# Valuation of Energy Infrastructure in a Carbon Neutral Market

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2023 Energy Valuation Conference – Houston, Texas
May 11, 2023

# Agenda

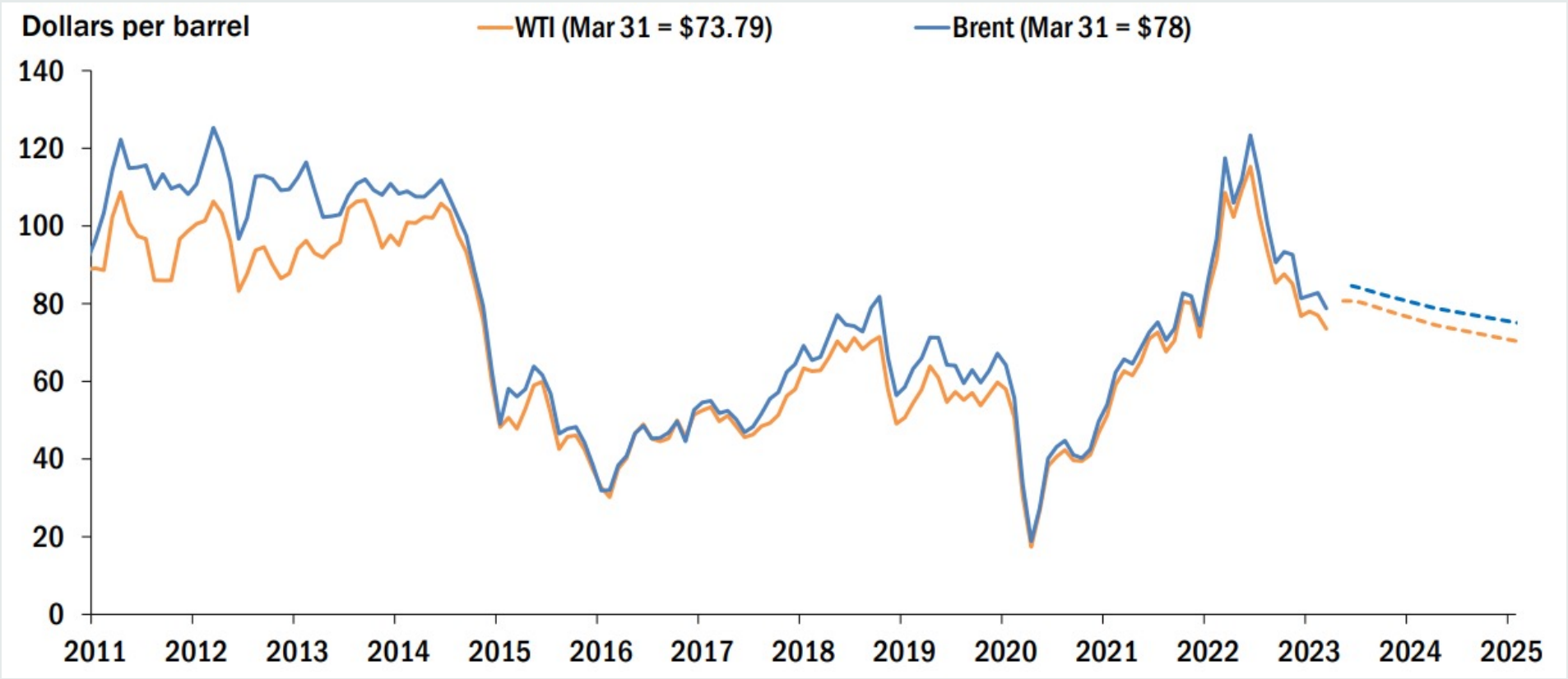
- Energy Fundamentals
- Energy Infrastructure Update
- Carbon Neutral Future
- Valuation Issues in a Carbon Neutral Marketplace

