

System Status and Outlook Briefing

Jan Oberholzer: Chief Operating Officer

Phillip Dukashe: Group Executive Generation

Segomoco Scheppers: Group Executive Transmission

Megawatt Park: Franklin Auditorium

27 January 2022



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- A background image of a spiral-bound notebook with white pages and silver rings, shown from a slightly elevated angle.
- 1 Performance Overview - COO**
 - 2 Generation Overview – GE: Generation
 - 3 System Outlook: Jan 2022 – April 2022 – GE: Transmission

Overview and summary of Eskom system year-to-date performance (1/3)



Eskom has **not implemented loadshedding since 19 November 2021**. However, we continue to see **varied performance** by our operating divisions year-to-date, with generally good performance from Transmission and Distribution. Performance from the Generation side (coal fleet) **remains unsatisfactory**.



The **Distribution technical performance** is positive in terms of **duration and frequency of outages**, **restoration times** were negatively impacted by weather patterns.



On the **Transmission side**, **positive performance** was attained with a low number of interruptions and **no major incidents**. We continue to strive for improved **Transmission system reliability** through our **Transmission Sustainability Plan**, doing sufficient maintenance and focusing on replacement of older assets.



Kusile Unit 4 was **first synchronised** on 23 December 2021 and achieved **full load** on 11 January 2022, delivering at times 800 MW to the National Grid as commissioning tests continue ahead of commercial operation.



Both Koeberg Nuclear Power Station Units **continue to operate safely**. Unit 2 commenced a refueling and long-term outage in January 2022 **during which the reactor vessel head and the three steam generators will also be replaced**. Regulator approval received.

Overview and summary of Eskom system year-to-date performance (2/3)



Our **coal stock levels** are healthy – **average of 46 stock-days, 80 stock-days when including Medupi, which has excess coal.** No station below Eskom prescribed levels or grid code. Good progress is made in **reducing the rand/ton costs** of coal.



Rain Readiness plans have held up against high and early summer rainfall and are continuously improved.



The **Camden ash dam facility** is operational. The **Majuba Power Station coal tippler facility** is slowly scaling up deliveries, with **now two trains per day delivering 8 400 tons each day, the equivalent of 247 road truck loads (to gradually increase to 6 trains/day).**









Environmental matters such as emissions have shown good improvements year-to-date but are not yet at the set targets. Water consumption requires additional focus to contain risks of spillages.



The Generation side of the business remains a concern, specifically the **availability of the coal power stations.** YTD Energy Availability Factor (EAF) at 62.9% is **not at the targeted performance level.** A key contributor to the low EAF was **high levels of planned maintenance** over the summer months. The **high levels of unplanned outages** remain a concern, however, we continue to drive our **Reliability Maintenance Recovery Programme to reduce these.**

Overview and summary of Eskom system year-to-date performance (3/3)

-  The **Reliability Maintenance Recovery Programme** has continued as a key contributor to addressing the low EAF. More effort is being applied to ensure that the key funding and enabling contracts are in place to support the objectives of this critical programme.
-  Unfortunately, as at 24 January 2022, increasing breakdowns and low plant availability forced Eskom to implement **load shedding totaling 51 days (1 213 GWh) since 01 April 2021**, compared to 47 days (1 034 GWh) for the 2021 financial year ended 31 March 2021.
-  Due to the system constraints, we have used more than the anticipated levels of diesel for **Open Cycle Gas Turbines (OCGTs)**.
-  **Safety** is well below the tolerance levels. Regrettably, we have had 3 employee and 2 contractor **fatalities** financial year-to-date.
-  Following the unfortunate **explosion at Unit 4 at the Medupi Power Station**, a detailed investigation has been completed. Recovery plans in progress, **Targeted return to service is August 2024**
-  Following September 2021 **transformer explosion, Kendal Unit 1 returned to service on 3 Jan 2022.**



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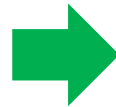
vs YTD target of 2.65



97.6 % Maintenance Completion



0 Major Incidents



vs YTD target of 2



15 Interruptions

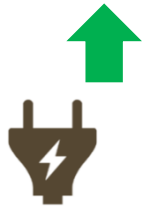


vs YTD target of 26

- **System reliability performance:** There have been fewer interruptions YTD relative to previous years and YTD **System Minute < 1** results are within planned performance limits.
- **Nil Major Incidents** have occurred YTD.
- **High levels of maintenance completion** has been sustained
- Asset condition risks require **increased asset renewal investment** going forward for future operational sustainability
- **Ongoing theft and vandalism** has **impacted operations** creating risks for interruption incidents

Distribution Performance YTD (December 2021)

Electrification



57 978

vs.

YTD Target of 52 551

SAIDI



37.60

vs.

38.00 Tolerance

SAIFI



12.85

vs.

19.60 Tolerance

Planned Maintenance Completed



91.29%

vs.

YTD Target of 93%

Refurbishment Spent



R210m

vs.

YTD Target of R329m

Restoration Time



90.9%

vs.

90% Target

- **Network performance**, measured by **SAIDI** (duration) and **SAIFI** (frequency) is sustained.
- **Planned Maintenance** and **Refurbishment** execution are below target but have not adversely impacted system reliability. Completion of the planned programs remains a key focus area for the business.
- **Theft, meter tampering** and **vandalism** of network equipment continues to impact operations and system reliability.
- **Electricity theft** continues to manifest as an operational, financial and public safety risk.

Criminal damage to network infrastructure



Marang – Trident 400kV transmission line

- Increasing **crime/theft/sabotage** and vandalism on the Transmission and Distribution networks have resulted in losses and **increased risks for customer interruptions.**
- Transmission and Distribution lines are **vulnerable due to the extensive geographic** areas they cover, the remoteness and the inability to continuously patrol these assets.
- **Community support and vigilance to report** such criminal activities is vital to assist Eskom in its response strategy.



Hera – Westgate 275kV transmission line



Pluto – Bighorn 400kV transmission line

Our network comprises of 33 158 km of transmission; 391 784km of distribution lines across the country

Group Capital Performance YTD (31 December 2021)



1 594MW YTD

vs YTD target of 1 594MW

(Jan 2021 to Dec 2021)



Execution of Major Plant Defects Correction

vs plan



Execution of Emissions Control Projects



Execution of Ash Dam Projects

- **Commercial Operation of new units:** On 31 July 2021, Medupi Unit 1, the last of six generation units, was successfully commissioned and handed over to Generation. On 29 March 2021, Kusile Unit 3 achieved commercial operation
- **Kusile Unit 4 first synchronized:** On 23 December 2021 and achieved **full load** on 11 January 2022, delivering 800MW to the National Grid as commissioning tests continue ahead of commercial operation
- **Major plant defects correction:** At Medupi, boiler plant modifications have been implemented on all six units, except for the long lead time milling modifications and the duct erosion modifications on **Unit 6**. **At Kusile Unit 1, the boiler plant modification outage was completed and commenced on Unit 2 in November 2021** (RTS February 2022).
- **Execution of emissions control projects:** Steady progress is achieved on the projects, however, some construction, contractual challenges, including COVID-19 constraints are impacting execution.
- **Execution of ash dam projects:** Significant progress achieved with ashing at Camden and Majuba, however some commercial, construction issues, including inclement weather and COVID-19 constraints are impacting execution.
- **Other:** Tender evaluations for Phase 1 of the **Battery Energy Storage Systems (BESS)** project is complete (approval obtained to proceed). At Majuba the coal tippler was successfully commissioned (late November 2021)

Medupi and Kusile major boiler plant defects correction

- Eskom is correcting all the major **boiler plant defects** (i.e., mills, gas air heaters, fabric filters, air and flue gas ducts, and reheaters) at both Medupi and Kusile.
- A defect correction program was established in **collaboration with the original boiler contractor**, to test, develop and implement technical solutions in all Medupi and Kusile units.
- **Medupi Unit 3 was used as a pilot** for the initial implementation of these solutions, which require extended unit outages to execute. Similar solutions were rolled out to **all Medupi units and Kusile Unit 1**, with roll-out commencing on Kusile Unit 2 in November 2021. Effective from 2021/2022, this roll-out will be implemented on the **remaining Kusile units**, as unit planned outages become available.
- **Medupi Unit 3** running at an average of > 93% EAF for ~8 weeks from inspection outage in November 2021
- Similarly, defect correction on the **milling plants** are done during planned mill refurbishment outages and as modified spares become available.
- Eskom is also developing **enhanced boiler plant solutions**, independently and in liaison with the boiler contractor and other parties. These modifications will be rolled out during standard **planned unit maintenance outages starting in 2022**.

Status of GCD New Build Programme (inception to date):

