Desautels Capital Management

Honours in Investment Management

Industry Overview

Fall 2023

Energy & Utilities

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Executive Summary

DCM's opinions

Main Outlooks

Oil and Gas – *Continuous OPEC Cuts driving up prices*
- Demand at an all-time high, prices up almost 50% since June
- Sector is trading below market P/E, but spread has compressed from 10x earnings to 7x YoY

Inflation Reduction Act – *Monumental Bill for energy*
- Government intervention nullifies our thesis from last year
- Synergies between clauses provides potential mispricing

Renewables – *Difficulties in an energy crisis*
- Massive private and public investment over the last year has driven interest higher
- Stock prices and multiples down YoY

Frontier Technologies – *High risk, high reward, if we can get it right*
- Batteries are poised to solve intermittency issues, growing at 30% CAGR through 2032
- Hydrogen offers a clean alternative to fuel, emitting only water as a byproduct

What's Next?

Reevaluate Current Holdings – *Trim exposure to O&G once we find the right stock*
- We believe oil is in a strong spot, but we will monitor the recession-induced demand destruction
- We have no exposure to any of the renewables value chain

New Investment Opportunities – *Finding value amidst the noise*
- Finding an undervalued renewables stock is difficult, since there aren't many (profitable) companies
- There is value out there, perhaps in a less widely-monitored sector (picks & shovels method)

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Overview: Energy & Utilities

General Information

Introduction to Energy & Utilities

Oil & Gas - Energy
- Primary fuel sources with a wide range of industry applications
- Complex, highly technical, and capital-intensive processes
- 4 segments: **Upstream**, **Midstream**, **Downstream**, **Services**

Transition Fuels - Energy
- **Low(er)-carbon fuels** (e.g., natural gas) as substitutes for higher-content fossil fuels (e.g, crude, coal)
- Essential in the **transition to phase out fossil fuels**

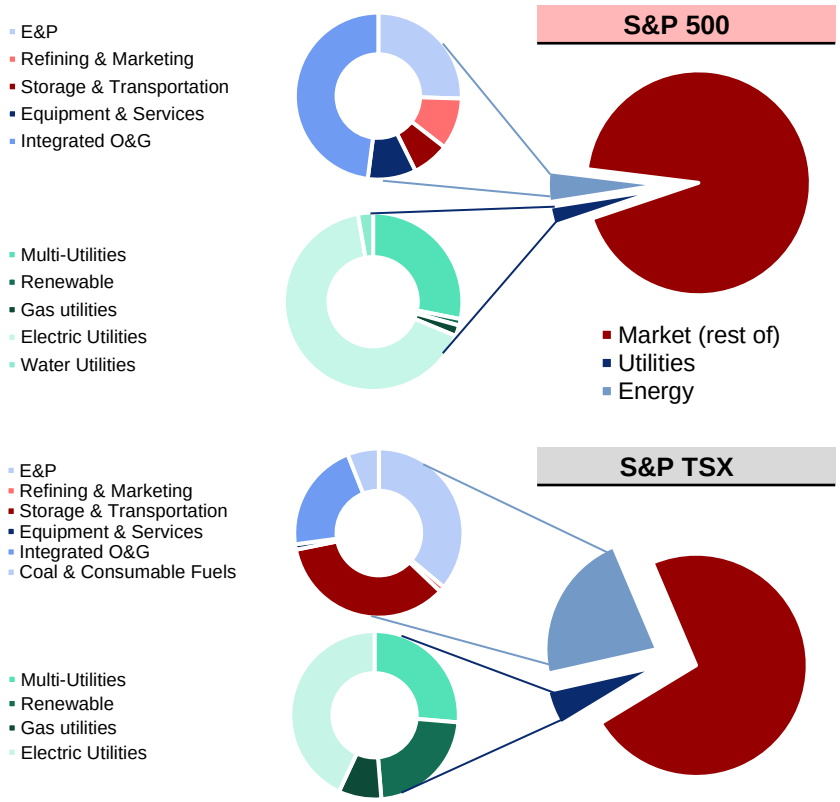
Renewable Power & Storage - Utilities
- Renewable power includes **Wind**, **Solar**, **Hydro**, **Thermal**
- Power Storage solutions: technologies connected to the power grid that **resupply stored energy to the grid when needed**

Key Concepts Glossary

A few helpful concepts throughout the presentation

- **1P, 2P, and 3P reserves:** 1P = Proven ; 2P = Proven + Probable ; 3P = Proven + Probable + Possible
- **Levelized Cost Of Energy (LCOE):** Standardized measure for comparison of energy generation costs from different technologies by dividing lifetime cost by lifetime production
- **Energy Return On Energy Invested (EROEI):** the energy output over the energy required (total) to produce the output

Weight within the S&P 500 and S&P TSX



	S&P 500	S&P TSX
Energy	4.22	18.12
Utilities	2.58	4.22
Combined	6.80	22.34

Note: Figures are expressed as % weight in their respective indexes

With renewable investment at an all-time high, we expect a progressive upward reweighting of Renewable Power and Storage segment

Sources: EIA, Bloomberg, McKinsey & Company

Macro Factor Exposure

A politicised commodity business with outsized macro exposure

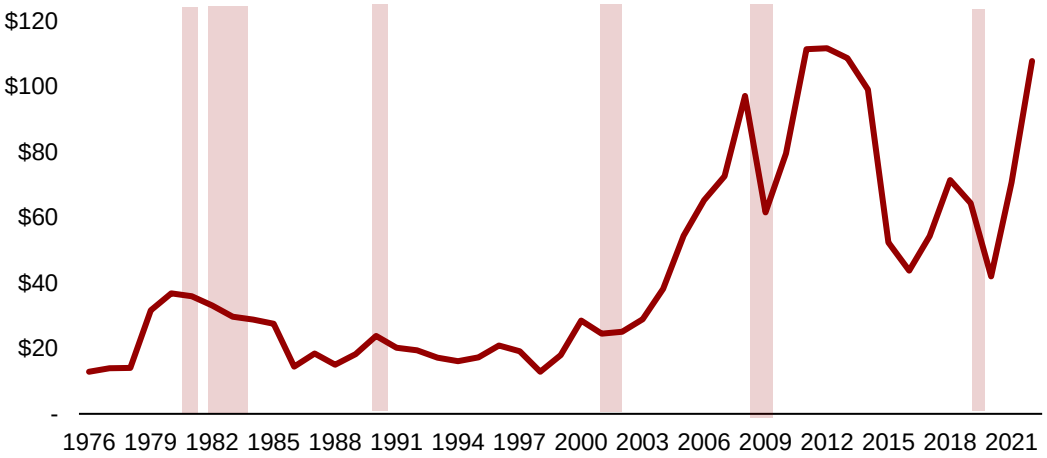
Sub-sectors

- **Oil & Gas**
- **Transition Fuels**
- **Renewable Power & Storage**

Primary Macro Drivers

- Crude Oil Prices
- Foreign Policy and Election Cycles
- Legislation
- Industrial Activity
- Interest Rate Environment
- Commodity prices
- Consumer Power Demand & Climate

Crude Oil, a heavily politicized commodity



The 1973 Oil Shock

The Arab-Israeli War of 1973
- OPEC boycott bars sales to West
- Production cut by 5% monthly
- Objective: quell support for Israel

Widespread impact on the economy
- Crude prices up +300% YoY
- Already fragile US economy tipped into crisis
- TBD

Risk exposure increasingly mitigated
- Technological advancements bring self-regulating reactors

TBD

CapIq, Company Filings, Bloomberg, Goehring & Rozencwajg

How the Macro has affected the sector historically

Energy as a political instrument

Explaining the Major Events

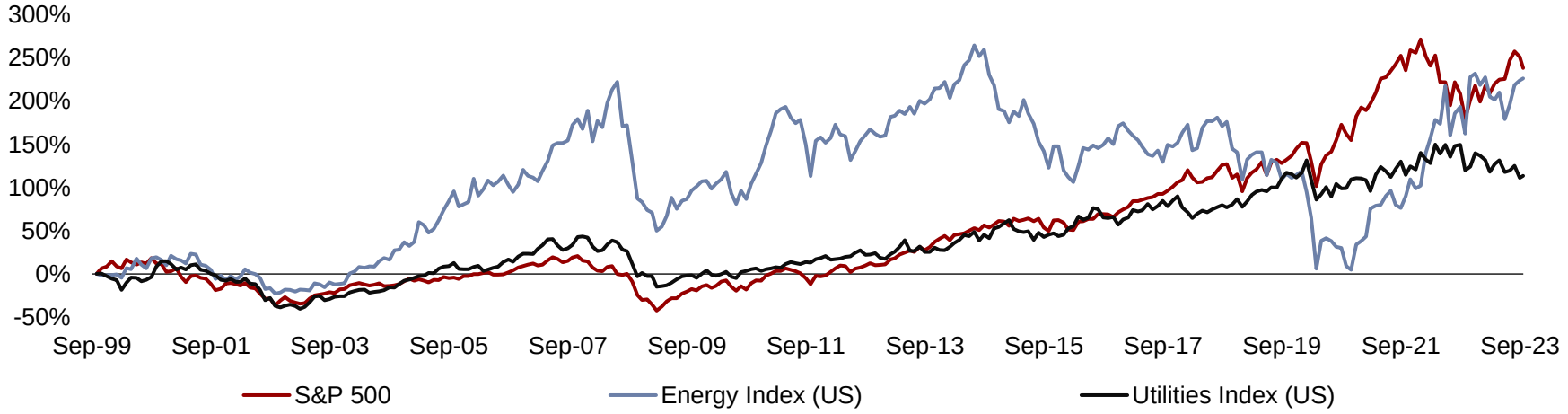
2001: 9/11 Attacks
- The 9/11 terrorist attacks sent oil prices plummeting by -35%
- OPEC delayed quota cut-backs until mid-2002
- Recovery in 2003 as military operations commenced in Iraq

The Great Financial Crisis & the 07-08 Oil Shock
- Crisis triggered deflation and liquidation wave lowering values of all assets, including O&G (~70% crash)
- Recovery by aggressive stimulus and inflation expectations

Russia's invasion of Ukraine
- Weaponization of natural gas supply and pipeline bombing triggered energy crisis in Europe (+63-113% energy cost)
- Government effort to keep energy bills low for consumers

Sector Performance

Historical Performance



Energy & Utilities are heavily exposed to the macro-economic environment, with Energy being the most volatile

Sources: Bloomberg

How the Macro has affected the sector historically

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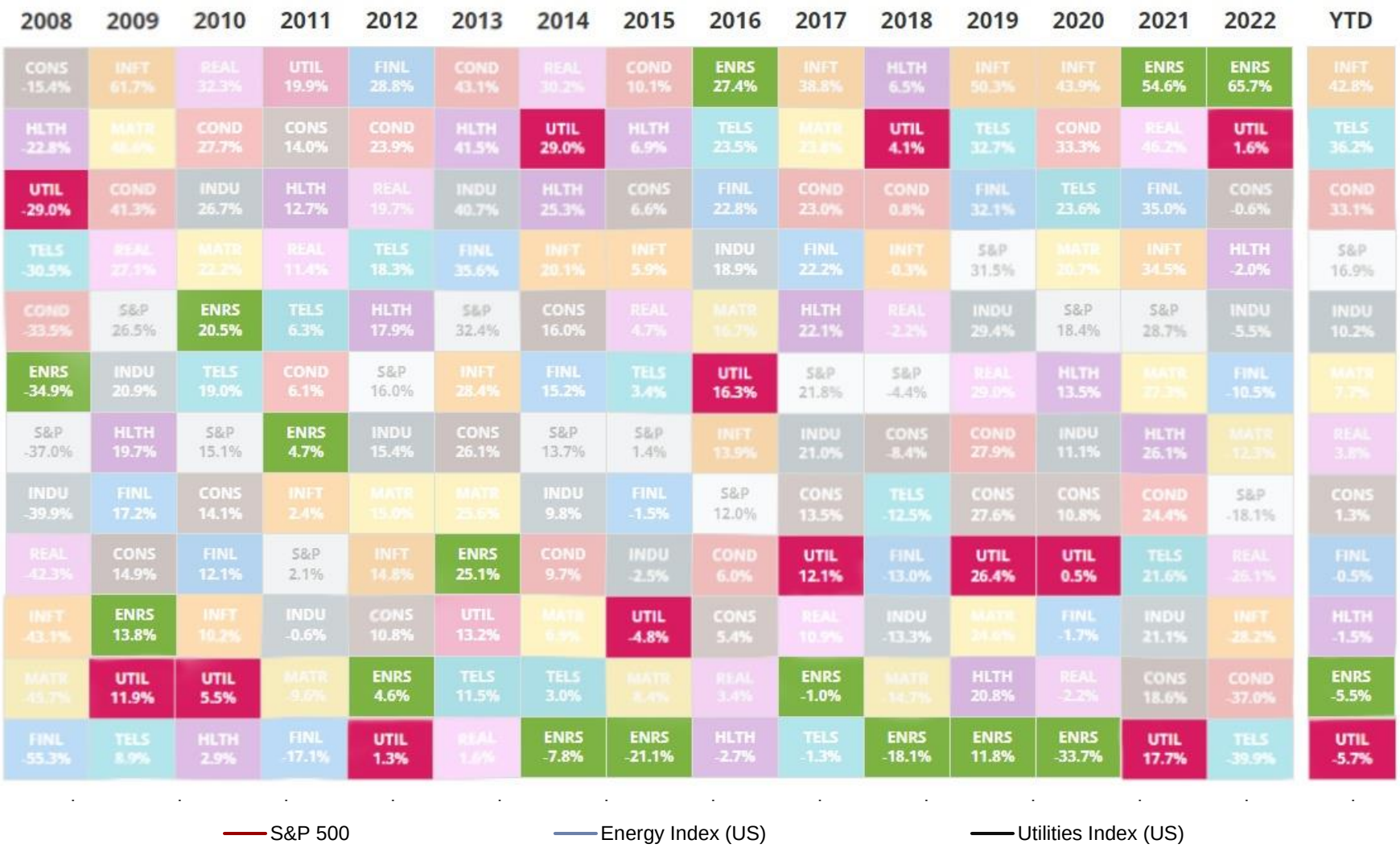
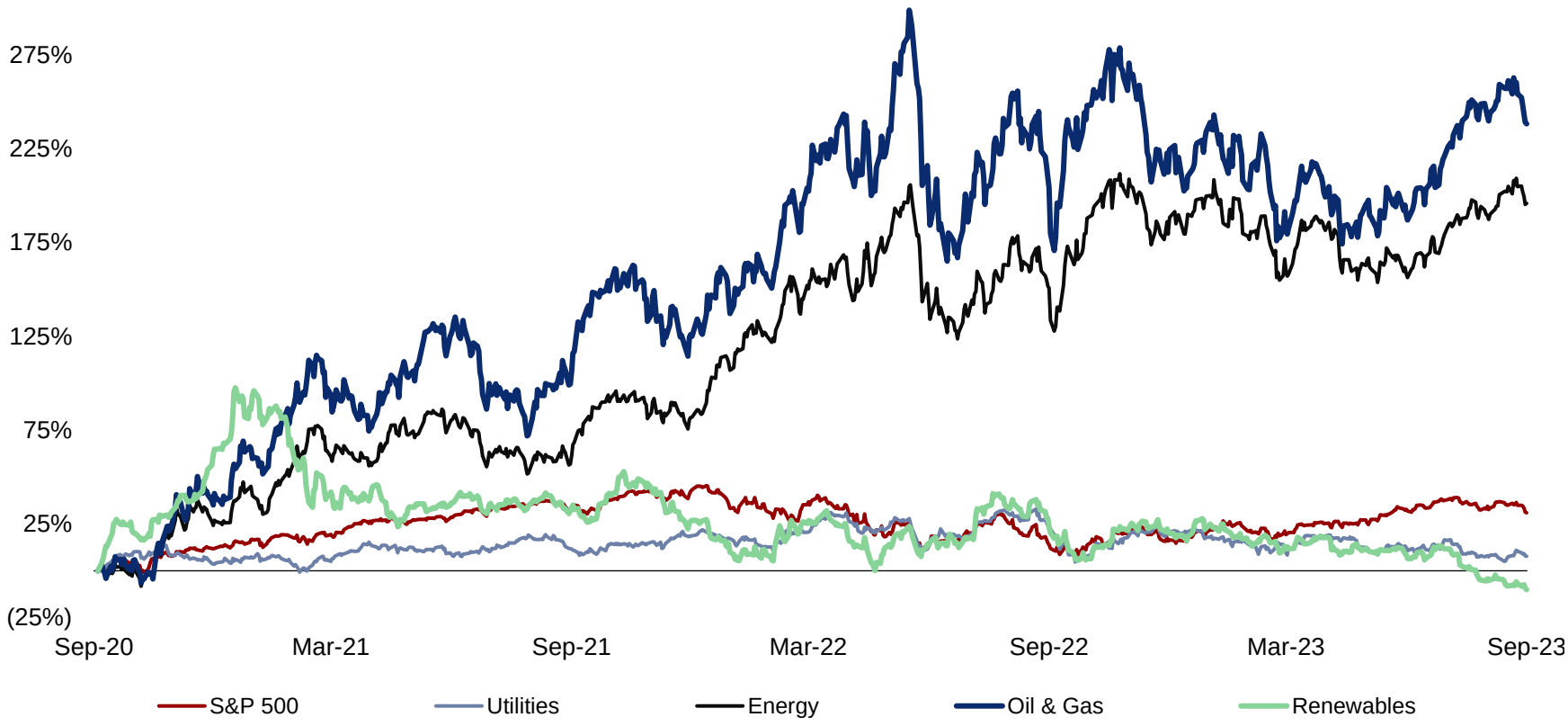


Energy & Utilities are heavily exposed to the macro-economic environment, with Energy being the most volatile

Sources: Bloomberg

Energy & Utilities

1. Beta & Standard Deviation



	Energy	Utilities	Oil & Gas	Renewables
3y Beta (vs S&P)	0.66	0.62	1.163	1.014
Standard Deviation	0.04	0.18	0.43	7.107
R-squared	0.273	0.377	0.355	0.402

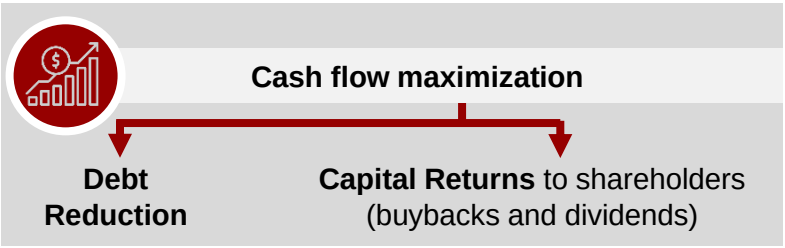
Source: Bloomberg

A Callback to our previous IO: what has been happening with Energy?

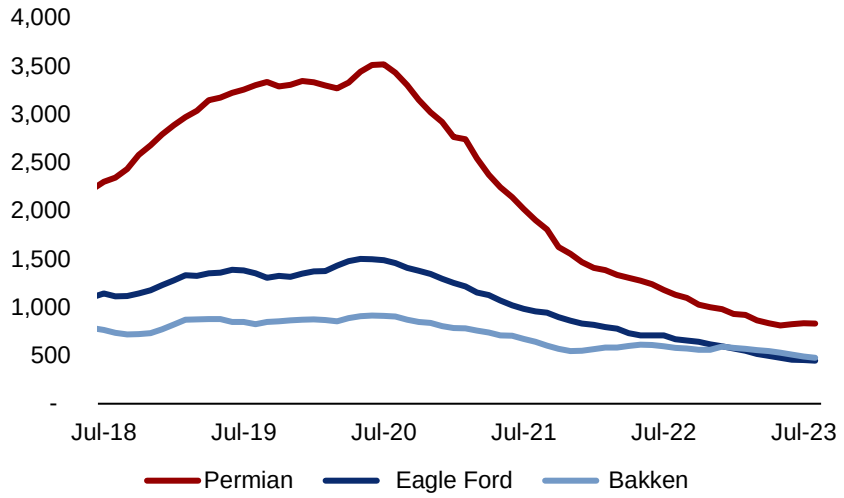
Declining production and a focus on capital discipline curtailed investment in new production capacity, straining supply

E&P sector shifted its focus to capital discipline

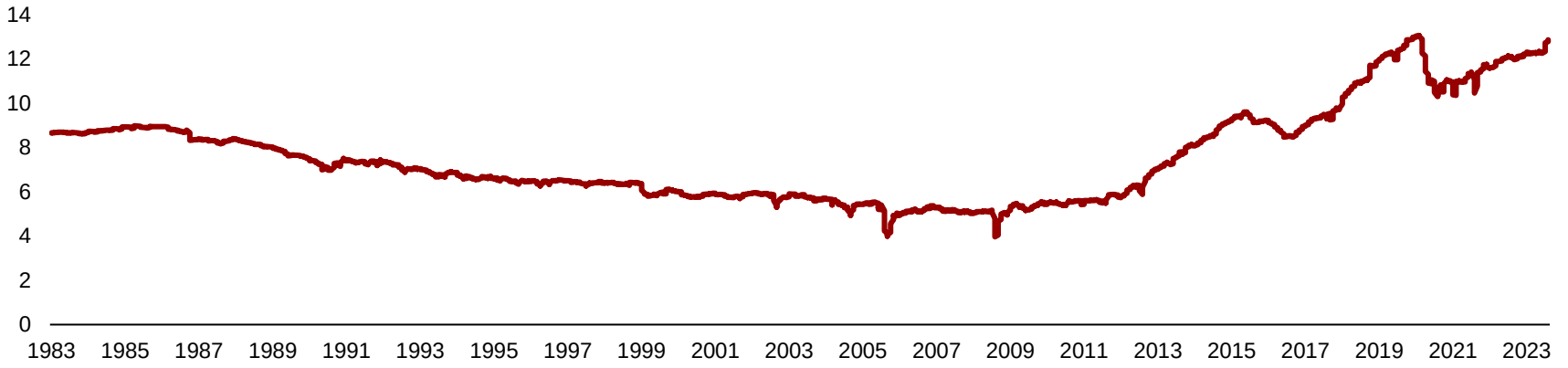
- Historically, high CAPEX focused on **production growth**
- 2020 oil price crash (OPEC+ crisis & COVID-19) shifted focus to **cash preservation** (limited capital uses)
- 2021 oil price rally (supply & demand mismatch) induced **paradigm shift:**



DUC inventories by region



US Field production of Crude Oil (mmBOE/d)



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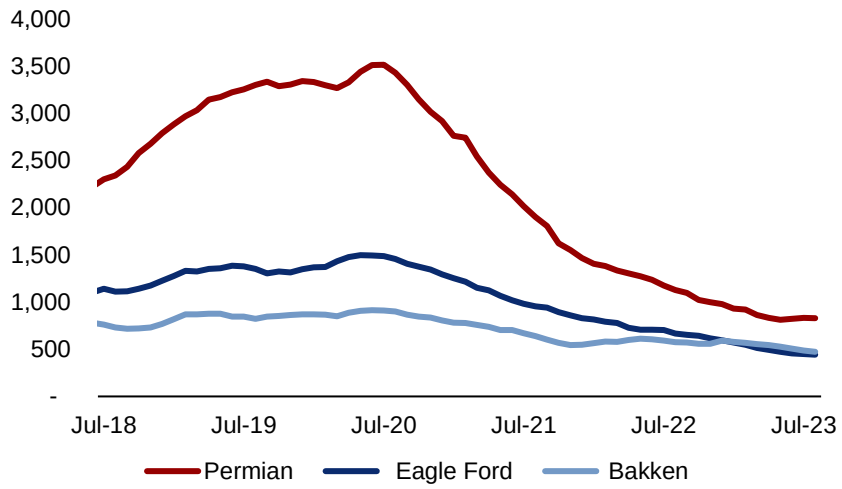
Cash flow maximization

Debt Reduction

Capital Returns to shareholders (buybacks and dividends)

DUC inventories by region



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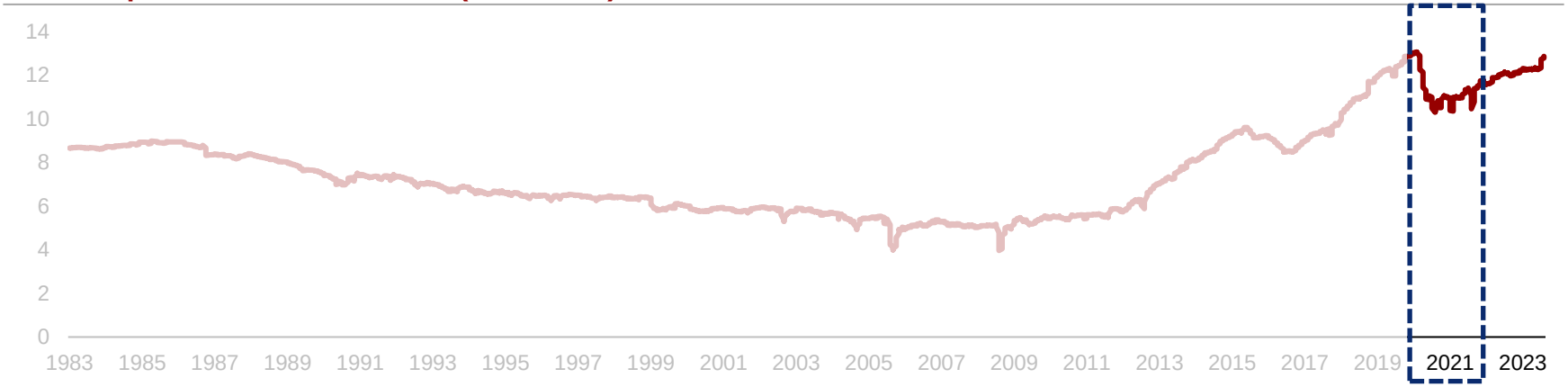
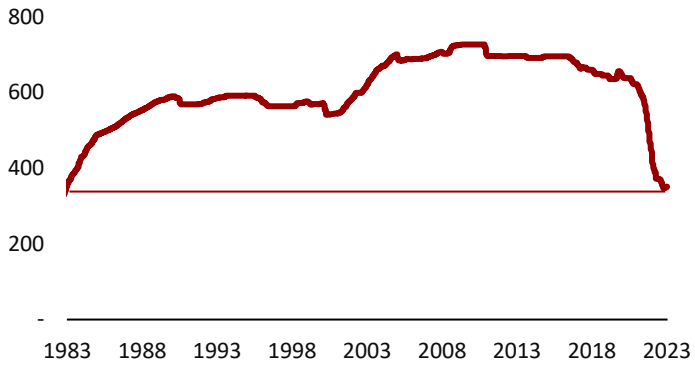


A Callback to our previous IO: what has been happening with Energy?

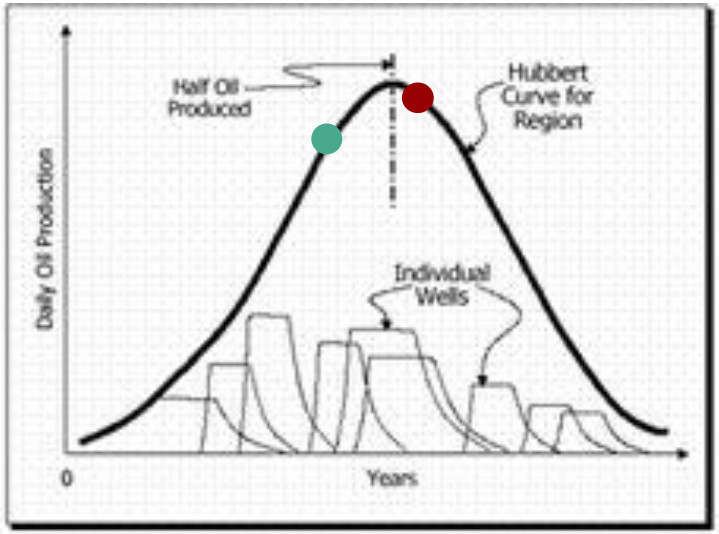
Simultaneously, politics motivated artificial price control inducing reserve depletion, further straining supply capacity



SPR releases to ease the supply strain

- US established SPR to cushion global market from oil price volatility
- SPR historically mitigated OPEC's leverage on oil prices
- Significant political pressure (US midterms) prompted mass SPR releases to contain oil prices
- 2023: US SPR down 50%+ from all-time high to 80's lvl
- SPR depletion reduces ability to defend OPEC supply disruptions

The OPEC bailout never materialized



Kingdom Claims
- Plenty of spare capacity to tap into
- Several years before production plateau

Verified Reserves
- Production currently plateauing
- Steep production declines imminent over next 5-10 years

- **DCM Thesis Refresh:** ***"OPEC is incapable of meeting production targets due to declining reserves and will cut production accordingly"***

- OPEC+ cut production by more than 2.5 million bpd since the start of 2023
- Looking ahead, sustained oil output cuts from Saudi Arabia and Russia until 1Q/24 will mean a **substantial market deficit through Q4/23**

A Callback to our previous IO: what has been happening with Energy?

