

Generation Update on EAF NEDLAC Energy Security Workstream

GROUP EXECUTIVE GENERATIONS: Bheki Nxumalo

5th June 2023



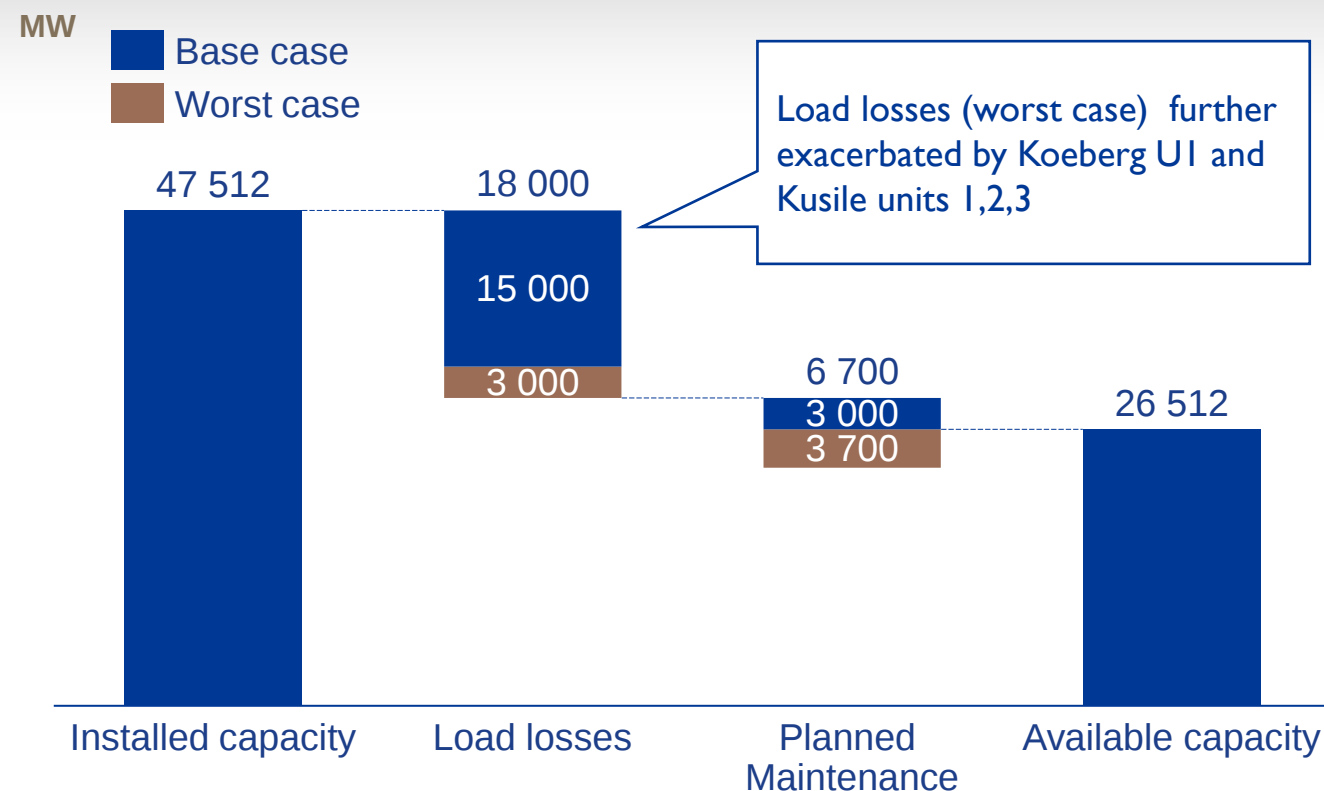
- Despite several positive developments to address Eskom's challenges, loadshedding has intensified with a devastating impact on our economy.
- The winter outlook indicates an increased risk of supply and demand shortfall, with our worst-case scenario indicating that loadshedding could intensify to stage 8, if our interventions are not successful.
- Generation's Energy Availability Factor (**EAF**) is currently sitting at **52%** against a **65% target**.
- The **increase in loadshedding levels does not mean there is a greater risk of a national blackout**, instead loadshedding is one of the processes we use to prevent such an occurrence.
- **Efforts to reduce and ultimately end loadshedding require us to work together** to drive interventions both on the supply side (improving available generation) and demand side (reducing peak demand)
- **Eskom is making effort to increase the amount of available generation**, with a specific focus over the winter period, by:
 - Reducing our unplanned losses in the generation fleet
 - Managing planned maintenance to the minimum level of maintenance required over winter
 - Increasing diesel burn at the open cycle gas turbines (OCGT) beyond our initial budget and what NERSA
- We are driving the **Generation Operational Recovery Programme with the support of our Board** to sustainably recover the performance of the plants over the next 24 months.
- **Leadership stability, skills interventions, partnering with industry and other Government departments** are some of the enablers we have put in place to ensure we succeed.

Despite several positive developments to address Eskom's challenges, loadshedding has intensified impacting the economy

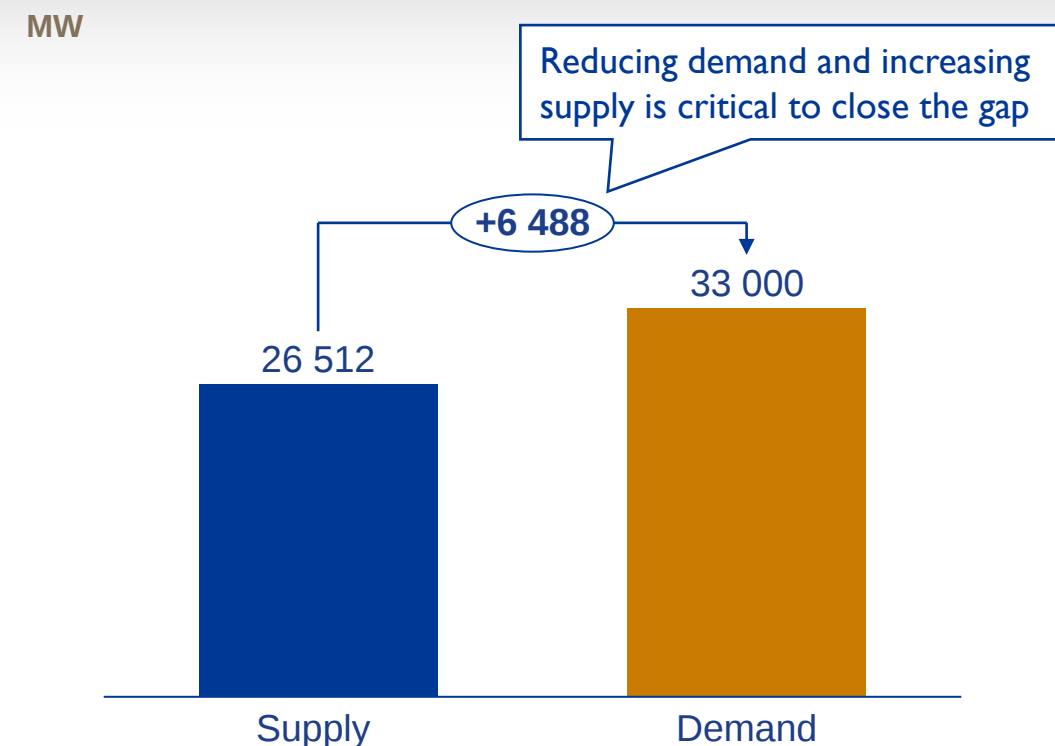
	Developments	Impact	
Establishment of NECOM, EAP and appointment of electricity Minister	Intergovernmental structure established, followed by the President's Energy Action Plan overseen by the Electricity Minister	✓	Impact 2022 experienced the highest levels of Loadshedding - Reduced Q3 real GDP growth by 2,1 percentage points - R300 bn cost to the economy ~ 5% of SA GDP lost in 2022
MES / air quality consultation panel	Independent advisory panel to assess impact of MES / air quality challenges and consider mitigations to security of supply	✓	
Positive developments in Eskom's financial challenges	NERSA determination with NT debt relief solution is a positive development towards a sustainable ESI	✓	
EAF deterioration	- EAF has deteriorated from target of 60% at the time and currently 52% - Load losses associated with Flue gas duct incident at Kusile and delays to Koeberg resulting in loss of ~ 3080 MW generation capacity	!	
Limited impact from sec 34 determination REIPP BW5&6, RMIPPP, etc.	- Developers experienced delays in reaching commercial close (global economic challenges) - 279.2 MW added since April 2022, - BW 5 and 6 anticipated to come online 2024 and 2025 respectively - Release of RFP for BW7 & Gas Programme highly dependent on available grid capacity	!	

