

**THX**

COMING SOON...

# THE REVENGE OF THE MINERS

**ROBERT FRIEDLAND**  
**Executive Co-Chairman**

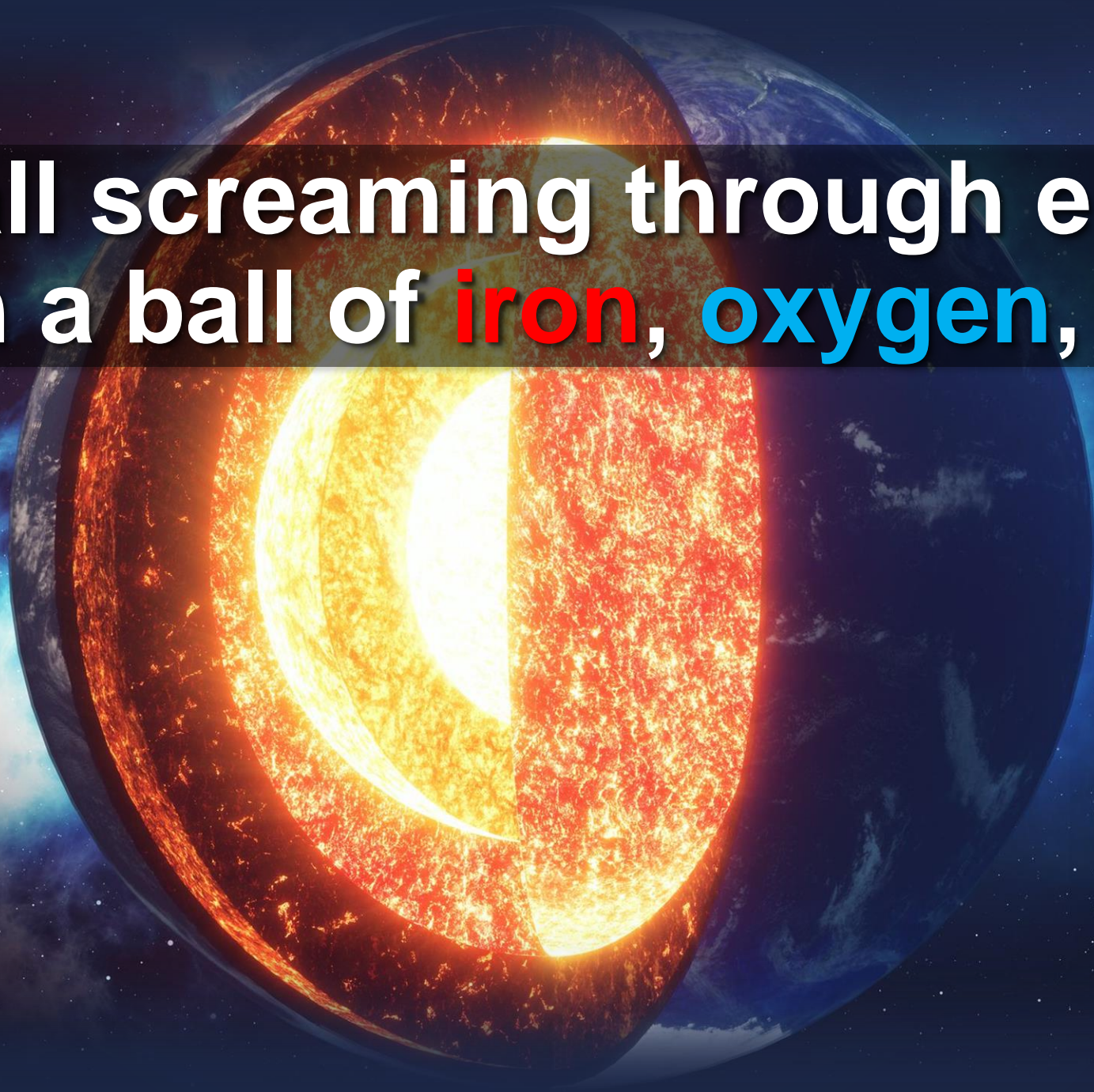
**PDAC, MARCH 2020**

**IVANHOEMINES**  
NEW HORIZONS

Our spaceship **MOTHER EARTH** rotates on her axis at ~1,000 miles per hour and races around our **SUN** at **66,627 miles per hour**

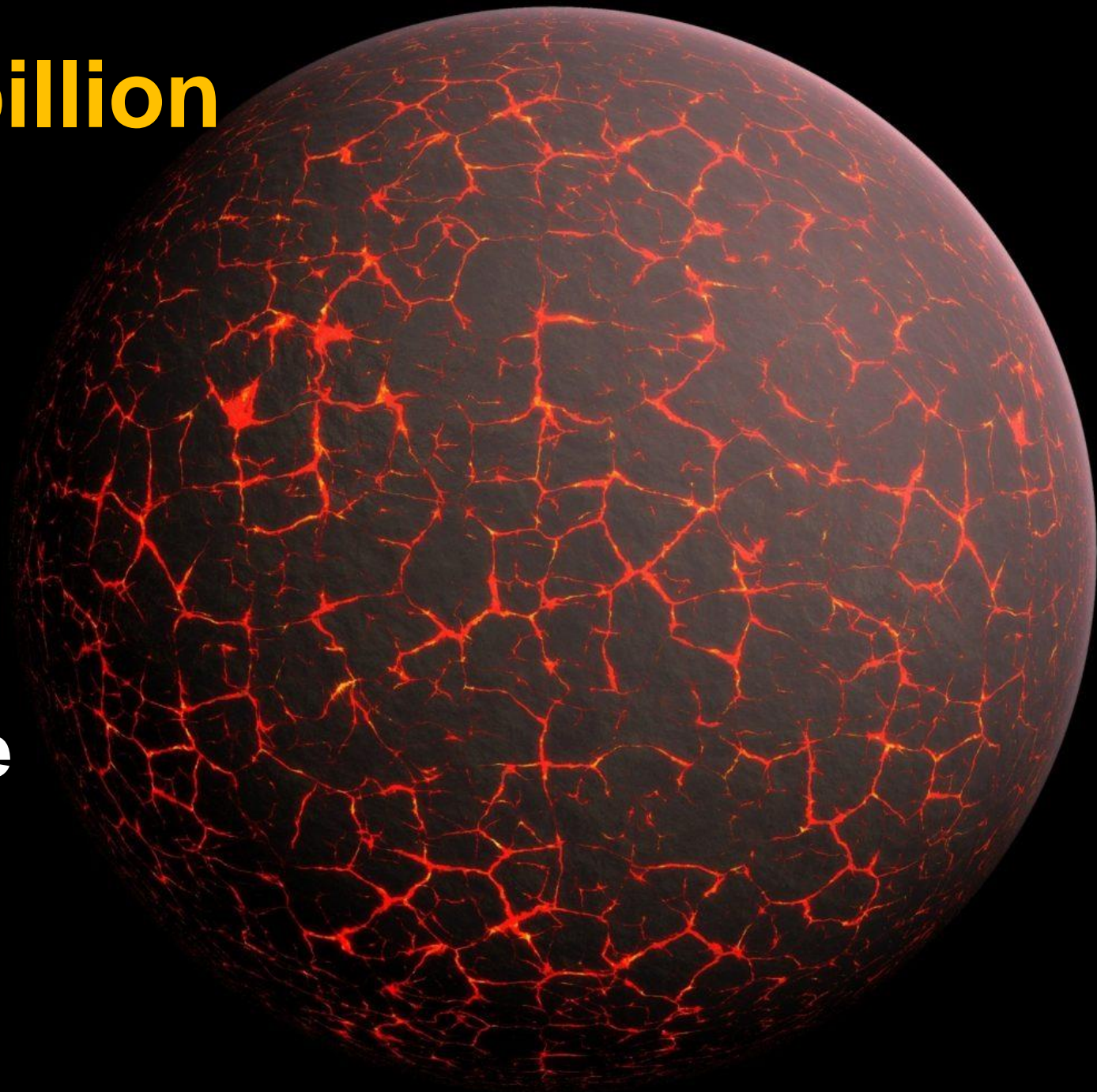


**We are all screaming through endless  
space on a ball of iron, oxygen, silicon**



**| Our Earth is 4.5 billion  
| Years Old ...**

**Financial markets have  
only existed for  
~3,000 years ...**



A close-up portrait of Xi Jinping, the President of the People's Republic of China. He is shown from the chest up, wearing a dark suit and a white shirt. His hair is dark and slightly graying at the temples. He has a slight smile and is looking directly at the camera. The background is a solid blue color.

**Xi Jinping**  
**President of the**  
**People's Republic of China**

A photograph of Shinzō Abe, Prime Minister of Japan, and Xi Jinping, President of the People's Republic of China, shaking hands. They are both wearing dark suits and ties. The background shows several national flags, including the Japanese flag, the South African flag, and the Chinese flag.