Focus is on bringing new capacity online and driving plant defect corrections



Target schedule



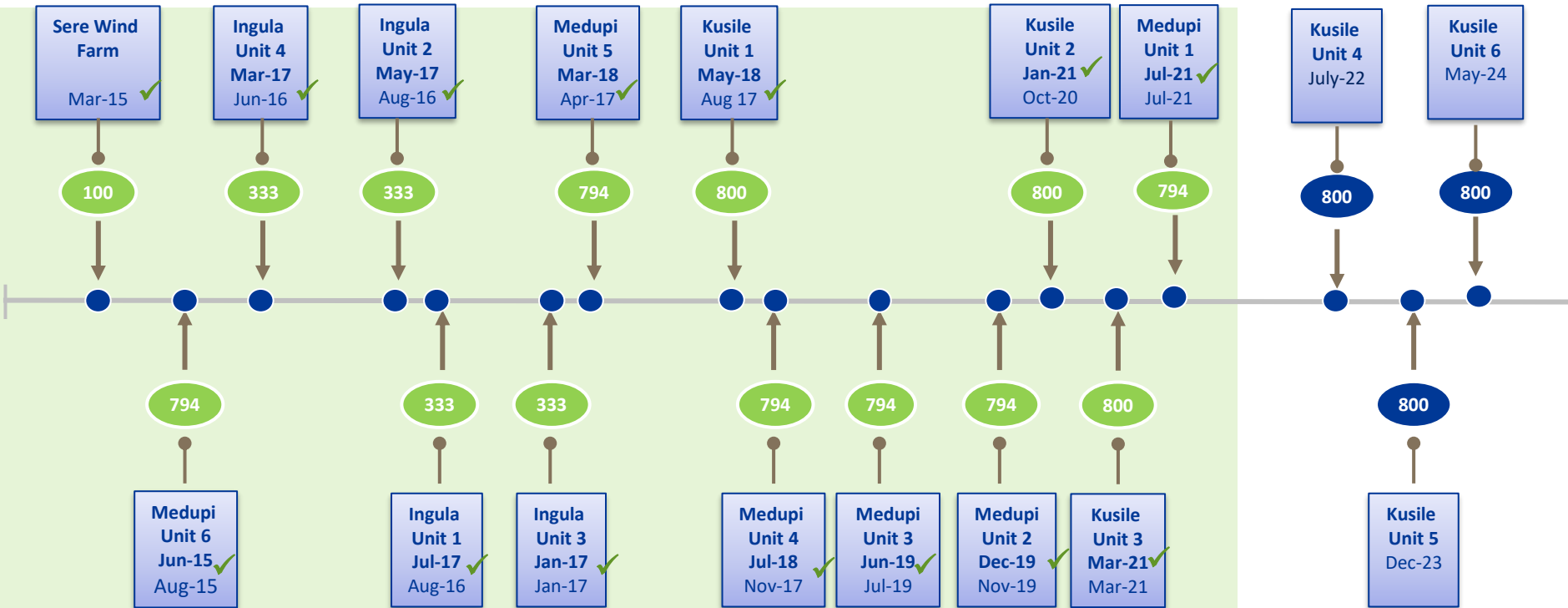
Achieved CO on or earlier than target

Completed Units

Latest Eskom Board Approved Target Dates

FY 2015 – FY 2022

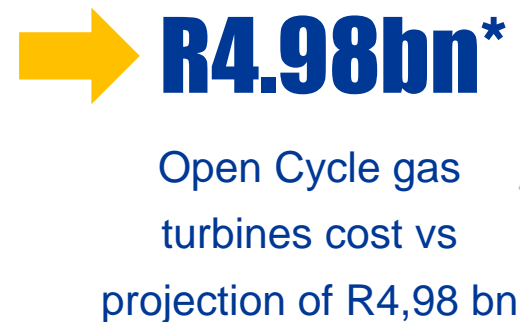
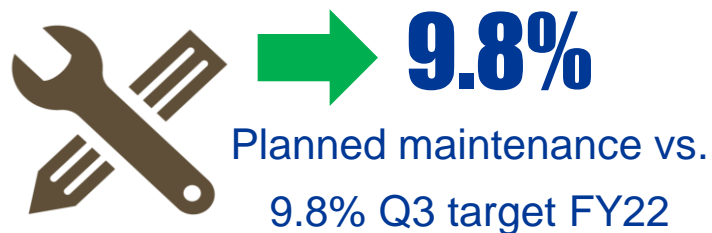
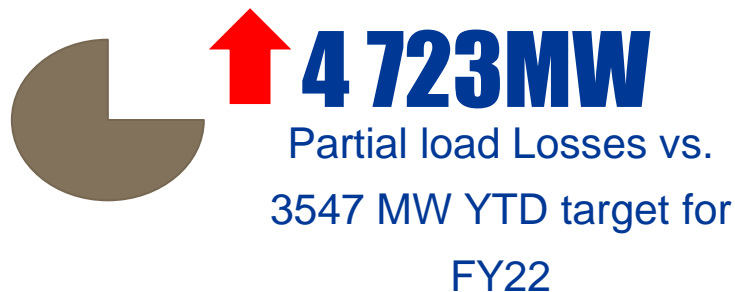
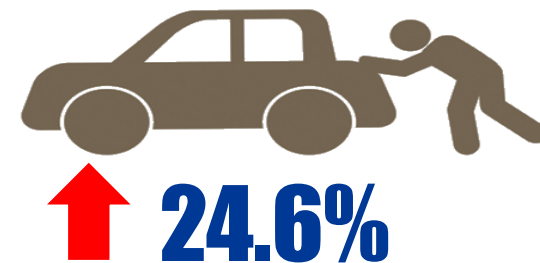
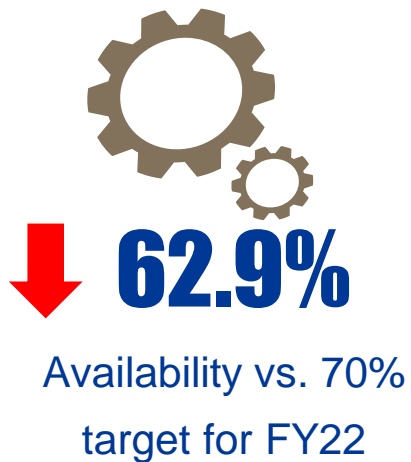
FY 2022 – FY 2025



8 596 MW installed since 2015 &
14 733 MW installed since 2005 ...

... 2 400 MW to be
installed over the next 4
years

Generation Performance YTD (December 2021)



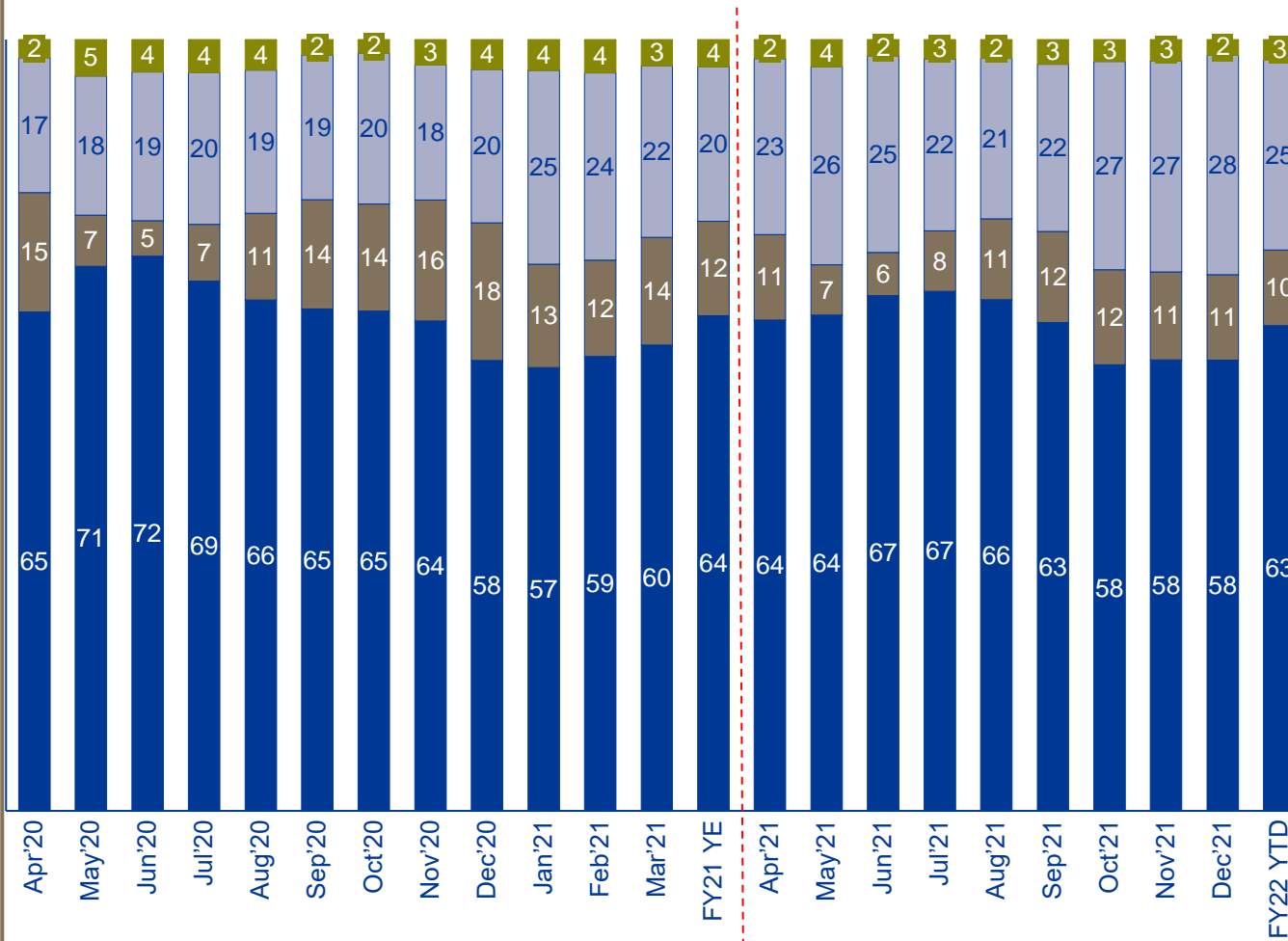
* Eskom OCGTs only as at 11 Jan 2022

The FY2021 EAF performance was lower overall compared to the FY2020 performance. The FY2022 performance continues to be lower than the aspiration resulting in intermittent load shedding.

Generation monthly and YTD performance

Percentage (%)

■ OCLF
 ■ UCLF
 ■ PCLF
 ■ EAF



Contributing factors

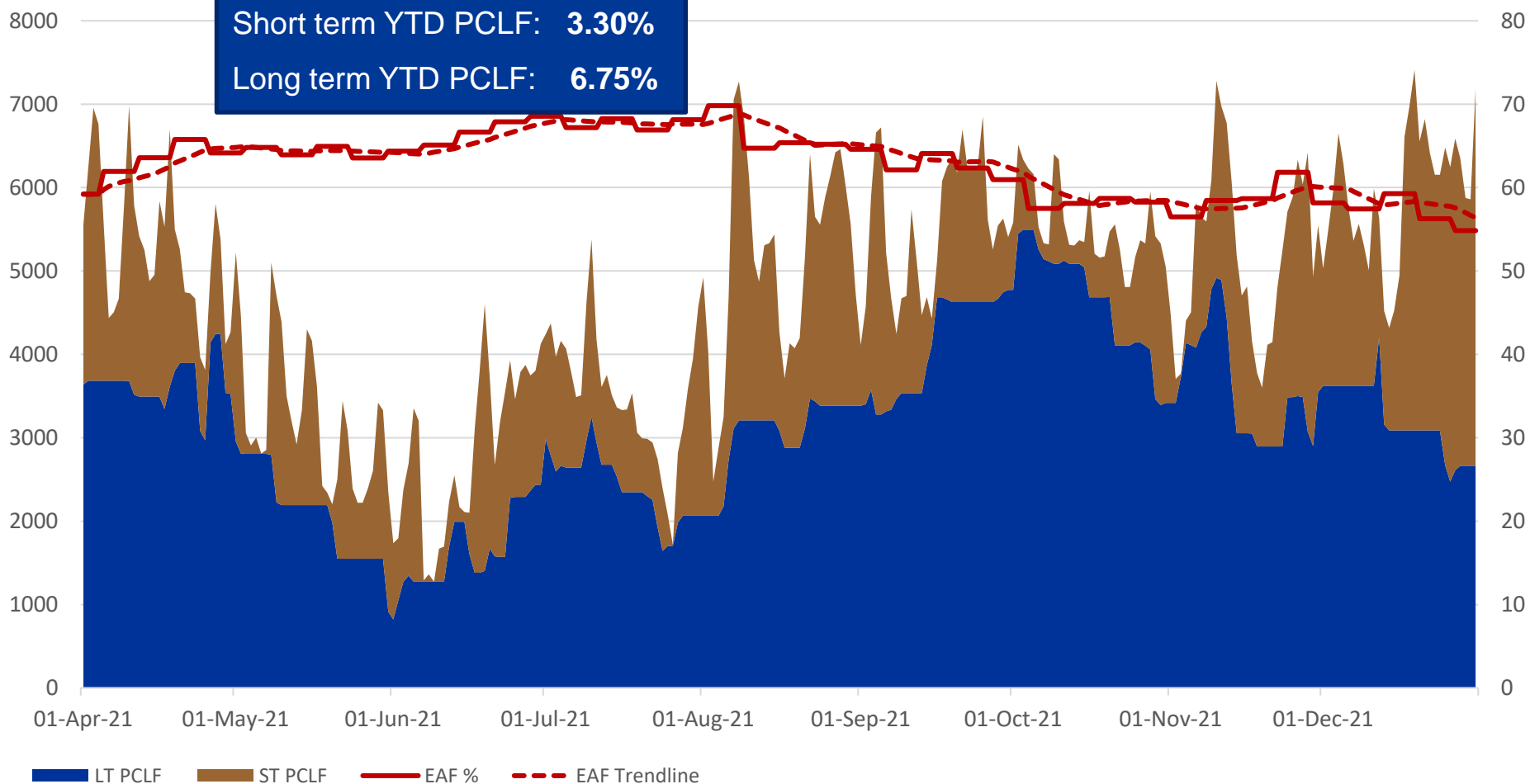
- Camden's ash constraint contribute about 36% to total YTD OCLF of 2.66%, with December 2021 being the first month with zero ash dam constraints.
- Slips, trips, boiler tube failures, partial and full load losses all contributed to the high UCLF.
- Gx fleet YTD EAF at 62.9% is below the YE SHC target of 74%.
- During the year, a delicate balance was required to giving the plants opportunity for planned maintenance and the having the plants available to support the system. The ratio of short-term to long-term is about 1:2