# Energy Fundamentals

Source: U.S. Energy Information Administration & Federal Reserve Bank of Dallas

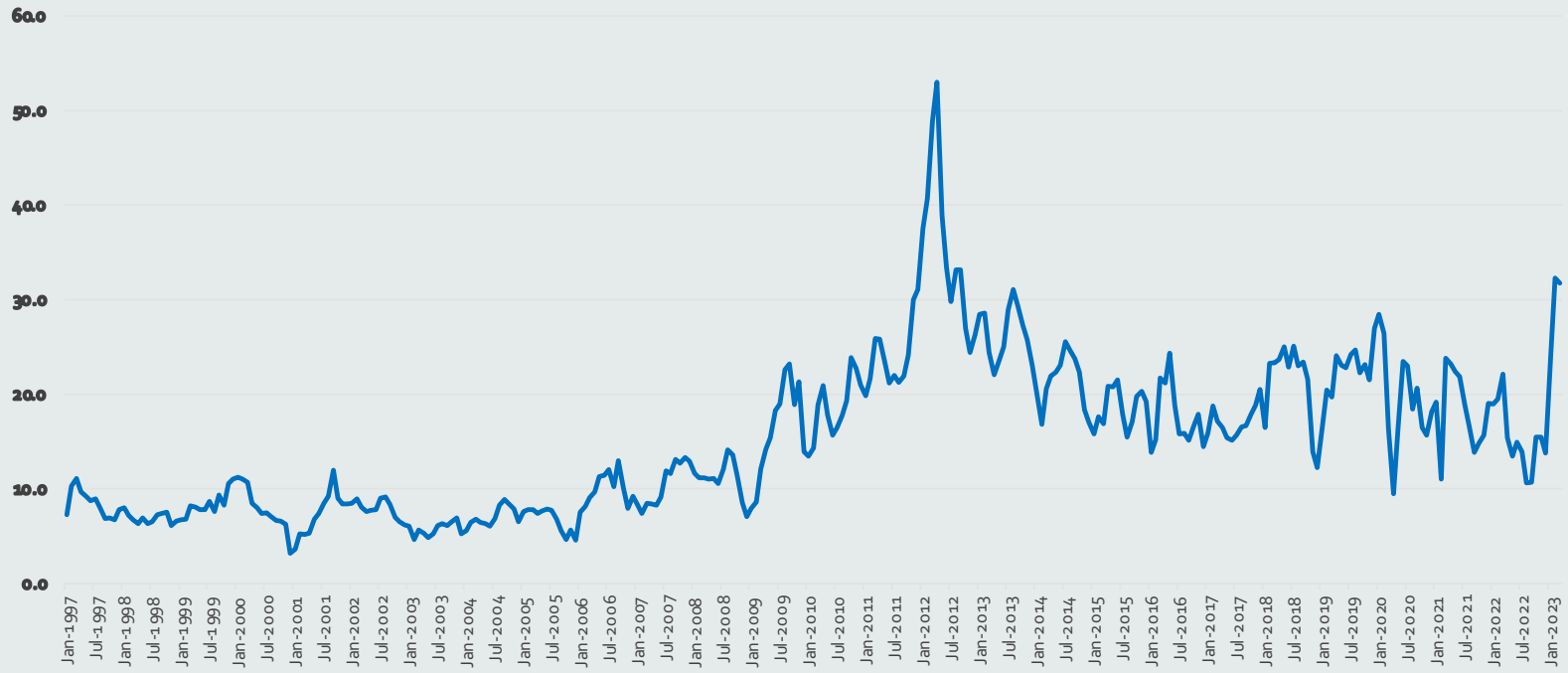
- "Energy Security" vs "Energy Transition"
- World needs "all of the above" sources of energy
- European and Asian gas prices led to the rare phenomenon of gas being worth much more than crude oil on a per-MM Btu basis
- Oil to Natural Gas Price Ratio - Pre-shale 8X / Post-shale 20X / Today 30X
- Breakeven price for WTI crude $58 bbl; shut in price $30 bbl
- Supply chain issues persist
- Workforce – retirements and labor shortages

