

DEVELOPMENT OF THE HYDROGEN ECONOMY AND FUEL CELLS MARKET

Renaissance Capital: Trends from the East Virtual Conference

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AGENDA

- Anglo American Platinum's approach to PGM Market Development
- Highlights of our activities and projects
- China – the engine room of the Hydrogen sector

Anglo American Platinum's approach to Market Development

To discover, nurture, scale and sustain a sufficiently diverse set of new and existing demand segments

Continue to support, with others, platinum jewellery and platinum investment demand creation efforts in addition to our work in accelerating the adoption of PGM enabled hydrogen technologies

Pursue metal-agnostic opportunity areas that are lesser known but with varying demand potential. All given the attention needed to yield the highest probability of realising a variety of end applications for our metals



Carbon neutral-feedstock

Battery & storage

Low-loss computing

Long-lasting FoodTech

MedTech

...and more...

Diversity of existing and new demand applications is attractive as it brings a combination of short to long term demand pull for PGMs

Market Development to discover and nurture an opportunity area into New Demand

Opportunity Areas (OAs) are attractive yet largely unfounded potential demand segments

Examples of OAs currently nurtured by Market Development

Green hydrogen production & mobility



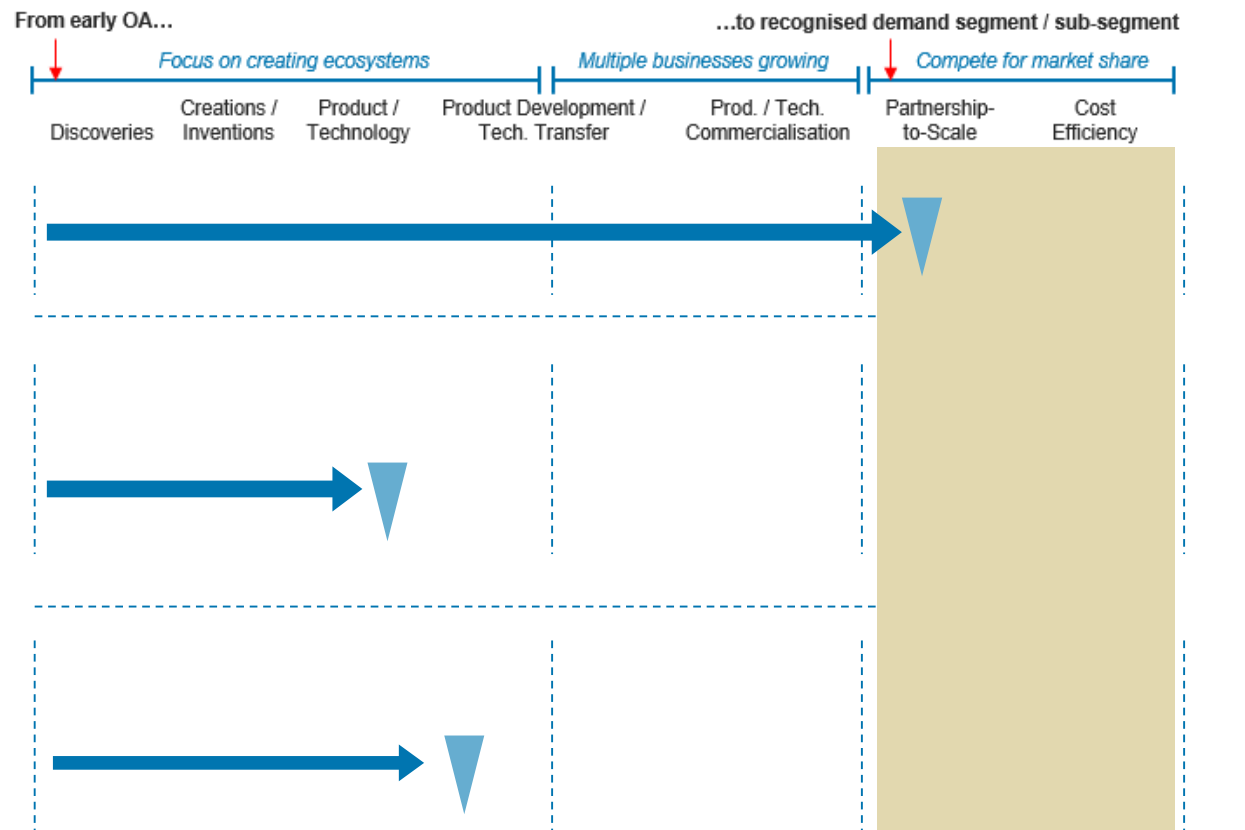
Carbon-Neutral Feedstocks



Low-loss Computing



In the context of ‘new demand’, Market Development is about progressing OAs into recognised new demand segments or sub-segments



OAs are considered from both volume-worthiness and narrative-worthiness

Shape the environment








Shape the Business



Using five core capabilities to shape the business and the environment of the businesses

Example here in the hydrogen space, the capabilities which we now apply across other areas of PGM demand too



- 1**  **Discover & assemble**
new ventures
(*R&D → New business*)
- 2**  **Deploy & leverage**
growth capital
(*New business → Sustainable business*)
- 3**  **Enable**
commercial collaboration
(*Light house projects*)
- 4**  **Advocate**
for favourable policy environment
- 5**  **Educate & Communicate**
perception and sentiment

Examples:

