



SETTING UP FOR THE 2020s:

Addressing South Africa's electricity crisis and getting ready
for the next decade... and now Covid-19

CSIR
our future through science

“The CSIR’s evidence-based research suggests loadshedding is here to stay for the next five years, unless the necessary supply/demand side interventions are employed”

Summary

Almost no one expected COVID-19 and a national lockdown but CSIR research published earlier this year has become increasingly relevant as households, businesses, funders and all spheres of government look for solutions to ensure adequate electricity supply for a successful economic recovery.

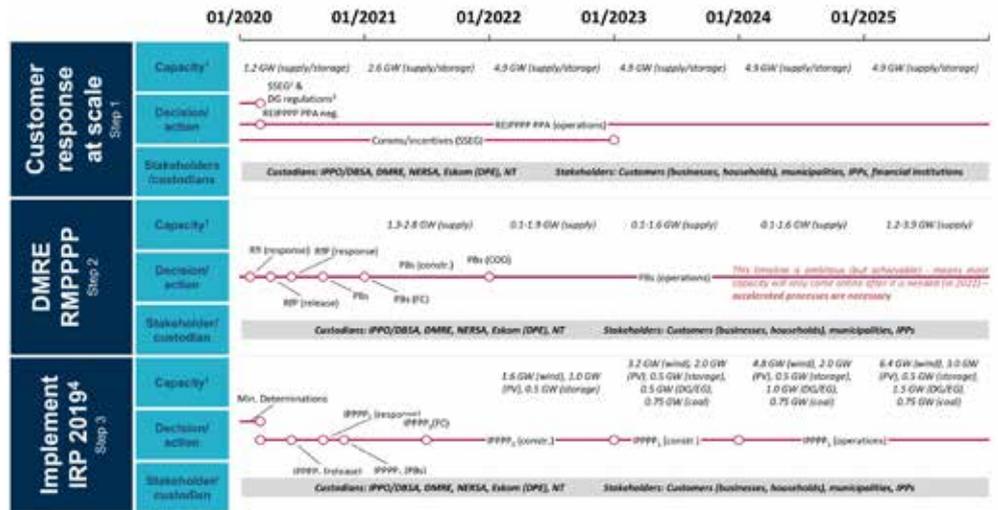
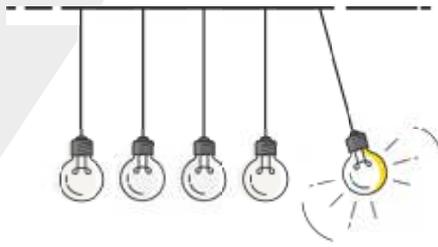
The COVID-19 pandemic shocked the economy, and the concern about adequate energy supply was arguably overtaken with the shutdown of the commercial and industrial sectors as a result of the pandemic. The CSIR, in partnership with GreenCape, will be presenting a webinar based on their analysis of the South African power system. This event aims to clarify the reality of shortages over the next five years, which will assist businesses in making resilience decisions and also proposes the necessary interventions that will enhance existing efforts to restore adequacy.

The constrained power system requires a concerted effort from all stakeholders and custodians to ensure a secure power system going forward. This has become increasingly clear as load shedding resumed at the beginning of July 2020 despite unprecedented reduced demand during Level 5 and Level 4 of the national lockdown. Without any interventions, shortages over the next five years are expected to range from morning/evening constraints in some of the years to high daytime demand hours combined with the morning/evening constraints in other years. These insights assist to inform the necessary type of supply-side and/or demand-side options required to ensure an adequate power system.

As a result, and in order to assist stakeholders with potential solutions, the CSIR has undertaken self-funded and self-initiated analysis to further understand the constrained nature of the South African power system and shortages experienced in 2019 and 2020. The CSIR has also proposed feasible options and solutions to alleviate these constraints and set up the country for a secure power system for the decade. Although the full hourly temporal resolution has been considered in the analyses undertaken, some representative weeks shown without interventions help to reveal the difference in shortages across just a brief two-week period as existing supply capacity performance changes.

The analysis and related proposals are made with the intention to enhance and support already existing initiatives of multiple stakeholders that can make a meaningful impact in addressing existing challenges

The CSIR welcomed the opportunity to share this research and to engage with questions from a range of interested stakeholders.



