Navigating Climate Risk amid geopolitical conflict, disrupted supply chains, and energy shocks

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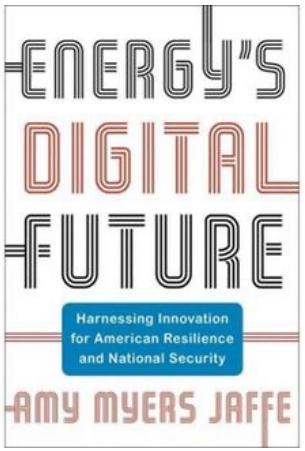


ESG and climate risk are distinct

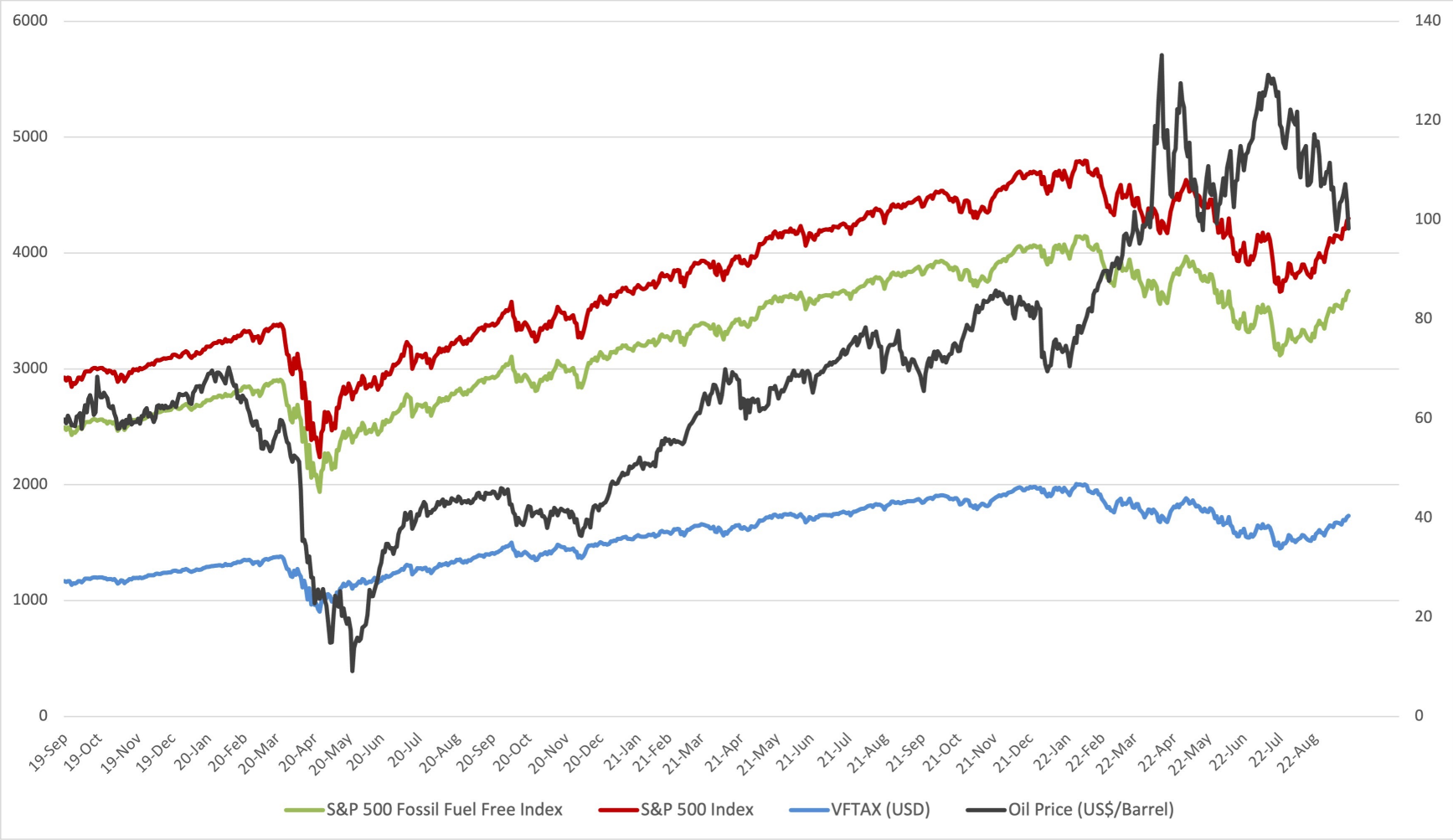
- Integrating risk evaluation of environmental sustainability, social responsibility, and prudent governance (ESG) factors systematically into investment evaluation processes, along with other financial metrics.
- It is sometimes used interchangeably, but climate risk should be differentiated from ESG as an investment thesis, impact investing theme, or risk metric.
- Buying an ESG index does not mean your portfolio is protected from climate risk.
- For some the single-mindedly a question is whether it is unethical to invest in fossil fuels.
- The Task Force on Climate Related Financial Disclosures (TCFD) is specific to climate risk (physical AND transition risk. Its tools are aimed to identify and guide disclosure of climate related risks and opportunities.
- Climate risk is even more relevant for real assets investing than for public equities holdings.
- Physical climate risks as they occur have already had tangible impact on stock values of particular companies (think, PG&E).

HSBC's Stuart Kirk fiasco

As the bank's head of responsible investing, was forced to step down after he said climate change was "not a financial risk we need to worry about." He called out the ridiculousness of "looking at something that's going to happen in 20 to 30 years" and added that "There is no place for virtue signaling in finance."

