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The Hong Kong Retirement Schemes Association



19 Sep 2024 (Thursday)  
9:30 – 10:30 am

## Fueling the Future – Investing Across the Global Energy Landscape



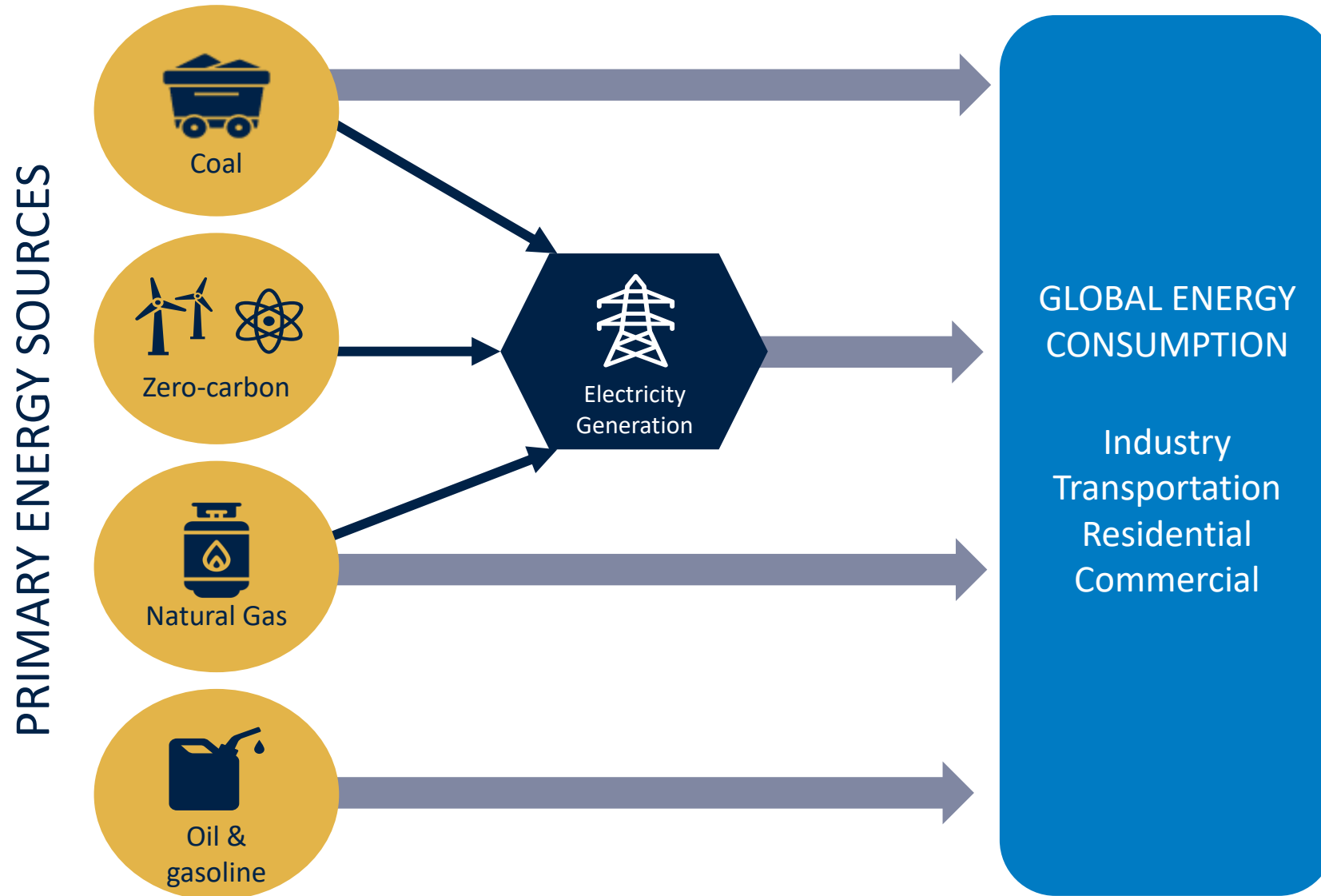


# FUELING THE FUTURE

Investing Across the Global Energy Landscape

PGIM Thematic Research  
September 2024

# Simplified schematic of the energy system



# Why energy matters for investors

1. **Not only is energy 10% of global GDP, but energy prices drive key macroeconomic indicators**, including inflation, consumer spending, economic growth and external balances.
2. **The energy transition** – the shift towards electrification and a low-carbon energy mix – creates an array of **attractive new investment opportunities**.
3. **For investors with ESG goals or decarbonization commitments**, a strategy dividing the investment world into “brown villains” and “green heroes” will not be the most effective approach; we need a more nuanced approach