NOTES: Timelines are estimated and in no way prescriptive; PBs – Preferred bidders, PPA – Power Purchase Agreement; Rf – Request for Information; RfP – Request for Proposal; FC – Financial Close, COD – Commercial Operations Date; 1 Total additional installed capacity; 2 Requires adjusted SSEG regulations (proposed lifting licensing requirement for SSEG & only requiring registration with NERSA - from 1 MW to 10 MW (or more)); 2 SSEG (res.) does not require regulatory changes (just communications rollout but could be further incentivised by Eskom/municipalities); 3 Will require Ministerial Determination - generators expected >10 MW (technologies aligned with IRP 2019); 4 Unlikely to get capacity online before 2023-2024 (risk of misalignment with IRP 2019)

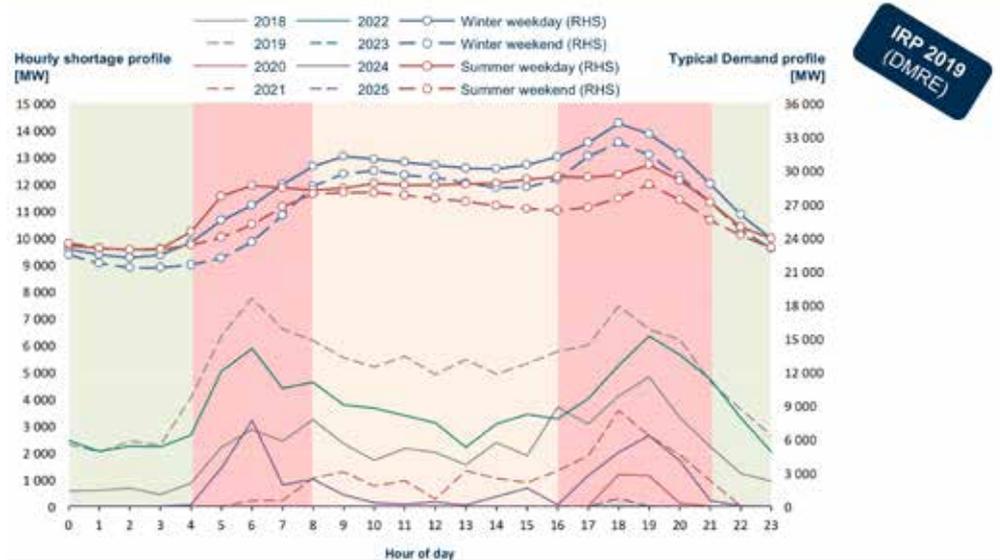
Critical decisions/actions needed along with accelerated processes to ensure timeous implementation allowing RSA to ramp into 2020s successfully

	DECISION/ACTION	IMPACT
Customer response at scale (Step 1)	Immediate focus on customer response at scale (self-supply) in all customer segments via enabling regulations (easy to implement) Driven by SSEG (residential), EG (commercial/agricultural), EG/DG (industrial/mining), municipalities & storage, REIPPPP 'power-up'	<ul style="list-style-type: none"> Immediate reduced load shedding as capacity can come online in 2020 already Further assistance from 2021 onwards as more capacity comes online
DMRE RMPPPP (Step 2)	Accelerate DMRE RMPPPP process to address remaining capacity & energy gap and ensure capacity can come online timeously An accelerated process necessary due to immediate shortages & should be based on estimated required capacity (complementing Step 1)	<ul style="list-style-type: none"> Capacity online from 2022 only (mid-2021 with accelerated DMRE RMPPPP process) Further reduction in load shedding once capacity comes online
Implement IRP 2019 (Step 3)	Immediate focus on Ministerial Determinations for all technologies in IRP 2019 followed by procurement process to ensure timeous implementation. Due to procurement processes & technology specific lead-times this action/decision is required now	<ul style="list-style-type: none"> First capacity online from 2023 only (best case) but required in 2022 (as per IRP 2019) Adequate power system into mid-2020s as existing capacity is decommissioned if IRP 2019 planned new-build capacity comes online