# WTI & Brent Crude Oil Price



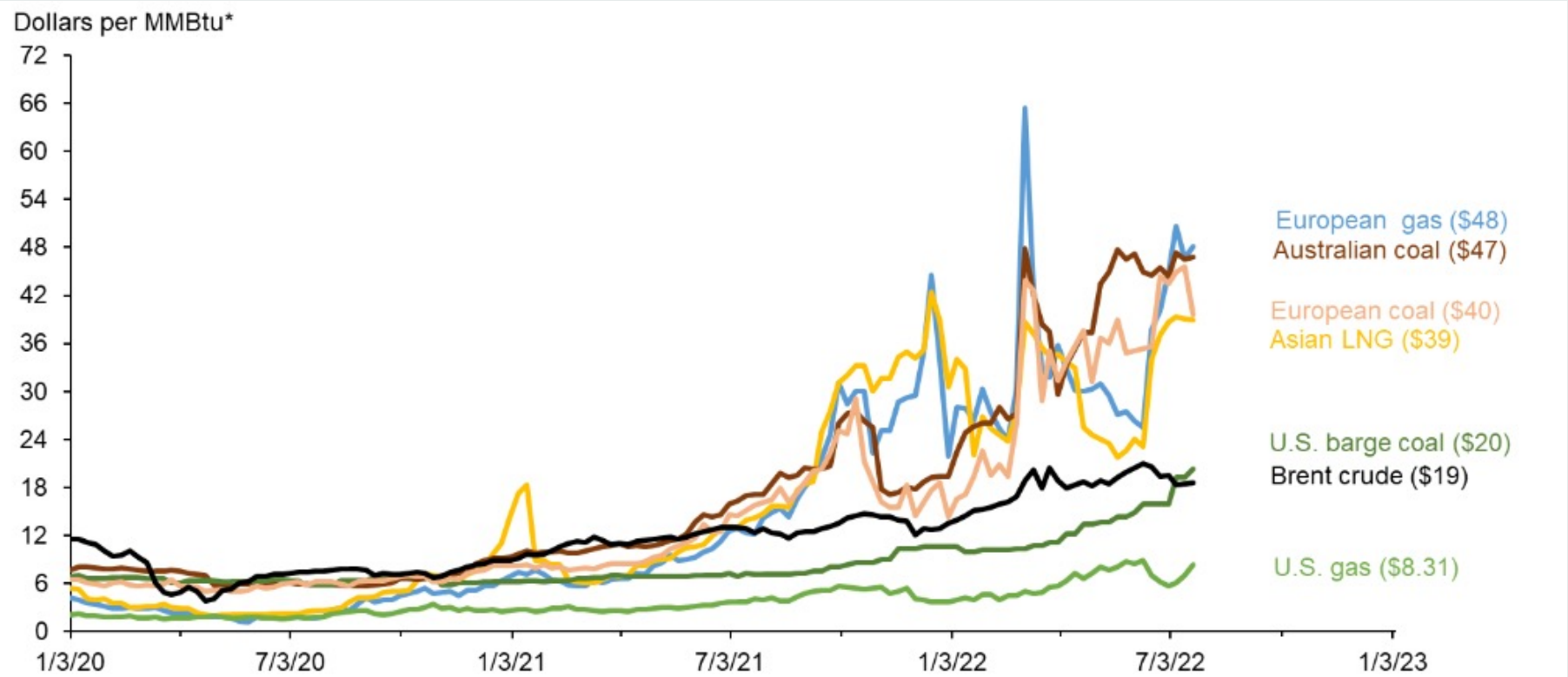

Source: Federal Reserve Bank of Dallas

# Oil to Natural Gas Price Ratio 1997-2023 YTD



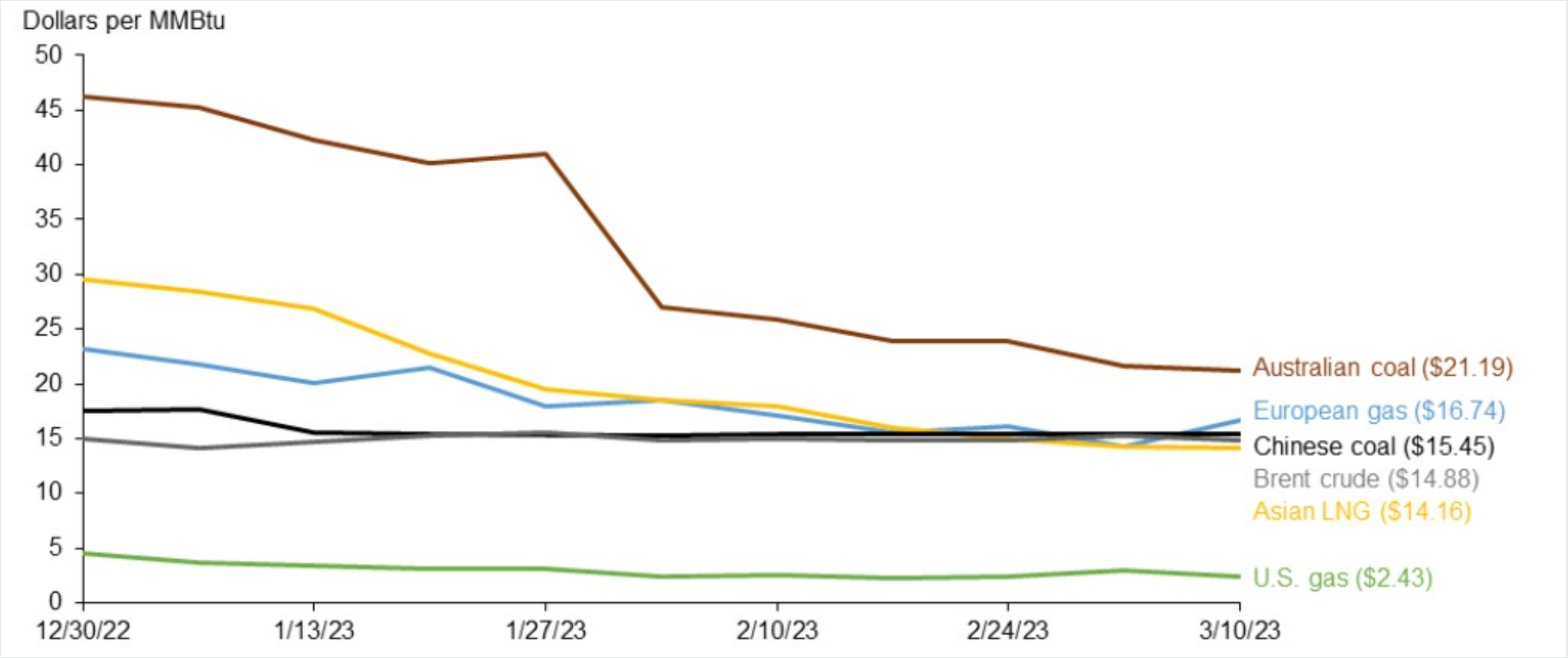

Source: EIA

# Global Energy Prices 2020- 2022




Source: Federal Reserve Bank of Dallas

# Global Energy Prices – 2023 YTD

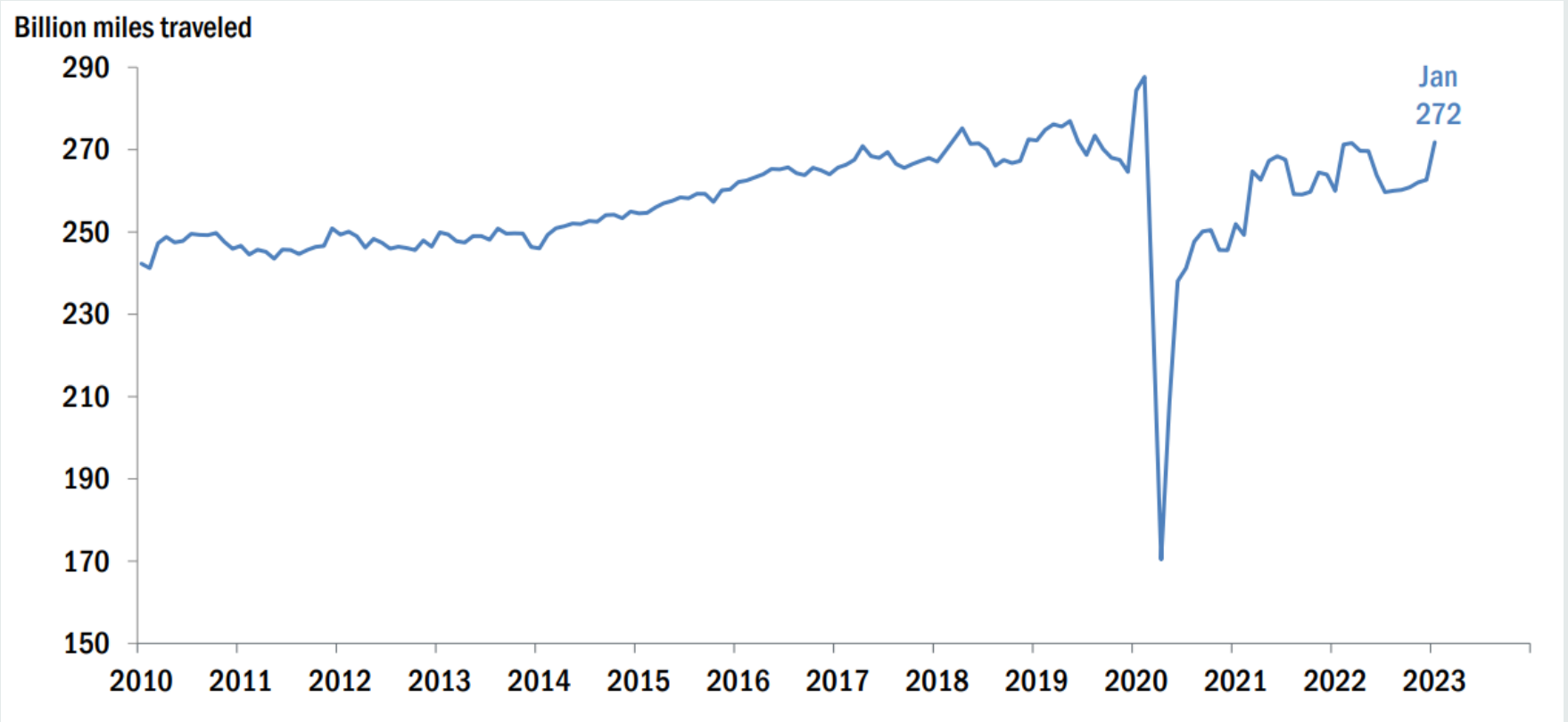



Source: Federal Reserve Bank of Dallas

