Power System Status Update

Tshediso Matona

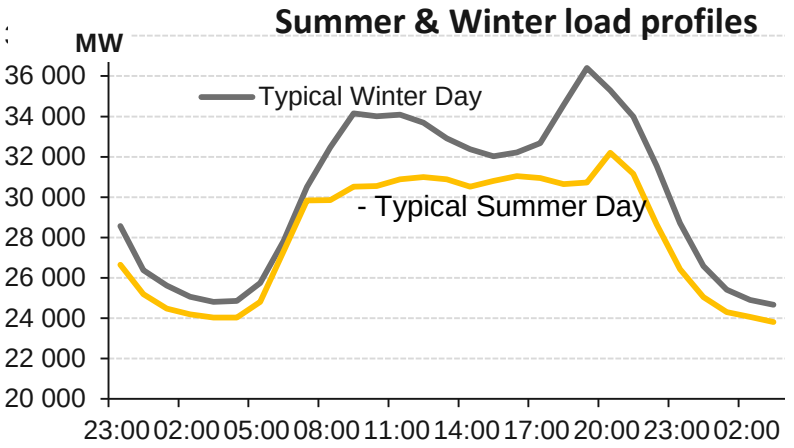
Chief Executive

8th December 2014

- Setting the context
- Current system status: Why are we load shedding?
- Prognosis
- Load shedding schedules
- Recovery plan
- Medupi update

Setting the context

- Eskom would like to **apologise to the nation** for the inconvenience of the past few weeks due to load shedding.
- We have communicated for an extended period to South Africa that the power system is extremely **constrained and vulnerable.**
- With the system being tight, any abnormal event pushes us into load shedding
- With the **reserve margin** being **low**, we do not have enough capacity to meet demand, necessitating the need for planned, controlled and rotational load shedding, to protect the power system from a total country-wide blackout
- Over the last few months we have seen a **significant increase in unplanned maintenance/breakdowns** on our plant (between 5000MW to 9000 MW) that has had a **compounding negative effect on power system reliability**



In summer, the system is tight all day up to 10pm, due to the flat “Table Mountain” profile

- Setting the context
- **Current system status: Why has system reliability declined?**
- Prognosis
- Load shedding schedules
- Medupi PS update
- Recovery plan and conclusion

Why has plant reliability declined?

- Unplanned outages has increased. Plant availability has negatively decreased from 85% to 75% over the last five years

- This is a result of:

  - running our plant hard and delaying critical maintenance in our past efforts to keep the lights on

  - deterioration of maintenance quality

  - 64% of Eskom's current installed base load capacity plants are past their midlife, requiring longer outages and extended restoration time than planned

  - declining coal quality impacts plant performance with the result of additional maintenance being required

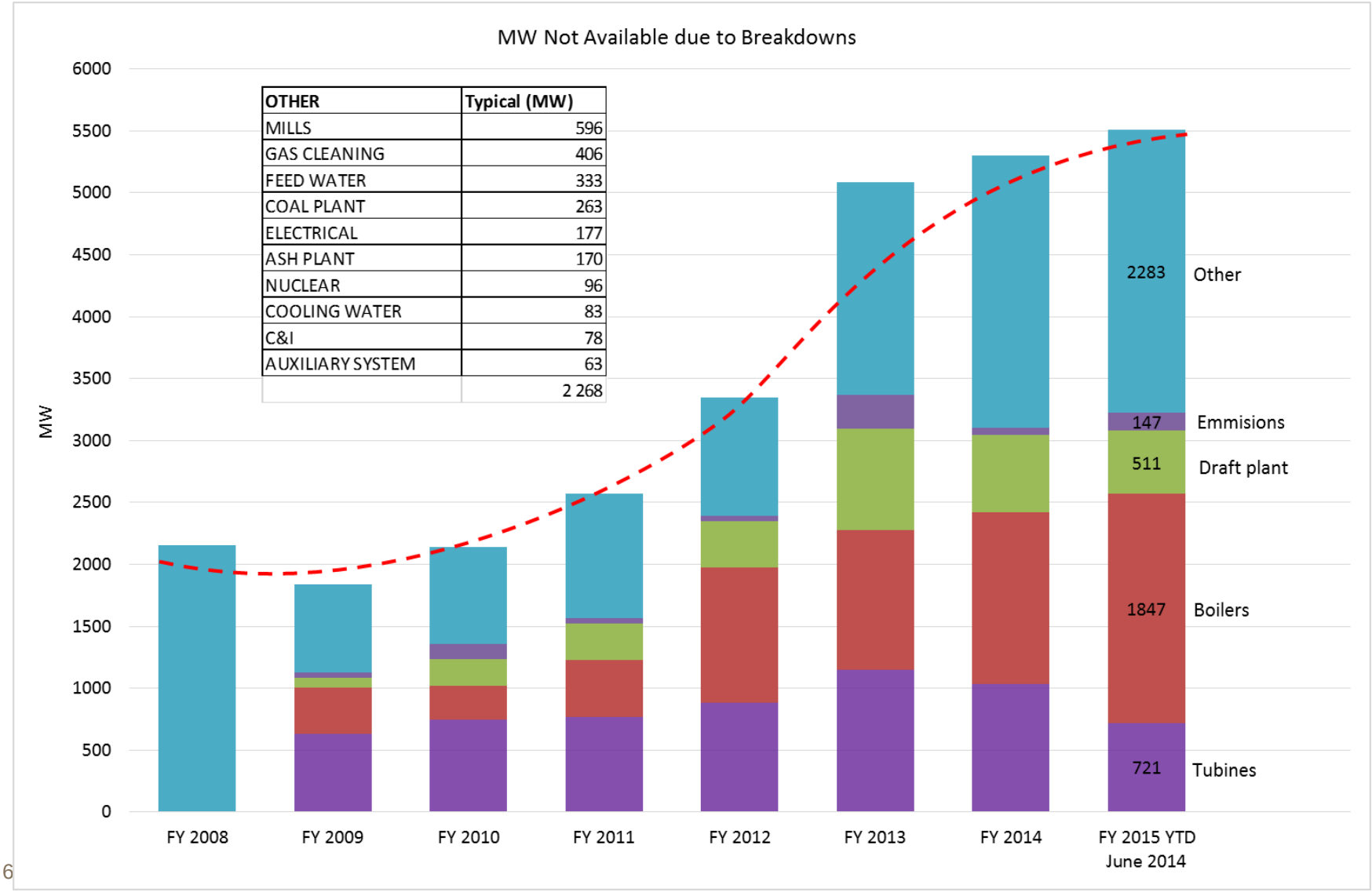
  - weather conditions, such as extreme heat or prolonged heavy rains

