

# Draft Programme for SAIP2026 Physics in Industry Day

**Theme:** Physics for the Energy Industry and the Just Energy Transition: Building Strategic Academia–Industry Partnerships for National Development

**Strategic Partner:** South African National Petroleum Company (SANPC)

**Format:** Hybrid Session (In-person and online)

**Co-Facilitators:** Professor Rudolph Erasmus (Wits, SAIP Past President) and Dr Gillian Arendse (iThemba LABS)

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## 1 Background and Strategic Intent

The SAIP2026 Physics in Industry Day seeks to establish and strengthen a long-term academia–industry collaboration between the South African physics community and the energy sector through SANPC, under the newly established SAIP–SANPC Memorandum of Understanding (MoU).

As a first engagement under the SAIP–SANPC MoU, this Industry Day is intentionally broad and platform-setting. It aims to introduce the South African physics community to opportunities, challenges, and career pathways across the energy sector while helping SANPC understand the breadth of expertise within the physics community. The objective is to establish relationships, identify opportunities, and build a long-term collaboration model rather than solve all challenges in a single event.

A key long-term ambition is the establishment of an annual SANPC–SAIP Physics Challenge Programme.

The engagement recognises two important realities:

1. **South Africa will continue to depend on petroleum and petrochemical systems for decades**, even as the country transitions toward cleaner and more sustainable energy systems; and
2. **The Just Energy Transition (JET) requires strong scientific and physics-based contributions** to ensure that the transition is evidence-based, economically viable, technologically feasible, and socially inclusive.

The event therefore aims to position physicists not merely as observers of industrial transformation, but as **active contributors to solving real-world national challenges through research, innovation, and multidisciplinary collaboration**.

The engagement looks at the broader energy industry value chain, helping the South African physics community better understand opportunities for impact across:

- Geophysics and exploration
- Petroleum and petrochemical systems
- Subsurface imaging and modelling
- Infrastructure integrity and monitoring
- Storage, transport and logistics systems
- Materials science and corrosion
- Instrumentation, sensing and measurement systems
- Data science, modelling and Artificial Intelligence (AI) applications
- Environmental monitoring and emissions reduction

- Hydrogen and transition fuels
- Renewable and alternative clean energy systems
- Energy systems optimisation
- Carbon management and industrial decarbonisation
- Catalysis and process optimisation

A key objective is to expose researchers and students—many of whom have limited experience working with industry—to opportunities for applications of physics in industry, innovation, postgraduate research, skills development, and national impact.

The event further seeks to strengthen awareness of career pathways for physics graduates in the energy industry, while also exploring how academia–industry partnerships can contribute to improving STEM, Mathematics, and Physical Sciences education and to building stronger scientific talent pipelines for South Africa.

The long-term goal is to strengthen the contribution of physics and multidisciplinary science to industrial innovation, socioeconomic development, energy security, and South Africa’s Just Energy Transition agenda

