



MINING WITH A GREATER PURPOSE: A NEW DAWN FOR AFRICA

ROBERT M. FRIEDLAND

FOUNDER AND EXECUTIVE CO-CHAIR, **IVANHOE MINES**

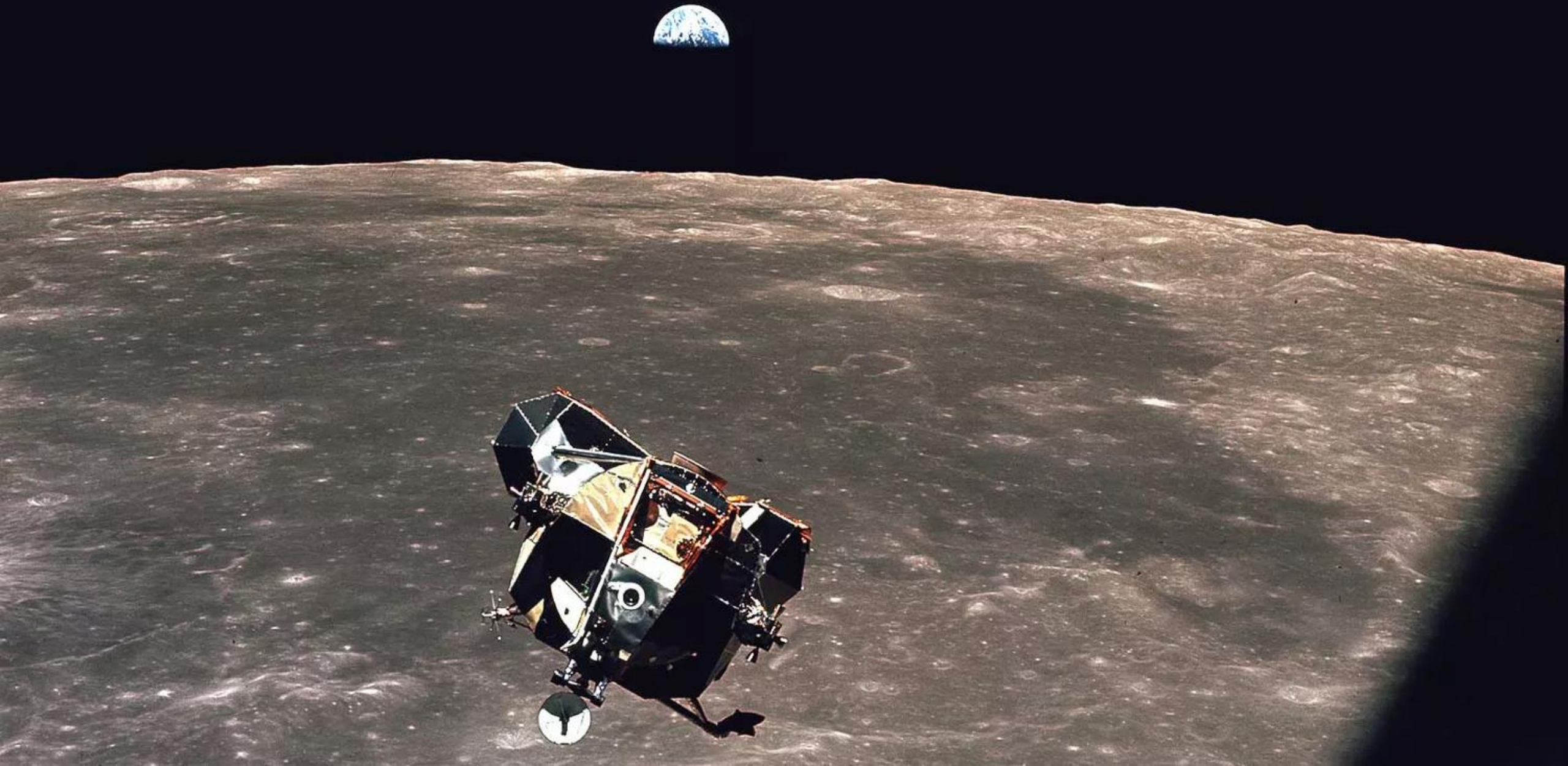
“Earthrise” by astronaut Bill Anders, Apollo 8, Christmas Eve 1968



“To see the Earth as it truly is, small and blue and beautiful in that eternal silence where it floats ... is to see ourselves as riders on the Earth together, brothers on that bright loveliness in the eternal cold.”