  - Disruptions of fuel supply to power stations

Breakdowns increased drastically from FY2009

We have slowed the trend but not yet arrested it.

The graph below shows the MW not available due to breakdowns



OTHER	Typical (MW)
MILLS	596
GAS CLEANING	406
FEED WATER	333
COAL PLANT	263
ELECTRICAL	177
ASH PLANT	170
NUCLEAR	96
COOLING WATER	83
C&I	78
AUXILIARY SYSTEM	63
	2 268

Recent load shedding

- Eskom is in a better position since 2008 to manage the situation, in terms of experience, skills and processes.
- However, while certain things are beyond our control such as the impact of weather conditions on our plant, we need to take responsibility for other factors that are in our control
- A lot of risks materialised on Thursday, some of which were in our control and others which were not, impacting power system reliability

Load shedding: November/December

Date	Stage
Sunday, 2 November	2
Friday, 21 November	1 then moved to 2
Saturday, 22 November	2
Sunday, 23 November	1 then moved to 2
Saturday, 29 November	2
Sunday, 30 November	1
Thursday, 4 December	2
Friday, 5 December	3
Saturday, 6 December	2 then moved to 3 then back to 2
Sunday, 7 December	2
Monday, 8 December	1 then moved to 2

Load shedding: Thursday, 3 December

- Stage 2 load shedding was implemented at 16h00 until 22h00
- This was due to :
  - continued unreliability of the generation fleet (A total of about 7 600MW were on outage, including outage slips)
  - depleted water reserves, to run our pumped storage schemes
  - low diesel supply at our peaking power stations
- The main contributing factor was the inability to source sufficient diesel for the open cycle gas turbines

Open cycle gas turbines

Ankerlig

Full load consumption
425 000 l/h

Gourikwa

Full load consumption
236 000 l/h

- During November Eskom burnt ±140Ml of diesel
- Eskom is working closely with Petro SA and other suppliers to secure diesel availability up to the middle of January
- OCGT stations should ideally run for maximum of 3 hours a day as peaking plants

Load shedding – Friday, 5 December 2014

- The constraints from Thursday continued, impacting our ability to meet national demand and we were still unable to adequately deal with the diesel supply situation
- Eskom had to implement stage 2 load shedding at 11h00. At 12h05 load shedding was extended from stage 2 to stage 3.
- The stage change was due to the termination, as a result of depleted gas reserves, at the two open cycle gas turbine power stations (Ankerlig and Gourikwa).
- The Drakensberg and Palmiet pumped storage schemes reduced output as a result of depleted water reserves.
- A further 1 000MW of capacity was offline after three coal powered units tripped over-night due to technical faults and a Majuba Unit due to coal supply problems.

