Strategic Resource Evaluation Study

Virginia Department of Transportation

Virginia Commonwealth Transportation Board Meeting

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the balmoral group

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Virginia Department of Transportation.

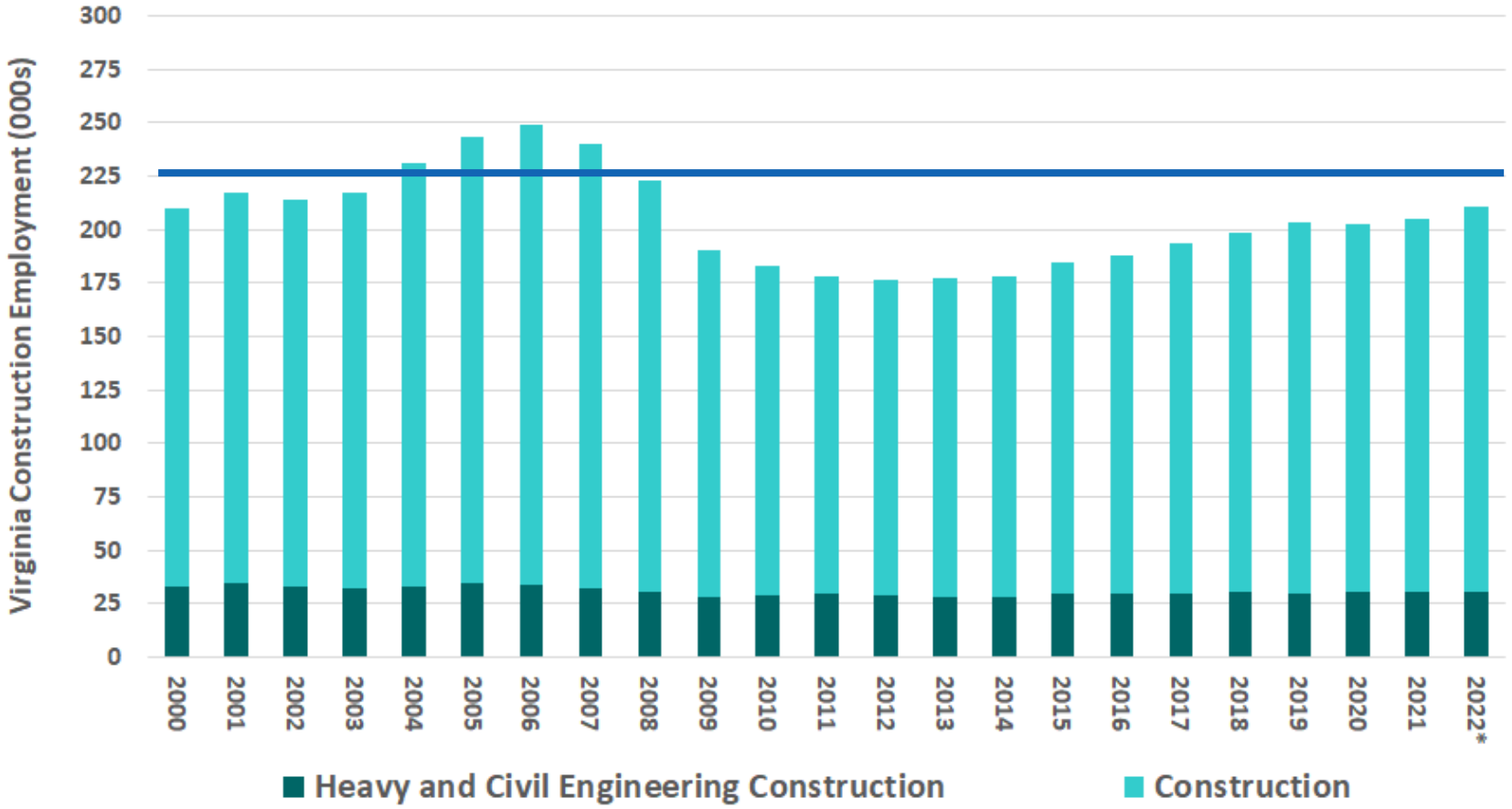
Study Purpose

The Virginia Department of Transportation (VDOT) has faced bid price increases since Spring 2021 due to rapidly changing market conditions.

During the global recovery from the COVID-19 pandemic, a series of supply chain disruptions occurred, labor markets tightened, and Russia invaded Ukraine. Construction costs have increased.

The Department undertook the study to better understand and manage future resource supply and cost issues affecting VDOT's infrastructure construction program.

Tight Labor Market



- Virginia construction employment has grown in recent years, but remains well below 2006 highs
- Overall, total Virginia employment reached exceeded 2006 levels in 2013, and has grown by 8%
- Surveyed contractors report tight labor pool as a constraint on capacity

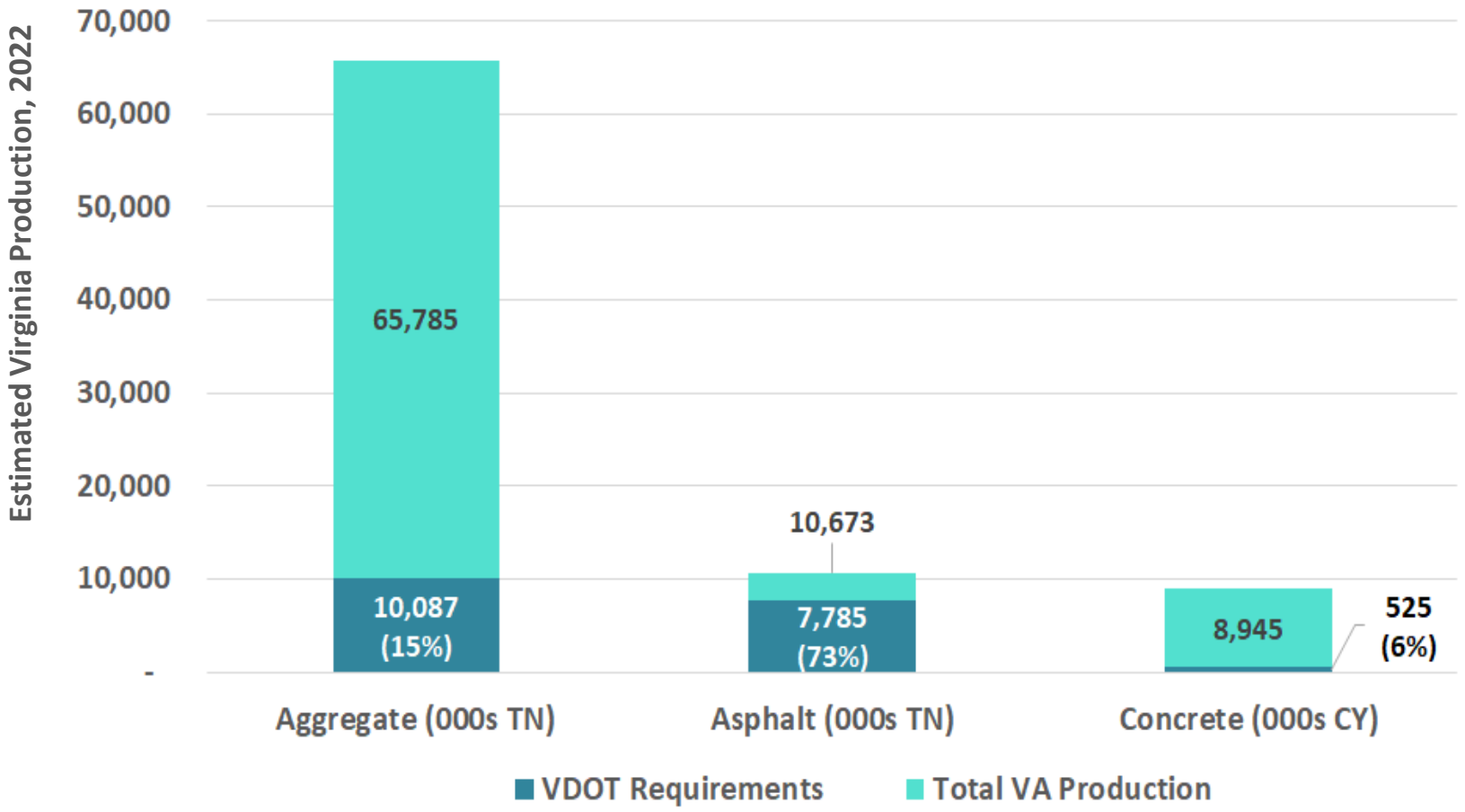
Source: BLS; *VA Works Short-term Projections