Archibald MacLeish, American poet and writer, 1968

Photo by Astronaut Michael Collins, Apollo 11, 1969

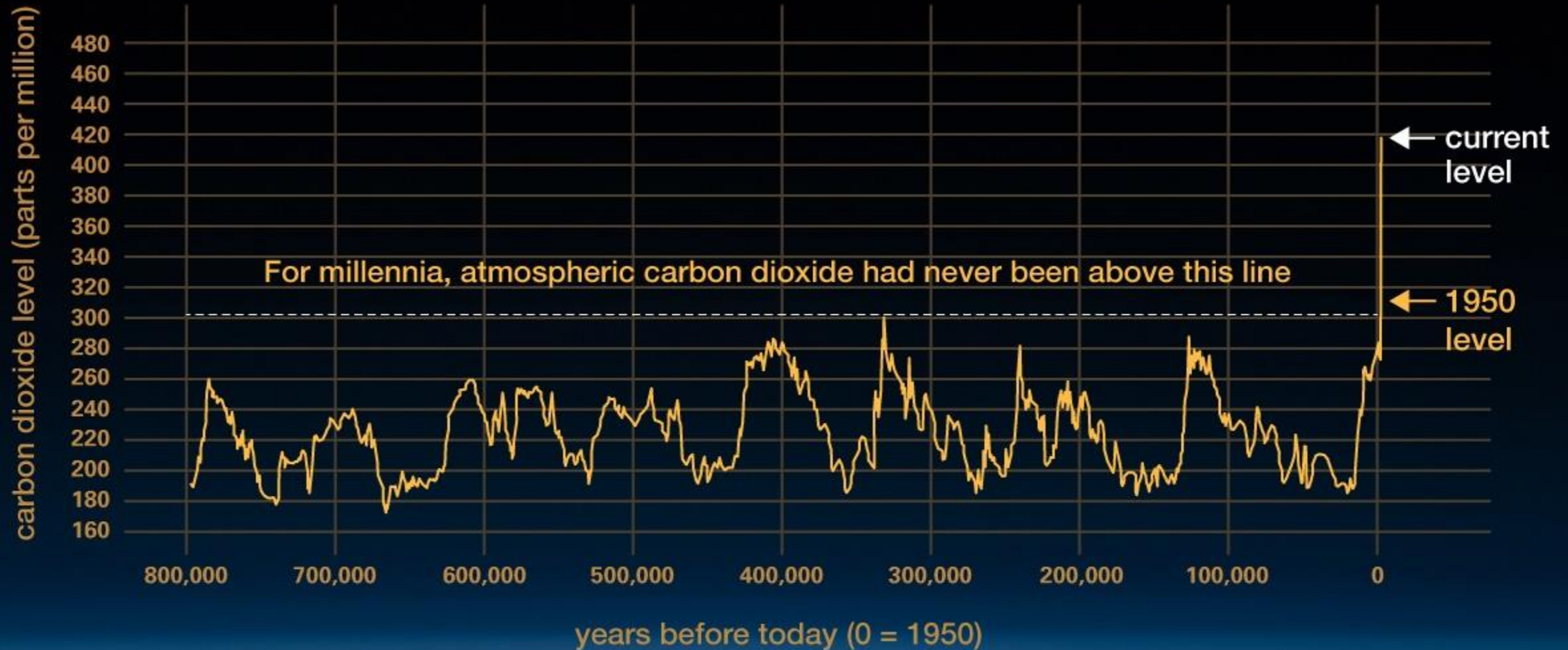


A black and white photograph of President John F. Kennedy speaking at a podium. He is wearing a dark suit, white shirt, and dark tie. He is gesturing with his right hand, which is raised and clenched into a fist. A vintage microphone is in front of him. In the background, other people in suits are partially visible but out of focus.

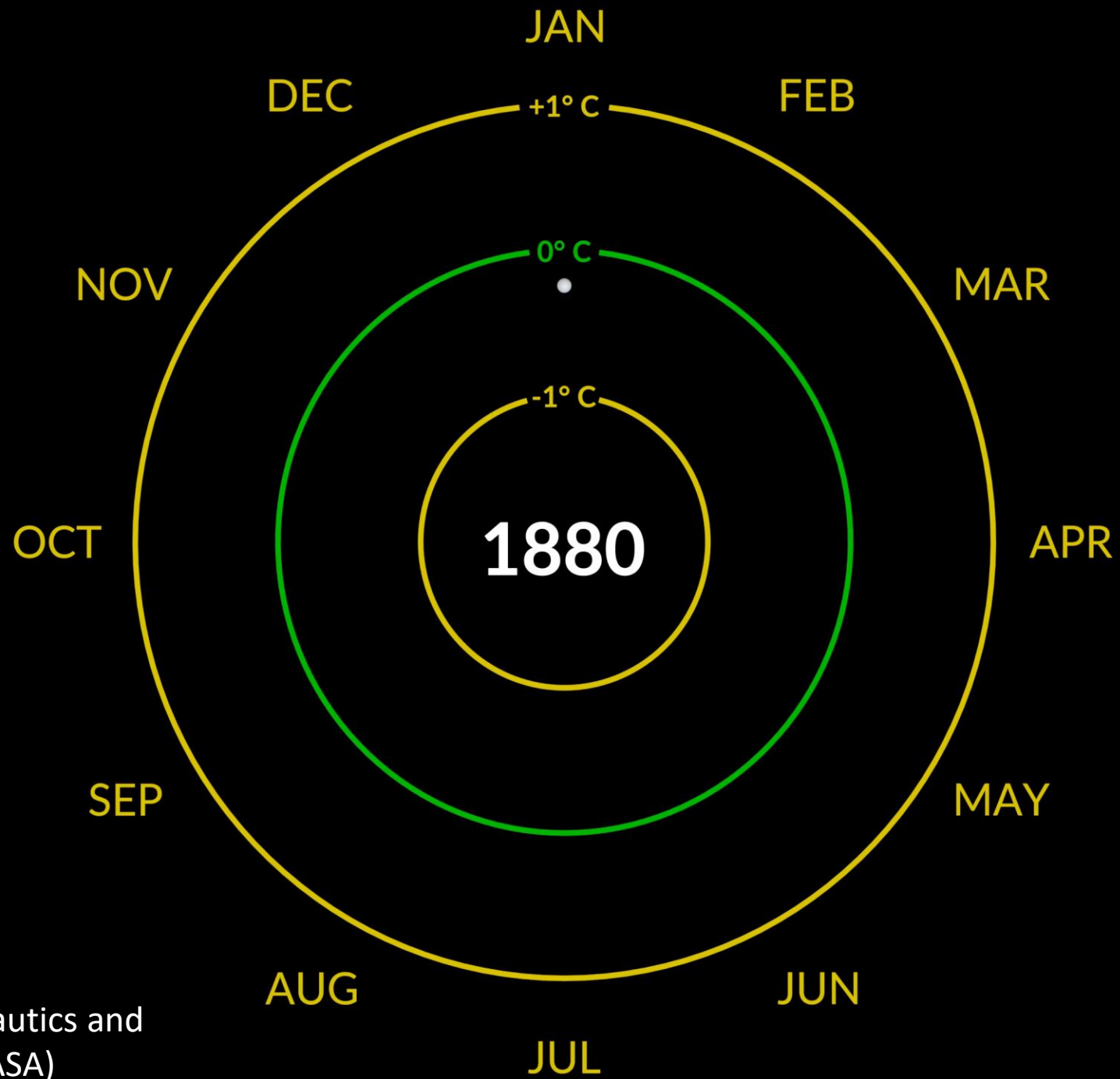
“

Space is open to us now; and our eagerness to share its meaning is not governed by the efforts of others. We go into space because whatever mankind must undertake, free men must fully share..."