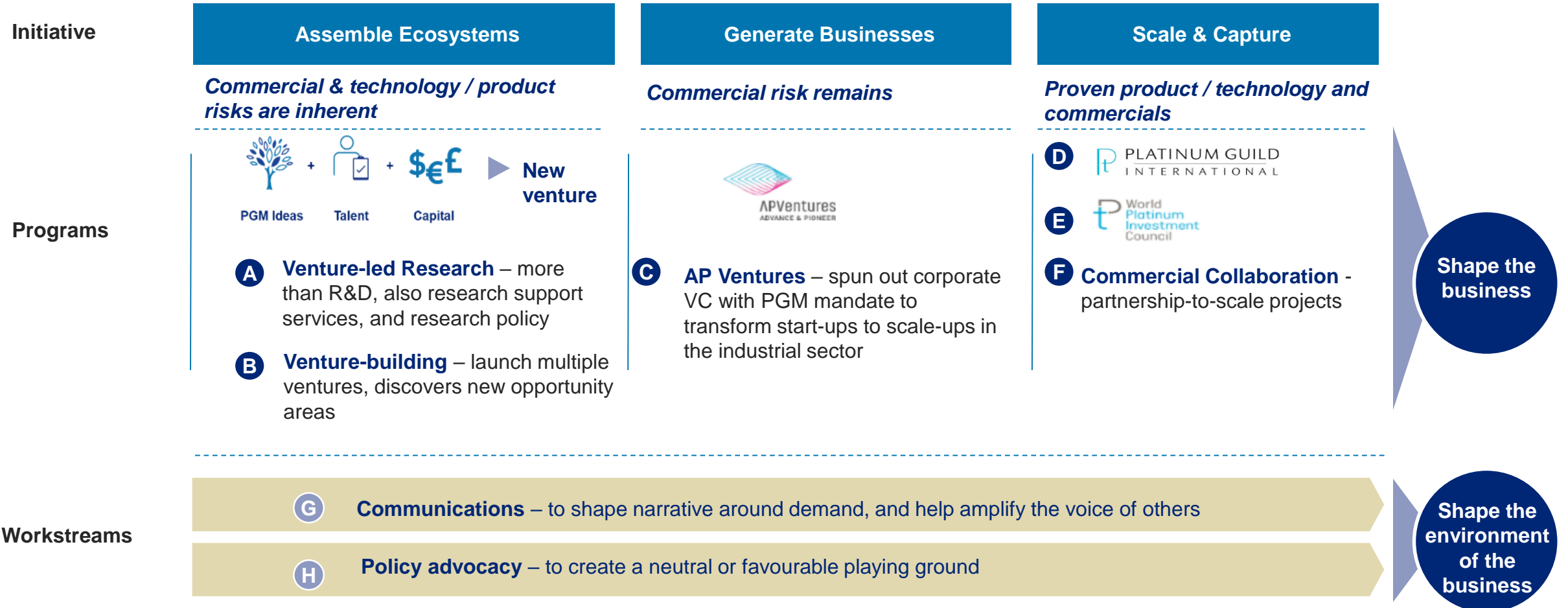


Shape the
business

Shape the
environment
of the
business

Anglo American Platinum's approach is "Programmatic, Complementary, Thematic, Leveraged & Customer-centric"

Initiatives designed to complement and amplify the activities of our peers, partners, suppliers & customers, as well as accrue value to AAP



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Highlight 1: alloys, the opportunity to be a material solution provider

Our collaboration with Alloyed to build a full-stack technology platforms for PGM alloys

Alloyed

Formerly OxMet Technologies



Alloyed head office in Oxford, UK

PGMs used

PGMs

What is it?

Collaboration with Alloyed to build the world's first digital + physical alloy platforms to accelerate the development of new PGM alloy compositions specially designed to address demand challenges.

Why does this matter to PGMs?

Today, alloy development follows a largely trial and error approach. Available PGM alloys are by and large composed of 2 metals (e.g. Pt/Rh or Pt/Cu) compared to sophisticated alloy systems of other metals, some with of 10 or more metals.

The computational and experimental platforms developed with Alloyed have opened up doors for exploration of a much wider range of PGM material solutions, and being able to predict the performance of a thousands of alloy formulations simultaneously, accelerating the discovery of new alloy compositions that uses PGMs to address specific demand needs, especially jewellery.

Highlight 2: Developing the battery of tomorrow while improving the battery of today with PGMs

Lion Battery Technologies – making game changing performance for lithium batteries



Partner



PGMs used

Pt

Pd



What is it?

A JV launched by AAP and Canadian PGM company Platinum Group Metal (PTM) to jointly fund a research group at Florida International University developing next generation Li-air & Li-sulphur battery technology that uses platinum and palladium.