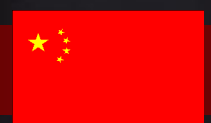
**Shinzō Abe**  
**Prime Minister of Japan**

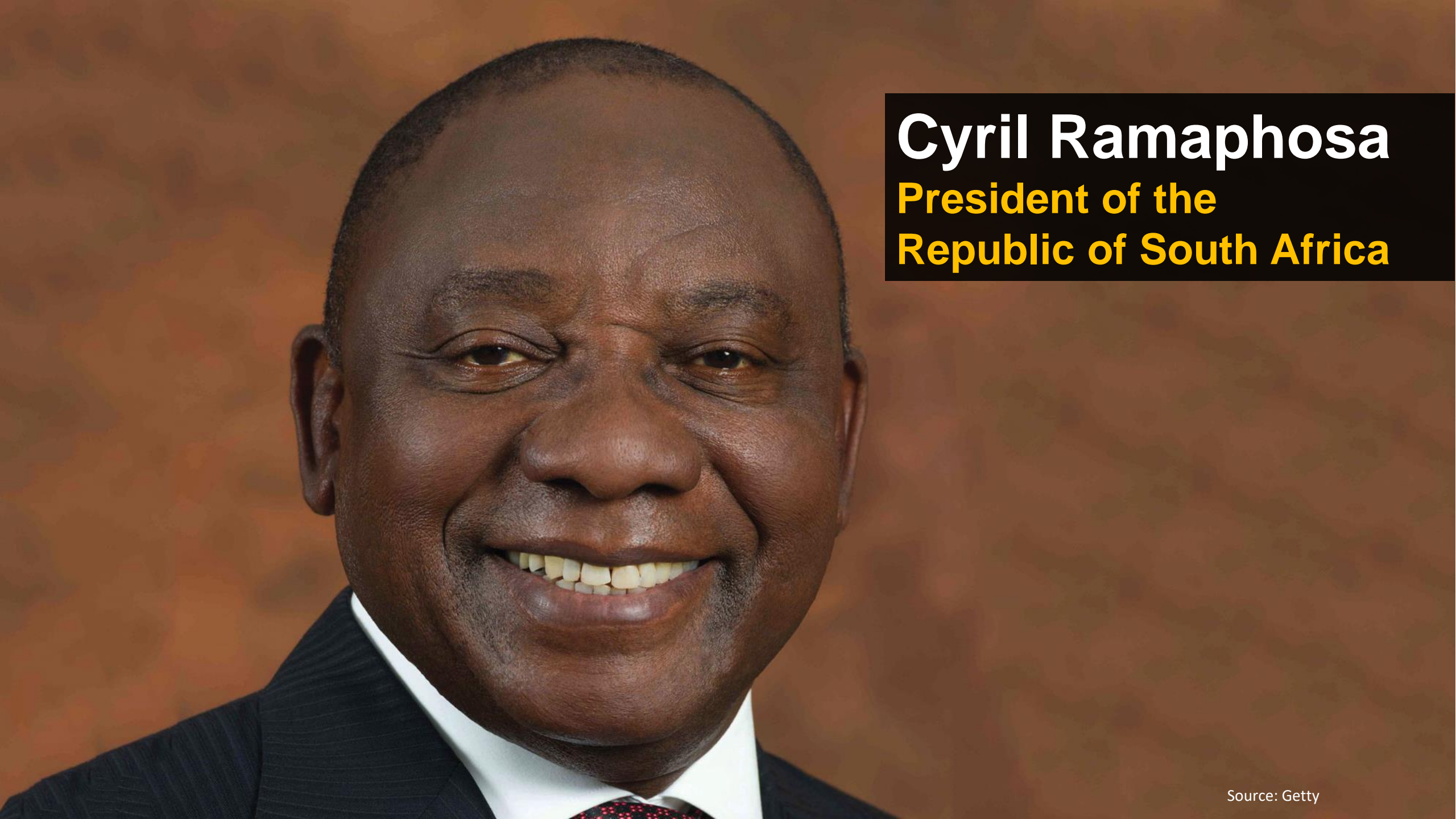
**Xi Jinping**  
**President of the  
People's Republic of China**

**PLATREEF**



**KAMOA-KAKULA**





**Cyril Ramaphosa**  
**President of the**  
**Republic of South Africa**



**Félix Tshisekedi**

**President of the  
Democratic Republic of Congo**

The background of the image shows the European Union flag, a green field with twelve yellow stars arranged in a circle, waving on a tall silver flagpole. In the background, a modern building with a grid-like facade is visible under a clear sky.

**European  
Commission  
\$1.1 trillion  
Green New Deal**



**Bernie Sanders**

**\$20 trillion Green New Deal**

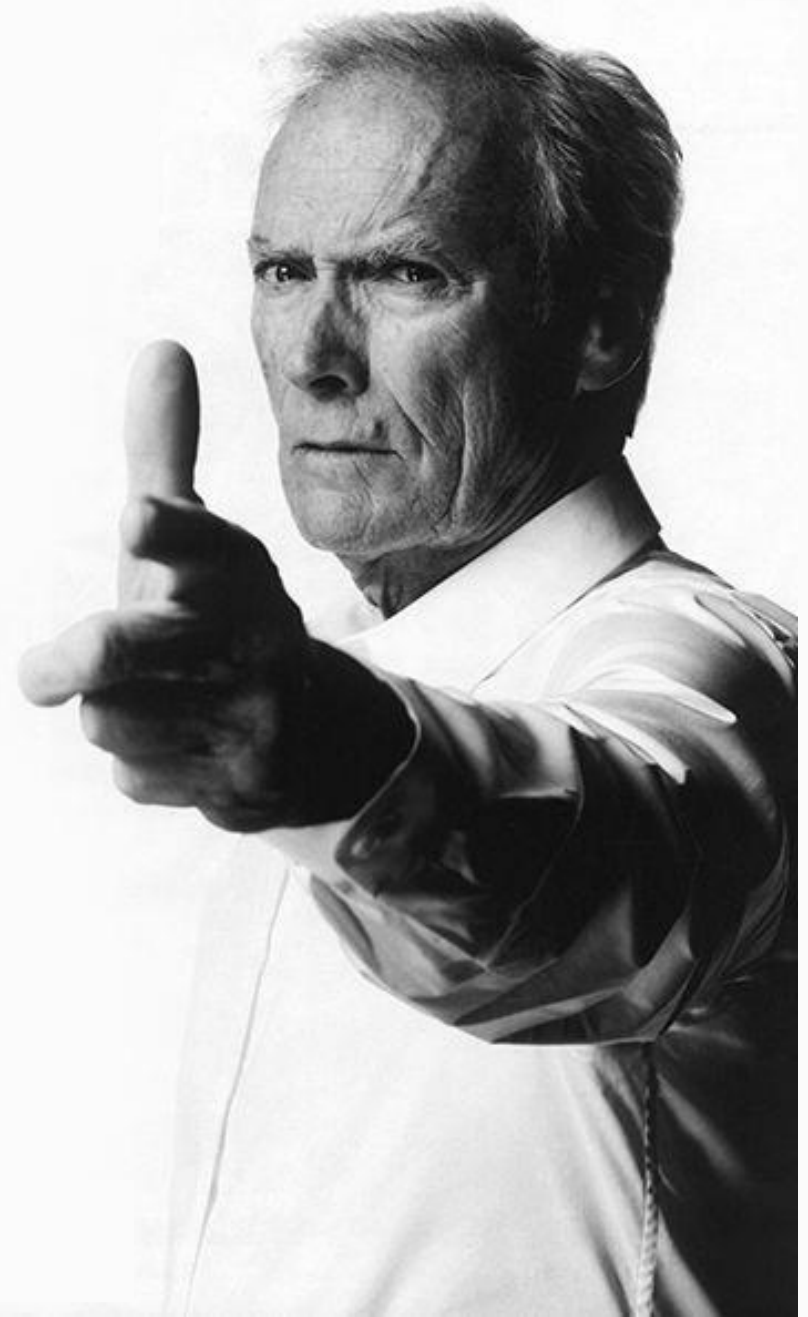
A photograph of Alexandria Ocasio-Cortez speaking at a microphone. She is wearing a blue dress and has her hands raised in a gesture. In the background, a crowd of people is visible, some holding signs. One sign in the upper left corner has the word "PATRIOTIC" on it. Another sign in the lower right corner has the letters "KA" on it. The image is partially overlaid with a black box containing white and green text.

# AOC

**\$90 trillion**

**Green New Deal**

**GO AHEAD,  
MAKE OUR DAY.**



# 中信金属战略入股艾芬豪矿业交割仪式

CITIC Metal's Strategic Investment in Ivanhoe Mines Closing Ceremony



**Ivanhoe Mines & CITIC**  
**The *Real* Green New Deal**

# URBANIZATION

*The greatest social and economic transformations in human history*

**CITIC's 108-story tower, Beijing's tallest**



# URBANIZATION

An aerial night view of the Tokyo skyline. The Tokyo Tower is prominently featured in the lower-left foreground, illuminated with bright orange lights. The surrounding city is a dense collection of skyscrapers and buildings, many of which are lit up with various colors like blue, white, and yellow. The sky is a deep blue with some light clouds, suggesting dusk or dawn.