John F. Kennedy, President of the United States, May 25, 1961




According to data published by NASA, CO₂ is at its highest point in more than two million years. Pre-industrial CO₂ levels were around 280 parts per million (PPM). In 2023, we are close to 420 PPM.



Courtesy National Aeronautics and
Space Administration (NASA)



Google Earth



The very air we breathe is growing dangerously polluted: nine out of ten people now breathe polluted air, which kills 7 million people every year

World Health Organization

“

Dried-out farms from China to Iowa put pressure on food prices

Bloomberg, August 2022



A high-angle, wide shot of a massive crowd of people at night. The scene is dimly lit, with some ambient light from the background. The vast majority of the individuals in the crowd are wearing white surgical-style face masks. The crowd is densely packed, filling the entire frame from the foreground to the background. Some individuals are looking towards the camera, while others are looking away or holding up their phones. The overall atmosphere suggests a large-scale public gathering or event during a period of health precautions.

- Habitat loss and climate change increase the risk of new diseases

The Economist, February 2023





**Balkanized Global Economy Loses
\$1.6 Trillion as World Struggles to
Avoid a New Cold War**

Bloomberg, May 2022

SOURCE: SPACEX

SPEED
0
km/h

ATTITUDE
-0.0
°

STAGE 1 TELEMETRY

T - 00:00:02
TRANSPORTER 2


LIFT OFF

STARTUP

MAX-Q

MECO

CLIMB

An aerial photograph of an electric vehicle (EV) charging station. Two cars, a white one on the left and a blue one in the center, are parked in designated spots and connected to charging cables. To the right of the blue car are two more parking spots, each marked with a white icon of a car and a charging plug. The ground is paved with red bricks, and the surrounding area includes a grey paved road, green bushes, and a yellow brick sidewalk.

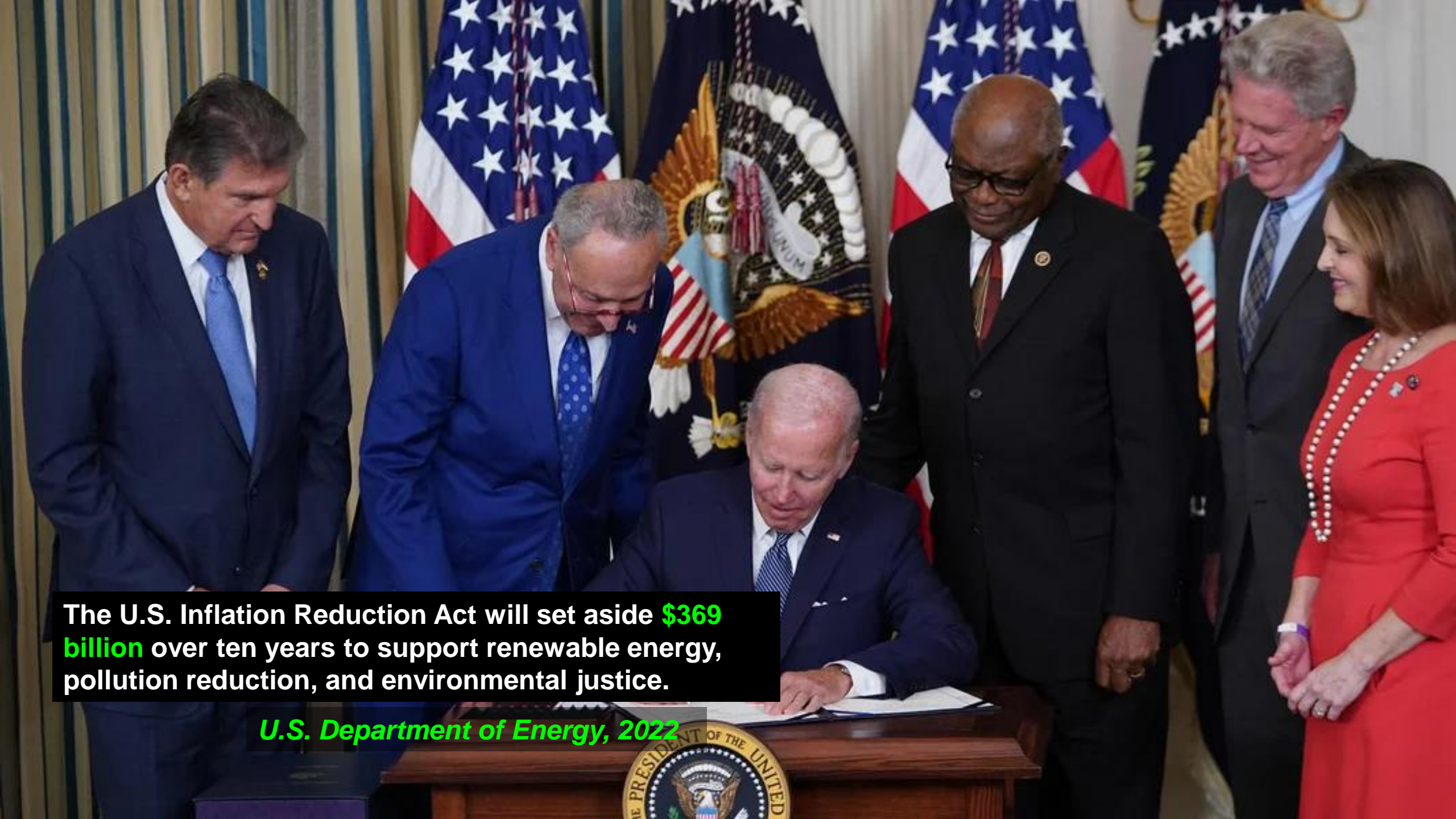
In 2021, the International Energy Agency predicted that EVs wouldn't reach a 10% market share until 2030 ... but EVs attained a 10% market share for the first time in 2022, surpassing a significant marker.