The winter outlook indicates significant risk of demand and supply imbalance

Available supply based on winter outlook (Base case + 3000MW)



Available supply against forecast peak demand



- Unplanned load losses have deteriorated to ~16 000 MW, impacted by Kusile, 1-3, 5, Medupi U4, and Koeberg UI
- **Should load losses deteriorate to 18 000 MW (base case +3000) and the forecast peak demand materialise – this could result loadshedding beyond stage 6 driven by variance of ~4000MW in UCLF.**
- Efforts are underway to return units from outages, reduce partial load losses and maintain planned maintenance between 1300 - 3000 MW over the winter period
- Eskom will be **intensifying demand side management** and **increasing diesel production** to reduce the supply deficit within stage 6 loadshedding

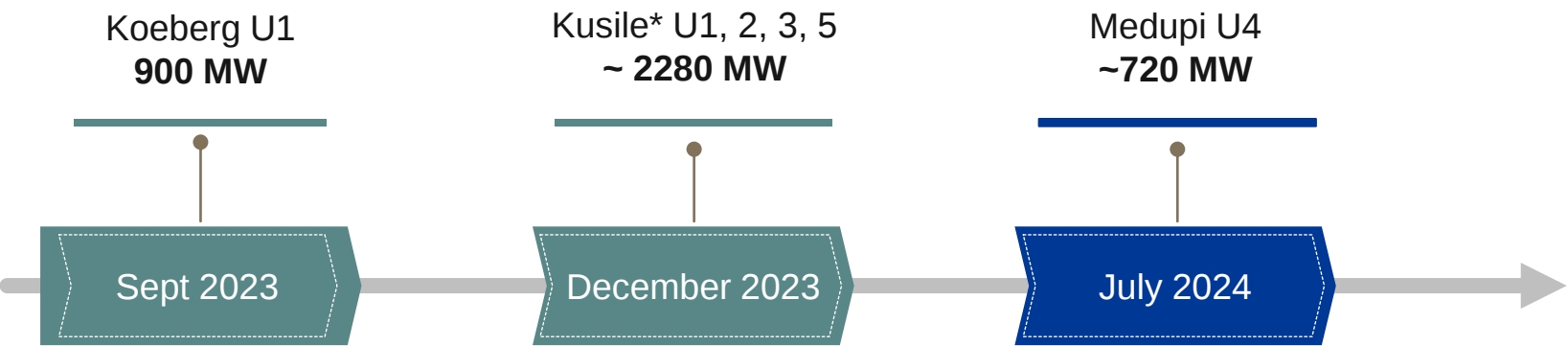
Multiple levers are being implemented to reduce address the performance issues over the winter period

Lever	Description	Potential impact for winter months	Comments
1 Reduce unplanned losses (UCLF)	- Returned Medupi U6, Lethabo U6, Tutuka U2&3 & Matla U6 from unplanned outages - Ensure UCLF reduces and is managed below 15000 MW - Addressing load losses at priority stations	~2000 MW	~6 000MW target over next 24 months - Enablers being implemented to ensure sustained recovery
2 Manage planned maintenance (PCLF)	- Maintaining maintenance between 1 300 MW & 3000 MW over winter with a focus on statutory maintenance - Between end of May 2023 until late June 2023 only three units will be on outage - Expediting return of units off load and address outage slips	~1700 - 3000 MW	Maintenance will be increased in the summer months when demand is lower
3 Increase diesel generators utilisation	- Increase the utilisation of Open Cycle Gas Turbines (OCGTs) to a 20% load factor for the winter period - Budget for diesel in FY2024 has been secured	~482 MW	20% load factor for the installed capacity of 2409 MW

The delivery against these levers will be managed through the Generation winter period that is intended to create a single-minded focus on reducing load losses in the shortest time possible to reduce the impact of loadshedding

1 We will return four Kusile units and Koeberg unit 1 before the end of 2023

Units on long term outage - return dates

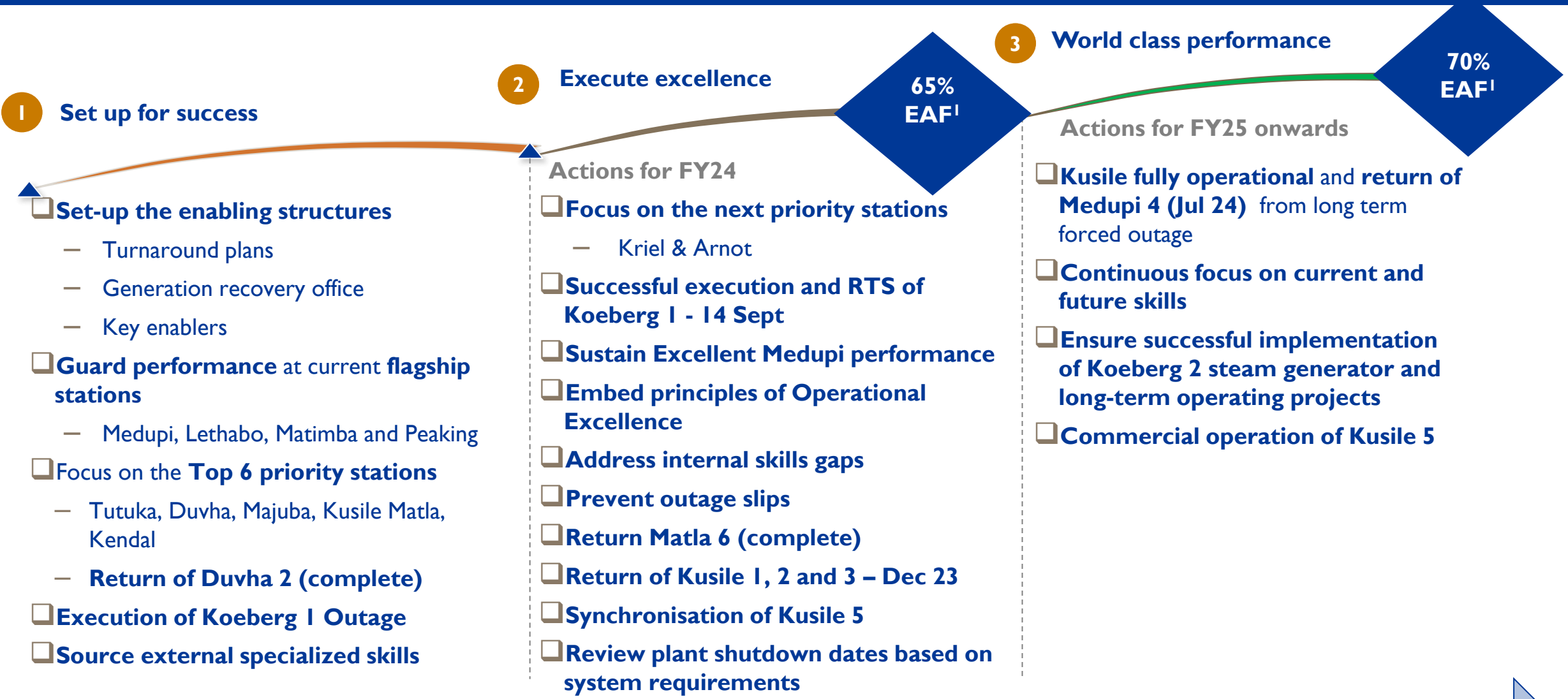


Key insights

- Due to the delays being experienced in replacing the steam generators at Koeberg U1, the commercial operation date is forecast to be September 2023
- Kusile U1, U2 and U3 will be operational by the end of December 2023 with the temporary stack but environmental exemption is required to operate at full capacity
- Kusile U5 will be synchronised to the grid by November 2023 and will provide 720MW
- Medupi U4 will be operational in July 2024 with the second-hand stator and the new stator will be operational in October 2025

Note: * Kusile U1, 2 and 3 output capacity limited to 520MW per unit due to environmental restrictions

The Generation Operational Recovery Programme is being implemented to sustainably recover the performance of the plants