Why does this matter to PGMs?

Li-sulfur & Li-air chemistries have power densities far superior to today's best in class technologies. But so far neither of the two chemistries has achieved the cycle life needed to make a commercial product. Adding PGMs to the chemistries aims to address this issue. If successful, the adoption of this battery chemistry would turn today's BEVs from a challenge into a sizeable opportunity for PGMs.

The JV has recently developed new innovations that have the potential application in several existing lithium-ion battery chemistries.

AAP is actively working with PTM group to establish route to market for the technology

Highlight 3: Leverage our capital to scale up the Hydrogen & PGM ecosystem

AP Ventures continuing success



Anglo American Platinum founded and remains a cornerstone investor in AP Ventures

AP Ventures is the pioneering and the only PGM-centric venture capital fund that is mission-driven to support the scaling-up of businesses in the hydrogen sector as well as businesses that have their value propositions underpinned by PGM-containing product or services

Seven Limited Partners today



Investments across the hydrogen value chain



...further endorsing its pivotal position to support PGM growth

Highlight 4: global demand aggregation for more FCEVs on the road through hydrogen freight corridors

Starting with the UK and South Africa

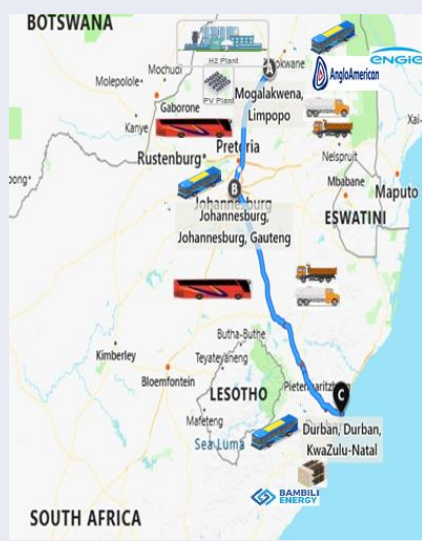
Each consortium is **vehicle-operator led** and brings a number of **large fleet operators** together with **vehicle OEMs** and **hydrogen refuelers** to deploy thousands of a versatile specification of **fuel cell trucks** and **vans**, and the refuelling infrastructure needed for their operation.