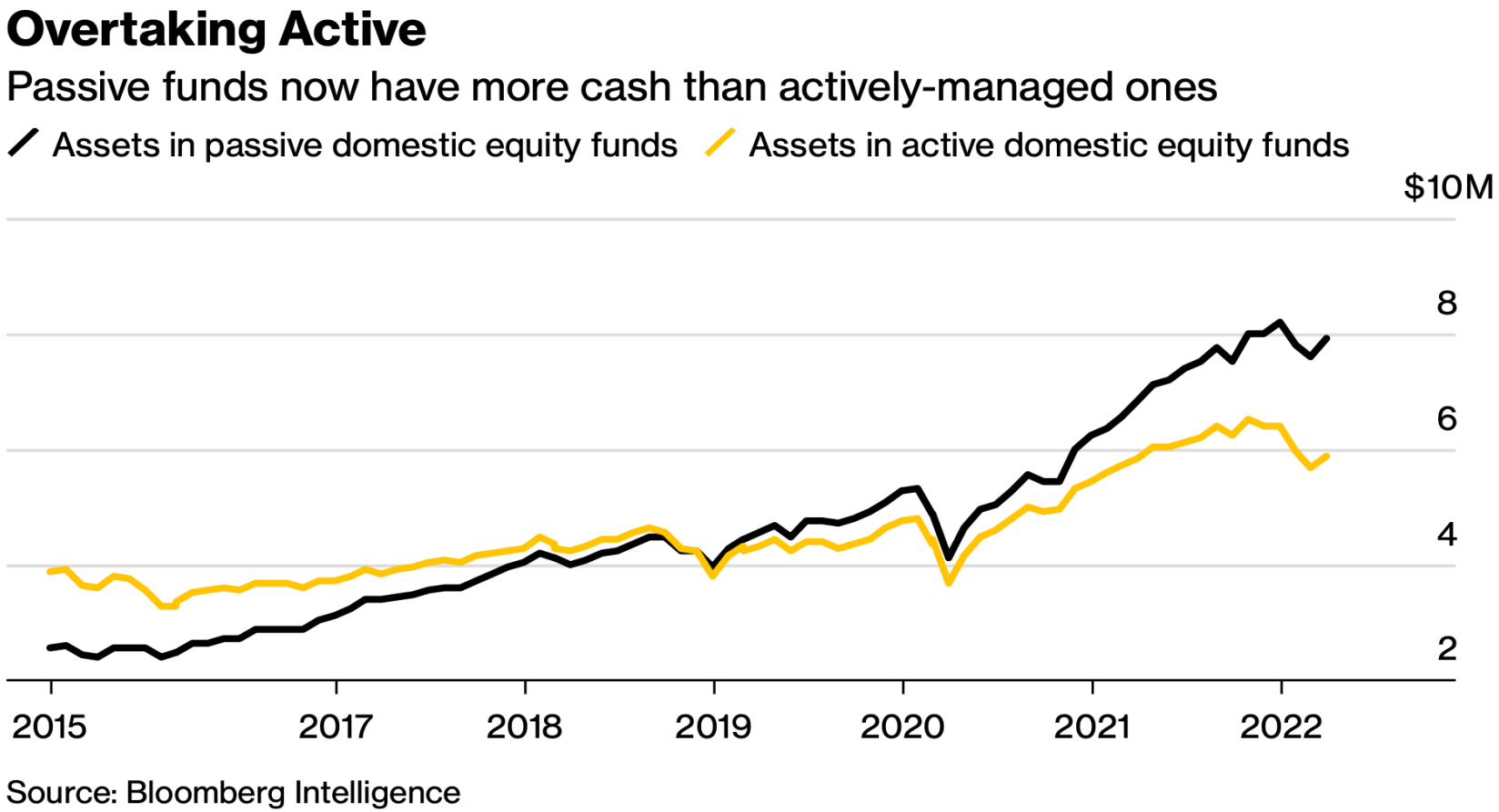
The 2017 shareholders of PG&E would likely beg to differ. The utility's stock fell 80% between late 2017 and end December 2019 amid wildfires caused by its wires in California which its management failed to assess and disclose as a climate risk. Then in January 2019 the stock fell a further 52% when the company declared bankruptcy.

An ESG Index is not the same as a Fossil Free Index…



When oil prices are low, the costs of fossil free are minimized but now that oil prices are high, the differential is more contentious.

Institutional investors are turning to passive index investing to reduce risks of poorly managed funds and avoid high fees. ESG screenings of indexes can introduce tracking error.



Academic review of ESG investing

- Black box ESG products have been shown to have insufficient bearing on environmental performance (Friede, Busch, and Bassen, 2015)
- ESG rating systems aggregate so many factors together that it has been critiqued to blur the underlying power of individual factors to influence outcomes
- Instead, going short or long negative or positive ESG news better investment strategy than buying an ESG index (Engle, Giglio, Kelly, Lee, and Stroebel, 2020)
- ESG systems have tended to lack comparability
- This incomparability has increased stock price uncertainty (Gibson, Krueger and Schmidt, 2021)