**2018:** 4.2 billion live in cities  
(55% of the global population)

**2050:** 6.7 billion live in cities  
(68% of the global population)

# 8.5 billion people will call Earth home by 2030

Shanghai's population tripled to  
**25 million** in only two decades



Source: Reuters

# Explosive Urban Growth: 2018-2030

2018

DELHI, INDIA

28.5 MILLION

SHANGHAI, CHINA

25.6 MILLION

DHAKA, BANGLADESH

19.6 MILLION

KINSHASA, DRC

13.2 MILLION

LAGOS, NIGERIA

13.5 MILLION

2030

DELHI, INDIA

38.9 MILLION

SHANGHAI, CHINA

32.9 MILLION

DHAKA, BANGLADESH

28.1 MILLION

KINSHASA, DRC

21.9 MILLION

LAGOS, NIGERIA

20.6 MILLION

Dhaka, Bangladesh, Source: Time, United Nations

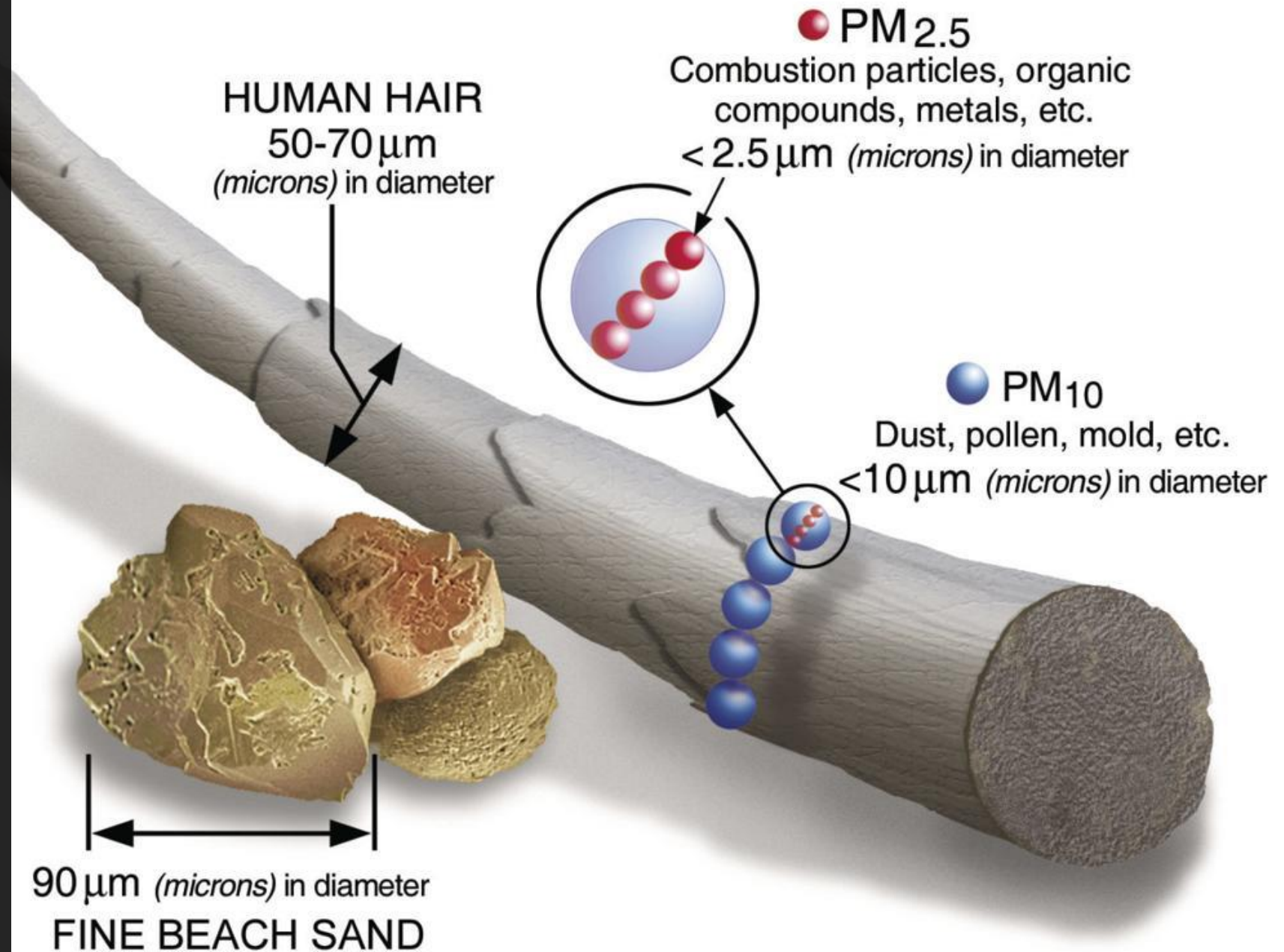
# WHO 2019: Air pollution is the greatest environmental **risk to health**

Dirty air kills around **7 million people annually** and drains the global economy of \$5 trillion annually

# Air pollution kills more people in the U.K. than car crashes: **2020** report

People living in UK towns and cities **25 times** more likely to die from air pollution than car crash

Humans are vulnerable to air pollutants seeping past the blood-brain barrier





# Higher **incidence of dementia** associated with living close to heavy traffic

*Lancet Medical Journal, Jan. 2017*

Mother Jones illustration; Getty

A photograph of a baby sitting in a blue and pink stroller on a city street. The baby is wearing a colorful patterned shirt and blue pants. The background is blurred, showing other vehicles and city buildings. The text is overlaid on the top half of the image.

**Babies in prams/strollers can be exposed to up to **60% more pollution** than adults**

**Toxic air puts **17 million babies'** brains and lungs at risk: UNICEF**

**GRETA** takes  
center stage



Bloomberg, December 2019



# Chile: Latin America's 'Oasis' Descends Into Chaos



PHOTO: PABLO VERA/AFP VIA GETTY IMAGES

Photo: Getty

# **BlackRock Drives ESG** **\$600 Million Investment**

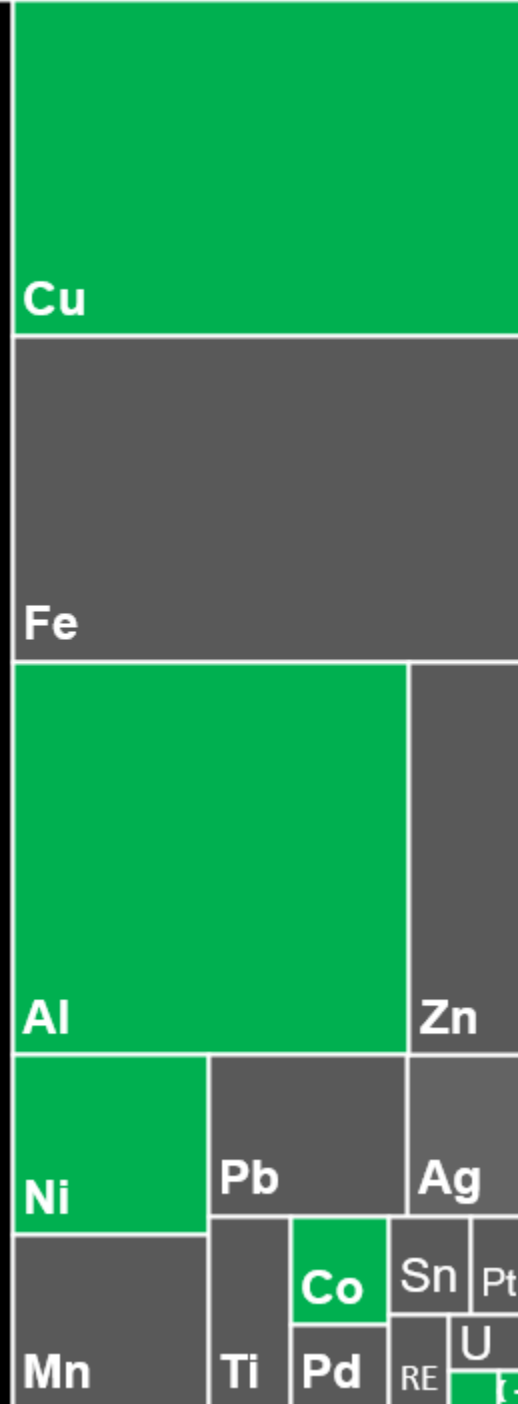
We are at an inflection point where awareness of climate change is becoming more widespread.

