

RE-IMAGINING MINING THROUGH HYDROGEN

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African Hydrogen Partnership

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Chris Griffith, CEO Anglo American Platinum, at an investor visit to China

Real Mining. Real People. Real Difference.



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- ❑ Who we are
- ❑ Platinum group metals enable core hydrogen and fuel cell technologies
- ❑ Anglo American Platinum proactively working to accelerate the adoption of H2 and Fuel Cells



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CONTENT

☐ Who we are

☐ Platinum group metals enable core hydrogen and fuel cell technologies

☐ Anglo American Platinum proactively working to accelerate the adoption of H2 and Fuel Cells



ANGLO AMERICAN: WHO WE ARE

Global leading mining company

OUR BUSINESS AT A GLANCE



64,000
PEOPLE
WORLDWIDE



\$27.6 bn
REVENUE IN 2018



WHERE WE ARE

OUR
HEADQUARTERS
ARE IN LONDON,
UNITED KINGDOM

WE PRODUCE

DIAMONDS



COPPER



PLATINUM
GROUP
METALS



IRON ORE,
MANGANESE



COAL

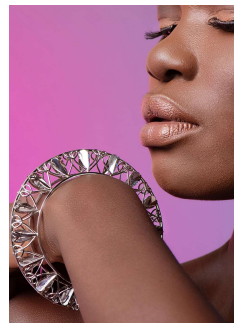


NICKEL



MINING
OPERATIONS IN
SOUTHERN AFRICA,
NORTH AND SOUTH
AMERICA AND
AUSTRALIA

WE ARE LISTED ON
THE LONDON AND
JOHANNESBURG
STOCK EXCHANGES



Source: Anglo American



ANGLO AMERICAN PLATINUM - WHY DEVELOP DEMAND FOR OUR METALS?

There are four core segments of platinum demand:



Unlike the majority of commodities, PGM demand can be created through our own efforts