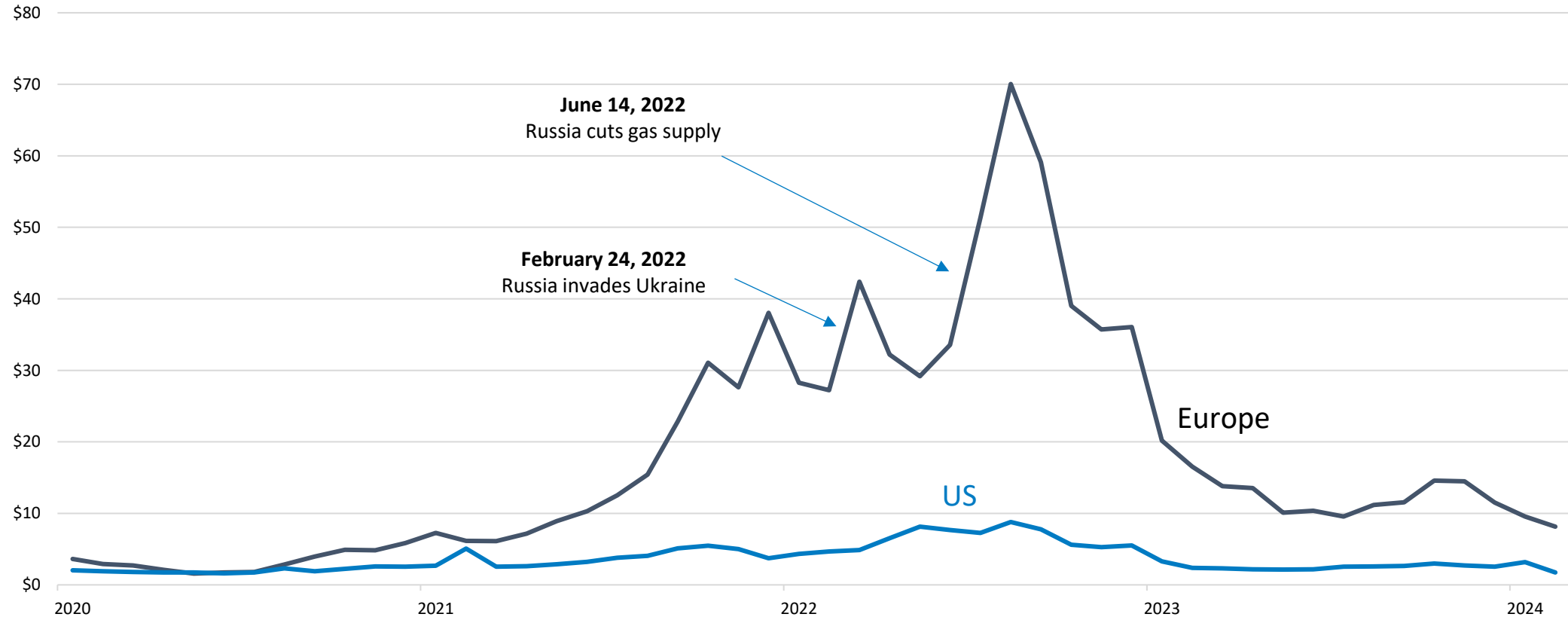
# The New Energy Landscape

The image is a monochromatic blue-toned photograph of a power line landscape. In the foreground, a large, detailed lattice tower stands prominently. Behind it, a series of similar towers recede into the distance, creating a sense of depth. The towers are interconnected by a dense network of power lines that stretch across the sky. The sky is a gradient of blue, with some light clouds visible on the right side. The overall atmosphere is serene and futuristic, suggesting a modern energy infrastructure.