I believe **we are on the edge of a fundamental reshaping of finance.**

*Larry Fink, CEO, BlackRock, Jan. 2020*

# | Metals are the New Oil

Oil



To scale – area represents global market value of the commodity // Source: Clean Tech

# | Less Oil, No Carbon, **Few Answers**





# THE REVENGE OF THE MINERS

The world will need to invest **\$240 BILLION** over the next 5 years to meet growing metals demand

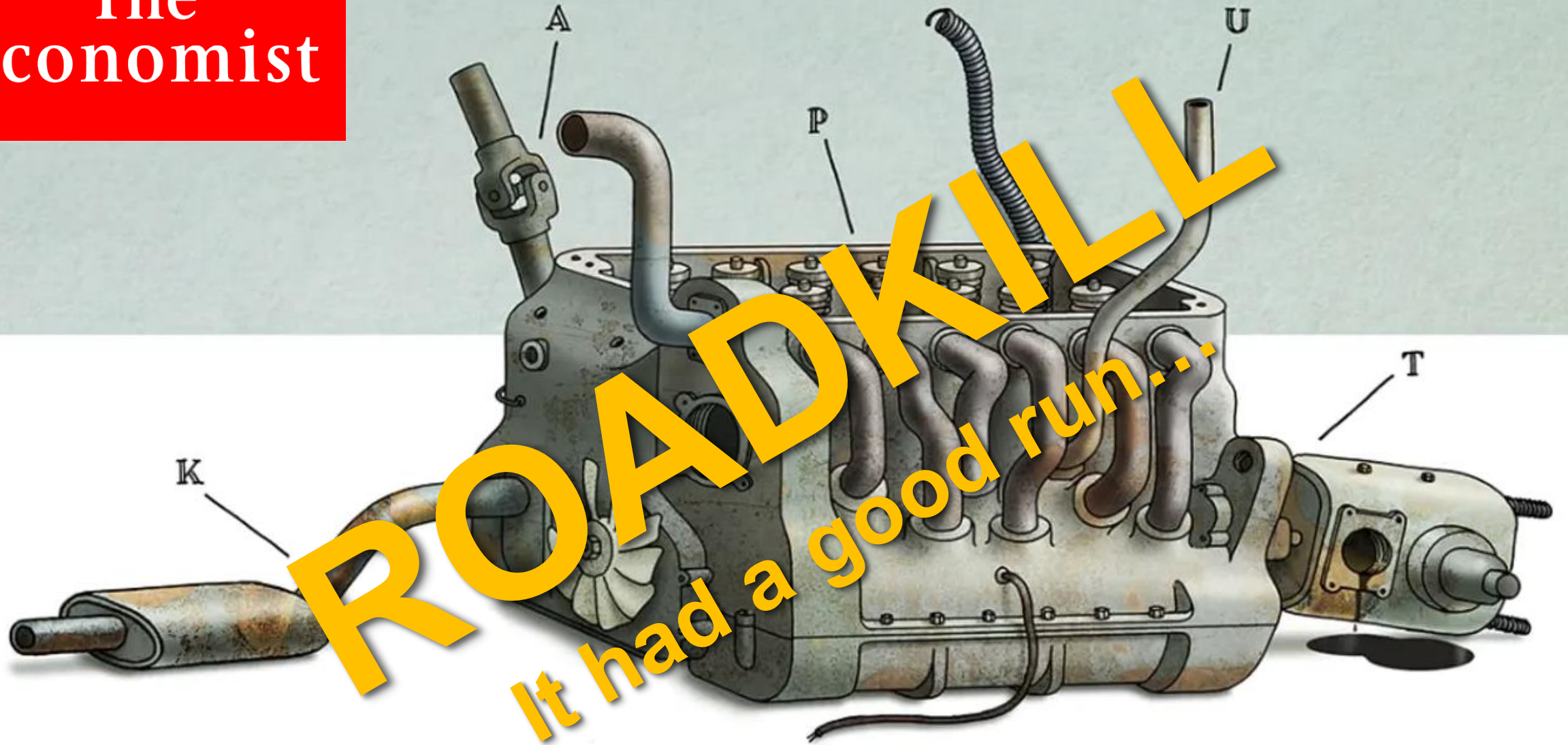


Fig.1 The Internal Combustion Engine

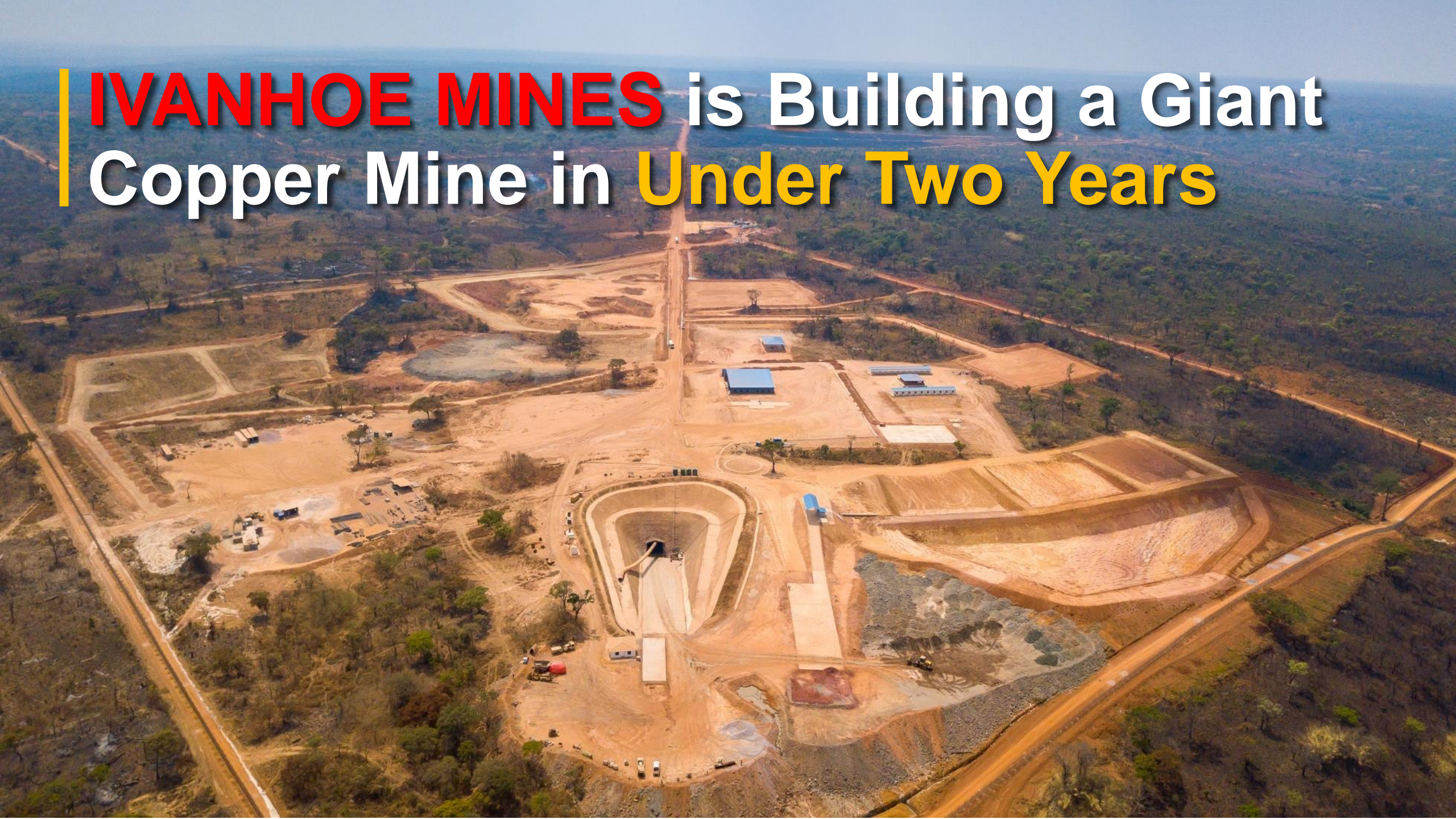
# Elon Musk Built a Tesla Factory in China in Less Than One Year



TESLA



# **IVANHOE MINES** is Building a Giant Copper Mine in **Under Two Years**





Copper demand for electric cars to rise **900% by 2027**



Sources: National Geographic; GM; Bernstein; Cleantechnica; Copper Alliance; BMO.