Source: World Platinum Investment Council



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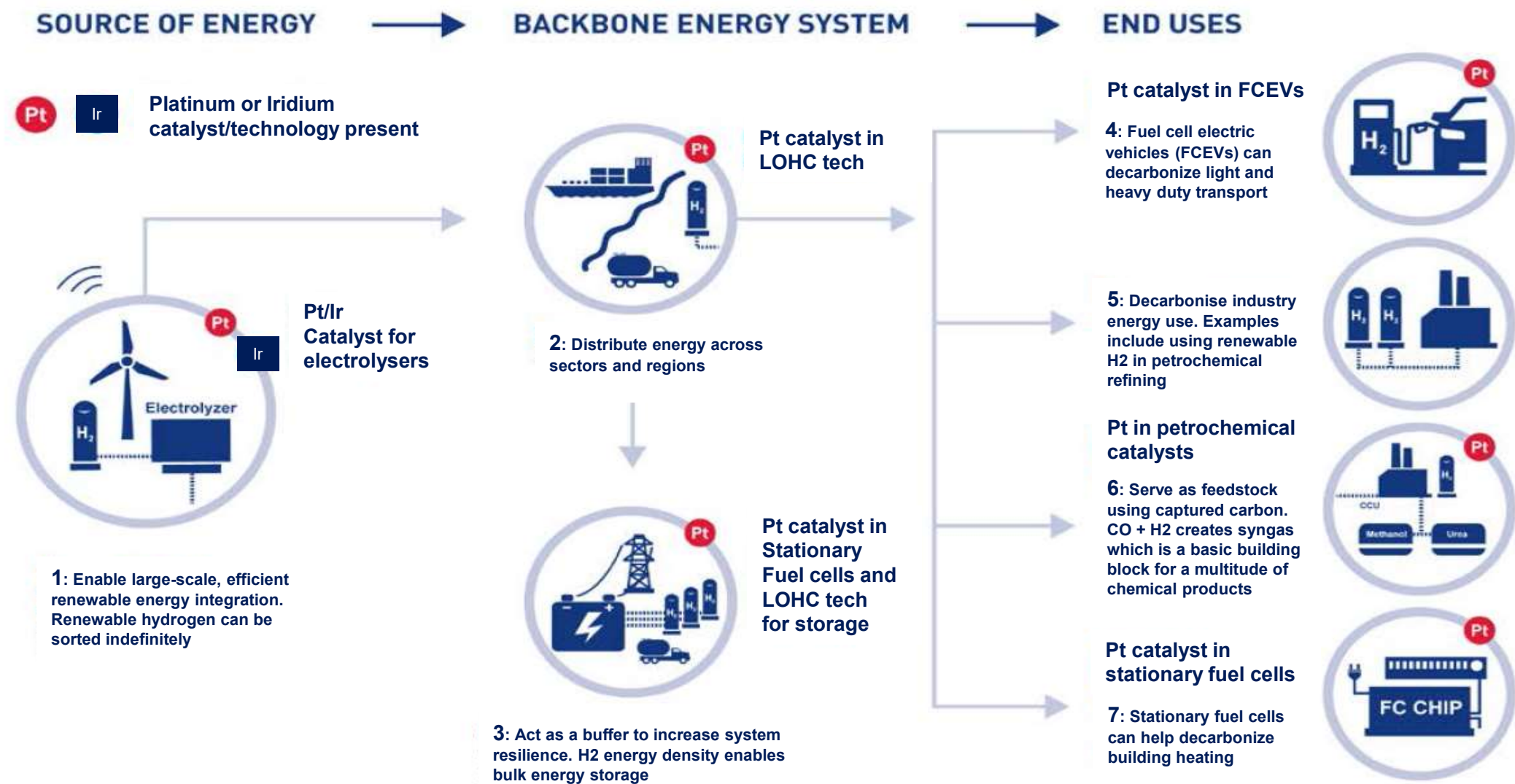
☐ Who we are