Long Term maintenance decreased from mid May to end June 2021, which is typical for the winter period, and increased for the summer months



Short term YTD PCLF: 3.30%

Long term YTD PCLF: 6.75%



Overview

The maintenance is still showing seasonal trend which is typical for planned outages, reducing in the winter and increasing in the summer period. However short term is fluctuating depending on the space available in the system.



↓ 82.72%
EAF Actual YTD vs.
YTD Target of 91.50%

↑ 2
UAGS Trip vs. target
of 1 for FY22



↑ 3.04%
Forced Loss Rate vs.
YTD Target of 3.55%

↑ 100%
LTO Readiness
vs. Target plan



- ❑ The lower than planned **EAF** is primarily due to the delays experienced in returning Unit 1 to service during the refuelling outage during 2021.
- ❑ The high reliability of Koeberg is **reflected in the low forced loss rate**, which remains below the target even though there have been two unit trips during FY22.

Recent noteworthy items related to Koeberg:

- **Unit 1 tripped on 24 Oct 2021** due to the spurious run-back of a steam feedwater pump which was being brought back to service after a statutory overspeed test. **Unit 1 has since been on-line for 91 days** (as at 26 Jan 2022) since returning to service on **27 Oct 2021**.
- Koeberg Nuclear Power Station **continues to be one of the most reliable power stations** on the Eskom network, with the **cheapest primary energy costs, essentially with capital fully depreciated**. Before being **taken offline on 17 Jan 2022**, **Unit 2 had been on-line for an uninterrupted 454 days since** completing its last refuelling outage in October 2020.
- **Koeberg Long-Term Operation (LTO)**
 - The LTO activities to enable Koeberg to **operate for another 20 years beyond 2024/25** continue as scheduled. The formal application to extend the operating license has been submitted to the National Nuclear Regulator and accepted for further processing.
 - Eskom will **by June 2022 submit the required supporting submissions** to the NNR for their evaluation, The required studies and reports remain on track **and as expected no safety concerns have been identified that would preclude long-term operation**.
 - As part of the internal Eskom process, a team from the IAEA will perform a review of the aging analysis that has been performed.
- **Steam Generator Replacement (SGR)** and long-term outage on Unit 2 have **commenced**, during which the three steam generators and the reactor vessel head will be replaced. **Regulator approval obtained January 2022**

Conclusion - COO

- We see a continuation of the strong performances from our **Transmission and Distribution** businesses,
- **Koeberg Nuclear Power Station** continues to be one of the most reliable power stations on the Eskom network. As an **asset that is fully depreciated, and has the lowest primary energy cost**, the business case to extend its life is compelling,
- Our **Generation business** performance (coal fleet) is **not satisfactory**. Specifically unplanned outage levels are too high, and this **requires high volumes of diesel** to run the Open Cycle Gas Turbines
- We continue to drive our **planned maintenance programme**, with a focus on the effectiveness of outages. This **will contribute to the risk of load shedding** during times of capacity constraints.
- Our Group Capital division is making **steady progress on the new build programme**, with **Kusile Unit 4** now during certain times, adding up to 800 MW of additional capacity to the grid during testing prior to commissioning,
- The process to address the **design defects of Medupi and Kusile is progressing well**, and we are looking at additional enhancements,
- We are **doing our utmost to limit load shedding**, but not at the cost of doing effective planned maintenance,
- We need **additional capacity of between 4 000MW and 6 000MW**. We hope to see a positive impact from government's emergency capacity procurement programme.
- Please continue to **use electricity sparingly**.


Use Electricity Sparingly : Together we can make a difference

Minimise workplace energy use with these six super savings tips

- Don't leave machines and equipment in standby mode; **switch off at the power button.**
- Use natural light where possible
- **Use efficient light bulbs.** Replace failed light bulbs with energy efficient lights / LEDs.
- When you leave the facility or building, **remember to switch off the lights, printers and air-conditioners.**
- Set air-conditioners' average temperature in summer to **around 23°C**
- Encourage staff to rather use the cold water taps to **reduce the energy consumption by geysers**



Please Use Only What You Need

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- A background image of a spiral-bound notebook with several pages visible, showing a grid pattern. The notebook is positioned diagonally across the page.
- 1 Performance Overview - COO
 - 2 Generation Overview – GE: Generation**
 - 3 System Outlook: January 2022 – April 2022 GE: Transmission

FY2022 System Performance (Commercial)



System Performance

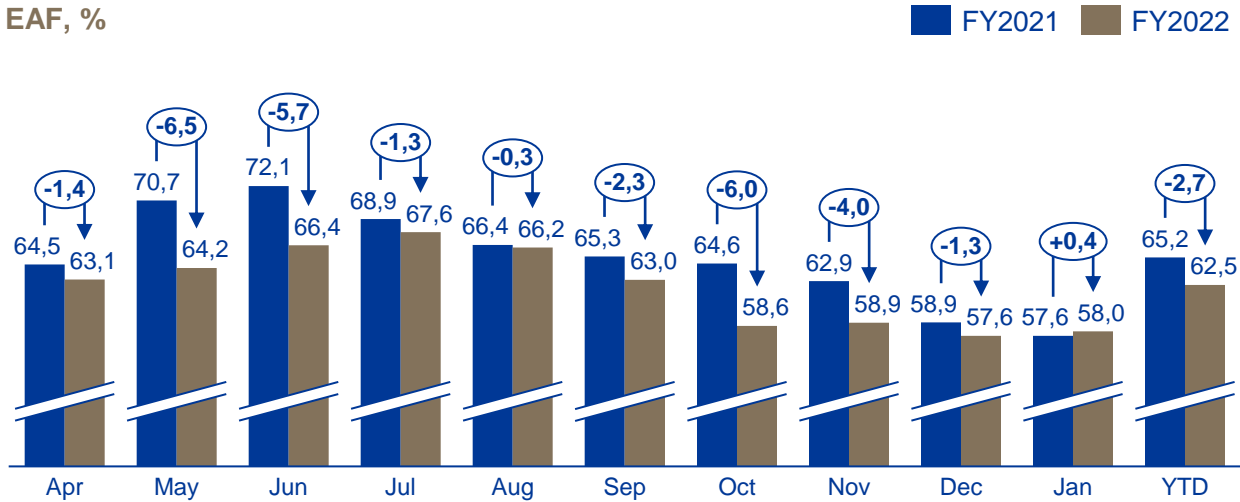
Commercial System EAF

- Current financial year **Jan 2022** MTD is **58.0%** which is similar (**actual: 57.6%**) compared to last financial year January actual.
- Current financial year **YTD Jan 2022** is **62.5%** which is about three percentage points (**actual: 65.2%**) lower than last financial year YTD figures.

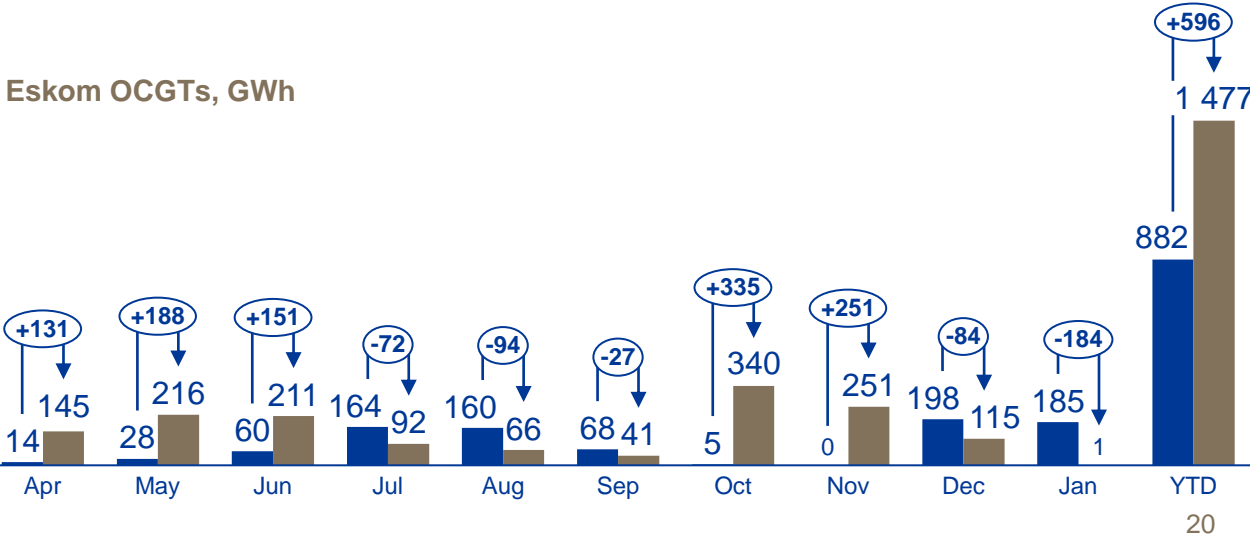
Eskom OCGTs

- MTD: Jan 2022** is **0.7 GWh** (0.1% load factor) compared to **185 GWh** actual for Jan 2021.
- YTD: Jan 2022** is currently at **1477 GWh** compared to **882 GWh** YTD actuals for last financial year.
- FY2022 YE budget** is **211 GWh** (1% load factor) versus **1477 GWh** YTD (8.9% load factor).