# Three drivers of change across the new energy landscape

## 1. Energy security is national security

*Natural gas price per one million British thermal units*



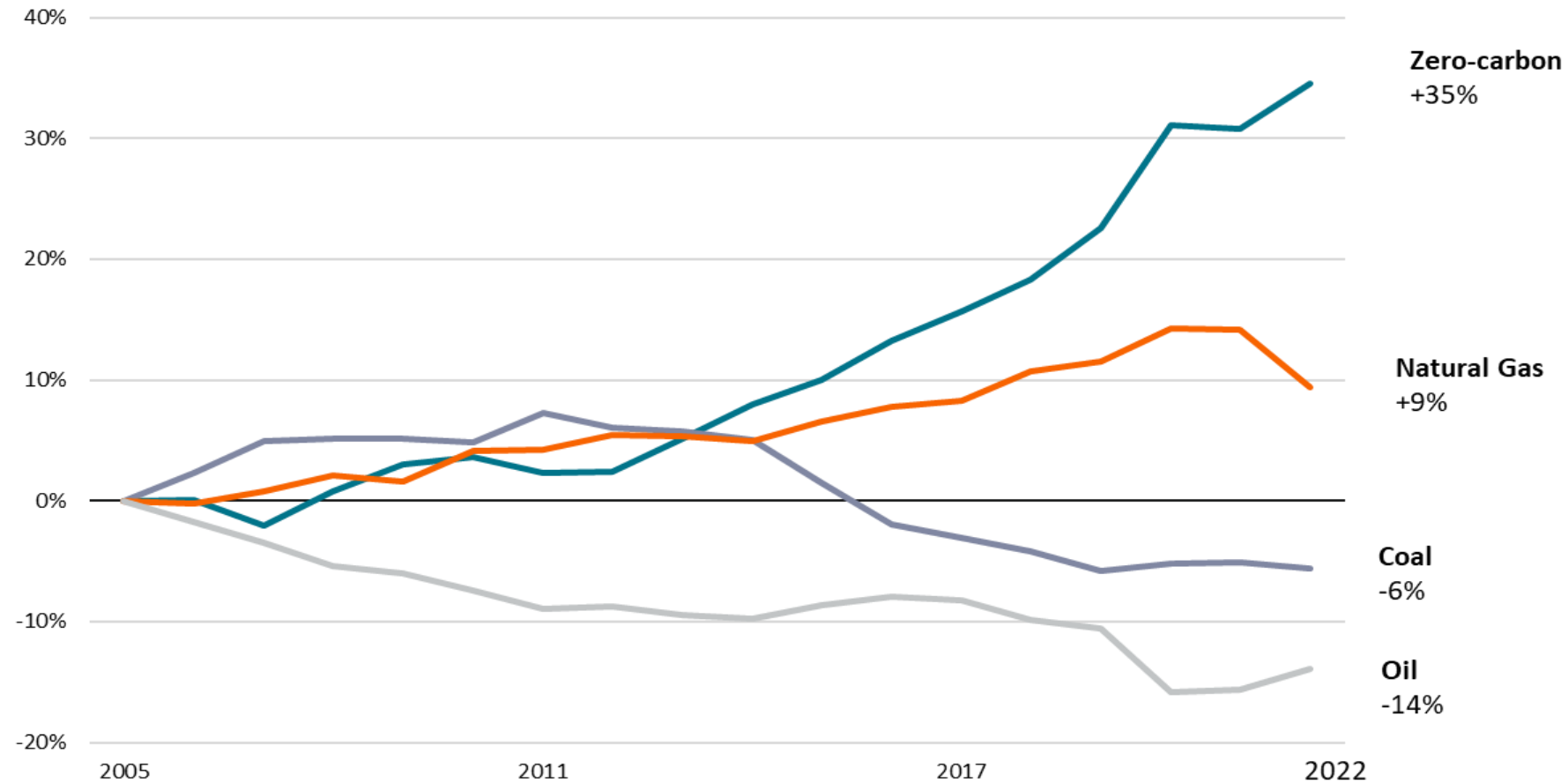
**Note:** The cuts to gas supply refer to the first Nordstream pipeline shutoff from Russia to Germany.