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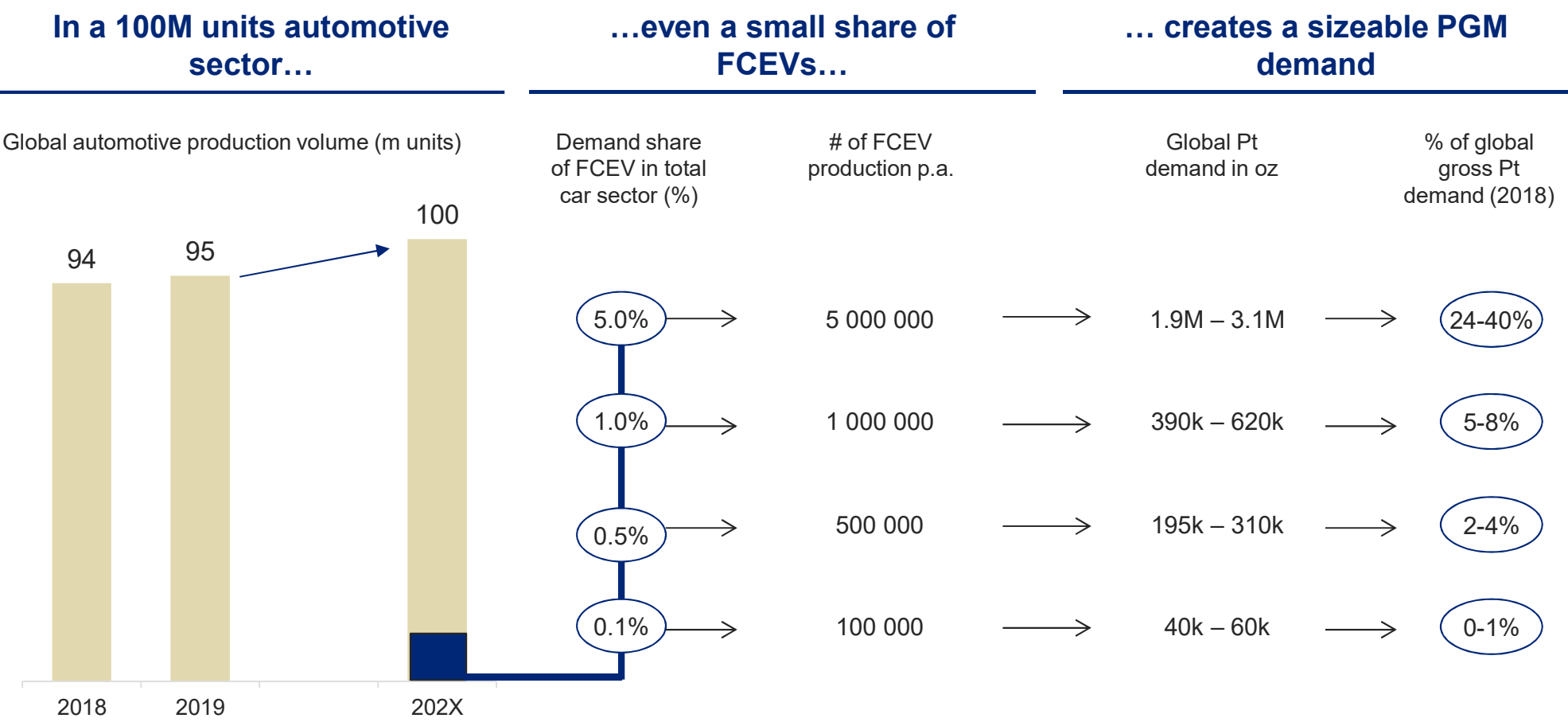
PLATINUM GROUP METALS FIND THEMSELVES AT THE CORE OF SEVERAL TECHNOLOGIES ACROSS THE HYDROGEN VALUE CHAIN



Source: Anglo American, H2 Council



THE RATE OF ADOPTION OF FCEVS CAN HAVE A SIGNIFICANT IMPACT ON PLATINUM DEMAND



Source: Anglo American Analysis, US DOE Technical Targets for Polymer Electrolyte Membrane Fuel Cell Components, IHS Markit Light Vehicle Production