Wall Street Journal, January 2023

Annual renewable capacity additions broke a new record in 2021, increasing 6% to almost 295 GW ... renewable capacity is expected to further increase over 8% in 2022, reaching almost 320 GW.

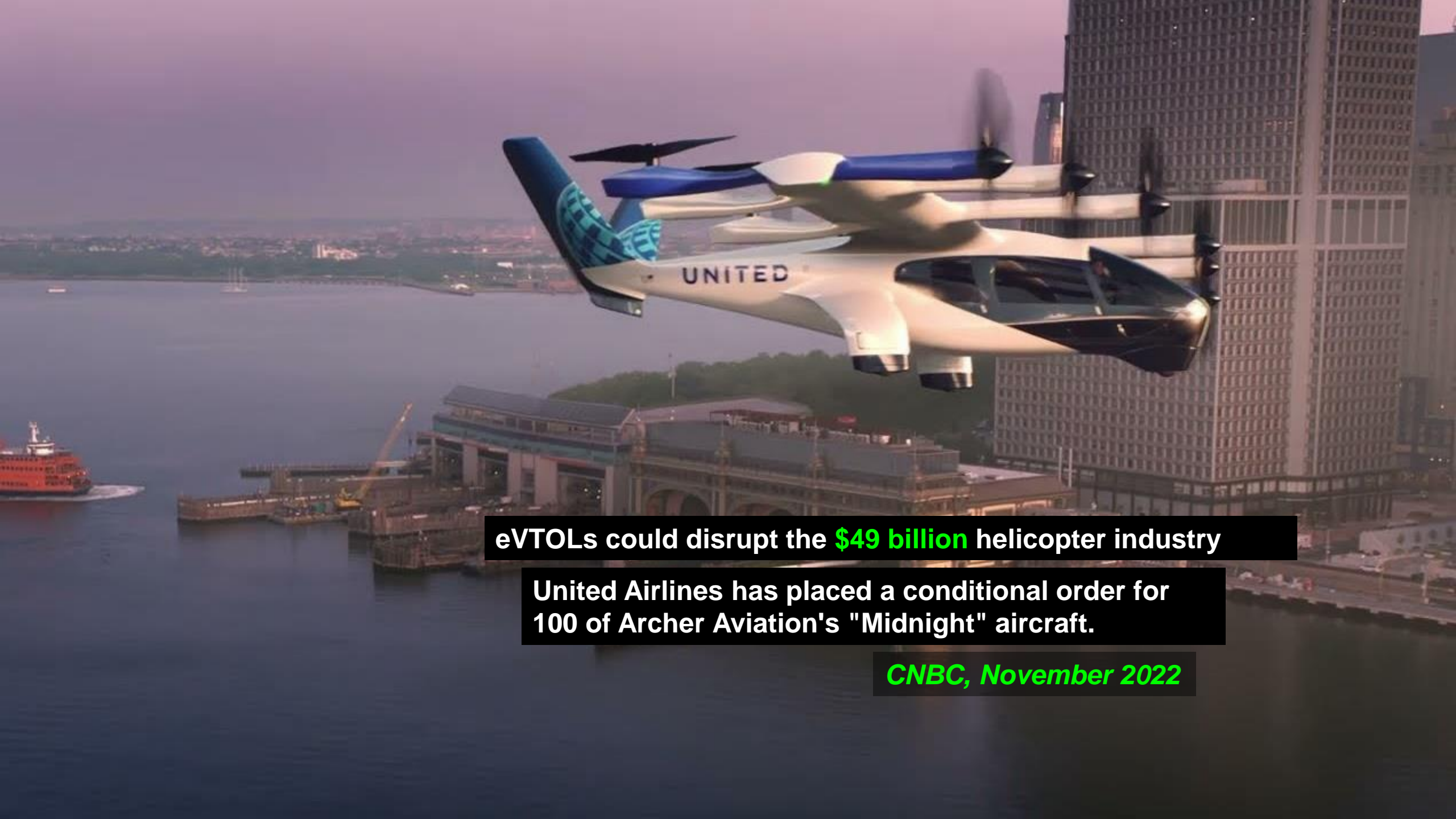
International Energy Agency, June 2022





The U.S. Inflation Reduction Act will set aside **\$369 billion** over ten years to support renewable energy, pollution reduction, and environmental justice.

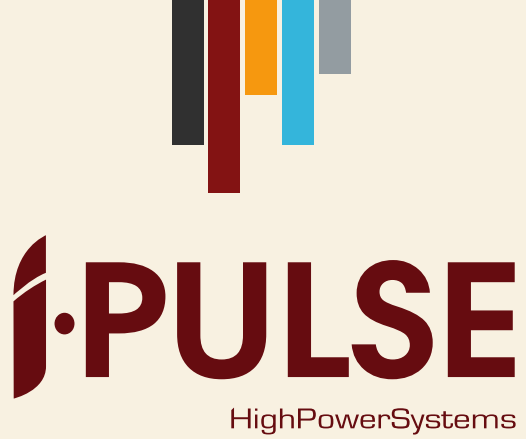
U.S. Department of Energy, 2022



eVTOLs could disrupt the **\$49 billion** helicopter industry

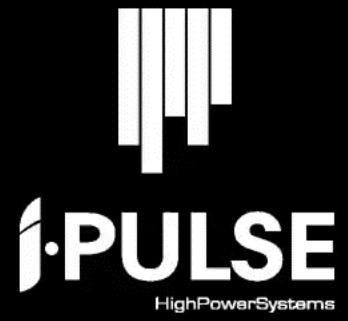
United Airlines has placed a conditional order for 100 of Archer Aviation's "Midnight" aircraft.