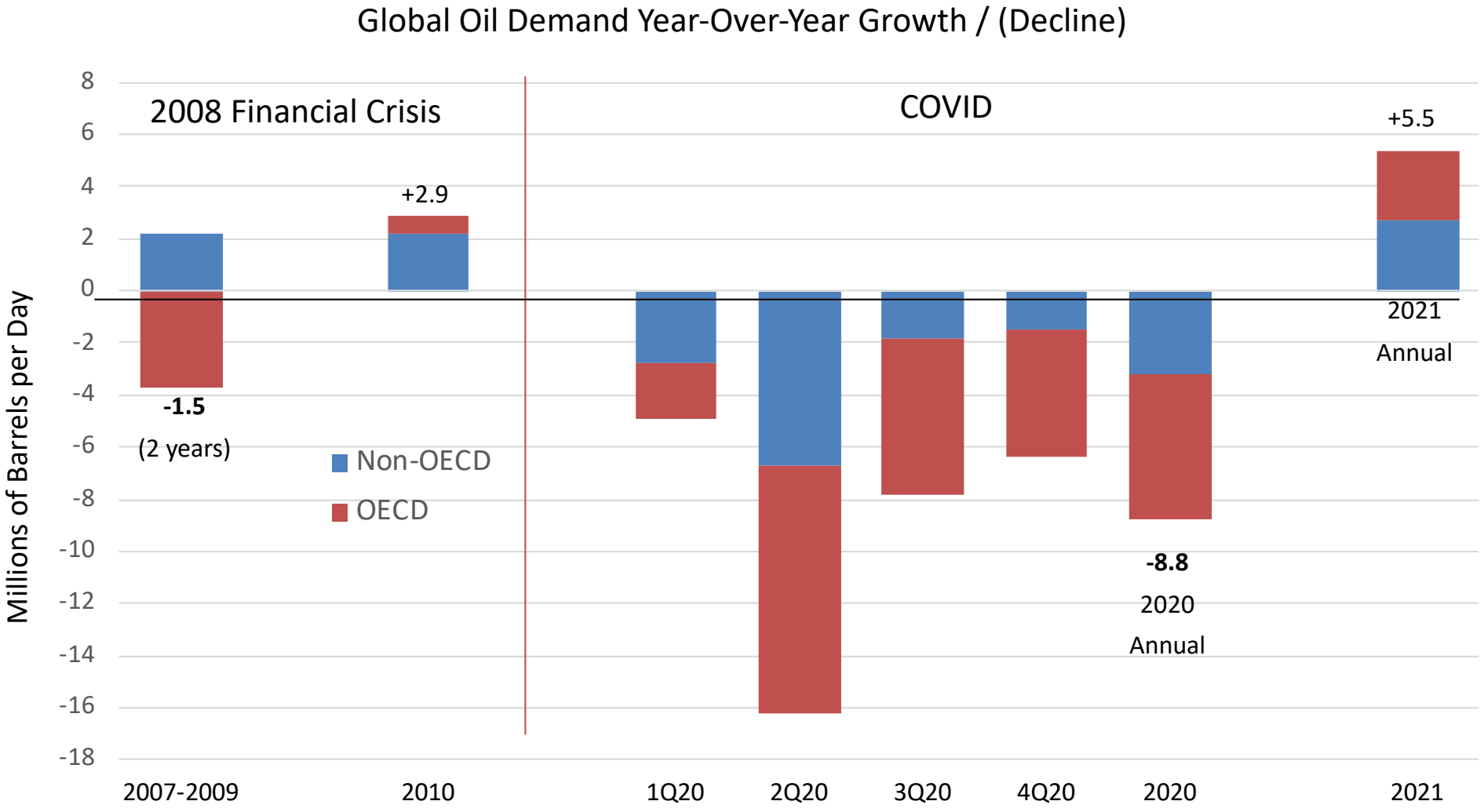
Academic review of Climate Risk and Finance

- Indexes capture pension fund preference for broadly diversified market portfolio that matches the overall global economy. The size of weighting of firms comprised in exclusions influences the level of tracking error, eg the more material the constraints, the higher the deviations from benchmark.
- Sireklove 2016 Fossil free investors can incur significant tracking error in the short run
- Since fossil fuels do not outperform market, they provide little diversification benefits (Trinks et al, 2018)
- Griffin, Jaffe, Lont, and Dominguez-Faus, 2015, Scientific report of limited level of oil, gas, and coal carbon emitting budget remaining contributed to a 2% drop in average stock price of 63 largest US oil and gas firms.
- Yook and Hooke, 2020 concur a fossil free portfolio strategy caused ”no undue harm” to the investor between 2004 to 2017 on an average basis but noted differences in early vs later time scale of study period.

Climate Risk and Oil Prices

It's still a cycle

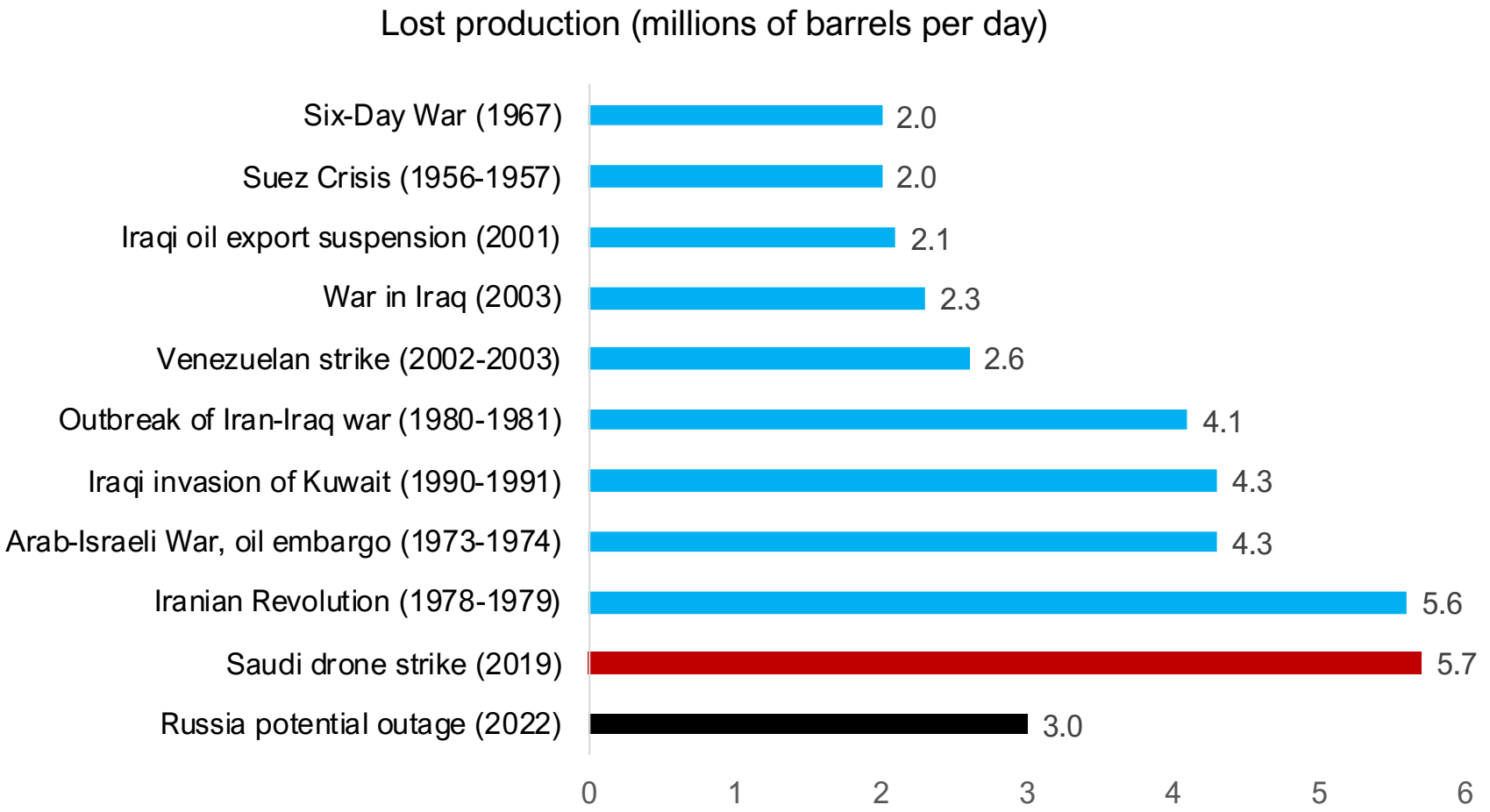
Change in Global Oil Demand:
COVID vs. the 2008-2009 Financial Crisis