CONTENT

☐ Who we are

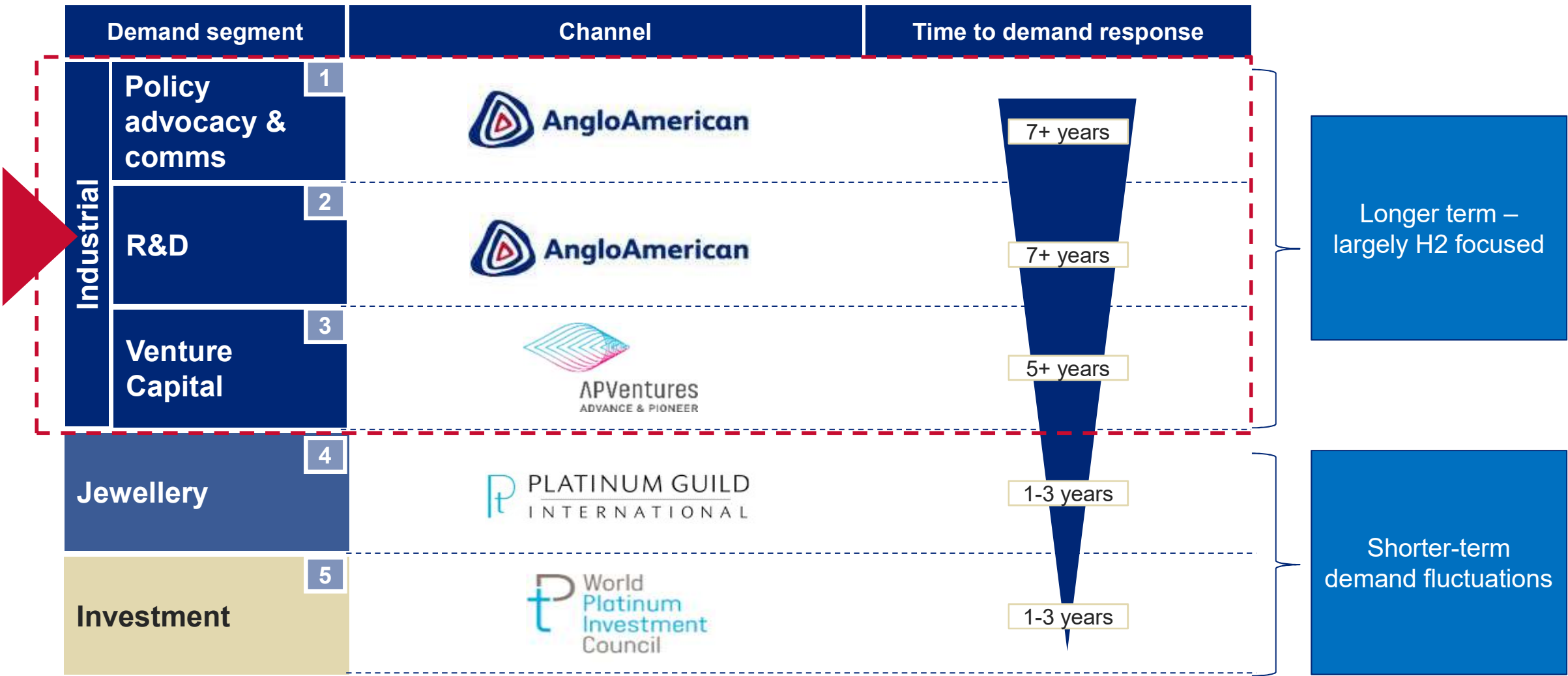
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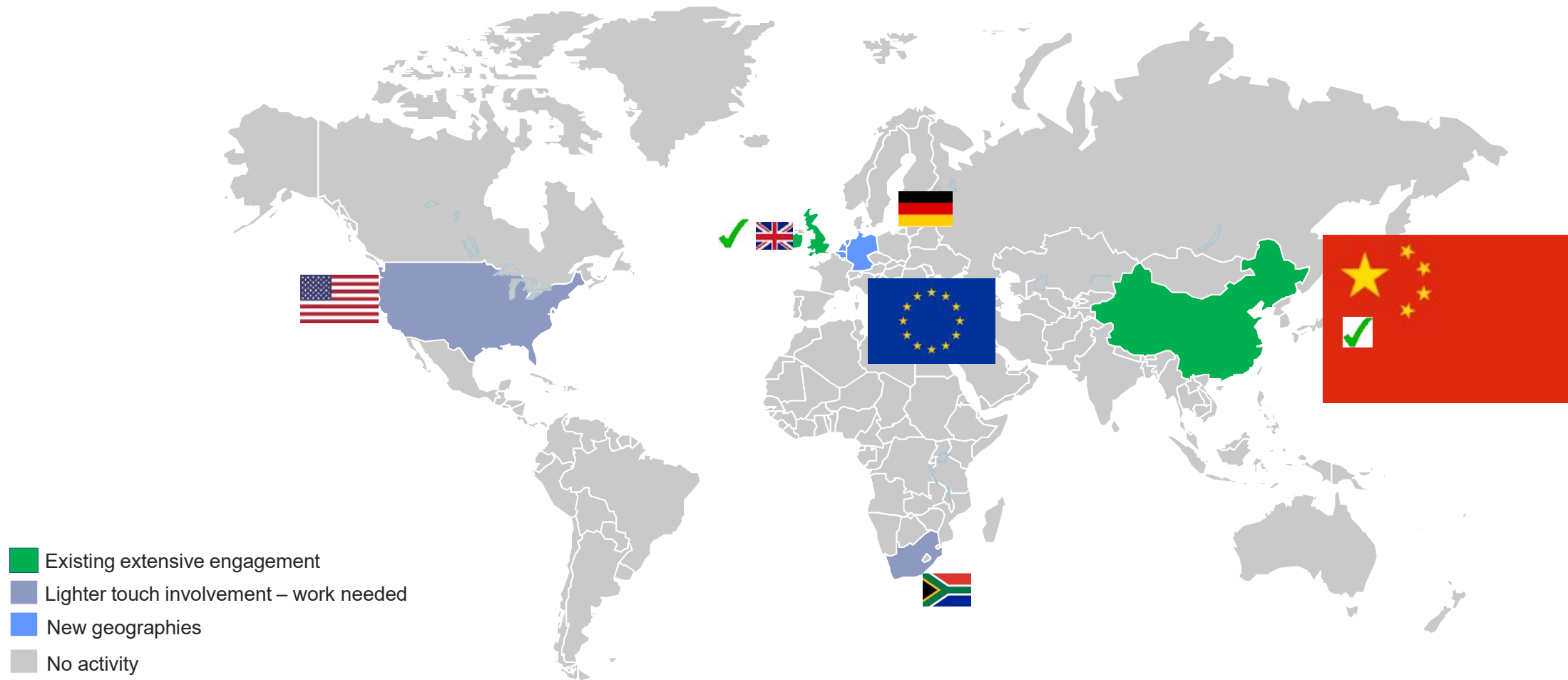


