RD 20 contribution to South Africa's G20 Presidency

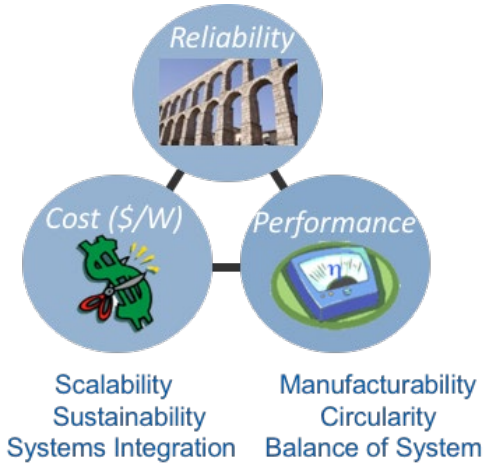
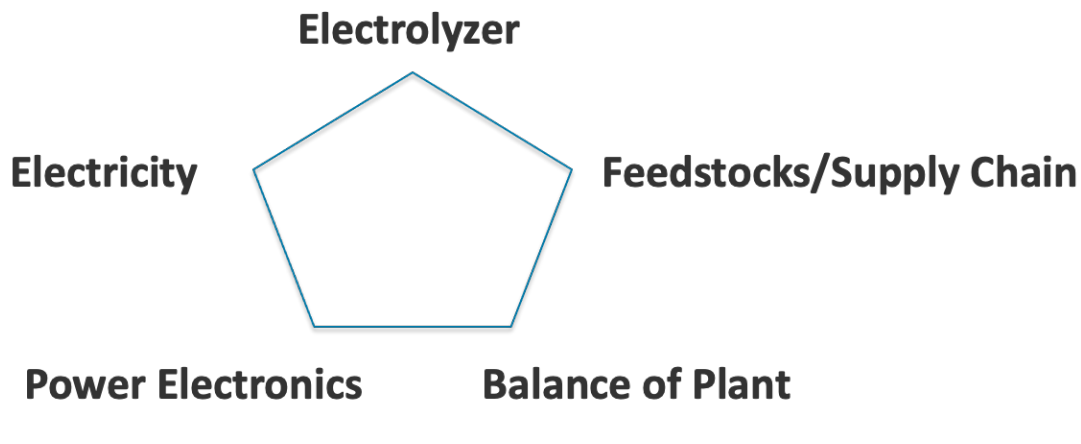
29 September 2025

science, technology & innovation
Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA

CSIR
Touching lives through innovation
80th anniversary

RD 20 contribution to South Africa's G20 Presidency

Concept Note: R&D contribution to unlocking the Hydrogen economy through collaboration

Theme	RD20's Original Idea on how to contribute to SA's G20 Presidency
R&D Contribution	▪ Through a collaborative approach with other research and development institutions/partners, such as **RD20, IEA, IRENA**, and others, we can identify gaps and innovations needed to address the following key areas: ✓ **Innovation** – Focus on cost, performance, reliability, and scalability. This includes what it takes to produce, transport, store, and utilize hydrogen effectively. ✓ **Integration** – Establishing connections between hydrogen production and green electricity sources (grid-scale, near-grid, and off-grid systems), including Balance of Plant and power supply components, which often involve high capital costs. ✓ **Infrastructure** – Developing efficient systems to transport and store hydrogen. ✓ **Inclusion and Equity** – Ensuring that all stakeholders are meaningfully included in the process, promoting fair participation and benefits for all.
Electrons to molecules: A Taxonomy	 

Feedback on ETWG submission

- ## Submission to G20 ETWG

1. **Innovation** – Focus on cost, performance, reliability, and scalability. This includes what it takes to produce, transport, store, and utilize hydrogen effectively.
2. **Integration** – Establishing connections between hydrogen production and green electricity sources (grid-scale, near-grid, and off-grid systems), including Balance of Plant and power supply components, which often involve high capital costs.
3. **Infrastructure** – Developing efficient systems to transport and store hydrogen.
4. **Inclusion and Equity** – Ensuring that all stakeholders are meaningfully included in the process, promoting fair participation and benefits for all

- ## ETWG ToR Deliverables

1. **Conducting Targeted Research**: undertake focused studies on green hydrogen and ammonia technologies, providing data-driven insights for ETWG discussions.
2. **Providing Technical Briefings**: prepare detailed reports and presentations to be shared in the ETWG.