United Kingdom



South Africa



EU

Air Liquide and Port of Rotterdam Authority: hydrogen road transport


Air Liquide and the Port of Rotterdam Authority announce the launch of a jointly created initiative, which aims at enabling 1,000 hydrogen-powered zero-emission trucks on the roads connecting the Netherlands, Belgium, and West Germany by 2025. Several partners representing the whole supply chain, from truck manufacturers such as VDL Groep, Iveco/Nikola to transport companies Vos Logistics, Jongeneel Transport and HN Post, as well as leading fuel cell suppliers have already agreed to join. This is one of the largest projects in Europe for the development of hydrogen trucks and related infrastructure and will contribute to improve air quality by reducing by an estimated amount of more than 100,000 tonnes CO2 emissions per year, which is equivalent to 110 million kilometers driven.



China

Yangtze River Delta hydrogen corridor construction and hydrogen economic integration development planning

Short-term : Form inner- and intercity connections 3 H2 highways Shanghai/Jiangsu/Wujiang/Huzhou	Middle-term : 10 H2 Highways Connecting main cities within Yangtze River Delta	Long-term : H2 network within Yangtze River Delta
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USA



... may see fuel cell trucks and vans on the roads a lot earlier than thought

Highlight 5: We are putting our money where our mouth is

Hydrogen haulage trucks in mining operations could provide the scale the hydrogen industry has been seeking

OUR TARGET

↓ **30%** in greenhouse gases by 2030

Green Electricity

Hydrogen

Green hydrogen generation through electrolysis

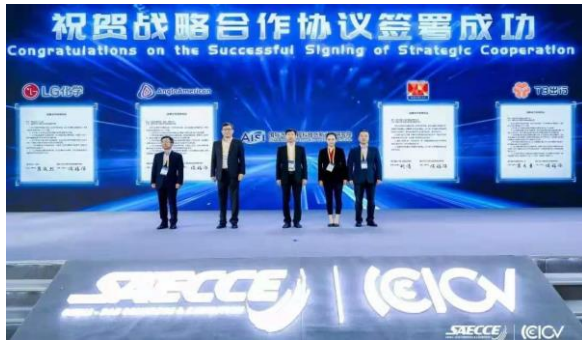
Overize Mogalakwena solar PV plant

The 3.5MW electrolysis plant at Mogalakwena makes up >10% of global electrolyser additions in 2020



Highlight 6: Communicating to and collaborating with industry partners to grow momentum for China's hydrogen economy

Cultivating the competitiveness of hydrogen economy and FCEVs



Signed Strategic Partnership Agreement on FCEV with Automotive Innovation & Strategy Institute of China SAE



Promoting platinum catalyst localization in China through strategic industrial partnership with Guangdong Jiping Ltd during 2020 UNDP Hydrogen Industry Conference



Co-shaped the Bluebook of Hydrogen Vehicles to develop green hydrogen economy in Sichuan Province

Anglo American Platinum is recognised as one of the thought leaders in the hydrogen and fuel cell space in China

Highlight 7: Building up regulatory framework for green hydrogen through key organisations



IFCGA 国际氢能燃料电池协会（筹）
International Hydrogen Fuel Cell Association (Preparatory)

CHINA SAE 中国汽车工程学会
China Society of Automotive Engineers

CH 中国氢能联盟
CHINA HYDROGEN ALLIANCE



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Chinese government & industry backing the hydrogen sector for three key reasons