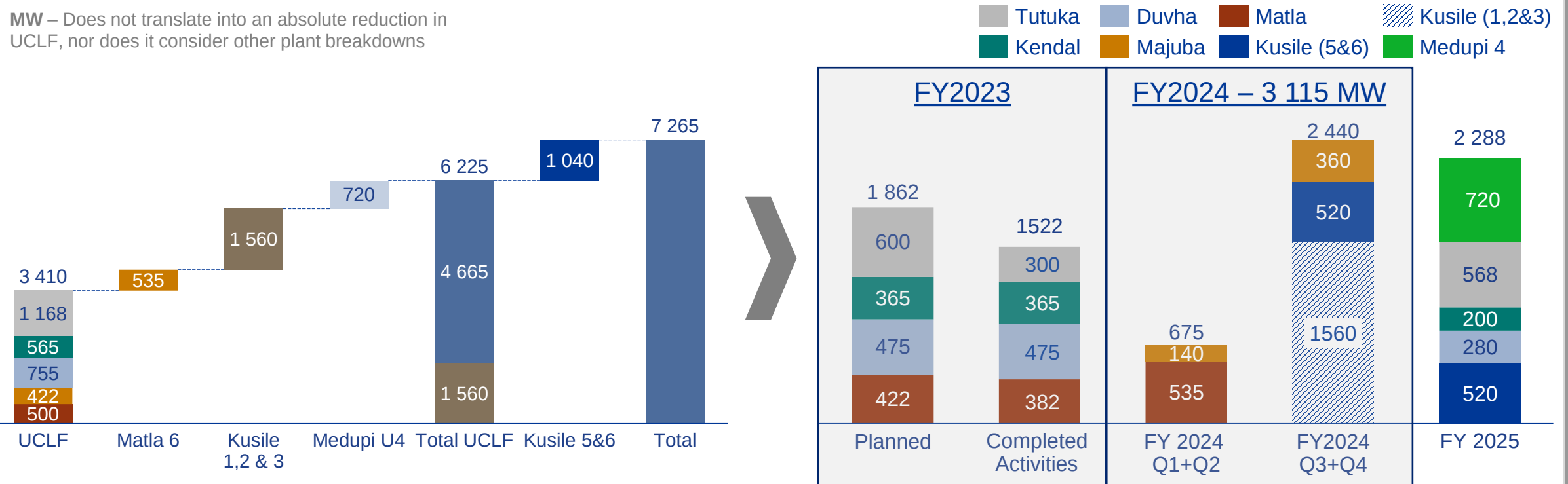


Continuous execution of Culture transformation and Strategic Levers as per the Generation recovery plan

Major capacity that has and can be recovered by Generation – FY'24 will target 3 115 MW with a system impact expected of 1 869 MW based on EAF of 60 %

Through the progress of last year 1 522 of 1 862 MW was recovered as per our plan

MW – Does not translate into an absolute reduction in UCLF, nor does it consider other plant breakdowns



- In FY2023, 1 522 MW was recovered. An additional 300 MW planned for last financial year from Tutuka 3 that was recovered in April 2023.
- The recovery of Kusile 1, 2, 3 with a design sent out of 2 160 MW is expected to only return 1 560 MW. The limitation is due to FGD.
- Kusile 5&6 will return with reduced sent out (520 MW), due to limitation on FGD plant
- Matla 6 recovery post fire incident.
- Majuba losses are spread over several recovery actions
- Medupi 4 return from long term forced Outage by 31 August 2024

Several enablers are being implemented to ensure that the Generation Recovery Programme is successful



Enablers and progress status	
	Management Interventions and progress
Leadership Stability	✓ Delayer and stabilise leadership team by closing critical vacancies ✓ Executive coaching and psychosocial support via EmpowerU intervention ✓ Prioritise Management Development, Technical training and authorisations
Critical Vacancies	✓ Closing critical vacancies through crowdsourcing and recruitment - focus on Engineering, Operating, Maintenance, Commissioning and Procurement ✓ Industry support on project management (Medupi U4 and Kusile recovery) and general technical support on valves, pumps, waste water recovery system, and coal conveyors
Maintenance & Inventory Management	✓ Prioritise insourcing of critical maintenance with labour support and limited outsourcing to credible service providers ✓ Establishment of inventory management and recovery team for turbine, boiler, and auxiliary plant
Government Support	✓ DPE minister initiative to leverage other SOE support - Engaging with Denel to leverage state capability on security and SAA on technical support for gas turbines ✓ Environmental exemption to allow for Kusile U1, U2 and U3 to operate at full capacity with temporary stack and for Hendrina, Grootvlei and Camden to operate until system is stable ✓ Support Eskom's participation in clean energy investments to support RE growth, e.g. gas and pumped hydro storage schemes



Transmission Grid - Capacity Considerations (LTC) NEDLAC Energy Security Workstream

SENIOR MANAGER GRID PLANNING: Ronald Marais

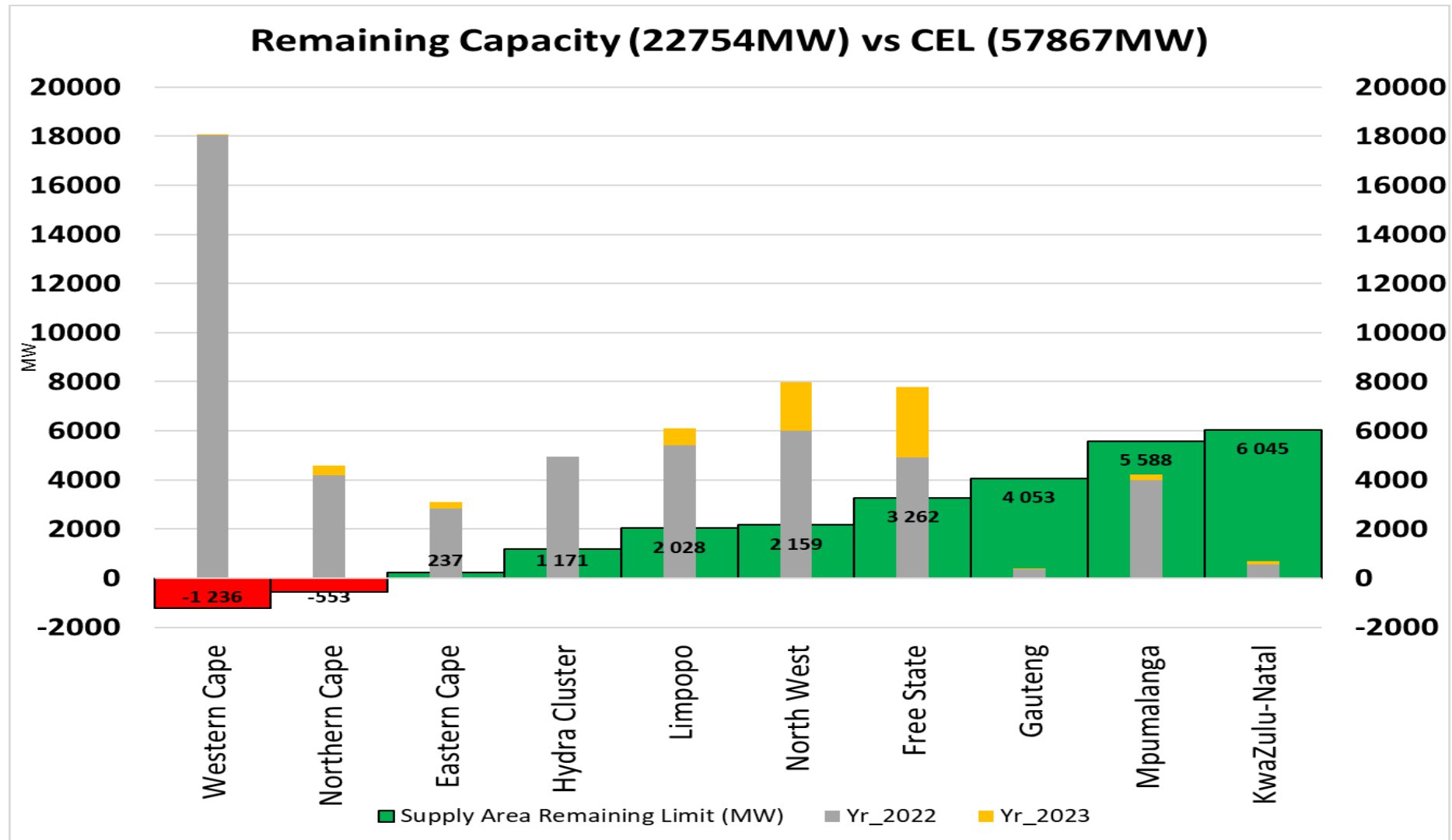
5th June 2023



GCCA – 2024 post Budget Quotations (BQ's)

Capacity vs CEL (interest)

Valid CEL 2022 and 2023



Maximising “existing” grid capacity

- Can’t be done on individual basis and assessments.
- Curtailment is an option to maximise use of the grid and increase generation connection capacity. Requires time series assessments to quantify the risks and periods of possible curtailment.
- Battery storage can reduce grid congestion during peak generation periods.
- Dynamic line rating – in areas where there are thermal constraints, however these are limited in areas of high interest.
- Replace terminal equipment on transmission lines if they limit capacity.