High-interest rates and EROEI concerns discouraged investment in renewables, but momentum is shifting

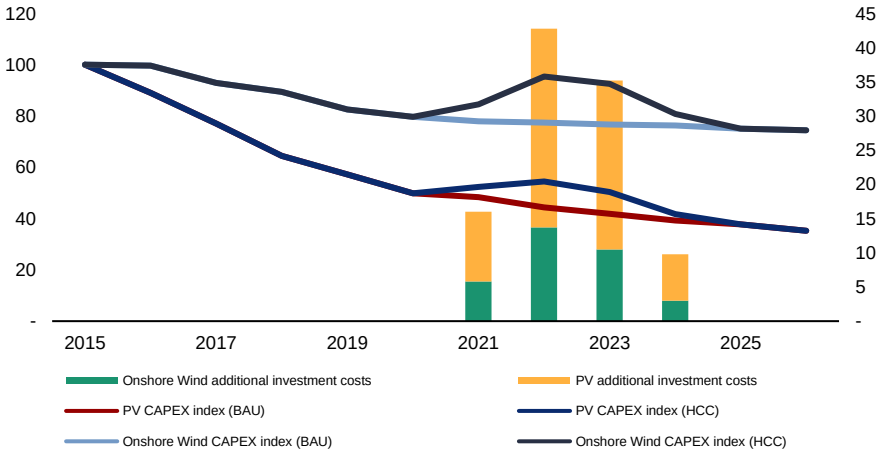
Drivers of investment in Renewables

EROEI curves place renewables at a disadvantage
- Wind & Solar (EROEI 12.5x) trail O&G (30x) and Coal (48x)
- In the crisis context, governments prioritize fossil fuels: the Netherlands temporarily reopened its coal sector (+70%)

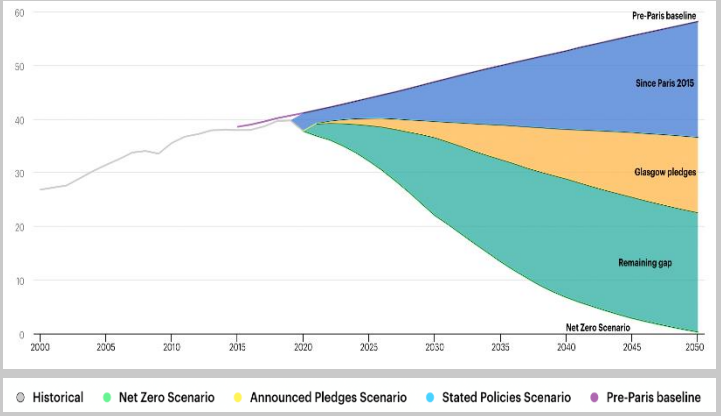
Commodity & rate appreciation drives investment costs
- Renewable projects are sensitive to **input commodity prices**
- **High interest rate** environment further raises financing cost
- YoY, wind projects +10%, solar 12%, Li-ion batteries +15%

A reversal in momentum as renewable investment rallies
- Governments are far behind their **Paris Agreement pledges**
- Widespread shift to renewables as **decarbonization lever**
- IRA further incentivizes major renewable investment

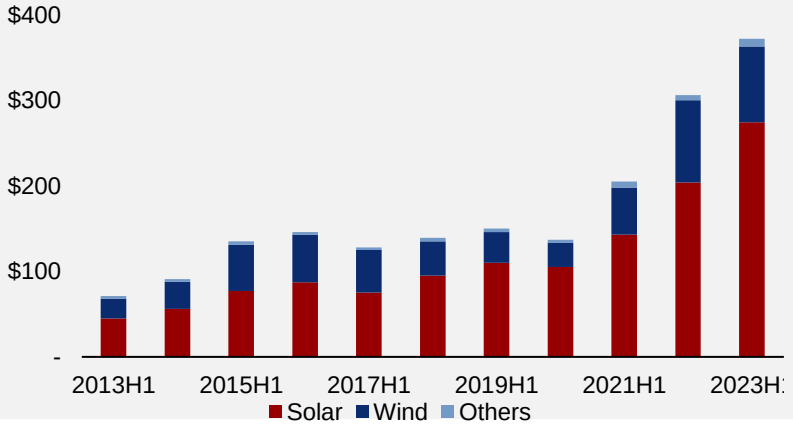
Impact of high commodity price scenario



Scenario Analysis: fulfilling the net-zero pledge



Investment in Renewable Energy

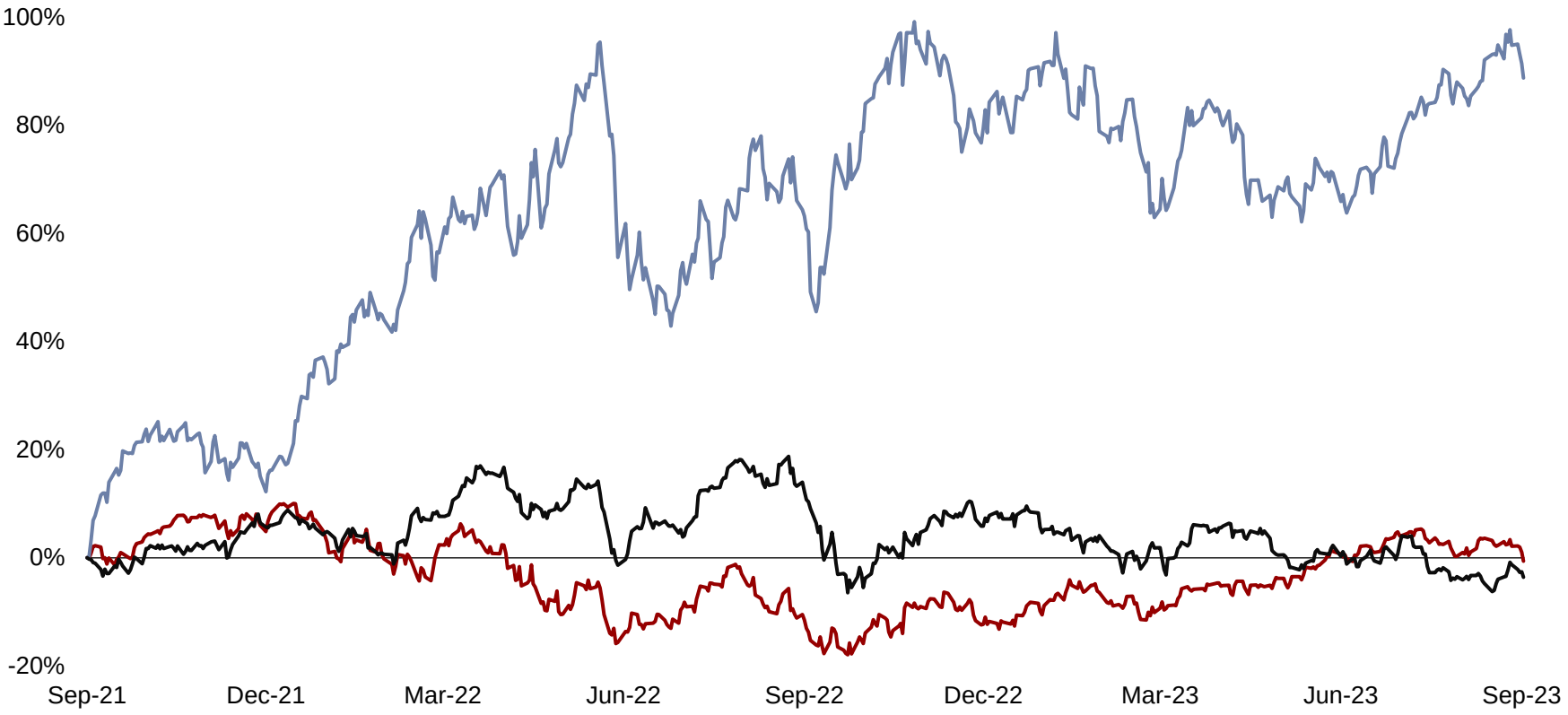


Nuclear Energy remains the only source of high EROEI carbon-free baseload power

Sources: IEA, G&R, Bloomberg

Recent Performance

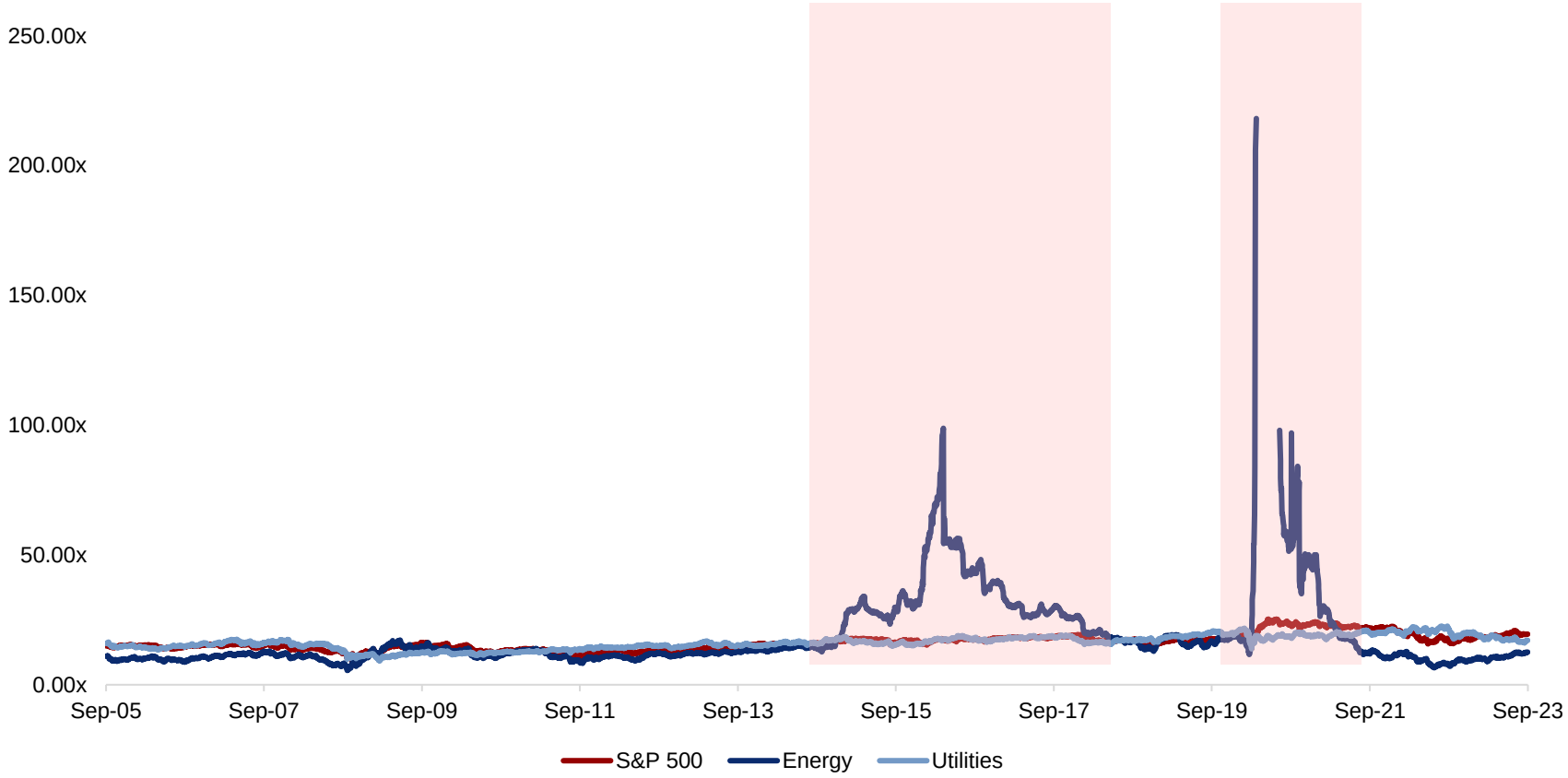
How do evolutions in the energy and utilities space translate to financial performance? (2Y)



	LTM Returns	YTD Returns	PE Expansion	Earnings Growth	Exp. Earnings Growth
S&P 500	16.97%	12.97%	-8%	9%	10.4%
Energy	18.83%	5.82%	5%	-15.5%	6.48%
Utilities	-11.80%	-10.23%	-14%	+12.2%	8.92%

Sector Relative Valuation

Historical and current relative valuation of the Energy and Utilities sector



	Fwd. P/E (20y avg.)	Fwd. P/E (Current)	Spread (20y avg)	Spread (Current)
S&P 500	16.32x	19.52x		
Energy[1]	17.38x	12.50x	1	-7
Utilities	16.23x	17.05x	0.1	-2.5

Energy's discounted P/E is largely due to rapid earnings growth from the 2021-2022 Energy Crisis. Market prices slow normalization of earnings.

Sources: Bloomberg, Capital IQ

Notes : 1) Outliers Excluded

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Subsector – Oil & Gas

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Oil & Gas - Products

The Big 3 of O&G

Crude Oil

- Liquid hydrocarbon found in reserves beneath the earth's surface
- Product quality and ease of extraction varies significantly
- 10% of the world's crude reserves are in shale formation reserves

Natural Gas

- Colourless, odourless and cleaner burning than petroleum products
- Largely composed of Methane (CH_4)
- Measured in cubic feet (1000s) or BTUs
- Extracted conventionally or unconventionally
- Very similar verticals to petroleum

Natural Gas Liquids (NGL)

- Also called associated hydrocarbons, often valuable by-products of natural gas
- Propane and condensate are common
- Useful in heating, crude refining, etc.
- Previously "flared off", now mainly captured and used
- An increasingly important percentage of production for some upstream producers

Common Benchmarks

WCS

WTI

Brent

AECO

HHub

TTF

Source: RBC

Oil & Gas – Production

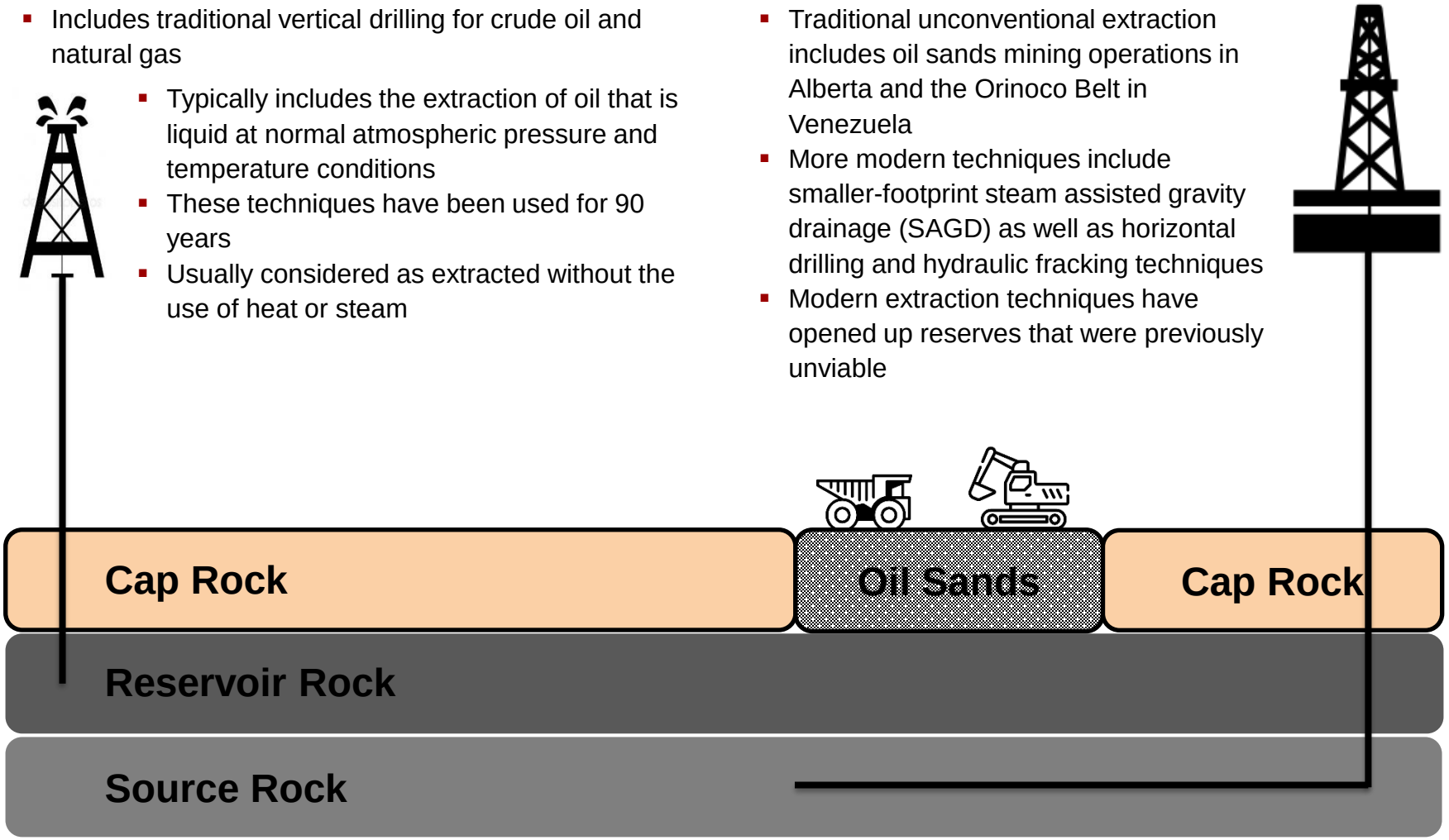
How are oil and gas produced?

Conventional

- Includes traditional vertical drilling for crude oil and natural gas
  - Typically includes the extraction of oil that is liquid at normal atmospheric pressure and temperature conditions
  - These techniques have been used for 90 years
  - Usually considered as extracted without the use of heat or steam

Unconventional

- Traditional unconventional extraction includes oil sands mining operations in Alberta and the Orinoco Belt in Venezuela
- More modern techniques include smaller-footprint steam assisted gravity drainage (SAGD) as well as horizontal drilling and hydraulic fracking techniques
- Modern extraction techniques have opened up reserves that were previously unviable



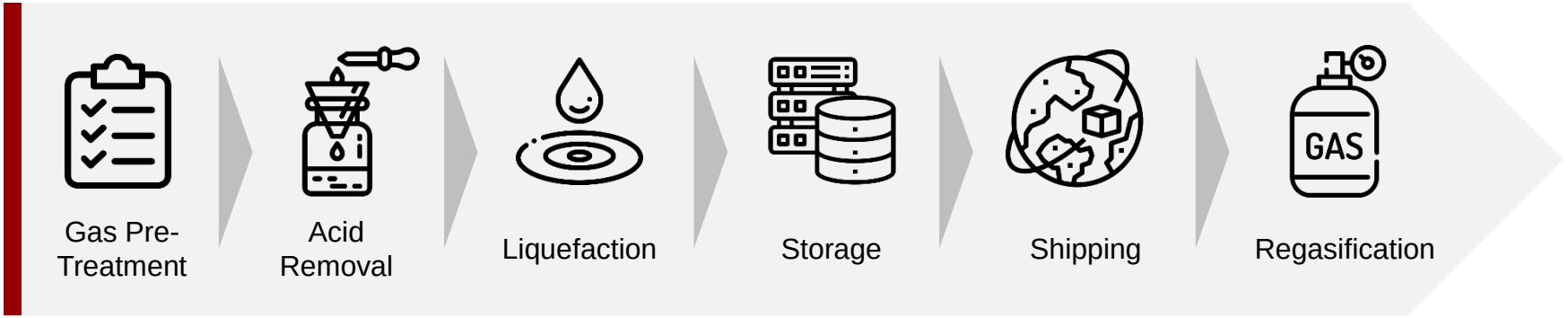
It is significantly more expensive to produce through unconventional methods

Sources: AER, EIA, Statcan

Liquid Natural Gas Refresher

The Notorious L.N.G.

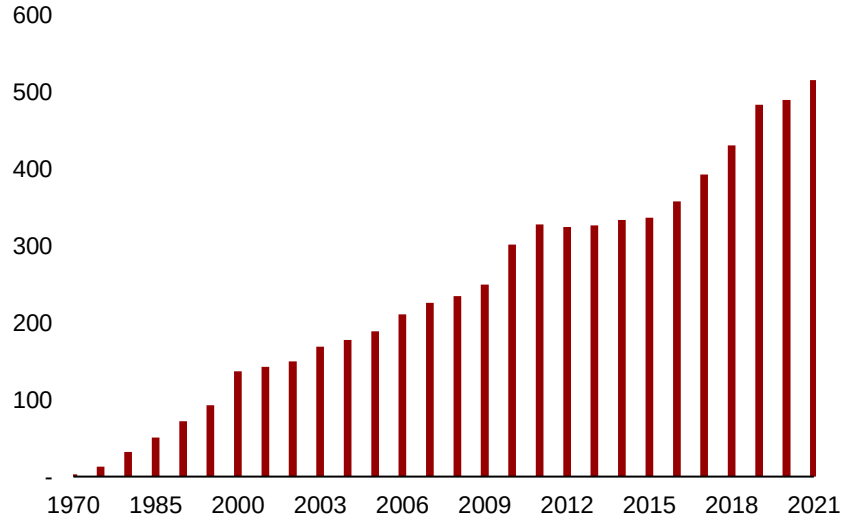
Production Process of LNG



Growth Potential

- Liquefied Natural Gas demand is poised to **grow at an annual rate of 3.4%** through 2050, compared to 0.9% for natural gas
- **LNG demand grew by 1% in 2020** during the height of COVID, while **natural gas demand fell by 1.2%**
- Essential for European and East Asian energy security
- NG is favored by energy contracts with emissions clauses
- Downsides include cost of production and transportation and very expensive ($15bn+) import/export terminals
- Due to high Capex for LNG production, industry is relatively concentrated for its nascent status

Global LNG Trade Volumes (in billion cubic meters)

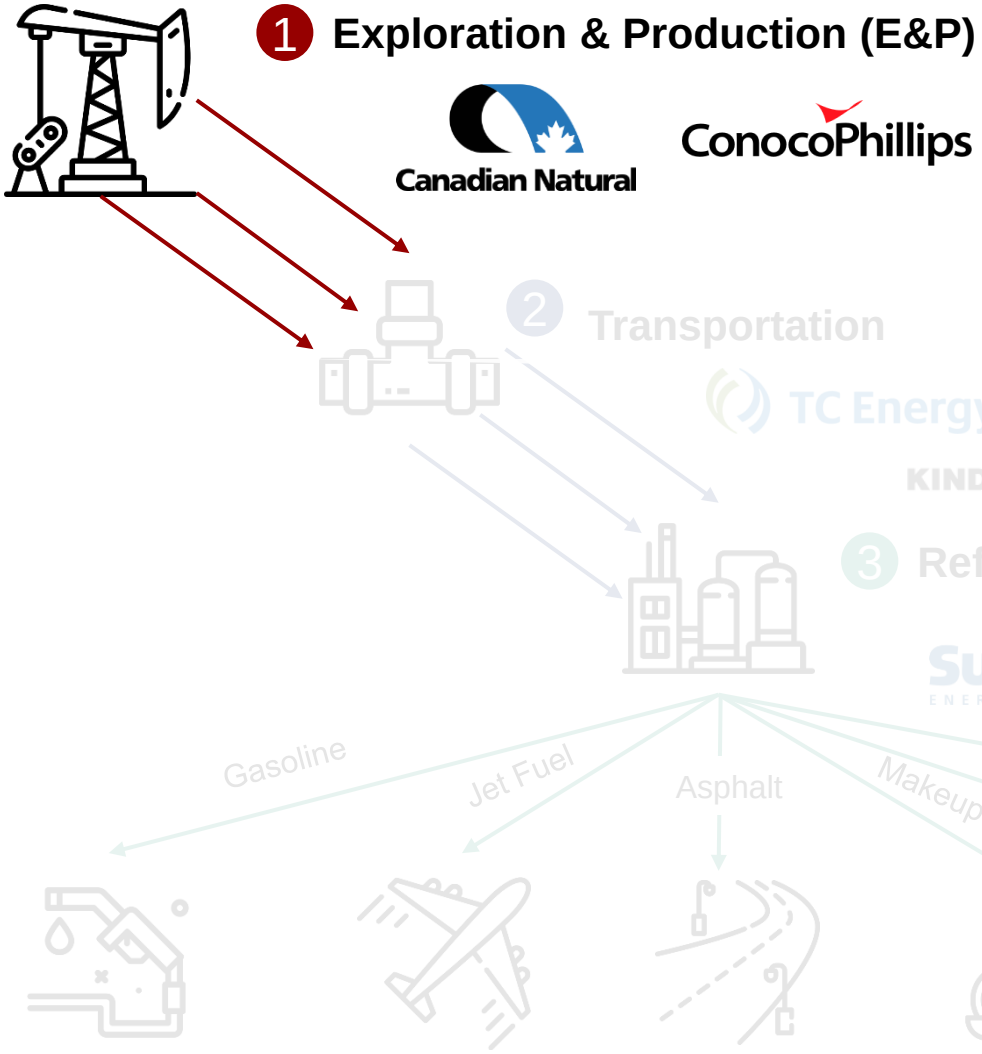


Long process between refining and end product

Source: Energy Made Simple, BMO Capital Markets, Statista, Scotiabank

Oil & Gas Value Chain

Thank you, dinosaurs



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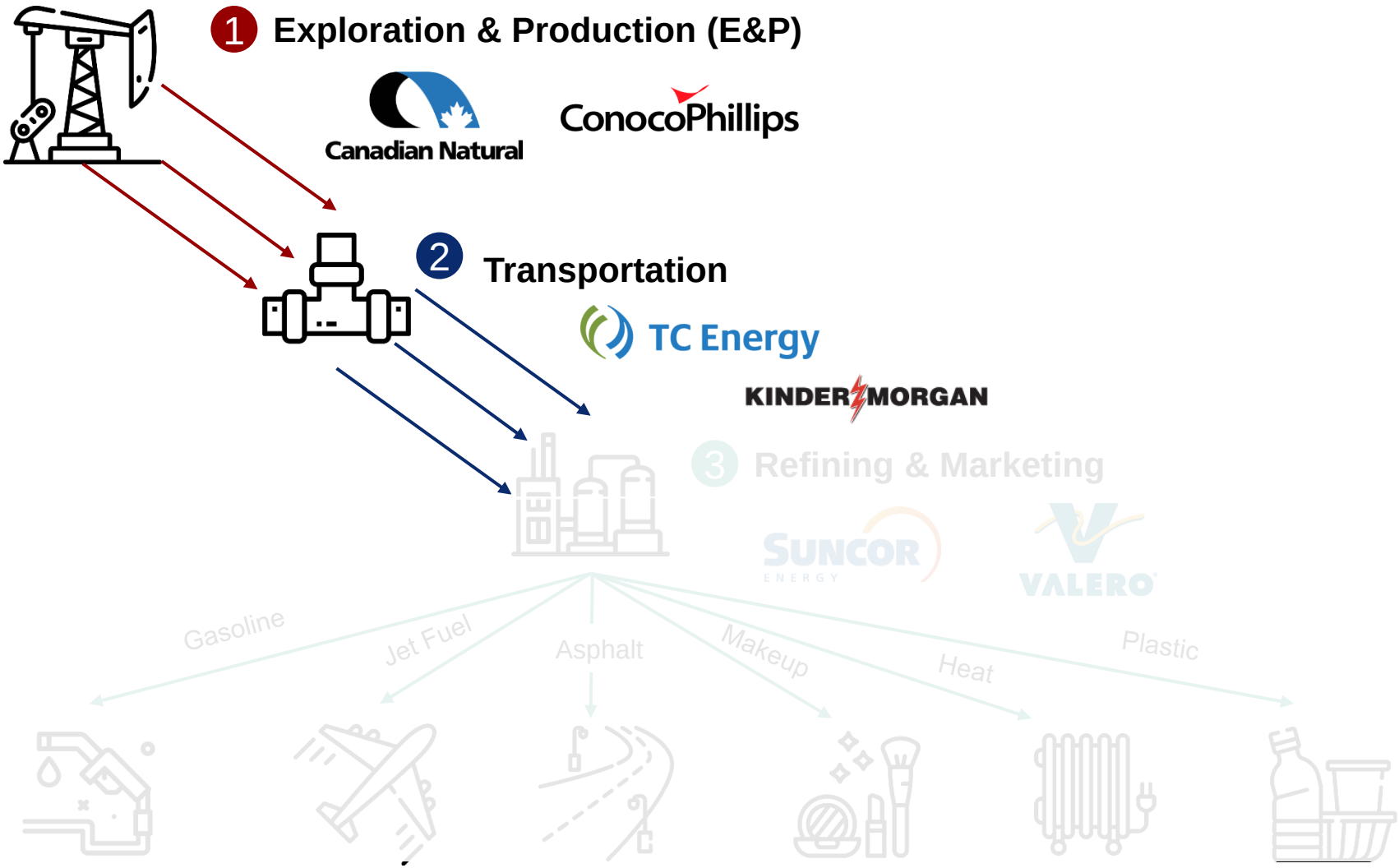

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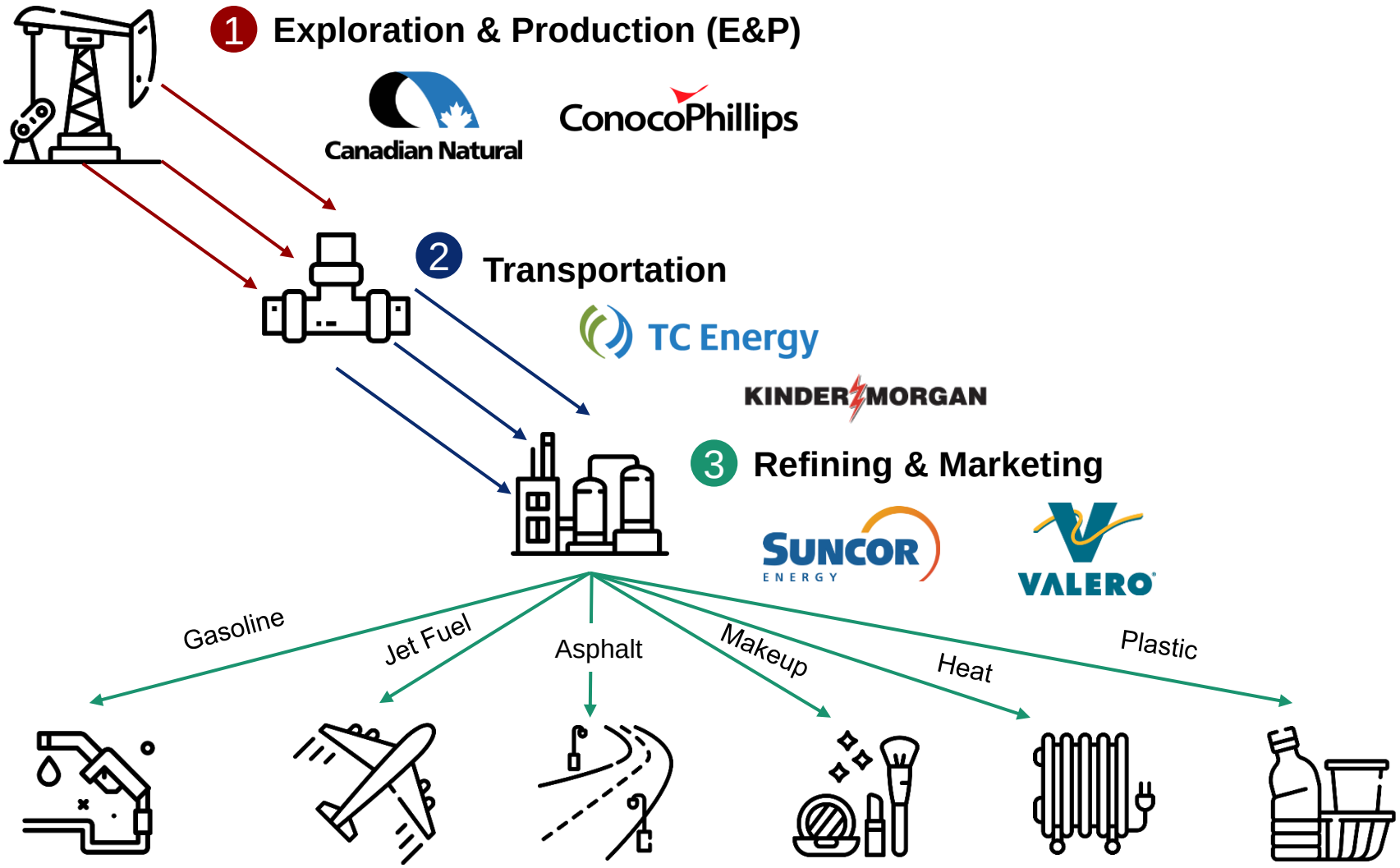
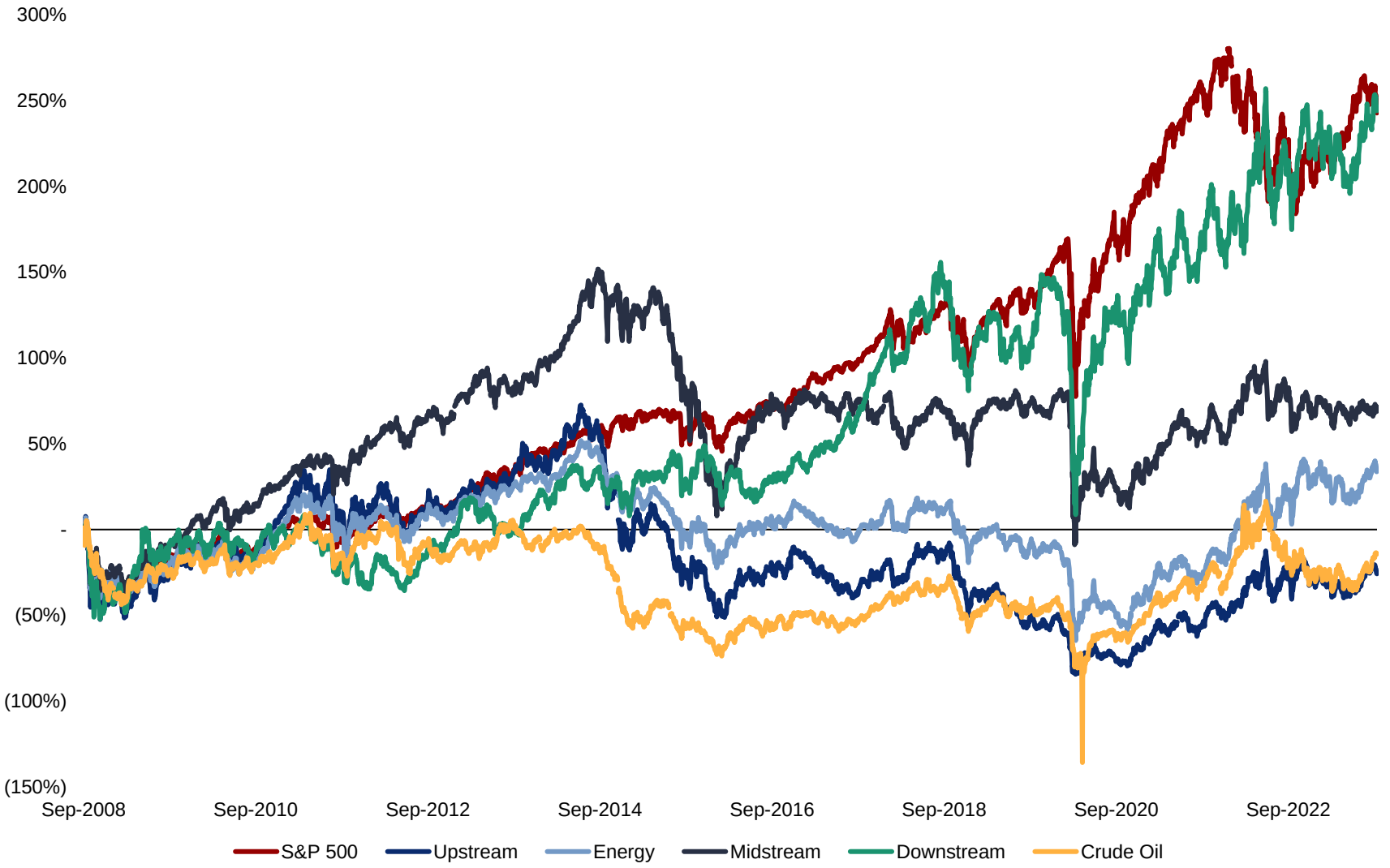


15-Year Returns

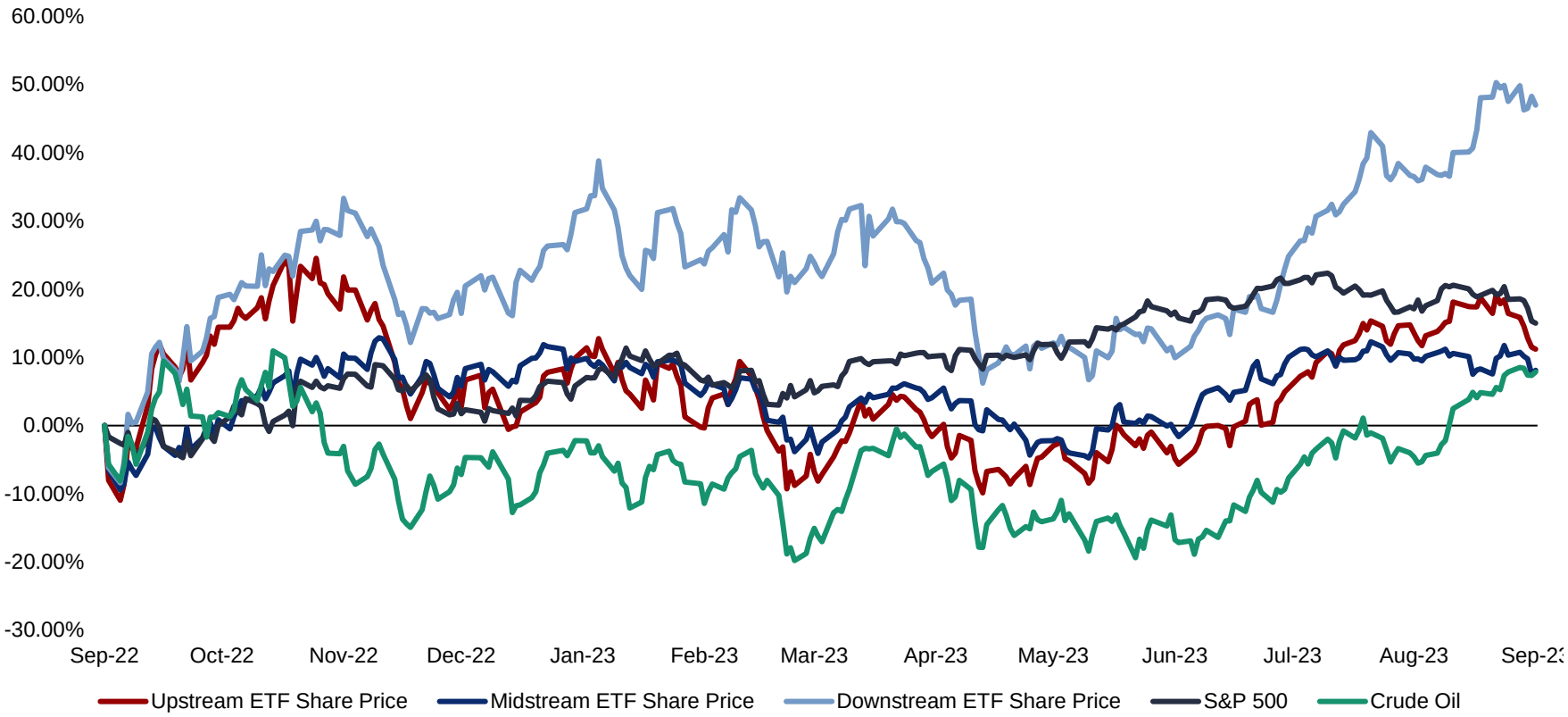


Source: Bloomberg

Crude Subsector Overview

How do crude subsectors respond to changing oil prices?