NOTE: Even with short-term interventions, if EAF does not recover to IRP 2019 levels, shortage is expected in 2020-2021 depending on capacity that can feasibly come online, structural load shedding may still need to be considered for 2-3 years (shortages exaggerated in Updated scenario)
 SSEG – Small-Scale Embedded Generation; DG – Distributed Generation; EG – Embedded Generation; RMPPPP – Risk Mitigation Power Purchase Procurement Programme

Step 1 is the only immediate feasible response as Step 2 & 3 are expected from 2022/2023 only (best case) but still critical to ensure system adequacy

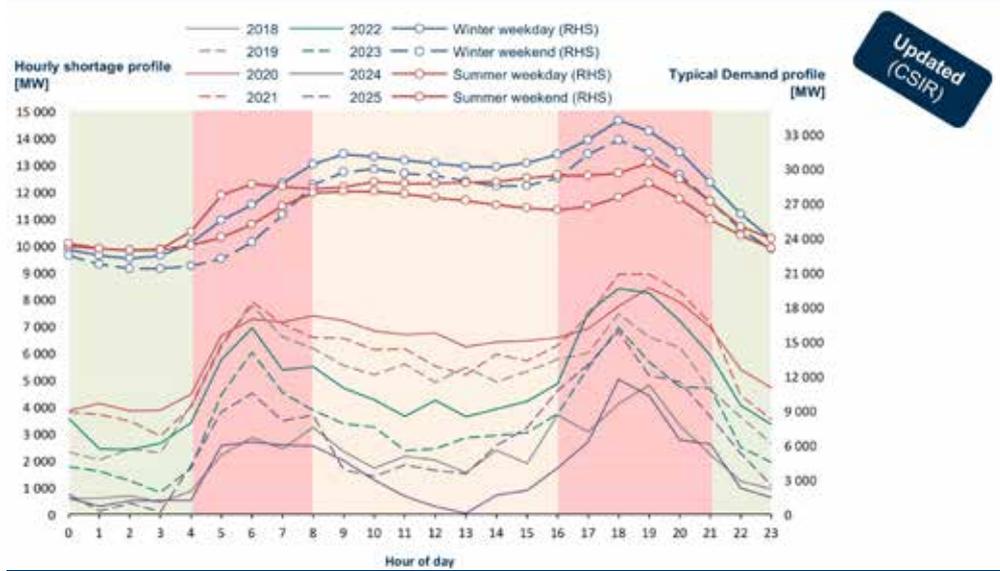




IRP 2019
(DMRE)

NOTE: Energy & capacity shortage is demand that cannot be served due to a lack of capacity (including OCGTs, pumped storage & Eskom DR); Outcomes shown are from deterministic simulations - thus indicative; 99th percentile of capacity & energy shortage is reported.
Sources: CSIR Energy Centre analysis

IRP 2019 daily shortage profile shows capacity need in the morning/evening peak combined with daytime energy needs

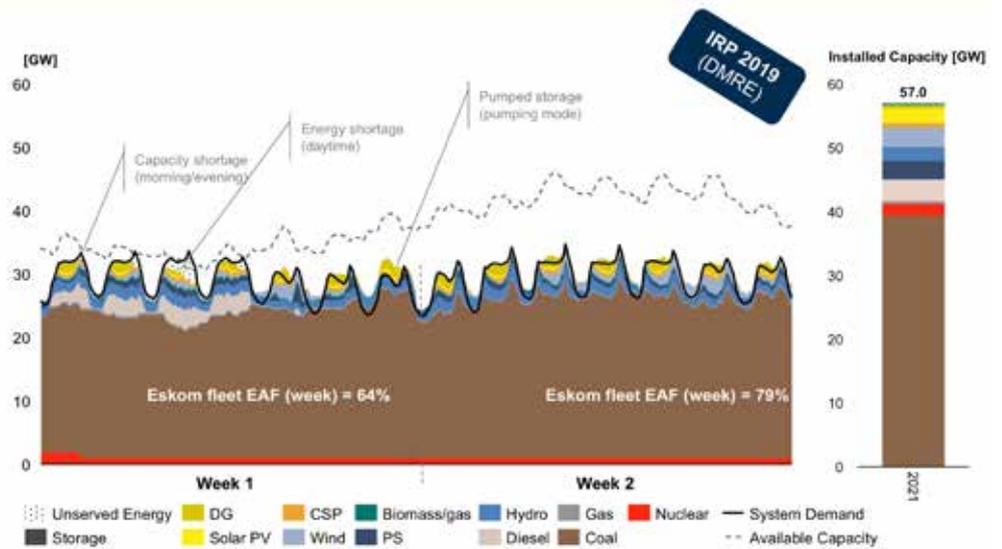


Updated
(CSIR)