Local connection capacity

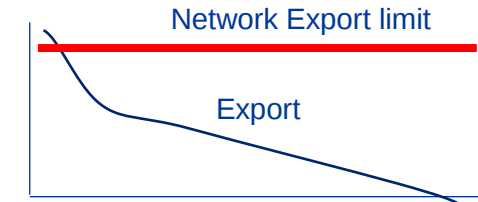
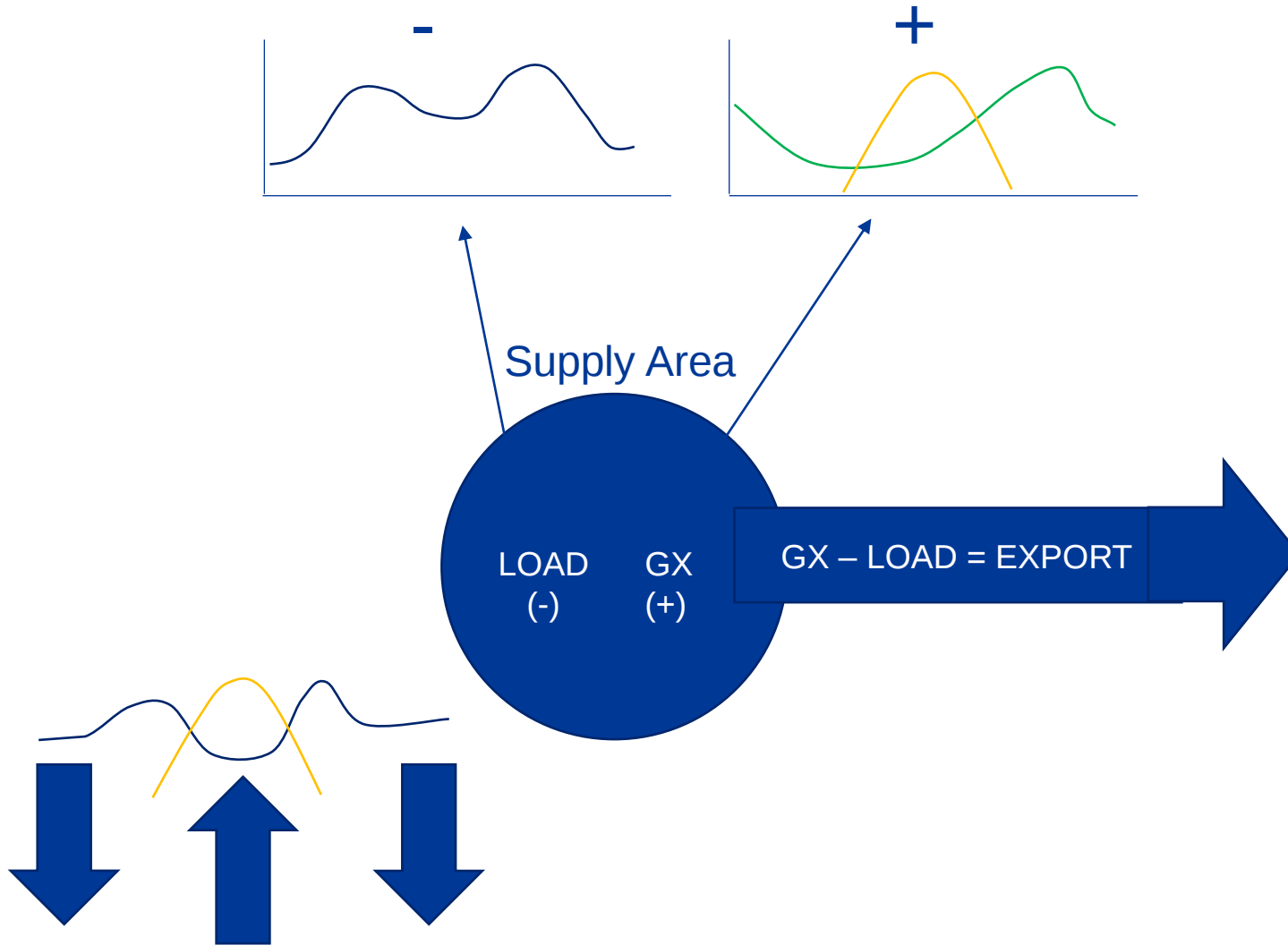
- Accelerate local substation expansions for additional transformers in areas where grid capacity exists and where RE interest is high.
- Replace equipment, where possible, that limits local capacity.

Major corridor expansions

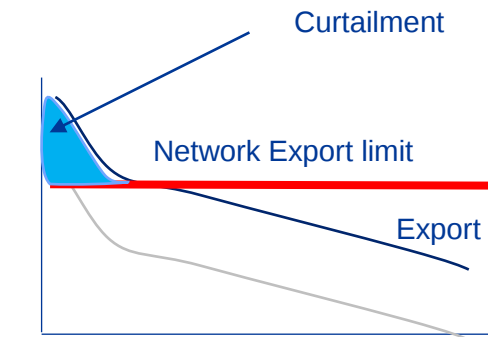
- Success in expropriation
- Prioritisation of the Transmission strengthening within Eskom
- Grid supporting equipment – such as synchronous condensers
- Self-build and PPP opportunities

Need for new approaches to connection application assessments to accelerate connection, capacity and strengthening.

Need to increase generation connection capacity with curtailment lever



Export is limited by the size of the network transfer capacity

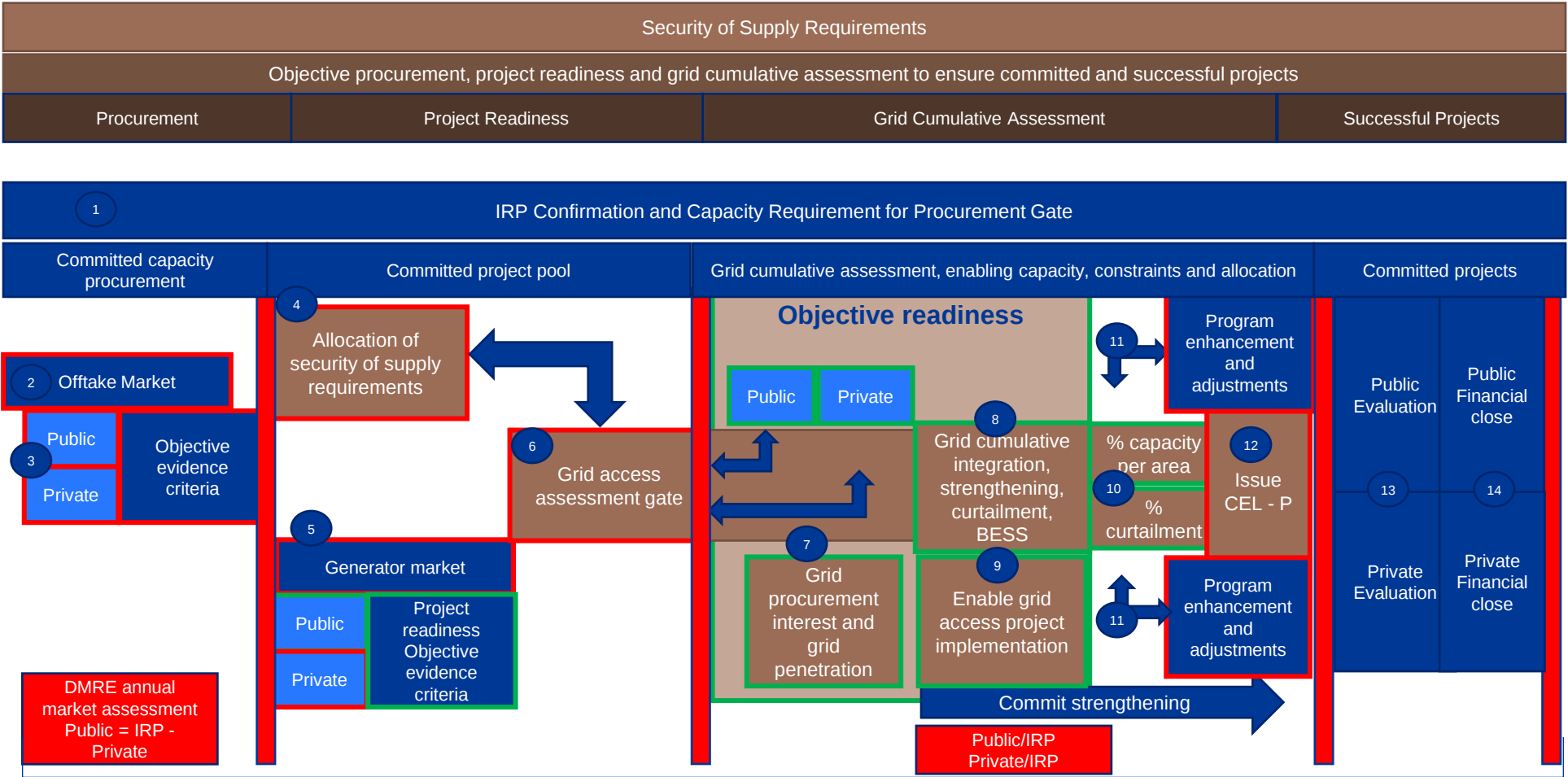


Increase generation connection with curtailment and still respect network export limits

