



S.E.T. for socio-economic growth

## National Science and Technology Forum (NSTF)

# media release

## Transitions in South Africa's energy provision

One might be hard-pressed to find a South African taxpayer – or, indeed, anyone old enough to flick a switch – who does not have a (less-than-favourable) view of the nearly 16-year-old energy crisis. In between the remonstrances of blame, scrambling by experts and laymen for more sustainable solutions, and an increasing realisation that energy security is a global challenge, the complexity surrounding this issue now seems to be firmly in the crosshairs of specialists from multiple disciplines.

The [National Science and Technology Forum \(NSTF\)](#) brought together speakers from government, industry associations, academia, and energy companies to present the challenges to and opportunities for powering South Africa fairly, sustainably and economically. The [Transitions in South Africa's energy provision online discussion forum](#) took place from 22-23 August 2023 with more than 200 subscribers.

Speakers shared their work and views against the following backdrop: There are various transitions that can be related to the Just Energy Transition. How should these transitions be managed? What science, engineering best practice, and technology can inform these transitions? How can South Africa's (SA's) electricity crisis be ended, its impacts mitigated and long-term supply of electricity be established on a firm footing?

NSTF Executive Director, Ms Jansie Niehaus, announced that in future, the NSTF plans to have one discussion forum per year focusing on energy issues in SA.

Several speakers alluded to the necessity for cross-disciplinary cooperation, a sense that was also evident from the discussion on the webinar's chat function and requests for further collaboration with the speakers and between attendees.

The speakers, unintentionally, were united on various key themes: The need for a transition that is economy-wide; the need for technological innovation and efficiencies; challenges with existing infrastructure and grid constraints; reducing emissions in the context of climate change; and the strong move to renewable sources of energy.

### The NSTF provides neutral collaborative platforms where issues and sectors meet

- One of the National Science and Technology Forum (NSTF) functions is to hold [discussion forums](#), bringing the private and public sectors together to address important issues and engage with government policy.
- Feedback from these [discussion forums](#) is disseminated to role players and stakeholders.
- The NSTF represents about [130 member organisations](#) participating as key stakeholders of the SET and innovation community.

### **An economy-wide transition**

The Just Energy Transition is complex, said [Mr Steve Nicholls](#), the Head of Climate Mitigation at the Presidential Climate Commission (PCC), opening the discussion, “The concept of a Just Energy Transition is not merely about energy; it encapsulates a transition that spans the entirety of the economy. In this context, our primary objective is to elevate individuals out of poverty, inequality, and unemployment while striving to enhance our economy's competitiveness and create opportunities for every individual in SA.”

“Moreover, 40–50% of people in SA live in poverty, we have one of the highest Gini coefficients [measurement for income/wealth inequality per country] in the world, and we have 33% unemployment.”

Mr Nicholls asserted that those in poverty are on the receiving end. He maintained worsening climate impacts, trade risks and physical risks will affect the poor more severely. “Not only are there physical risks, but there are also transitional risks, risks imposed on the economy based on things like international policy, trade, technology change and so on”.

Mr Nicholls explained there are two main views. One that proposes a slower transition and believes that high variable renewable energy penetration systems are not secure; that the economic cost of coal closure on jobs and livelihoods is too high; and concerns that once ancillary services are factored in, variable renewable energy is not competitive. The PCC's research has shown that while complex, these problems are solvable.

On the other end of the debate, a faster transition is proposed, which, it is believed, would enhance access to capital, enhance trade competitiveness, increase geopolitical influence, reduce the impacts of climate change and other related environmental issues like water, and reduce the impacts of air pollution. This has huge implications for how we think about the economy.

[Mr Norman Moyo](#), Chairperson of the South African Photovoltaic Industry Association (SAPIA), amidst the ongoing energy crisis, said he recognised potential economic prospects.

Mr Moyo emphasised a need to recontextualise the electricity issue in terms of broad economic reforms required. "Addressing the energy situation offers a fresh economic opportunity to revitalise the continent's economy. What opportunities does this crisis present? It promises energy security and stability, affordability, and the crucial decarbonisation of the economy, starting with a reliable energy supply."