Energy Weight in S&P 500: 4.60%



	Upstream	Midstream	Downstream
Beta	0.67	0.31	0.40
Standard Deviation	4.2	2.2	2.6

Upstream oil securities move the most closely to changes in crude oil prices

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Upstream

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Upstream

First on everyone's chopping block

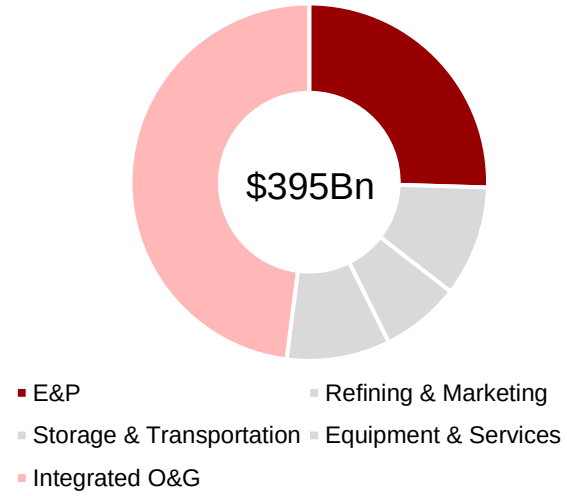
General Information

Exploration
Aims to identify subsurface hydrocarbon deposits and estimate commercial viability

Production
Drilling wells to extract crude oil & natural gas from wells with various techniques

Revenue Streams
E&P companies are price takers: sell their O&G for the going market rate → higher volatility

Market Share



Key Metrics

- **Field Netback:** Margin created from a barrel of oil after subtracting standard costs & indicates profitability of the asset without T&I
- **Average Realized Prices:** Based on the "netback" period. Often reported on a gross and/or net of hedging gain/loss
- **Hedging gain/loss:** can be realized (from closed derivative positions) or unrealized (market-to-market gain/losses)
- **EBITDAX:** earnings before interest, taxes, D&A and Exploration
- **EV/EBITDAX;EV/boed:** valuation multiples

Competitive Forces

Integrated O&G Companies

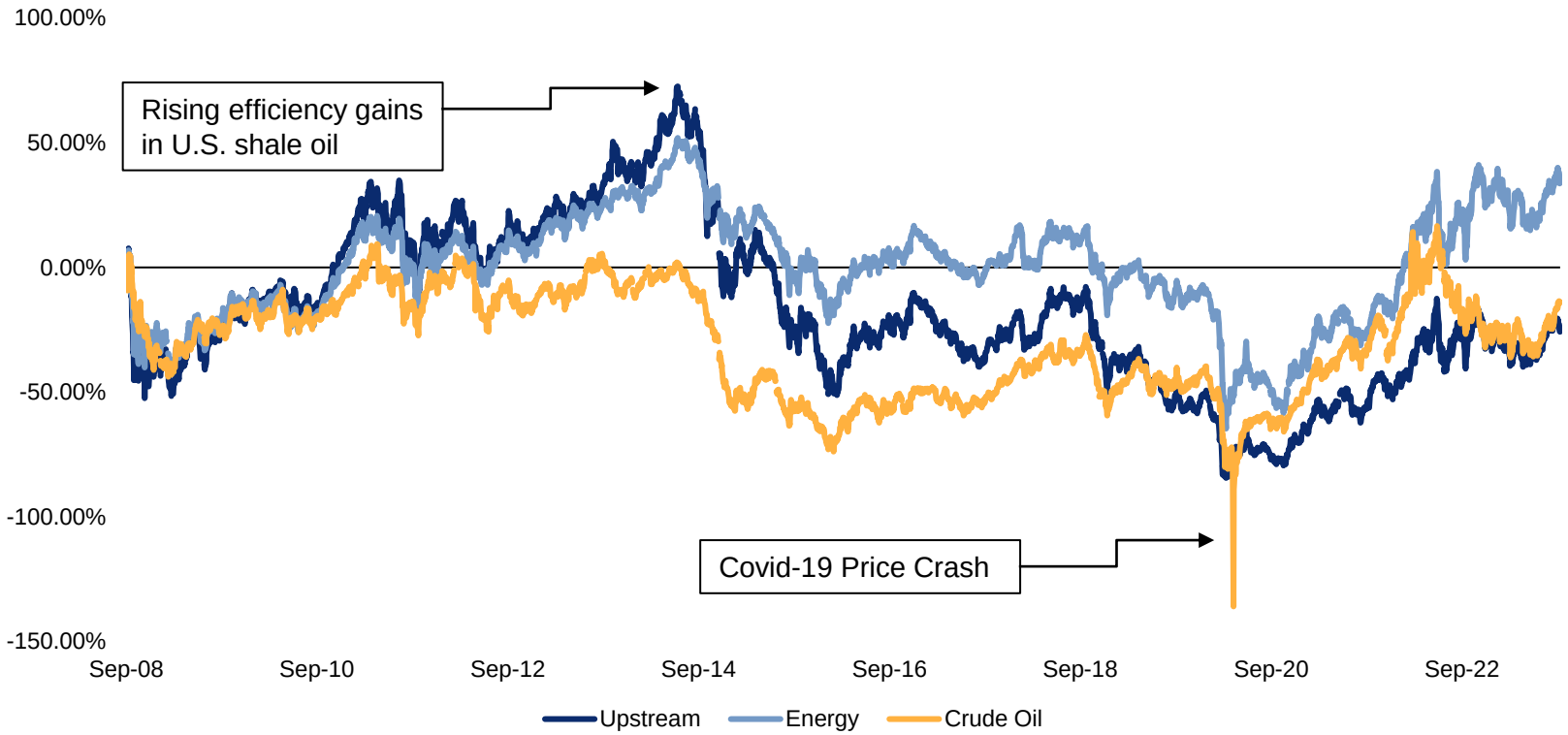
Private Upstream O&G Companies

National O&G Companies

High level of competition and high barriers to entry due to the monopolistic nature of IOCs and National Companies' activities

Source: EIA

15-Year Returns



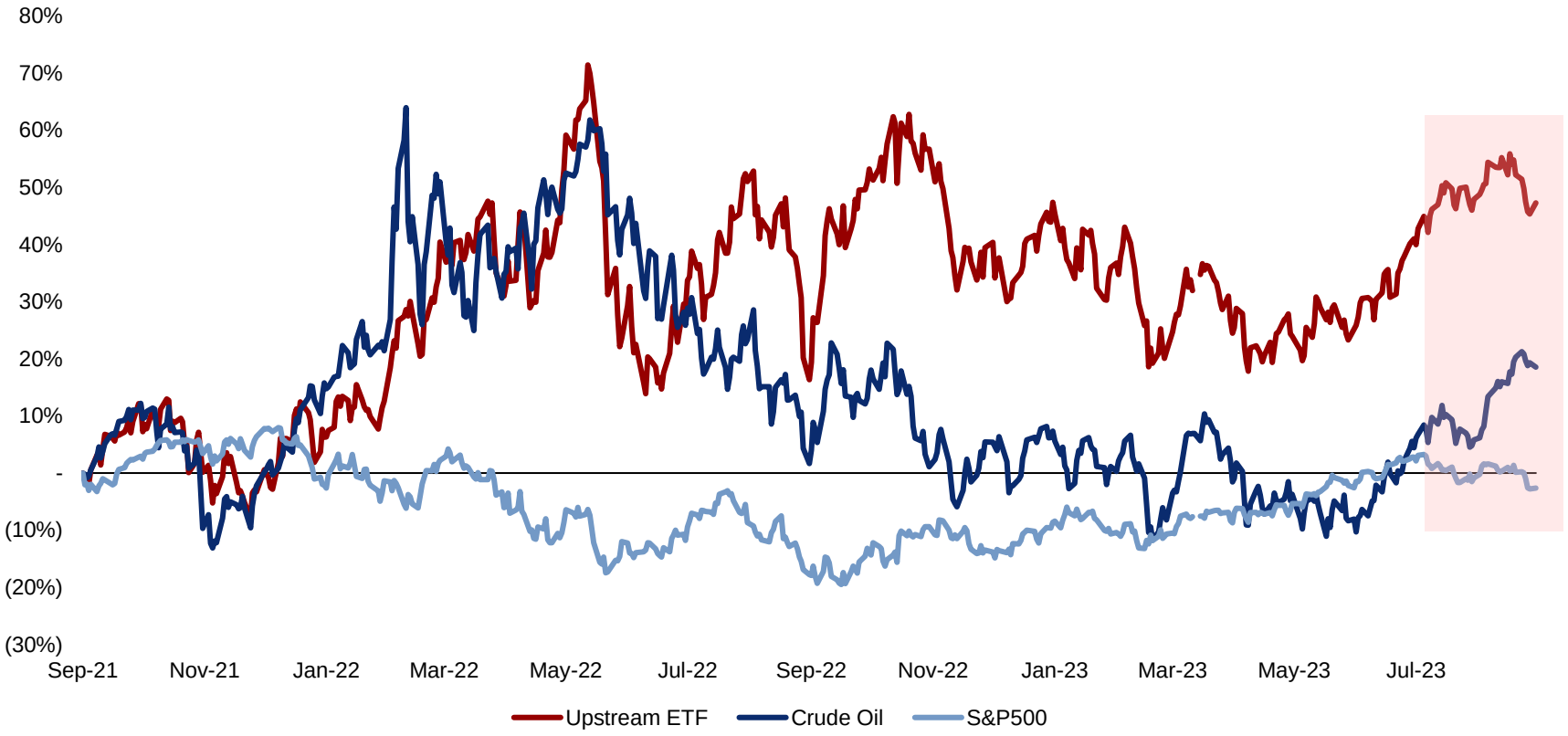
Upstream Subsector	**0.67** Beta	**42.3%** Annualized Standard Deviation
Energy Sector	**0.67** Beta	**32.6%** Annualized Standard Deviation

E&P Companies are Price Takers → **Sell O&G to going market rate** → **Subject to volatility** → **Moves most closely to changes in oil prices**

Source: CapIQ

2Y Returns

Recent Performance



18.54%
LTM Returns

0.93%
1 Year Returns

+31.0%
PE Expansion
40% of change in P

-48.23%
Earning Growth
60% of change in P

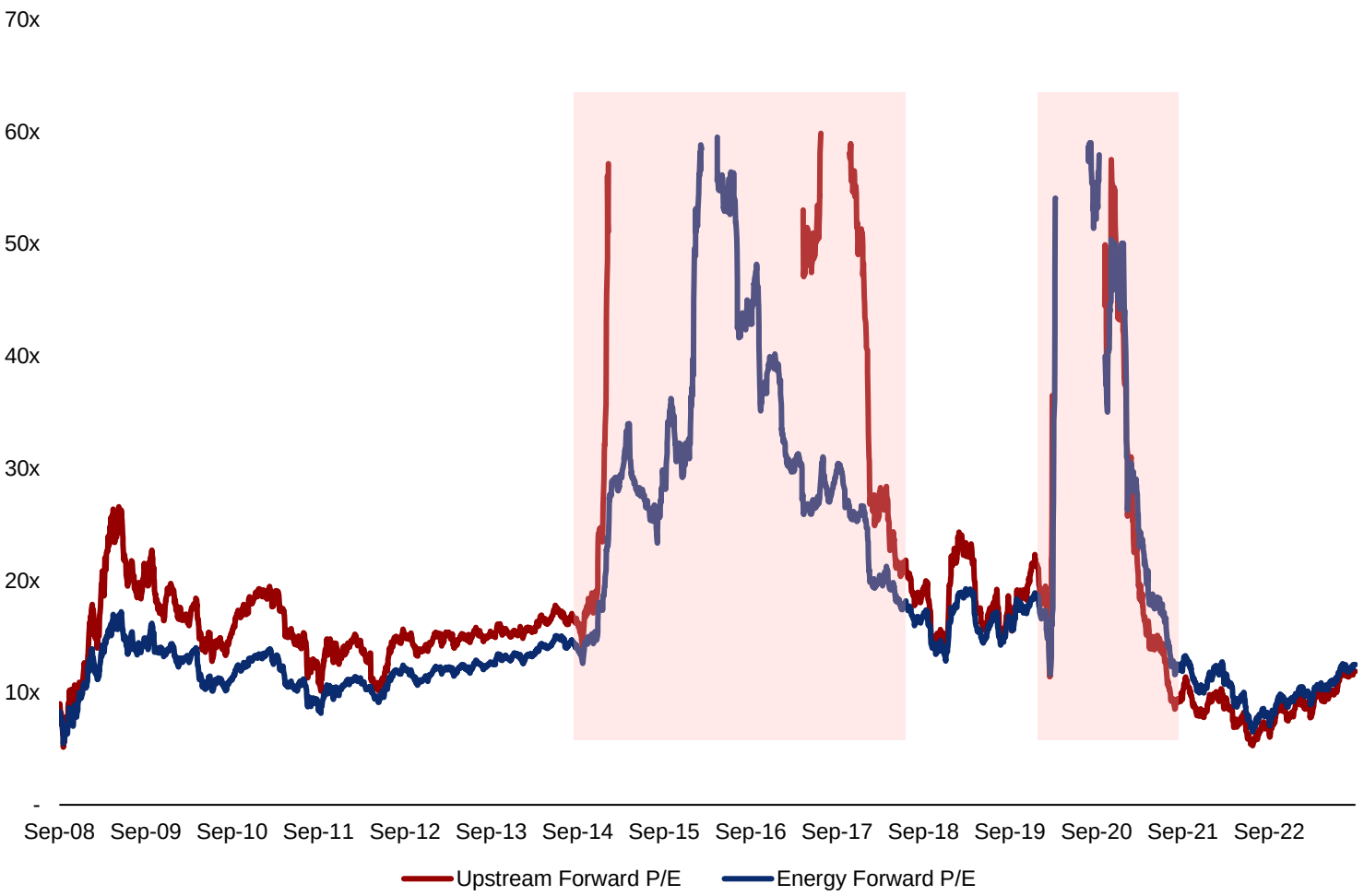
6.4%
Expected Earnings Growth

Shift to more reliable fossil fuels because of the energy crisis

Source: CapIQ, Reuters

Current Valuation – Forward PE last 15 Years

Upstream Forward P/E



17.36x
Average
Forward PE

11.92x
Current
Forward PE

1x
Average Spread

0.58x
Current Spread

Upstream is trading at a discount compared to historical averages

Source: CapitalIQ

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Midstream

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Midstream

Overview

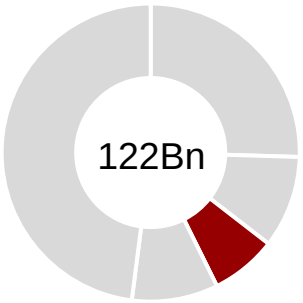
General Information

Transportation & Storage
Offshore and onshore, facilitating transfer from production sites to refineries or consumers

Infrastructure Investment
Safe and efficient transport of O&G, expanding and upgrading facilities to meet growing demand

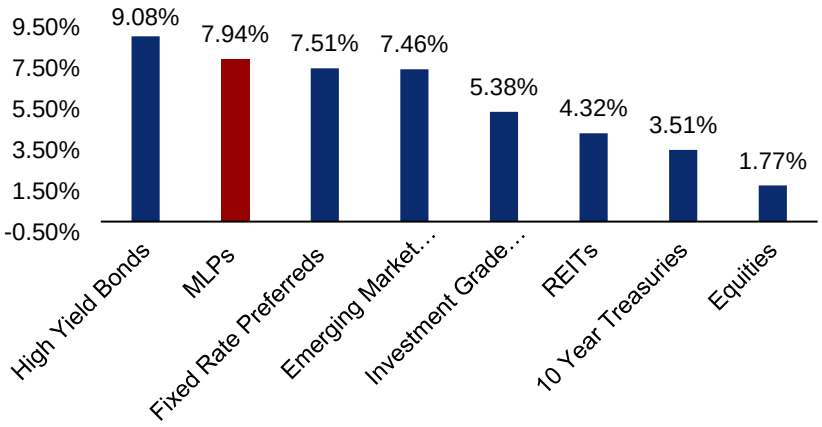
Revenue Streams
Fee-based arrangements, providing more stable cash flows and less susceptible to price volatility

Market Share & Key Players

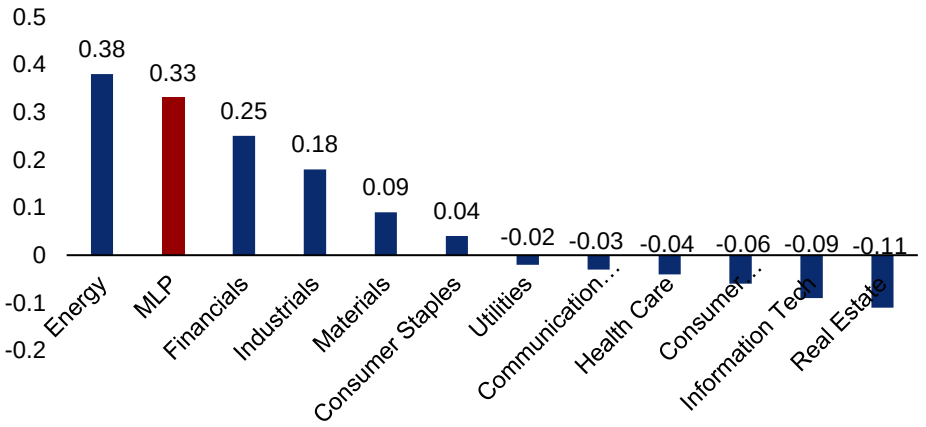


TC Energy
KINDER MORGAN
dcp Midstream
PLAINS
HESS Hess Midstream

Yield Spread Analysis



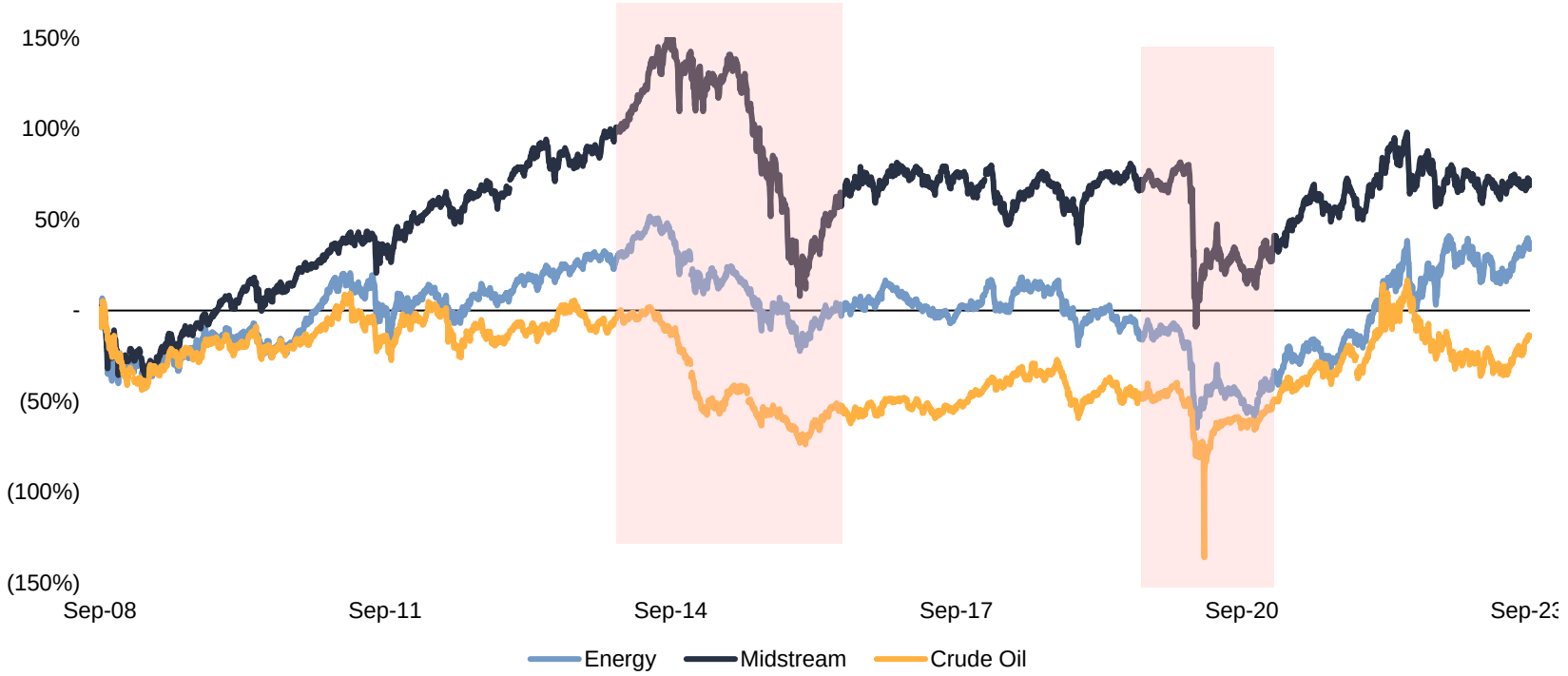
Correlations with 10-Y Treasury



Commodities exposure and inflation protection provisions in contracts allow higher yield even in uncertain conditions

Source: EIA, Deloitte

15-Year Returns



Midstream Subsector

0.31	20.6%
Beta	Standard Deviation

Energy Sector

0.67	32.6%
Beta	Standard Deviation

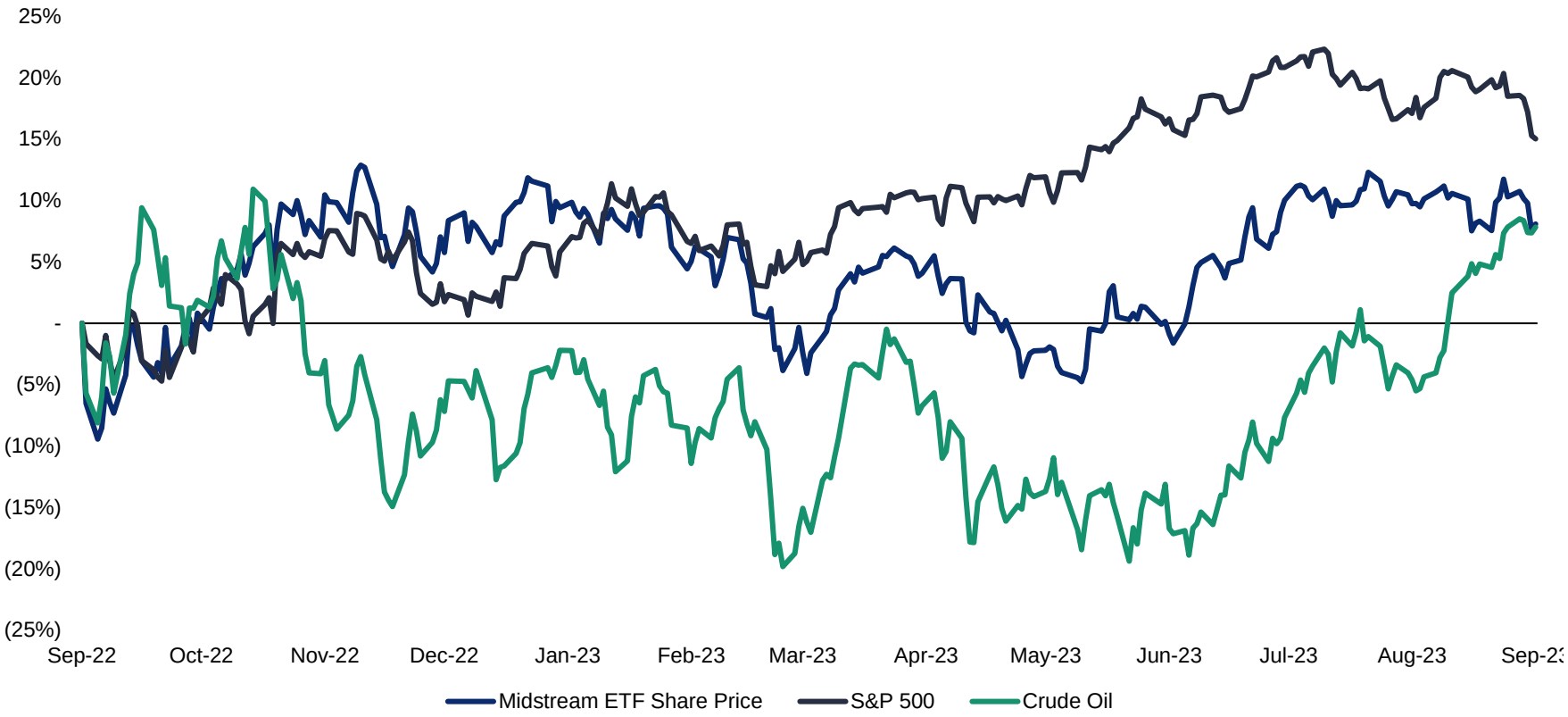
Fee Based arrangements → **More stable cashflows** → **Less price volatility**

After 2 periods of investor uncertainty towards midstream, the sub-sector is proving resilient

Source: CapIQ

1Y Returns

Recent Performance

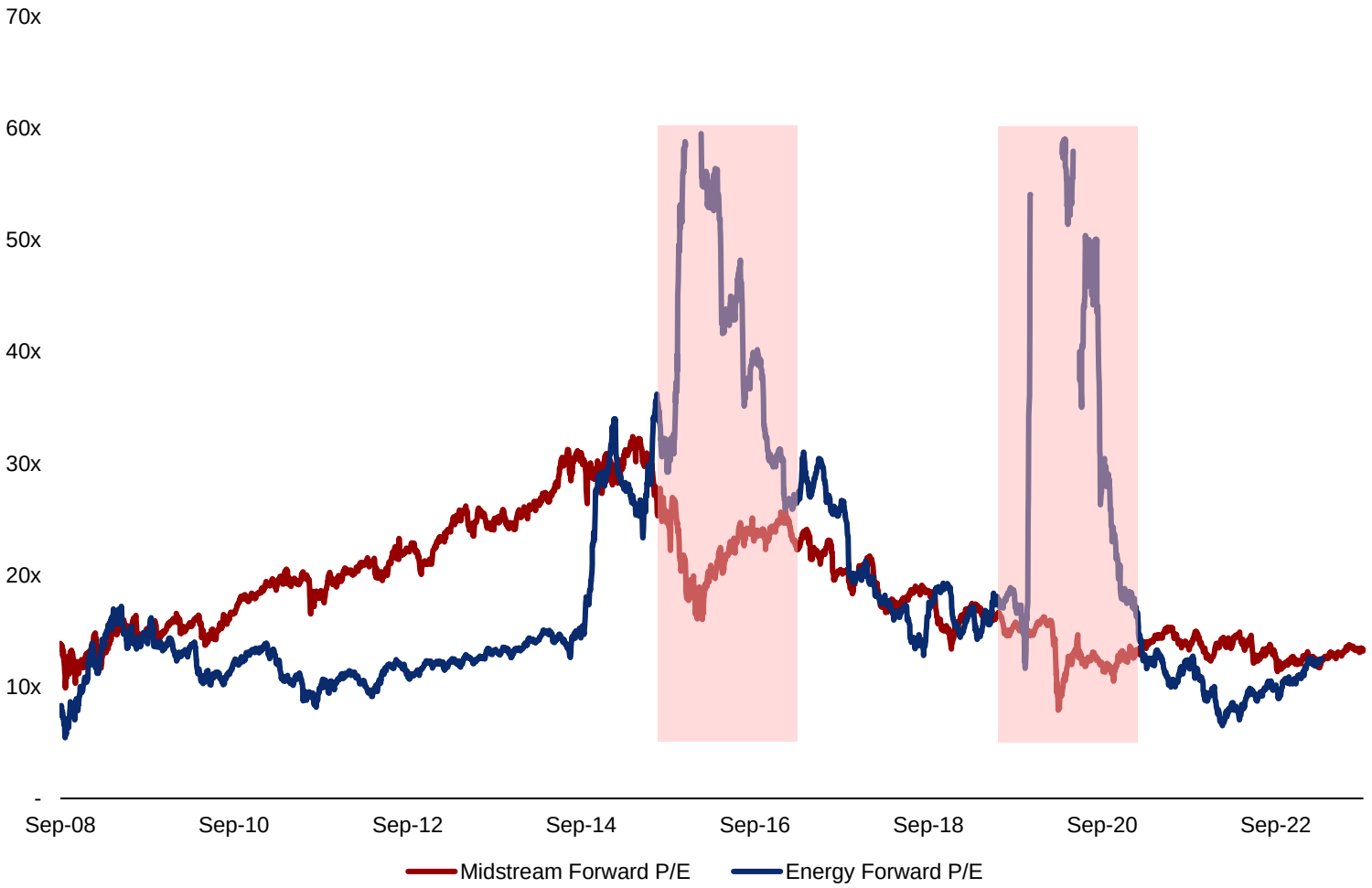


6.14%	2.91%	10.57%	-53.25%
LTM Returns	**YTD Returns**	**PE Contraction**	**Earning Growth**
		17% of change in P	*83% of change in P*

Source: CapIQ

Current Valuation – Forward PE Last 15 Years

What is the market seeing?