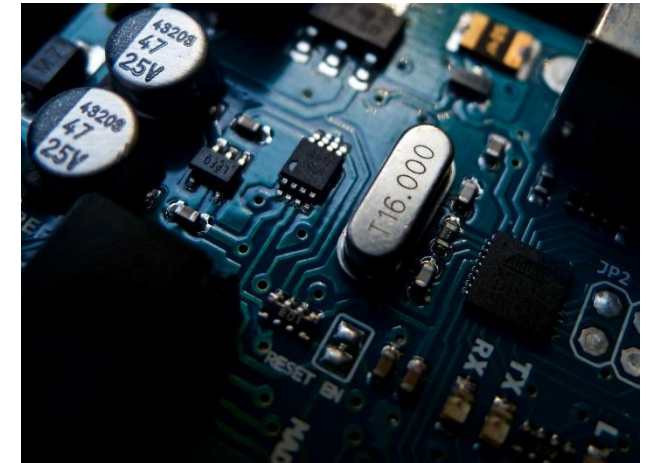
1 Energy independence



2 Pollution reduction

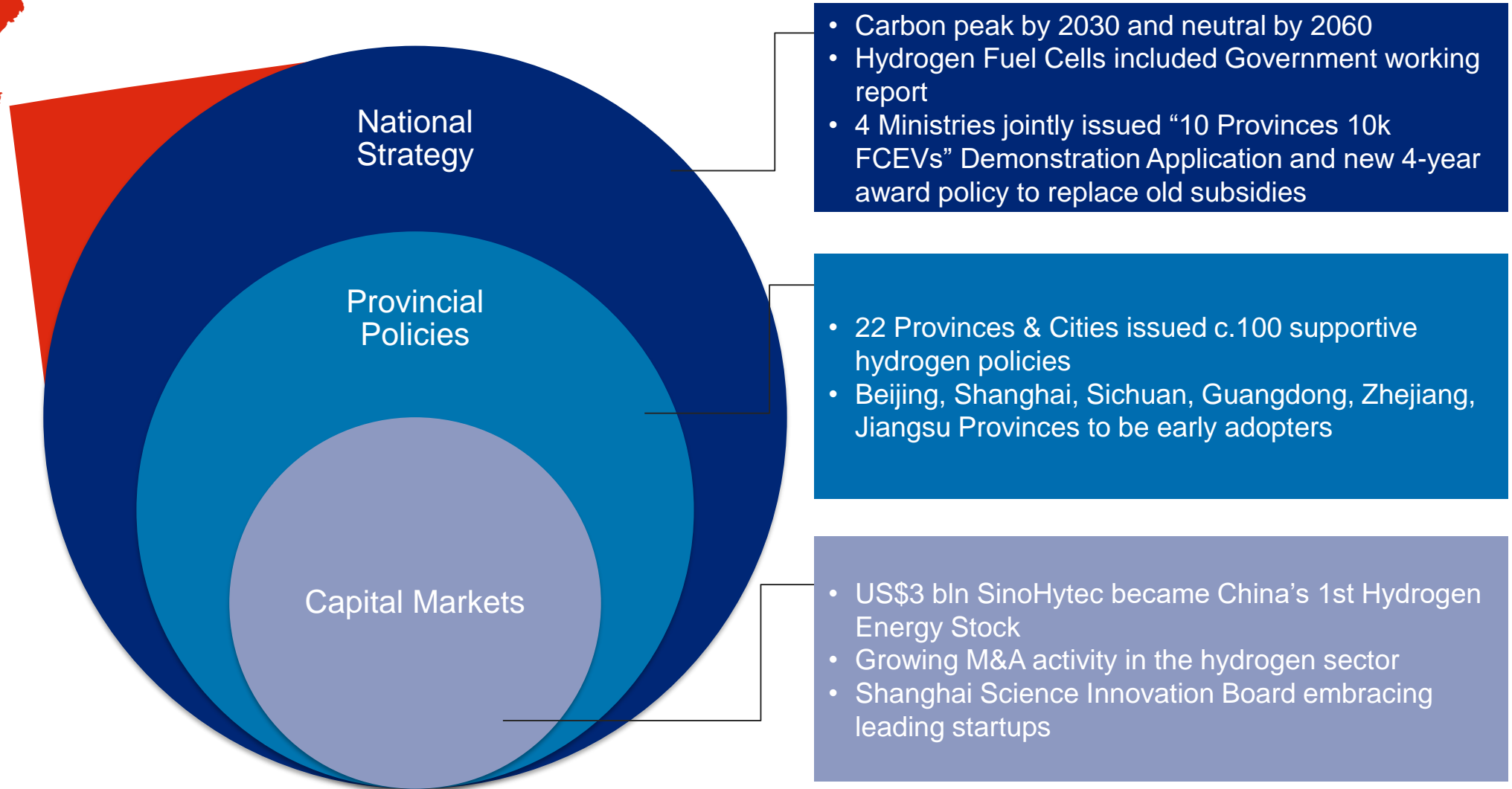


3 Technology leadership





