://www.eia.gov/dnav/pet/pet_pri_gnd_a_epm0_pte_dpgal_w.htm

THANK YOU

Baker & O'Brien