# Oil Refining Infrastructure Update

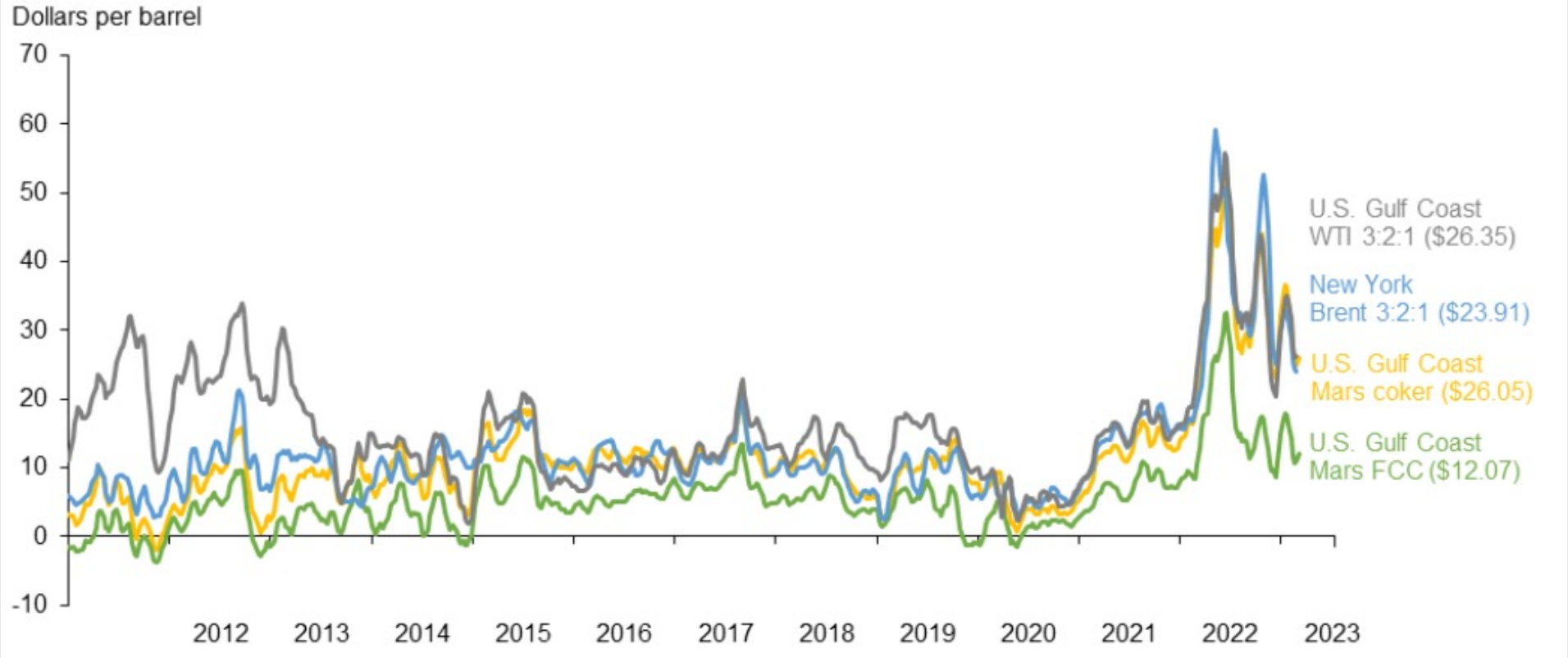
- Global demand has returned
- Loss of significant capacity in US & Europe
- Large growth in capacity in Middle East & Asia
- Increasing operating expenses with higher natural gas prices – electricity, heating, and hydrogen
- Disrupted supplies of crude oil worldwide
- Lack of intermediate feedstocks and products
- High shipping costs