VDOT Materials Requirements (Estimated for Forecasting)

	QUANTITIES (000s)				
Fiscal Year (1st fiscal budget year SYIP)	2023	2024	2025	2026	2027
Aggregate (tons)	7,400	8,400	8,400	7,400	7,600
Asphalt (tons)	5,700	6,600	6,800	6,200	6,400
Concrete (CY)	400	400	400	300	300
Reinforced Steel (lb.)	16,200	15,500	12,100	7,400	5,900
Structural Steel (lb.)	57,800	53,300	53,000	31,600	27,700
PVC (LF)	28,600	32,800	34,100	31,000	32,100
Pavement Markings (LF)	271,400	310,700	322,800	293,600	303,900

Source: VDOT Historical Lettings and SYIP Data

Availability – VDOT Share of Total Market



VDOT consumes most of the **asphalt** produced in VA, but a smaller share of **aggregate** and **concrete** – important because this means VDOT is a **price "taker"** for aggregate/ concrete, but a **price "maker"** for asphalt.

Source: VDOT Historical Lettings and SYIP, USGS, Industry Sources

General Market Conditions

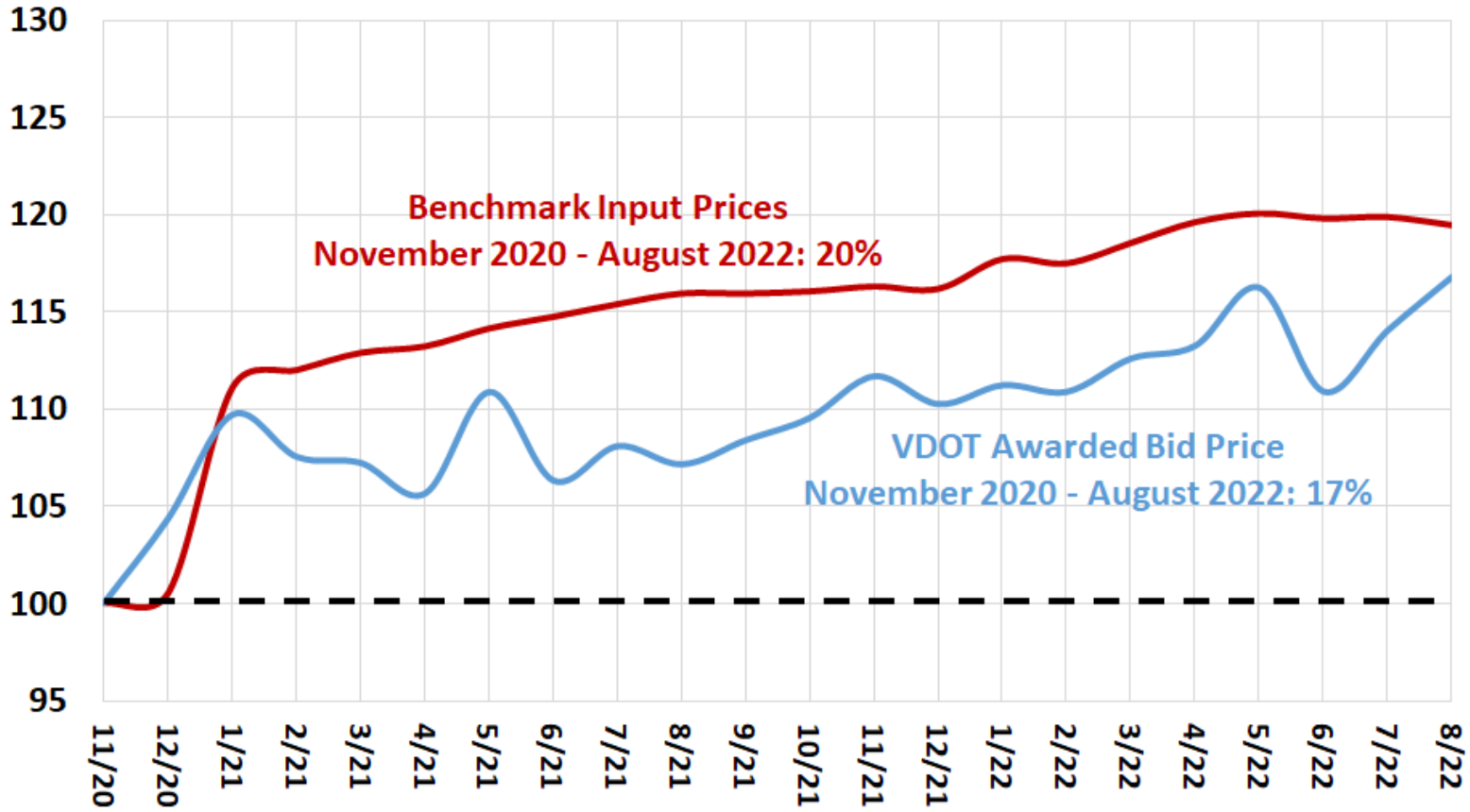
	Raw Materials	Skilled labor	Competition	Trucking	Global Shipping	Geopolitics
Aggregate	=	↑	↓	↑	=	=
Asphalt	↑	↑	=	↑	=	↑
Concrete	↑	↑	=	↑	↑	↑
Steel	↑	↑	=	=	↑	↑
Heavy Equipment	↑	↑	=	=	↑	↑
Labor	=	↑	↑	↑	=	=
Industry Capacity	↑	↑	↑	↑	=	=

Legend

- Exerting negative influence on construction costs
- Exerting positive influence on construction costs
- Neutral or N/A

Benchmark Input Prices vs VDOT Bids

- Uptick in VDOT bid prices reflects input price increases that contractors can no longer absorb
- VDOT bid prices were 17% higher in August compared to the end of 2020
- Benchmark industry input costs were 20% higher over the same period



Source: TBG calculated from VDOT historical bid data and benchmark industry input prices.

Key Market Influences

Supply Chain

- VDOT is likely to see higher prices – around 10% higher for asphalt due to energy costs
- CDL driver shortage may push up the cost of transporting aggregates, 6-10%