EAF, %

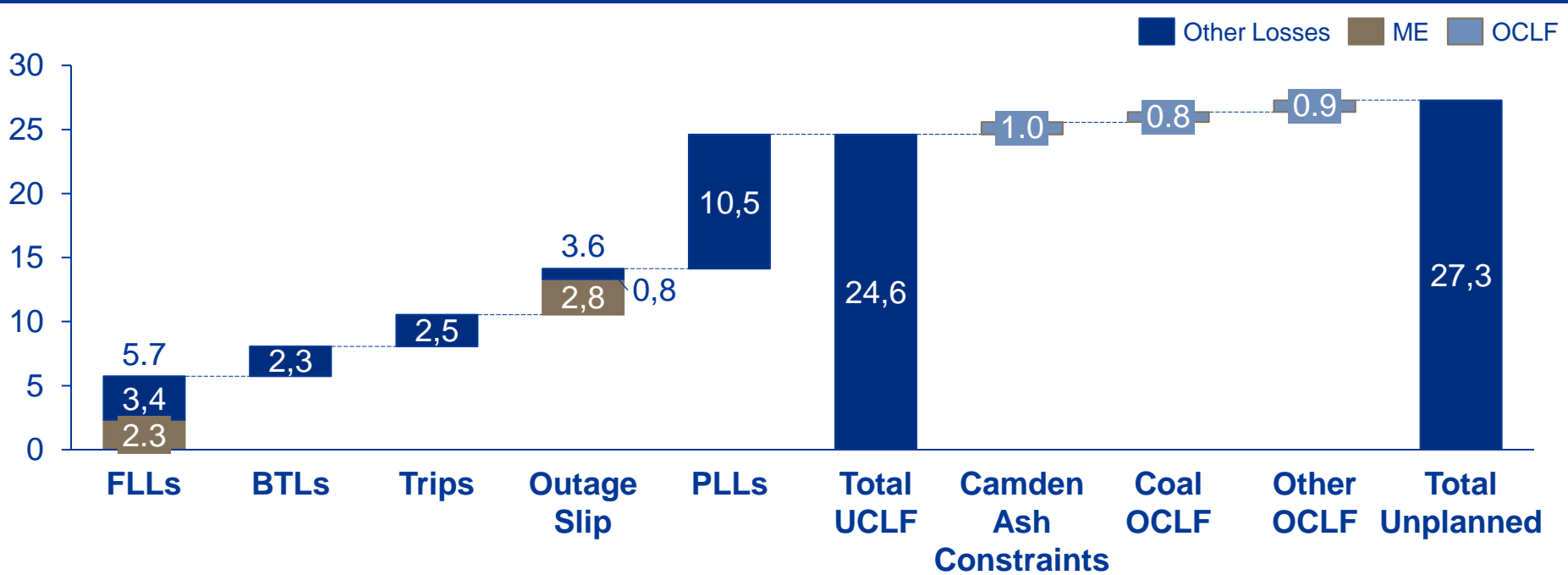


Eskom OCGTs, GWh



Lower Generation performance is largely driven by high UCLF

Build-up of Unplanned Losses for FY2022 January YTD from major contributors



Key insights

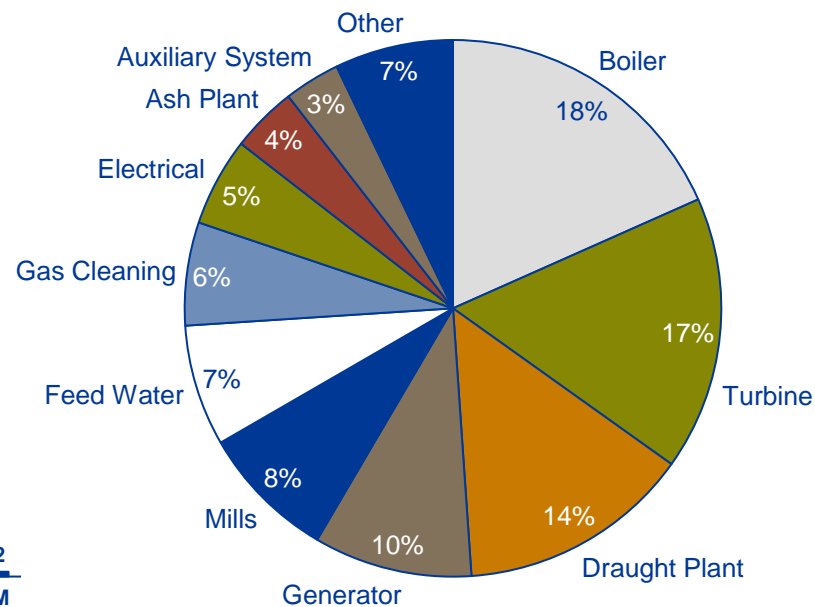
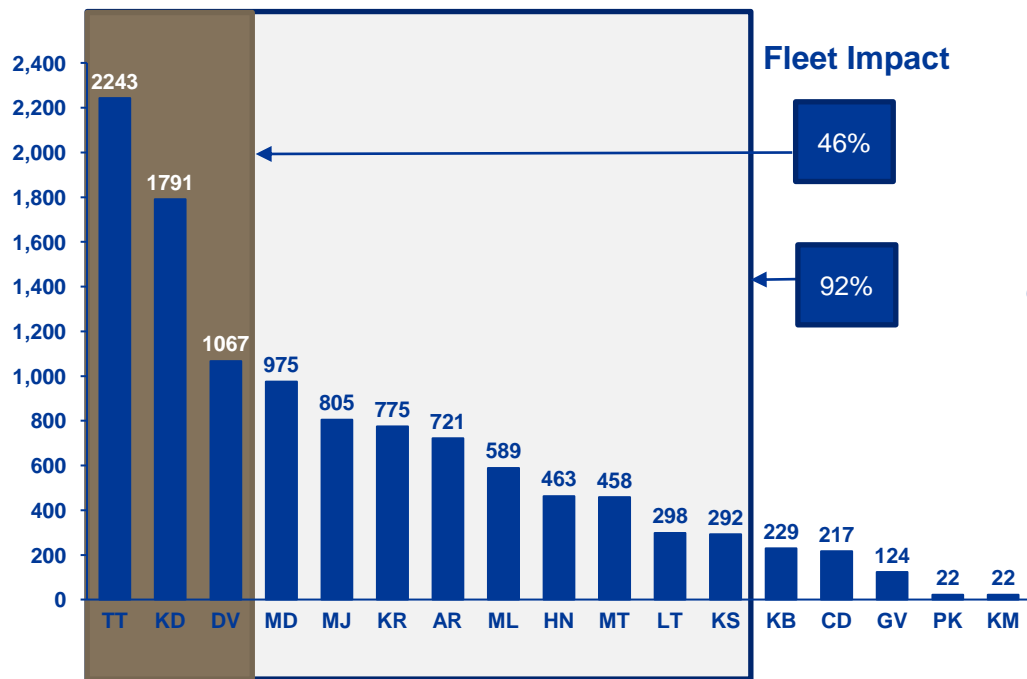
- **Plant performance is unpredictable** with multiple failures experienced continuously
- Partial Load Losses (PLLs) continues to be the biggest contributor to UCLF for FY2022
- **Resolving the issues sustainably requires extensive maintenance Outages and implementation of refurbishment projects**

Station Contribution to Total UCLF

F2022 Dec YTD – 24.6%



Average MW loss YTD end Dec 2021



Key Insights

- Tutuka, Kendal and Duvha contributed about **46%** of the total UCLF YTD.
- **Boiler, Turbine, Draught and Generator** were the main contributors (58% contribution) for the period of December FY2022 YTD.

The Generation Improvement Plan focus areas and initiatives

Improve Energy Availability



9-Point plan and MTTR actions
Power Station Improvement Plans



Address PLL's
through the established recovery teams



Coal Quality improvement drive
through regular mine interactions



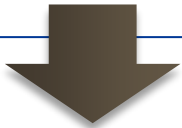
Fill critical vacancies
in Leadership, Ops, maintenance, engineering and outages



Outage preparation improvement
Implement maintenance effectiveness



Reduce trips
through identification of root causes and initiatives



Furthermore

Leadership and Culture

Key priorities

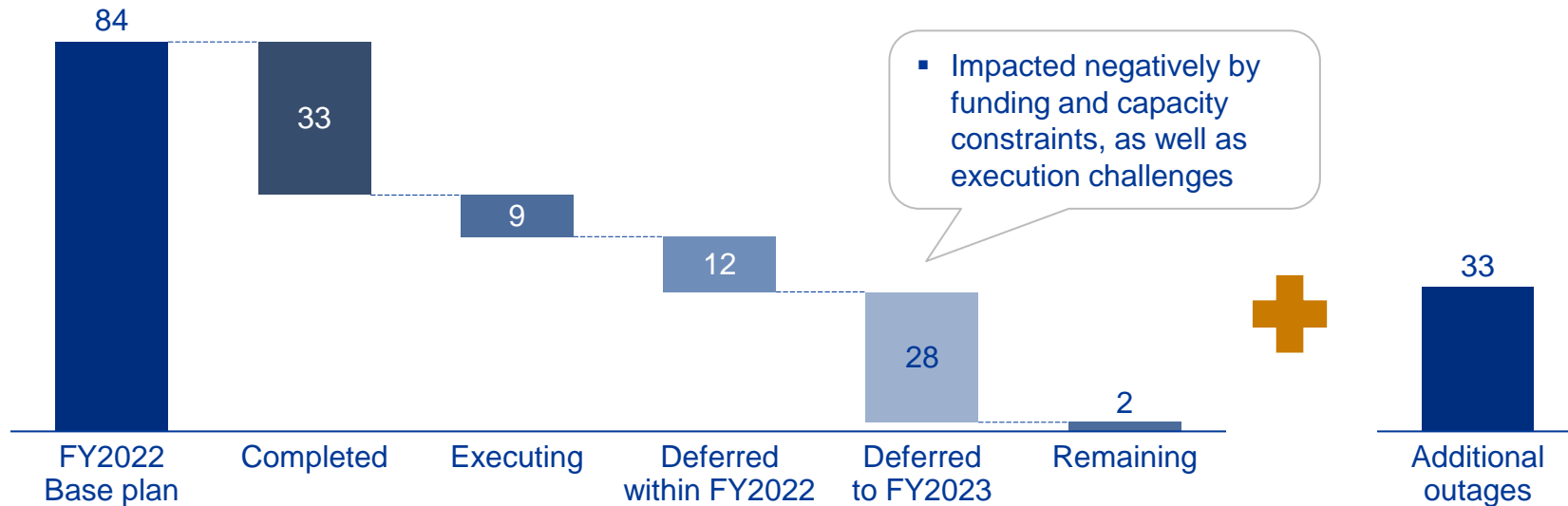
- Clear leadership expectations
- Drive technical focus
- Improve housekeeping
- Active risk management
- Power station assessment drive
- Restore pride in employees