## FUTURE PLUG-IN ELECTRICS

(Bernstein projection for a generation of bigger, longer-range electrics)

## A TRUCK LOAD OF COPPER

### PLUG-IN ELECTRIC

240 lbs. / 109 kg



*Tesla Model 3*



*Tesla Cybertruck*

### HYBRID

88 lbs. / 40 kg



*Hyundai Hybrid*

### GASOLINE

66 lbs. / 20 kg

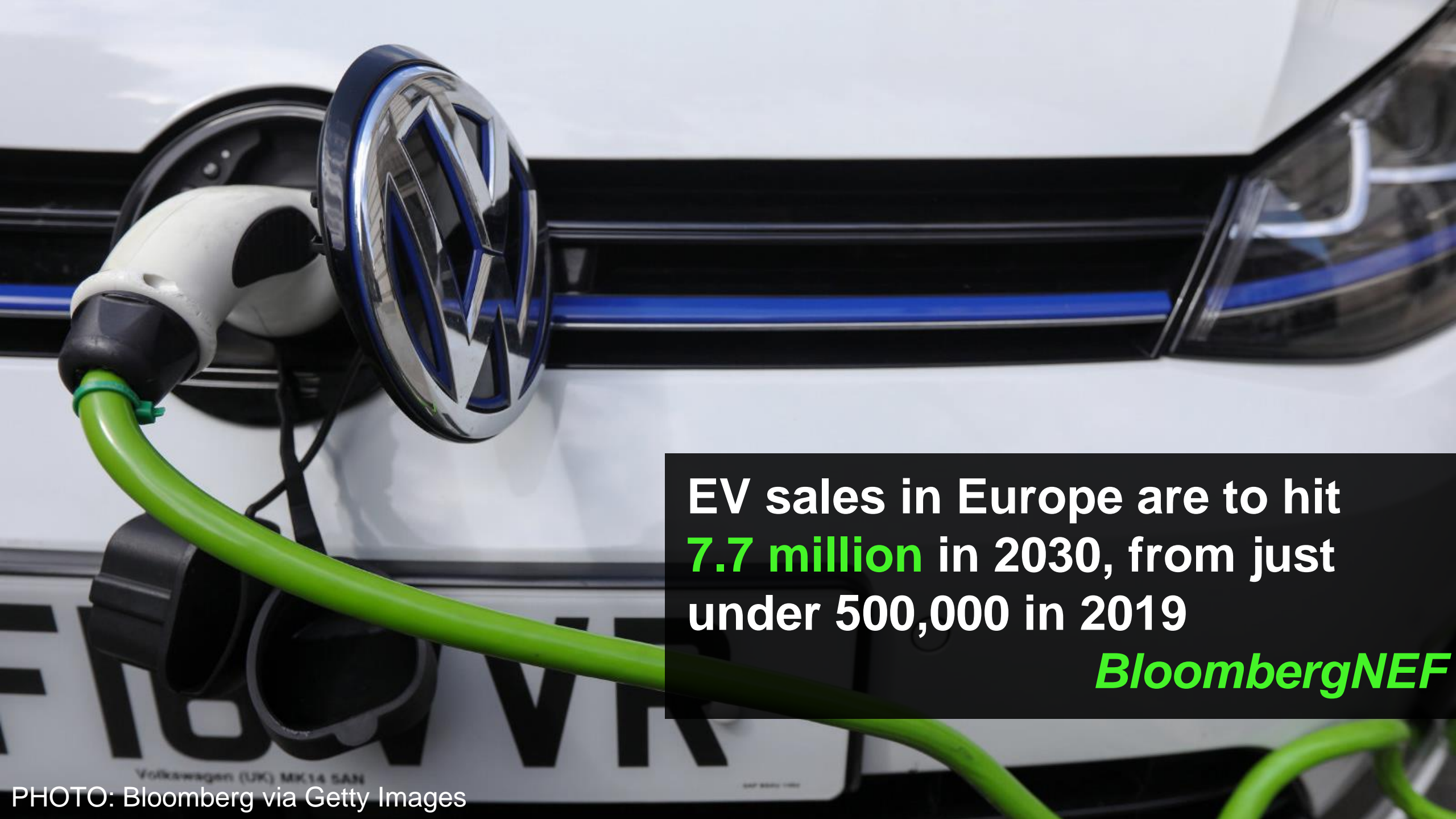


*Ford Mustang*



**MORE THAN 230 ELECTRIC-VEHICLE MODELS  
WILL BE AVAILABLE BY 2021**





EV sales in Europe are to hit  
**7.7 million** in 2030, from just  
under 500,000 in 2019

***BloombergNEF***

# NYC mayor orders all municipal vehicles to be electric by 2040



# LAPD Hollywood Division Tests Out **Tesla Cop Car**

*0 to 60 in 2.8 seconds...*



**Porsche Canada CEO:**  
Half our cars to be  
electric in 5 years

Porsche has invested ~\$6.5 billion  
in electric/hybrid technology

# | Electric Big Rigs are on the Horizon



**Tesla's fully-electric Class 8 truck sprinting from 0 to 60 miles/hr in 5 seconds**



# Honda and Isuzu Ink **Hydrogen** Deal for Heavy-Duty Trucks

# Platinum and copper intensive fuel-cell electric vehicles backed by Toyota

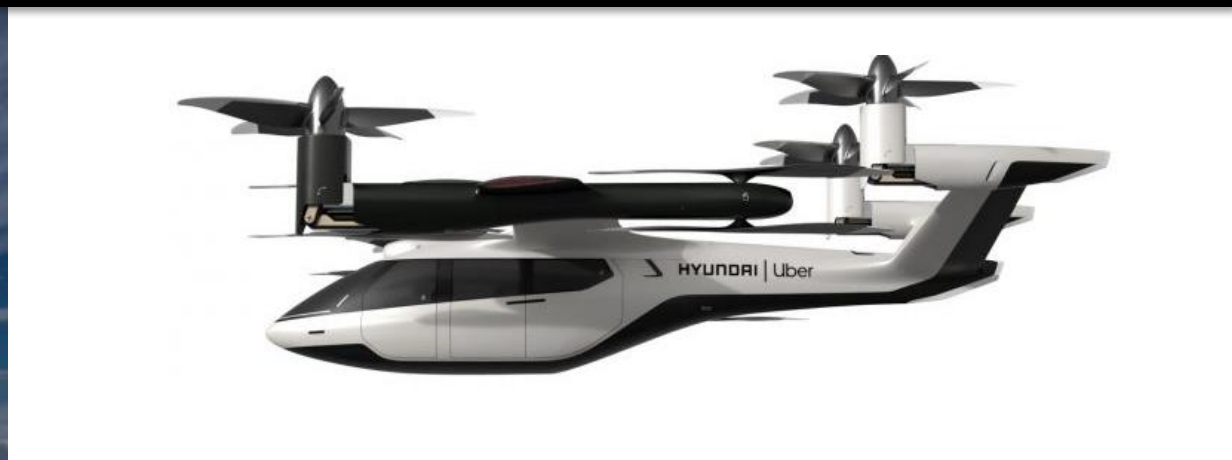


**THE 2019 TOYOTA MIRAI:**  
In Japanese, Mirai (未来) means 'the future'



THE FUTURE HAS ARRIVED.

# THE ELECTRIC **EVERYTHING** ERA



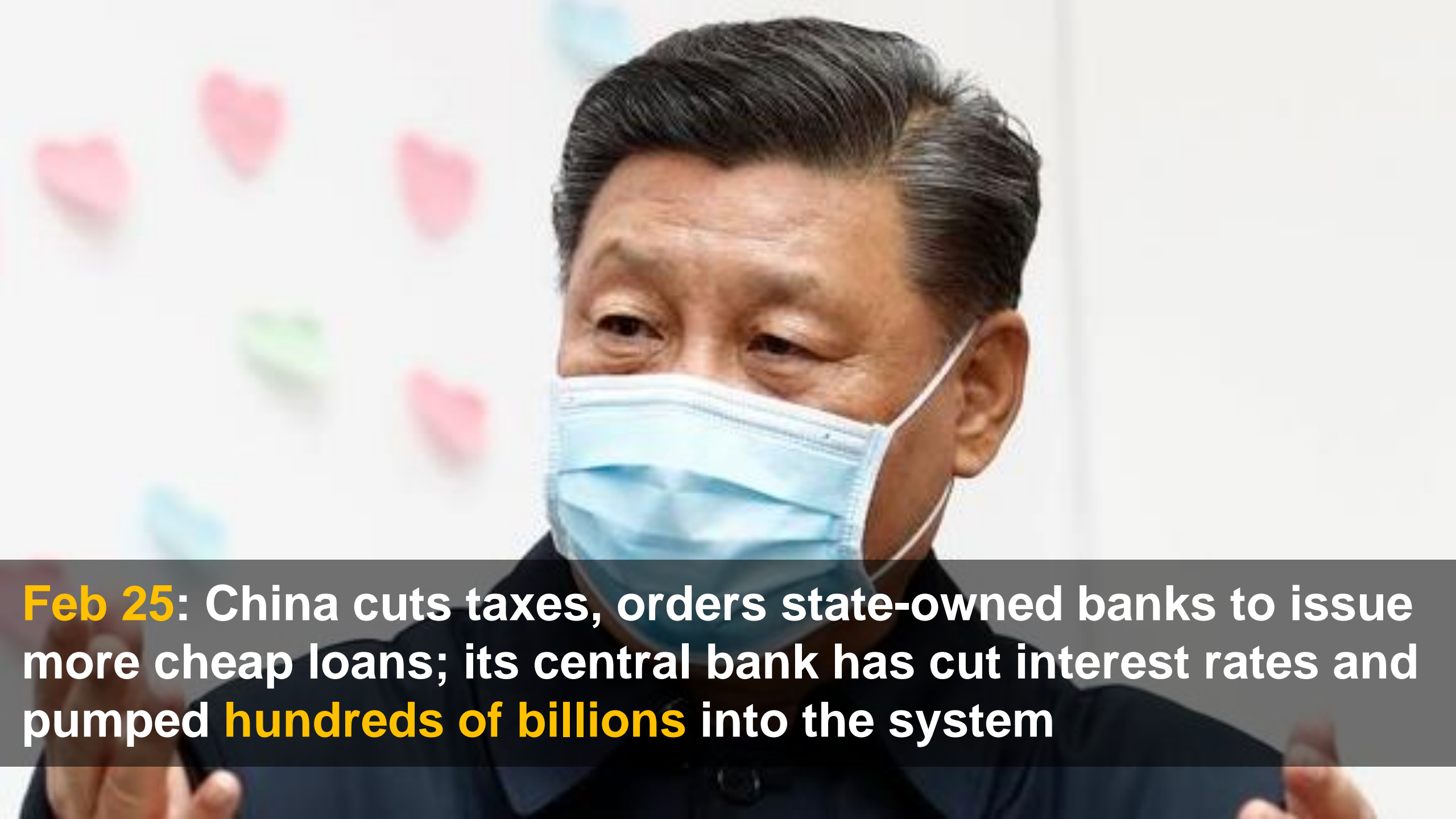
# UAE Powers Up World's **LARGEST** Solar Field