Suggested work in Progress on a 'A Concept Framework'

Accumulation of grid applications and assessment gate

Concept Framework



Eskom System Briefing
NEDLAC Energy Security Workstream

GENERAL MANAGER SYSTEM OPERATIONS; Isabel Fick

5th June 2023



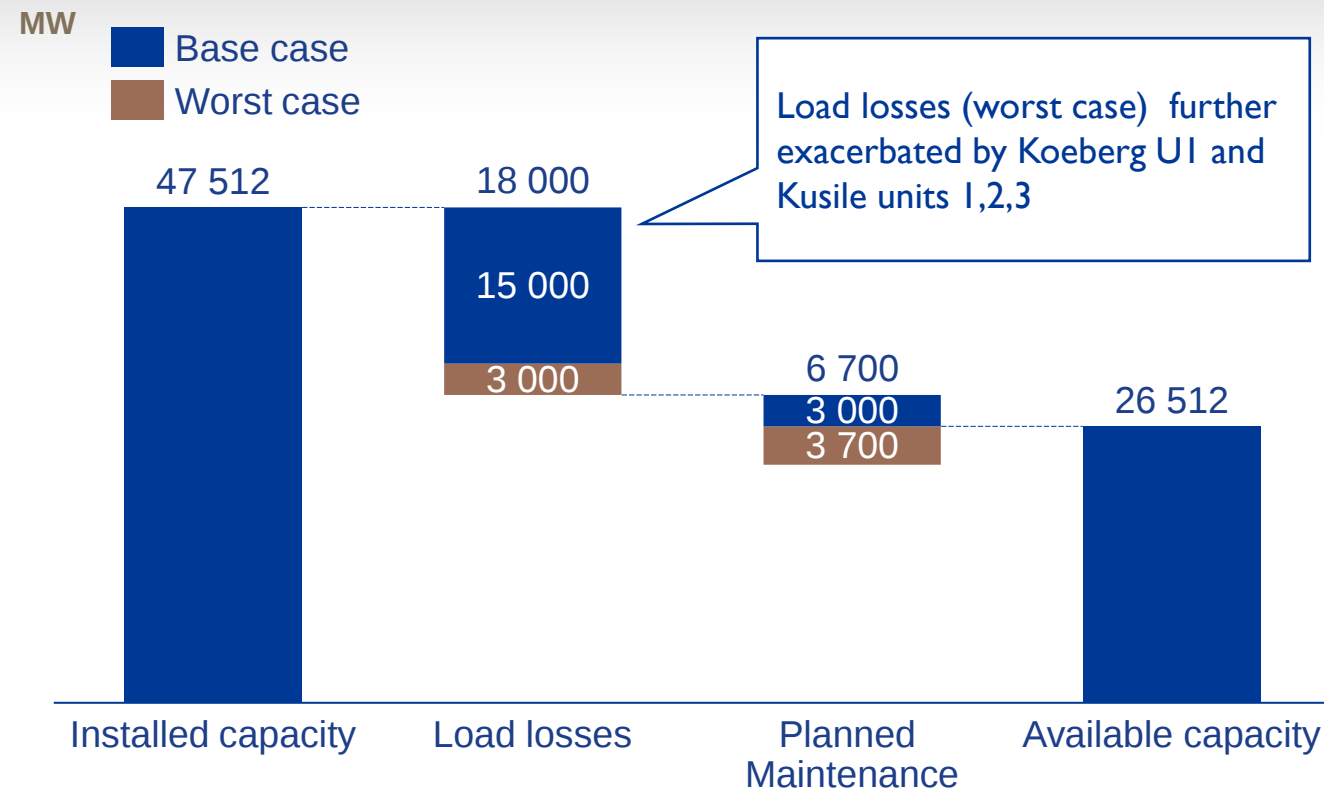
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- The winter outlook indicates an **increased risk of supply shortfall against expected demand**, with our worst-case scenario indicating that loadshedding could intensify to stage 8, if our interventions are not successful.
- The **increase in loadshedding levels does not mean there is a greater risk of a national blackout**, instead loadshedding is one of the processes we use to prevent such an occurrence by managing the demand for electricity at a given time.
- **Efforts to reduce and ultimately end loadshedding require us to work together** to drive interventions both on the supply side (improving available generation) and demand side (reducing peak demand)
- **Eskom remains committed to increase the amount of available generation**, with a specific focus over the winter period, by:
 - Reducing our unplanned losses in the generation fleet
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 - Increasing diesel burn at the open cycle gas turbines (OCGT)
- We are driving the **Generation Operational Recovery Programme with the support of our Board** to sustainably recover the performance of the plants over the next 24 months.
- **Leadership stability, skills interventions, partnering with industry and other Government departments** are some of the enablers we have put in place to ensure we succeed.
- Despite all these efforts, **more needs to be done to reduce the level of electricity demand specifically during the peak**. We believe **the public can greatly support efforts to mitigate impact of the energy crisis** especially over the winter period

Despite several positive developments to address Eskom's challenges, loadshedding has intensified impacting the economy

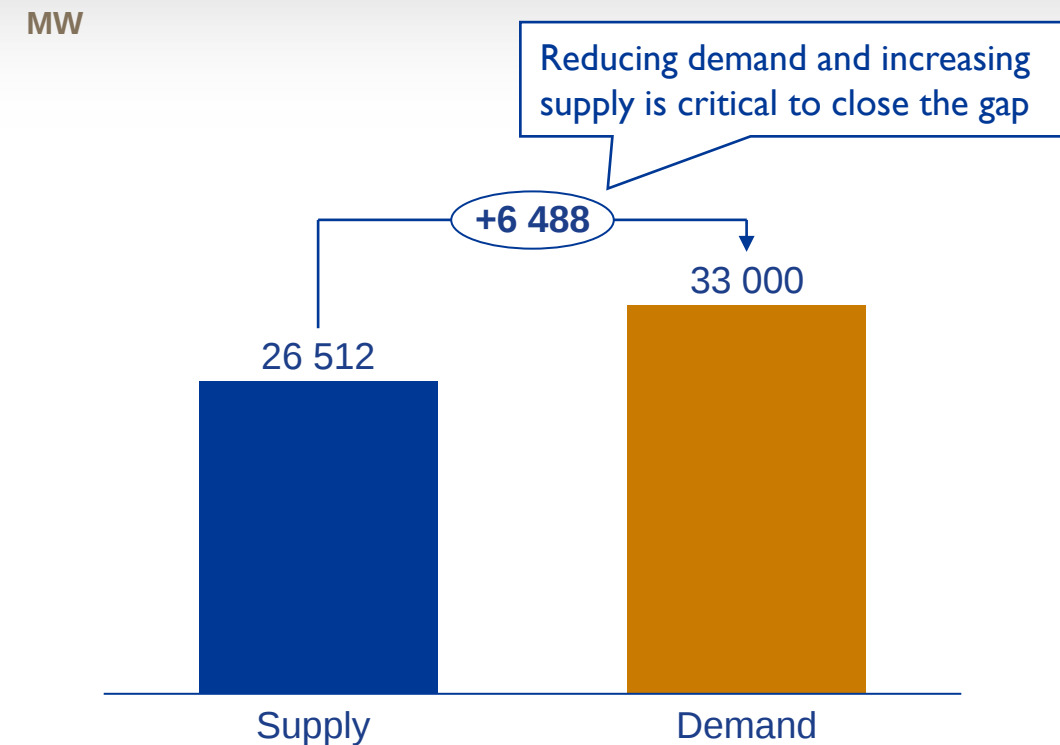
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The winter outlook indicates significant risk of demand and supply imbalance

Available supply based on winter outlook (Base case + 3000MW)



Available supply against forecast peak demand



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Winter period comparison between 2022 and 2023 shows a net reduction in Capacity ~3000MW over winter

Capacity



Demand

Decrease of 3080 MW due to unavailability of Kusile 1,2,3, and Koeberg 1



Demand in winter 2023 is expected to be similar to 2022 at around 34 000 MW

Planned maintenance reduced over Winter to range of 1300MW - 3000MW, however same principle between 2022 and 2023



151 MW increase in Demand Response (DR) from April 2022 to April 2023

IPP of 75 MW has been added to the grid and a 100MW Standard Offer participant has signed to deliver by winter



DSM is 57 Mw higher in April 2023 than in April 2022

290 MW from the Emergency Generator Programme is expected during winter 2023



Power alert delivers up to 270 MW at peak, but is mature and not expected to increase

