Fuel Cells Collaboration in South Africa
June 2018
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Market Development Manager
The HySA Programme
Our interest as South Africa
Implats Fuel Cell Roadmap
South African Fuel Cell Industrial Hub
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HySA centres of competence

- Renewable hydrogen production, storage and distribution
- Electrolysers and hydrogen compression systems

- Hydrogen catalysis
- Portable power systems
- Fuel processors, catalysts and MEAs

- Systems integration and technology validation
- Combined heat and power
- Hydrogen fuelled niche vehicles
HySA implementation phases

2008 - 2013

Establish R&D capability

- Recruit mission-critical staff
- Identify initial markets
- Develop first pre-commercial technologies

2014 - 2018

Demonstrate and validate technology

- Establish critical supply chain capability
- Deliver first products to market
- Demonstrate capabilities in pilot markets

2019 - 2023

Commercialise South African innovation

- Contribute to international innovation
- Compete successfully on world market
- Capture 25% of global catalysis value chain in hydrogen and fuel cells
Partnerships based on market pull

Public Private Partnerships (PPPs)

**Anglo American Platinum**

- Fuel cells in underground mining equipment
  - Metal Hydride Hydrogen storage material
  - Liquid Organic Hydrogen Career
  - Cost effective hydrogen storage and distribution

**Impala Platinum**

- Fuel cells in material handling equipment
- Fuel cell powered forklift
- Hydrogen refueling infrastructure
- Increase in productivity due to reduced refueling time
- Improved air quality

**South African Post Office**

- Fuel cells as range extenders in electric mobility
  - Limited range of electric scooters impacting on productivity
  - Fuel cells will be used to extend the driving range
South African Drivers

World Platinum Reserves

- Zimbabwe
- Finland
- Russia
- North America
- South Africa

South Africa possesses 75% of global Pt reserves

South Africa
$14,400/ounce
$9,500/ounce
$2,170/ounce
$958/ounce

Export
Zimbabwe
Finland
Russia
North America
South Africa

June 2018
Advance Manufacturing & Value Chain Opportunity through Fuel Cells

- Point of Market Entry
  - Geographic location
  - ‘First Mover advantage’
    - South Africa
    - Africa
  - Nascent Market
    - Limited window of opportunity
- Use of mature technologies
- FC manufacturing capital intensive
- Installation, distribution and refuelling are labour intensive
- Backward integrate South African sub-components
South African Opportunity?

- 1000 MW stationary fuel cells PAFC (Minister Rob Davies – June 2015)
- Contains 2.5kg Pt and 100 g Rh per 400 kW PAFC system
  - equivalent to 160 000 oz of new platinum demand
- 2000 underground trackless fleet component conversions result in 16 000 oz of new metal demand
- FC penetration of vehicles drives the market
### Mobile Fuel Cell - Pt demand

**Additional Proportion of World Pt Supply Consumption vs Vehicle FC Penetration**

<table>
<thead>
<tr>
<th>Pt content per vehicle</th>
<th>Fuel Cell Light Duty Vehicle penetration</th>
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<tbody>
<tr>
<td>grams</td>
<td>ounces</td>
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<tr>
<td>50</td>
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Fuel Cell Forklift and Refuelling Station

- fuel cell supplies the base load power
- combined with a battery to allow for operation at peak power loading
- On-board metal hydride containers store the hydrogen at lower pressures
- installed hydrogen supply pipeline
- hydrogen is compressed
- compressor is thermally driven and consumes steam and cooling water instead of electric power
- higher pressure hydrogen is stored in a cylinder pack
Fuel Cell Forklift – Implats/HySA Systems/DST/UWC

- Launched March 2016
- Operational for a year and a half
- First service on forklift, fuel cell and refuelling station
- Prototype proof of concept
- Need to industrialise the unit for commercialisation – importance of demonstration projects
South African PGM Industrial Hub
Focused on Fuel Cell Manufacturing
June 2018
A Fuel Cell Special Economic Zone (SEZ)?

- Provision of serviced land for the SEZ
  - 16 Ha Land
  - GIDZ & Ekurhuleni Metropolitan Municipality
- Guarantee of platinum metal supply
- Closed looping of platinum
- Promotion of industrialization
- Potential to enhance overall competitiveness
- Potential to significantly grow knowledge-based jobs
  - current industry 6000 direct jobs, 3-5 times multiplier effect
- Provision of new opportunities for other key industry sectors
- A platform to grow high value exports
- Opportunity for South Africa to:
  - reducing global greenhouse emissions
  - diminishing urban pollutants
  - improved quality of life