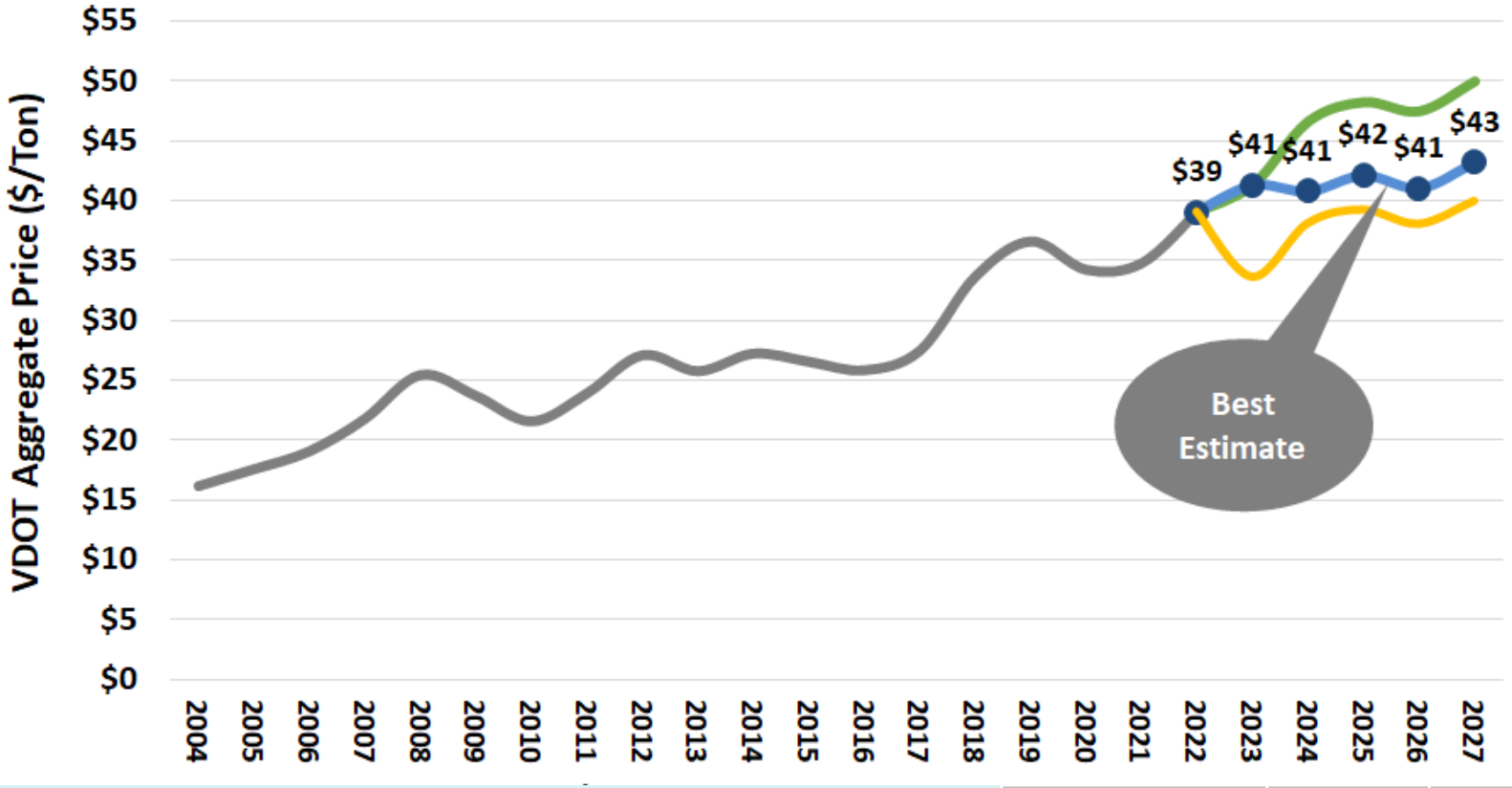
Demand & Inflation

- Globally, greatest commodity price increases since 1970s
- Based on the modeling, every additional $1 billion in infrastructure funding adds about 3% to VDOT's costs

Ukraine War

- VDOT can expect steel and other metals costs to increase up to 12% and remain high through 2023
- Precast concrete will also be affected due to high reinforcing steel costs. Lead times remain long

Aggregate Cost Projections



2022
$39 per ton

2023 – 2027 Forecast

Upper Bound: high crude oil price, spending, non-farm employment

Best Estimate: medium crude oil price, spending, non-farm employment

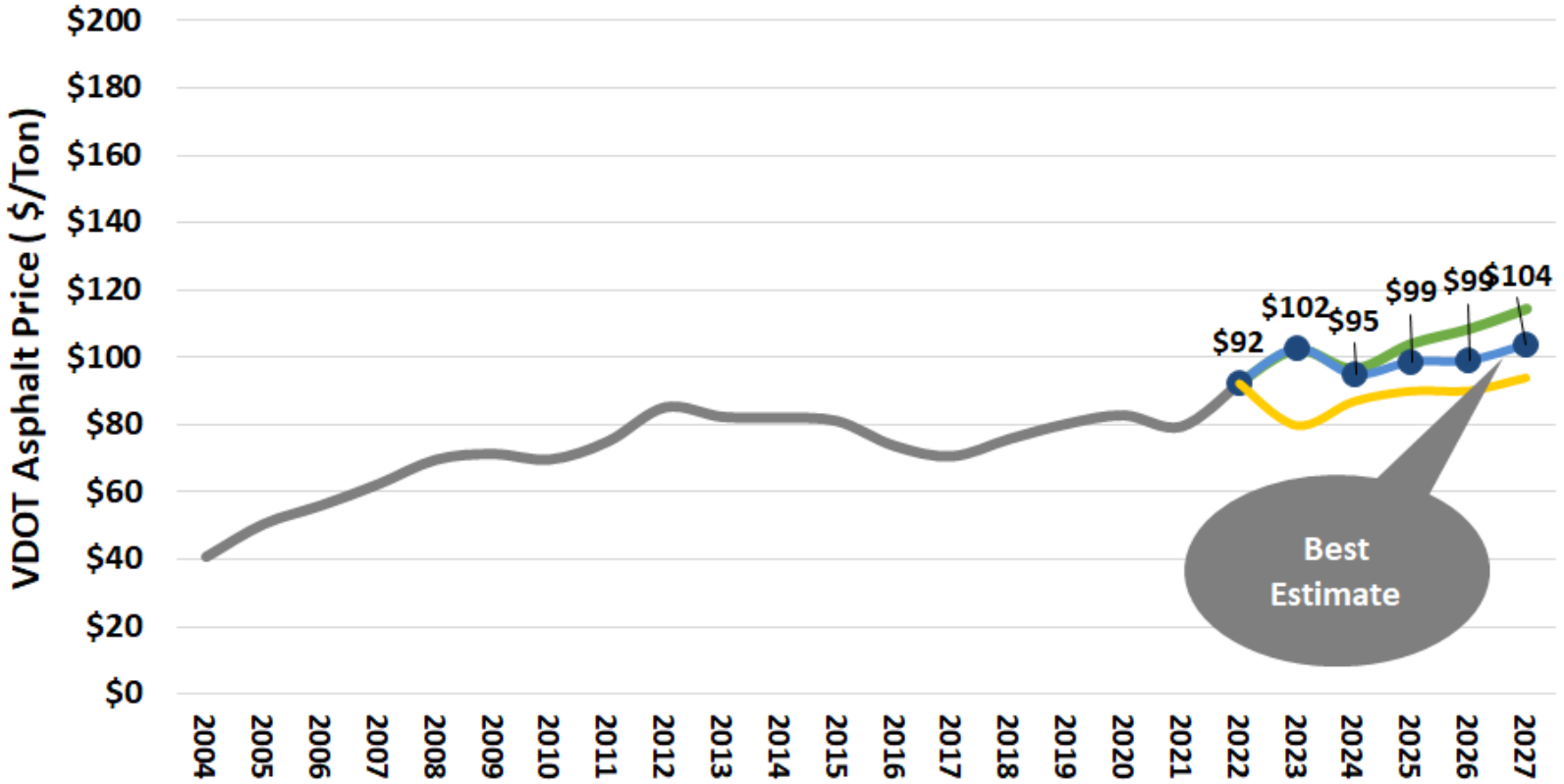
Lower Bound: low crude, spending, non-farm employment

- Crude oil prices (High, Med, Low Scenarios)
- Employment
- Infrastructure spending

FY ($/ton)	2021*	2022*	2023	2024	2025	2026	2027
Upper Bound	$35	$39	$41	$47	$48	$48	$50
Best Estimate	$35	$39	$41	$41	$42	$41	$43
Lower Bound	$35	$39	$34	$38	$39	$38	$40