The scenarios of the winter outlook indicate loadshedding could intensify to stage 8 if our interventions are not effective



Winter 2023 – 1 April -31 August (153 days)

Scenarios		Base case: 15 000 MW UCLF		Base case +1500MW : 16 500 MW UCLF		Base case + 3000 MW 18 000 MW UCLF	
Number of LS days OCGT costs		122 Days R 12.1bn		152 Days R 12.5bn		153 Days R 12.5bn	
Highest stage of LS		Stage 5		Stage 6		Stage 8	
Month	Peak residual forecast	Load reduction days	Max load reduction stage	Load reduction days	Max load reduction stage	Load reduction days	Max load reduction stage
May	32 499	27	5	31	6	31	7
June	32 572	18	3	30	6	30	7
July	32 378	28	5	31	6	31	8
August	31 413	28	5	31	6	31	8

If unplanned outages average **18000MW** for the winter period, load shedding will be required **everyday** and will be implemented up to stage 8

Risks & uncertainty with regards to System Operators winter outlook



Load shedding is implemented to maintain the stability of the national power system. Schedules are available up to Stage 8 load shedding so that it can be implemented in a controlled way to ensure that the required operating reserves are maintained. Beyond stage 8 SO will determine the amount of MW to be reduced per area



The winter outlook is “tight” and any significant outage slips will have a knock-on effect that will influence the plan from that point forward.



The winter outlook does not cater for difficulties that could arise at power stations due to industrial action or other protests.



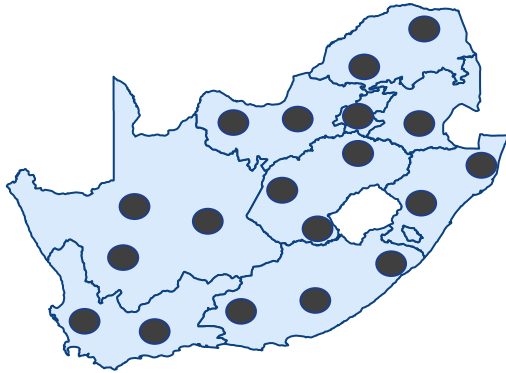
There is a $\pm 2\,000$ MW variance in UCLF (4 000 MW). This is often the variance in one week (168 hours). This cannot be predicted and makes planning uncertain. Trend analysis suggests that this variance could increase to $\pm 4\,000$ MW by the end of the outlook period (March 2024)



The unavailability of Kusile units 1, 2 & 3 as well as Koeberg Unit 1 has removed 3 080 MW of Capacity from the power system for winter 2023. This is equivalent to 3 stages of load shedding.

Increased loadshedding does not mean greater risk of a national blackout

Increased loadshedding



- **Controlled reduction** of electricity demand to match supply
- **Scheduled** ahead of time, **sequenced** for specific areas
- **Proactively managed** through a **well established process** from the national control



National blackout



- **Uncontrolled loss of energy** in the entire power system
- **Multiple systems would have to fail** at the same time for a black out to occur
- Generally, occur as a **result of cascading tripping of critical transmission lines**, possibly caused by **significant weather events** (tornadoes, storms)

Loadshedding does not increase the risk of a national blackout
Loadshedding is implemented to prevent a national blackout

Multiple levers are being implemented to reduce the level of loadshedding

Lever	Description	Potential impact for winter months	Comments
1 Reduce unplanned losses (UCLF)	- Returned Medupi U6, Lethabo U6, Tutuka U2&3 & Matla U6 from unplanned outages - Ensure UCLF reduces and is managed below 15000 MW - Addressing load losses at priority stations	~2000 MW	~6 000MW target over next 24 months - Enablers being implemented to ensure sustained recovery
2 Manage planned maintenance (PCLF)	- Maintaining maintenance between 1 300 MW & 3000 MW over winter with a focus on statutory maintenance - Between end of May 2023 until late June 2023 only three units will be on outage - Expediting return of units off load and address outage slips	~1700 - 3000 MW	Maintenance will be increased in the summer months when demand is lower
3 Increase diesel generators utilisation	- Increase the utilisation of Open Cycle Gas Turbines (OCGTs) to a 20% load factor for the winter period - Budget for diesel in FY2024 has been secured	~482 MW	20% load factor for the installed capacity of 2409 MW
4 Drive Demand Side Management (DSM)	- Fast-track the COUNTRY initiatives to encourage the management of consumption and demand initiatives to incentivize customers to add to the existing base of Demand Management Programs of 4.5 GW. - Demand Response of through the recently launched Distribution Demand Management Programme (DDMP) by Eskom in partnership with municipalities	~740 MW	- Aggressive Media Campaign "Use What you need" - Energy losses radio campaign currently flighted on National and Regional stations

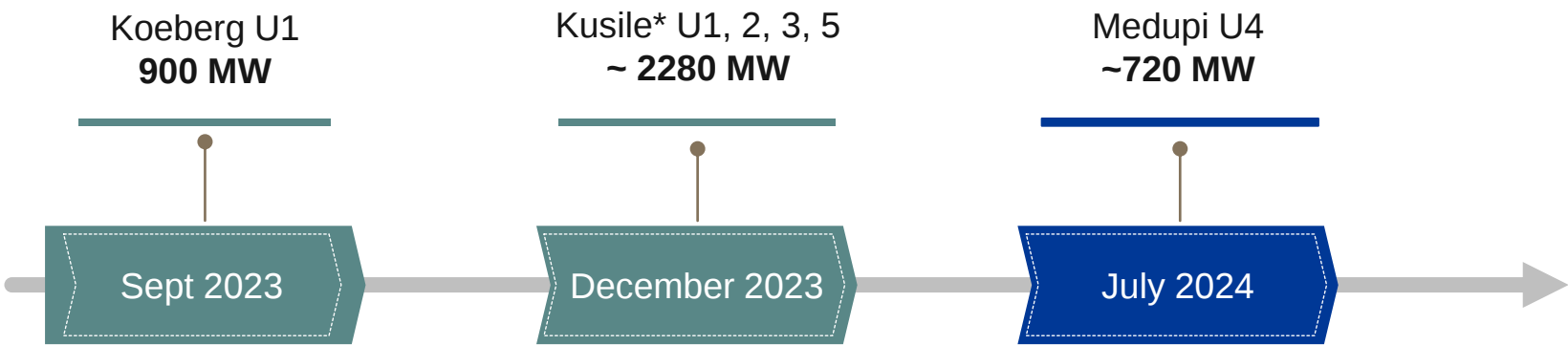
The delivery against these levers will be managed through the Generation winter period that is intended to create a single-minded focus on reducing load losses in the shortest time possible to reduce the impact of loadshedding