18.52x
Average
Forward PE

13.29x
Current
Forward PE

1.19x
Average Spread

0.79x
Current Spread

Midstream is trading at a discount compared to historical averages

Source: CapitalIQ

Desautels Capital Management

Honours in Investment Management

Downstream

Section V

DESAUTELS Capital Management
Gestion de capitaux

McGill

Downstream

Overview

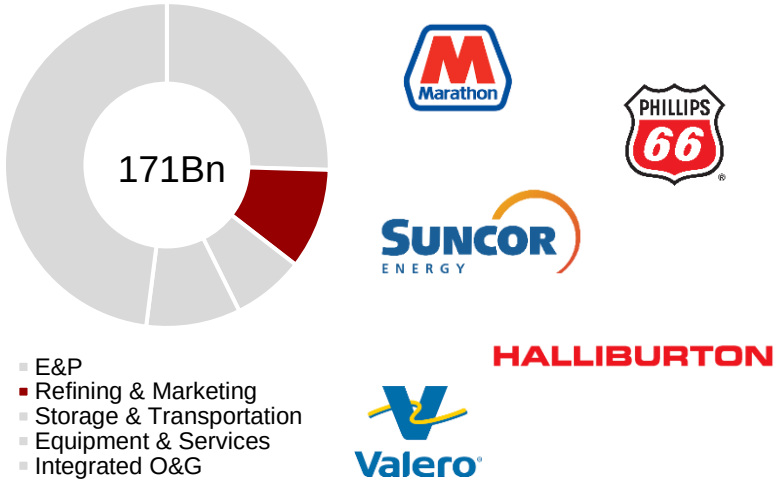
General Information

Refining
Processing into various products like gasoline, diesel, jet fuel

Distribution & Marketing
Transporting refined products to end-users via pipelines, trucks, and ships and marketing

Revenue Streams
Based on the spread between what they pay to buy raw materials and price

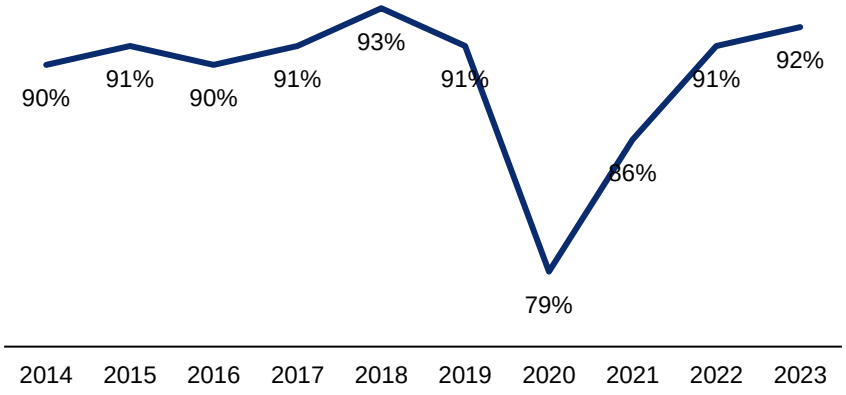
Market Share & Key Players



Key Metrics

- **Revenue per barrel:** Blended price for all petroleum products after refining the raw crude oil. Measured in mmboed
- **Gross Refining Margin (GRM):** Difference between the total revenue generated from selling petroleum products refined at an oil refinery + cost of feedstock
- **Crack Spread:** Proxy for GRM. Compares cost of crude oil inputs to spot prices of the output
- **Marketing Sales Volume:** Calculated in M Gallons

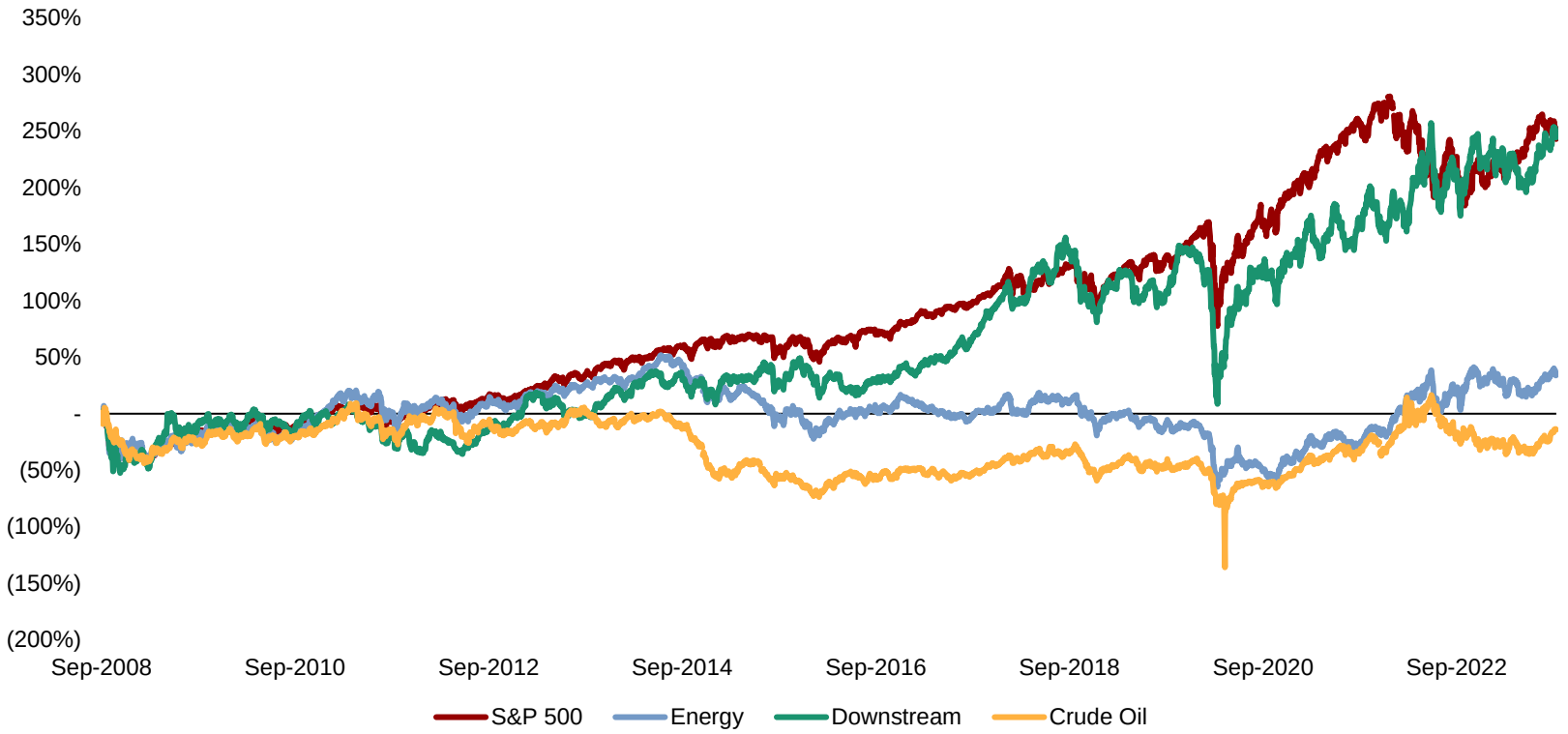
Refinery utilization rate in the U.S



Refineries are operating at near-maximum capacity

Source: EIA

15-Year Returns



Downstream Subsector

0.40	23.5%
Beta	**Standard Deviation**

Energy Sector

0.67	32.6%
Beta	**Standard Deviation**

Commodity Based Margins

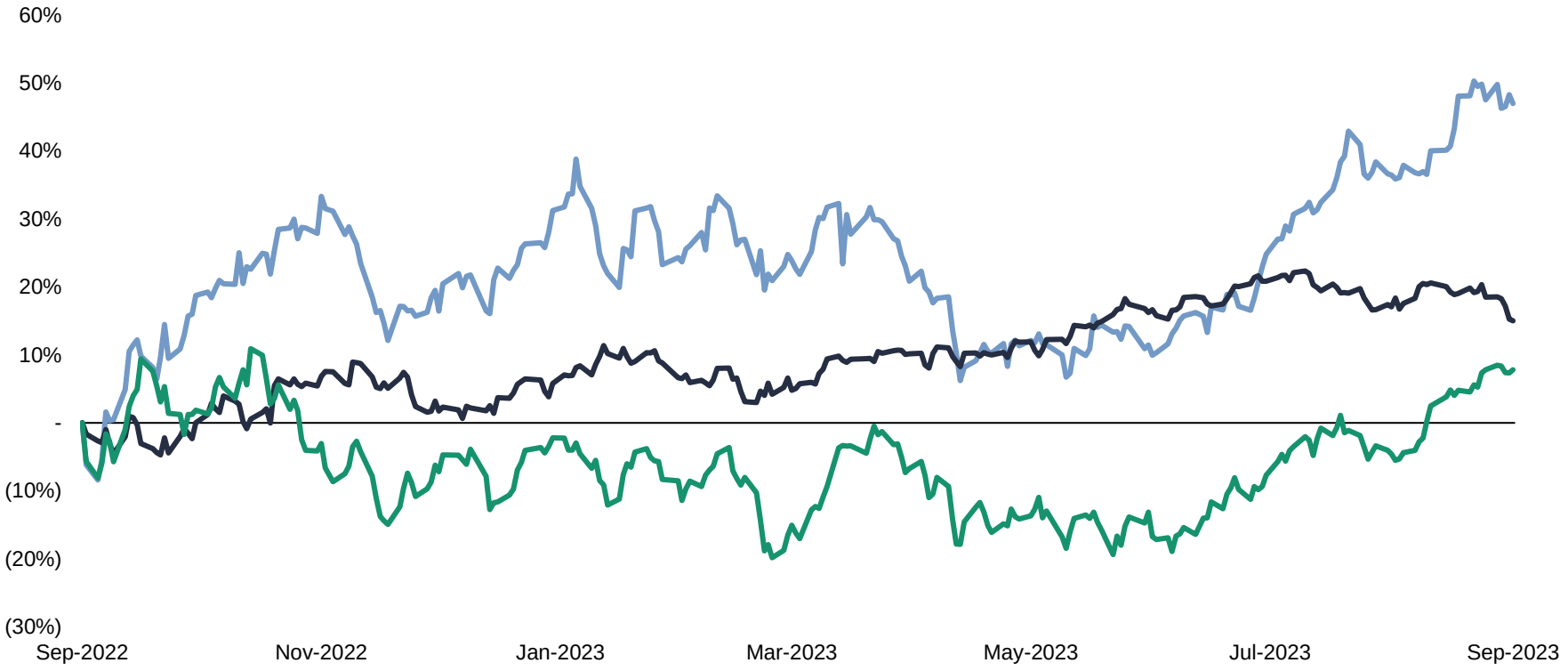
Less volatility than upstream, but more than downstream

Downstream has been the highest performing sub-sector in O&G in the past 2 years

Source: CapIQ

1Y Returns

Recent Performance



46.97%
LTM Returns

23.30%
YTD Returns

40.45%
PE Contraction
51% of change in P

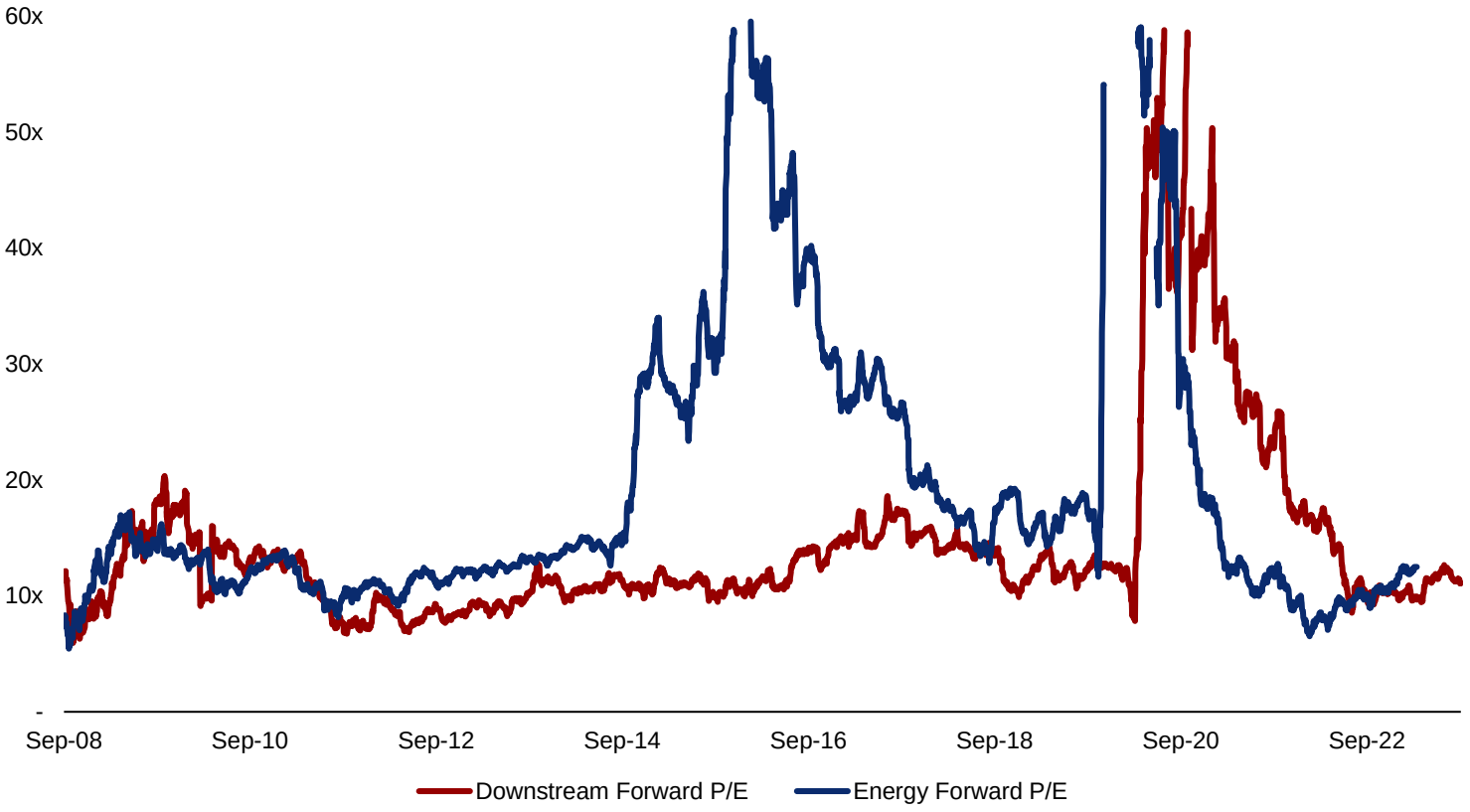
38.22%
Earning Growth
49% of change in P

Growing demand, along with reduced supplies, is driving downstream's performance up

Source: CapitalIQ

Current Valuation

What is the market seeing?



14.49x
Average
Forward PE

11.06
Current
Forward PE

5.22x
Average Spread

0.75x
Current Spread

Downstream is trading at a discount relative to previous years

Source: CapitalIQ

Desautels Capital Management

Honours in Investment Management

Oil Field Services

Section VI

DESAUTELS Capital Management
Gestion de capitaux

McGill

Oil Field Services

Overview

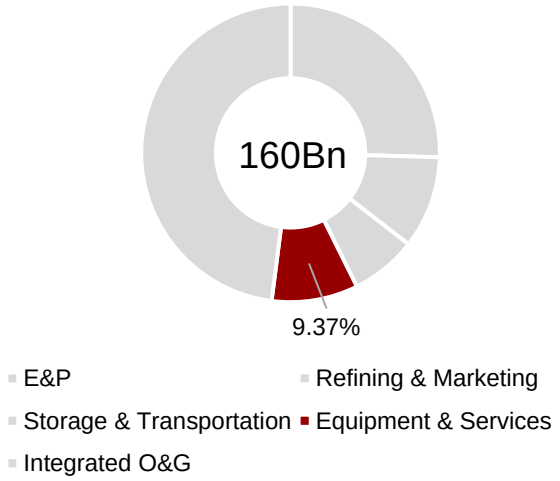
General Information

Diverse Offerings
Services including drilling, formation evaluation, well construction or completion services

Technology Innovation
Advancements like data analytics, automation and remote monitoring increase efficiency

Revenue Streams
Contracts with E&P companies; closely tied to upstream performance → high volatility

Market Share



Key Players

Schlumberger
HALLIBURTON
Baker Hughes
Weatherford
GE Oil & Gas

Competitive Forces

Drillers Most asymmetric bargains	PTEN **5.3X EV/EBITDA** H&P **3.3X EV/EBITDA**	Leverage cash upfront from clients for new rig activations
Frackers Runners-up	LBRT **5.0X EV/EBITDA** PUMP **3.0X EV/EBITDA**	As new rigs come to work multiples will adjust higher
The Big Names	HAL **12.0X EV/EBITDA** SLB **13.6X EV/EBITDA**	Growth should come from increasing cashflows

Source: EIA

Desautels Capital Management

Honours in Investment Management

Oil & Gas Outlook

Section VII

DESAUTELS Capital Management
Gestion de capitaux

McGill

O&G Outlook

What has contributed to recent performance and what we see going forward, overall

Recent News Driving Oil Prices Up

Commodities

Oil edges up on prospect of extended OPEC+ supply cuts

By Stephanie Kelly

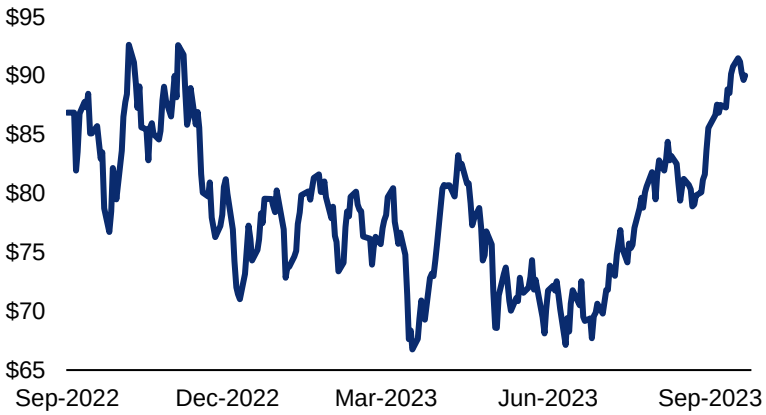
September 4, 2023 2:02 PM EDT · Updated 19 days ago

Commodities

Russia temporarily bans fuel exports to most countries in response to shortages

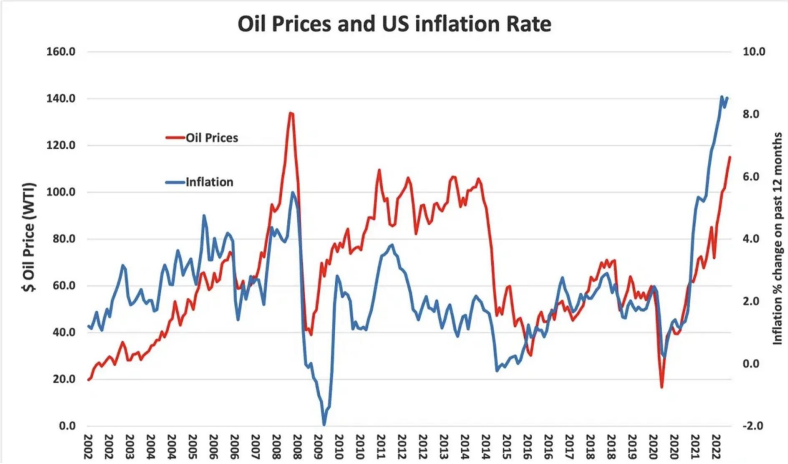
Reuters

September 21, 2023 3:36 PM EDT · Updated 2 days ago



Oil Prices have reached 90$ a barrel this week

Uncertain Macroeconomic Conditions

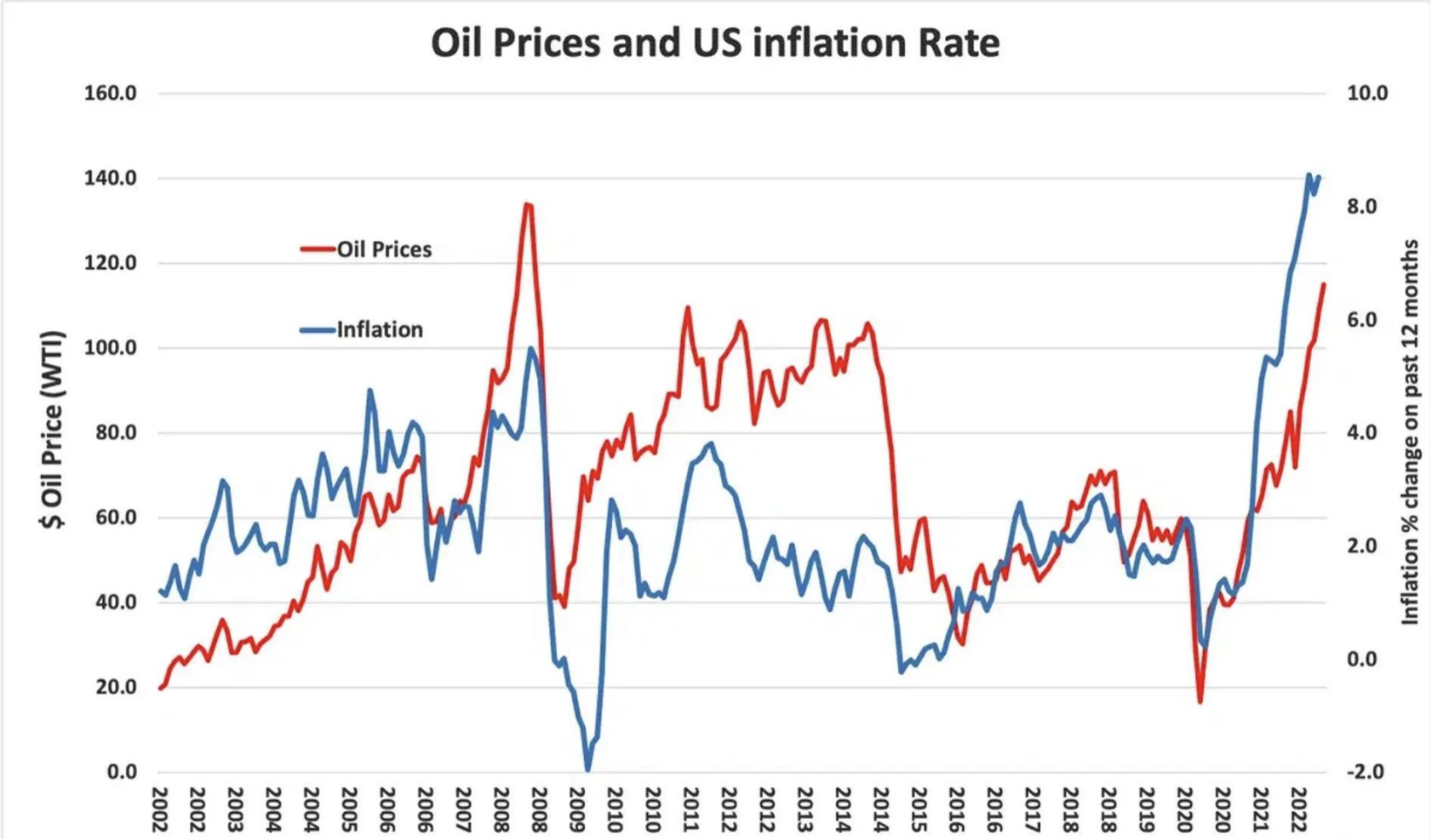


"Typically, rising crude oil prices are either a significant component in the cause of broader inflation, or the rise in oil price is a function of a strong economy and greater demand."
Bob Laccino

Source: Bloomberg NEF, McKinsey, Reuters

What has contributed to recent performance and what we see going forward, overall

Uncertain Macroeconomic Conditions

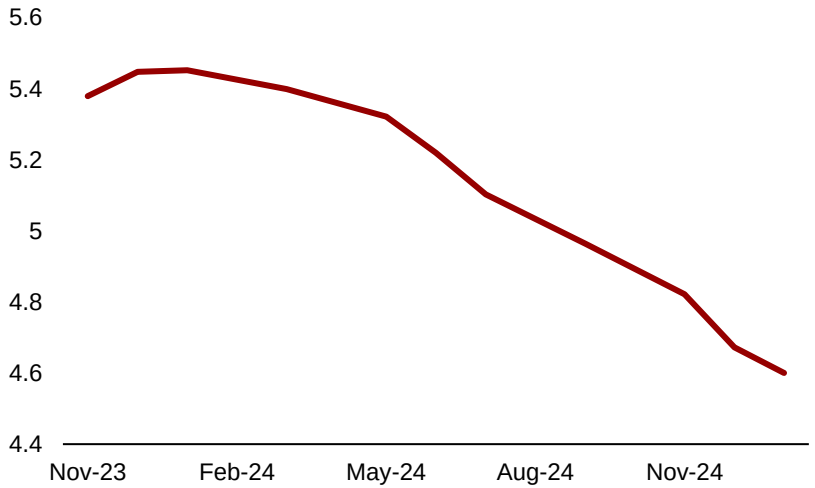


Source: Bloomberg NEF, McKinsey, Reuters

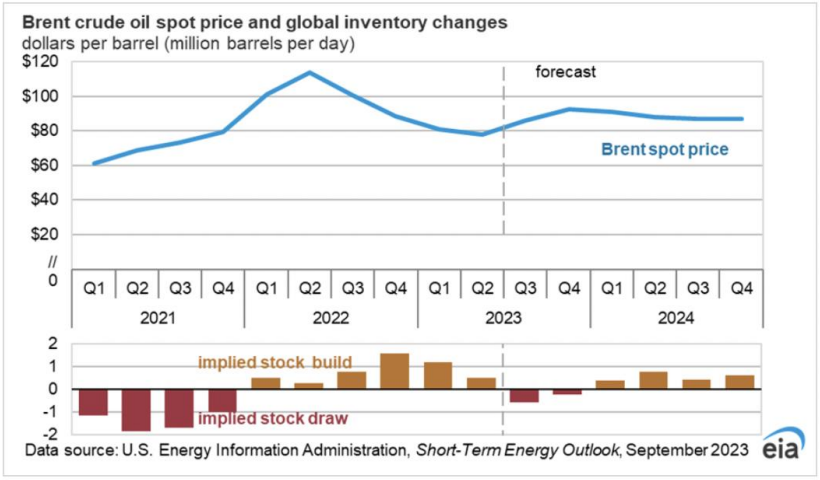
O&G Outlook (cont.)

What has contributed to recent performance and what we see going forward, overall

Interest Rate Futures



Expectation of O&G Prices



Use of O&G will remain prevalent

Conjuncture of supply & demand
Non-OPEC production seen as a driver for production growth

Reluctancy to Divest
In an uncertain economic environment, governments will prioritize crude oil

DCM's Exposure

SUNCOR ENERGY

COTERRA

DCM's holdings gives us satisfying exposure in the O&G Sector, both in the upstream and downstream subsectors

We give the O&G sector a **Market Weight** Rating

Source: EIA, Bloomberg, Reuters

Desautels Capital Management

Honours in Investment Management

The Inflation Reduction Act (IRA)

Section VIII

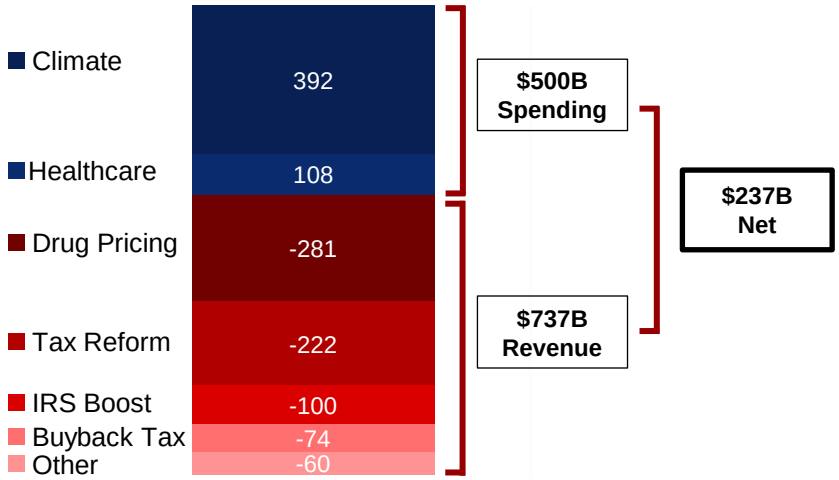
DESAUTELS Capital Management
Gestion de capitaux

McGill

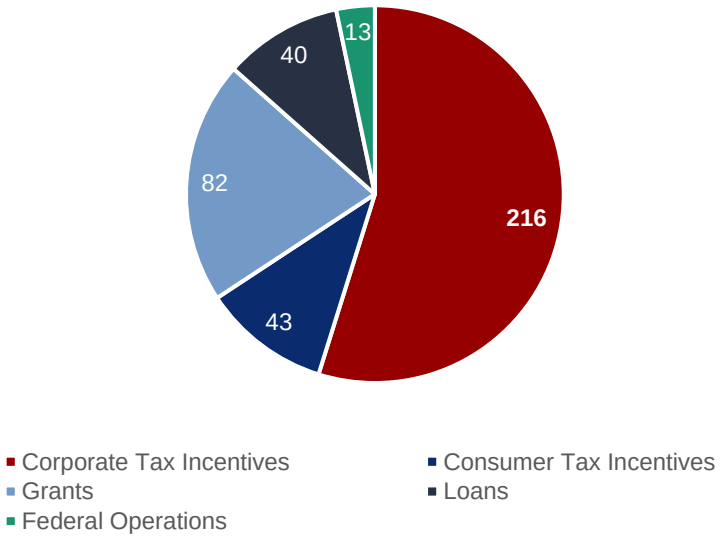
What is the IRA?

~~Inflation~~ Emissions Reduction Act

Sources and Uses



Distribution of Funds



Tangential Factors

1 *Very* Divisive

- Senate vote was split 50/50 with VP Harris casting the tie-breaking vote
- Potential for IRA to be repealed, depending on 2024 elections

2 Deficit Reduction

- Congress Budgeting Office projects $237B reduction to deficit from IRA
- Due to uncapped tax breaks, spending numbers may be understated

3 O&G Provisions

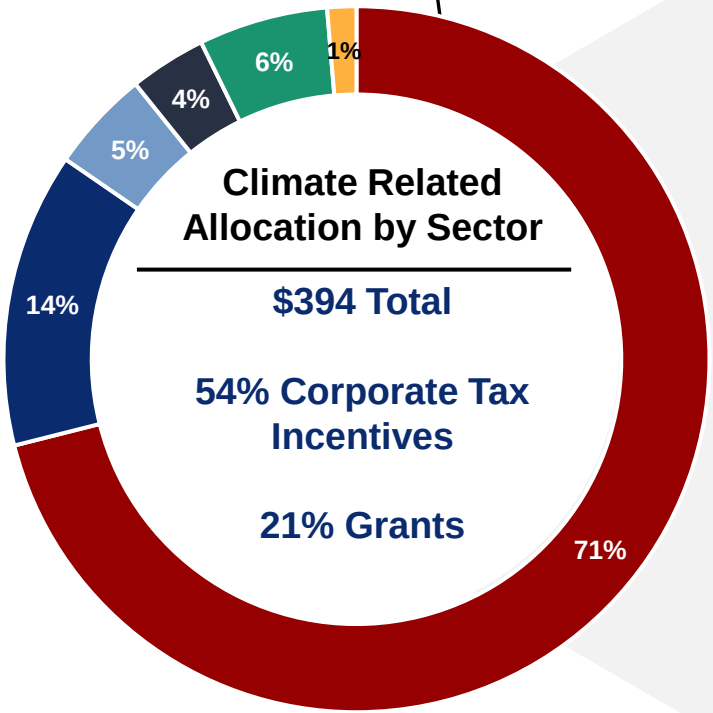
- Oil leases for new wells in Gulf of Mexico and Alaska
- 10-year clause allowing companies to extract O&G on federal land

Source: McKinsey, Statista

Breaking Down the IRA

Where is all that money going?