“We want to reposition science, technology and innovation to ensure that it contributes to economic growth,” said [Dr Cosmas Chiteme](#), Acting Chief Director of Hydrogen and Energy at the Department of Science and Innovation (DSI).

### **The need for technological innovation and efficiencies**

The focus was on technology innovation and commercialisation to bridge the gap between technological development and market implementation. The challenge was in successfully commercialising products to address the energy crisis effectively, [Mr Dayanandan Naidoo](#), Head of Natural Resources and Energy Business Units at the Technology Innovation Agency (TIA), explained. TIA is an organisation that funds technology development. He elaborated that issues persist regarding the commercialisation of technologies. He explained, “Commercialisation is the process of transforming a new product or service from conceptualisation to actual sale. We've noticed that there is a lot of technology development happening in SA and a lot of research being done, but very few products actually go out into the market. In TIA we are working towards commercialising the technologies.”

**Mr Moyo** (SAPIA) alluded to our progress in technology. “We have a unique technology that aligns perfectly with what Africa has in abundance...” (solar energy).

**Mr Thomas Garner**, Chief Executive Officer of Earth & Wire (Pty) Ltd and Chair of the South African Independent Power Producers Association (SAIPPA) spoke about technology disruption: at a certain market size (75%), one reaches an inflection point where one really starts to see disruption from a technology perspective, which is a good thing. “You will see it in solar, wind, and battery technology, and it is also happening in the hydrogen electrolysis technologies”.

**Ms Jesse Burton**, Senior Researcher in the Energy Systems Research Group of the Department of Chemical Engineering, University of Cape Town (UCT), showed the global trends in technology costs and uptake of Photovoltaics (PV), onshore wind, offshore wind, and concentrated solar power (CSP).

**Ms Ashanti Mbanga**, Project Manager of Appliance Standards and Labelling at South African National Energy Development Institute (SANEDI) and Vice Chairperson of South African Females in Energy Efficiency, underscored the significance of adjusting to technological shifts. “We realise that energy efficiency requires a multi-layered approach. It requires behaviour change, particularly when you’re introducing new technologies, and with that communication and raising awareness are key; and it also necessitates changes in terms of operations, hardware and software – all areas where technology can be introduced to effect greater efficiencies,” she said.

Ms Mbanga underscored the crucial importance of energy efficiency. “Energy efficiency is not just an end goal in terms of consumption of energy itself, but it must be considered from the source of energy,” she emphasised.

She stated one of SANEDI’s programmes delves into cleaner coal because it will still be a big part of our energy mix, and SANEDI is exploring technologies to make coal more sustainable and less harmful.

SA is also led by the National Energy Efficiency Strategy (NEES, 2005). She explained: “In 2014, the Energy Efficiency Target Monitoring System was established to track progress. Since NEES, a 15% improvement was achieved in industry and mining, 10% in residential, 15% in the commercial and public sectors, 9% in transport, and 15% in the power sector”.

SANEDI works with the energy regulator to set minimum energy performance standards for various electric products coming into the country. “This is a huge import market and if these products are not regulated, we will have older technologies being dumped in SA. This also protects consumers and greatly assists to reduce the amount of electricity used in our buildings,” she said.

### **Challenges with existing infrastructure and grid constraints**

**Mr Moyo** said that Eskom’s biggest asset is its transmission infrastructure. “This infrastructure is a robust investment which took many years to build, and which can easily become a white elephant.”

**Mr Garner** bemoaned Eskom’s old infrastructure. “We have an ageing generation fleet in Eskom,” he said. More than half of the stations are older than 37 years and replacement or refurbishment of major components is expensive and requires extensive outage time.

### **Reducing emissions and climate change**

**Dr Chiteme** said they are looking at reducing the carbon intensity of the energy mix. “To maintain our market share, we must also make sure that we meet our climate change commitments,” he added.

Dr Chiteme listed some of the catalytic projects that could form a “just transition and try to find the link between the existing industry, which is mostly fuelled by coal, to the incoming industry where green hydrogen is at the core of this transition. That will then allow us as a country to transition responsibly. If we can reduce the emissions coming out of our coal-generation fleet, we can continue to generate electricity or power using those assets and do that without a negative impact on the environment. We are, for example, also looking at how to use green hydrogen to produce green steel products etc.”