CNBC, November 2022



POWER GREAT IDEAS

I-PULSE IS THE WORLD'S LEADING HIGH PULSED POWER COMPANY





January 11, 2023, Ma'aden and Ivanhoe Electric Establish
50-50 Joint Venture in the Kingdom of Saudi Arabia

Al Naslaa rock formation, Tayma oasis



COPPER SHORTAGE COULD DERAIL THE ENERGY TRANSITION, S&P GLOBAL

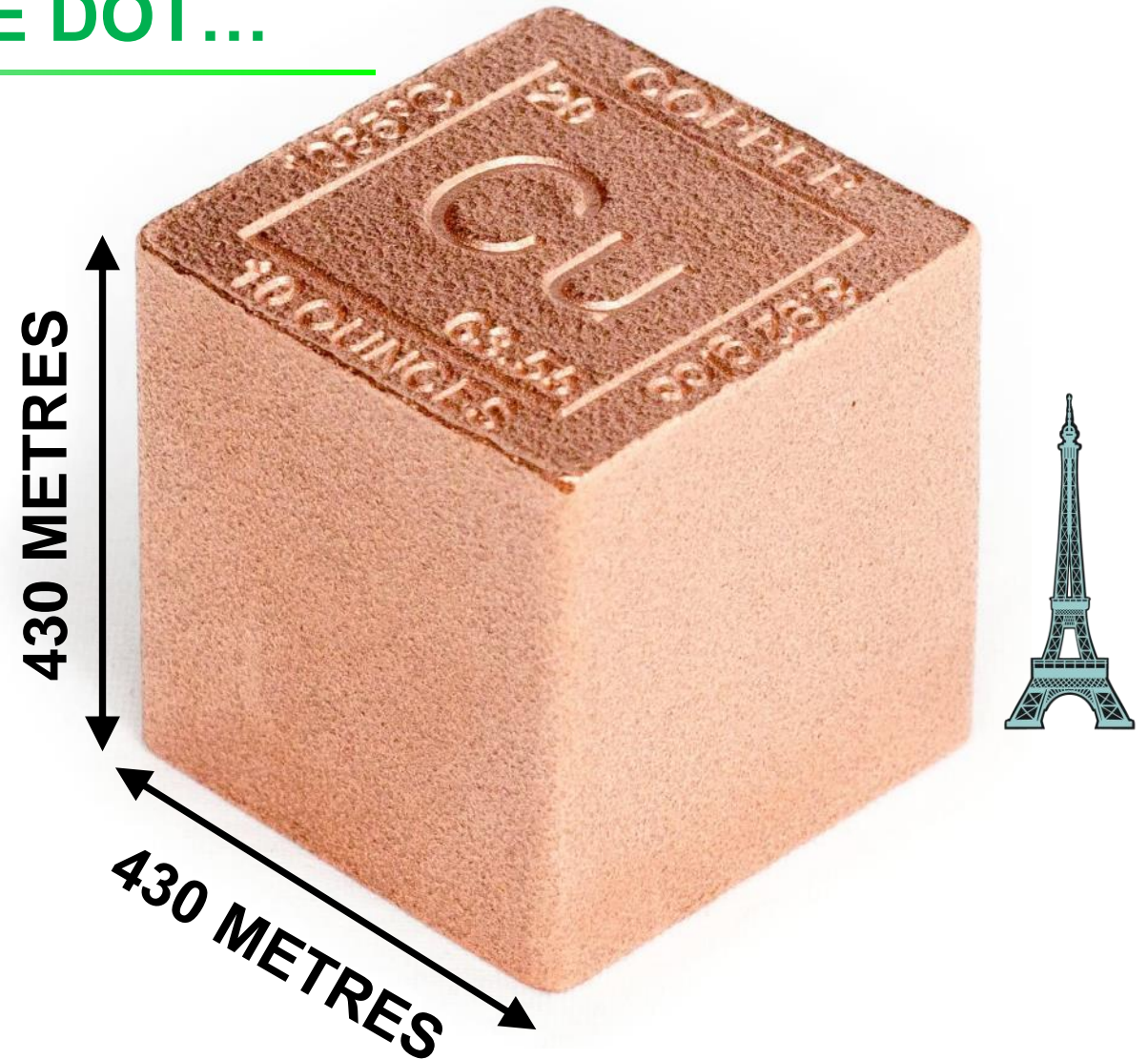
Achieving net-zero emissions by 2050 will translate into a rapid ramp-up of copper demand, increasing by more than **82% between 2021 and 2035.**

Daniel Yergin et al., S&P Global, Future of Copper report, July 2022

HERE IS THE SUM TOTAL OF ALL THE COPPER
EVER MINED ON OUR PALE BLUE DOT...