RD20 support to SA's G20 Presidency

- Technical resources to support the ETWG
  - Part of technical working groups
  - Support in energy transition research
  - Provide presentation in some ETWG meeting alongside International Organisations
  - Compilation of any reports
- Data and Tools
  - Access to tools, databases, and simulation models

Priority Area 2 OUTCOMES: Just, Affordable and Inclusive Energy Transitions

Develop a **roadmap** and **action plan** for establishing clean industrial frontier hubs in Africa by 2027

Outcome 1: Green Industrialization Hubs

Develop a framework for inclusive energy transition policies and practices that mitigate job losses in fossil fuel sectors while promoting clean energy job creation and meaningful participation of impacted regions.

Outcome 2: Socio-economic Safeguards for Coal-Dependent Regions

Outcome 3: A G20 action agenda for affordable and inclusive transitions

Outcome 4: Local Content Requirements

Develop a **roadmap** and **action plan** for a local social compacting to implement 60% domestic sourcing policy for renewable projects by 2026, to mitigate “jobs deficits”

Outcome 5: Clean Hydrogen for hard to abate sectors

Develop a **roadmap** and **action** for the establishment of industrial frontier hubs, with emissions reduction targets for steel and chemicals by 2030

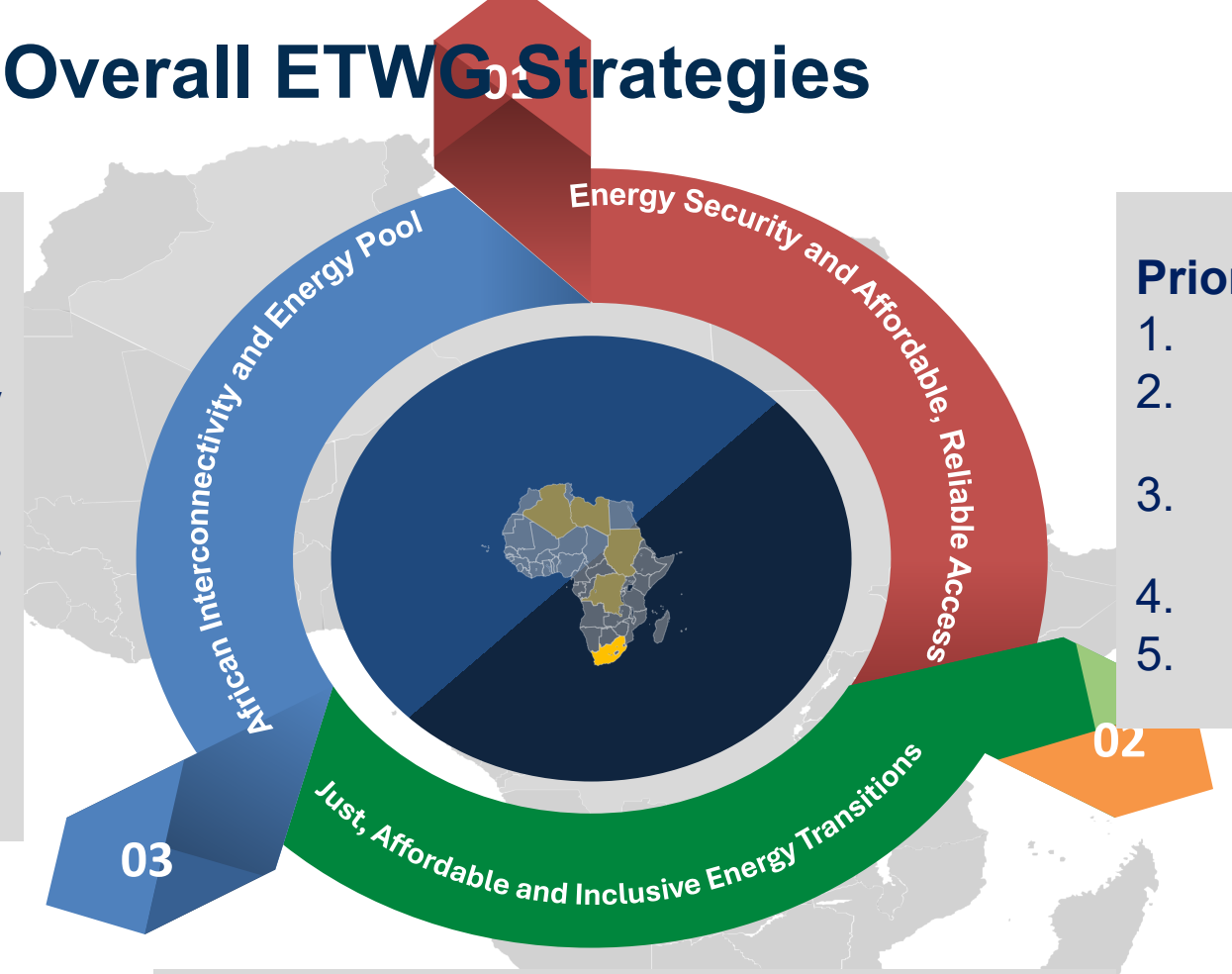
Outcome 6: Sustainable Fuels

Develop a **roadmap** for sustainable fuels building on the latest global analysis and related collaboration initiatives

South Africa's Overall ETWG Strategies

Priority 3

1. Exchange best practices on regional interconnectivity with an action plan for achieving regional interconnectivity in Africa based on the three pillars
2. Ten-year infrastructure investment plan for Africa's Cross-Border Projects