# US Vehicle Miles Traveled




Source: Federal Reserve Bank of Dallas

# USGC Crack Spread Indicators

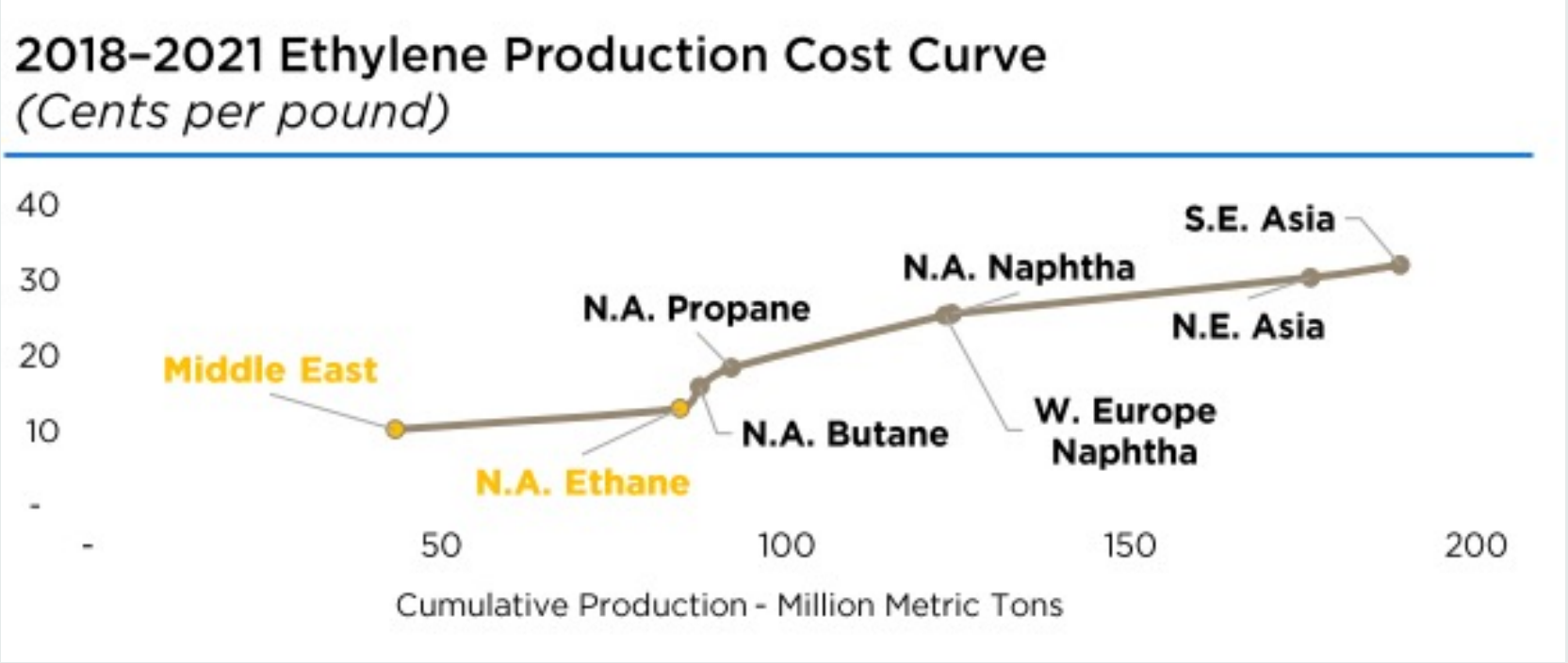



Source: Federal Reserve Bank of Dallas/EIA

# Petrochemical Infrastructure Update

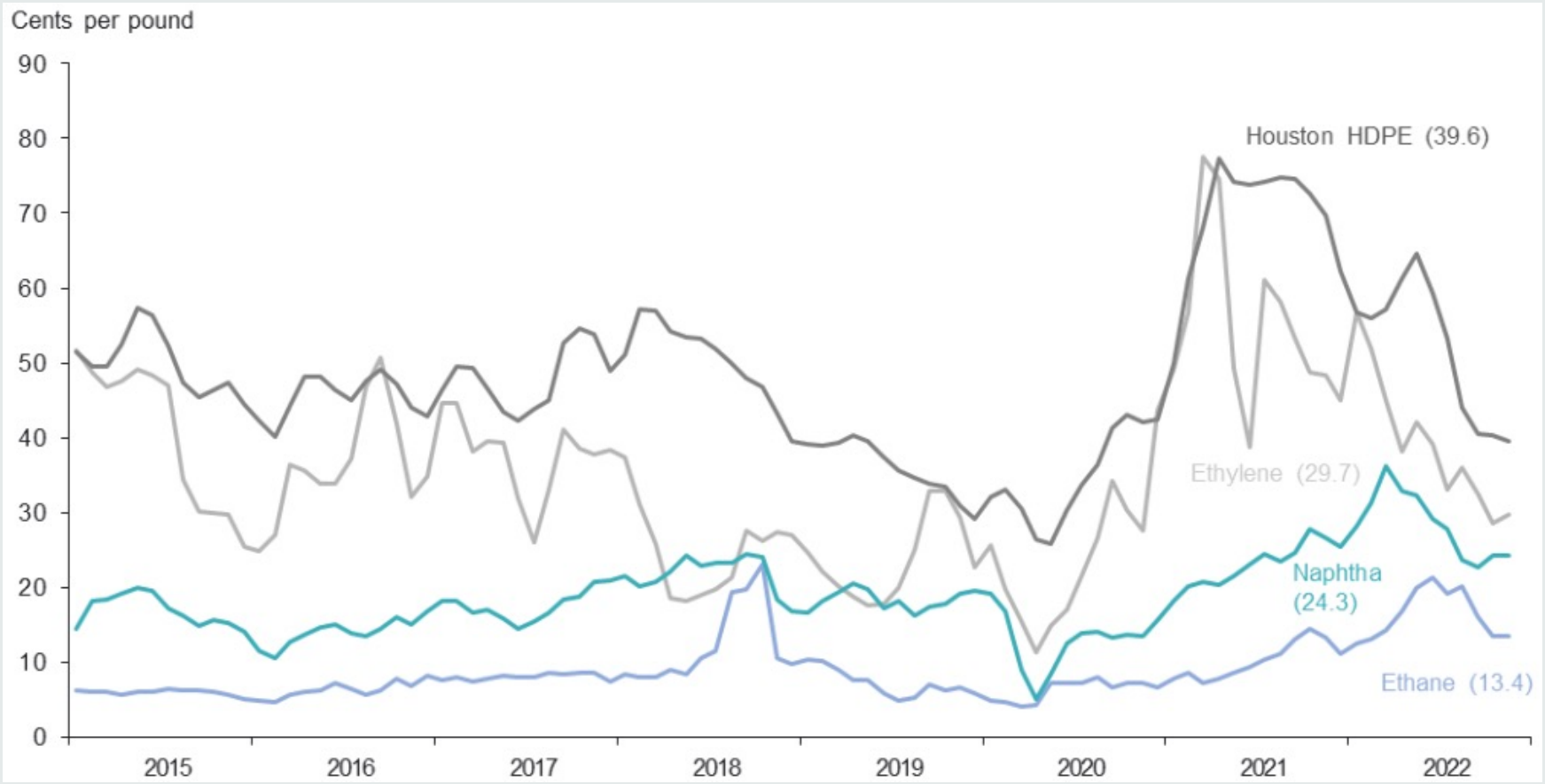
- Oil to Natural Gas Price Ratio - Pre-shale 8X / Post-shale 20X / Today 30X
- US has seen over $200 billion in petrochemical infrastructure investment since 2014
- Investment has slowed down
- Petrochemical growth is driven by the growing global middle class
- High raw material & energy costs in Europe
- Ammonia to play a key role in the future