Skills and resourcing

- Enhance knowledge at a senior level
- Augment specialised skills
- Drive capability building
 - Project R and PCM training
 - Engineering Practitioners training
 - OEM training
- Develop resourcing strategies – technical roles

The biggest opportunity to fix the plant is during Outages – hence the importance of the RMR Programme

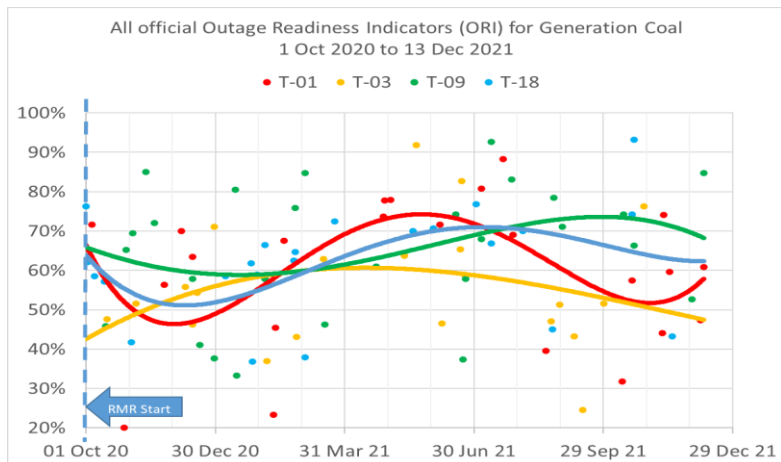
Reliability Maintenance Recovery (RMR) Programme Status at 19 January 2022



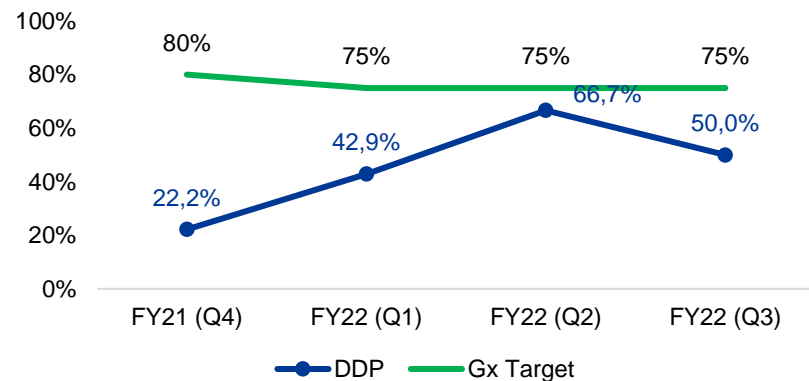
Key insights

- Status of Reliability Maintenance FY2022:
 - As at **19 January 2022**, of the **84 outages** planned for FY2022, **33** have been completed, **9** are in execution, **2** are remaining and **12** have been deferred within the financial year while a further **28 outages** have been deferred to FY2023.
 - These outages include General Overhauls (86 days); Mini General Overhauls (70 days); Interim Repairs (30 – 50 days) and Opportunity Maintenance
- The main work impacting plant reliability and predictability is carried out during Mini-Overhauls and General Overhauls. There are on average 20 MGO's and GO's per annum for coal fired power stations
- There will be a 3-year lag period to have completed MGO's or GO's on the coal fleet units

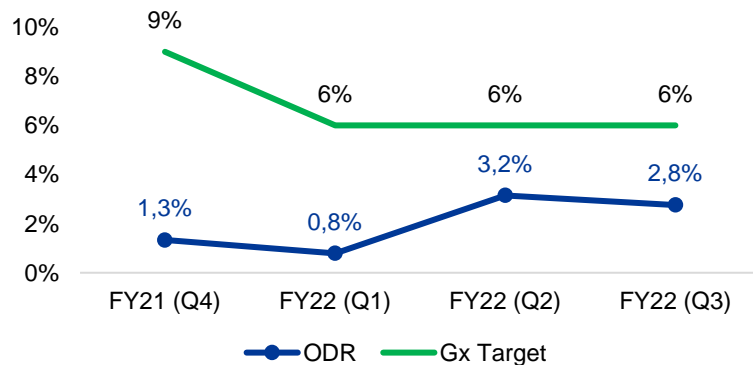
Generation Outage Performance



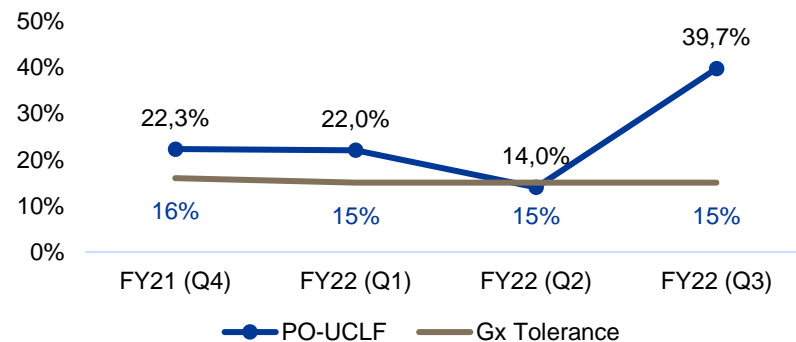
Due Date Performance



Outage Duration Reduction



Post-outage UCLF



Following the decline from about mid-year all the major assessment categories started to show improvement in the fourth quarter. The longer-term reviews started showing improvement as well, this could be related to the availability of funding. Remaining a concern is the contracts/procurement category, which also forms a large part of the T-03 review.

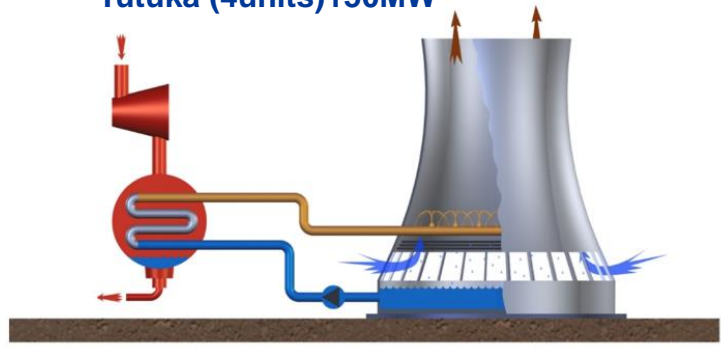
The maintenance backlog remains a substantial risk to performance

Maintenance issues cutting across multiple stations (deep dive on next slides)

- A. Vacuum issues at various power stations
- B. Late Control and Instrumentation Refurbishment projects
- C. Maintenance backlog in preventing Boiler Tube Leaks
- D. Overdue environmental projects
- E. Water Treatment Plants refurbishment projects

Vacuum related load losses:

- Matla 4 - 6 150MW
- Kriel 640MW
- Tutuka (4units)150MW



Stations affected: Tutuka, Kriel, Matla 4-6

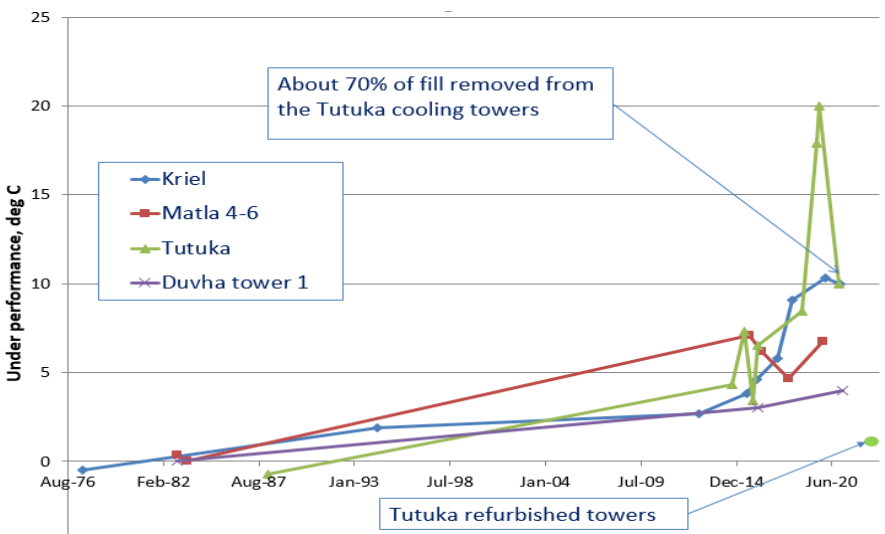
- Scaling/fouling affect Condensers and Cooling Towers Fill
- Suspended solids, e.g., ash, in CW accelerate fouling
- HP cleaning or chemical cleaning used during outages to clean condenser tubes
- Cooling tower fill fouling is irreversible, cannot be cleaned
- Result is load losses and unit trips due to vacuum

Projects to address poor vacuum:

- ### Tutuka:
- Investment approval in Feb 2022
 - Plan to start construction in 2023

- ### Kriel
- Contract awarded
 - All 4 towers planned to be completed: April 2023
 - **Risk:** Two unit operation on one tower during unit 6 Outage starting 28 Jan 2022

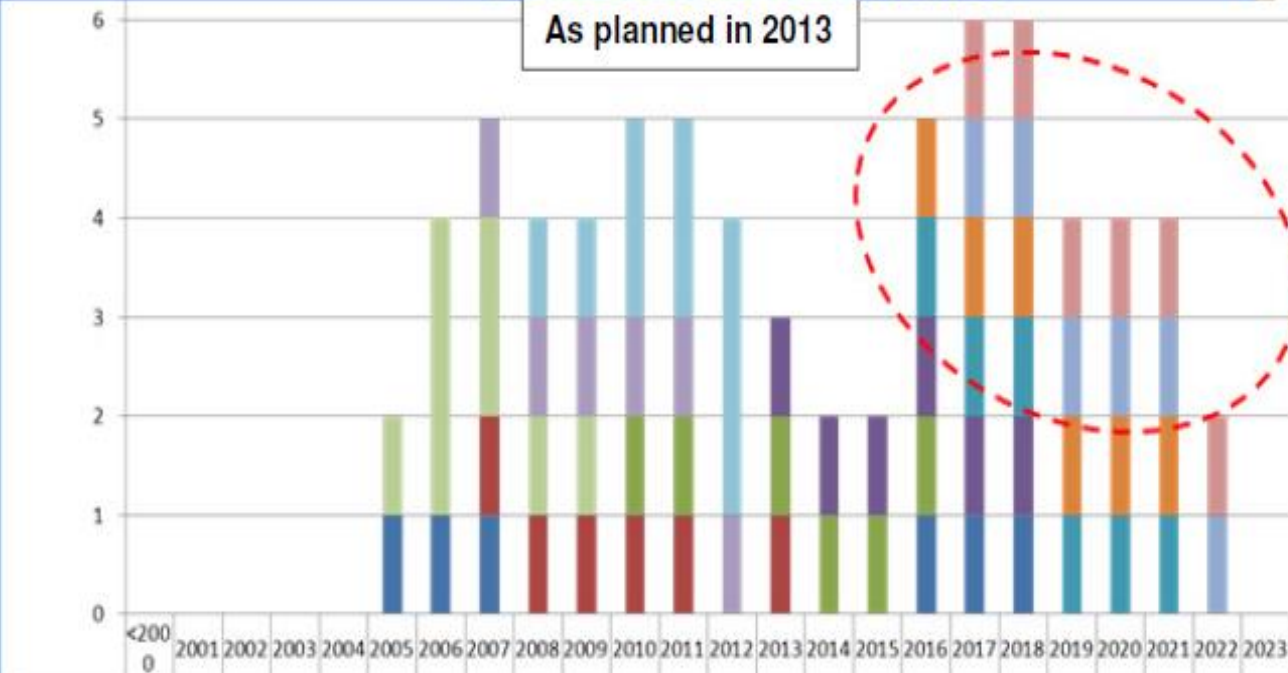
- ### Matla 4-6
- Contract awarded
 - All 3 cooling towers planned to be done in 2022