OUR EXISTING DEMAND DEVELOPMENT INITIATIVES

Industrial focus is on longer-term structural demand changes



POLICY AND COMMUNICATIONS – USA, UK, EU & CHINA



*Wider industry involvement beneficial
More voices = more impact*



POLICY AND COMMUNICATIONS - PROACTIVE ADVOCACY WITH PARTNERS PAYING OFF

Anglo American Platinum has played an instrumental role in a number of initiatives

EU/UK and USA (non-exhaustive list)

- Founding member of H2 Council
- Successfully lobbied to amend Automated and Electric Vehicles Bill in the UK
- Convinced the UK Committee of Climate Change to recognise H2 as a key part of decarbonising the UK
- Member and active supporter of numerous FC associations in the US and EU
- Led formation and development of the FCHEA zero emissions, zero compromise campaign in the USA

China (non-exhaustive list)

- One of 3 key initiators of the International H2 Fuel Cell Association (IHFCFA)
 - Influenced multiple companies to join IHFCFA, such as Honda, Hyundai, Shell, PDC, Re-fire, Ballard, SDIC Fund, etc.
- Co-organized the 1st Pt and H2 FC forum and closed-door investment introduction meeting with WPIC
- Key sponsor and co-organizer of the annual international hydrogen fuel cell vehicle congress and roadshow in China (next roadshow taking place 22-25 Sept, 2019 across Jiaxing, Shanghai, Changshu, Nantong and Rugao)



FCVC 2019

第四届国际氢能与燃料电池汽车大会

The 4th International Hydrogen Fuel Cell Vehicle Congress



2019年9月26-28日 | September 26-28, 2019
中国·如皋 | Rugao · China



WE HAVE INVESTED DIRECTLY IN THE DEVELOPMENT OF NEW HYDROGEN APPLICATIONS AND THE ROLLOUT OF H2 INFRASTRUCTURE

Investments in H2 research, demonstration projects and HRS infrastructure



- Supported the funding of:
 - Seven hydrogen refueling stations in California in collaboration with Toyota, Honda and Shell
 - Five new hydrogen refueling stations, and the upgrade of four existing hydrogen refueling stations in the UK also in collaboration with Toyota, Shell and other players
- Invested in the development of a fuel cell rural electrification project in Kroonstad, South Africa in collaboration with Ballard
 - Methanol fuel cell system combined with battery bank and power inverters to provide primary power, through a micro-grid to 34 rural households in the Naledi Trust community near Kroonstad, South Africa
 - Operated for 28 months from 1st August 2014 to 30th November 2016
 - The field trial successfully achieved its objectives forming the basis for a Taiwanese company, CHEM, to develop a new prime power product for rural electrification based on fuel cell micro-grids