The Noor Abu Dhabi power plant includes **3.2 million solar panels**; will produce approximately 1.2 gigawatts of electricity

# Coronavirus Strikes **AGAIN**





**Feb 25:** China cuts taxes, orders state-owned banks to issue more cheap loans; its central bank has cut interest rates and pumped **hundreds of billions** into the system

# Two Israeli startups develop copper, zinc nanotech masks to block coronavirus

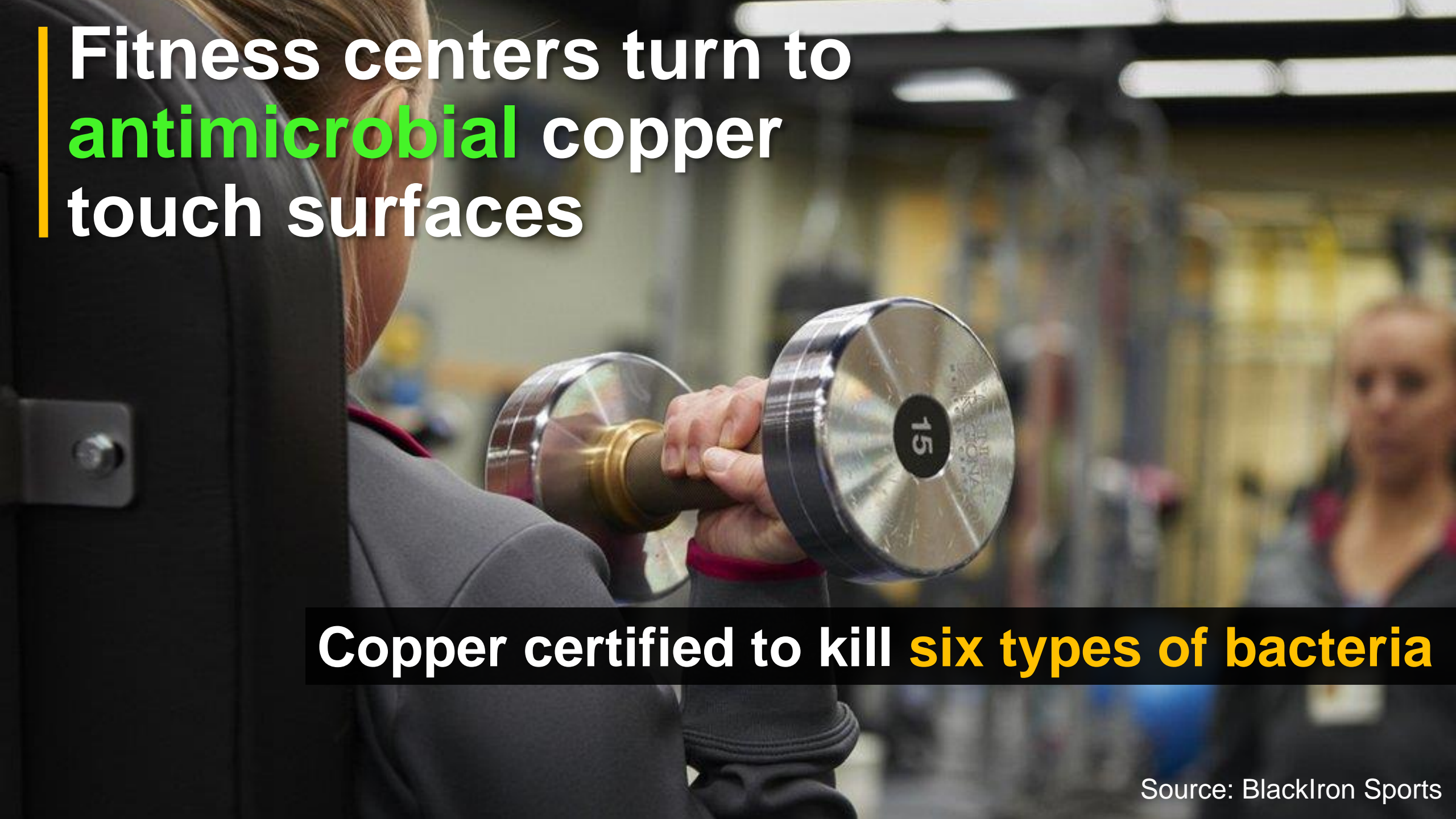


Copper and zinc nanoparticles **kill virtually all Corona viruses** and bacteria in dramatic new use for the metals



# Copper: the friendly, **GREEN** bug fighter

Anti-microbial copper continuously kills up to 99.9% of bacteria, including '**superbugs**' resistant to antibiotics, within 2 hours of contact

A person is shown from the side, lifting a 15lb dumbbell. The dumbbell has a gold handle and silver ends with the number '15' on a black circle. The background is a blurred gym setting with other people and equipment.

# Fitness centers turn to antimicrobial copper touch surfaces

Copper certified to kill **six types of bacteria**

Source: BlackIron Sports

# Installation of antimicrobial copper in Brazilian airport





Antimicrobial  
Copper

Cu



# | Starbucks Roastery

This **massive copper cask** is where all Starbucks Reserve coffee beans rest and de-gas after roasting

# The Biggest Problem in Electric Cars



We have to scale battery production to crazy levels that people cannot even fathom today. That's the real problem.

*Elon Musk, Jan. 2020*



Tesla expects global shortages of nickel, copper and other **EV battery minerals** due to underinvestment in the mining sector.

*Sarah Maryssael  
Global Supply Manager for Battery Metals, Tesla*



Source: Reuters

Source: Tesla

# Renewable technology is absurdly **PGM and copper** intensive

Wind & solar energy up to **37 times more copper  
intensive** than conventionally-generated electricity



**Global wind turbine fleet to consume more than 5.5 million tonnes of copper by 2028**

**GE planning 85-storey-high offshore wind turbine**

A photograph of a car completely engulfed in bright orange and yellow flames. The fire is intense, with thick smoke rising from the vehicle. The background is dark and smoky, suggesting a large wildfire. The overall scene is one of destruction and danger.

# Aged U.S. Power Grid in **Dire Need** of an Overhaul

A snapped wire from PG&E's **100-year-old power line** started the Paradise fire that killed 85 people in California

# What an average American consumed per capita **BEFORE** the New Era of Electrification

1,515 tons of minerals, metals and fuels per person  
Current U.S. population: **328 million**

971 lbs.  
copper

521 lbs.  
zinc

+54,336 lbs.  
other minerals  
& metals

1.76 troy oz.  
gold

24,698 lbs.  
iron ore

12,129 lbs.  
clays

17,343 lbs.  
phosphate rock



5,708 lbs.  
bauxite  
(aluminum)