$250B to Energy Sector



Tax Credit Examples:

- Polysilicon Manufacturing - $3/kg
- Utility Inverter - $0.015/W
- PV Module - $0.07/W

- Offshore Wind – 30% of Expenditures
- Small Land Based Wind – 30% of Expenditures
- Generation Tax Credit - $0.026/KWh

- Electrode Materials – 10% of costs
- Battery Cells - $35/KWh
- Critical Minerals Mining – 10% of costs

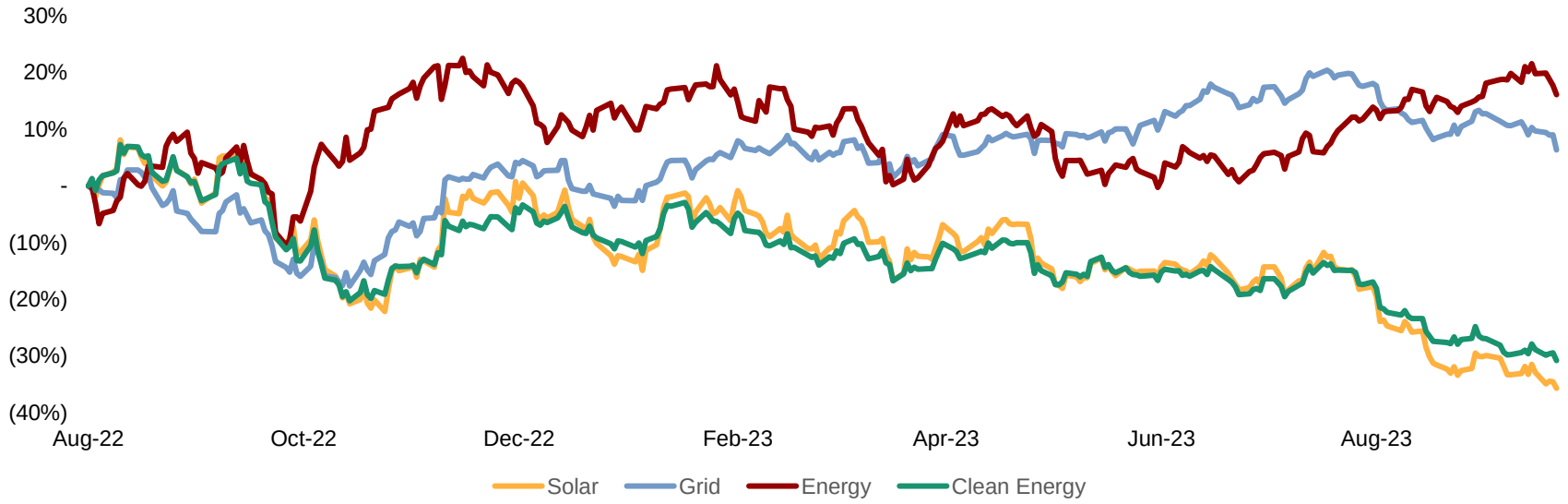
$250B distributed to energy companies that meet specific qualifications

Source: EIA, DoE. McKinsey

Clean Energy Stocks Since IRA

Solar & Wind Have Significantly Underperformed

Stock Price of Energy Industries



Explaining Clean Energy Underperformance

1

Potential Solar Overinvestment

- Annual demand: 344GW
- Annual capacity: 657Gw
- Most of supply comes from China

2

Interest Rates

- Cost of capital for solar developers has increased ~500bps
- Rates expected to peak in the next 6 months, cuts expected shortly after

3

Commodity Costs

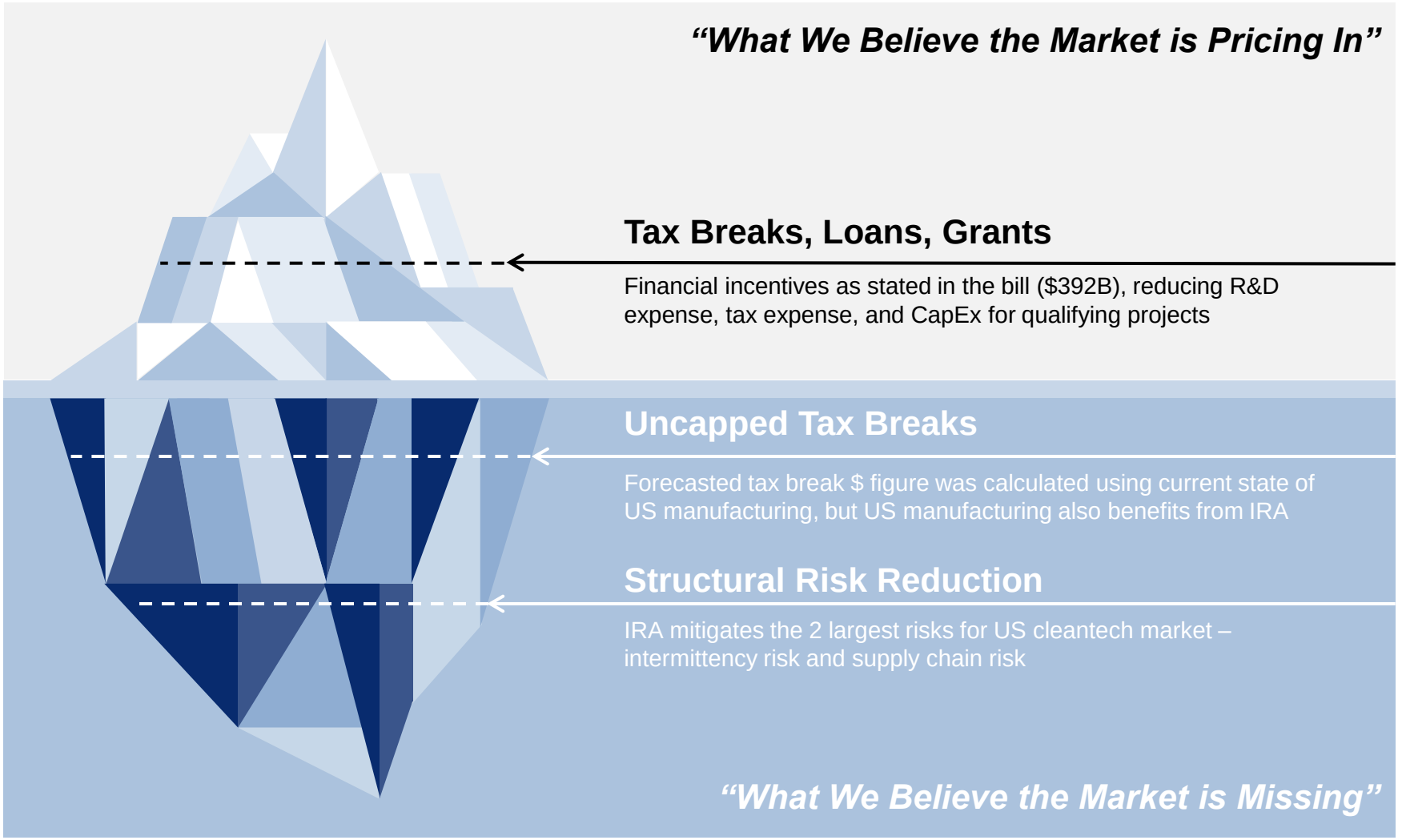
- Renewables are very sensitive to commodity costs
- Exacerbated by high investment requirements

IRA passed in a bad time for clean energy stocks, adding to our investing opportunity

Bloomberg, EIA, McKinsey

How is the market feeling about the IRA?

~~Wenhan's~~ Original Iceberg Analogy



Mirella builds really cool slides

Source: Goldman Sachs.

IRA Mispricings

Original ~$400B Figure Used the Current State of US Manufacturing – We Think the Real Number is Much Higher

Uncapped Tax-Breaks

What about $394B?
- Original figure estimated at pre-IRA manufacturing rates
- Banks are revising the expected cost of the IRA to incorporate private investment: GS's model says $1.3T

Domestic Content Provision
- 10-30% tax-breaks on advanced domestic manufacturing
- More manufacturing allows for more domestic parts

Reinforcing Cycle of On-shoring
- Renewables manufacturers can cash in on unlimited tax breaks due to increased US manufacturing

Supply Chain Reinforcement

Boosts for Critical Minerals
- Rebates for lithium, cobalt, nickel, etc.
- Incentives for FTA nations to sell to US

Recycling Efforts
- US REE recycling capacity expected to grow at 15% CAGR through 2030

Decoupling from China
- Diminished geopolitical risk as US moves towards REE independence

Intermittency Risks

Typical Stability, Occasional Volatility
- Power generators sell power to utilities under a PPA
- When there is no wind, they must fulfill contracts via spot mkt

Lethal Bidding Wars
- If a period of intermittency coincides with a demand spike, RCPs bid against each other, driving prices up 9000%+

Texas wind farms face billion-dollar losses from blackouts

Risks

Repealing of IRA Post-2024

Uncertainty of Provisions

Weak Stock Reactions

Intricacies and synergies between the vast number of IRA clauses provides opportunity for market mispricing

EU Council, EIA, Reuters, Statista, WSJ

Desautels Capital Management

Honours in Investment Management

Renewables

Section IX

DESAUTELS Capital Management
Gestion de capitaux

McGill

Renewables Overview

Why do renewables exist?

General Information

What are Renewables?
- Energy derived from natural resources that can be naturally replenished
- Includes solar, wind, hydroelectric, geothermal power

Why are renewables important?
- Decreases dependence on finite fossil fuels, enhancing energy security and sustainability
- Reduces greenhouse gas emissions

Subsector Weight
- Renewables make up 2.78% of Utilities in the S&P500
- Renewables make up 16.19% of Utilities in the S&P500/TSX

Big Players

NextEra Energy, Constellation, Ormat, Clearway

Brookfield Renewable, Algonquin Power & Utilities Corp.

Competitive Environment

- Threat of substitutes (fossil fuels)
- New entrants, diversifying big oil companies
- High growth, competitive rivalry
- Limited suppliers, Chinese tariffs
- Government policy and incentives (IRA)
- Economic conditions & interest rates

Key Metrics

MWh	A megawatt hour is used to measure electric output
LCOE	The levelized cost of electricity is used to compare the lifetime costs of generating electricity
EROEI	Energy returned on energy invested, ratio of usable energy delivered to energy used to obtain it
EPBT	Energy payback time, time it takes to generate energy equivalent what was used to produce it

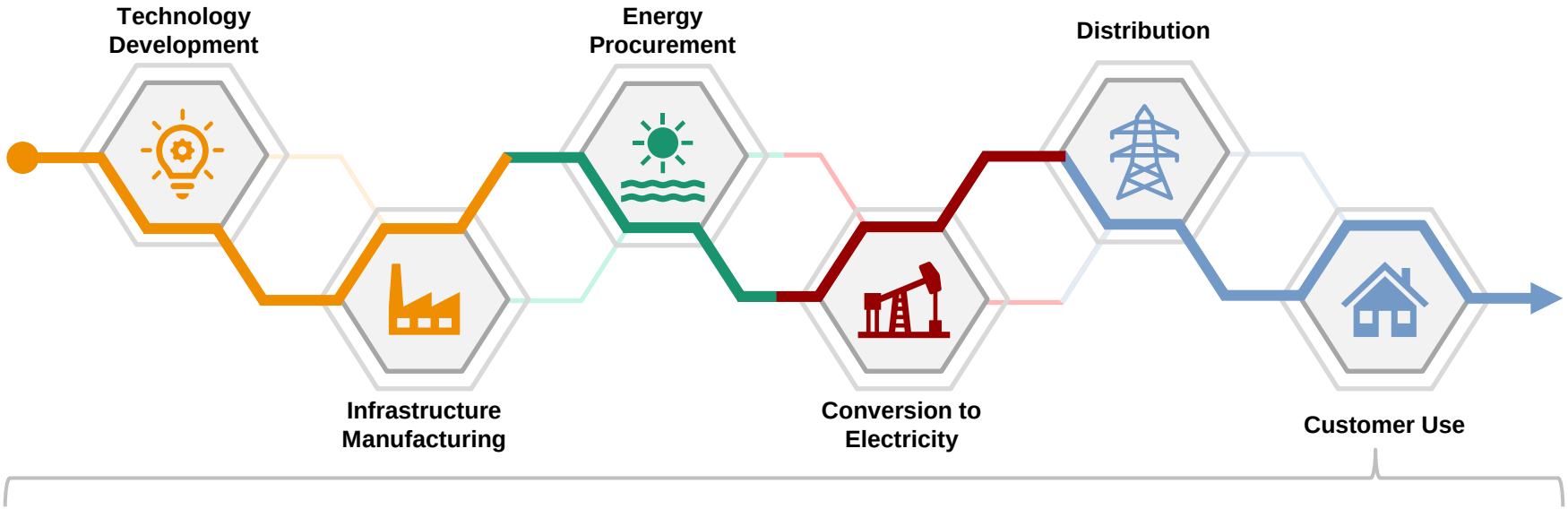
Big North American players face challenges including Chinese established companies & high interest rates, alleviated by government incentives

Source: Bloomberg NEF, IEA, EIA

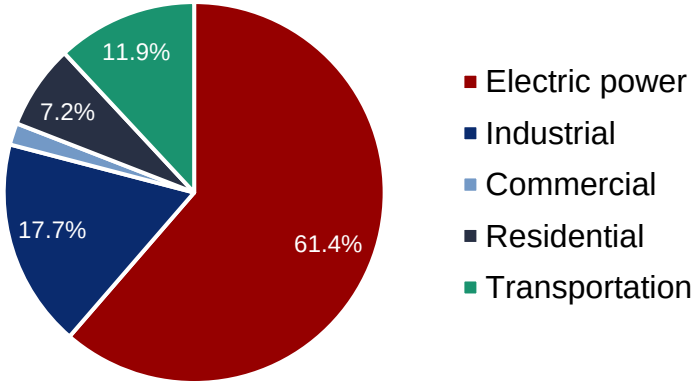
Renewables Value Chain

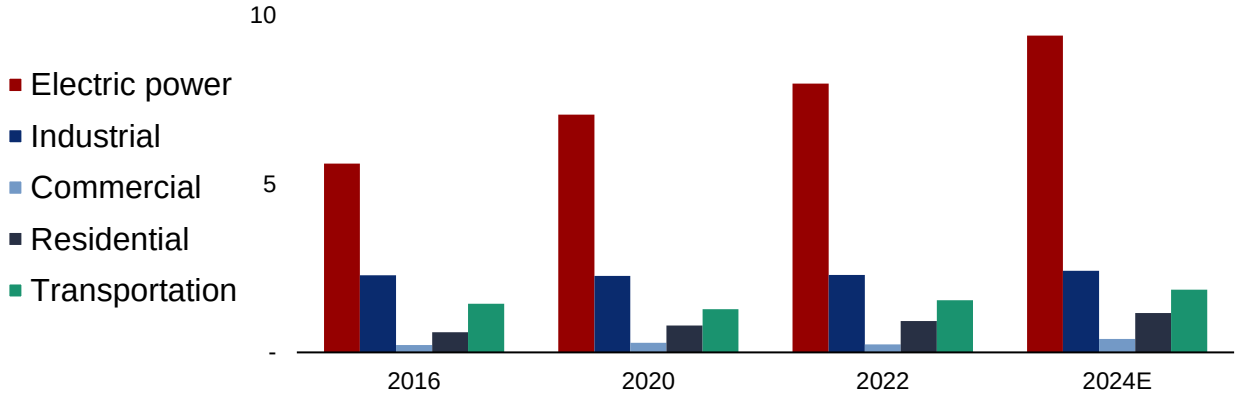
From technology development to end-user, where is the value creation

Development | **Upstream** | **Production** | **Downstream**



USA Renewable Energy Consumption by Sector, (in BTU, approx. = 300K GWh)





Source: IEA, Bloomberg NEF

Breaking down the Renewable Sector

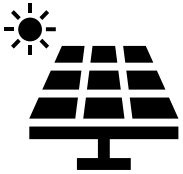
The avatar of Energy Production

What are the most common forms of Renewable Energy?

1 Wind (on- & off-shore)

- 3.66% of energy mix
- LCOE: $74/MWh offshore, $42/MWh onshore
- EPBT: 1 year

2 Solar (Photovoltaic)



- 1.71% of energy mix
- LCOE: $48/MWh
- EPBT: 6 years

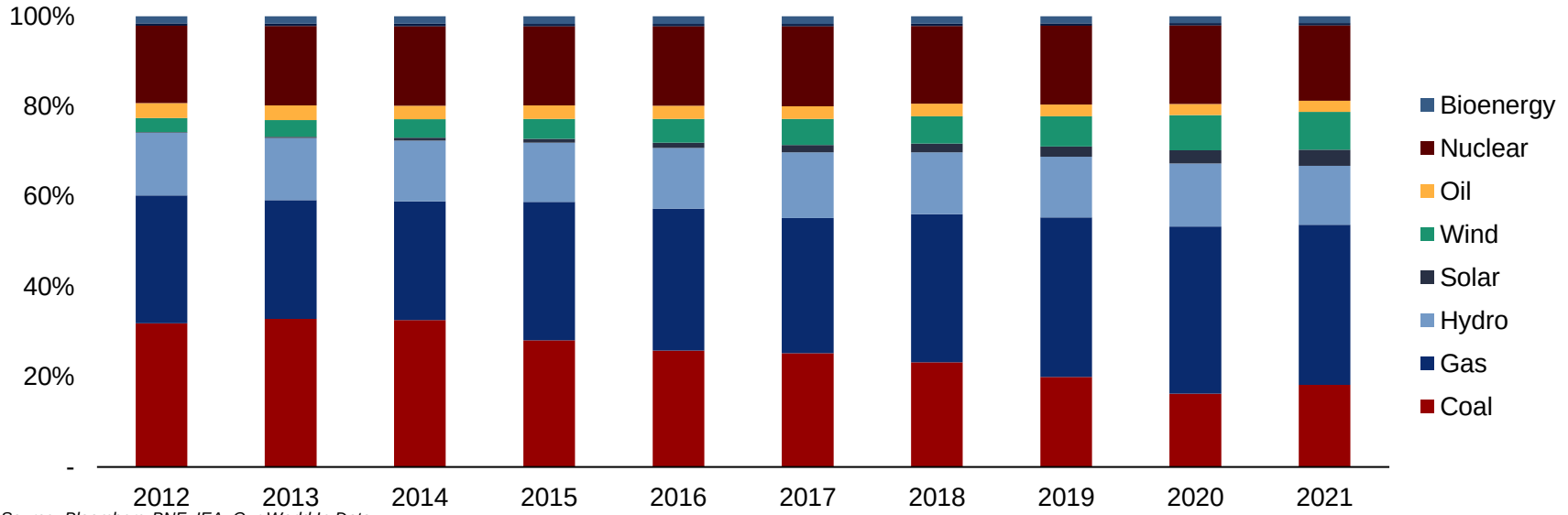
3 Hydro

- 5.09% of energy mix
- LCOE: $98/MWh
- EPBT: 2-4 years

4 Geothermal

- 0.77% of energy mix
- LCOE: $76/MWh
- EPBT: 5-10 years

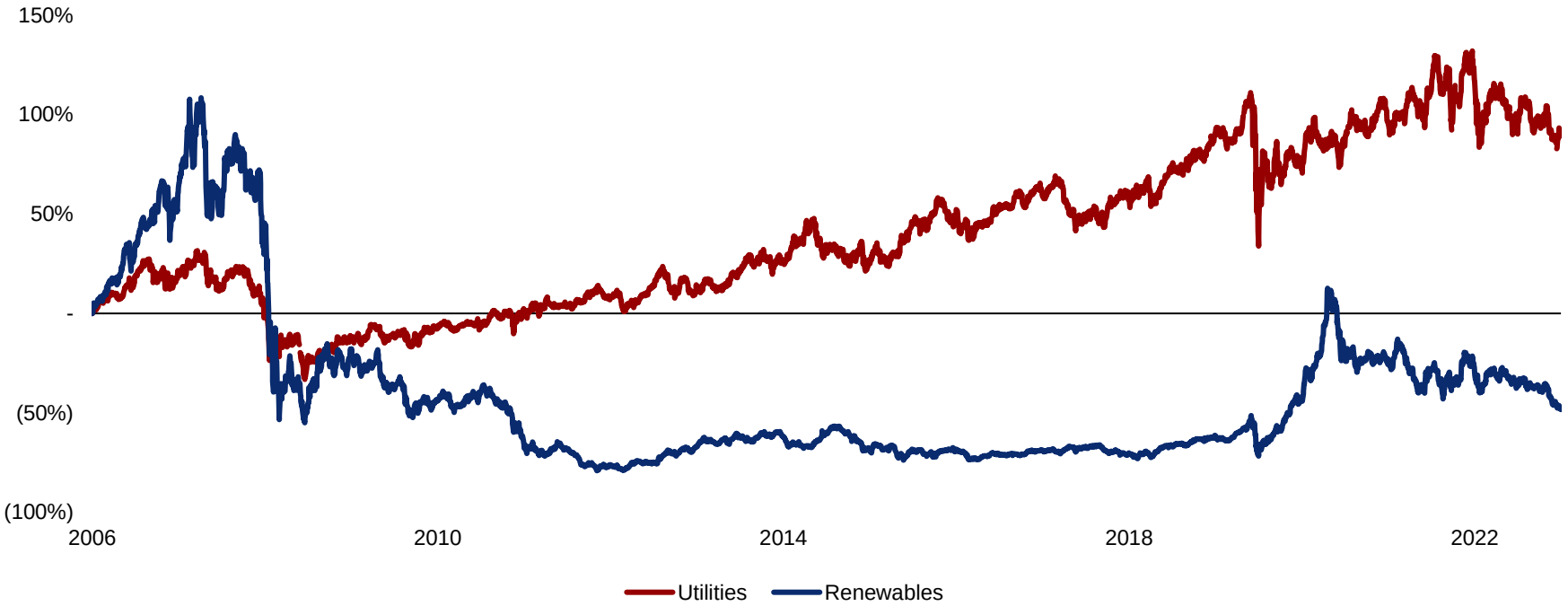
North American Primary Electricity Generation by source



Source: Bloomberg BNF, IEA, Our World In Data

15-Year Returns

Recession sensitivity



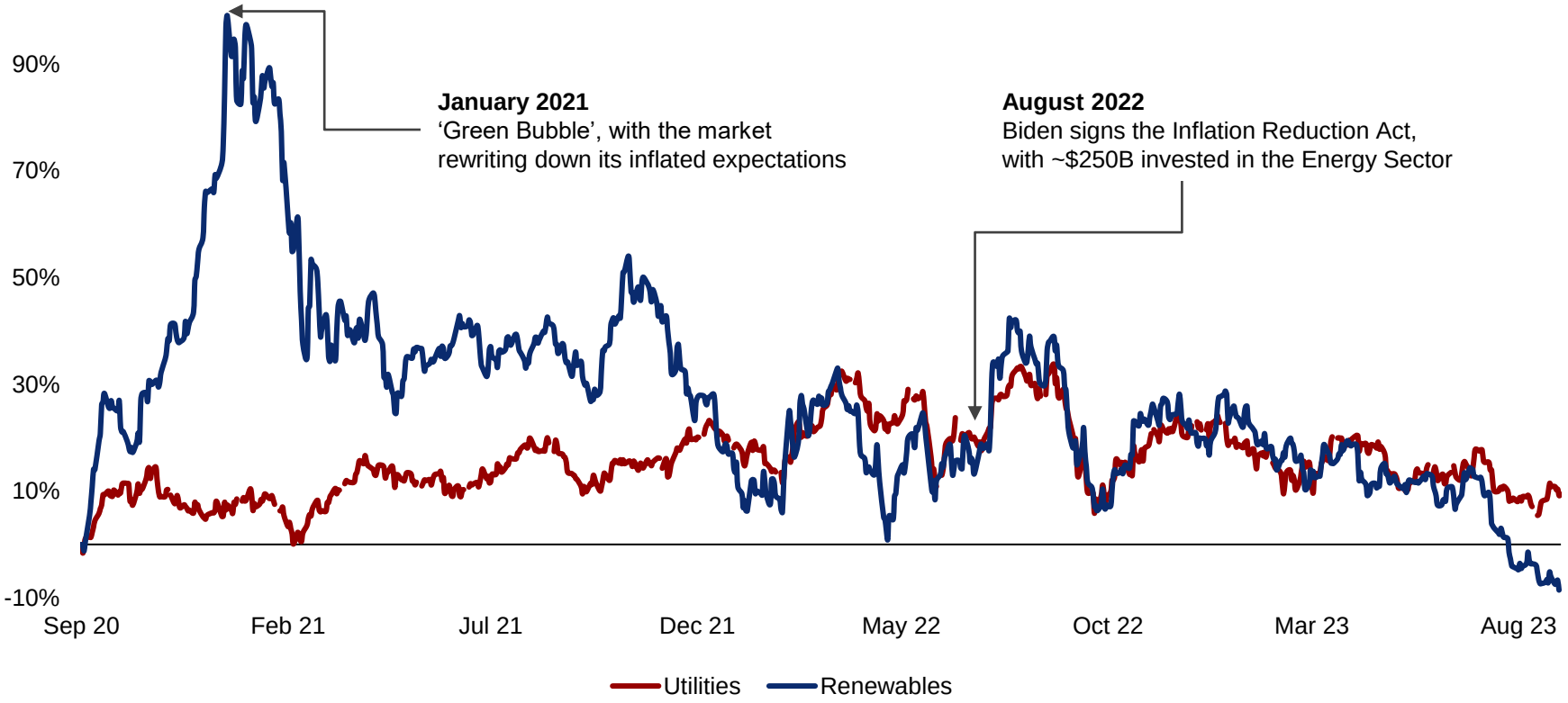
Renewables Subsector	**1.03** 3-Year Beta	**28.7%** Standard Deviation
Utilities Sector	**0.62** 3-Year Beta	**17.8%** Standard Deviation

Volatile economic environment → **Shift to more efficient energy sources** → **Returns fall & greenhouse gas emission increase** → **Government incentives foster growth**

High-rates generally results in shift to more reliable fossil fuels, but government incentives push businesses and consumers back to renewables

2-Year Returns

Recent Performance



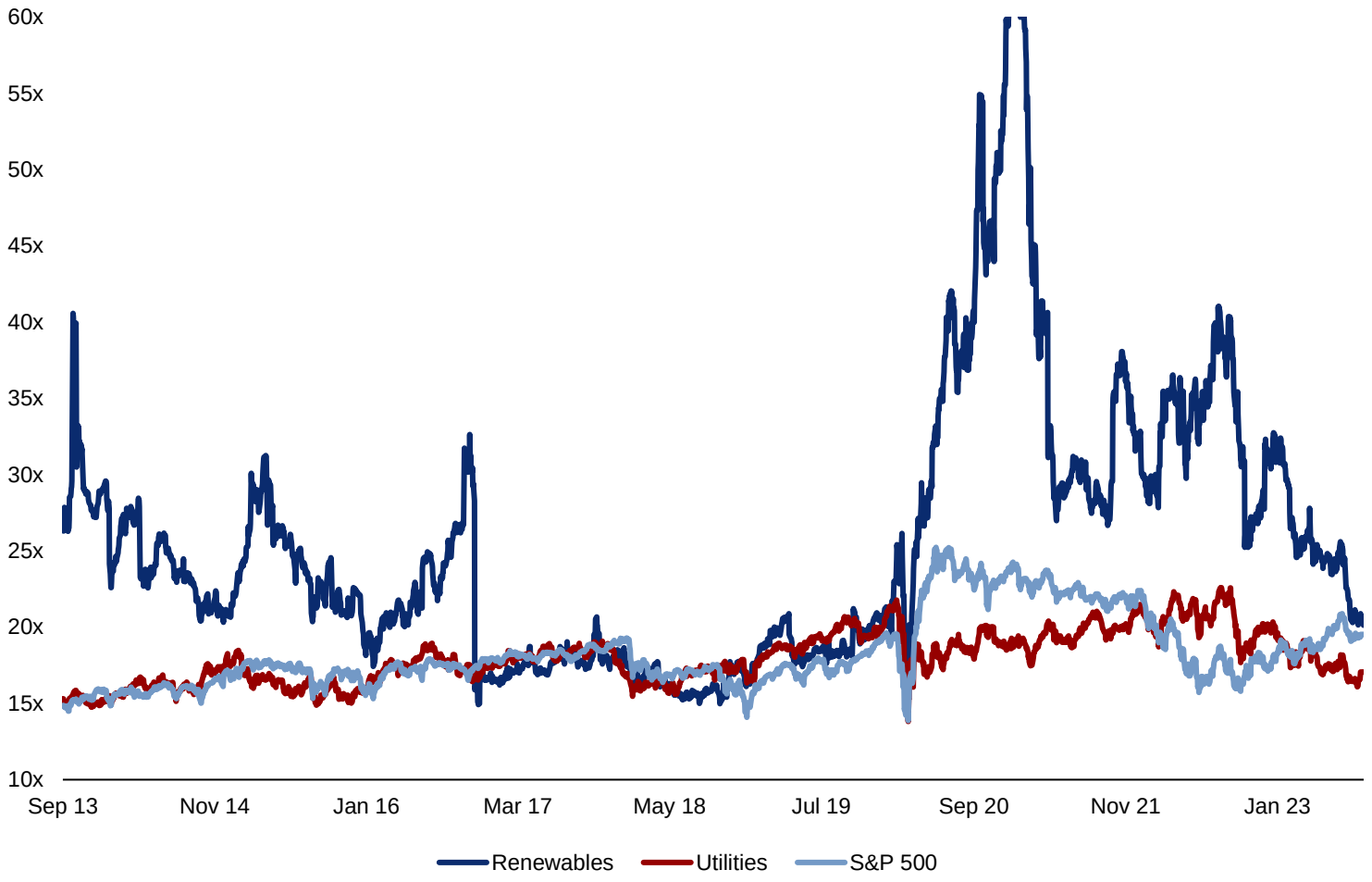
-23.7%	-8.55%	-60%	+102%	46.4%	Earnings Beat
YTD Returns	3-Year Returns	PE Contraction *37% of change in P*	Earning Growth *63% of change in P*	Expected Earnings Growth	on average

With high earnings growth over the last few years, PE contraction is the cause of the fall in stock prices

Source: Bloomberg

Current Valuation

What is the market seeing?