*Year-over-year and quarter-over-quarter except where noted

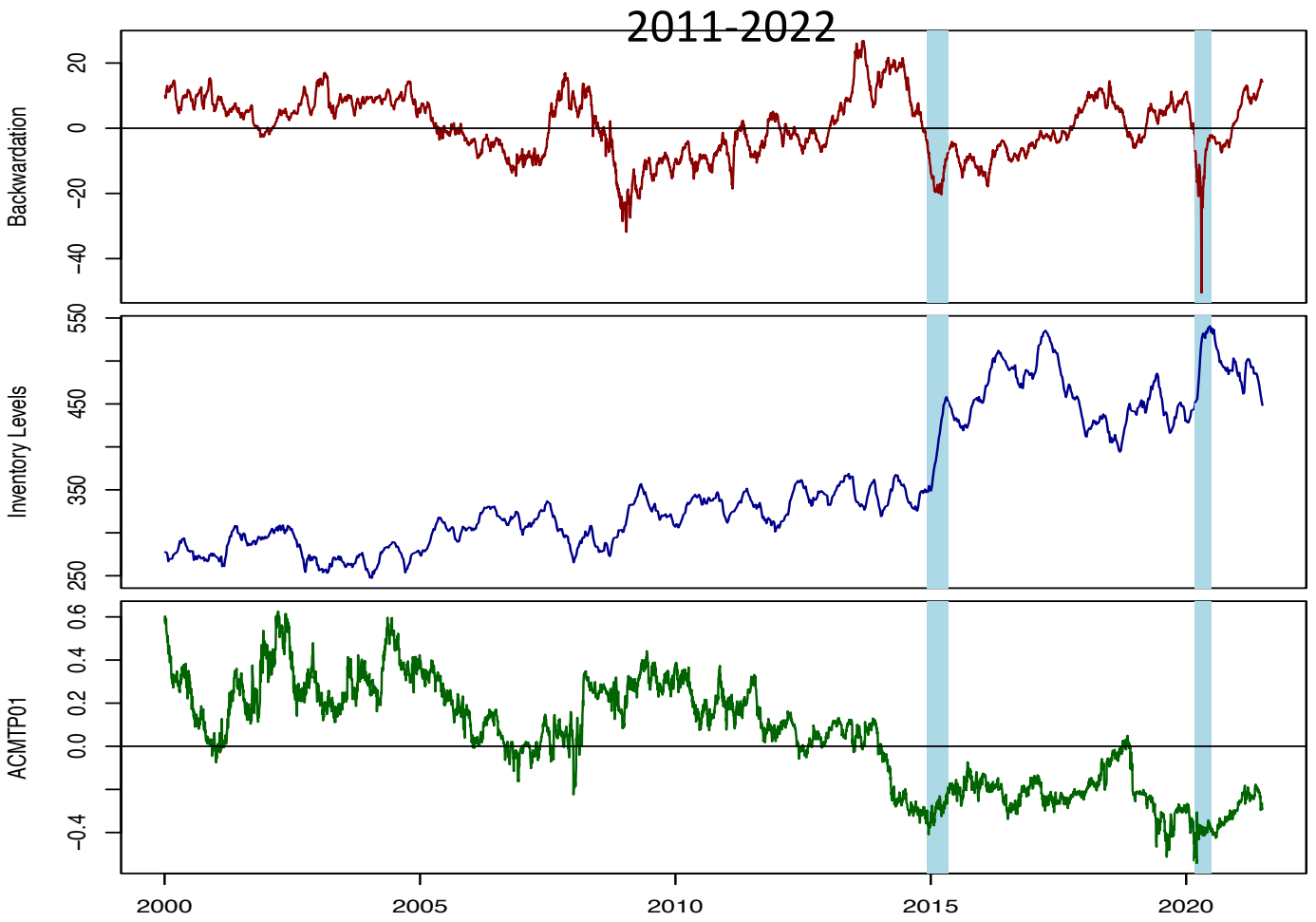
Source: International Energy Agency, Oil Market Report, January 16, 2021 and IEA Annual Statistical Supplemental 2007-2009