# Ethylene Production Costs




Source: Enterprise Products Partners LP

# USGC Petrochemical Prices

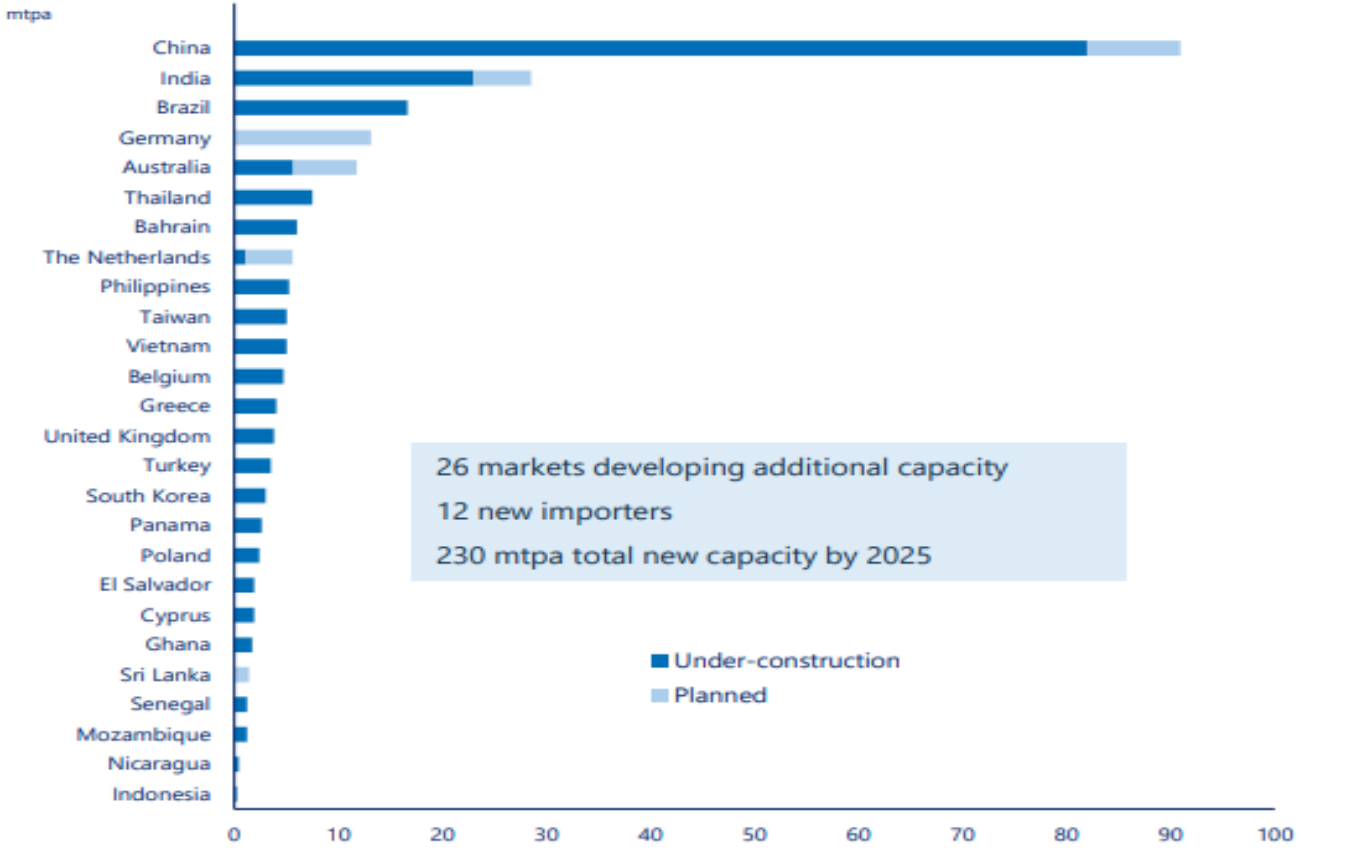



Source: Federal Reserve Bank of Dallas/EIA

# LNG Infrastructure Update

- Asia primary destination for LNG historically
- Europe now primary destination for LNG
- US expanding LNG export capacity rapidly
- US will be worlds largest LNG exporter by 2030
- Long Term contracts average 15 plus years
- Spot contracts provide additional flexibility
- Cost inflation and unfavorable financing terms

# LNG Regas Capacity Under-construction and Planned - 2025




Source: Cheniere Energy, Inc.