*Actual Data, Final Weighted Average Price

Asphalt Cost Projections



2022
$92 per ton

2023 – 2027 Forecast

Upper Bound: high crude oil and binder prices

Best Estimate: medium crude oil price, non-farm employment, spending

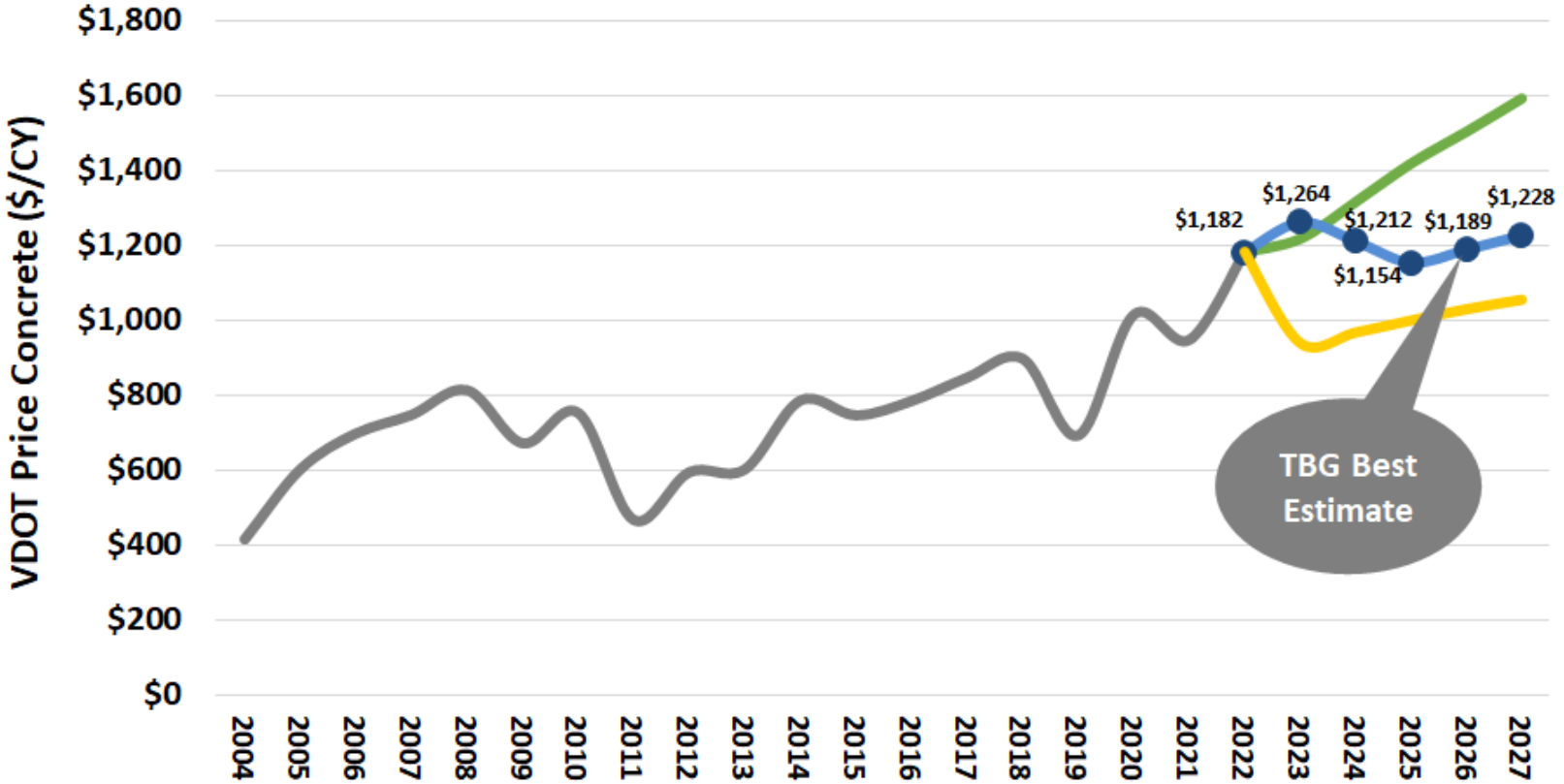
Lower Bound: low crude, non-farm employment, spending

- Binder prices
- Crude oil prices
- Employment
- Infrastructure spending

FY ($/ton)	2021*	2022*	2023	2024	2025	2026	2027
Upper Bound	$79	$92	$102	$97	$104	$109	$115
Best Estimate	$79	$92	$102	$95	$99	$99	$104
Lower Bound	$79	$92	$80	$87	$90	$90	$94

*Actual Data, Final Weighted Average Price

Concrete Cost Projections



2022
$1,182 per CY

2023 – 2027 Forecast

Upper Bound: GSP (Gross State Product), construction employment

Best Estimate: increasingly scarce fly ash, medium crude oil price

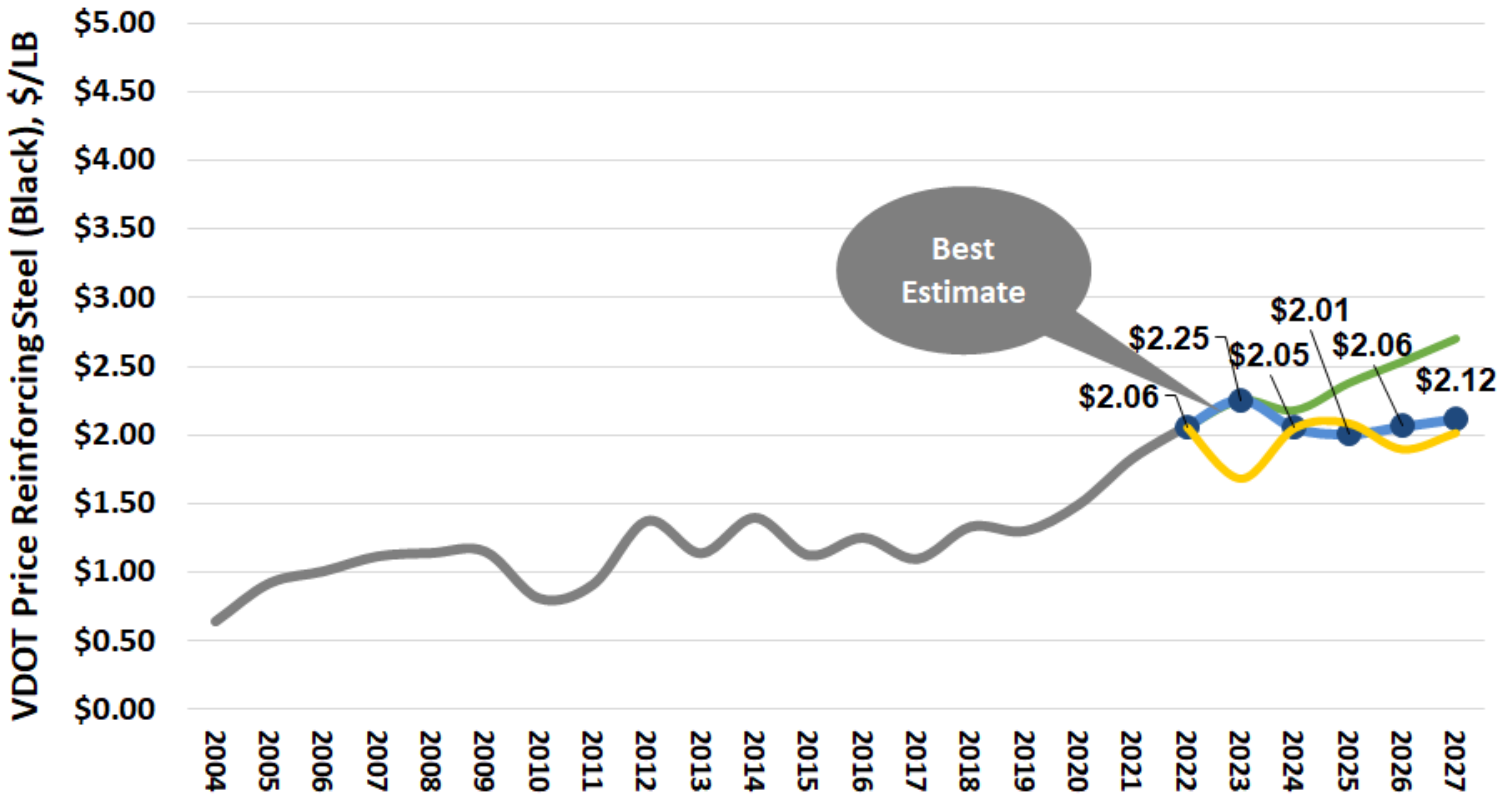
Lower Bound: increasingly scarce fly ash, low crude oil price