3. Policy Harmonisation to support cross border trade.
4. Renewable Energy Corridors: Establish two corridors by 2030



Priority 1

1. Energy Security
2. Decentralised Energy Systems
3. Closing the clean cooking gap
4. Infrastructure resilience
5. Affordability framework

Priority 2

1. Sustainable Industrialisation Hubs, including hydrogen and ammonia
2. Socio-economic Safeguards for Fossil Fuel-Dependent Regions.
3. A G20 action agenda for affordable and inclusive transitions
4. Sustainable Fuels: with a focus on e-fuels for water stressed regions.

Outcome 1: Sustainable industrialisation Hubs, including Hydrogen and Ammonia

- **Priority Area:** Just, affordable and inclusive energy transitions
- **Outcome:** Sustainable Industrialisation hubs, including hydrogen and ammonia
- **Outcome Lead**: Kittessa Roro & Ebrahim Takolia (CSIR) supported by **IEA, RD20 and MI** and others

G20 Negotiated Outcome

Outcome 1

Output	*Building Blocks*	*Focusing on*
G20 voluntary Principles for establishing sustainable industrial frontier hubs in Africa by 2027, including hydrogen and ammonia	Mobilise financing for sustainable industrialisation hubs	▪ Different pathways to achieve global net-zero greenhouse gas emissions / carbon neutrality. ▪ Creating long-term sustainable jobs and low-carbon industries. ▪ Funding options to enable sustainable industrialisation hubs.
	Localising and regionalising industrialisation to enhance energy security	▪ Unlock opportunities on industries such as manufacturing, steel, aviation, shipping, cement manufacturing, chemicals, refining and heavy duty logistics.
	Support continental and regional integration of hydrogen supply and demand	▪ Outlining the necessary intercontinental partnerships required to unlock funding, and advance joint R&D collaboration to accelerate technology development