Renewables

25.35x* Average Forward PE

20.12x Current Forward PE

Utilities

16.39x Average Forward PE

17.05x Current Forward PE

8.96x Average Spread

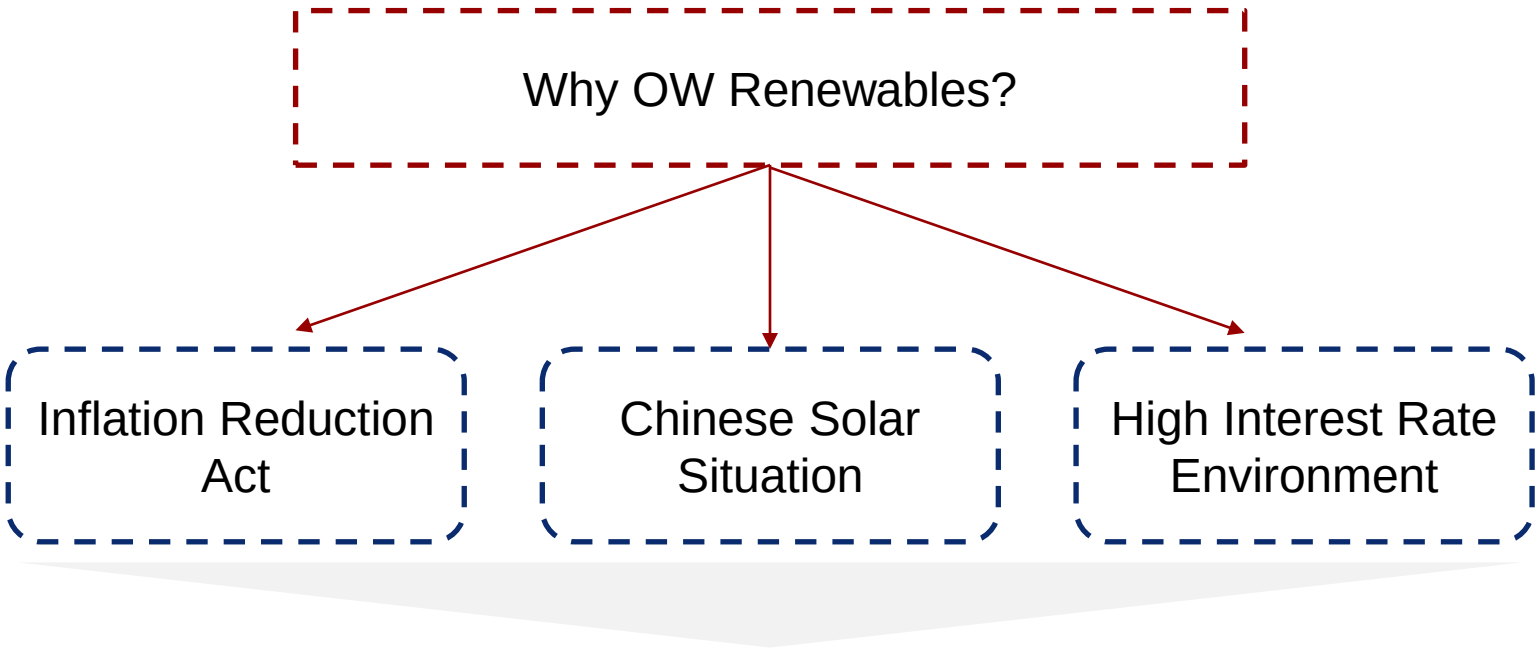
3.07x Current Spread

Renewables are currently more expensive than the market but cheap relative to historical levels

** Excluding greater than 40x. Source: Capital IQ*

Outlook: Overall Renewables

OW: Upside potential, notably within solar

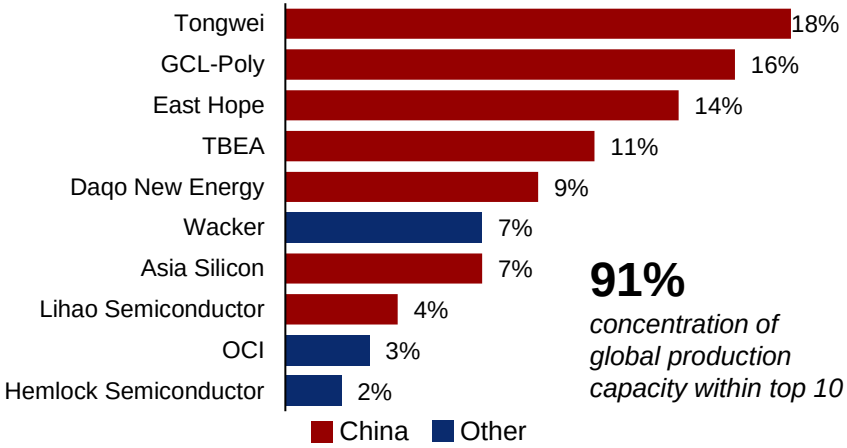


Chance to identify outperformers in a period of high volatility, through potential to capitalize on remaining IRA mispricing, advantages relative to Chinese rivals, and good capital allocation

Chinese Power & Western “Reshoring”

Potential big winners among North American solar companies

Share of capacity of top 10 solar suppliers, 2022



91%

concentration of global production capacity within top 10

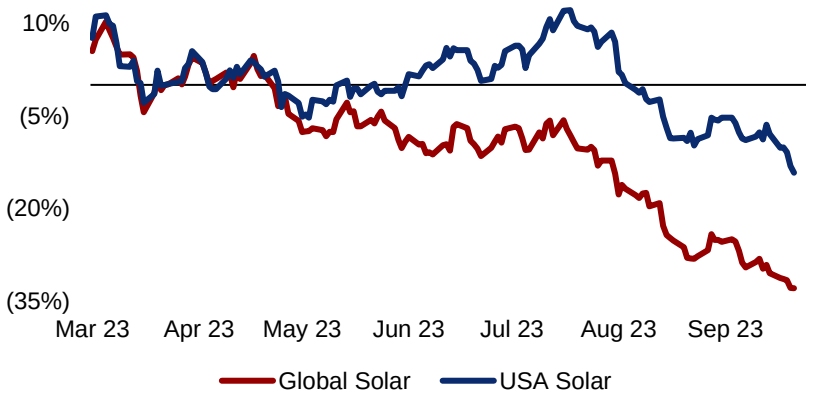
“Reshoring” renewable supply chains (incl. IRA)

New USA tariffs on Chinese solar companies

Trinasolar BYD CanadianSolar

We expect stricter tariffs going forward, an opportunity for American & Canadian companies to expand

USA vs global stock price reaction to tariffs



Companies that can hold their weight till 2024 will get a chance to gain market share vs China

Source: Bloomberg NEF, McKinsey, Reuters

USA Solar Outperforming Global

USA tariffs significantly impact Chinese companies

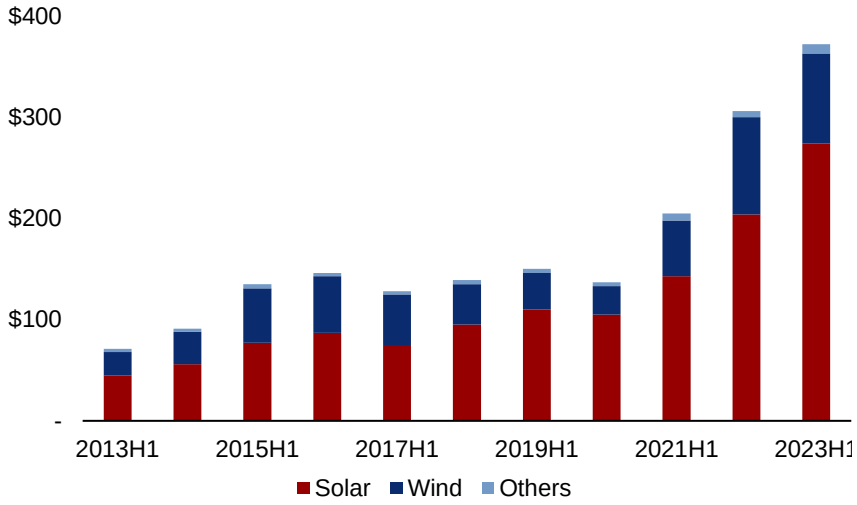
Interesting pick potential within solar in North America

Source: Capital IQ

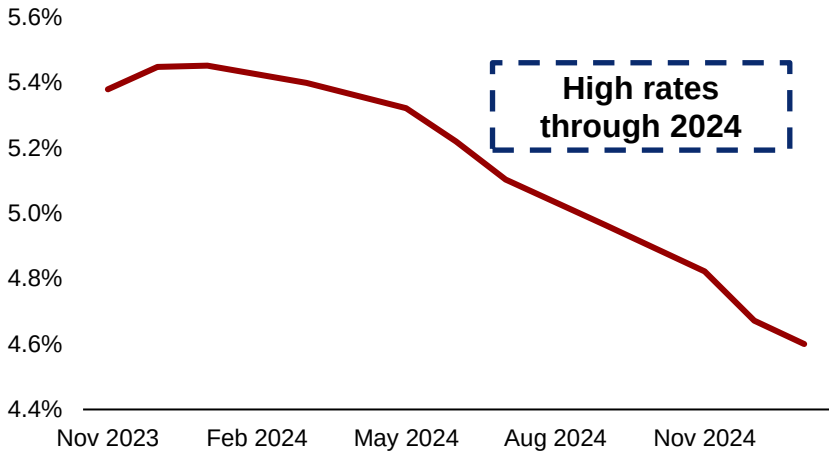
Interesting Macroeconomic Environment

Macro risks, micro opportunities

Renewable Energy Investment Record (in billions)



Interest Rate Futures



Importance of capital allocation in current environment

Capital Intensive Industry
Renewables require high capital investments to start, whether we are talking about machine manufacturing, R&D, or material sourcing costs

High-Rate Environment
As previously discussed, the current interest rates do not allow for as elevated capital expenditure as required to grow in the industry

41

corporate defaults in H1-2023 according to Moody's, more than double the same period in 2022

Opportunity to identify low debt-high cash flow profile despite high rates and pricing pressure to find company strength

Identifying a healthy target who can benefit from the IRA as much as possible while allocating capital smartly will be the key

Source: Bloomberg NEF, Moody's

Desautels Capital Management

Honours in Investment Management

Frontier Technologies

Section X

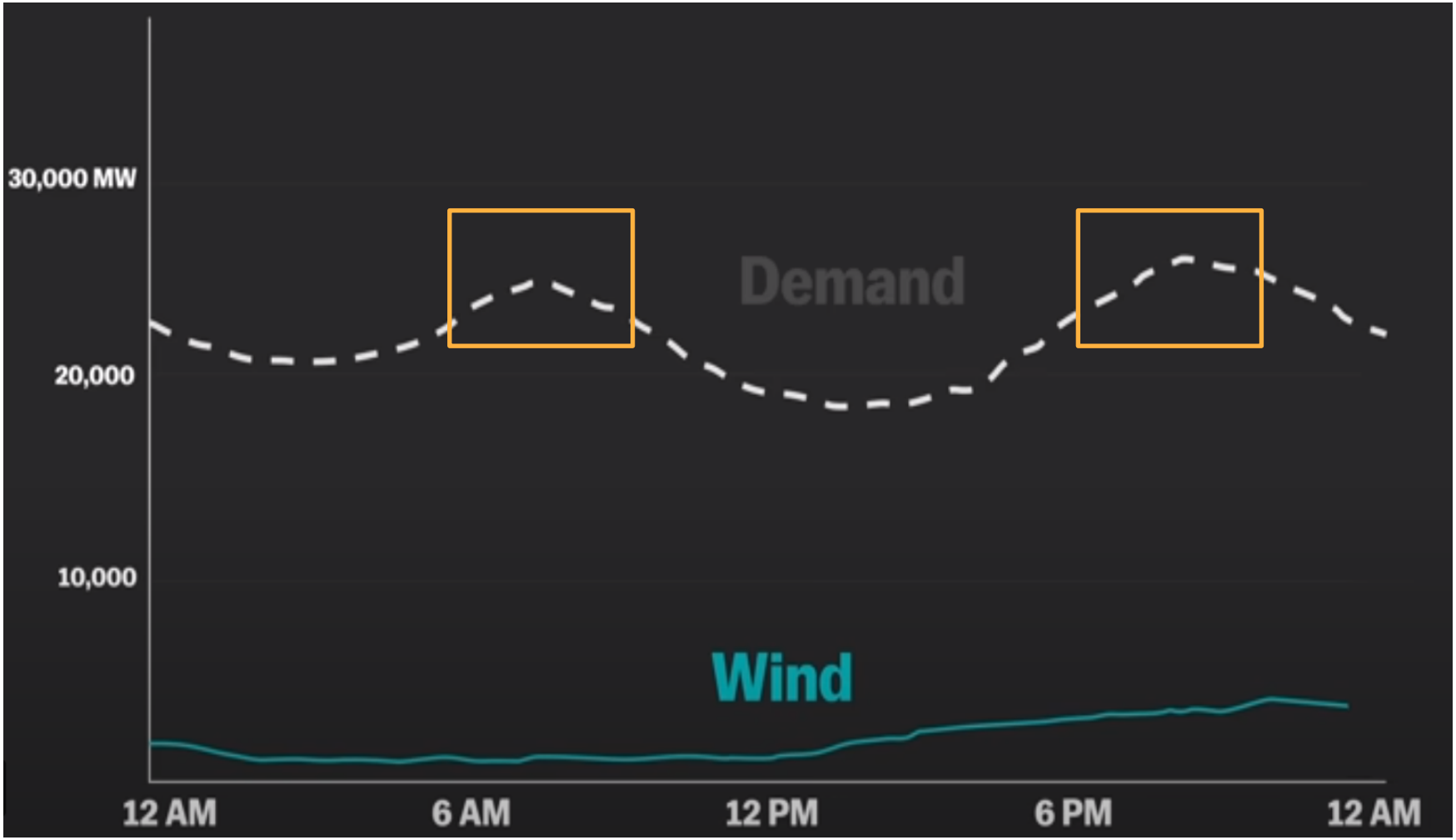
DESAUTELS Capital Management
Gestion de capitaux

McGill

How To Fix Clean Energy's Storage Problem Given Its Intermittency

Wind Energy intermittency

Electricity demand and sources on April 7, 2023

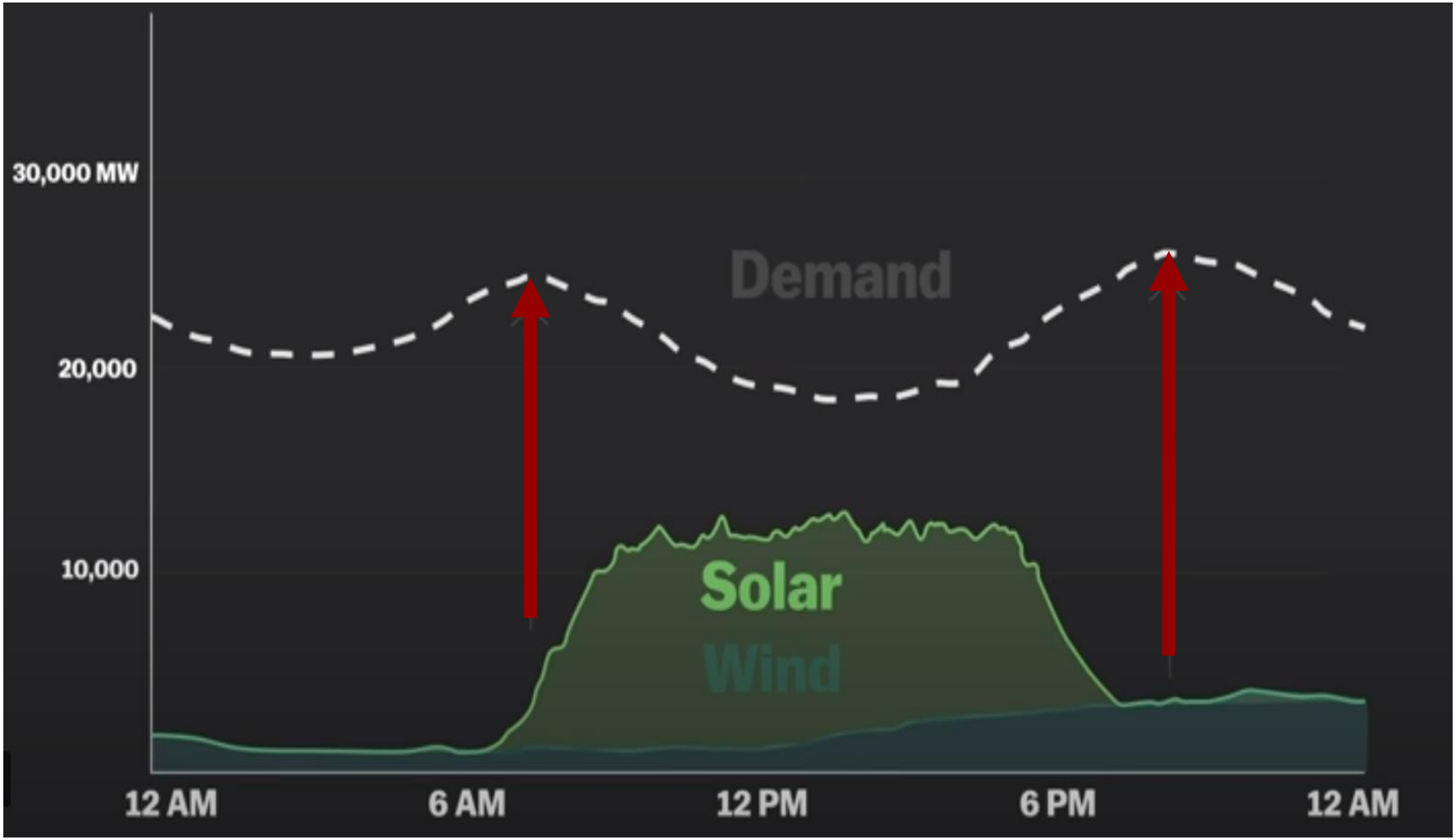


Source: California ISO

How To Fix Clean Energy's Storage Problem Given Its Intermittency

Solar Energy intermittency

Electricity demand and sources on April 7, 2023

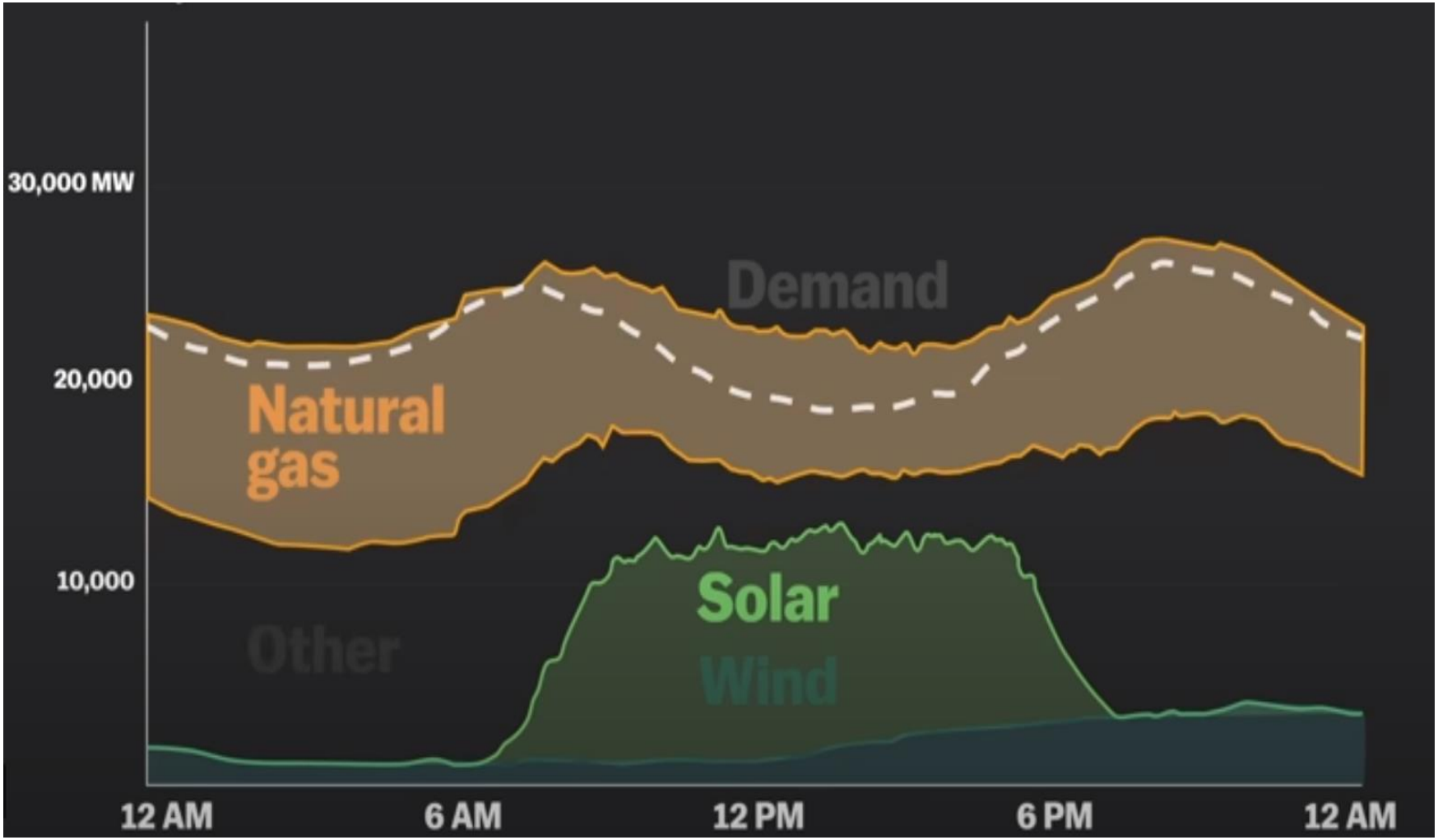


Source: California ISO

How To Fix Clean Energy's Storage Problem Given Its Intermittency

Natural Gas bridges the gap

Electricity demand and sources on April 7, 2023



Source: California ISO

The future of energy storage in utilities: Batteries and Beyond

Electricity storage on a large scale as intermittent renewable energy has become more prevalent.

1 Pumped Hydro

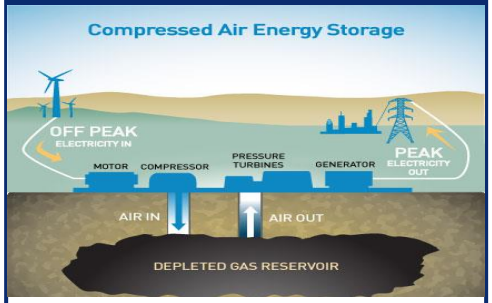
- 94% of installed global energy storage capacity
- Involves using two reservoirs at different elevations to store energy

Efficiency: 70 – 80%
LCOS: 150-200 USD/MWh

- **Pros**:
- Can produce considerable energy

- **Cons**:
- Limited to local geography

2 Compressed Air



- Compress air to store surplus power
- Generate electricity by releasing high-pressure air through a turbine

Efficiency: 60 – 65%
LCOS: 200-300 USD/MWh

- **Pros**:
- High capacity and long-duration storage

- **Cons**:
- Low power density
- Limited to geological locations

3 Battery

- Through electrochemical processes
- Converting electricity into chemical energy and back to electricity when needed

Efficiency: 80 – 90%
LCOS: 250-350 USD/MWh

- **Pros**:
- Immediate response time
- Adopts intermittent energy

- **Cons**:
- High costs

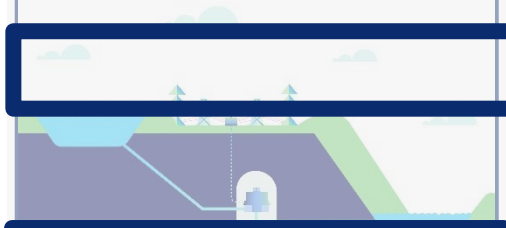
Source: Storage Lab

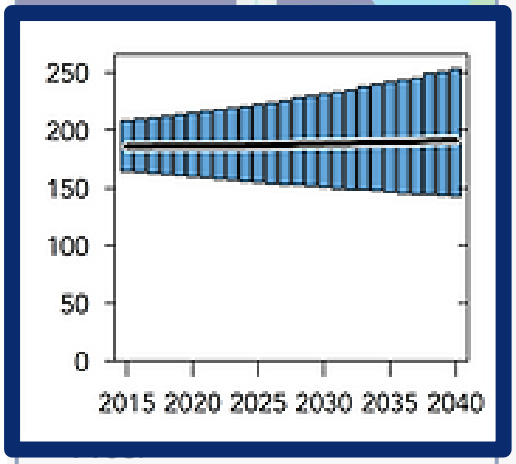
Cost of Different Storage Systems

Electricity storage on a large scale as intermittent renewable energy has become more prevalent.

Range of LCOS in USD/MWH

1 Pumped Hydro

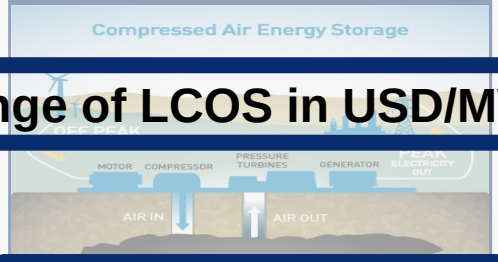


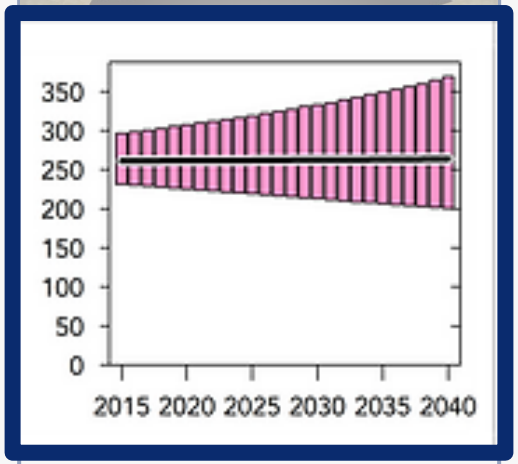


- Can produce considerable energy

- **Cons**:
- Limited to local geography

2 Compressed Air

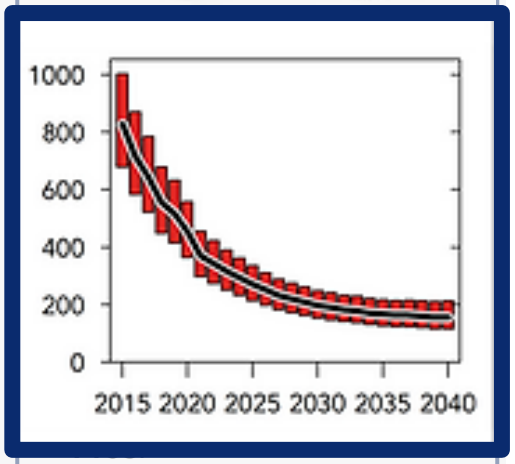




- High capacity and long-duration storage

- **Cons**:
- Low power density
- Limited to geological locations

3 Battery



- Immediate response time
- Adopts intermittent energy

- **Cons**:
- High costs

Battery will represent the lowest LCOS Before 2040

Source: Storage Lab

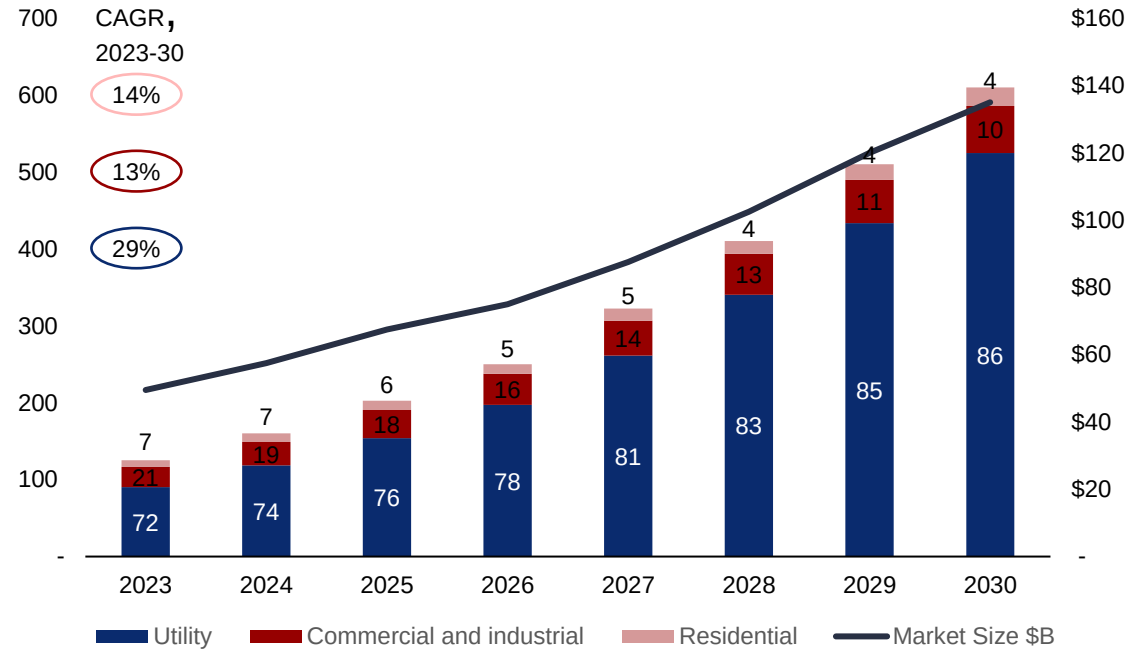
Battery Energy Storage Systems: Utility-scale Storage Will Capture The Most Profit

Battery energy storage capacity is likely to quintuple between now and 2030

Front-of-the-Meter	Back-of-the-Meter	
Utility-scale generation, energy storage, distribution	Commercial and industrial	Residential

- Transform renewable energy into a reliable source of 24/7 generation.
- ~50% > Manufacturers of storage components
- 25-30% > System integration activities
- 10-20% > Sales entities, project development, commissioning

Annual added battery energy storage system (BESS) capacity, 100% in GWh



Source: McKinsey & Co.

Leading Battery Players

Pure Play Battery Companies

Battery Pureplay Comparison

High-potential technologies

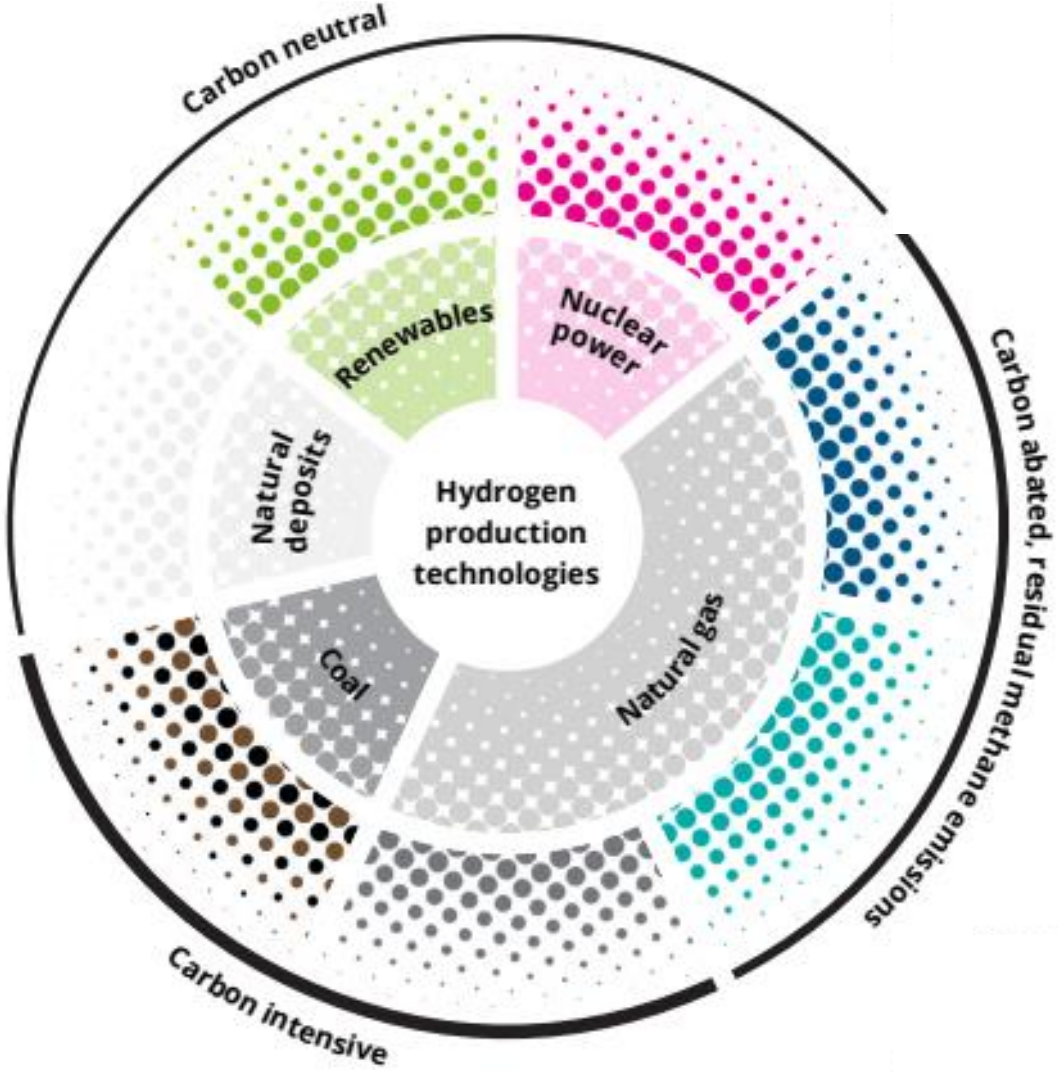
	EBITDA (LTM, $M USD)	Revenue	EV/Revenue	Net Debt	End Market	Technology
Freyer	(130)	-	-	(312.5)	Energy Storage, Transportation	None
Solid Power	(68)	15.7	8.35	(211.4)	Transportation	All-solid-state Silicon Battery Cell
Microvast	(111)	225.3	2.45	(4.2)	Transportation, Heavy Equipment, Utility Energy Storage	Lithium-ion Battery

Microvast seems to have interesting technologies and huge potential

Source: Company Filings

The Beyond: Hydrogen Energy Storage System (HESS)