- Fly ash production and consumption – increasing scarcity
- Overall economy – GSP, employment
- Crude oil prices

FY ($/CY)	2021*	2022*	2023	2024	2025	2026	2027
Upper Bound	$947	$1,182	$1,216	$1,315	$1,418	$1,503	$1,591
Best Estimate	$947	$1,182	$1,264	$1,212	$1,154	$1,189	$1,228
Lower Bound	$947	$1,182	$938	$966	$998	$1,028	$1,054

*Actual Data, Final Weighted Average Price

Reinforcing Steel (Black) Cost Projections



2022
$2.06 per lb.

2023 – 2027 Forecast

Upper Bound: medium crude oil price, construction employment, GSP

Best Estimate: medium crude oil & iron ore prices, non-farm employment

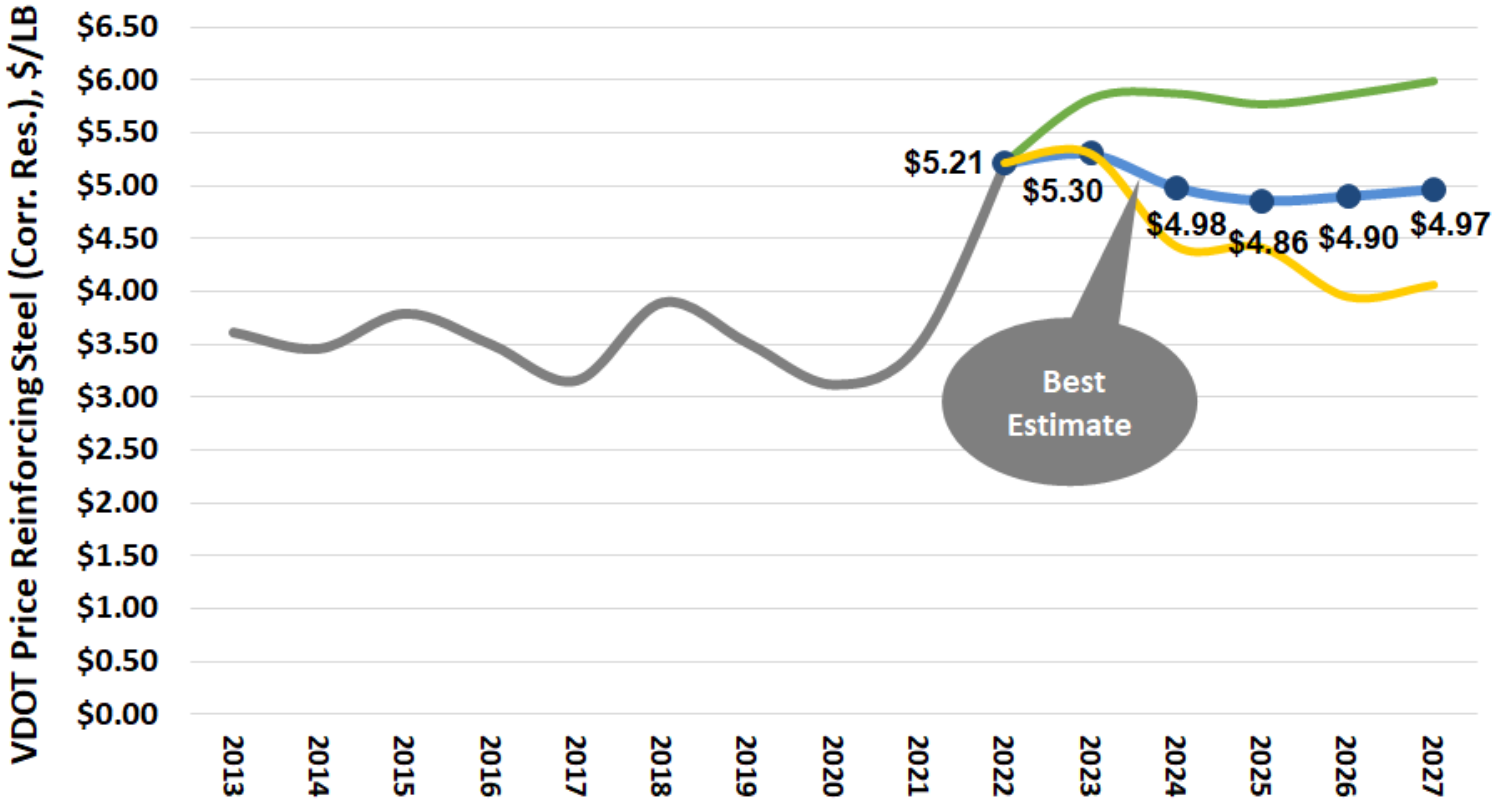
Lower Bound: medium crude oil price, spending, non-farm employment

- Iron ore prices
- Energy prices
- Macroeconomic conditions – Employment
- Infrastructure spending

FY ($/lb.)	2021*	2022*	2023	2024	2025	2026	2027
Upper Bound	$1.83	$2.06	$2.25	$2.18	$2.38	$2.53	$2.70
Best Estimate	$1.83	$2.06	$2.25	$2.05	$2.01	$2.06	$2.12
Lower Bound	$1.83	$2.06	$1.69	$2.05	$2.09	$1.90	$2.02

*Actual Data, Final Weighted Average Price

Reinforcing Steel (Corrosion Resistance) Cost Projections



2022
$5.21 per lb.