DEVELOPMENT OF FUEL CELL POWERED UNDERGROUND MINING EQUIPMENT CONTINUES

Liquid Organic Hydrogen Carrier (LOHC) innovator Hydrogenious Technologies inspires use of LOHC for underground mining applications



- **Leveraging Hydrogenious LOHC technology has numerous benefits:**
 - Liquid state in broad temperature range between -39 to 390°C and ambient pressure
 - Non-toxic and not classified as a dangerous good
 - No evaporation of stored hydrogen – multi-month storage possible without any losses
 - Transportable in conventional fuel infrastructure
- **Other benefits of LOHC & fuel cell technology for underground mining include:**
 - No harmful emissions – positive impact on underground ventilation needs
 - Low heat generation
 - Energy security
 - LOHC is biodegradable

LOHC Fuel Cell Dozer



LOHC Fuel Cell Loco



LOHC Fuel Cell Load-Haul-Dump (LHD)



Source: Hydrogenious; Anglo American Platinum



AT ANGLO AMERICAN, WE ARE COMMITTED TO DELIVERING ENDURING VALUE THROUGH SMART ENERGY

Transformational use of renewables at our operations

Challenge

Transformational use of renewables

Approach

1. Oversize PV
2. Plant tariff demand arbitrage
3. Produce H2 with excess PV
4. Consume H2 in trucks

Value

Reduce GHG on large site by 30% in plant and 100% in trucks

Increase truck power by 5%

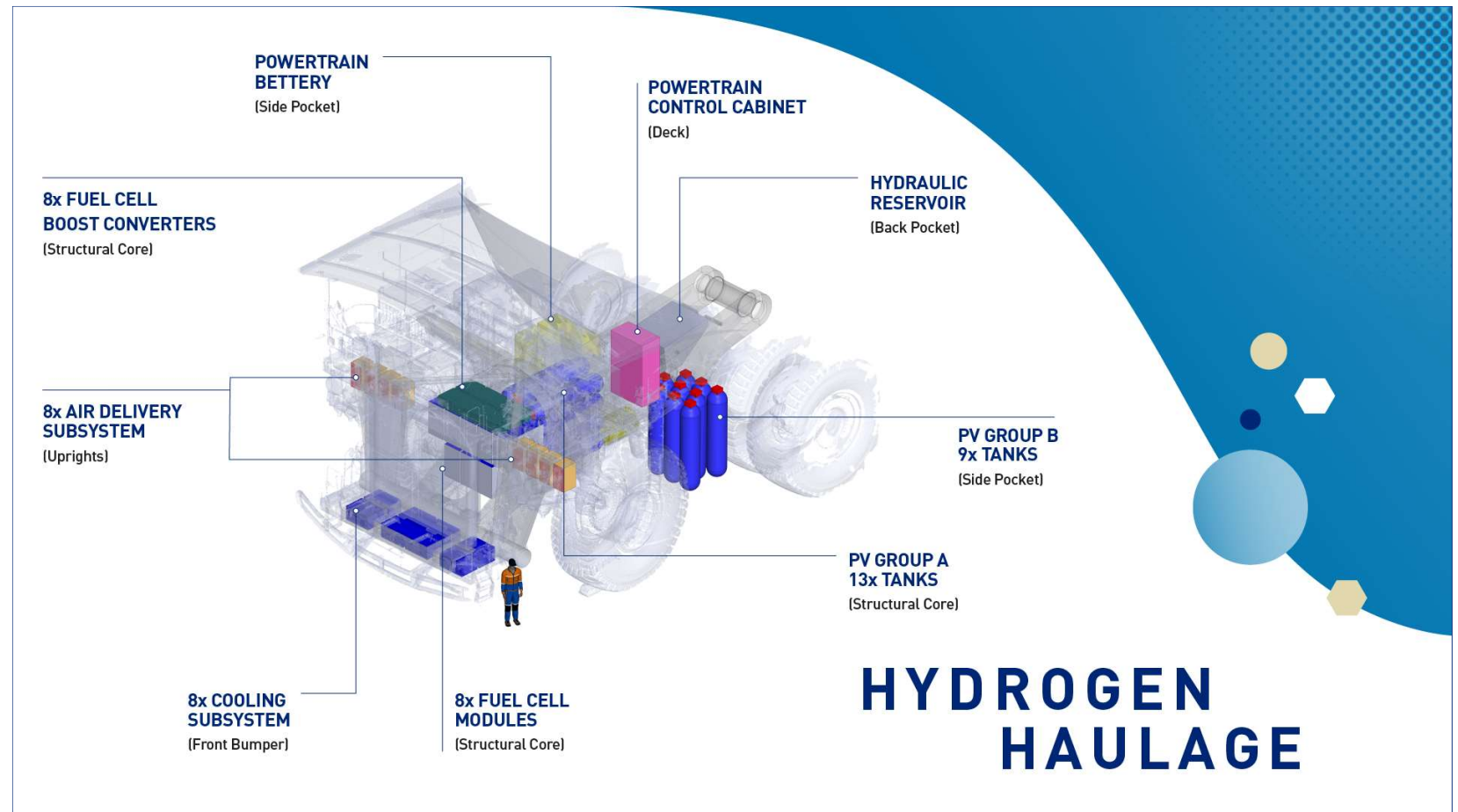
Energy security

Price resilience

Move to hydrogen economy

Next generation mining vehicles

Host community participation



ANGLO AMERICAN HAS LAUNCHED A VENTURE CAPITAL FUND WITH A STRONG HYDROGEN AND FUEL CELL FOCUS

Capital Partners



Current Portfolio



World's first PGM-focused venture capital fund launched in July 2018 - now drawing in new capital providers and deploying capital largely into the hydrogen and fuel cell value chain



SUMMARY & KEY TAKEAWAYS