459,784 lbs.  
coal

45,060 lbs.  
cement

72,080  
gallons  
petroleum

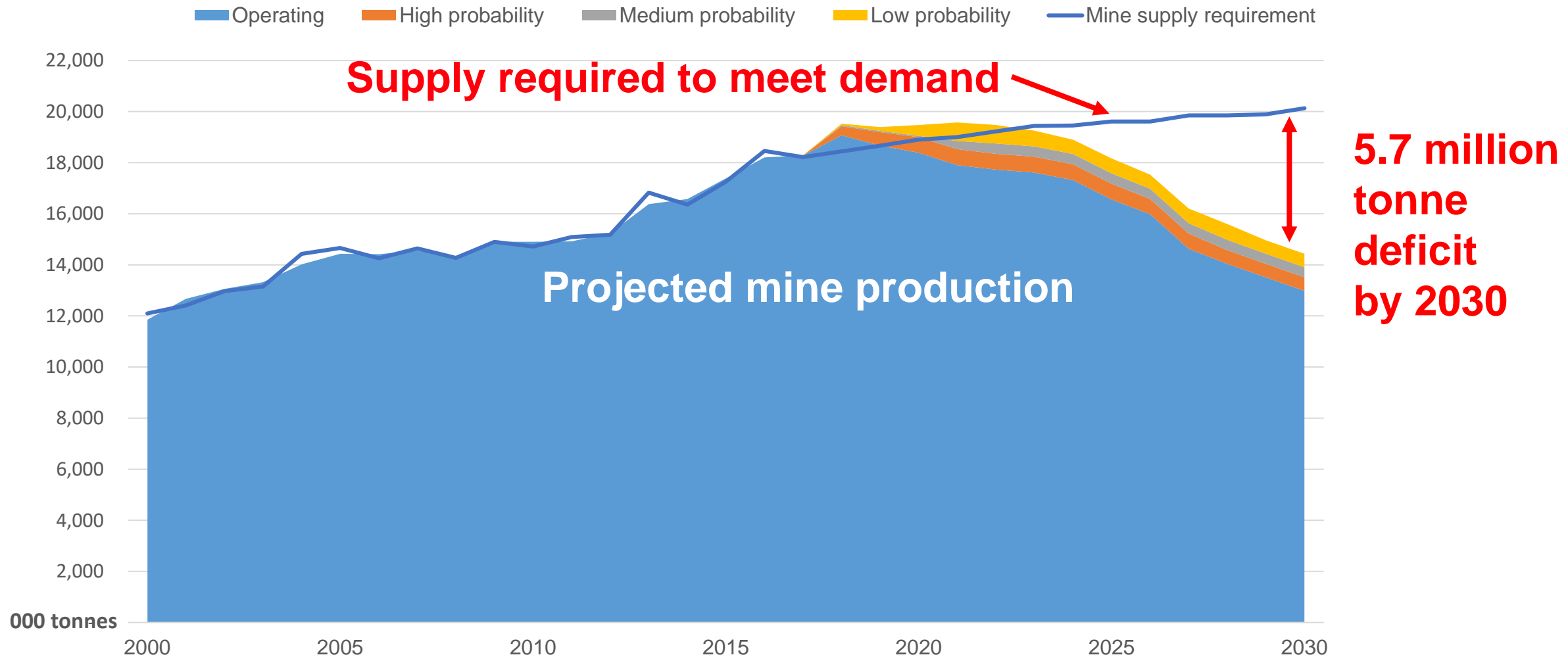
27,442 lbs.  
salt

6.8 million cu. ft.  
natural gas

1.18 million lbs.  
stone, sand & gravel

889 lbs. lead

# Not Enough Copper is Being Discovered



Source: S&P Global Market Intelligence

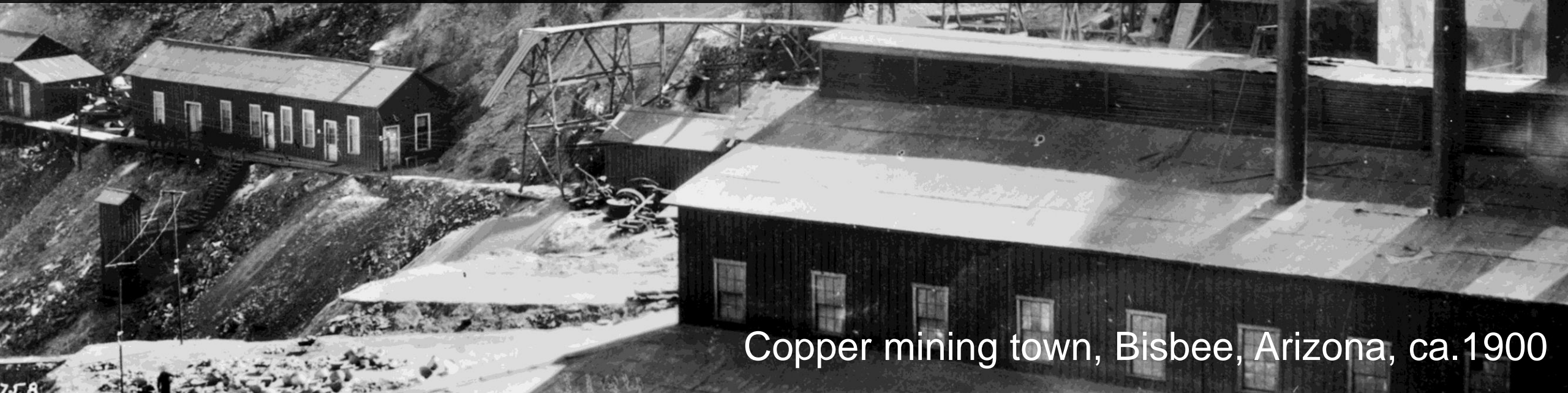
# Chile's Grade Problem: Mining More, Producing Less

■ Codelco ore grades (R1)  
■ Mineral Processed (L1)



# Falling Grade, Greater Impact

Since 1900, the energy needed to produce copper has increased **16 fold per unit**, while water consumption has doubled



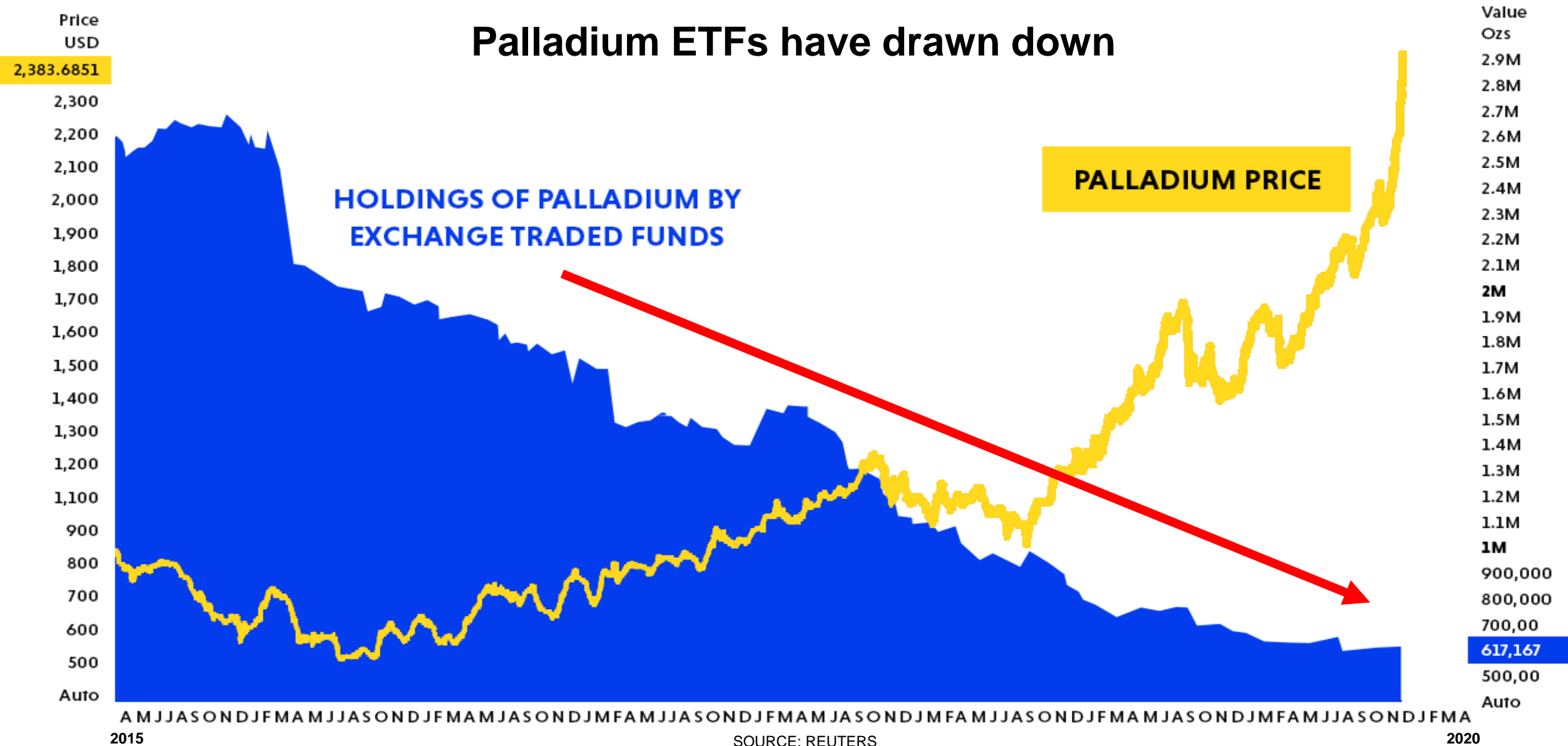
Copper mining town, Bisbee, Arizona, ca.1900