B Late Control and Instrumentation (C&I) refurbishments

C & I Refurbishments

As planned in 2013

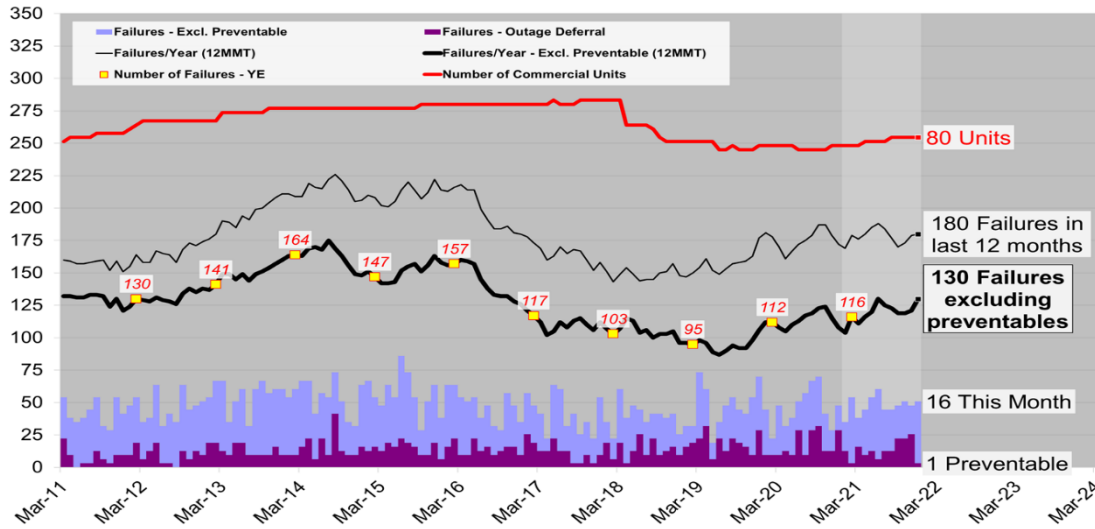


	<200	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Komat									1	1	2	2	3											
Grootvlei							1	1	1	1	1	1	1											
Camden					1	3	2	1	1															
Majuba																		1	1	1	1	1	1	1
Kendal																		1	1	1	1	1	1	1
Matimba																	1	1	1	1	1	1	1	1
Lethaba																	1	1	1	1	1	1	1	1
Duvha														1	1	1	1	1	1					
Matla											1	1		1	1	1	1							
Kriel							1	1	1	1	1	1		1										
Tutuka					1	1	1										1	1	1					

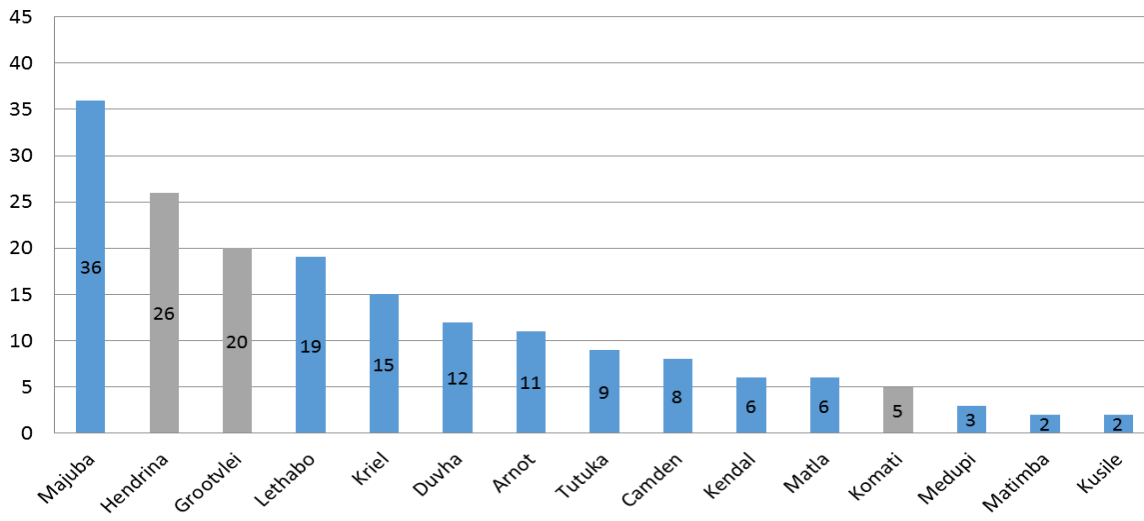
Key Insights:

- 2013 plans not executed
- Cross-lined – **not executed yet**
- Historically – if project is not funded (say at Concept), all development would stop
- 2016 – 2021 Peak shifting forward to 2022 – 2027
- Results of non-refurbishment:
 - Increased unit trips
 - Unreliable plant
 - Possible plant damage
 - Risk of long shutdowns

Generation Boiler Tube Failure Numbers



Total Number of failures (180 BTFs) in past 12 months



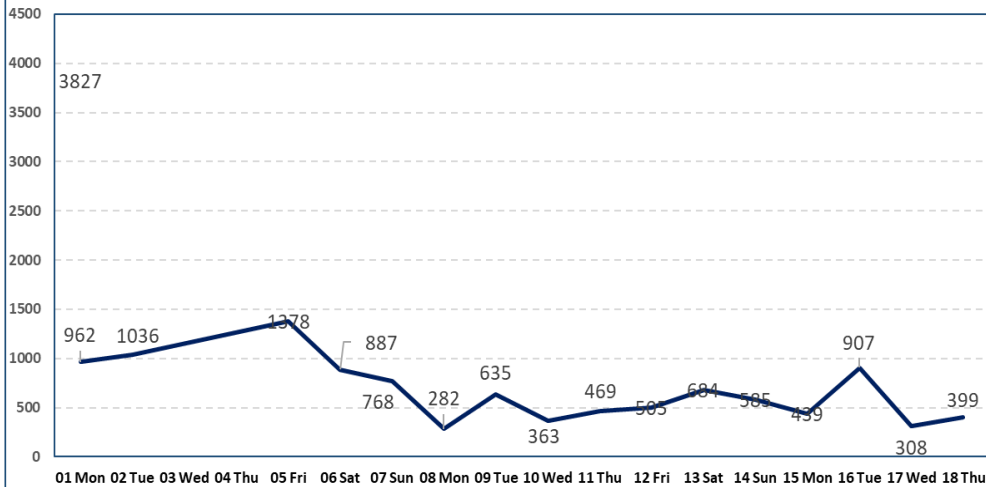
Key Insights:

- Maintenance backlog of 28% that resulted in 50 additional BTFs
 - HD (12), GV (9) & KM (3) contributed 24 BTF's (~48%) – exempted from BTRF program
 - Of the remaining 26 preventable BTF's - MJ (5), KR (6), KD (3), LT (3), DV (3), CD (3) & AR (2) contributes ~ 48%

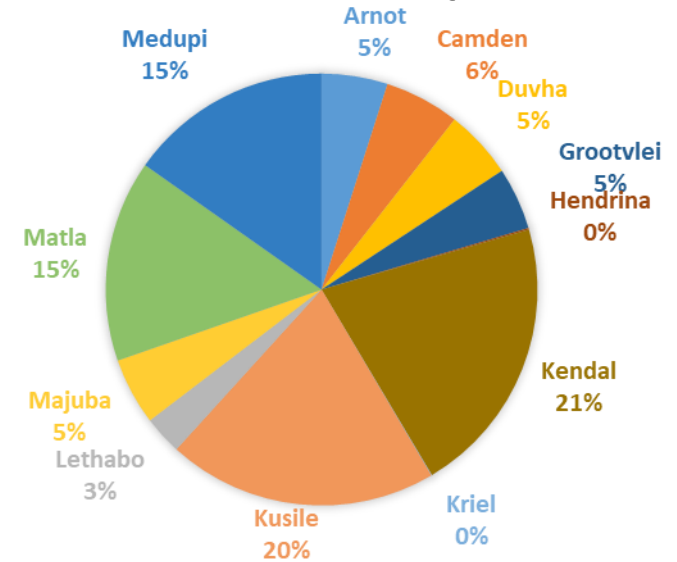
D Station contribution to emission load losses

MW loss November 2021 due to emissions

Gx Environmental Partial Load Losses - November 2021



GAS CLEANING UCLF (APR-SEP21) - PARTICULATES (1 304 334 MWH, 2.85% OF TOTAL GX UCLF)

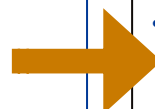


Key Insights

- Medupi and Kusile load losses due to design during construction.
- Kendal due to strike action in 2018, recovery is in progress but will only be resolved once remaining four units are refurbished, Matla, delay of retrofitting units 1 and 4, Lethabo refurbishment planned from 2022. Duvha High Frequency Power supply delayed, planned for 2022/23.

Status across the fleet:

	Chemical Indices (make-up water)	Demin availability %	Demin plant PM's	Refurbishment history	Spares availability%	WTP review Gap analysis	Overall rating	
KDL							5.7	Priority 1
DVH							5.3	Priority 1
MDP							5.0	Priority 1
TTK							4.7	Priority 2
LTB							4.3	Priority 2
KRL							4.3	Priority 2
ARN							4.3	Priority 2
GVL							4.3	Priority 2
MTL							4.3	Priority 2
MJB							4.0	Priority 2
CMD							3.3	Priority 3
MTB							3.3	Priority 3
HND							3.0	Priority 4
KSL							2.7	Priority 4
KMT							2.3	Priority 4



Key Insights

- The **majority of Demin Water Production Plants are in dire need of refurbishment**. Typical scope includes:
 - Ion exchange vessel repairs
 - Sump repairs / relining
 - Major pump and valve overhauls / replacement
 - Piping replacement / repairs
- These **systems are being run to failure and are falling apart**.
- **Refurbishment plans have been developed** for each station.
- **Refurbishment will ensure increased availability and reliability** of plant and equipment. It will also allow us to improve the performance of the plant, increase demin water production rate, improve demin water quality, and reduce risk to plant health.