RD20 Research and Development 20 for Clean Energy Technologies

MISSION INNOVATION

Leveraging RD20's strategic partnership to deliver on Priority 2 Outcome 1

- Advancing Green Hydrogen Integration into the emerging economies energy future. (MI)
- Innovative Ammonia Production: A Sustainable Solution for Energy Transition. (RD20)
- Strengthening Energy Security through Green Hydrogen and Ammonia. (RD20)

RD20 Deliverable

- **Main Report: Green Hydrogen for the Hard to abate sectors**
- **Theme 3: Strengthening energy security through green hydrogen and ammonia (with support from RD20)**

- Mini report (10 - 15 pages long) with recommendations
- Background paper (3 pages long)
- Presentation

Feedback on the Two Deliverables

Background Paper

Outcome 1 – Sustainable Industrialisation Hubs

Develop a roadmap and action plan for establishing sustainable industrial frontier hubs in Africa, focusing on long term sustainable jobs and low-carbon industries. The roadmap should also outline the necessary intercontinental partnerships required to unlock funding, secure off-takers to derisk investments, and enable technology transfer to the continent. In addition, this initiative must unlock opportunities on industries such as steel, aviation, cement manufacturing, chemical and refineries with a focus on Africa. The roadmap and action plan should recognise different pathways in achieving global net-zero greenhouse gas emissions/carbon neutrality. Agree and publish common principles for standard terms to secure agreements with off-takers for clean hydrogen investment.

The G20 initiative for industries in transition will focus on identifying opportunities in three critical areas
✓ Beneficiation of critical minerals
✓ Beneficiation of heavy industry inputs
✓ Production of hydrogen and its derivatives

Background paper

Low-emissions hydrogen to decarbonise hard-to-abate sectors

Contribution to Outcome 1

G20 SOUTH AFRICA 2025

Priority 2, Outcome 1: G20 High-Level Voluntary Principles for Sustainable Industrialization Hubs, including zero and low emission Hydrogen and its derivatives

Explanatory note by the Presidency

The G20 Energy Transition Working Group (ETWG) under South Africa's G20 Presidency prioritizes the critical role of low-carbon industrialization in supporting just energy transitions, fostering economic development, and achieving global net-zero commitments.

While it is generally accepted that countries will follow differentiated pathways in line with their national circumstances to ensure security of supply and achieve a just, inclusive and affordable energy transition, hydrogen produced from zero and low emission technologies and its derivatives such as ammonia, have emerged as one of key enablers in decarbonizing the hard-to-abate sectors while creating new economic and trade opportunities.

Final Report Contribution: Strengthening energy security through green hydrogen and ammonia