2023 – 2027 Forecast

Upper Bound: higher crude oil & iron ore prices, non-farm employment

Best Estimate: medium crude oil & iron ore prices, non-farm employment

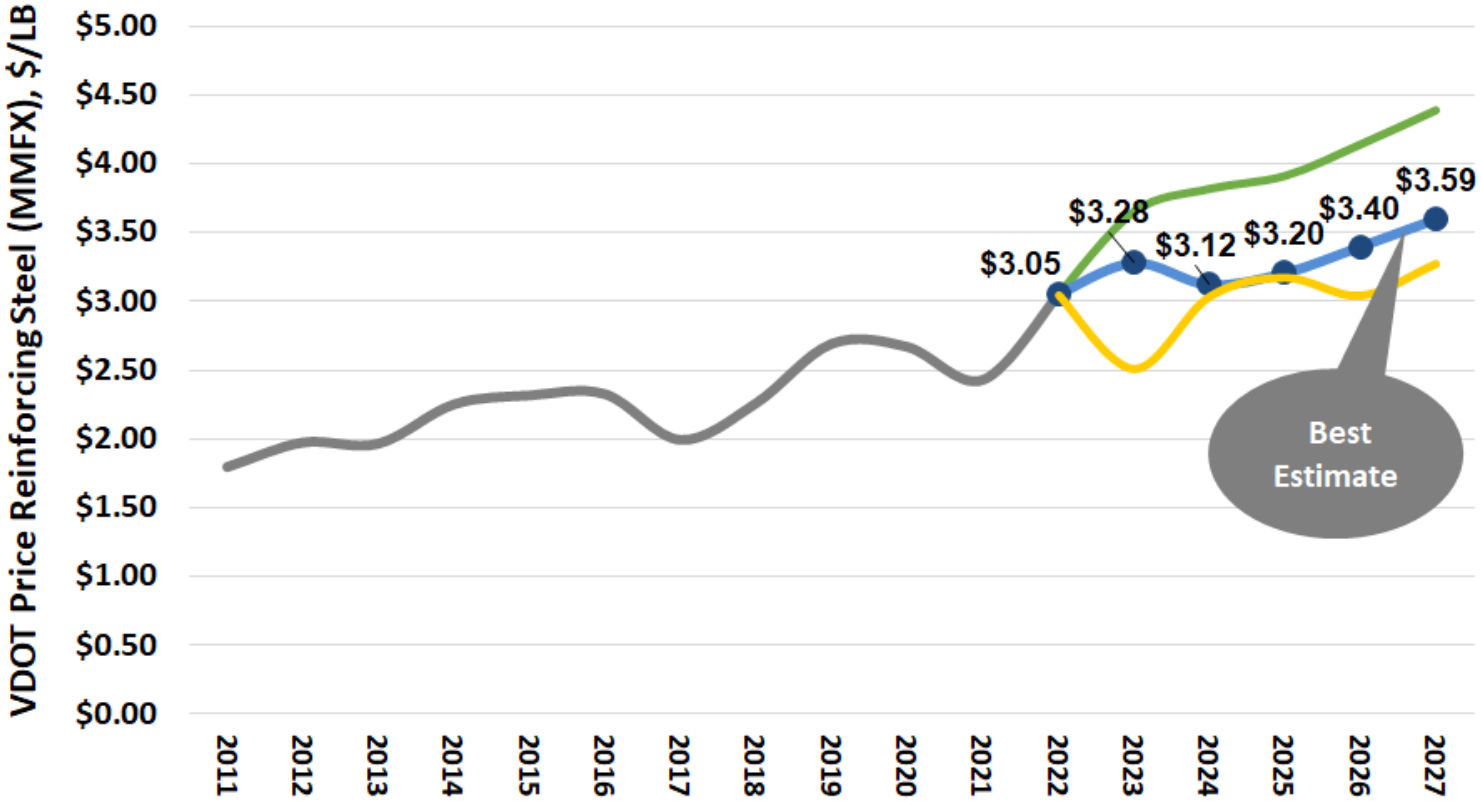
Lower Bound: medium crude oil price, spending, non-farm employment

- Iron ore prices
- Energy prices
- Macroeconomic conditions – Employment
- Infrastructure spending

FY ($/lb.)	2021*	2022*	2023	2024	2025	2026	2027
Upper Bound	$3.50	$5.21	$5.83	$5.88	$5.77	$5.86	$5.99
Best Estimate	$3.50	$5.21	$5.30	$4.98	$4.86	$4.90	$4.97
Lower Bound	$3.50	$5.21	$5.30	$4.43	$4.42	$3.95	$4.06

*Actual Data, Final Weighted Average Price

Reinforcing Steel (MMFX) Cost Projections



2022
$2.06 per lb.

2023 – 2027 Forecast

Upper Bound: medium crude oil price, construction employment, GSP

Best Estimate: medium crude oil & iron ore prices, non-farm employment

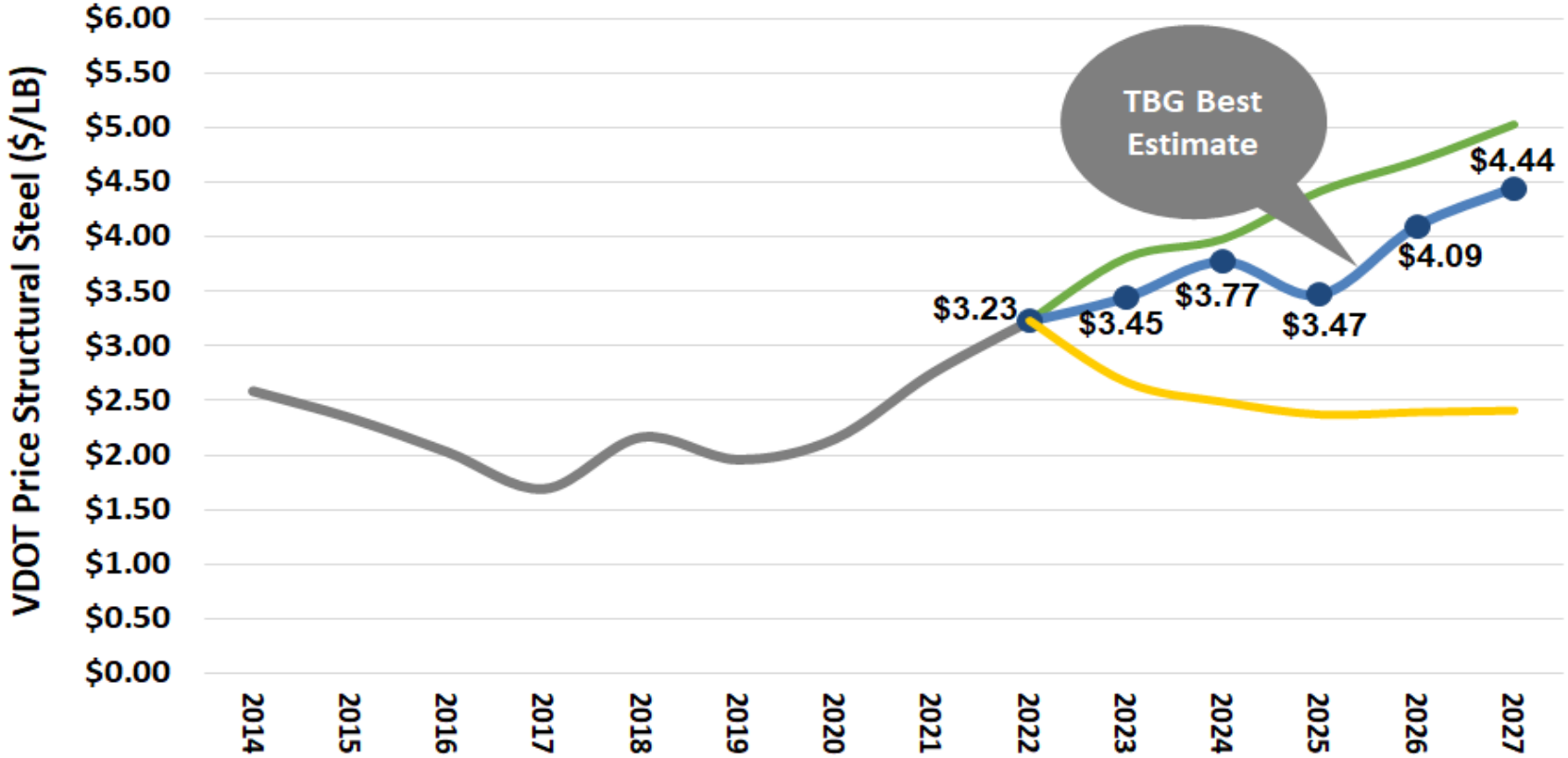
Lower Bound: medium crude oil price, spending, non-farm employment

- Iron ore prices
- Energy prices
- Macroeconomic conditions – Employment
- Infrastructure spending

FY ($/lb.)	2021*	2022*	2023	2024	2025	2026	2027
Upper Bound	$2.43	$3.05	$3.65	$3.82	$3.91	$4.14	$4.39
Best Estimate	$2.43	$3.05	$3.28	$3.12	$3.20	$3.40	$3.59
Lower Bound	$2.43	$3.05	$2.51	$3.04	$3.17	$3.04	$3.27

*Actual Data, Final Weighted Average Price

Structural Steel Cost Projections



2022
$3.23 per lb.