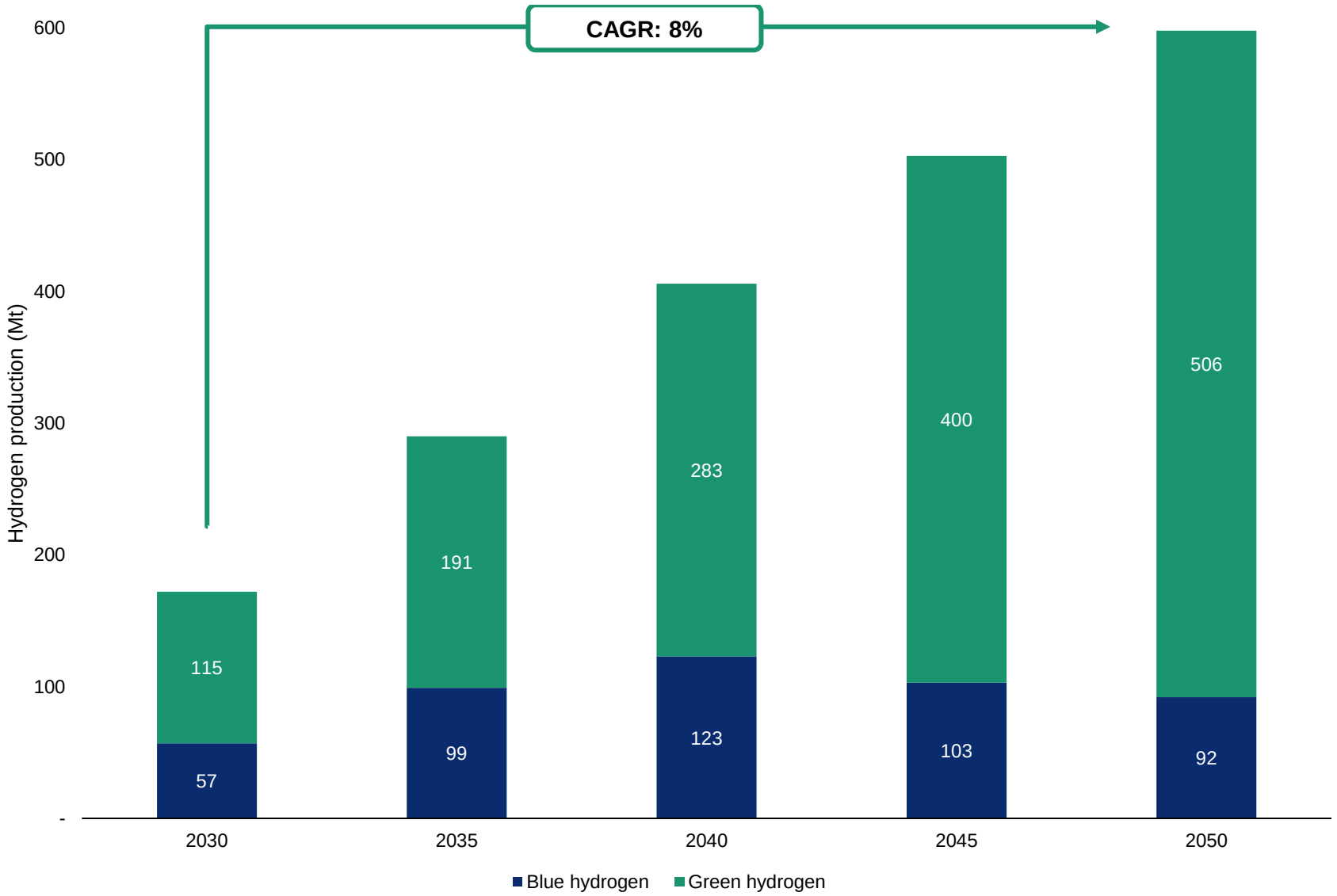
Hydrogen Production Technologies



Source: Deloitte

Clean Hydrogen Supply by Technology, 2030 to 2050

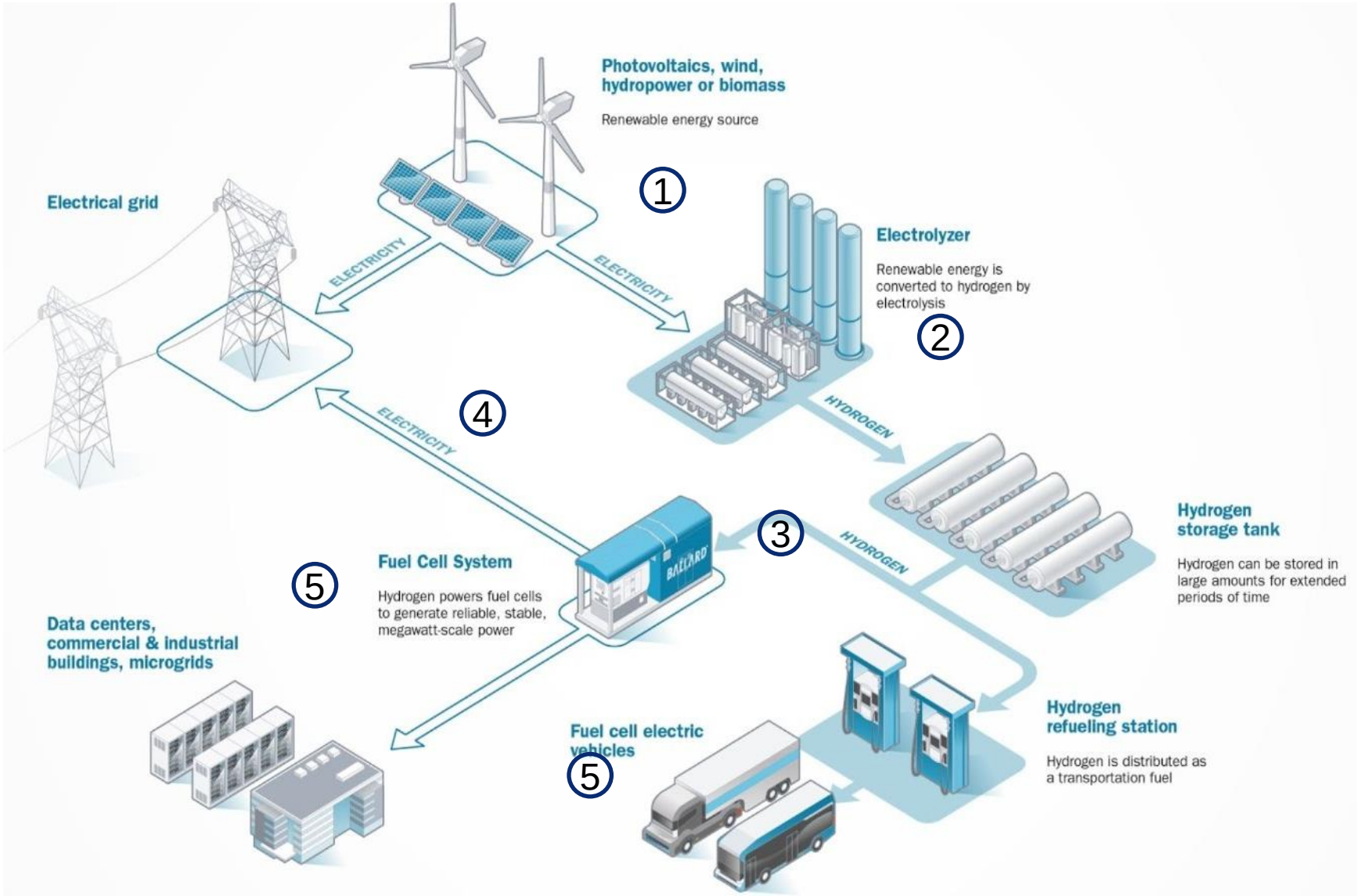
Continuous growth till 2050



Source: Deloitte

The Beyond: Hydrogen Energy Storage System (HESS)

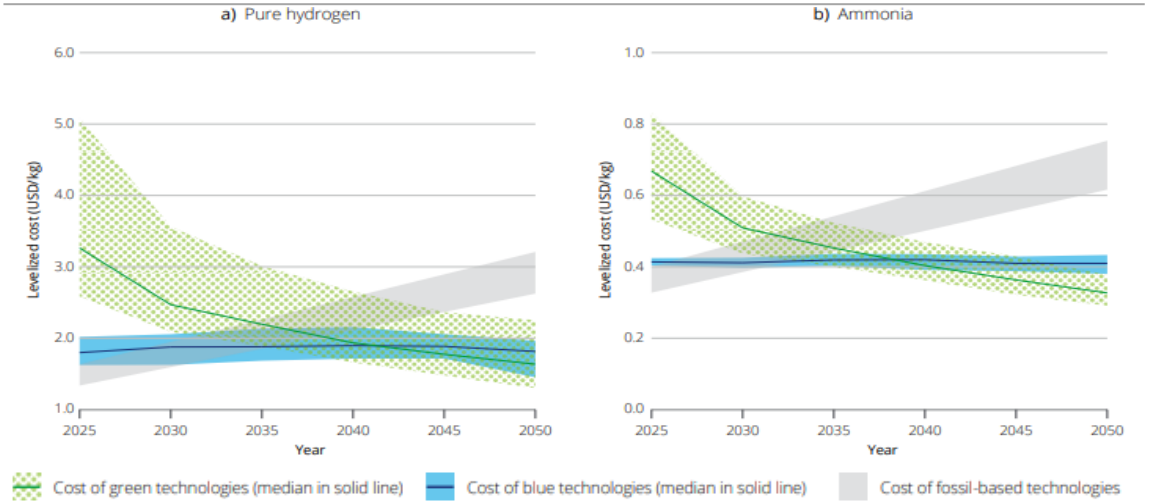
Ultimate zero-emission solution



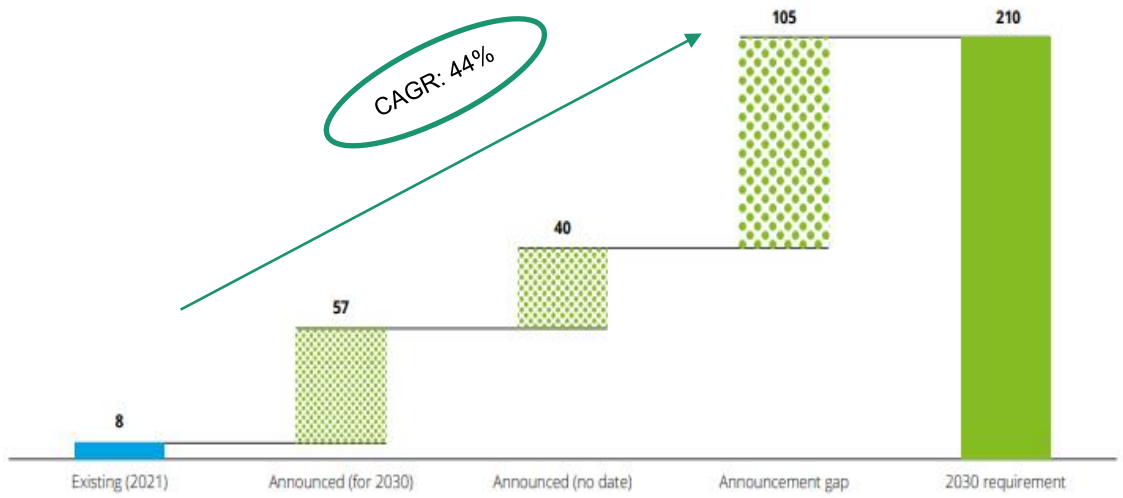
Overcoming Bottlenecks for Green Hydrogen Production: High Production Costs

Limitations stem from the superior production costs currently

Outlook on Production Costs of Clean Hydrogen, 2025 to 2050



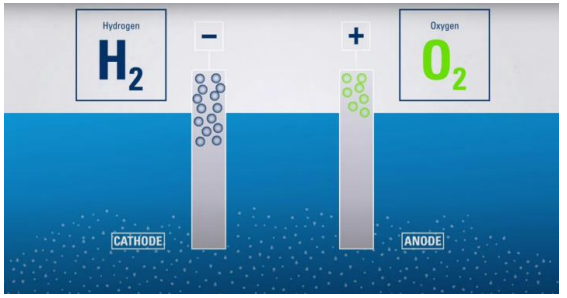
Global Electrolyzer Manufacturing Capacity Required by 2030 (GW per year)



Source: Deloitte

Electrolysis

$2H_2O = 2H_2 + O_2$



Leading Hydrogen Players

bp

AIR PRODUCTS

Pure Play Hydrogen Companies

PLUG POWER

FUSION FUEL

fuelcellenergy

Hydrogen Pureplay Comparison

High-potential technologies

	EBITDA (LTM, $M USD)	Revenue	EV/Revenue	Net Debt	End Market	Technology
Plug Power	(716)	879	4.9x	(114)	Distributed Power Generation (E-mobility)	Clean Fuel Cell Power
Fusion Fuel	(33.3)	-	-	0.2	H_2 Production	HEVO Electrolyzer Solution
Fuelcell Energy	(116)	-	-	(252)	Energy Storage	Fuel Cell Power

Fusion Fuel seems to have interesting technologies and huge potential

Source: Company Filings

Desautels Capital Management

Honours in Investment Management

Appendix

DESAUTELS Capital Management
Gestion de capitaux

McGill

Executive Summary

DCM's opinions

Main Outlooks

Oil and Gas – *Continuous OPEC Cuts driving up prices*
- Demand at an all-time high, prices up almost 50% since June
- Sector is trading below market P/E, but spread has compressed from 10x earnings to 7x YoY

Inflation Reduction Act – *Monumental Bill for energy*
- Government intervention nullifies our thesis from last year
- Synergies between clauses provides potential mispricing

Renewables – *Difficulties in an energy crisis*
- Massive private and public investment over the last year has driven interest higher
- Stock prices and multiples down YoY

Frontier Technologies – *High risk, high reward, if we can get it right*
- Batteries are poised to solve intermittency issues, growing at 30% CAGR through 2032
- Hydrogen offers a clean alternative to fuel, emitting only water as a byproduct

What's Next?

Reevaluate Current Holdings – *Trim exposure to O&G once we find the right stock*
- We believe oil is in a strong spot, but we will monitor the recession-induced demand destruction
- We have no exposure to any of the renewables value chain

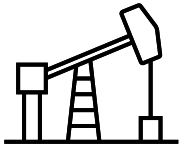
New Investment Opportunities – *Finding value amidst the noise*
- Finding an undervalued renewables stock is difficult, since there aren't many (profitable) companies
- There is value out there, perhaps in a less widely-monitored sector (picks & shovels method)

What is Natural Gas?

Prices are ~~Dino~~ Algae-soaring

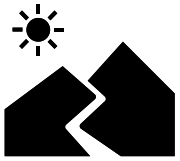
Where Does it Come From?

1 Conventional Gas Accumulations



- Natural Gas trapped by "the seal"
- Produced by a well drilled into a geologic formation

2 Tight Sand Gas



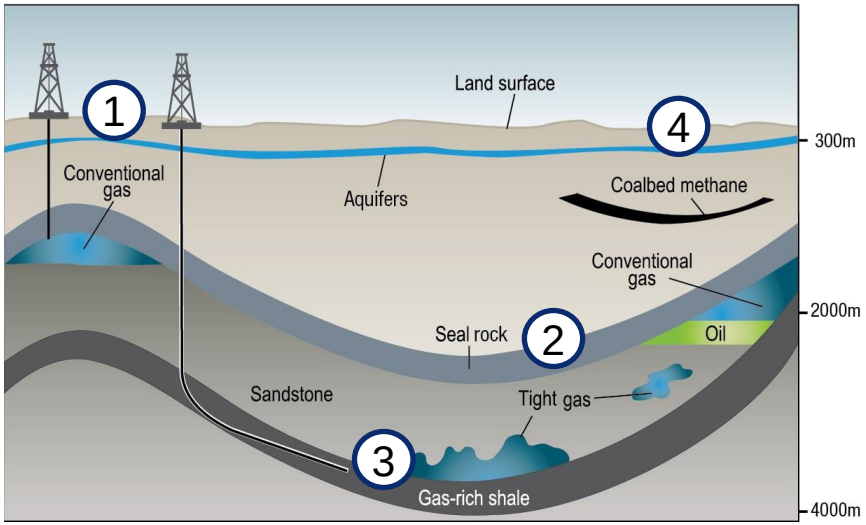
- Gas cannot pool in the way conventional gas does
- Remains diffused over large area

3 Shale Gas

- Remains trapped under source rock
- Production by virtue of horizontal drilling and hydraulic fracturing

4 Coalbed Methane

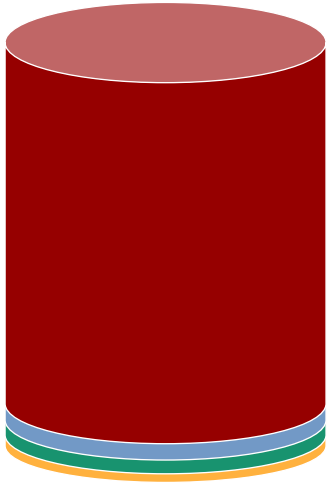
- Decomposition of organic matter, transformed into coal
- Forms beds underground



Source: Energy Made Simple

Component Breakdown

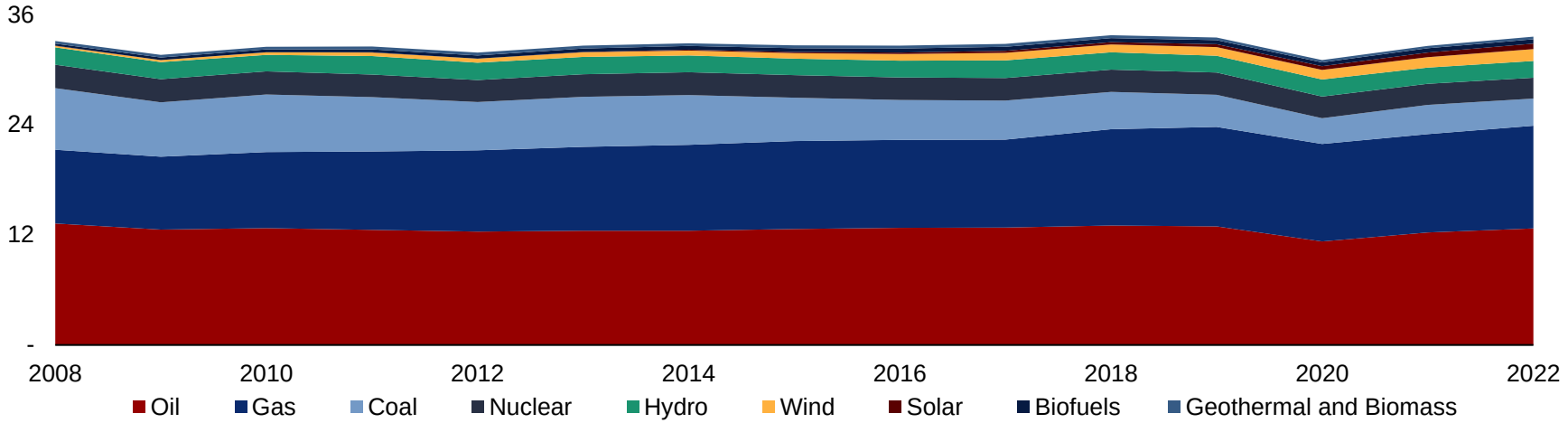
- Methane (94.70%)
- Ethane (4.20%)
- Propane (0.90%)
- Butane (0.20%)



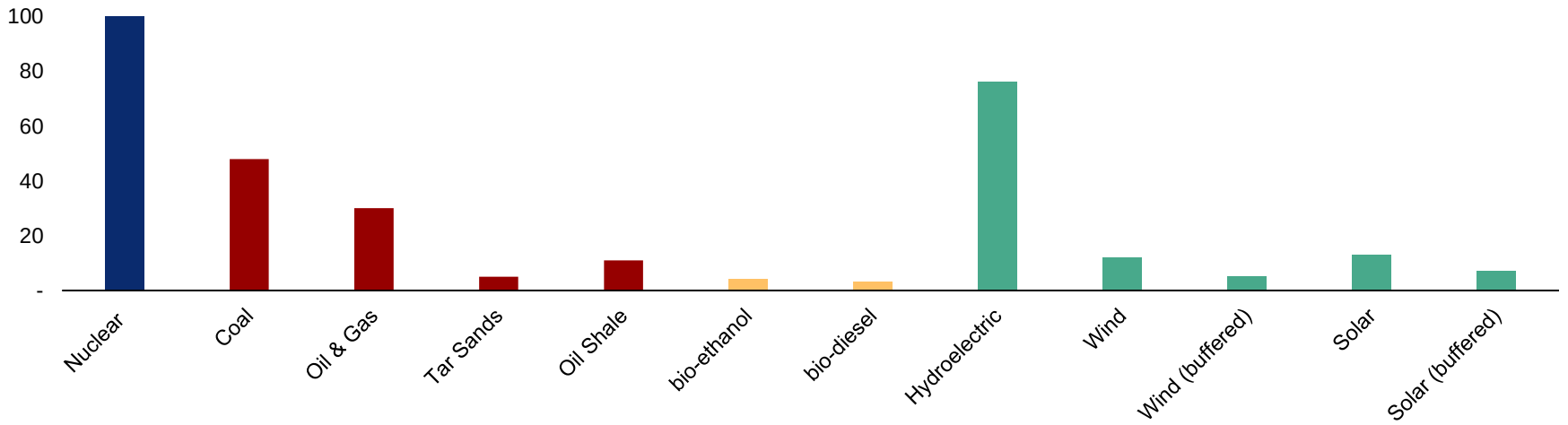
Renewables

Energy Consumption & Efficiency

Energy Consumption in North America (Thousand Terawatt Hours)



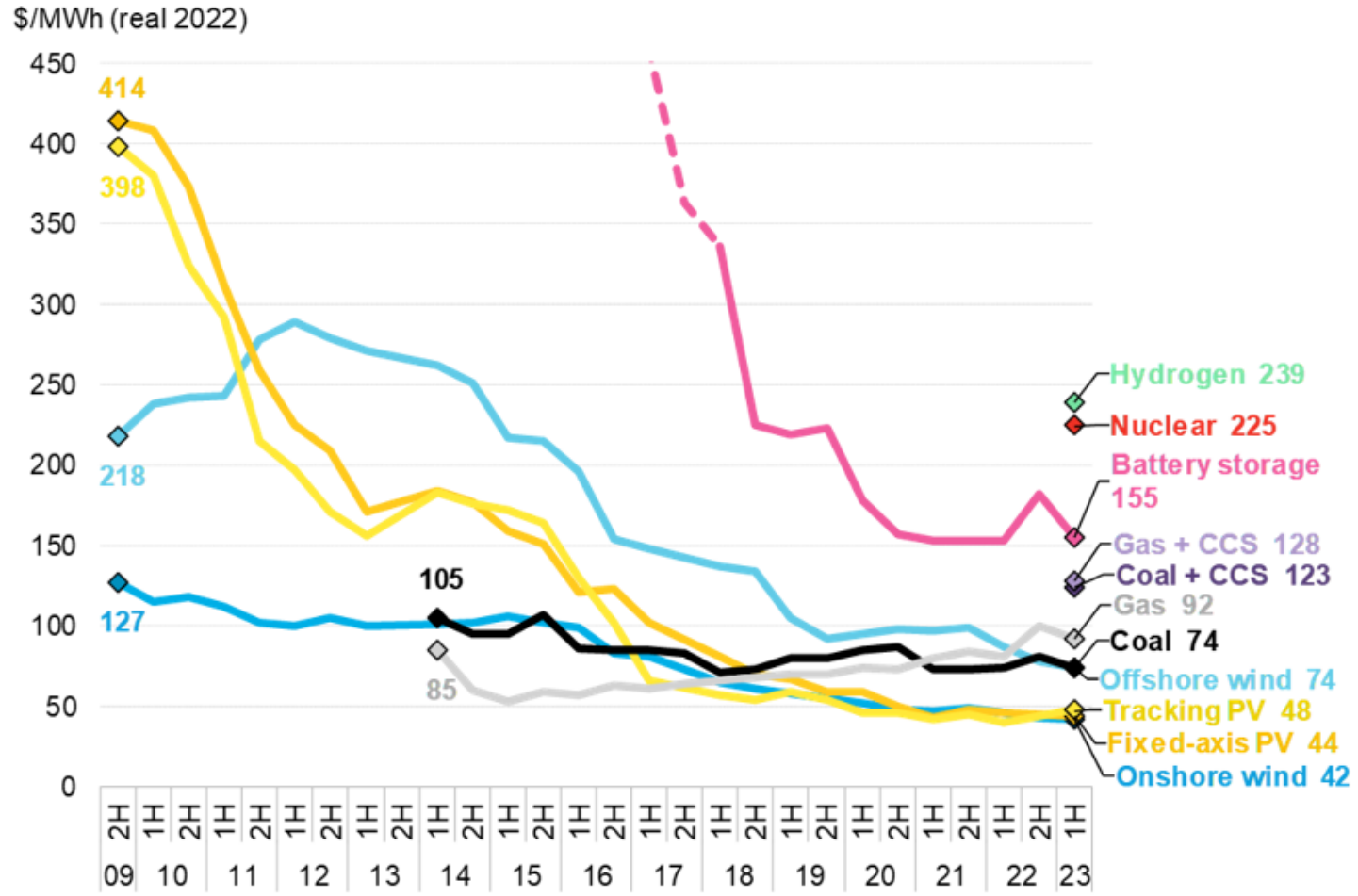
Energy Return On Energy Invested (EROEI)



Decline in coal, counteracted by growth in solar and wind electricity generation

Source: Our World In Data

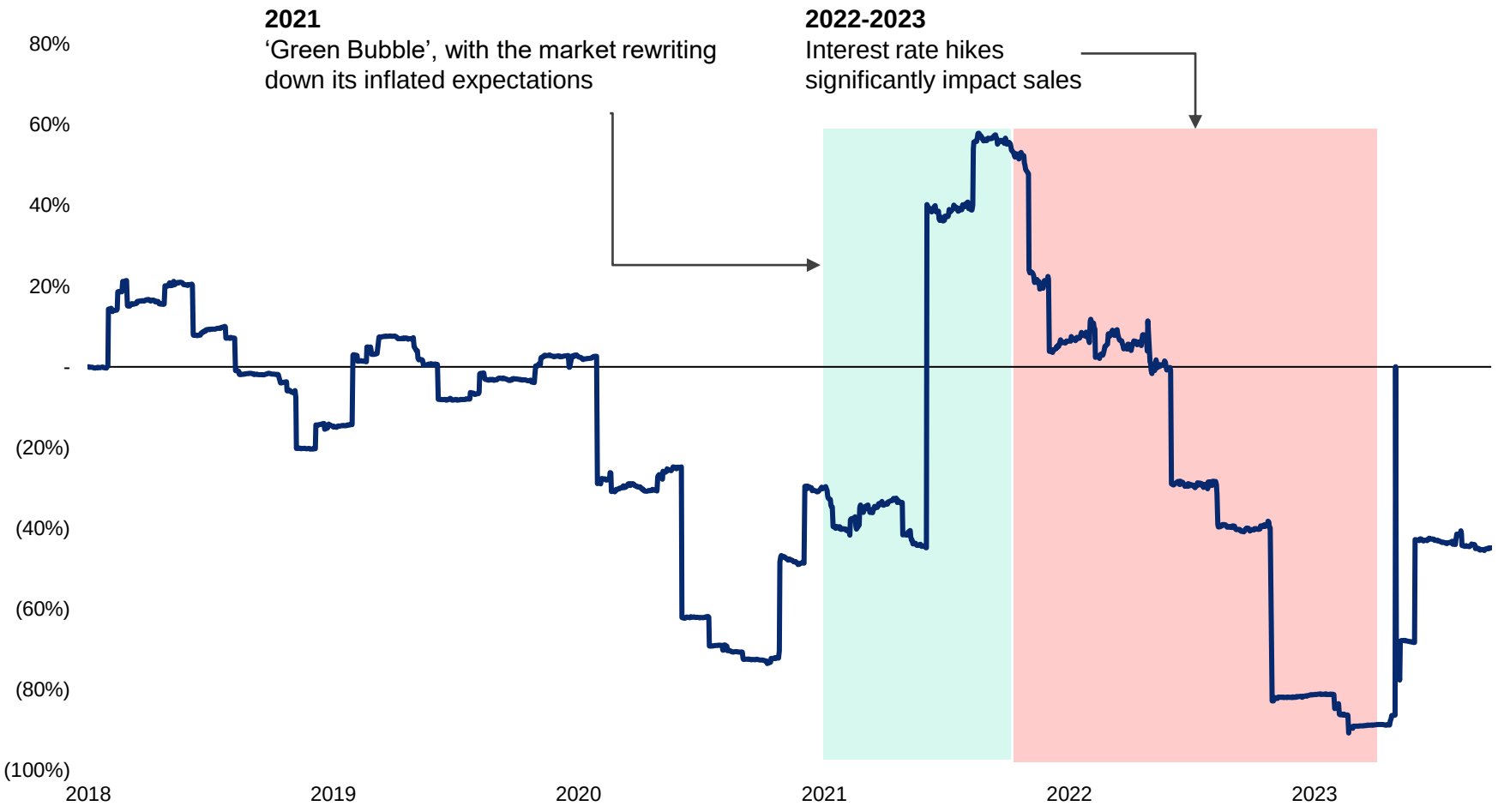
Figure 1: Global levelized cost of electricity benchmarks, 2009-2023



Source: Bloomberg NEF

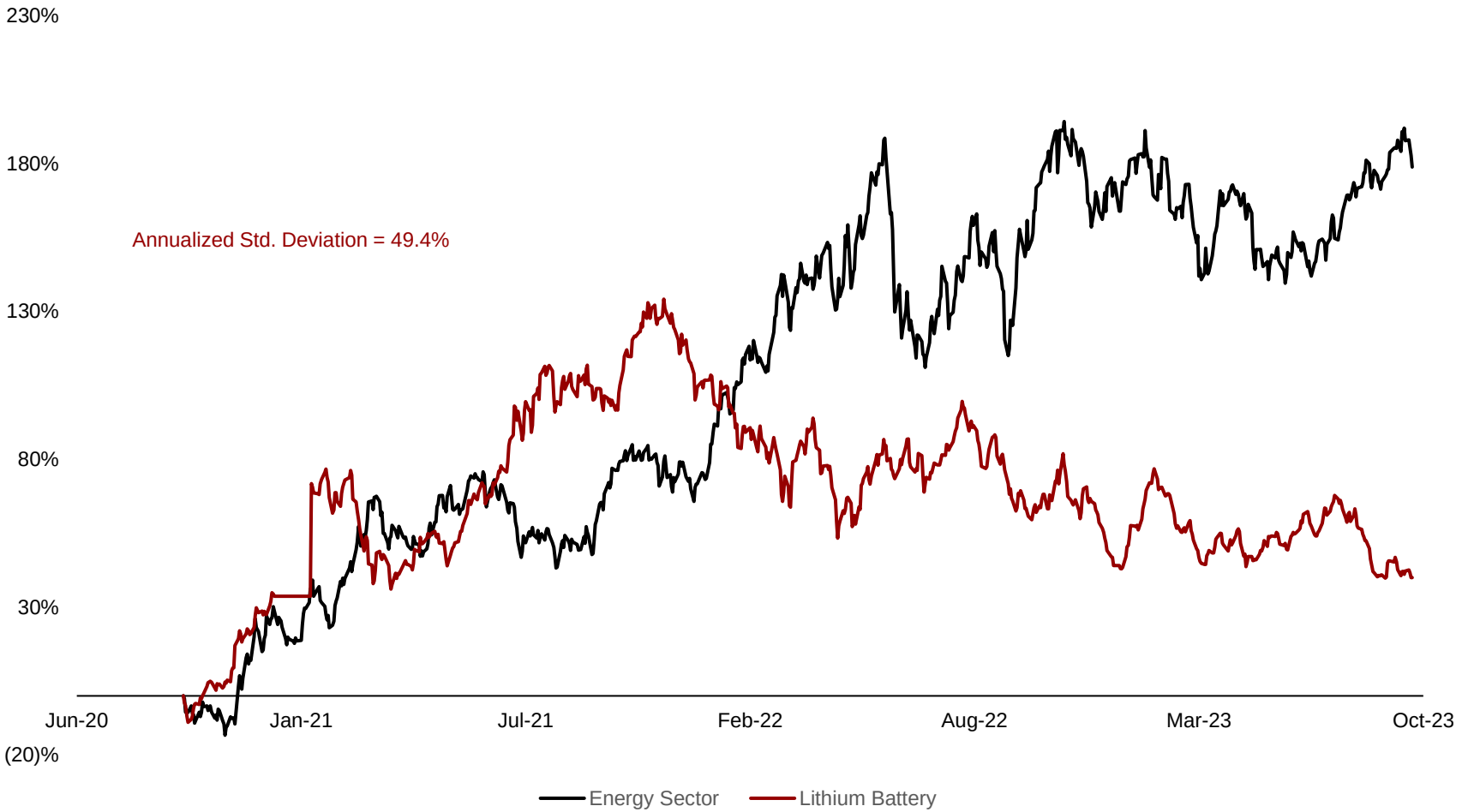
Renewables

Earnings Growth



Green Bubble, interest rate hikes, commodity prices, and energy crisis caused extreme earnings volatility