Strong targets and incentives in place, capital following





The government speaks, the country acts

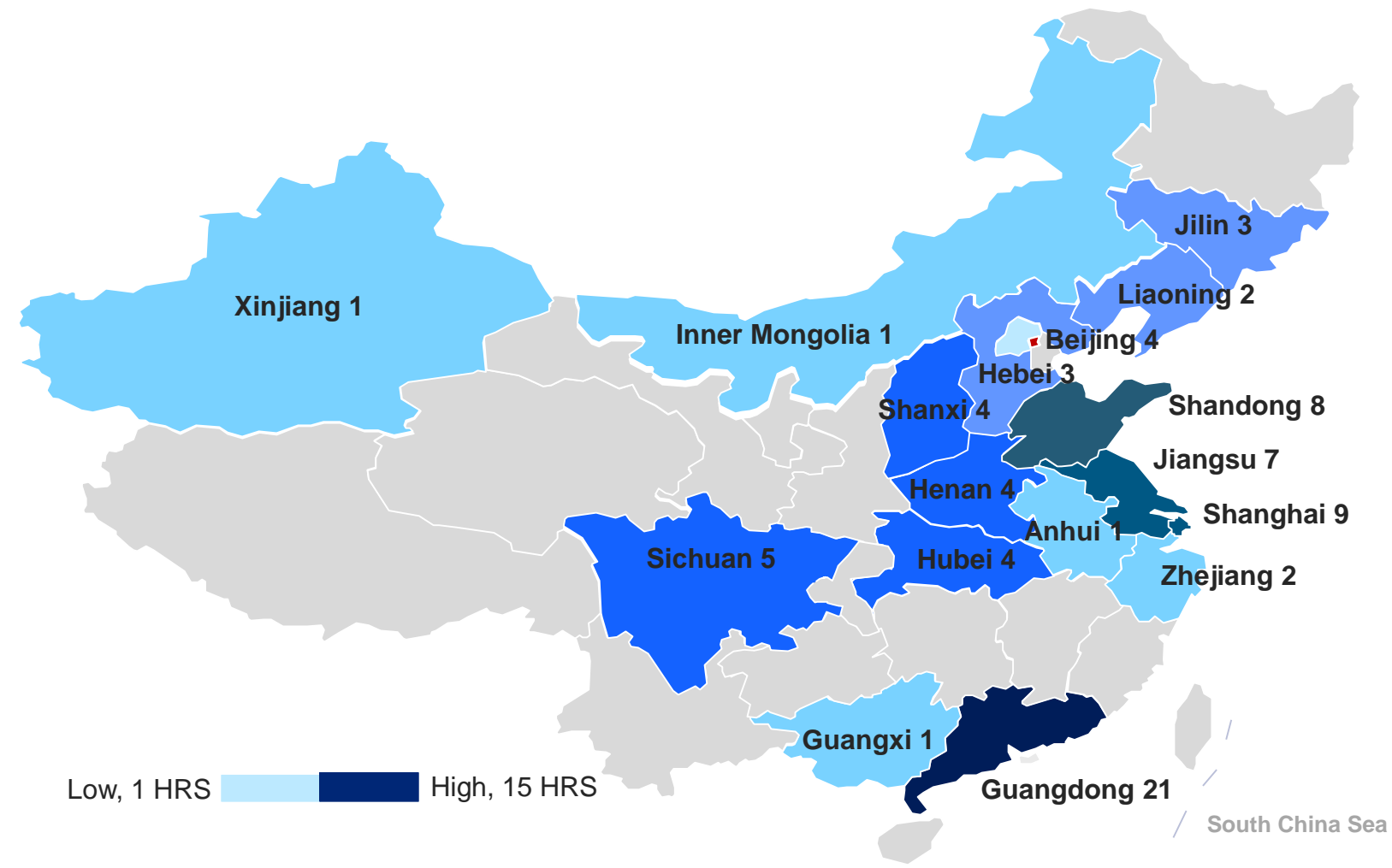
Hydrogen refuelling infrastructure is growing across the country