## 2 Draft Programme

| Time          | Session                                                                                                                       | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 09:30 – 09:40 | SAIP Welcome and Overview of the SAIP–SANPC Collaboration & MoU                                                               | <b>Prof. Rudolph Erasmus.</b> Official welcome, overview of the SAIP–SANPC partnership and Memorandum of Understanding (MoU), objectives of the Industry Day, and strategic framing of why physicists should engage with industry. Emphasis on physics as a contributor to solving national challenges, industrial innovation, and shaping evidence-based pathways for the <b>Just Energy Transition</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 09:40– 09:50  | SANPC Welcome Remarks:<br>Understanding the Energy Industry Value Chain, Career Pathways and Opportunities for STEM graduates | <b>SANPC Representative.</b> Official welcome from SANPC and overview of the broader <b>energy industry value chain</b> . The presentation should expose participants to areas including exploration and geophysics, offshore and subsurface systems, refining and processing, infrastructure and logistics, environmental monitoring, emissions reduction, digitalisation, hydrogen and alternative fuels, transition technologies, and future energy systems.<br><b>Career Opportunities for Physics Graduates:</b> Highlight existing and emerging career pathways for STEM graduates in energy systems, geophysics, modelling, instrumentation, environmental monitoring, AI, nuclear and radiation applications, industrial R&D, sensing technologies, hydrogen and transition fuels.<br><b>STEM and Talent Pipeline Development:</b> Discussion on how industry–academia partnerships can help improve <b>STEM, Mathematics, and Physical Sciences education</b> , strengthen future scientific talent pipelines, and inspire youth participation in science and energy-related careers. |
| 09:50 – 10:00 | Multidisciplinary Systems Thinking for Solving Real-World Problems                                                            | <b>Dr. Gillian Arendse.</b> Overview of multidisciplinary collaboration, systems thinking, and innovation ecosystems. Discussion on how physicists can work alongside engineers, chemists, geoscientists, environmental scientists, economists, and data scientists to solve complex industrial and societal challenges. Includes examples of successful academia–industry collaboration models and multidisciplinary innovation ecosystems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 10:00 – 10:30 | SANPC Energy Industry Challenges: Current Priorities, Future Opportunities                                                    | <b>SANPC Representatives (Two Talks – 15 minutes each).</b><br><b>Talk 1: <i>Where Science &amp; Tech Has Added Value: Lessons, Successes and Innovation Opportunities</i></b> — Overview of successful scientific interventions and examples of where multidisciplinary science has contributed to solving real industry challenges and enabled innovation across the energy value chain.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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|                      | and the Just Energy Transition                                          | <b>Talk 2: Priority Challenges Requiring Research Support</b> — Future-focused challenge areas requiring academic collaboration, including Just Energy Transition pathways, geophysics and petroleum physics, infrastructure monitoring, environmental monitoring, emissions reduction, materials science, hydrogen, synthetic fuels, carbon management, sensing technologies, AI and computational modelling, and energy systems optimisation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>10:30 – 11:00</b> | Tea Break and Networking                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>11:00 – 11:10</b> | DSTI/NRF                                                                | DSTI/NRF/SAASTA Rep gives remarks on how this SAIP-SANPC collaboration & industry day aligns with national science, innovation and skills priorities;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>11:10 – 12:00</b> | Physics Research Lightning Talks: What Can the Physics Community Offer? | <b>Facilitated by Dr. Gillian Arendse.</b> Approximately <b>10 nominated researchers/departments/COEs, etc.,</b> present <b>3-5-minute lightning talks</b> showcasing relevant research capabilities and opportunities for collaboration. Suggested fields include: materials science and modelling, lasers and photonics, quantum science and technologies, renewable energy systems, geophysics/petroleum physics, catalysis, computational modelling, AI and big data, sensors and instrumentation, remote sensing, fluid dynamics, biophysics, environmental monitoring, nuclear and radiation applications, hydrogen and energy storage, and science communication. Purpose: to showcase the breadth of expertise within the South African physics community and identify alignment with SANPC priorities.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>12:00 – 12:30</b> | Open Discussion, Q&A and Collaboration Dialogue                         | <b>Facilitated by Prof. Rudolph Erasmus &amp; Dr. Gillian Arendse.</b> Open dialogue between SANPC, researchers, students, and industry representatives to identify opportunities for collaboration, multidisciplinary team formation, postgraduate research, internships, co-supervision, pilot projects, shared data opportunities, bursaries, and funding mechanisms.<br>NRF SAASTA & DSTI inputs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>12:30 – 13:00</b> | Draft SANPC–SAIP Physics Challenge Brief and Way Forward                | <b>Facilitated by Prof. Rudolph Erasmus &amp; Dr. Gillian Arendse.</b> Consolidation of discussions into an initial SANPC–SAIP Physics Challenge Brief, focusing on identifying 3–5 high-priority challenge areas, opportunities for multidisciplinary team formation, postgraduate projects, internships, bursaries, co-supervision, innovation, and intellectual property considerations.<br><br><ul style="list-style-type: none"> <li>• Materials science and modelling</li> <li>• Lasers and photonics</li> <li>• Quantum science and quantum technologies</li> <li>• Nuclear physics and radiation applications</li> <li>• Big data, Artificial Intelligence (AI), and computational modelling</li> <li>• Geophysics and petroleum physics</li> <li>• Biophysics</li> <li>• Renewable and alternative clean energy systems</li> <li>• Hydrogen, synthetic fuels, and energy storage</li> <li>• Sensors and instrumentation</li> <li>• Fluid dynamics and modelling</li> <li>• Remote sensing and environmental monitoring</li> <li>• Catalysis and process optimisation</li> </ul> <p>The session will identify priority challenge areas, multidisciplinary teams, postgraduate opportunities, co-supervision arrangements, internships, pilot projects, shared datasets, and mechanisms for strengthening the contribution of the South African physics community to industrial innovation, socioeconomic development, and the <b>Just Energy Transition</b>.</p> |
| <b>13:00 – 13:40</b> | Lunch Break                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

### 3 SANPC–SAIP Physics Challenge Model Example

- Identify a maximum of 3–5 priority SANPC challenge areas at the end of the workshop.
- Form multidisciplinary and cross-institutional teams (physicists, engineers, chemists, geoscientists, AI/data scientists, astronomers, etc.).
- Develop a challenge or 'hackathon-type' innovation model over the year.
- Support postgraduate projects, internships, co-supervision, pilot studies, and industry mentorship.
- Recognise progress and winning solutions at future SAIP conferences

### 4 Expected Outcomes

By the end of the session, participants should:

1. Understand the breadth of opportunities across the SANPC energy industry value chain;
2. Appreciate how physics and multidisciplinary science contribute to both current industrial needs and the long-term Just Energy Transition;
3. Gain awareness of career opportunities for physics graduates in the energy industry;
4. Explore opportunities to improve STEM, Mathematics and Physical Sciences education, and strengthen scientific talent pipelines;
5. Identify opportunities for research collaboration, postgraduate projects, internships, bursaries, and co-supervision;
6. Begin forming multidisciplinary research teams around industry-defined challenges;
7. Contribute to a draft SANPC–SAIP Physics Challenge Brief to guide future collaboration; and
8. Strengthen the role of physics in national development, industrial innovation, and socioeconomic impact.