Russian crude oil supply export cutoff in historical terms is more limited than people think and it didn't actually happen yet



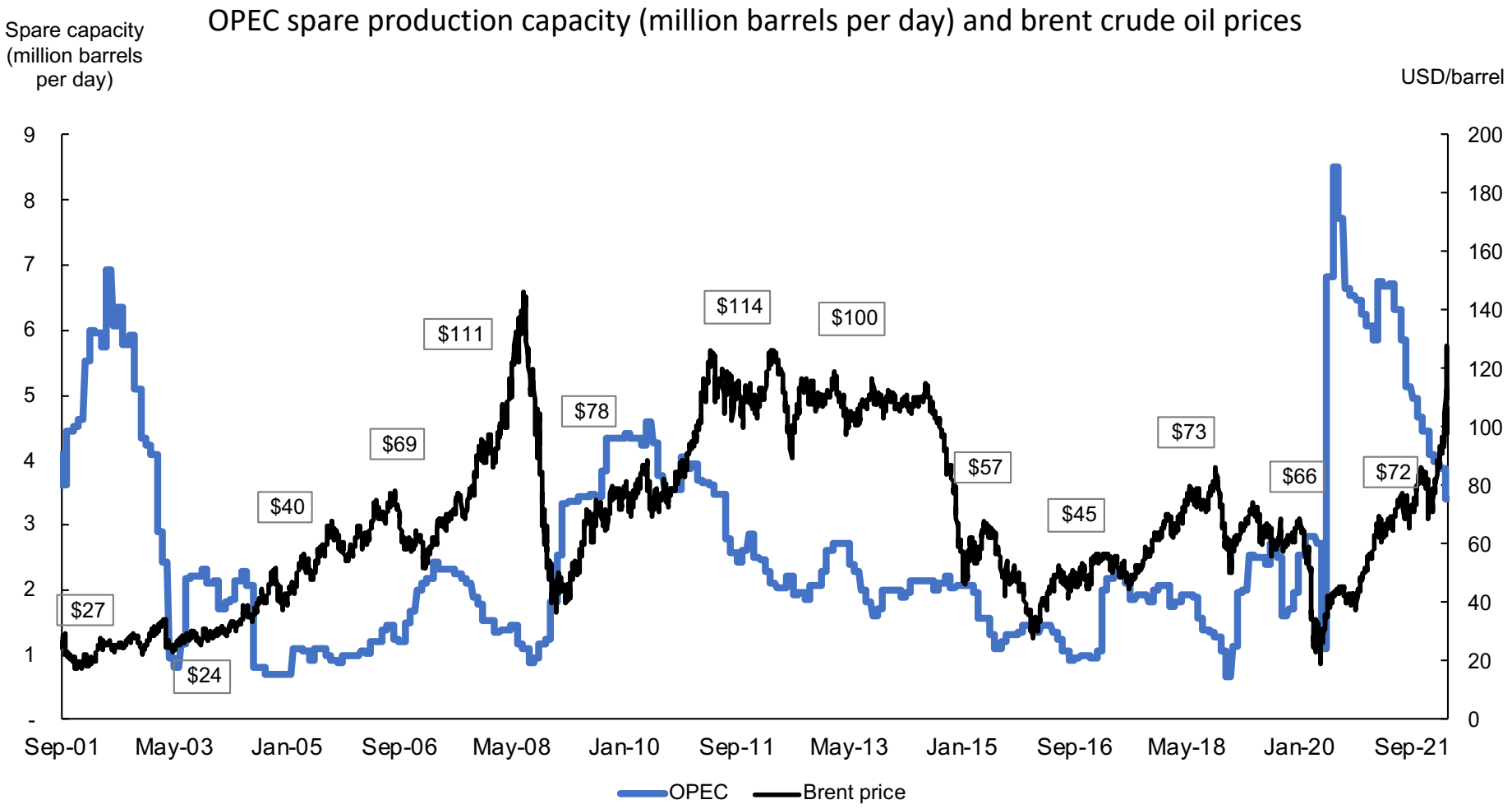
Source: Bloomberg & IEA (2019)

Shape of WTI curve in periods of high geopolitical risk and rising open interest from financial players exhibits more backwardation than is justified based on fundamentals for the cost of storage and interest rates. Markets failing to recognize rising risk to oil commodity funds and ETFs.



Backwardation (DNS Slope term), US Inventories Excluding SPR, and ACM Treasury One Year Term Premium – Blue is Contango Collapse