>100 HRS

In operation

>1,000 HRS

Planned by 2030



Source: ASIACHEM China Hydrogen Refueling Stations Industrial Research Report 2020

Leading OEMs increasingly rolling out heavy duty fuel cell vehicles, increasing commercial viability of early hydrogen refueling infrastructure

Laying the foundation for the adoption of passenger vehicles



Dayun FC HD Truck



Shaanxi Auto FC HD Truck



Feichi FC HD Truck



China Auto FC HD Truck



1st Auto FC HD Truck



Hongyan FC HD Truck



Jianglin FC HD Truck



Aoxing FC HD Truck



Dongfeng FC HD Truck



Weichai FC Haul Truck



Dongfeng FC Semi Truck



Xugong FC HD Truck



Growing availability of fuel cell passenger vehicles



FAW's FC Passenger Car



Guangzhou Auto's FC SUV



Dongfeng Auto's FC SUV



SAIC/MAXUS' FC MPV, Model Euniq7



SAIC/MAXUS' FCV80



Hyundai's NEXO FC SUV



Honda's Clarity FC Passenger Car



Toyota Mirai FC Passenger Car

Source: FCVC2020/ China local media



SAIC Motor unveils hydrogen strategy plan



SAIC Motor unveils hydrogen strategy plan

September 13, 2020

SAIC Motor released its hydrogen strategy plan, which is first of its kind in China's auto industry, at the SAIC Hydrogen Strategy Conference in Shanghai on Sept 13, aiming to turn out ten fuel cell vehicles to claim a more than 10 percent market share by 2025.

According to the plan, Jieqing Technology Co, a high-tech enterprise set up by SAIC Motor to provide fuel cells and engineering services for auto industry, will reach a market value of 10 billion (\$1.48 billion) by 2025. It will build a team of more than 1,000 people for fuel cell system research, development and operation to reach the goal of producing and selling 10,000 hydrogen fuel cell vehicles per year.

Sales of SAIC Motor's fuel cell systems are expected to exceed 30,000 by 2025 and this would make the carmaker a leading company in the field. The company aims to become a globally competitive fuel cell vehicle manufacturer with complete independent intellectual property rights in the next decade.



Senior executives of SAIC Motor announce the hydrogen strategy plan at the SAIC Hydrogen Strategy Conference in Shanghai on Sept 13.

Goals by 2025:

>1,000 new R&D and operations employees focused on fuel cell development

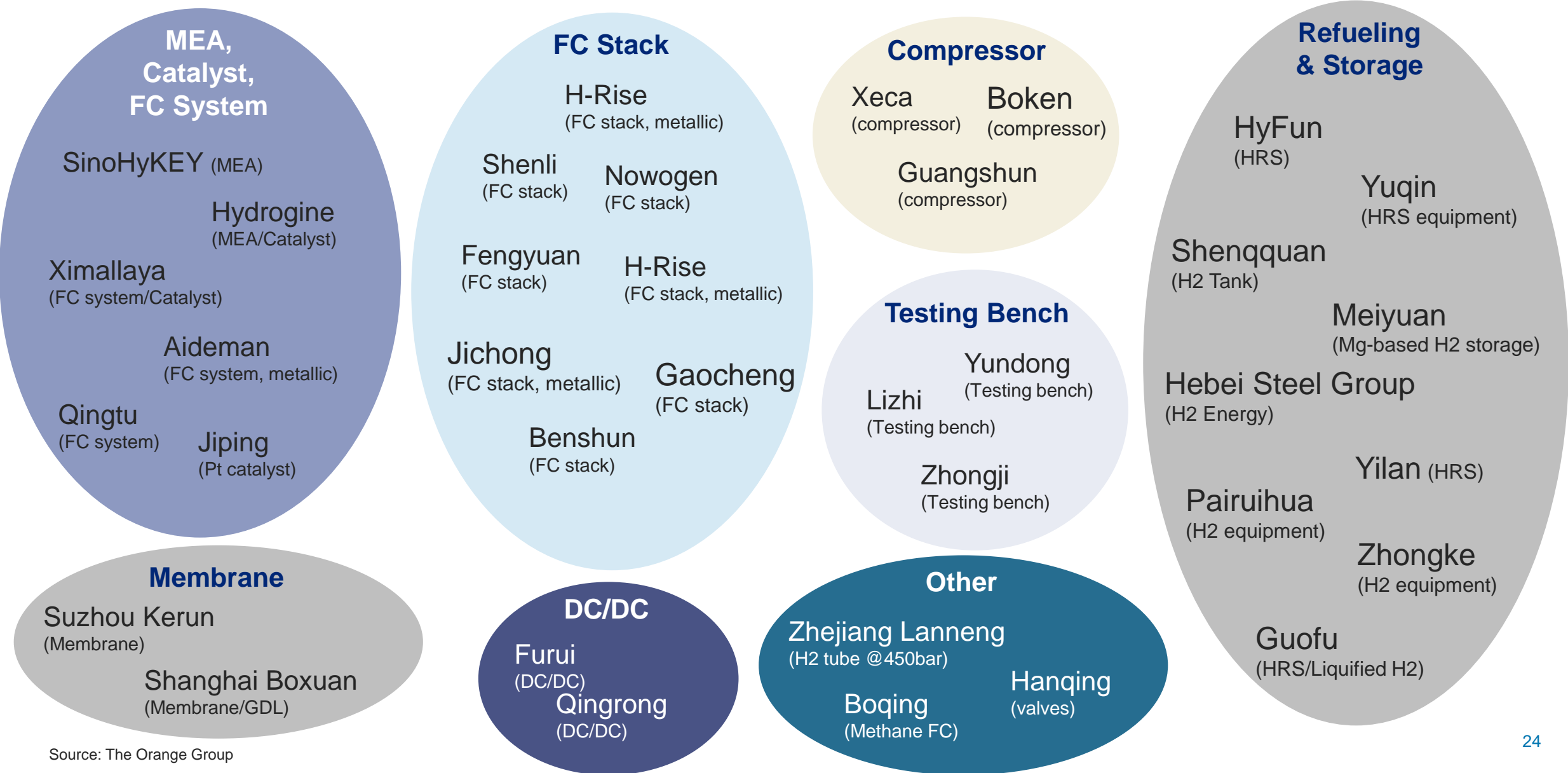
>10 new FCEVs offered

c. 10,000 hydrogen FCEVs produced & sold per year



Proliferation of innovative start-ups and new ventures in China

Selected list of start-ups in the hydrogen and fuel cell space in China



Source: The Orange Group

A market development approach which brings benefit to Anglo American Platinum, and at the same time, to the industry as a whole

To discover, nurture, scale and sustain a sufficiently diverse set of new and existing demand segments

- 1 Accelerate the adoption of PGM enabled hydrogen technologies**
- 2 Support platinum jewellery and platinum investment demand creation**
- 3 Pursue OAs that are less known but with varying demand potential**

...to yield the highest probability of realising a variety of end applications for our metals

Diversity of existing and new demand applications is attractive as it brings a combination of short to long term demand pull for PGM

THANK YOU