YTD Act < YTD Tar	80%-100%	RBO PM'S In SAP; 90%-100% PM executed	Refurb in past 10 yrs & Insp in past 5 yrs; no failures	90%-100%	III-IV
YTD Act > YTD Tar	60%-80%	RBO PM'S In SAP; 76%-89% PM executed	Refurb in past 10 yrs OR Insp in past 5 yrs; no failures	76%-89%	II
	0%-60%	No RBO PM'S in SAP; 0%-75% PM executed	NO Refurb in past 10 yrs and NO Insp in past 5 yrs; had failures	0%-75%	I

- Detail Major Event Technical Investigation has been concluded
- Human error investigation has been completed
- The incident was caused by a hydrogen explosion resulting from mixing of hydrogen and air during the purging process
- The incident seems to indicate procedural non-compliance and management failures
- Corrective actions has been initiated
- Full time recovery manager has been appointed and recruitment of multi-disciplinary team has been initiated.
- The Property Damage Assessment phase of the damaged property is underway led by Eskom Rotek Industries (ERI) with Technical Support from the OEM: General Electric (GE).
- An insurance claim has been lodged and the Insurers have their appointed technical assessors who are working with Eskom and OEM Engineers to assess the damage
- Avenues are being explored to accelerate the recovery of the unit
- Twenty three (23) plant systems (non-damaged property) require preservation. Preservation is ongoing on some of the plant systems, however the pressure parts, headers, and feedwater heating systems require special preservation equipment which is currently being procured.
- This incident is being used as a case study to improve internal processes going forward

Kendal U1: Progress on recovery of Main Generator Transformer fire

At 03:36, 11 September 2021, Unit 1 Main Generator Transformer failed and caught fire

- The transformer unexpectedly failed and caught fire resulting in complete damage to the transformer and associated equipment
- The burning oil from the transformer flowed into the Main Cooling (MCW) ducting, burning cables that affected Units 2 and 3.

Progress

- Unit 2 and 3 burnt cables repaired and units returned to service on 14 September 2021 after incident
- Unit 1 scope of work was frozen on 14 October 2021
- Opportunity maintenance conducted during this period
- **Kendal unit 1 successfully returned to service on Monday 3rd January 2022** – all tests including the replaced generator transformer were successful

Preliminary investigation response:

- All requested investigation data captured and sent to Assurance and Forensics (Investigation in progress)
- Lessons learned from preliminary investigation have been shared with other power station personnel
- **Draft investigation report submitted to Kendal Management for review and comment;**
- Kendal Management providing support for information to be furnished to the Insurance Company to conclude the claim.




Enablers required for improved Generation performance

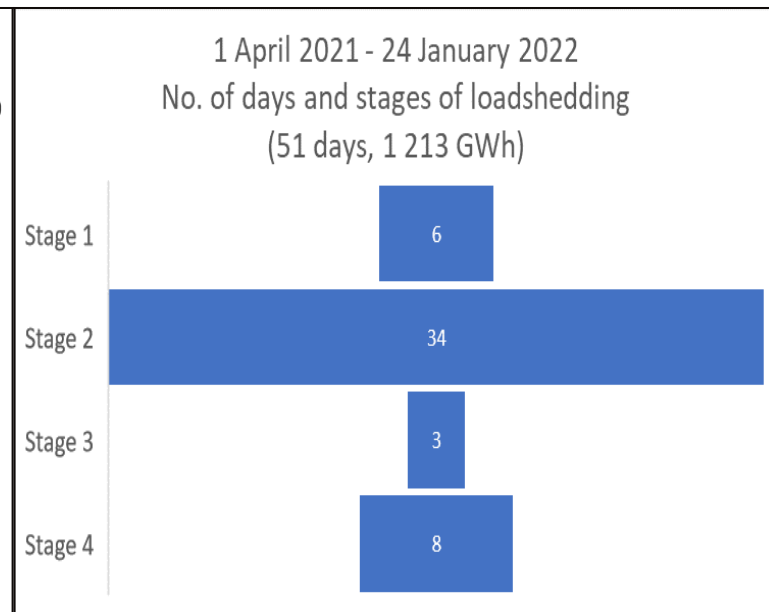
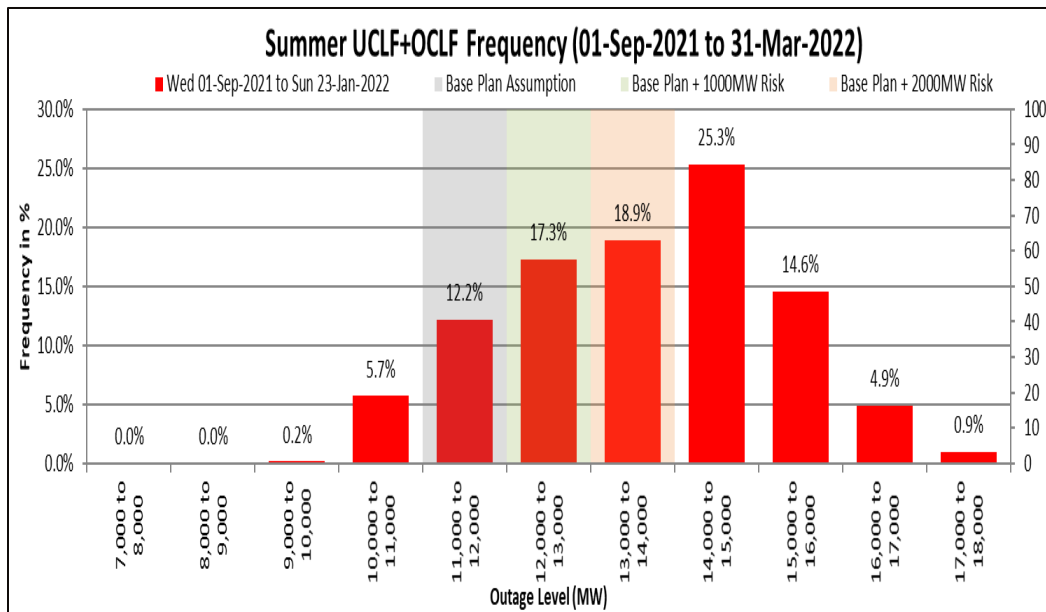
- Stable
- Internal focus
- Additional support required

Generation stays committed to drive progress through our improvement plans, however certain areas require more focus to enable improved performance

- Capable and knowledgeable contractors ● Internal focus
- Timeous and adequate outage funding ● Additional support required
- Space for planned maintenance ● Additional support required
 - Current shortfall of at least 4000MW
- Managing change in energy environment ● Internal focus
 - Station shut down plans, JET transition
- Reach mutual agreement on environmental statutory compliance requirements ● Additional support required
- Internal issues ● Internal focus
 - Skilled workforce
 - Turnaround of critical procurement
 - Disciplined execution - Planning and execution of routine maintenance and outages
 - Motivated workforce

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- 1 Performance Overview - COO
 - 2 Generation Overview – GE: Generation
 - 3 System Outlook: Jan 2022 – April 2022 GE: Transmission**

- The **majority of the coal power stations are operating past the midway (average 42 years) of their operational life**, resulting in high levels of breakdowns.
- The **drive to implement the reliability maintenance and refurbishment projects** in order to **address the unreliability** is under way to get the plant performance back to **acceptable levels**.
- The **public** is therefore **cautioned to expect an elevated risk of loadshedding while the Reliability Maintenance program is being implemented**.



Key Insights

Unplanned unavailability > 11GW for ~94% of the time during the summer period

Loadshedding occurs when:

- High demand periods coincide with high unplanned unavailability
- High unplanned unavailability for a prolonged period of time depletes emergency generation reserves

Total of 51 days of Loadshedding between 1 April 2021 to 24 January 2022 compared to 31 days of Loadshedding the previous year.

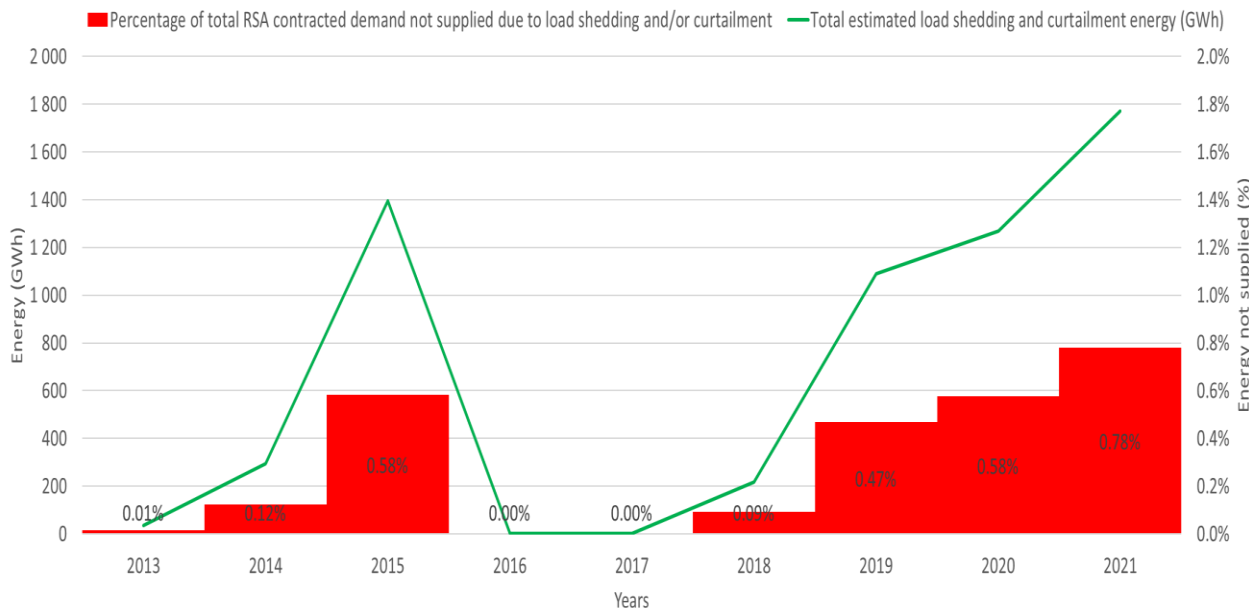
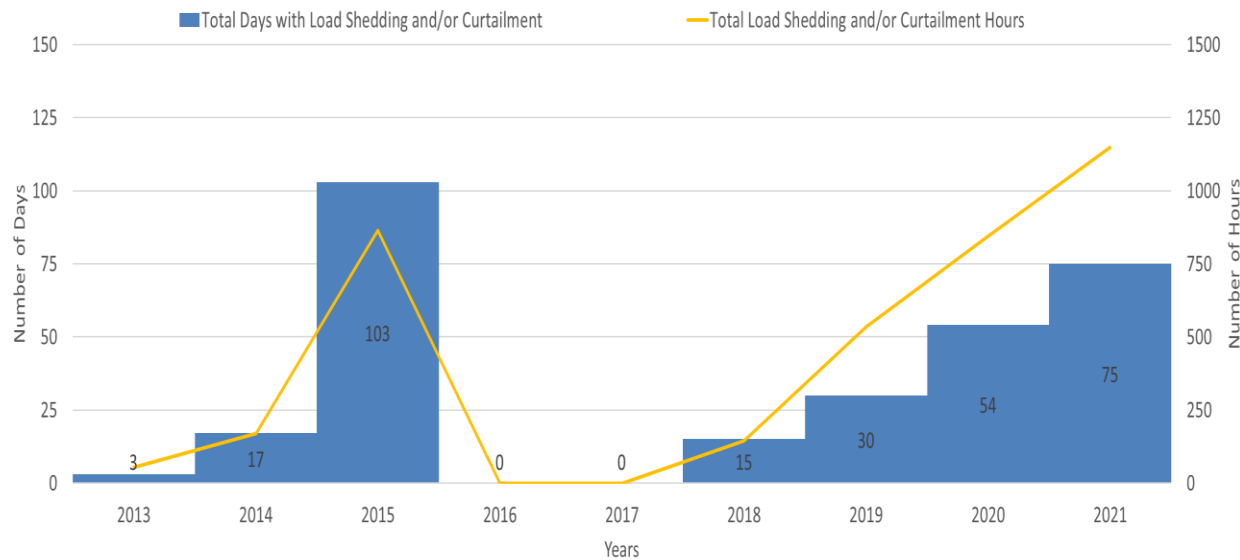
Total of 30 days of Loadshedding since 1 September 2021