NOTE: Energy & capacity shortage is demand that cannot be served due to a lack of capacity (including OCGTs, pumped storage & Eskom DR); Outcomes shown are from deterministic simulations - thus indicative; 99th percentile of capacity & energy shortage is reported.
Sources: CSIR Energy Centre analysis

Updated scenario shows initial morning/evening capacity need combined with all-day energy, shifting to morning/evening need only in later years

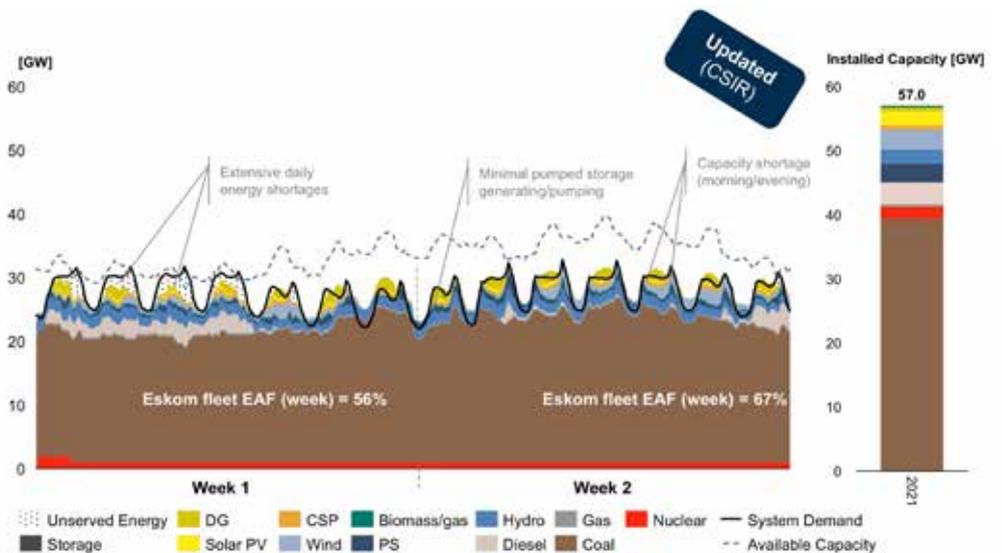




NOTE: Representative week(s) shown but entire time horizon is simulated at hourly resolution in production cost model applying unit commitment and economic dispatch principles;
One nuclear unit on planned outage from day 2.

Sources: CSIR Energy Centre analysis

Representative 2 weeks - constrained/unconstrained showing capacity needs along with daytime energy needs during some weekdays



NOTE: Representative week(s) shown but entire time horizon is simulated at hourly resolution in production cost model applying unit commitment and economic dispatch principles;
One nuclear unit on planned outage from day 2.

Sources: CSIR Energy Centre analysis

Updated scenario shows initial morning/evening capacity need combined with all-day energy, shifting to morning/evening need only in later years



About us

The Council for Scientific and Industrial Research (CSIR) is a leading scientific and technology research organisation that researches, develops, localises and diffuses technologies to accelerate socioeconomic prosperity in South Africa. The organisation's work contributes to industrial development and supports a capable state.

The CSIR was established through an Act of Parliament in 1945, and the organisation's executive authority is the Minister of Higher Education, Science and Innovation.

The organisation plays a key role in supporting the public and private sectors through directed research that is aligned with the country's priorities, mandate and its science, engineering and technology competences.

Our core values pursue Excellence, celebrates People, personifies Integrity and welcomes Collaboration (EPIC). They are the driving force behind our ability to conduct cutting-edge research and technological innovation to improve the quality of life of South Africans.



Contact Person

Dr Jarrad Wright

Tel: +27(12) 842 7269

Email: jwright@cscir.co.za



Joanne Calitz

Senior Researcher

Email: jrcalitz@csir.co.za