1

We will return four Kusile units and Koeberg unit I before the end of 2023



Units on long term outage - return dates

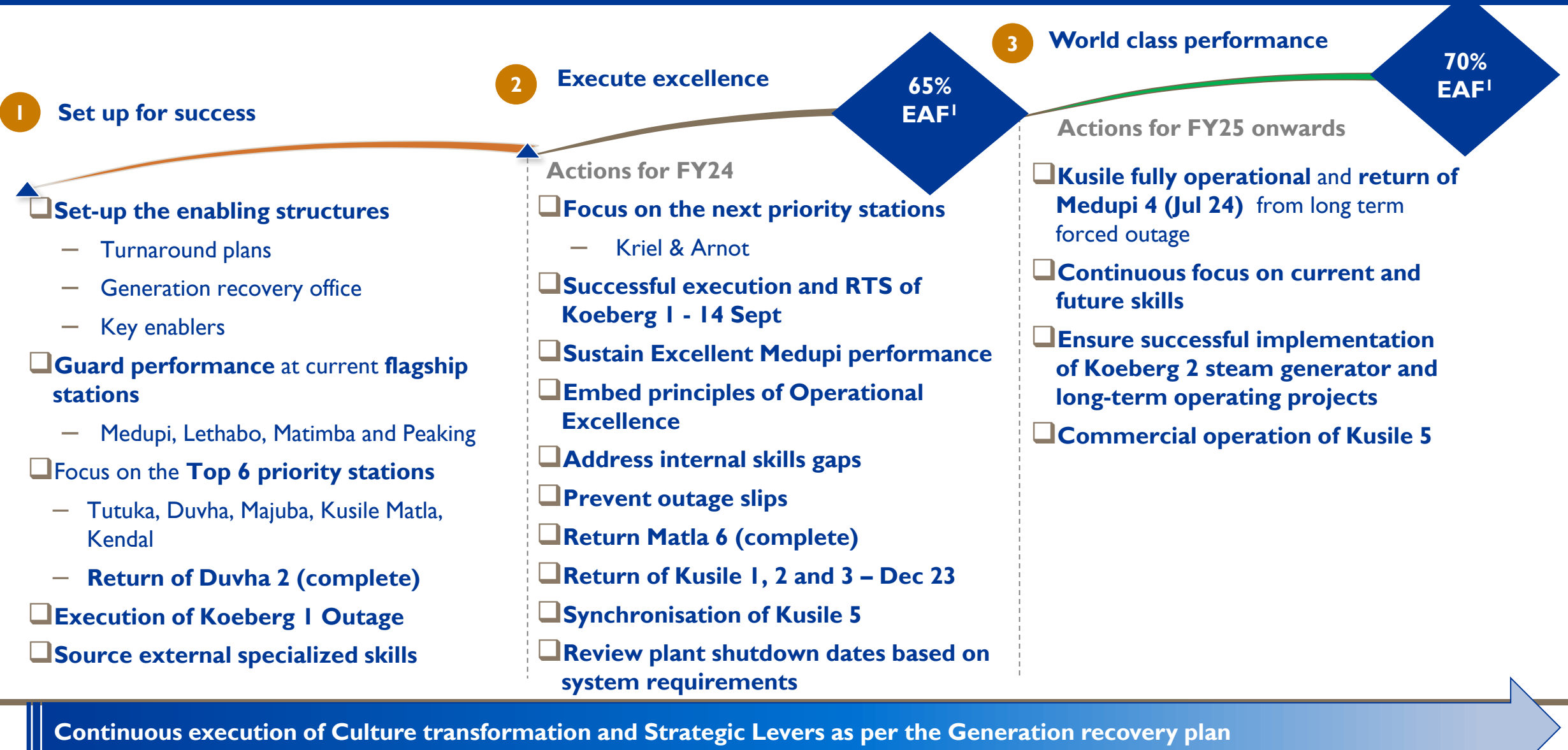


Key insights

- Due to the delays being experienced in replacing the steam generators at Koeberg U1, the commercial operation date is forecast to be September 2023
- Kusile U1, U2 and U3 will be operational by the end of December 2023 with the temporary stack but environmental exemption is required to operate at full capacity
- Kusile U5 will be synchronised to the grid by November 2023 and will provide 720MW
- Medupi U4 will be operational in July 2024 with the second-hand stator and the new stator will be operational in October 2025

Note: * Kusile U1, 2 and 3 output capacity limited to 520MW per unit due to environmental restrictions

The Generation Operational Recovery Programme is being implemented to sustainably recover the performance of the plants



Several enablers are being implemented to ensure that the Generation Recovery Programme is successful

Enablers and progress status

Management Interventions and progress

Leadership Stability

- ✓ **Delay and stabilise leadership team by closing critical vacancies**
- ✓ **Executive coaching and psychosocial support via EmpowerU intervention**
- ✓ **Prioritise Management Development, Technical training and authorisations**

Critical Vacancies

- ✓ **Closing critical vacancies through crowdsourcing and recruitment - focus on Engineering, Operating, Maintenance, Commissioning and Procurement**
- ✓ **Industry support on project management (Medupi U4 and Kusile recovery) and general technical support on valves, pumps, waste water recovery system, and coal conveyors**

Maintenance & Inventory Management

- ✓ **Prioritise insourcing of critical maintenance with labour support and limited outsourcing to credible service providers**
- ✓ **Establishment of inventory management and recovery team for turbine, boiler, and auxiliary plant**

Government Support

- ✓ **DPE minister initiative to leverage other SOE support - Engaging with Denel to leverage state capability on security and SAA on technical support for gas turbines**
- ✓ **Environmental exemption to allow for Kusile U1, U2 and U3 to operate at full capacity with temporary stack and for Hendrina, Grootvlei and Camden to operate until system is stable**
- ✓ **Support Eskom's participation in clean energy investments to support RE growth, e.g. gas and pumped hydro storage schemes**



CALL TO ACTION for WINTER: Protect our electricity supply – we can reduce stages if we do our bit



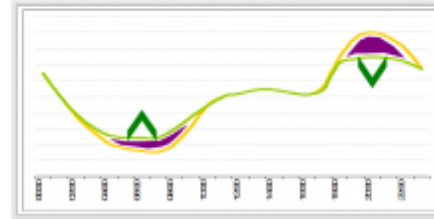
1 What have we done...

1. Eskom has **ACHIEVED 4500 MW** (Demand programs)
2. Eskom launched a **national incentive program targeting 1450MW over 3 years**
3. **SMART** metering is being **deployed** (>300 000) – customer support required
4. Aggressive Media campaign for a **CALL TO ACTION**
5. We have **implemented** a number of **pilots across various sectors**

2 What are we doing...

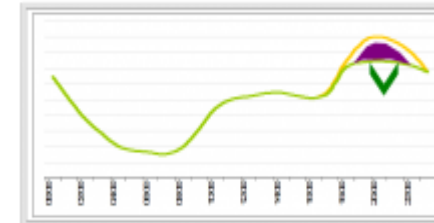
Program 1:

Load Management Programme (LM)



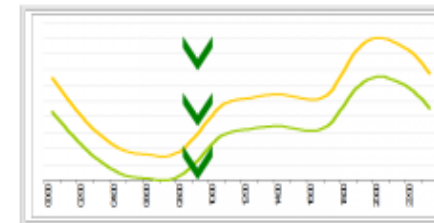
Program 2:

Residential Load Management (RLM)



Program 3:

Energy Efficiency (EE) Programme



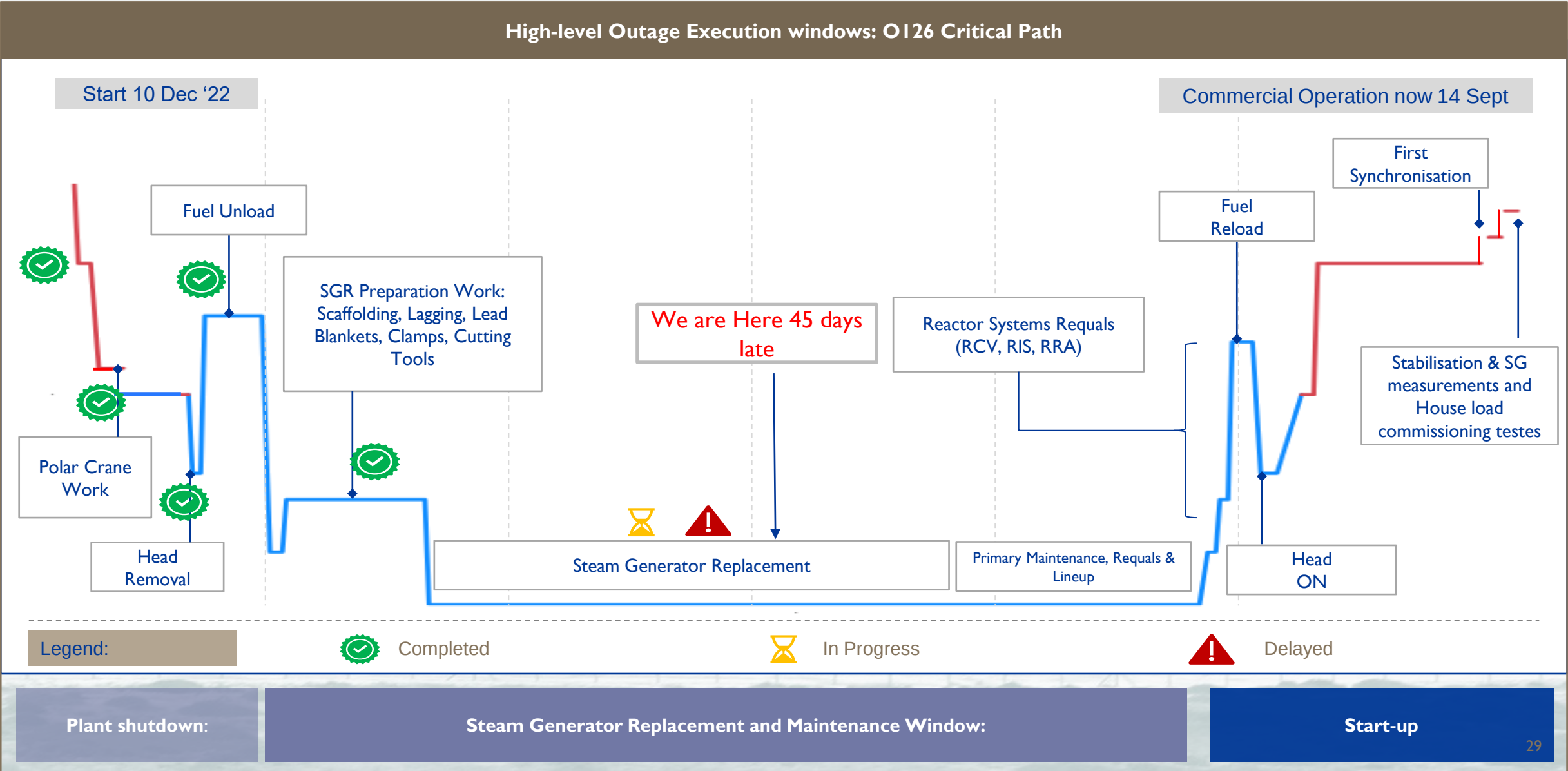
3 What can you do....