2023 – 2027 Forecast

Upper Bound: high crude oil price, optimistic housing starts, spending

Best Estimate: high crude oil price, slowdown in housing starts, spending

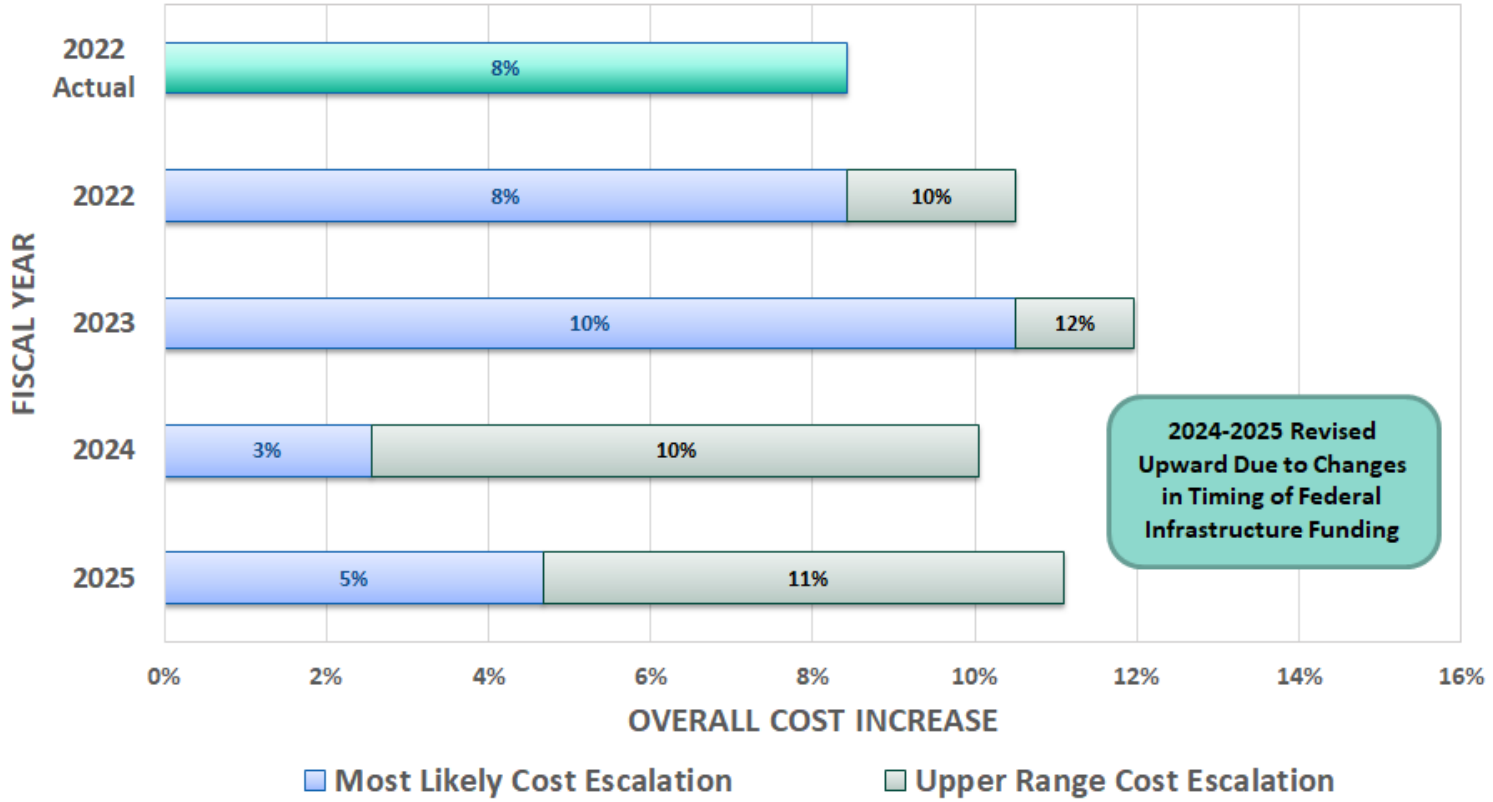
Lower Bound: medium iron ore price, low crude oil price

- Iron ore prices
- Energy prices
- Competition from other sectors/overall economy
- Infrastructure spending

FY ($/lb.)	2021*	2022*	2023	2024	2025	2026	2027
Upper Bound	$2.75	$3.23	$3.81	$3.98	$4.42	$4.70	$5.03
Best Estimate	$2.75	$3.23	$3.45	$3.77	$3.47	$4.09	$4.44
Lower Bound	$2.75	$3.23	$2.67	$2.49	$2.37	$2.39	$2.41

*Actual Data, Final Weighted Average Price

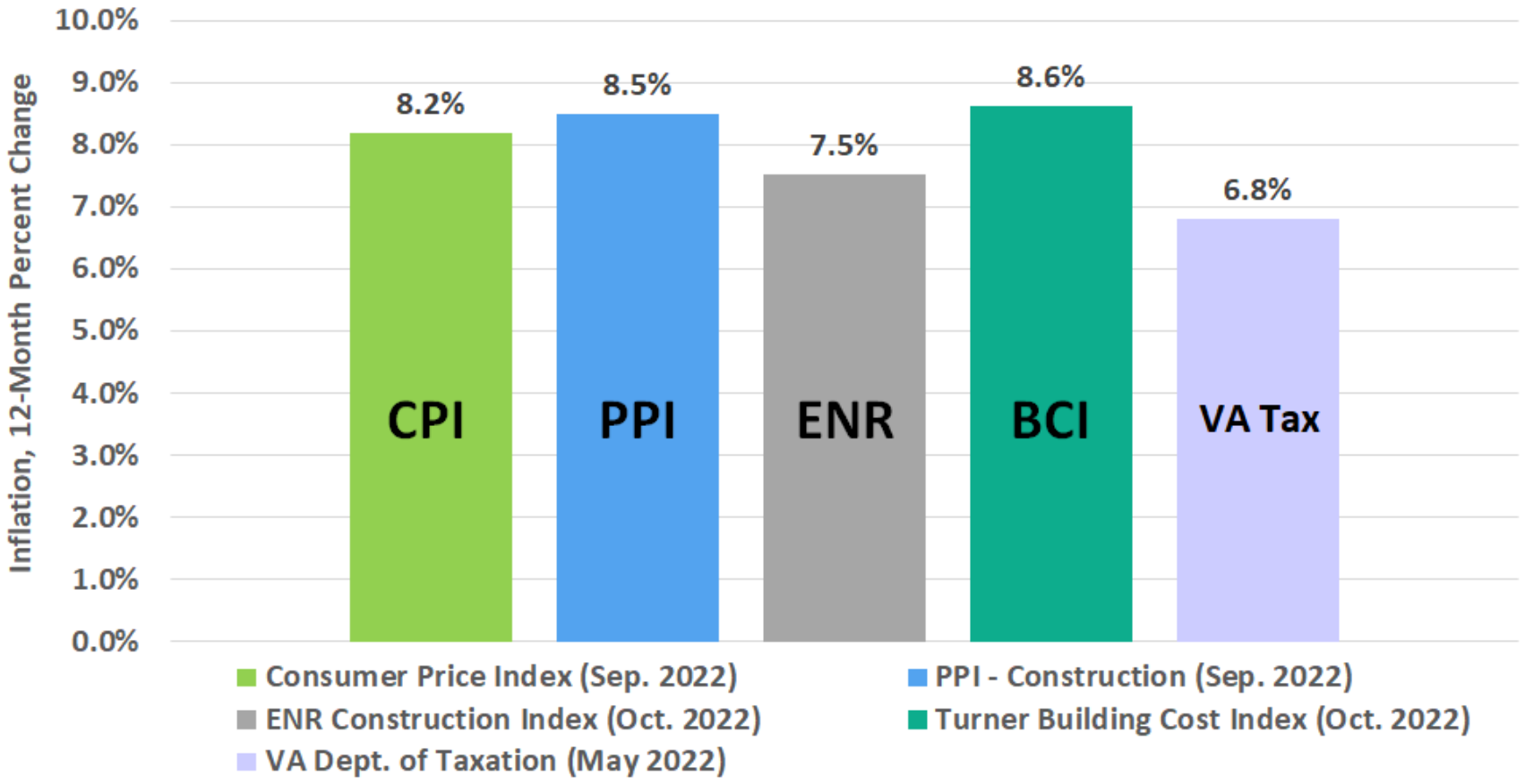
Forecasted Cost Escalation



- No one flips a switch on July 1 – costs continue to escalate through the calendar year
- Recent updates on timing of federal infrastructure funding may extend pressure on construction sector
- For planning purposes, the midpoint of 11% for 2023 is still appropriate