**Source:** World Bank. April 2024.

# Three drivers of change across the new energy landscape

## 2. A major transition is underway – with electrification at the center of it

*Energy consumption by primary source, terawatt hours*

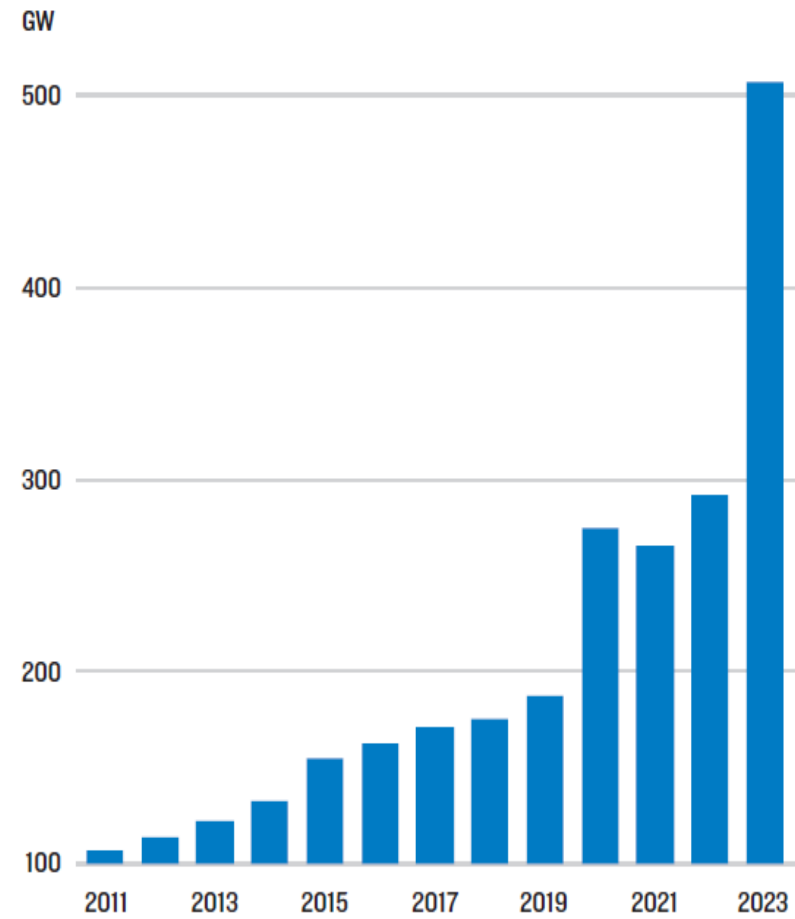


Source: PGIM Thematic Research, Ember and Pinto, et al; 2023. April 2024.

# Renewable power generation is skyrocketing

- Electricity is the one form of energy that can be affordably produced with limited carbon emissions.
- Global capacity of renewable power generation grew by 50% in 2023.
- Renewables are the first choice for *new* power generation in: China, Spain, US, India, UK and Brazil.