# Palladium more expensive than **GOLD HAS EVER BEEN**

■ Palladium ■ Gold ■ Silver ■ Platinum

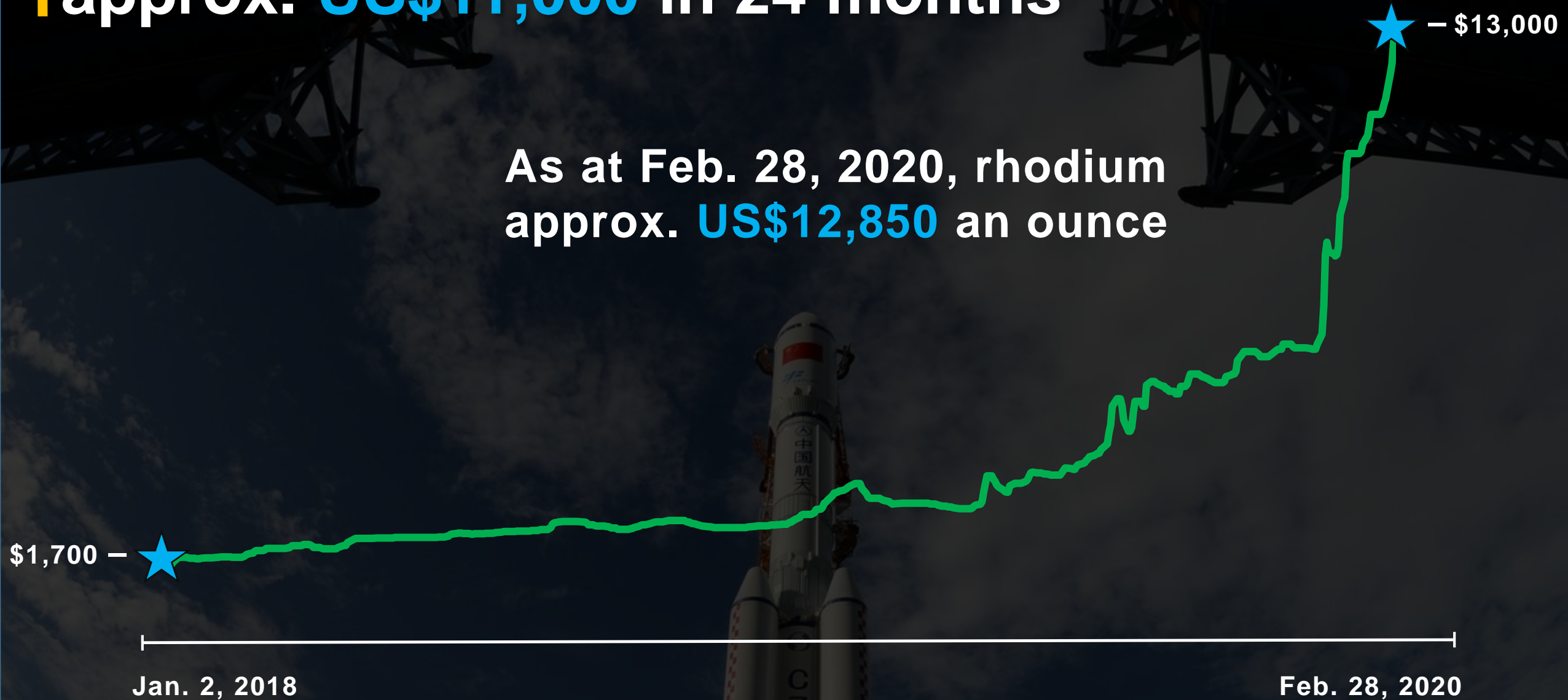


# Palladium Market nears 10-year deficit



# Rhodium Rocket – Prices have risen approx. **US\$11,000** in 24 months

As at Feb. 28, 2020, rhodium approx. **US\$12,850** an ounce



Source: Johnson Matthey

# IVANHOE MINES

29 <b>Cu</b> 63.546	46 <b>Pd</b> 106.42	28 <b>Ni</b> 58.693	78 <b>Pt</b> 195.08
79 <b>Au</b> 196.967	45 <b>Rh</b> 102.906	30 <b>Zn</b> 65.38	32 <b>Ge</b> 72.631
30 <b>Ag</b> 65.38			

**CLEAN  
TEQ**

Powering innovation

27 <b>Co</b> 58.933
---------------------------

28 <b>Ni</b> 58.693
---------------------------

21 <b>Sc</b> 44.96
--------------------------

**VRB  
ENERGY**

Vanadium Redox Battery Solutions

23 <b>V</b> 50.94
-------------------------

Ivanhoe group of companies is in the business of providing metals for the 'Smart Age'

# IVANHOE WILL PRODUCE GREEN COPPER

- Underground mines with **tiny surface footprint**
- **55% of tailings** returned underground
- Powered by clean, green **hydro-electricity**
- **High grade** = more copper, less CO<sub>2</sub>

The Mwadingusha hydropower plant in the Democratic Republic of Congo (DRC).


# Kakula's chalcocite ore grading **63% copper**



**Kamoa-Kakula's +6% Cu ore grade will have the lowest carbon footprint of any major copper mine on our planet, which will realize future premium prices in the supply chain**



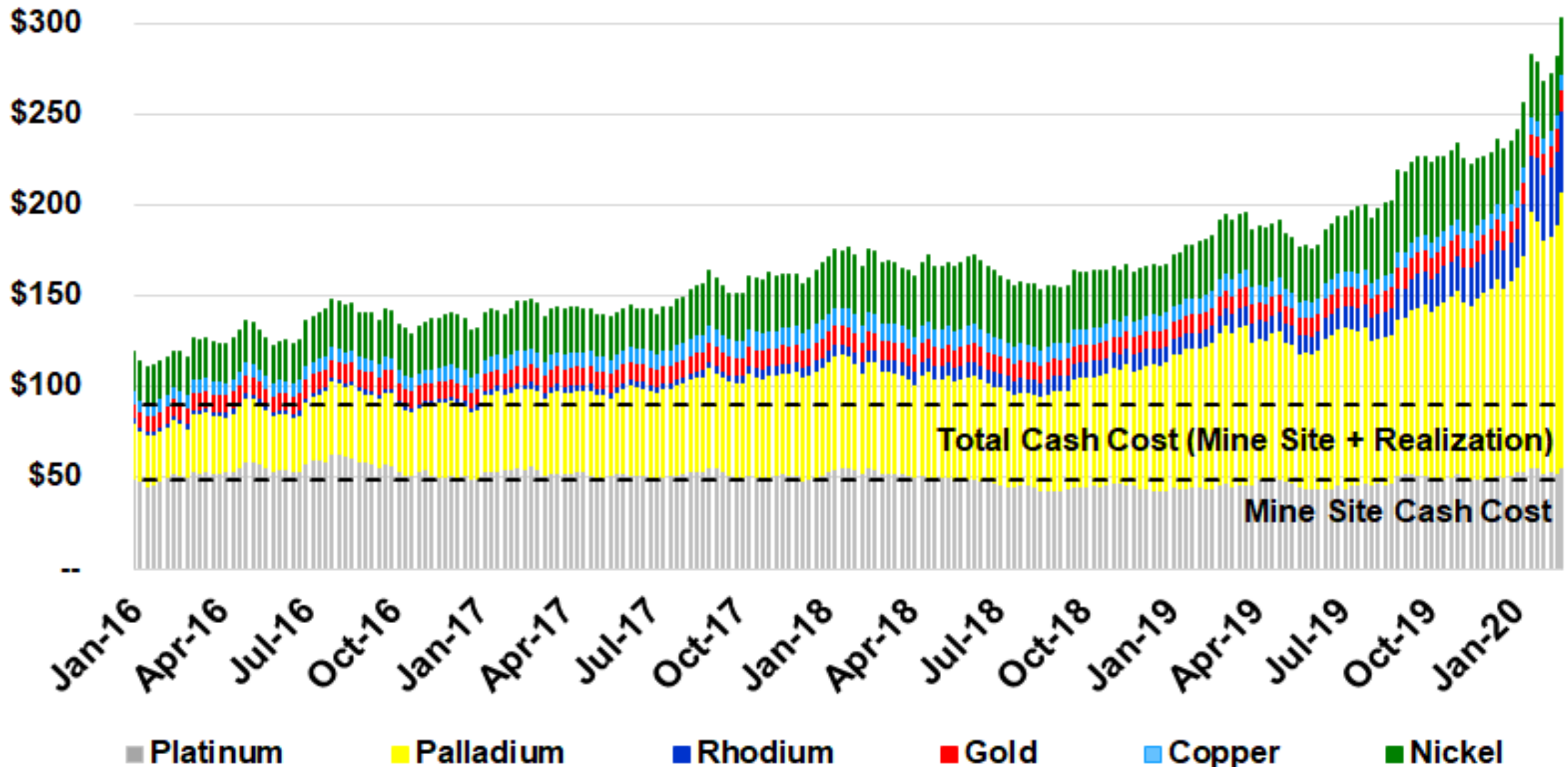
Photo by Tetyana Kovyrina from Pexels



Platreef on track to be Africa's **lowest-cost producer** of palladium, rhodium, platinum and gold

**Phase 1:** 476,000 oz. platinum, palladium, rhodium and gold (**3PE+Au**), plus 33 million lbs. nickel and copper, at US\$351/oz. 3PE+Au

# Platreef Revenue Per Tonne of Probable Reserves (US\$/tonne ore)



**Kipushi is the world's highest-grade  
zinc-copper-silver-germanium mine**



**Best drill hole intersected  
340 metres of 44.8% zinc**

A group of people are silhouetted against a bright sunset sky, performing a dance on a rooftop. They are holding large, open red fans. In the background, the Shanghai skyline is visible, including the Oriental Pearl Tower. The scene is captured in a cinematic style with long shadows and a warm, golden light.

恭喜发财!

**The Ivanhoe Group**