**700 MILLION
METRIC
TONNES**

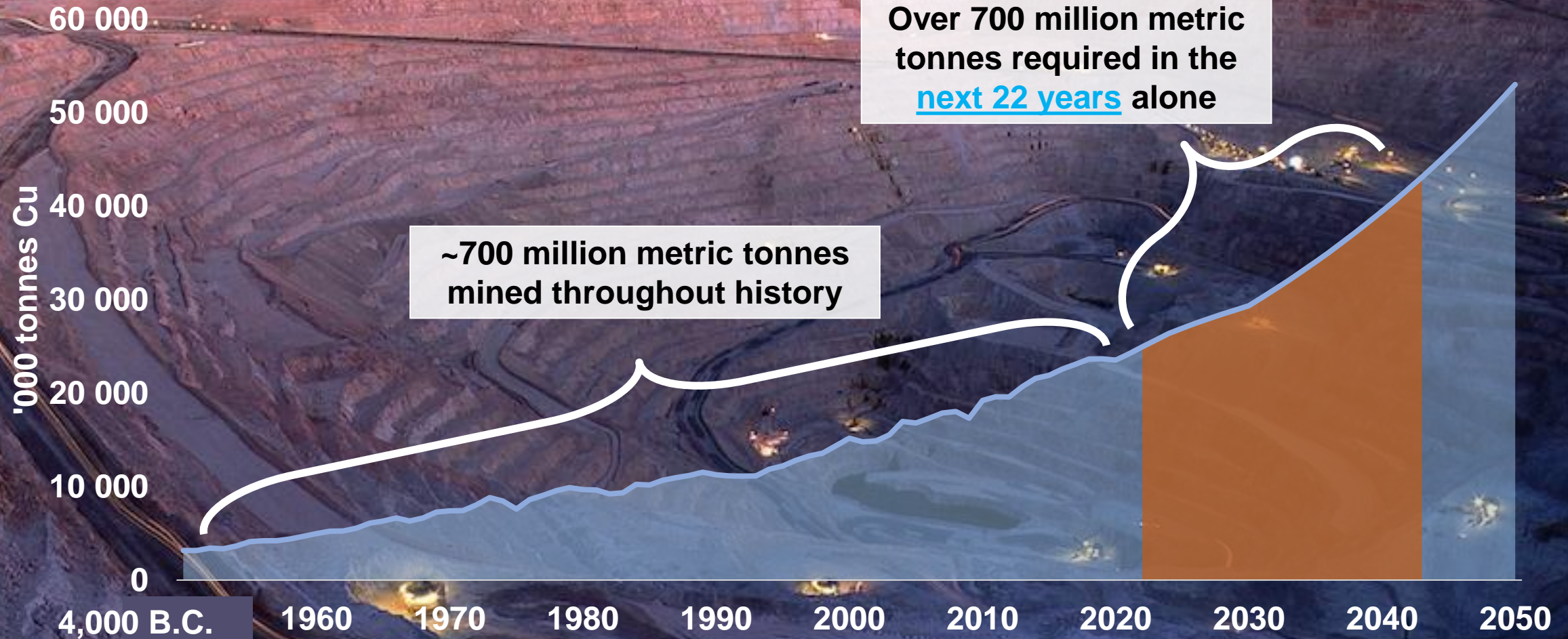
Approximately 80% of
all this copper still
exists in human use...



Source: United States Geological Survey

COPPER: THE 'GREEN' METAL

WORLD CONSUMPTION OF REFINED COPPER



An aerial night photograph of a city, likely New York City, showing a dense grid of streets and buildings illuminated by city lights. A large body of water, possibly the Hudson River, runs through the center of the image, reflecting the lights. The overall tone is dark with bright orange and yellow highlights from the city lights.

| THE GLOBAL ENERGY CRISIS

“

Most economies around the world are facing a deepening energy crisis—due to global supply disruptions, high energy prices, geopolitical turmoil, and an as-yet-unrealized energy transition away from carbon-intensive sources.

S&P Global, July 2022



| ALL POWER GRIDS ARE INCREASINGLY UNRELIABLE

Wall Street Journal, January 2022

**\$2.8 trillion in annual investment is needed
to meet zero carbon needs this decade**

Goldman Sachs, December 2022



RENEWABLE TECHNOLOGY IS ABSURDLY METALS INTENSIVE

Wind and solar energy between **7x** and **37x** more
copper intensive than conventional electricity

Bernstein Research

Peru's Violent Protests Imperil 30% of Its Copper Output

Bloomberg, January 2023






Copper's Fight for Critical Mineral Status Gets Political Push

Some of the biggest names in copper have found high-ranking political allies to support their efforts to get the wiring metal included on a US critical minerals list.

Bloomberg, February 2023

Investment required for M&M supply – **US\$1.2 trillion** by 2050



An aerial photograph of Cape Town, South Africa. In the background, the rugged, flat-topped Table Mountain and the pointed peak of Lion's Head rise above the city. The city itself is densely packed with buildings, extending from the mountains down to the coast. The Cape Town Stadium, a large, circular, white structure with a retractable roof, is visible in the lower center of the image. The ocean is a deep blue, with white waves crashing against the shore. The sky is bright blue with scattered white clouds.

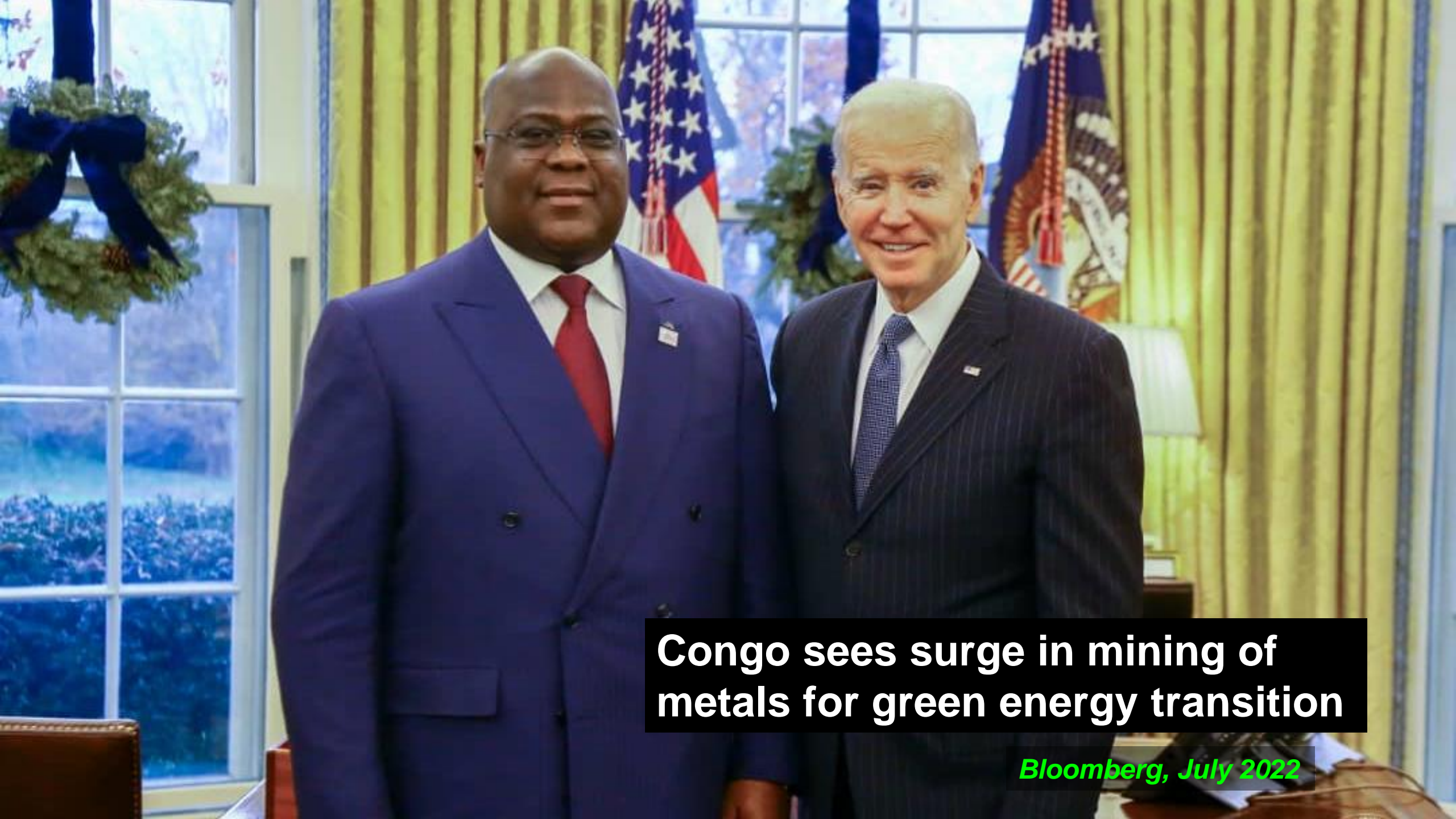
Africa is home to some 30% of the world's mineral reserves and its rich, critical mineral endowment is crucial to global energy transition.