1	We proactively develop demands for our metal & H2 a key focus	<ul style="list-style-type: none">• We have been investing in creating demand for our metals successfully for over 15 years• We focus on stimulating demand from jewellery, investment and industrial applications• We have a specific interest in supporting the development of hydrogen and fuel cells• We invest directly in a portfolio of activities from R&D, to venture capital, demonstration, commercialisation and policy advocacy
2	We partner with customers and industry	<ul style="list-style-type: none">• We seek to form relationships and invest in opportunities that are mutually beneficial• We strive to efficiently develop demand by collaborating with our customer and industrial partners• We have a track record of successful partnerships and investments.
3	We walk the talk and are working to make H2 a key part of decarbonising and powering our own operations	<ul style="list-style-type: none">• We have been developing fuel cell powered underground mining equipment for a number of years• We have recently begun the development of hydrogen haul trucks which would require large amounts of hydrogen and could kickstart large scale green hydrogen production. If widely adopted by the industry as a whole, significant demand for fuel cells and H2 would be created.
4	South Africa is key to the global success of H2 & fuel cells	<ul style="list-style-type: none">• South Africa houses more than 80% of the world's PGM reserves and the PGM mining sector employs over 160,000 people• Investment and development in the hydrogen economy has potential to sustain or create jobs, develop skills and improve overall quality of life• Anglo American has dedicated efforts to support the hydrogen and fuel cell sector both locally and globally



CONTACT US



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THANK YOU