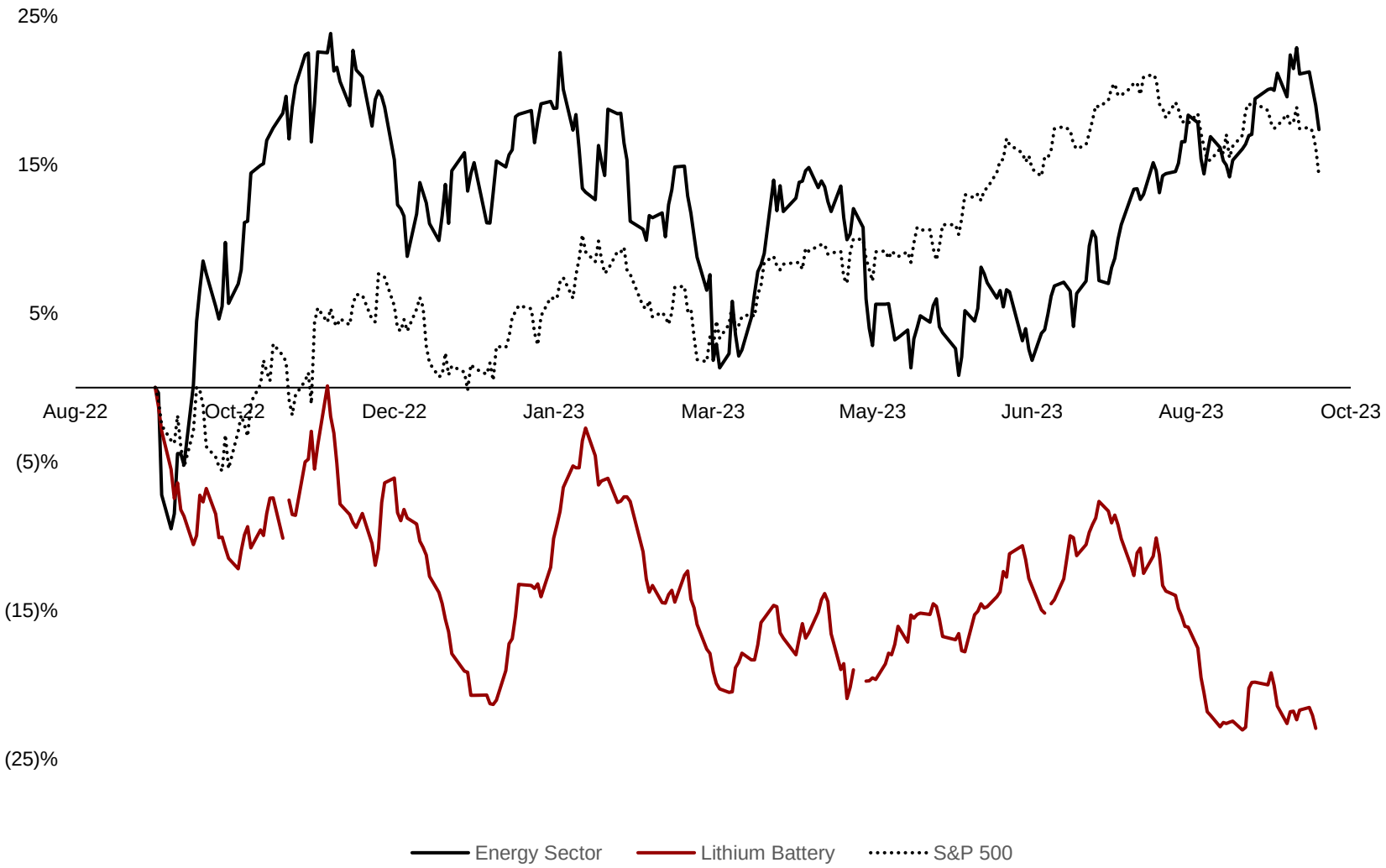
Battery 3-Y Performance



	Lithium Battery
Beta	0.28
R-squared	0.019

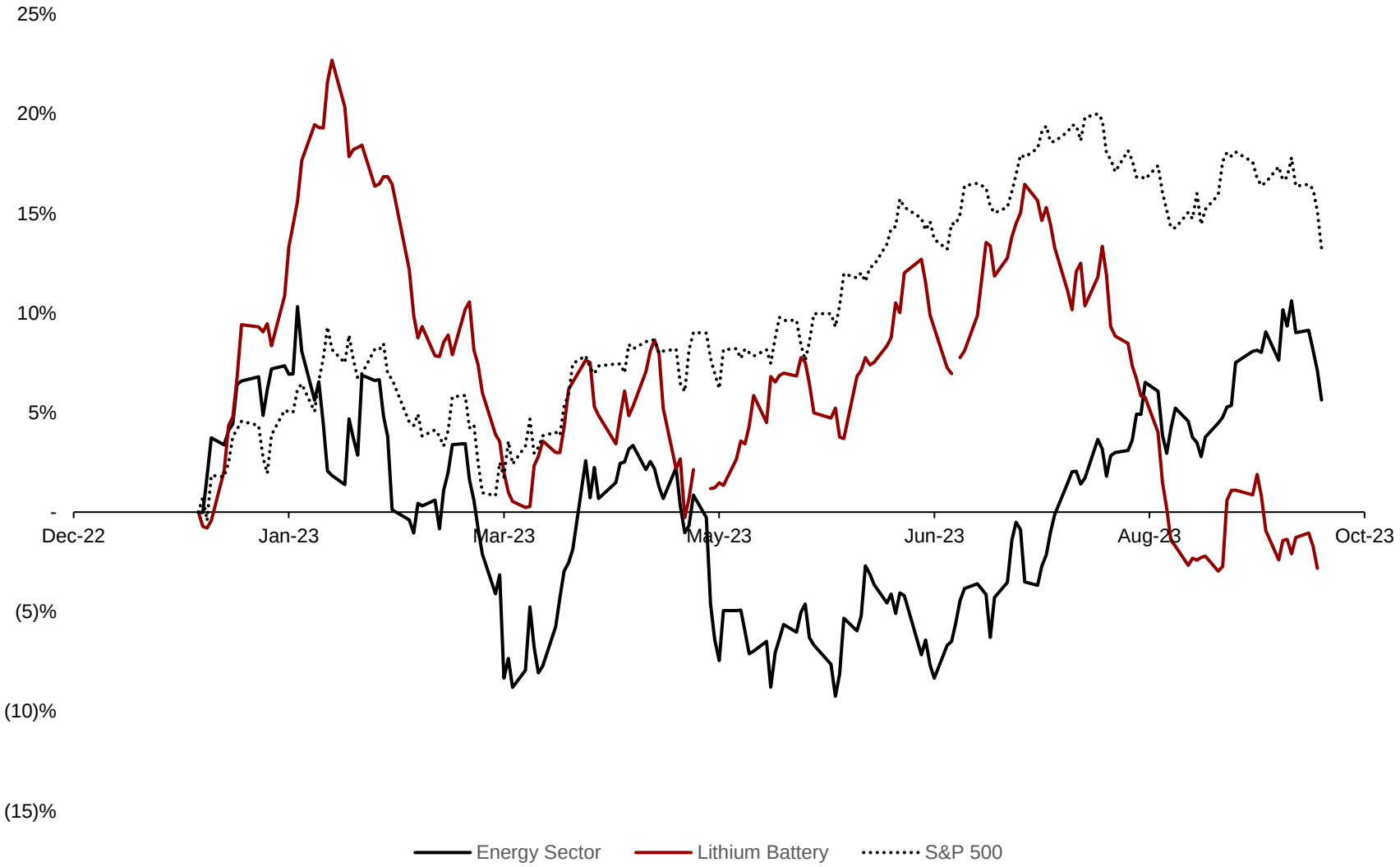
Source: Capital IQ

Battery 1-Y Performance



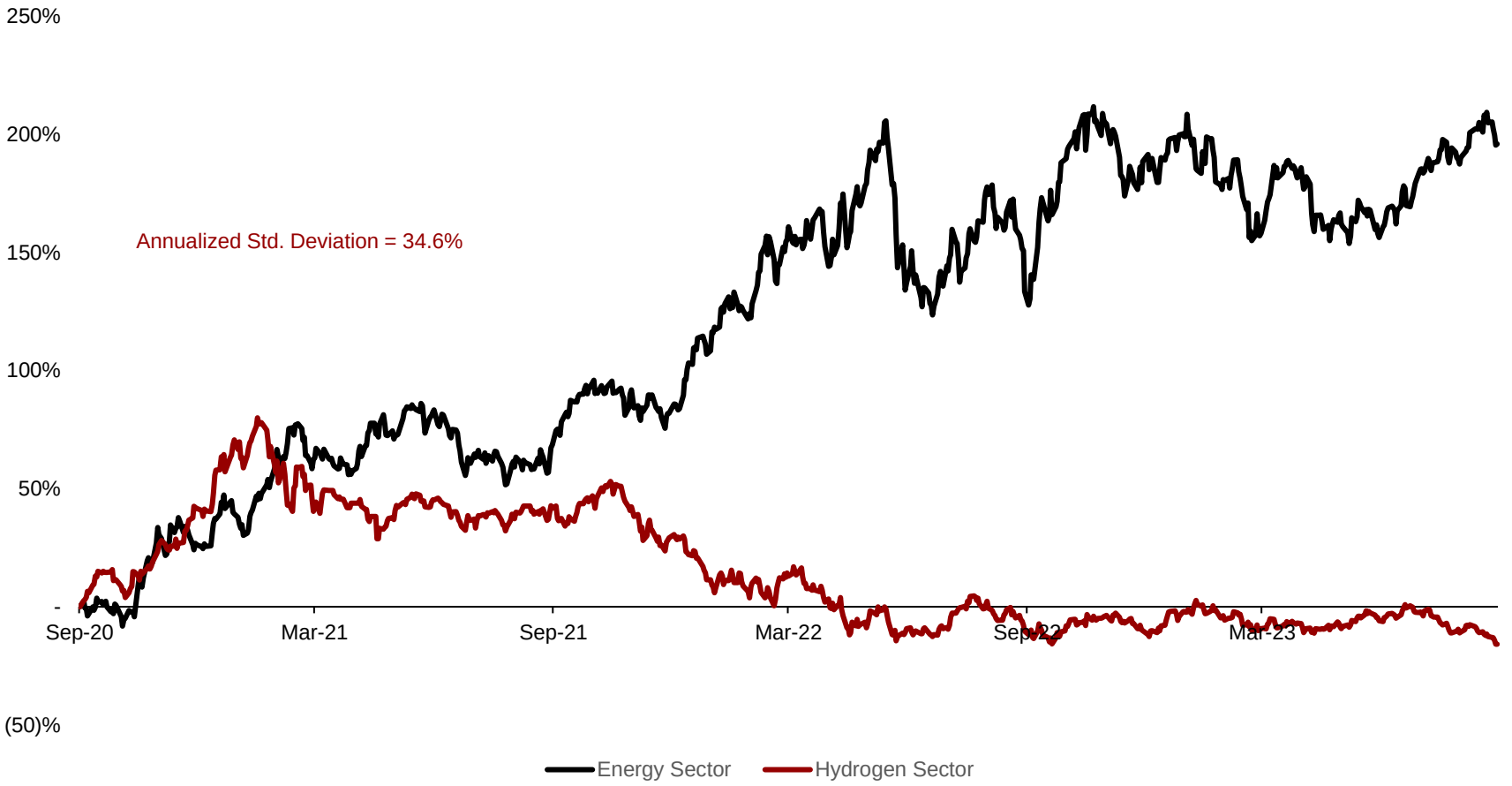
Source: Capital IQ

Battery YTD Performance



Source: Capital IQ

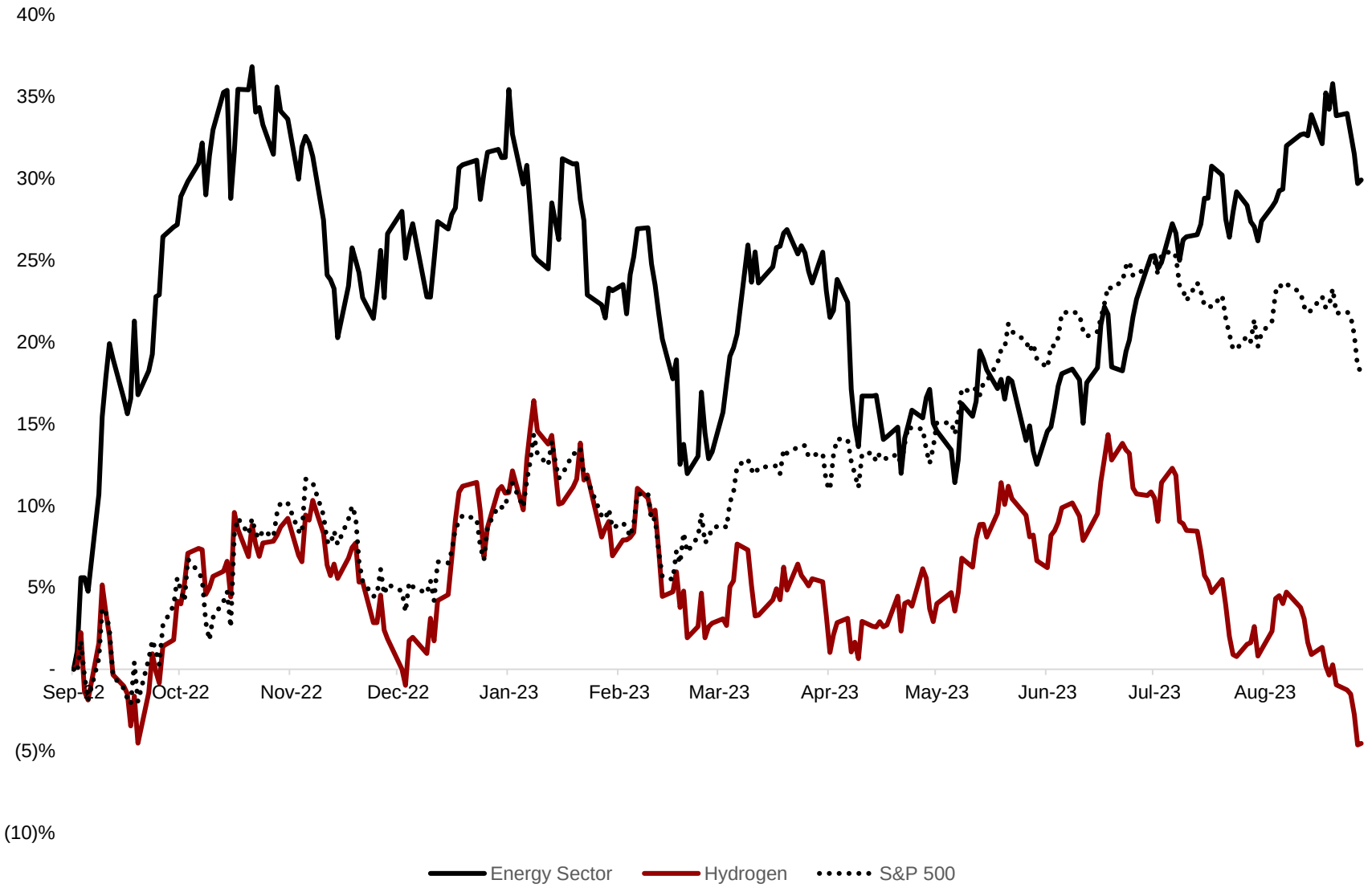
Hydrogen 3-Y Performance



	Hydrogen
Beta	-1.95
R-squared	0.59

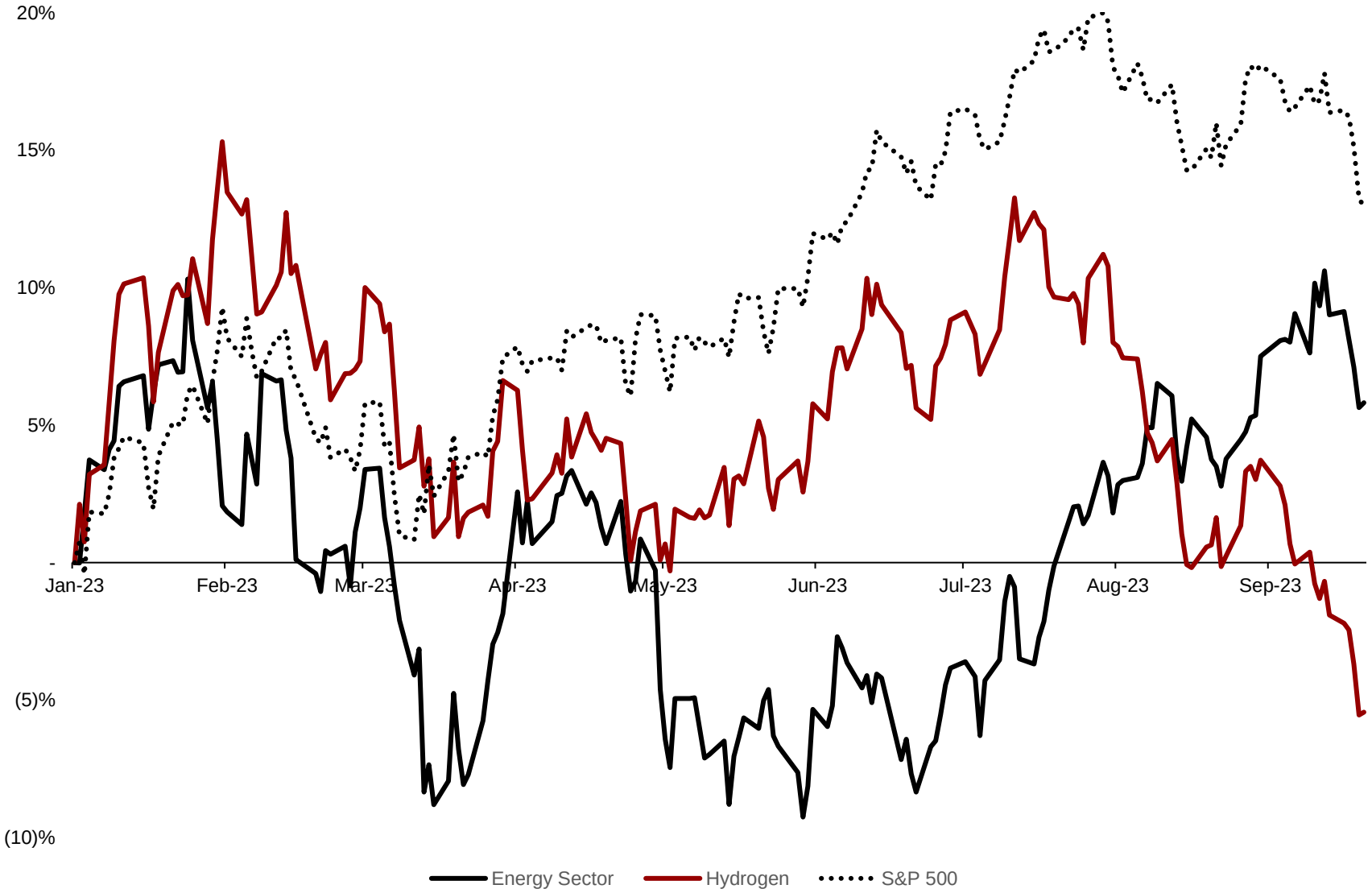
Source: Capital IQ

Hydrogen 1-Y Performance



Source: Capital IQ

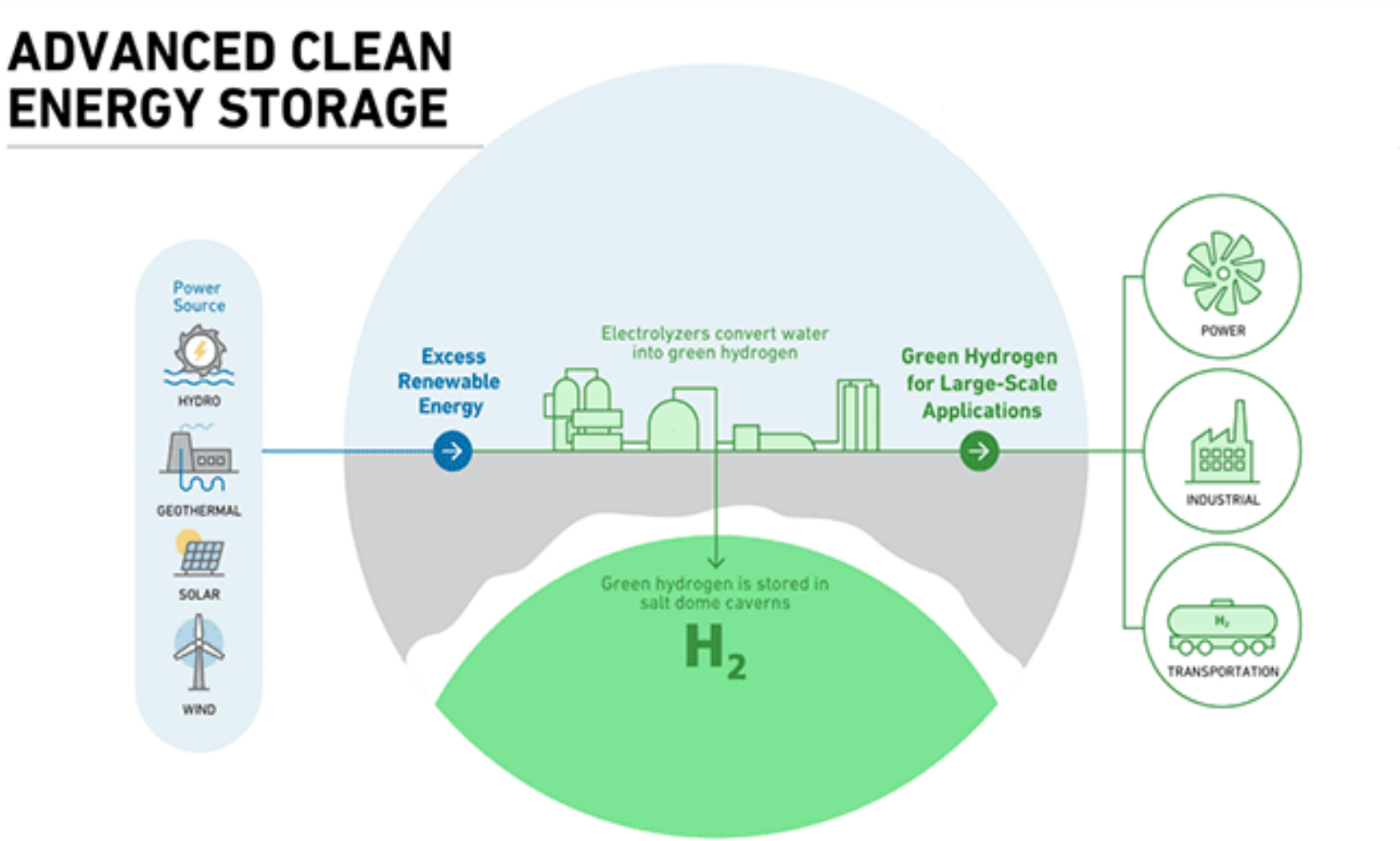
Hydrogen YTD Performance



Source: Capital IQ

Underground Hydrogen Storage

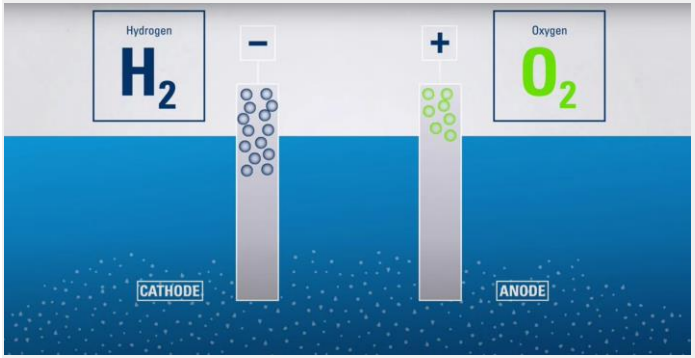
The only viable large-scale storage technology for hydrogen



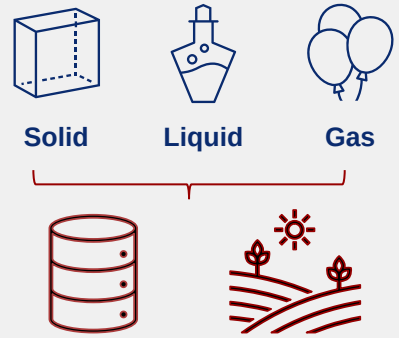
Compressed Hydrogen Stored Underground Is Likely To Be the Best Solution

Electrolysis

$2H_2O = 2H_2 + O_2$

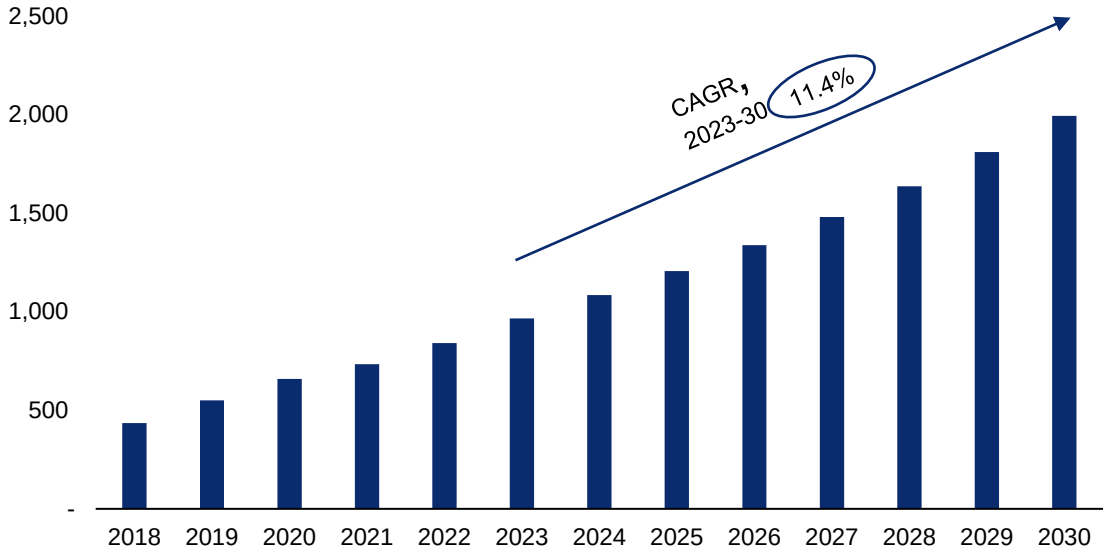


Storage Method



- Only viable large-scale storage tech for H_2
- Much safer and more efficient than above-ground storage
- Supply hydrogen as a transportation fuel for H_2 fuel cells
- High cost of building and maintenance

North America Underground Hydrogen Storage Market Forecast, in MCM



Source: Grand View Research

Leading Hydrogen Players

bp

AIR PRODUCTS

Pure Play Hydrogen Companies

PLUG POWER

FUSION FUEL

fuelcellenergy

A major advantage of alternating current is that its voltage can be modified relatively easily using a transformer, which allows power to be transmitted at very high voltages before being taken down to safer voltages for commercial and residential use.[3] This minimizes energy losses, as shown below[4] (see residential household circuits for more details):

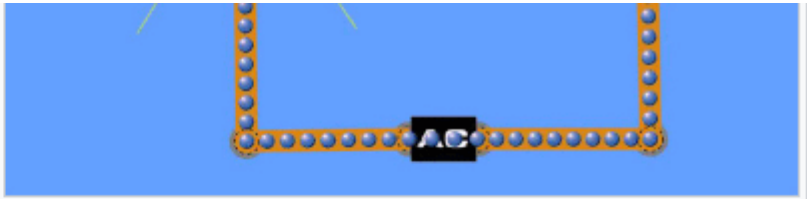


Figure 1. An animation from a PhET simulation[2] of alternating current which has been slowed down considerably. See direct current for a comparison.

$$P_{lost} = I^2R$$

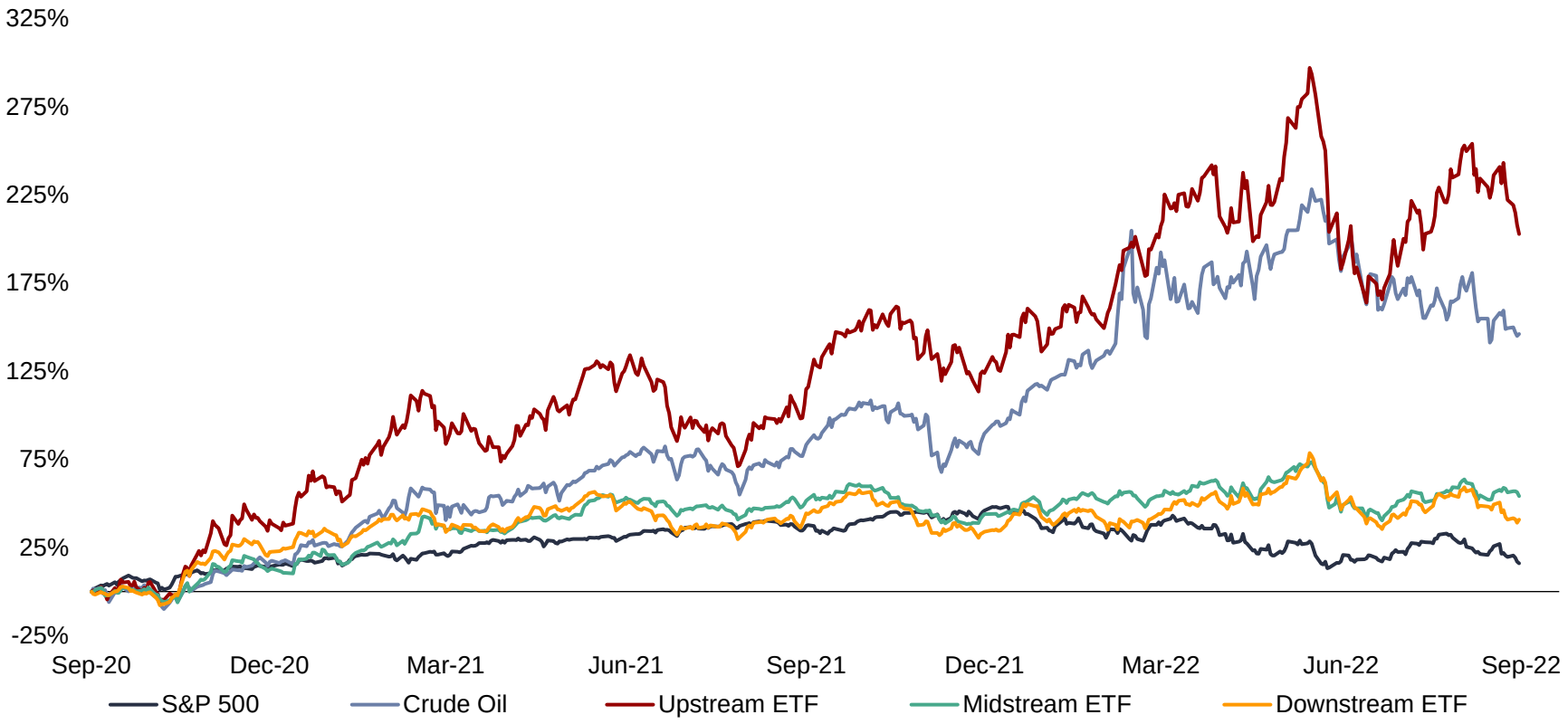
The power transmitted down the line however has a different expression:

$$P_{transmitted} = IV$$

- P is the power, either lost or transmitted and is measured in watts
- I is the electric current through the wire, measured in amperes
- V is the voltage, measured in volts
- R is the resistance, measured in ohms

Energy & Utilities: Volatility

1. Beta & Standard Deviation



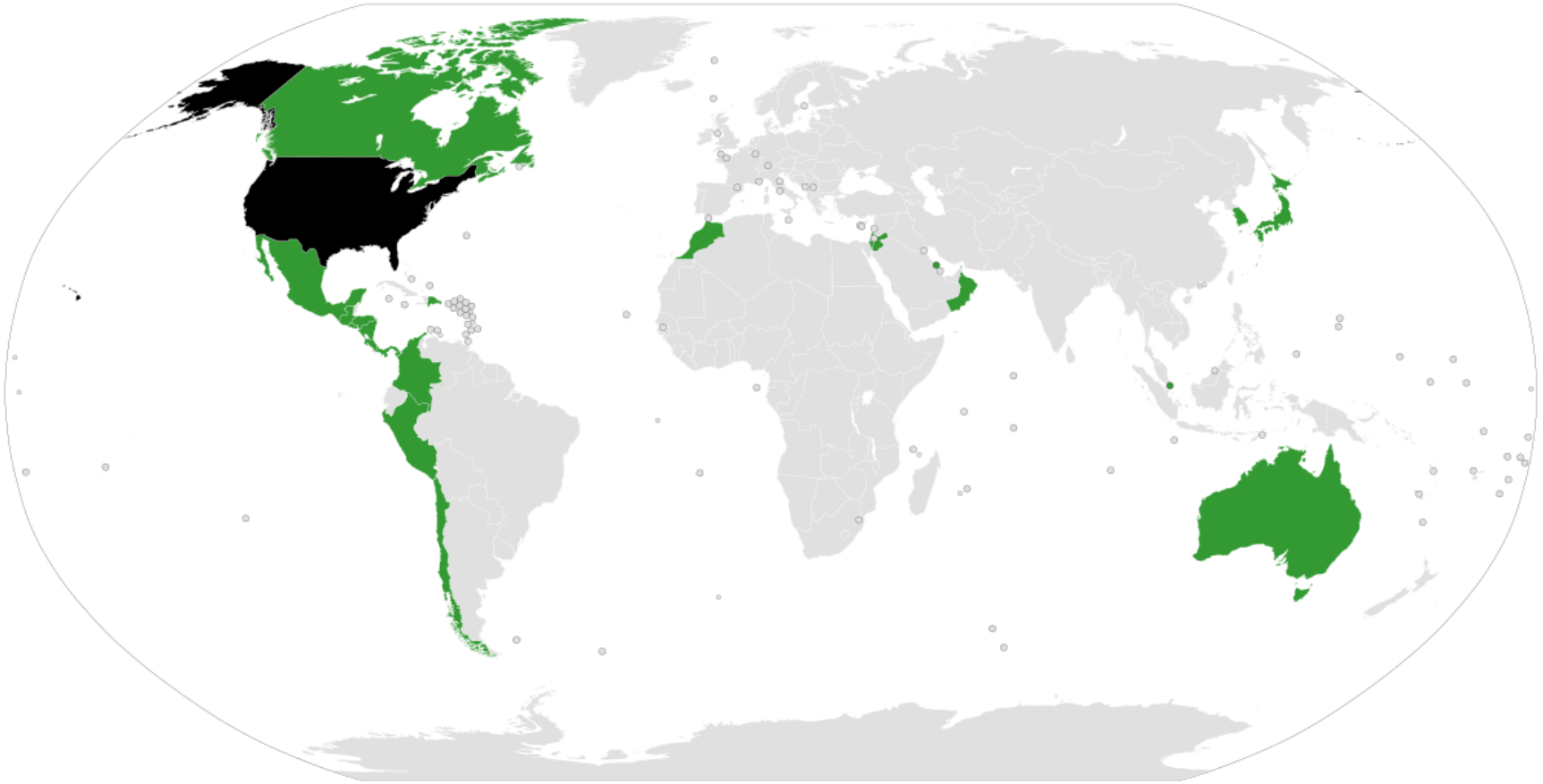
	Energy	Utilities	Oil & Gas	Renewables	Transition Fuels
3y Beta (vs S&P)	0.915	0.62	1.163	1.014	TBD
Standard Deviation	8.580	4.14	9.005	7.107	TBD
R-squared	0.273	0.377	0.355	0.402	TBD

TBD

Source: Bloomberg

US Free Trade Agreements

Materials companies in these countries will benefit from IRA



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