Communication and Marketing Department
Isebe loThungelwano neNtengiso
Kommunikasie- en Bemarkingsdepartement
Private Bag X3, Rondebosch, 7701, South Africa
Tel: +27 (0) 21 650 5427/5428/5674
www.uct.ac.za | www.news.uct.ac.za

19 August 2026

Deep emissions cuts possible at Secunda coal-to-liquids complex

The role of the Secunda coal-based liquid fuels and chemicals production complex within South Africa's energy transition is heavily debated. Sasol has estimated that a rapid and unplanned shutdown of operations at Secunda could reduce the country's gross domestic product (GDP) by an estimated R9.9 billion and result in 24 900 job losses.

Concern over such negative impacts has motivated a new paper released by researchers from the University of Cape Town's (UCT) Energy Systems Research Group. The paper builds on modelling work done in 2025 to support the national government in deciding on a mitigation target for South Africa's 2nd nationally determined contribution (NDC) under the Paris Agreement, for which the full technical report was recently released on UCT's Zivahub.

For their analysis, the researchers evaluated alternative decarbonisation strategies and transition pathways for the Secunda coal-to-liquids complex, after developing an enhanced version of the South African TIMES (SATIM) national energy-system optimisation model. Three pathways were examined: a baseline case reflecting current operations; a roadmap-aligned pathway reflecting near-term efficiency with renewable energy integration measures; and a structural decarbonisation pathway in which low-carbon technologies are deployed under a national long-term emissions constraint.

The Secunda complex is particularly important to South Africa's energy system but is also responsible for a substantial share of the country's greenhouse-gas emissions. Sasol reported total emissions of approximately 63.9 million tonnes of carbon dioxide equivalent in 2022, with about 80% to 85% attributed to Secunda, according to the study.

In a LinkedIn post announcing the publication of the paper and commending the lead author Dr Nasibe Nosrati-Ghods, Professor Harro von Blottnitz, the director of UCT's Energy Systems Research Group, wrote: "In the best tradition of independent academic research, this mammoth analysis was done entirely without influence or input from the corporate owners of the complex Sasol and Air Liquide. Working from dozens of publicly available sources, our team developed an enhanced representation of this facility within our unique technology-rich SATIM energy systems model. The objective function in SATIM optimisation runs always is to find the lowest cost energy pathway for South Africa as a whole, not to maximise profits or benefits to any specific corporate entity."

Professor Von Blottnitz added: "The economic consequences of a disorderly transition could be significant. The South African government should have a strategic plan for this transition and must have a contingency plan in case market conditions abruptly lead to Sasol's failure."

The study confirmed that Sasol's Roadmap to achieve a 30% emission reduction by 2030 appears feasible. Under the modelled roadmap-aligned pathway, renewable electricity procurement and efficiency improvements could reduce facility-level emissions by about 26% by 2030. Sasol also intends to use purchased carbon credits to meet its 2030 targets and has become the largest South African buyer of such credits.

The modelling uses information published by Sasol indicating that capital expenditures of between R4 billion and R7 billion could be reprioritised to achieve an approximately 30% reduction in carbon dioxide emissions, alongside an additional R2 billion to R4 billion in renewable-energy investments.

The model supports Sasol's claim that renewable electricity could make a particularly significant contribution in the short term. Under the roadmap-aligned pathway, the targeted 2 gigaWatt of renewable electricity capacity by 2030 could reduce emissions by about 5.3 million tonnes of carbon dioxide a year.

However, it is known that efficiency improvements and renewable electricity alone will not be enough to achieve deep decarbonisation.

A more ambitious structural decarbonisation pathway introduces a binding long-term emissions constraint and investigates in the deployment of technologies such as electric boilers, green hydrogen, carbon capture and reverse water-gas shift (RWGS) technology. Under the modelled 8.5 gigatonne national emissions constraint (2021-2050), emissions could be reduced by 45% by 2030, 56% by 2040 and 62% by 2045 compared with 2017 levels.

But these deeper cuts come with economic trade-offs.

Lead author Dr Nosrati-Ghods and colleagues found that the carbon-constrained pathway incurs additional system costs, particularly when technologies such as RWGS and other process modifications are introduced. Under a constant oil-price scenario, the model estimates average annual profitability of about R24 billion for the business-as-usual pathway, compared with lower profitability under the carbon-constrained pathway.

Oil prices also matter. Falling oil prices could accelerate the transition by reducing the profitability of Fischer-Tropsch production, while higher oil prices could prolong the economic viability of coal-based production and delay structural changes.

"The findings demonstrate the need for policies that provide clear signals for investment in renewable electricity, hydrogen infrastructure and electrification, while managing the economic and operational risks faced by carbon-intensive industries," reads a key position of the authors.

The authors wrote: "The challenge is to avoid both carbon lock-in and an economically disruptive shutdown. A structured transition provides an opportunity to reduce emissions progressively while considering energy security, industrial continuity, investment requirements and employment."

The study stressed that the transition would require more than technological solutions. Binding emissions constraints, coordinated infrastructure investment and credible policy signals will be necessary to overcome the existing dependence on coal. According to the paper, the carbon tax alone, as represented in the modelling, is insufficient to drive the structural technological changes needed at Secunda.

A key conclusion of the paper reads that "decarbonisation should be approached as a managed transformation in which existing assets are progressively reconfigured rather than simply abandoned."

The study, "An exploration of transition pathways for South Africa's coal-to-liquids complex under long-term national greenhouse gas emissions constraints", was published in *Energy Conversion and Management*.

ENDS

Issued by: UCT Communication and Marketing Department

Ridovhona Mbulaheni
Media Liaison and Monitoring Officer
Communication and Marketing Department
University of Cape Town
Rondebosch
Tel: (021) 650 2333
Cell: (064) 905 3807
Email: ridovhona.mbulaheni@uct.ac.za
Website: www.uct.ac.za