How can you help to reduce loadshedding:

1. **Use only the electricity you need**
2. **Switch off** what is not needed
3. **Protect the electrical infrastructure** in your area
4. **Stop the Izinyoka** – they leave you in darkness
5. **Pay and be legal**
6. **Delay charging** should be implemented for **inverter systems**

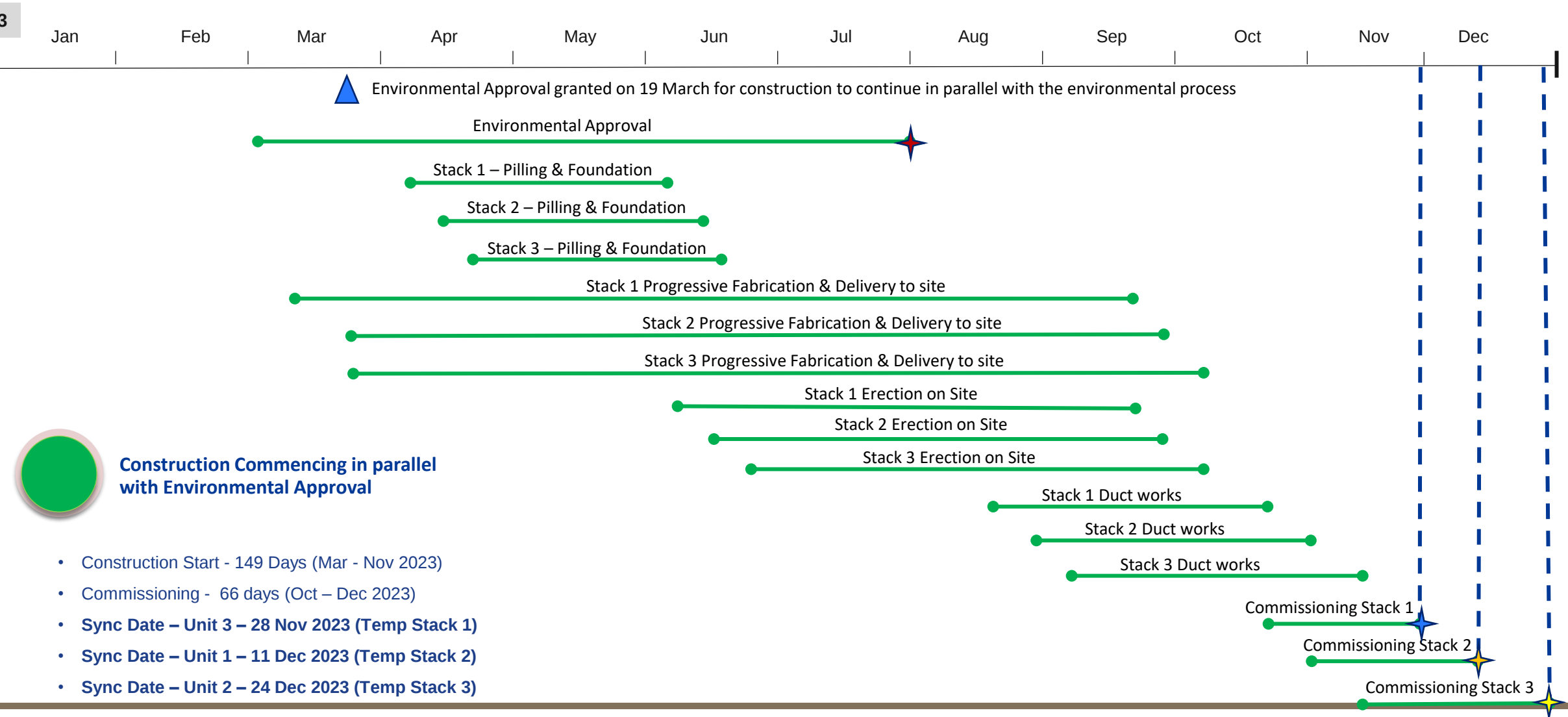


Replacement of the Koeberg Unit 1 Steam Generation is underway, though experiencing delays



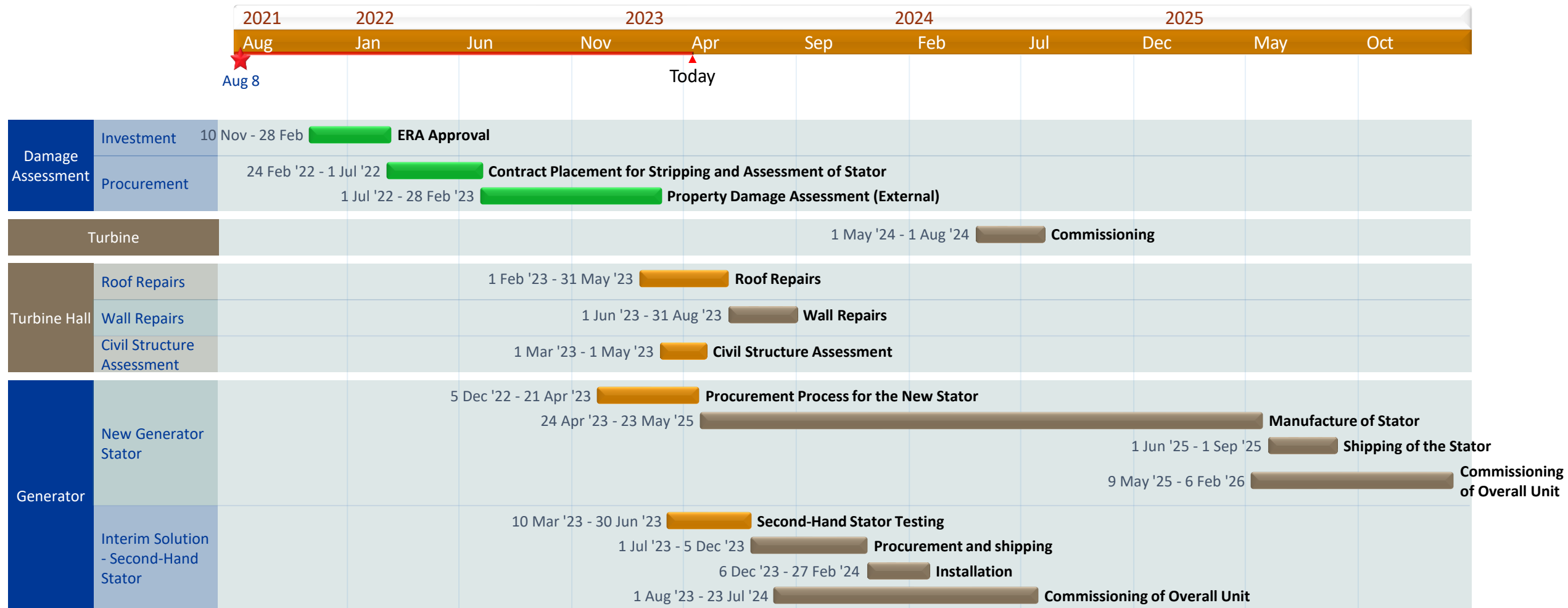


Kusile Unit 1, 2, 3 Recovery Update Projected Timelines





Medupi 4 Recovery



In conclusion:

- **Eskom would like to apologise to all South Africans** for the negative impact caused by the implementation of loadshedding
- **We understand the impact loadshedding has on the economy and on the livelihood of all South Africans**, however loadshedding is implemented to maintain the stability of the national power system to avoid a blackout
- The **immediate winter outlook indicates a higher risk of demand and supply imbalance**, and scenarios indicate loadshedding could intensify to stage 8 if the interventions are not effective
- **Higher levels of loadshedding do not mean that we are at a higher risk of a national blackout** – we implement loadshedding to ensure that a national blackout occurs
- **There are plans, systems and processes to prevent the possibility of a national black out.** The alarmist approach by various stakeholders is not helping manage the energy crisis
- **We will intensify efforts to overcome the winter period, and continue to implement the Generation Recovery Programme** which will sustainably improve the performance of our plants
- **The biggest impact we can all make as a nation is to use electricity sparingly, especially during the peaks**



Thank You