UCLF+OCLF has been lower than the Summer Plan assumptions for 6% of the time while it has exceeded the assumptions for 46% of the time so far this summer.

Contributing factors

- Shortage of generation capacity;
- Increased *unplanned unavailability*;
- Increased planned maintenance;
- The need to conserve and replenish depleted *emergency resources*;
- *Poor coal* quality and compromised *emissions* performance.

Annual Load Shedding and Curtailment events (Calendar years)



Key insights

- The highest number of loadshedding incidents took place during 2015. These tended to be mostly over evening peak periods, for short duration, due to insufficient peaking generation capacity.
- In 2021 there were fewer loadshedding incidents, but the energy (GWh) shed was higher than in 2020 because of OCGT and pumped storage constraints.
- Many of the loadshedding incidents were necessary to replenish pumped storage dam levels overnight or over the weekend and ration diesel at the OCGT power stations while additional diesel was being delivered to these sites.
- 2021 had the highest number of loadshedding hours (1 150 hours) as well as the highest energy not supplied (1 773 GWh) to customers.
- This amounted to 0.78% of the energy required by customers not being supplied.

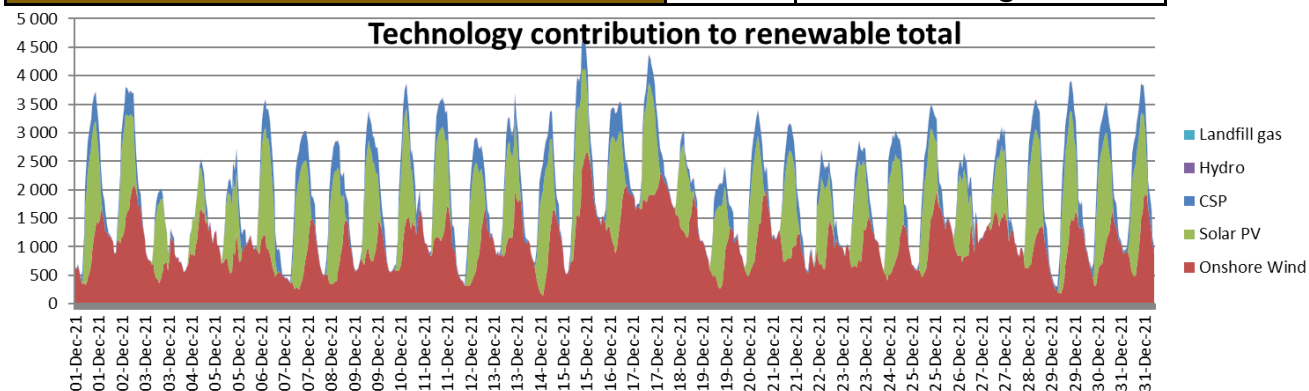
Renewable statistics

Current installed capacity (MW)	
CSP	500
PV	2 212
Wind	3 163
Total (including other renewable generation)	5 901

Maximum contribution (MW)		
CSP	505	30-Nov-2021 16:00
PV	2 100	24-Oct-2021 12:00
Wind	2 639	15-Dec-2021 17:00
Total	4 785	01-Nov-2021 13:00

Maximum % contribution towards hourly energy supplied		
Total	19.1%	01-Nov-2022 13:00

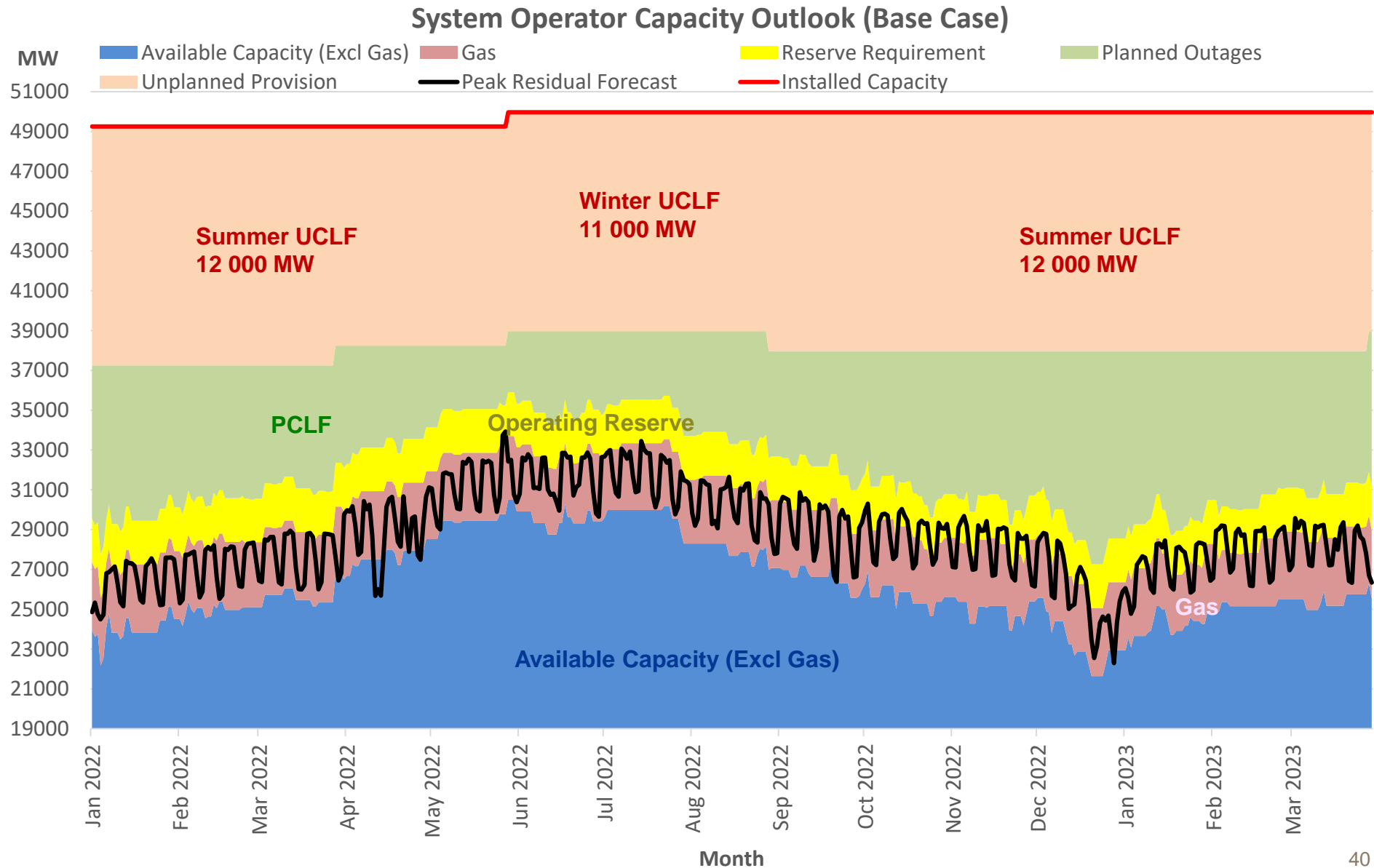
Maximum difference in 24 hours (MW) (evening peak to evening peak)		
Total	1 744	7 - 8 August 2021



Key insights

- The installed capacity of renewable generation continues to grow as more facilities are commissioned.
- Most days, renewable generation contributes more than 3 500 MW to the power system at midday.
- The highest peak demand of the day occurs after sunset and is supported by wind generation and to a lesser extent by CSP generation that has up to 6 hours of storage capacity.
- On 1 November 2021, at 13:00, 19% of the country's demand was supplied by renewable generation.
- In 2021, renewable generators supplied 6.7% of the contracted energy in the country.
- The variability of renewable generation over a 24-hour period requires conventional generation to be reduced or dispatched to compensate for the change in renewable generation output.
- The maximum variation recorded from one evening peak to the next evening peak was 1 744 MW, equivalent to three large coal fired generators.

System Operator Capacity Outlook for the next 18 Months (Base Case)



Outlook to 31 August 2022

Unplanned unavailability	Summer: 12 000 MW Winter: 11 000 MW	Summer: 13 000 MW Winter: 12 000 MW	Summer: 14 000 MW Winter: 13 000 MW
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Summer 2021/22 (24 January 2022 – 31 March 2022)

Number of LS days	0 days	2 days	29 days
Highest stage of LS	N/A	Stage 1	Stage 2
OCGT costs	R 0.5bn	R 1.7bn	R 4.1bn

Winter 2022 (1 April 2022 – 31 August 2022)

Number of LS days	0 days	5 days	61 days
Highest stage of LS	N/A	Stage 1	Stage 2
OCGT costs	R 0.8bn	R 1.8bn	R 3.4bn

Dramatic increase in load shedding days and OCGT cost for only 1 000 MW change in UCLF + OCLF

History has shown that it is not possible to use more than about R 1.2bn of diesel in a month due to the physical limitations of moving the diesel to the OCGT stations. Where the Plan shows a diesel usage greater than this, additional stages of load shedding should be expected

Summer: 1 September 2021 – 31 March 2022. UCLF+OCLF: 12 000 MW – 14 000 MW
 Winter: 1 April 2022 – 31 August 2022. UCLF+OCLF: 11 000 MW – 13 000 MW

Thank You