*New renewable electricity generation added globally*

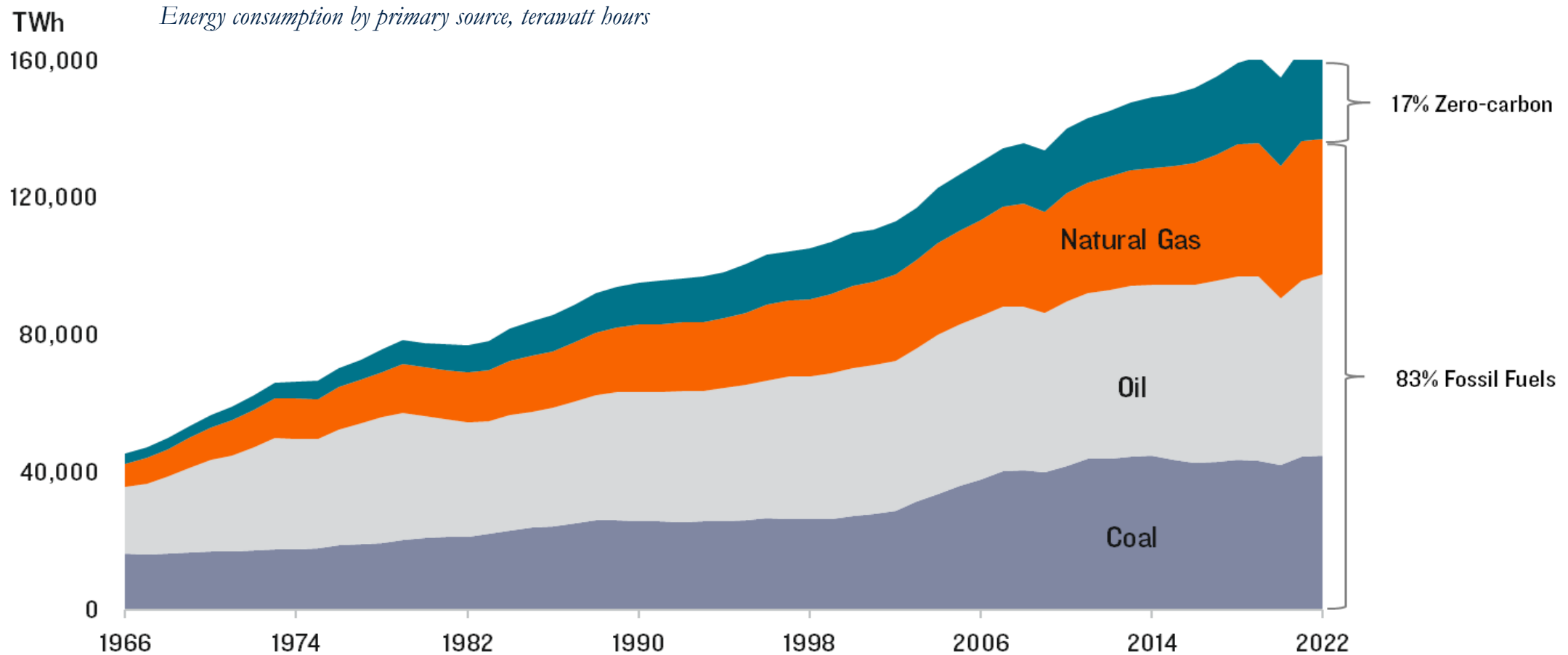


Source: International Energy Agency and International Renewable Energy Agency. April 2024.