# Carbon Neutral Future - Tailwinds

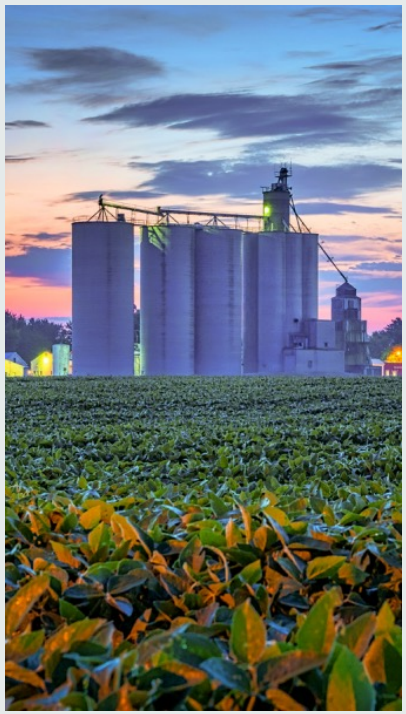
- Majority of Energy companies have net-zero carbon emission equivalent targets by 2050
- Focus on hydrogen and ammonia as carbon neutral fuel sources – former Lyondell Houston Refinery complex
- Carbon Capture & Storage (CCS) – investments starting
- Electronic Vehicles (EV) – Auto manufacturers transitioning to a 2035 target date to phase out the internal combustion engine - $500 billion invested.
- Inflation Reduction Act (IRA) - $370 billion to energy and climate change initiatives

# Carbon Neutral Future - Headwinds

- Finite resources available for low carbon feedstocks – Food vs Fuel
- Grid strain & unintended consequences of renewable energy
- No nationwide transmission system
- Extraction of green metals (cobalt, lithium, nickel, copper, rare earth metals) will need to significantly increase
- China dominates mining and processing of green metals

# New Product Terminology for "Liquid Fuels"

- Methanol – green , blue, gray
- Ammonia – green , blue, gray
- Hydrogen – green, blue, gray
- SAF – Sustainable aviation fuel
- Renewable Diesel & Biodiesel
- Ethanol – blending & raw material
- $CO_2$ - stored or consumed



# Carbon Intensity "C.I."

- Carbon Intensity is a measure of carbon dioxide and other greenhouse gases per unit of energy
- Used for ESG transparency, regulation and compliance
- Key is the carbon in the raw materials and inputs

**Carbon Intensity of Common Fuels**

| Product | Carbon Intensity |
|---|---|
| Gasoline | 101 |
| Diesel | 100 |
| California grid electricity | 100 |
| **Vegetable oils for biomass-based diesel** | **55** |
| **Waste oils for biomass-based diesel** | **10-30** |

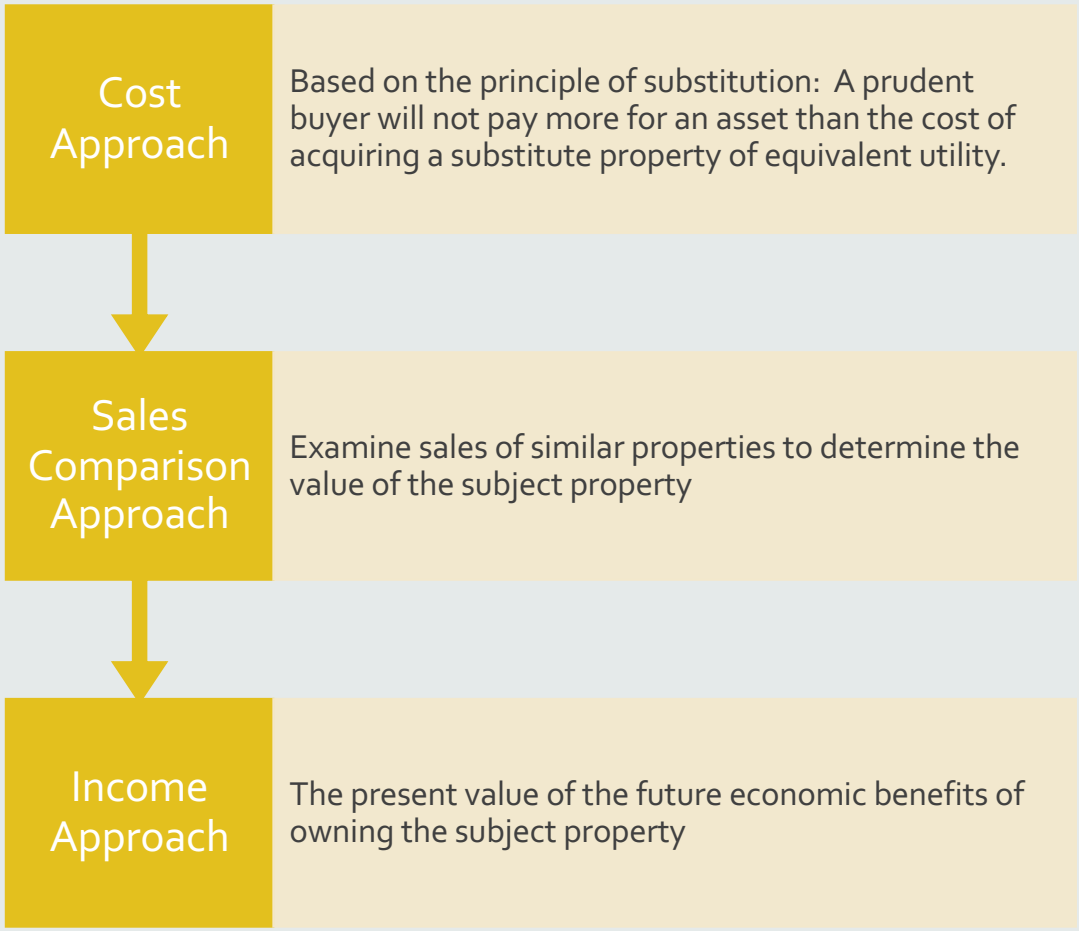
# Energy Transition

- Decommissioned Plants – location for new generation of low carbon fuels, petrochemicals & CCS projects
- Site Clean-up – Commercial / Industrial Development
- Decommissioned Offshore Platforms
  - Artificial Reefs for marine life habitats
  - Reuse/Recycle metals & materials
  - Rocket Platforms – Space X