Changes in level of OPEC Spare Capacity



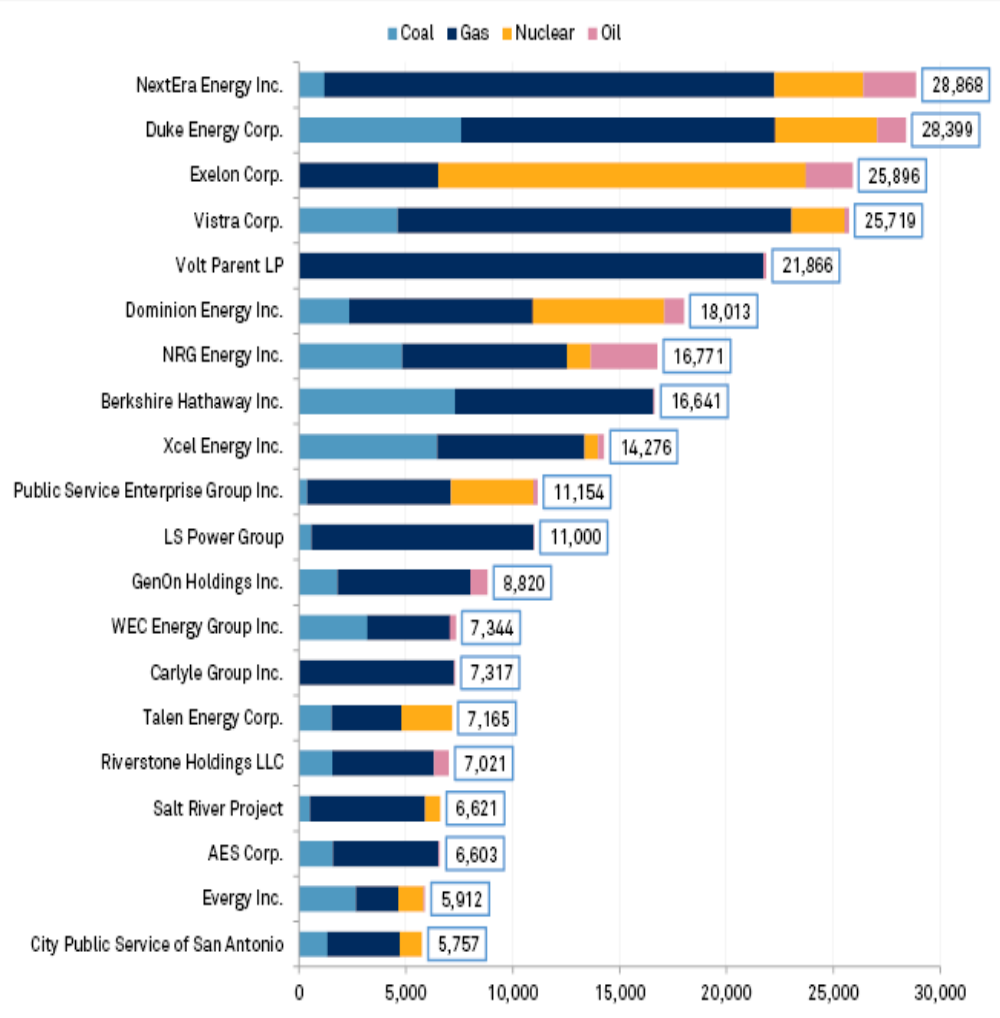
*spare capacity < 2.5 million barrels per day
*data labels correspond to the dates on the x-axis.
Source: US Energy Information Administration, Bloomberg Terminal (Retrieved March 17, 2022)

Climate Risk: What does TCFD process aim to help companies and investors do?

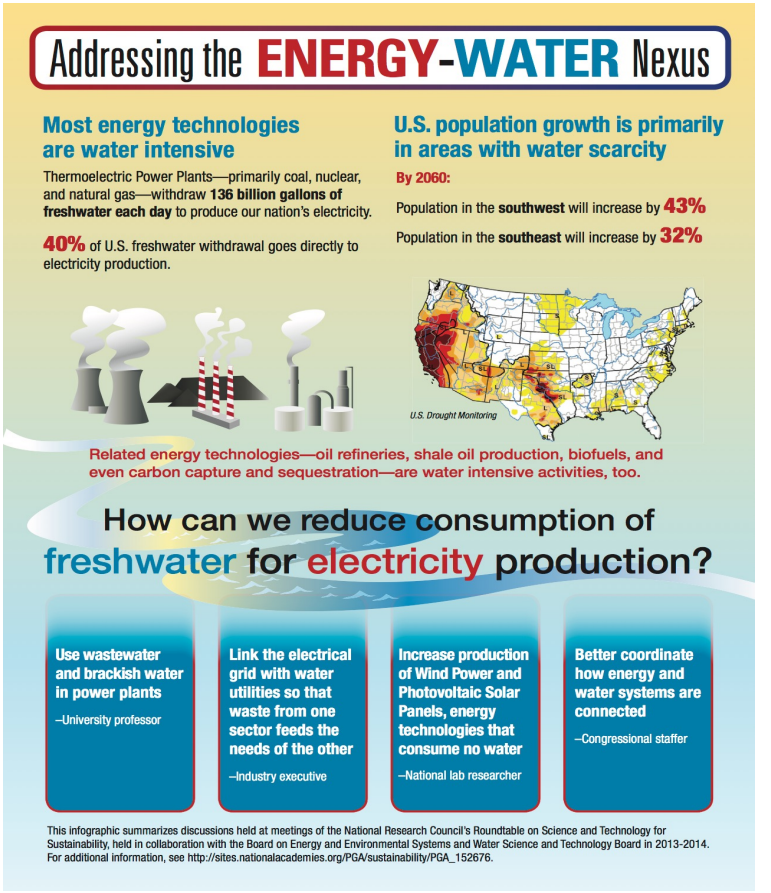
Examine risks and explore opportunities

20 largest owners of fossil and nuclear capacity in contiguous US areas projected to be water stressed (MW)

Capacity is adjusted by ownership and limited to those that WRI projects to be in areas of medium-high to extremely high water stress in 2030*



Data compiled Oct. 12, 2020.
WRI = World Resources Institute
The analysis is limited to operating power plants tracked by S&P Global Market Intelligence with a primary fuel of coal, nuclear, natural gas or oil.
* Projected water stress in 2030 was sourced from WRI's Aqueduct tool. The data is based on WRI's business-as-usual scenario that assumes stable economic development, atmospheric concentrations of carbon dioxide reaching about 1,370 parts per million by 2100, and global mean temperature increasing by 2.6-4.8 degrees Celsius by 2100 relative to levels in the 1986-2005 period.
Sources: S&P Global Market Intelligence; World Resources Institute Aqueduct tool accessed as of July 27, 2020