# Three drivers of change across the new energy landscape

## 3. Our reliance on fossil fuels will continue for decades

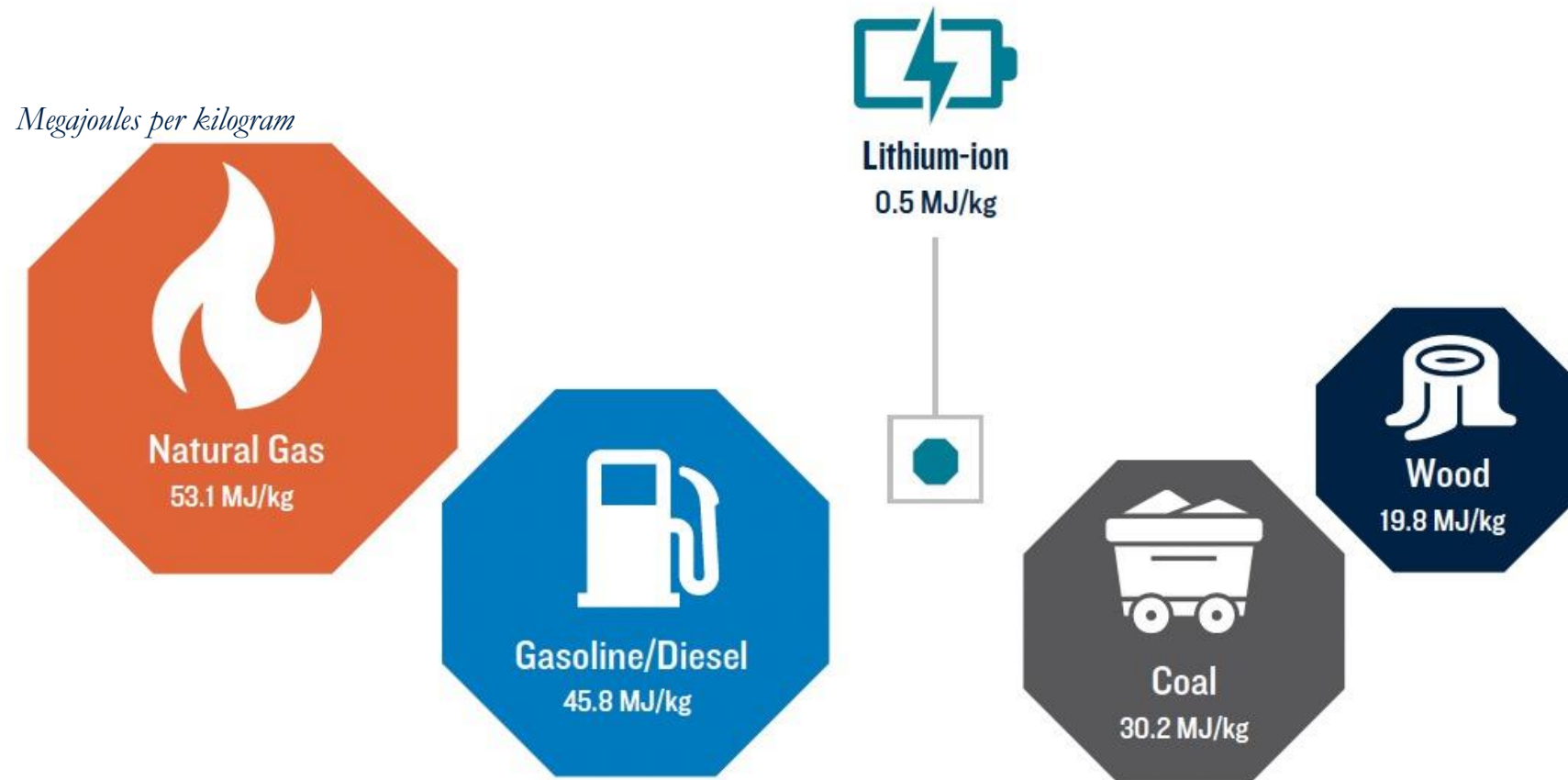


**Note:** Zero-carbon includes solar, wind, biofuels, hydropower and nuclear.

**Source:** US Energy Information Administration, Global Energy Outlook 2023. April 2024

# Electricity cannot compete on energy density

- The transportation and industrial sectors account for 72% of all energy use
- This consumption is dominated by *direct use* of fossil fuels



Source: Adapted from Brookings, “Why are fossil fuels so hard to quit?”



# Nobody is Perfect: Tradeoffs in Electricity Sources

# A perfect source of energy would be...

1. **Dispatchable:** ability to deliver power when it is needed; adjust it up or down at will
2. **Affordable:** few things spark universal political backlash quite like high energy prices
3. **Sustainable:** low-carbon energy system is critical to reducing global GHG emissions and mitigating climate change

## *Key points:*

- No single source of energy is perfect along these 3 fronts*
- Optimal system of the future will require multiple sources*

# Nobody is Perfect: All sources of electricity require tradeoffs



**Note:** Affordability is measured by the levelized cost of energy and carbon-emissions captures emissions per BTU.  
**Source:** PGIM Thematic Research, Lazard, International Energy Agency and US Energy Information Administration.

A collection of various light bulbs is scattered on a dark wooden surface. The bulbs include several standard incandescent bulbs with frosted glass, a compact fluorescent bulb (CFL) with its characteristic spiral shape, a halogen bulb with a clear glass envelope and visible filament, and several LED bulbs with different shapes like A19, BR30, and MR16. The text "Investment Implications" is overlaid in white on the left side of the image.

# Investment Implications

# Key Investment Themes for a New Energy Landscape

1. **Enabling renewables:** critical inputs, complementary infrastructure globally and select debt opportunities in mature markets
2. **Investing in lower-carbon fossil fuels** while avoiding obsolescence risk
3. **Avoiding the hype:** Monitoring innovation around renewable energy sources and green tech

## Enabling renewables by supporting critical inputs and complementary infrastructure

### 1. Renewable debt opportunities beyond wind and solar power generation

- With equity returns compressing in Europe and the US, debt financing of solar and wind power could offer attractive investment opportunities – especially senior debt in mature projects with offtake agreements and grid connections in place.
- Look beyond wind and solar power generation projects at less crowded opportunities in hydro and geothermal projects.

### 2. India's growing renewable market offers intriguing opportunity

- Strong energy demand growth provides a powerful macro tailwind for renewable power generation companies in India.
- Established companies with a track record of executing projects and cash flow from existing production may be especially attractive.

### 3. Wind turbines offer a different risk-reward proposition

- Wind turbines offer a way to invest in renewables with limited exposure to both individual power projects and the price volatility of electricity – with leading technology incumbents in Europe and North America in this sector potentially offering good risk-return opportunities.



## Enabling renewables by supporting critical inputs and complementary infrastructure

### 4. Investments in grid modernization and expansion

- Manufacturers of key grid components – including inverters and substations – offer exposure to a rapidly growing market segment.
- In South America, for example, transmission companies offer exposure to a portfolio of transmission lines with cost pass-thru capabilities and attractive debt structures.

### 5. The need for long duration storage

- Utility-scale power storage is worth evaluating as it can mitigate the issues of intermittency and is a vital part of the energy transition.
- Pumped-storage hydropower is attractive given its scale, technological maturity and dispatch capacity. While new projects are very limited, investors should consider global players who may have room to expand.