Inflation shown is not cumulative and based on current SYIP budgets:
- $100 M in current budget is expected to cost $110 by 2023
- $100 M in current budget is expected to cost $103 by 2024
- In current dollars; i.e. *not* considering discount rates/time value of money

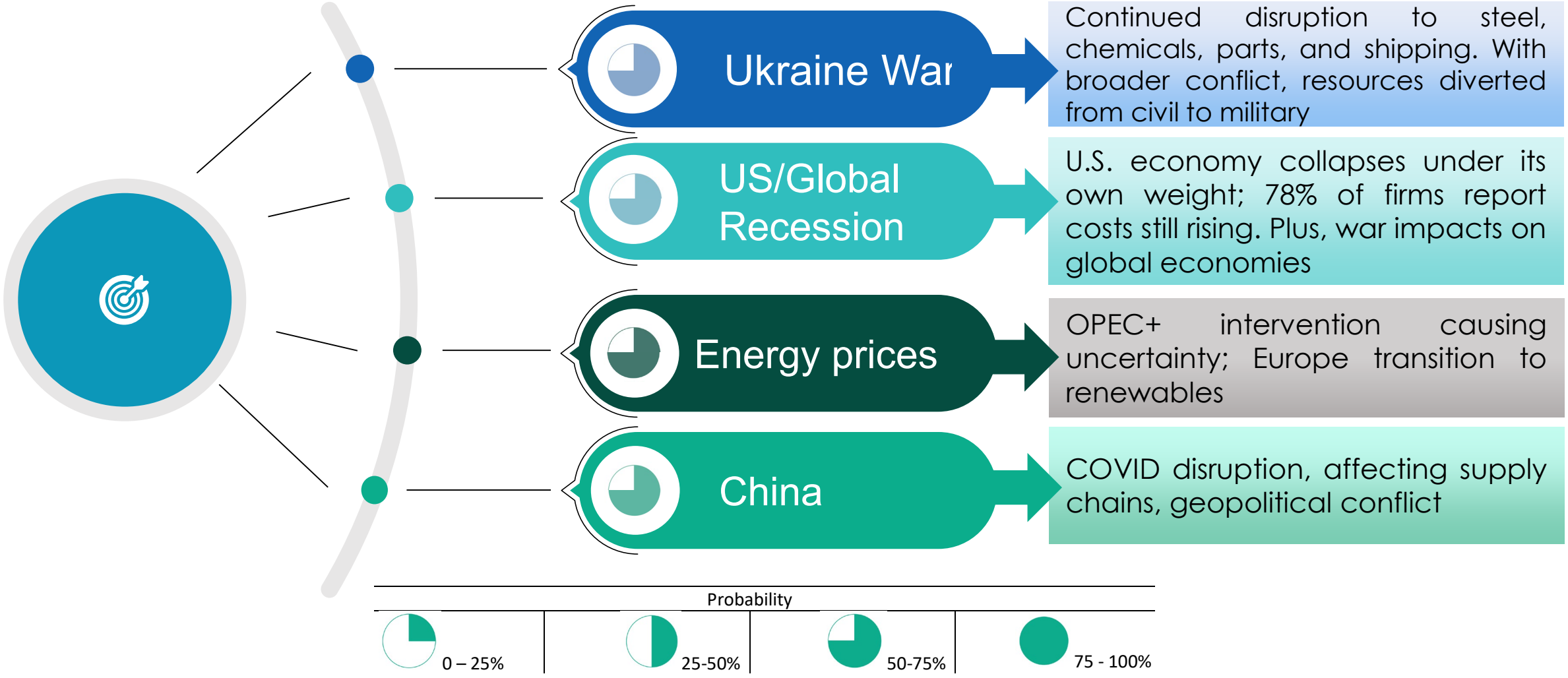
Comparison to Other Measures



Anticipate lag with construction costs:

- Consumer prices more responsive
- Construction contracts longer duration than bread purchases
- Materials disruption due to long-term issues

Things to Watch – Next 24 Months



Managing Inflation

		VDOT Using?
Cost Indexing	• TAMU* estimated 1.5% cost, potential 5-10% savings • Most states offer indices for fuel and asphalt binder • 14 states offer a steel index	√ - but not to extent of some other DOTs
Spec Waivers	• Primarily substitution - e.g. steel strand from multiple sources vs. one source - saves lead time • Parameters vary, project size, community impact, etc.	√ - providing flexibility in specs
Bundling Procurements	• 90% of DOTs saw no increased risk, 5-10% savings • *Not* grouping • Fewer procurements, not fewer projects	√ - grouping for efficiency

*Texas A&M University Transportation Institute

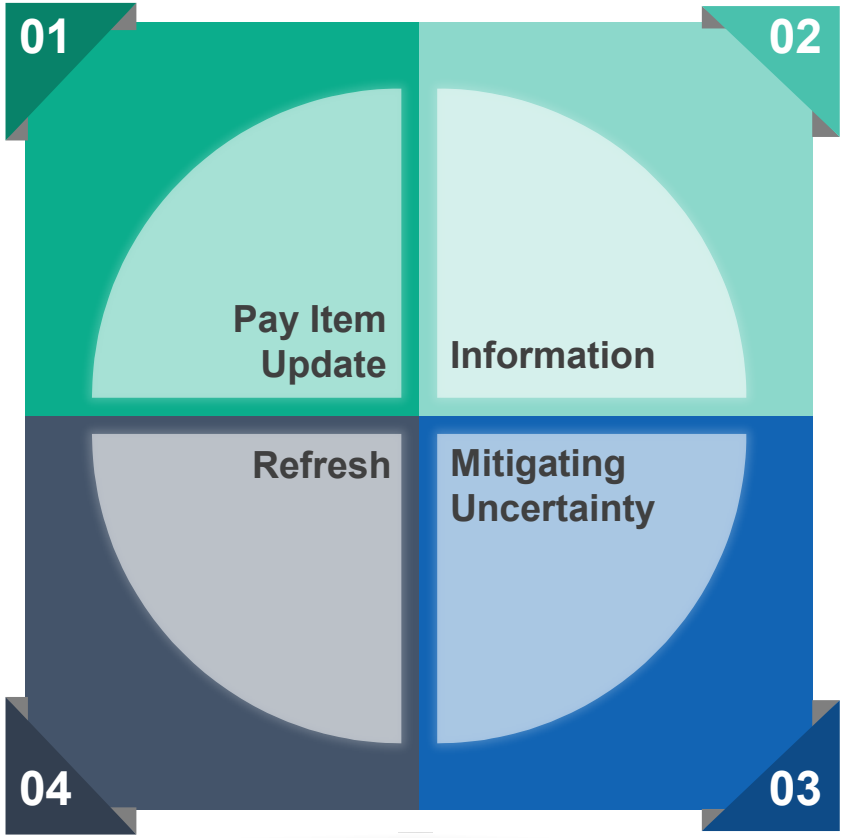
Additional Considerations

Non-standard Items

Updating pay items to reduce the large share of non-standard items will improve VDOT's ability to track cost trends.

Routine Reviews

Scheduling routine reviews of specs and procurement strategy may allow VDOT to respond more quickly to future market conditions and technology changes.



Alternative Bid Data

Consider maintaining materials quantities estimates for non-traditional procurements to increase information about results, quantities and estimates.

Uncertainty Premiums

Against continued potential cost increases, Cost Escalation or Payment Adjustment Clauses may significantly reduce uncertainty premiums from contractors and reduce bid prices.

Questions? Thank you!