International Energy Agency, November 2022



**US looks to Africa to diversify
supply chain for critical minerals**

Bloomberg, December 2022



Congo sees surge in mining of metals for green energy transition

Bloomberg, July 2022

IVANHOE MINES

TSX: IVN | OTCQX: IVPAF



KAMOA-KAKULA MINING COMPLEX

FEBRUARY 2023

A LEADING PRODUCER, DEVELOPER AND EXPLORER IN AFRICA

World's fastest growing high-grade major copper mine

OWNERSHIP:

Ivanhoe Mines (39.6%)
Zijin Mining Group (39.6%)
Government of DRC (20%)
Crystal River Global (0.8%)

KAMOA-KAKULA



Copper

World's highest-grade zinc project

KIPUSHI



Zinc, Copper, Silver,
Germanium

OWNERSHIP:

Ivanhoe Mines (62%)
Gécamines (38%)

World's best copper hunting ground

OWNERSHIP:

Ivanhoe Mines (90-100%)
Government of DRC (Up to 10%)

**WESTERN
FORELAND**



Copper

*World's largest precious metals
development project*

PLATREEF



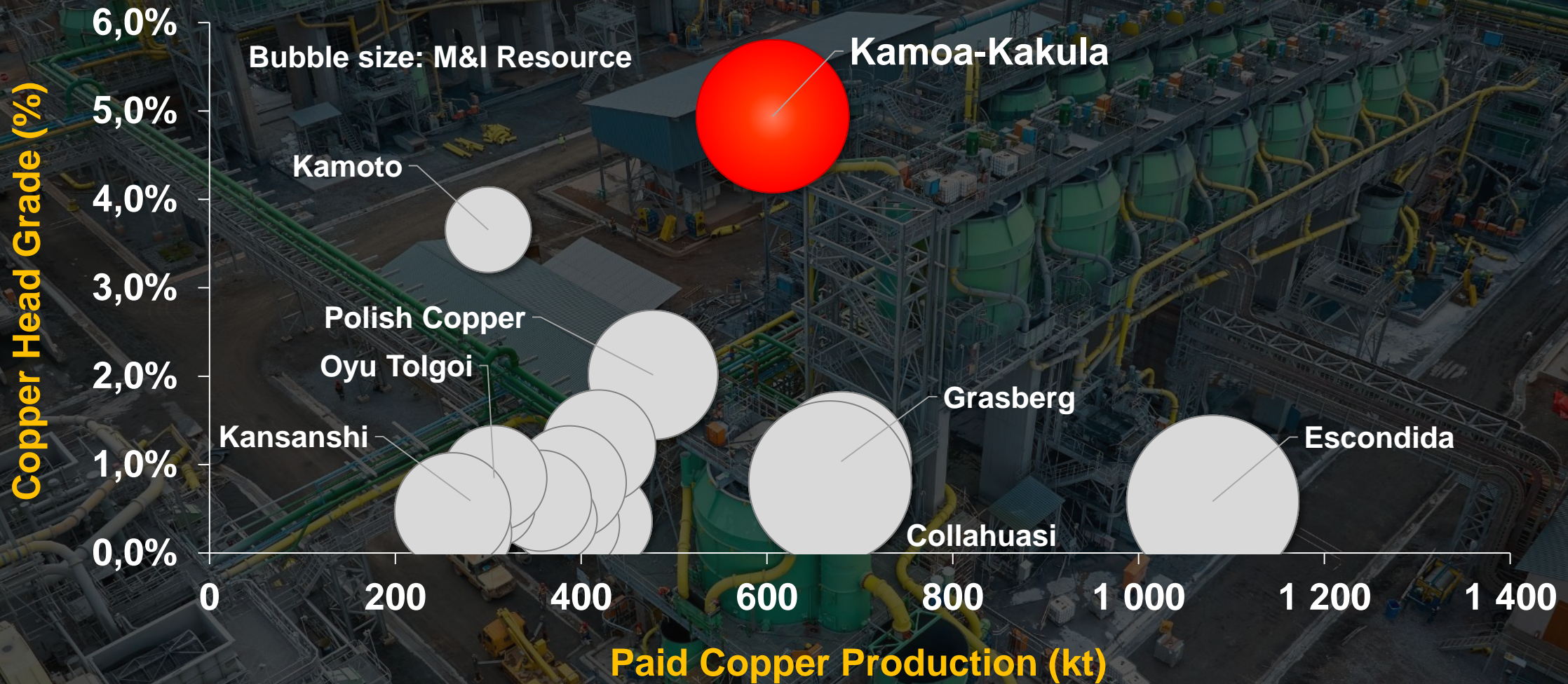
PGMs, Nickel, Copper

OWNERSHIP:

Ivanhoe Mines (64%)
B-BBEE Partners (26%)
Japanese Consortium led
by Itochu (10%)

KAMOA-KAKULA: HIGH-GRADE, SUPER-GIANT COPPER MINE

World's projected top 20 copper mines in 2025, by key metrics.