### 6. Vertically integrated energy providers

- Given their long track record of building and maintaining infrastructure, and ability to pass-thru higher costs, regional utilities with power generation and distribution capabilities offer an intriguing investment opportunity.
- Some large energy providers finance segments of their power generating assets in private credit markets. Debt investors can find opportunities to get exposure to portfolios of mature projects.

## Not all fossil fuels are created equal: the lower-carbon end of the traditional energy sector

### 1. Natural gas is displacing higher carbon-emitting fuels

- Natural gas can play a critical role in the energy transition by displacing thermal coal. In the US, small gas producers and large LNG players offer growth potential as global demand soars.
- Investing in the debt of regional pipeline operators offers investors a different risk-reward proposition with less exposure to short-term price volatility.

### 2. Debt opportunities in private mid-market credit

- As banks have receded, debt financing for energy producers in the middle-market has become scarcer – creating private credit opportunities.
- Investors should look for projects that have passed the exploratory phase as they offer reliable cash flows and tangible collateral.

### 3. Big Oil and the future role of incumbents

- Investors need to periodically consider the obsolescence risk in their exposure to Big Oil companies.
- Big Oil firms that lean into lower-carbon and renewable sources may face less obsolescence risk – though these firms have not seen strikingly higher valuations from markets yet.
- Some global oil incumbents are also major players in research around green tech and clean energy. They are among the leaders in patents in areas like biofuels and carbon capture and may be positioned to be winners in the new energy landscape.

## Avoiding the hype: Monitoring innovation around renewable energy sources and green tech

### 1. Hydrogen fuel cells as an alternate, clean energy source

- Hydrogen has gained much attention as a promising alternate fuel source and has some compelling attributes: it is relatively abundant globally, has two and a half times the energy density of gasoline or diesel and burns clean with no carbon emissions.
- However, it faces numerous challenges in transport and storage before it can be used widely. One of the main challenges to wider adoption of hydrogen fuel cells is the specialized infrastructure (and immense cost) needed to produce, transport and store hydrogen

### 2. Nuclear energy: fission to fusion

- With today's focus on energy security and carbon-free energy sources, however, fission-based nuclear power is drawing renewed attention as a key part of the future energy system.
- The latest fission innovations are around small-scale reactors, known as small modular reactors (SMRs). But while many new SMR projects are announced, few make it to the end because of supply chain challenges as well as cost overruns and delays that make the projects no longer economical

## Avoiding the hype: Monitoring innovation around renewable energy sources and green tech

### 3. Innovations in grid-level energy storage

- Current lithium-based batteries for industrial power storage face several challenges. Most importantly, lithium batteries are not easy to scale and not always environmentally sustainable.
- As a result, alternative chemistries that go beyond lithium are emerging. For example, sodium is more abundant than lithium, is cheaper to access and has similar chemical properties. Given their long discharge times, efficiency and improving technology around their density, sodium batteries have tremendous potential for use on the grid.

### 4. Carbon capture and storage

- Carbon capture and storage (CCS) is another potentially transformative technology that faces many real near-term challenges.
- The challenges of CCS are straightforward. First, there are locational challenges – the sites where carbon is emitted are not often near where carbon can be easily and reliably sequestered. A second challenge for CCS is how to monetize the operation. the costs of operation – capturing and filtering the CO<sub>2</sub>, transporting it to a different location and sequestering the gas – must be below the value of the incentives for it to be commercially viable.

## Portfolio Implications

### 1. Align with key stakeholders on the best approach to energy investing

- Given the potential for conflicting mandates from key stakeholders around decarbonization, climate change and energy investing, CIOs need to build consensus and clarify key portfolio objectives and timeframes up front.

### 2. Multiple approaches to decarbonization across portfolios

- Minimizing a portfolio’s current carbon footprint offers the benefit of supporting companies with low-carbon emission today but still requires evaluation of future emissions.
- Investors that take a longer-term perspective, should consider firms that have the potential to reduce their own emissions as well as technologies with high potential to avoid carbon emissions in the future.

### 3. Analyze how the current - and future - regulatory landscape effects investment portfolios

- Investors in every region need to analyze how government “carrots and sticks” alter the risk-reward proposition of energy investments at every stage of development – from basic research all the way on through to large-scale projects.
- Evaluate the impact of current government subsidies, tariffs and regulations on their portfolios today - as well as anticipate changes over the life of their investments.

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