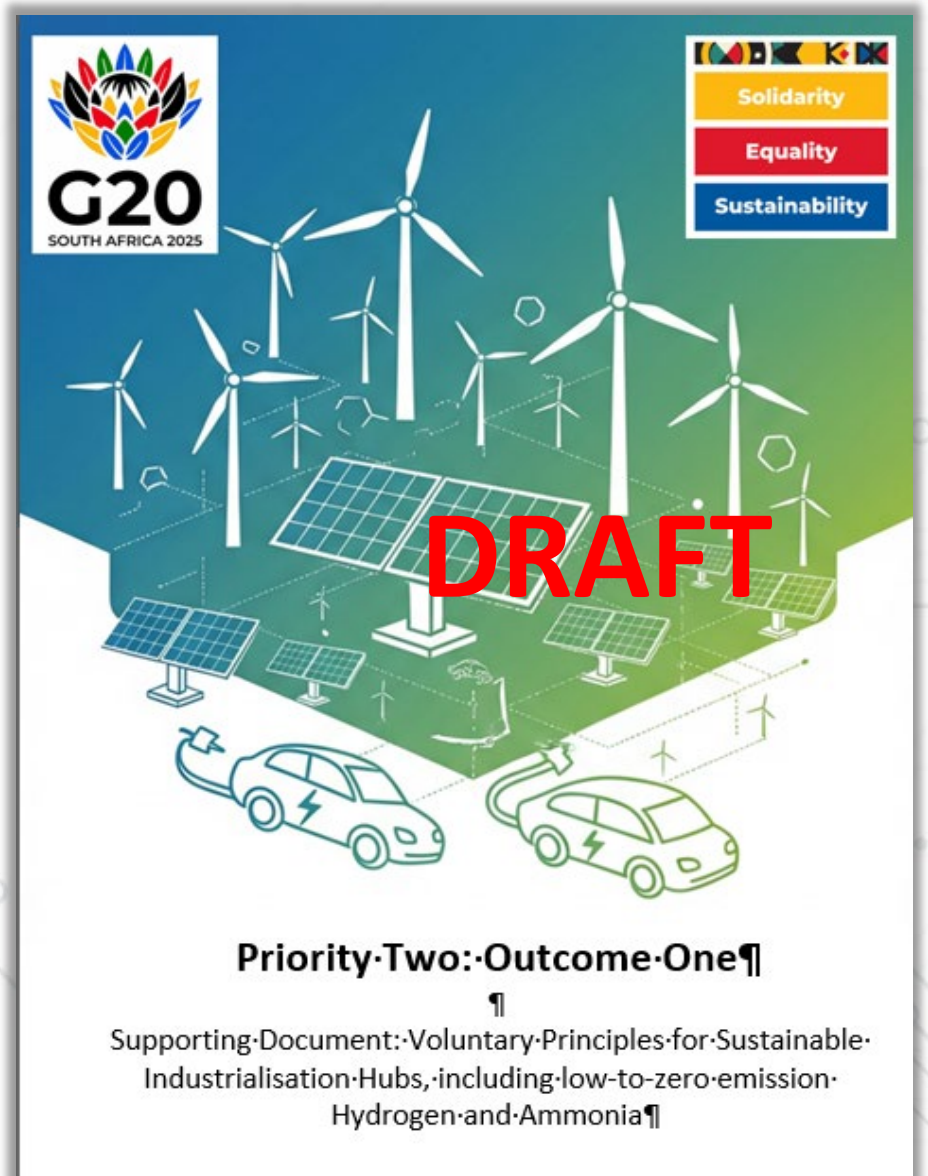
Current status of Ammonia technology

(Drafted by Y. Manaka, S.Y. Chen, M. Nishi, N. Iki, Y. Fan, T. Nanba, AIST)

1. Fundamental Properties of Ammonia

Ammonia, with the molecular formula NH_3 and a molar mass of 17.031 g/mol, is a compound that contains no carbon atoms. Under standard temperature and pressure, it is a colorless gas characterized by a pungent odor, toxic and corrosive properties. However, due to its ability to be liquefied under relatively mild conditions—such as at atmospheric pressure and −33 ºC, or at ambient temperature and 0.85 MPa—it is considered relatively easy to handle.

Globally, the primary application of ammonia lies in the production of fertilizers, such as urea, ammonium nitrate, and ammonium sulfate, which together account for over 80% of its total use. The remaining portion serves as a fundamental raw material in the chemical industry. With an annual global production volume reaching approximately 200 million tons, major manufacturing facilities are concentrated in countries with high agricultural demand such as China, Russia, the United States, and India. The ammonia market is estimated to grow at a rate of approximately 2%, closely tied to population growth.



Recommendations

01 Collaboration:

Leveraging global initiatives like the RD20, Breakthrough Agenda, and Clean Hydrogen Mission to support developing countries through joint R&D, skill development, pilot projects, and policy alignment on standards and certification for zero and low emissions hydrogen and derivative sectors

02 Development of regional hubs

Facilitating the development of regional hydrogen hubs produced from zero and low-emission technologies produced from zero and low-Emission that connect producers, users, financiers, and technology technologies providers, with a focus on shared value creation and skills development.

03 Enhancing regional and global alliances

Create enabling environments for trade, certification, and investment in hydrogen produced from zero and low-emission technologies, especially in Africa and other emerging regions.

04 Harmonising methodologies for certification systems

Thank you