**Mr Nicholls** explained that the climate offers a crucial strategic framework. SA warms at twice the rate of the global average – a great concern for an already arid and water-scarce country. Worsening climate impacts, trade risks and physical risks will affect the poor more severely.

**Mr Naidoo** contended that another focus area of TIA is to identify technologies that will combat the immediate effects of load shedding on businesses, schools, and communities. He maintained: “It’s Just Energy Transition focus area comprises energy innovation and climate change initiatives, the low-carbon economy, and skills development”.

The climate challenge, **Ms Burton** reminded delegates, is that we need to reach global net zero by 2050 with one of the most critical aspects being the fair share contributions that consider development, capability, responsibility, and national circumstances.

#### **The good and bad of SA’s regulatory framework**

**Mr Garner** extolled the government's regulatory framework. “Amazing work is being done by the same government, and yet you have these challenges in the policy and regulatory environment”, he added. We see more government support for the old technology and less government support for the new, resulting in negative network effects, halted supply, and you get less infrastructure investment but more private sector support. We have a massive challenge in this regard.”

**Mr Loyiso Tyabashe**, the Chief Executive Officer of the South African Nuclear Energy Corporation (Necsa), in his presentation also stressed the country’s policy framework. “In terms of the policy framework, we have a National Energy Act of 2008 which gives rise to the Integrated Energy Plan. The latter talks about eight objectives: ensure security of supply, minimise the cost of energy, promote job creation and localisation, minimise environmental impacts, minimise water consumption, diversify supply resources, promote energy efficiency, and promote energy access. Our policy framework can give us the best energy system if utilised appropriately and if we do implement and move forward – less talk, more action.

**Ms Ruse Moleshe**, the Non-Executive Director of Revego Africa Energy Limited, gave a regulatory overview of the electricity market in SA in the context of the transition to renewable sources. She explained that the electricity market has four elements: generation, transmission, distribution, and the end-user/customer. The generation aspect has as its key player Eskom, together with independent power producers (IPPs), and the Southern African Power Pool (SAPP) that looks at imports. Eskom also owns the transmission infrastructure (the second element) with SAPP looking at exports. Eskom owns 40% of the distribution infrastructure, and municipalities the remaining 60%. The fourth element is the final residential, commercial and industrial customers.

Ms Moleshe stressed: “There is a proposed unbundling of Eskom Transmission on the table to allow the IPPs to compete with Eskom”.

She also expounded on the key drivers of the transition. "The White Paper on Energy Policy (1998) and the White Paper on Renewable Energy (2003). The former has five

critical objectives: to increase access to affordable energy services, improve energy governance, stimulate economic development, manage energy-related environmental impacts, and secure supply through diversity of technologies to aid sustainability. The latter was the foundation for the promotion of renewable energy in SA and set a 10-year target to diversify the energy mix including renewable energy. It is driven by concerns around global warming and aims to secure cleaner energy from renewables”.

Ms Moleshe maintained one of the long-term energy planning strategies is the IRP 2019 which aims to diversify the South African energy mix. It states, among others, that renewable energy has an increased role in future energy. Further, it discusses the decommissioning of coal-fired power plants; gas for conversion of open-cycle gas turbines to combined-cycle gas turbines.

“In summary, looking at our policy and regulatory frameworks, we are on the right track in terms of attracting investments from renewable energy projects. There are, however, several policy dilemmas and challenges related to the grid, related to Eskom’s sustainability, policy confusion when it comes to whether SA is planning to decommission, and also concerning renewable energy capacity transition without other flexible technologies that will provide security of supply,” Ms Moleshe concluded.

### **The strong move to renewable sources of energy**

**Mr Nicholls** explained there is a belief that high variable renewable energy penetration systems are not secure; that the economic cost of coal closure on jobs and livelihoods is too high; and concerns that once ancillary services are factored in, variable renewable energy is not competitive.