# APPROACHES TO VALUE

ALL APPROACHES REFLECT "THE MARKET"

Source: American Society of Appraisers - Valuing Machinery and Equipment 4th Edition



# The Cost Approach

Source: American Society of Appraisers - Valuing Machinery and Equipment 4th Edition

- Reproduction Cost New
- Less Functional Obsolescence Due to Excess Capital Costs or Advancements in Technology
- Equals Replacement Cost New
- Less Physical Deterioration
- Equals Replacement Cost New Less Physical Deterioration
- Less Functional Obsolescence Due to Excess Operating Expenses
- Less Economic Obsolescence
- Less Necessary Capital Expenditures
- Add Land
- Equals Cost Approach Indicator of Value

# The Cost Approach

## *Advantages of the Cost Approach*

- Starting Point to Identifying the Assets of the Subject Property
- Reflection of the Subject Property as of the appraisal date
- Relates Value to Cost
- Identifies and Quantifies all forms of Depreciation & Obsolescence
- Useful for special purpose properties

## *Disadvantages of the Cost Approach*

- Difficult to Qualify and Quantify all Forms of Depreciation & Obsolescence
- Time Consuming & Costly

# The Cost Approach

***Direct Costs*** - Material, labor, and related expenditures normally and directly incurred in the purchase and installation of an asset, or group of assets.

- Direct Material Costs
- Direct Labor Costs
- Freight
- Foundations
- Mechanical & Electrical Costs

***Indirect Costs*** - Expenditures that are normally required to purchase and install a property but are not included in the vendor invoice.

- Interest During Construction (IDC)
- Insurance During Construction and Ad Valorem Taxes During Construction
- Engineering & Architect Fees, Permits, and Licenses

# Construction Cost Benchmarks

Sources: U.S. Energy Information Administration, Reuters, and Company SEC Releases

2.0 MM MT/YEAR ETHYLENE PLANT – US$8 BILLION

1,000 MW CCGT POWER PLANT - $1 BILLION

13.5 MM MT/YEAR LNG EXPORT TERMINAL – US$13 BILLION

BROWNFIELD 50,000 BBL PER DAY BIOFUEL REFINERY - $1 BILLION

# The Cost Approach

***Functional Obsolescence*** - is loss in value due to lack of utility or desirability of part or all the property, inherent to the improvement or equipment.

- Caused by:
  - Old, obsolete units
  - Piecemeal construction
  - Changes in technology
  - Mistakes of the past
  - Multiple Units
- Quantified by:
  - Quantified by comparing operating expenses of the subject to the modern replacement
  - Cost to Cure

***Economic Obsolescence***- Economic obsolescence is defined as the loss in value or usefulness of a property caused by factors external to the asset.

- Caused by:
  - Government Regulations
  - Environmental Requirements
  - Supply/Demand Imbalance
- Quantified by:
  - Return on Capital Analysis
  - Sales Comparison Approach
  - Gross Margin Analysis
  - Supply/Demand Analysis
  - Utilization/Inutility
  - Income Approach

# The Sales Comparison Approach

Source: American Society of Appraisers - Valuing Machinery and Equipment 4th Edition

- Preferred by appraisers because it reflects **ACTUAL** transactions by buyers and sellers.
- Based on the proposition that the informed purchaser would pay no more for a property than the cost of acquiring a similar property of the same size and utility.
- Three key steps:
  - Gathering data
  - Determining the appropriate units of comparison
  - Applying the results of the analysis to the subject property
- Important to account for intangible assets when included in the transactions.
- The sales comparison approach is most reliable when there is an active market providing a sufficient number of sales of comparable property that can be independently verified through reliable sources.

# The Income Approach

Source: American Society of Appraisers - Valuing Machinery and Equipment 4th Edition & Appraisal Institute - The Appraisal of Real Estate 15th Edition

- Future cash flows developed by projecting revenues, operating expenses, capital expenditures, and working capital requirements.
- A market-based discount rate is used to discount the cash flows. This discount rate represents the expected return to account for the specific risk in owing the subject property.
  - Opportunity cost
  - Must compensate investors for inherent risk
  - The cost of capital, both equity and debt
- Direct Capitalization: Value = Income / Capitalization Rate
  - Review historical Net Operating Income (NOI)
  - Develop a normalized NOI
  - Capitalization Rate = Discount Rate less growth
- Yield Capitalization or Discounted Cash Flow (DCF)
  - Project future cash flows over the period of ownership
  - Discount the cash flows to Present Value
  - Discount the Terminal Value or exit value of property
  - Discount the Salvage Value of the equipment and conversion costs
- Results in a Business Enterprise Value which includes tangible assets, intangible assets and working capital.

# Case Study – Well Site Amine Units

- Well site Amine Units used to treat natural gas to remove $CO_2$
- Amine treating prevents corrosion in downstream pipelines and process equipment
- The midstream energy sector is focusing on the energy transition to reduce GHG emissions
- Since amine units remove and emit $CO_2$ emissions, each amine unit at a well site is required to be permitted under the Clean Air Act
- More economical to permit and operate larger amine plants at centrally located gas processing facilities rather than at the well site
- Amine units are being pulled from well sites and located to laydown yards to sit idle

# Additional Resources

- U.S. Department of Energy – Energy Information Admiration - www.eia.gov
- Federal Reserve Bank of Dallas – www.dallasfed.gov
- U.S. Environmental Protection Agency – www.epa.gov
- Federal Energy Regulatory Commission – www.ferc.gov
- The Appraisal for Ad Valorem Taxation of Communications, Energy and Transportation Properties Wichita Conference – https://cmd.wichita.edu/
- Oil & Gas Journal- www.ogj.com

# Thank You

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