Notes: Kamoakakula production and grade are based on average paid copper production and average copper feed grade during the first 10 years as detailed in the Kamoakakula 2023 PFS. Kamoakakula resource is based on the contained copper in the Measured & Indicated category in the Kamoakakula 2023 PFS. The 'Copper Head Grade' reflects the average reserve grade. 2025 Measured & Indicated resources take into account 2023-2024 production figures (which have been subtracted from the starting 2023 M&I resources balance). Measured & Indicated resources are inclusive of reserves and are on a 100% basis.

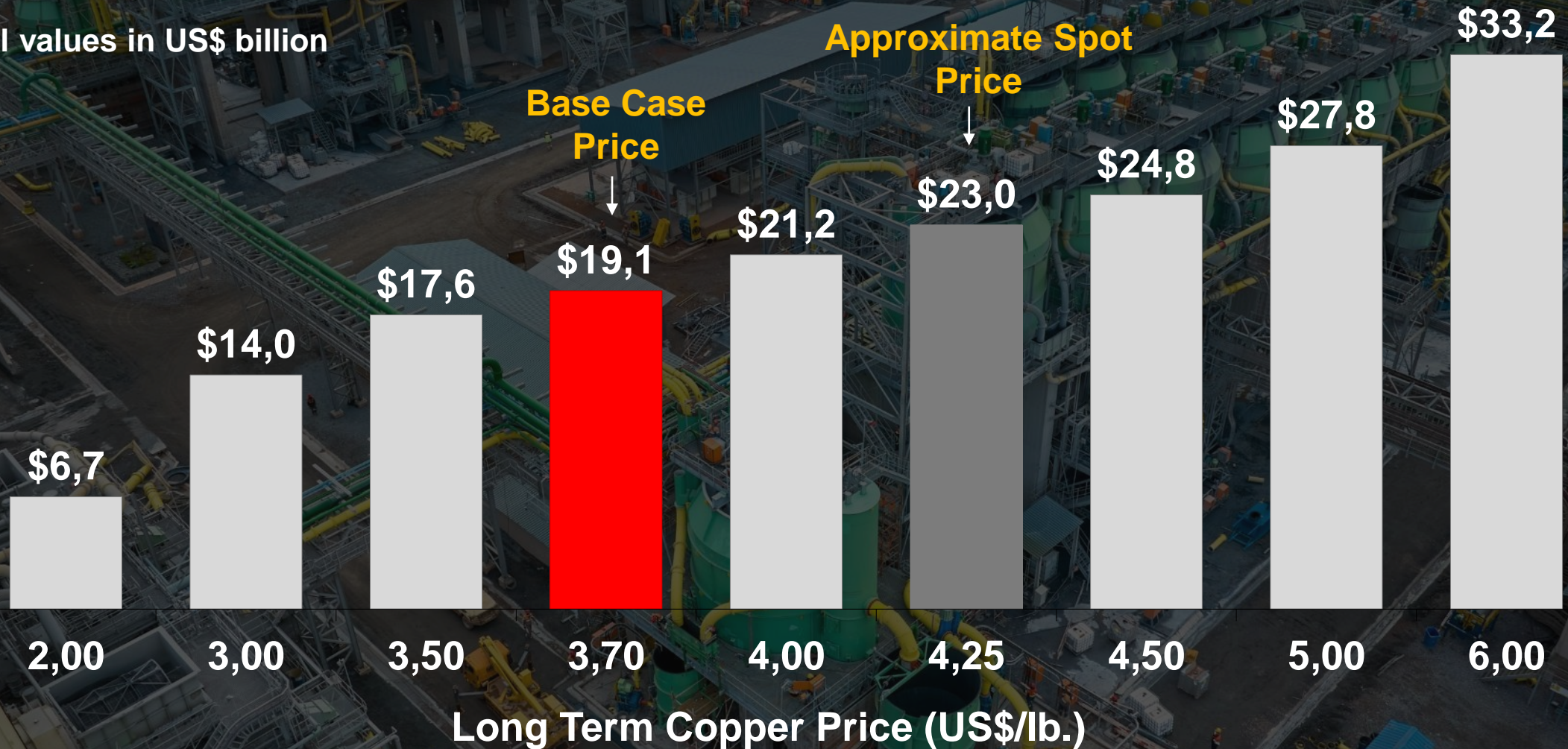
Source: Wood Mackenzie (based on public disclosure, the Kamoakakula 2023 PFS has not been reviewed by Wood Mackenzie).

KAMOA-KAKULA 2023 PFS (PHASE 3 & PHASE 4) AFTER-TAX NPV8% SENSITIVITY TO COPPER PRICE

All values in US\$ billion

Approximate Spot
Price

Base Case
Price



Note: The copper price used in the economic analysis is \$3.80/lb. in 2023, \$3.90/lb. in 2024, \$4.00/lb. in 2025, \$4.00/lb. in 2026 and a long-term copper price of \$3.70/lb. from 2027 onward. Assumes an 8% discount rate.



“Look again at that dot. That's here. That's home. That's us. On it everyone you love, everyone you know, everyone you ever heard of, every human being who ever was, lived out their lives.”

Carl Sagan, Pale Blue Dot, 1994