**Dr Chiteme** contended SA aims to use its mineral endowment, renewable energy assets, land availability and industry capabilities to create a globally competitive hydrogen economy as part of its Economic Reconstruction and Recovery Plan.

“There is growing need for massive build-out of renewables,” explained **Mr Garner**. “We need between three to five times solar and wind than the current system; we need between 120 to 200GW of solar and wind. We need 35 to 90 hours of battery storage. Investment in grid infrastructure needs to be prioritised and government needs to show commitment to push through with the unbundling of Eskom.”

Rooftop solar installation in SA in March 2022 amounted to 983.1MW. In June 2023, this amount ballooned to 4 411.50MW. To put this into perspective, the Renewable Energy Access Programme estimated 6GW in 12 years, yet in little more than a year, rooftop solar installation reached more than 4GW.

**Prof Bernard Bekker**, Chair of Power System Simulation at the Department of Electrical and Electronic Engineering, Centre for Renewable and Sustainable Energy Studies, Stellenbosch University (SU) spoke on the integration of renewable sources into the South African electricity system.

Apart from an increased focus on renewables, born out by statistical graphs forecasting growth in this field, Prof Bekker highlighted “an incredible focus on behind-the-meter (BTM) solar photovoltaics (PV)”. “It is strongly incentivised if you look at what our President said and Treasury then implemented in terms of tax incentives for installing PV on your roof.”

According to **Mr Tyabashe**, there are approximately 410 nuclear power reactors in operation with installed capacity of about 368GW, globally. North America is very dominant, followed by Western Europe and Far East Asia. Nuclear contributed about 10.4% towards the global energy mix in 2022. SA’s installed capacity from nuclear stands at about 3.5%.



Some 57 new reactors are being constructed worldwide with China and India dominating, followed by Turkey, the Republic of Korea, Egypt, the United Kingdom, Russia, Japan, Bangladesh, Ukraine, France, Brazil, the United Arab Emirates, the USA, Iran, and Slovakia. Last on the list is Argentina, a new entrant with its first reactor under construction.

### Conclusion

The NSTF brought together individuals from public entities and private companies and associations to discuss the current electricity crisis. Various transitions are needed simultaneously: the transition from over-reliance on fossil fuels to embracing renewables, a just transition that will minimise the harmful effects of dramatic change, and involves the entire economy, transitions to unique and innovative solutions, and to greater efficiencies. By its very nature, technological change is disruptive – of society, economies and countries. SA's institutions, researchers and leaders are guiding the country through these transitions – and although it is a challenging journey, there are competent and well-intentioned people working on this.

### The National Science and Technology Forum (NSTF) is:

- Independent non-profit [stakeholder body](#) and network – a civil-society forum
- [Voice to government](#) for the science, engineering, technology (SET) and innovation community
- Includes private and public sectors
- [Promotes SET and innovation](#) in South Africa since 1995

Speakers can be contacted through the NSTF Media Liaison and Communications Manager, [Mr Barnard Manne](#). Further information can be found on the [NSTF website](#) and the [NSTF YouTube channel](#).

Read about previous NSTF Discussion Forums on related topics:

- [Climate Change Just Transition Framework](#): comments and consultation session with the Presidential Climate Commission (8 April 2022)
- [Loadshedding and power cuts – what is really going on?](#) (25-26 October 2021)
- [Sustainable Energy for All in SA](#) (17 April 2018)

## About the NSTF

The National Science and Technology Forum (NSTF), established in 1995:

- is a broadly-representative stakeholder body for all science, engineering and technology (SET) and innovation organisations in South Africa
- gathers stakeholders around burning issues of national and global interest, across the public and private sectors, including matters of public policy
- includes a network of professional societies in SET and STEM education (STEM = science, technology, engineering and mathematics) - the NSTF proSET membership sector.
- recognises, awards and profiles the outstanding contributions of individuals and groups to SET and innovation through the prestigious NSTF Awards
- runs and supports collaborative projects and youth outreach, including recognition of top performance in mathematics and science, role modelling, bursary and STEM career information
- runs and supports the STEMulator.org which attracts youth and educators to Explore>Discover>Learn the world of STEM including careers. (Established by NSTF proSET)

### For more information

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