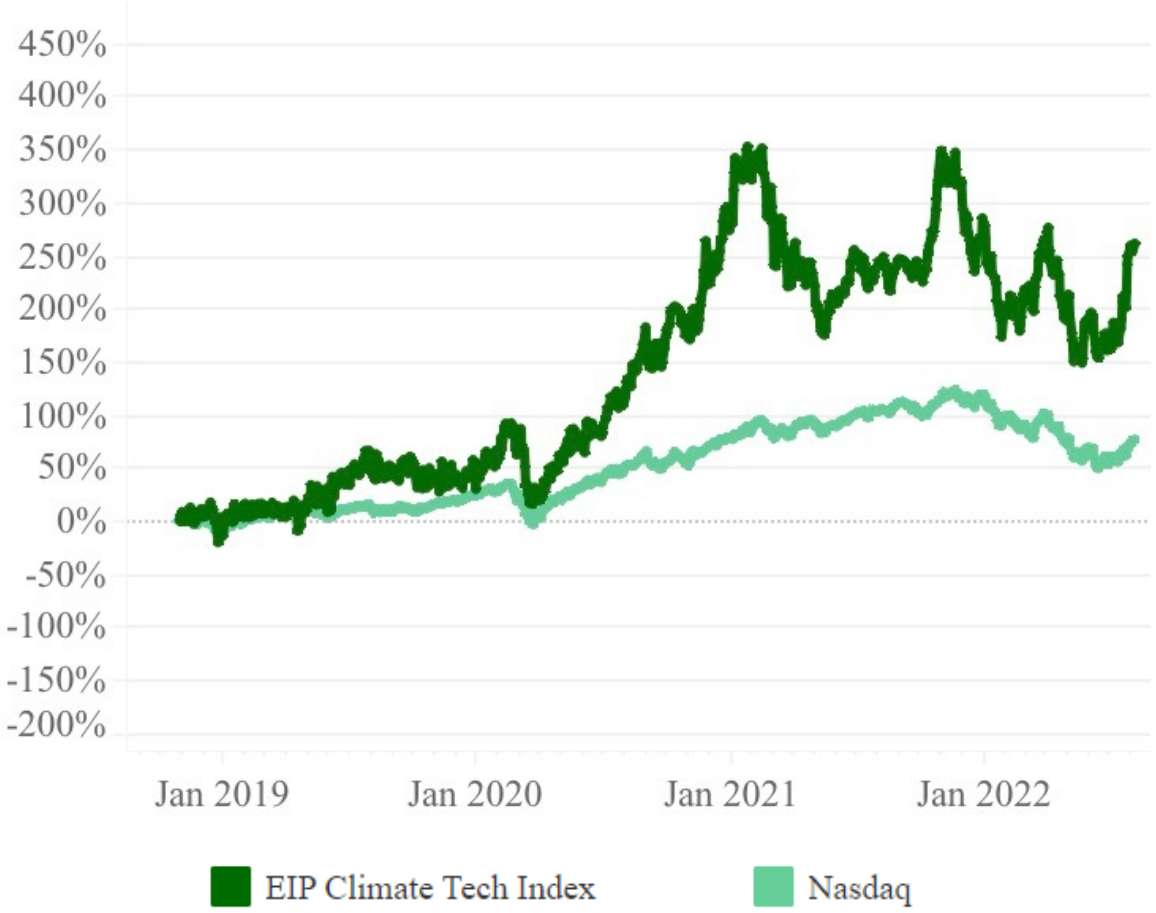
Water used by power plants unpacked:

Coal – 100 to 1,100 gallons per MWh

Nuclear – 600 to 800 gallons per MWh

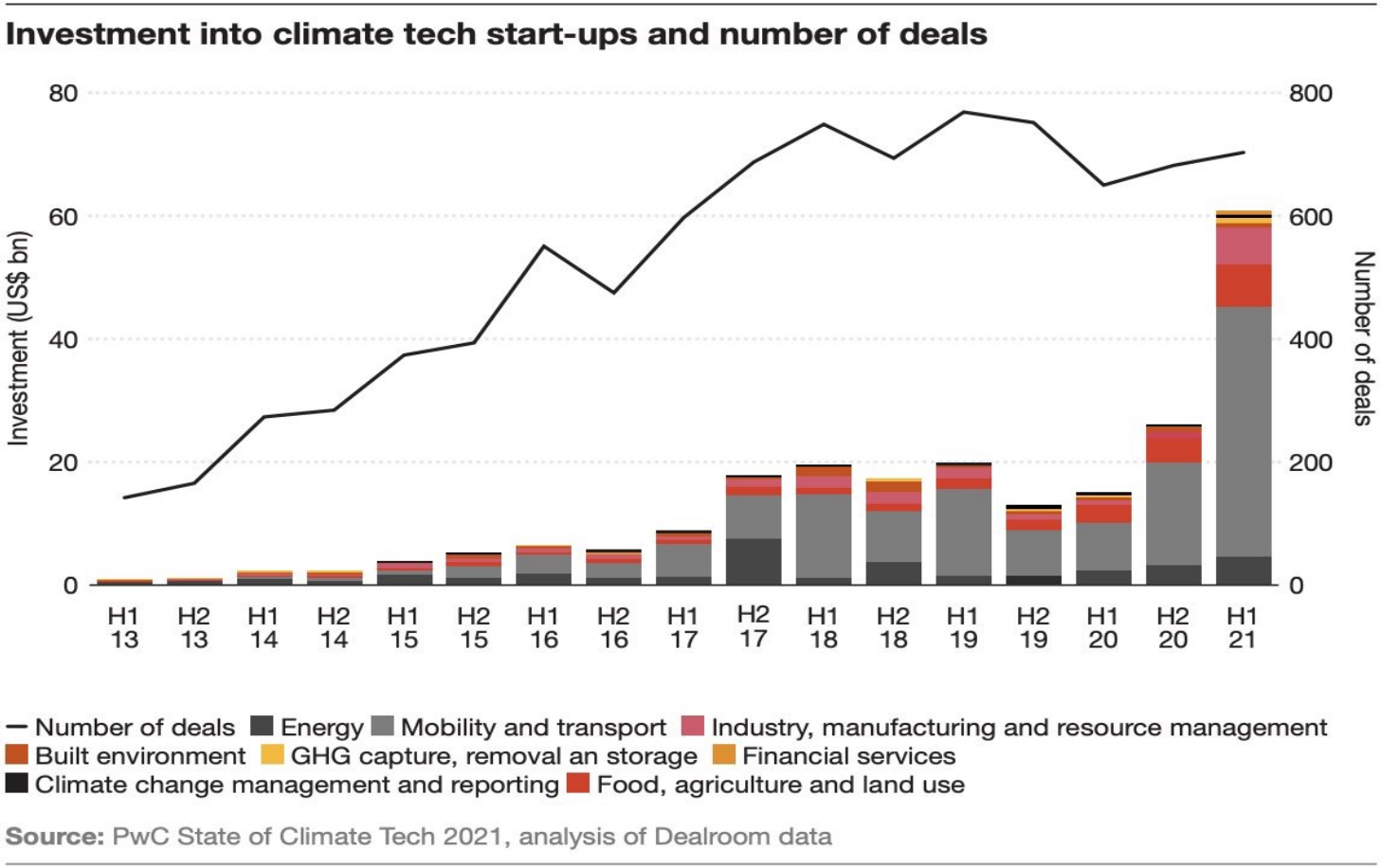
Natural gas – 20 to 300 gallons per MWh

Climate Tech Was Overcrowded by Late 2021, Early 2022 But Still Outperforming NASDAQ as a Thematic Investment Thesis

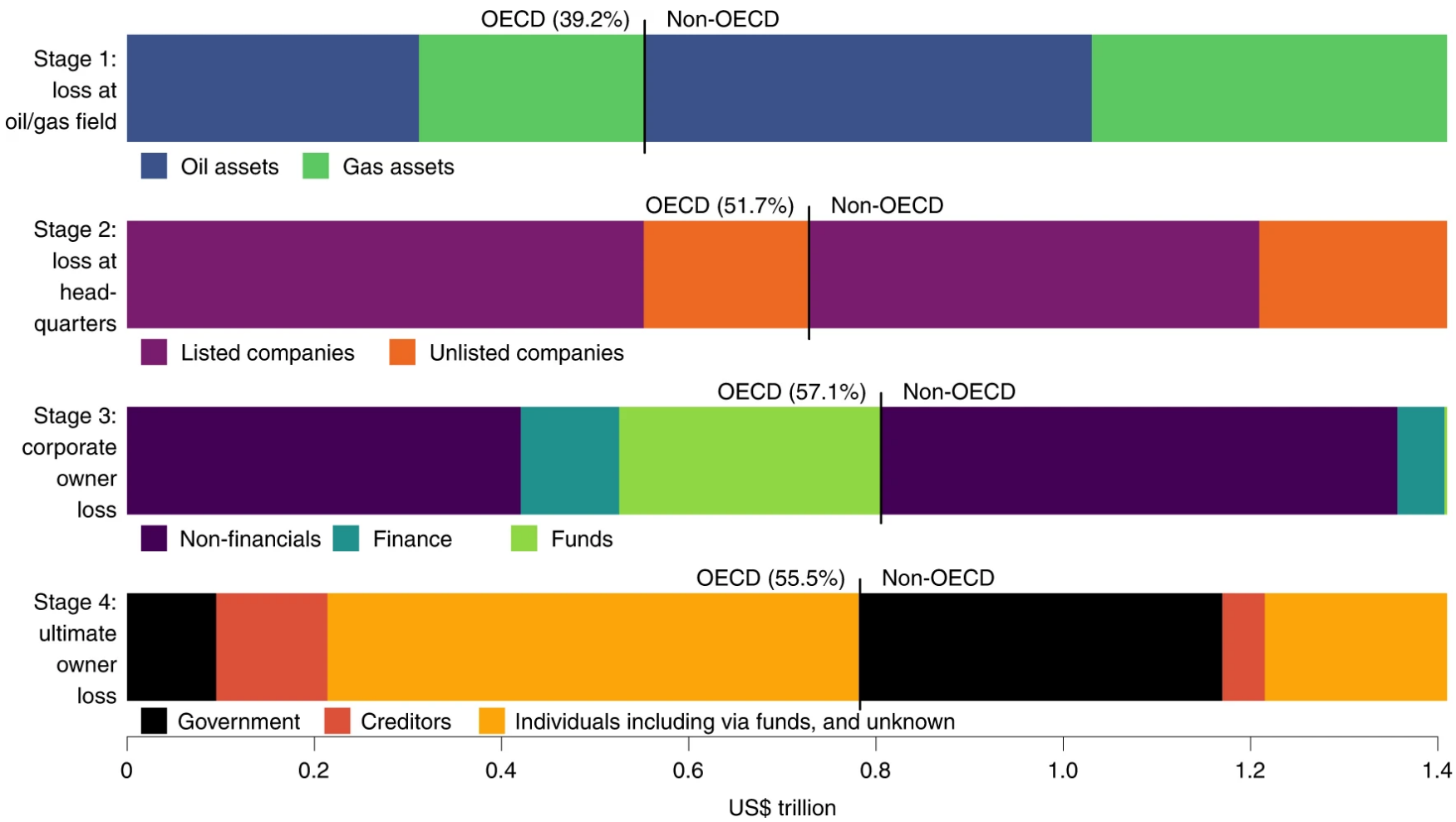


Source: EIP Climate Index

Governments have mobilized $1 trillion in post-COVID clean energy stimulus, over 50% higher than post- 2009 stimulus. But supply chains remain an immediate headwind.



Stranded Assets Question



Semieniuk, et al, Nature 2022

Investment Time Horizons Matter

- **Installation time for Deep Offshore Wind is same as constructing LNG export terminals**
- **Onshore oil and gas (US) resource extraction and monetization takes months, not years**
- **Arctic and other remote resources cost recovery can take a decade or more before profit fully recovered**