Weekend: 6-7 December 2014
Monday 8 December 2014

- We announced weekend load shedding in advance with three main objectives:-
  - To recover pumped storage Dam levels
  - To recover diesel storage tank levels
  - To undertake essential weekend maintenance
- On Saturday, 6 December, approximately 8 700 MW was unavailable as a result of unplanned outages and 5 690MW was on planned maintenance
- We were successful in recovering dam levels and partially successful in recovering diesel levels (doubling up of diesel deliveries)
- We were unsuccessful in bringing units back from maintenance timeously. This factor, coupled with the loss of power supply to coal feeders at Majuba, necessitated load shedding throughout today – 8 December

- Setting the context
- Current system status: Why are we load shedding?
- **Prognosis**
- Load shedding schedules
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Units returning today (8/12)

Unit	Reason	Time	MW
Majuba 02	Main Steam Stop Valve repairs	14:00	612
Lethabo 03	Ash backlog	18:00	593
Majuba 05	Coal feeder cable damage	19:00	669
Majuba 06	Coal feeder cable damage	22:00	669
	Total		2543

Units to be shut down for Maintenance today

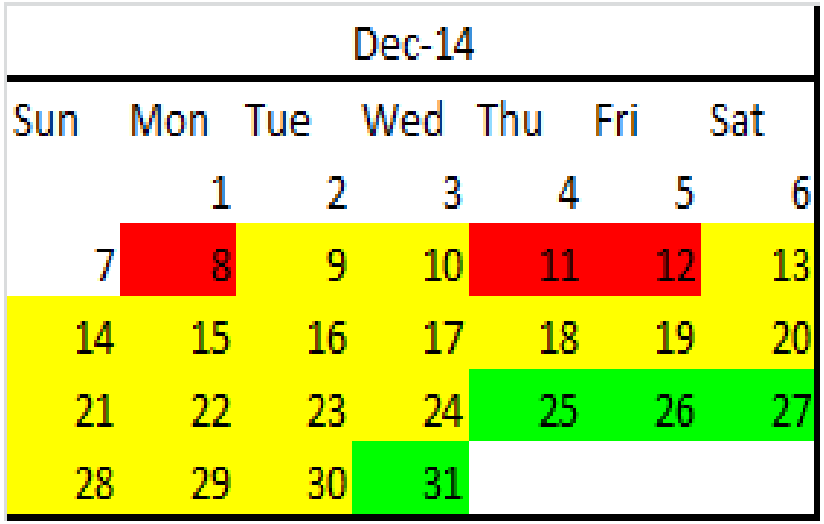
Unit	Reason	Date	Time	MW
Kendal 01	Tube leak repair	8/12	23:00	640
Palmiet 02	Scheduled Maintenance	8/12	23:00	200
	Total			840

- Total capacity returning: 2543 MW
- Units to be shut down for Maintenance: 840 MW
- Net MW added: 1703 MW
- Additional planned Maintenance for December: 3000 MW

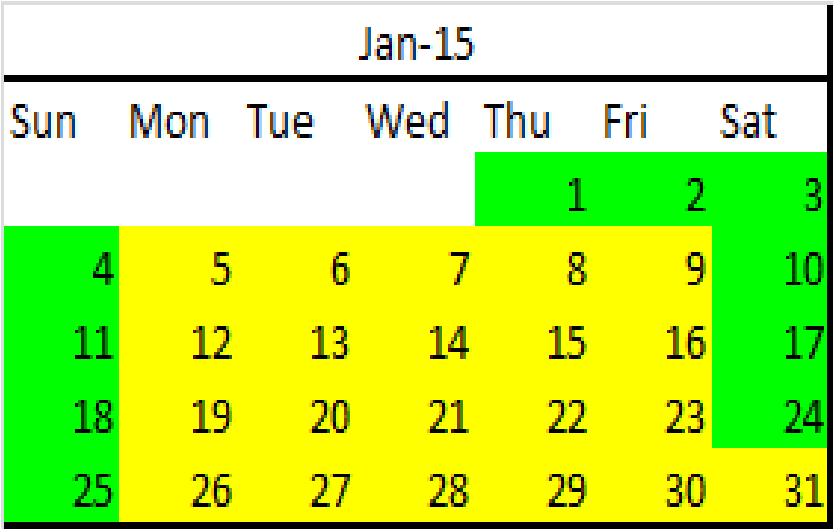
Units on Forced outage returning in December 2014

Unit	Reason	RTS date	Time	MW
Majuba 02	Main Steam Stop Valve repairs	8/12	14:00	612
Lethabo 03	Ash backlog	8/12	18:00	593
Majuba 05	Coal feeder cable damage	8/12	19:00	669
Majuba 06	Coal feeder cable damage	8/12	22:00	669
Arnot 01	Steam leak	9/12	05:00	376
Grootvlei 05	Outage slip (Pressure relief valves)	10/12	10:00	180
Camden 01	Tube leak	11/12	05:00	190
Hendrina 02	Tube leak	11/12	05:00	190
Kriel 06	Cable damage (tube leak)	11/12	22:00	475
Camden 04	Hydrogen seals repairs	12/12	05:00	175
Lethabo 04	Induced Draft fan replacement	14/12	05:00	593
	Units (MW) returning next 7 days			**4722**
Kendal 02	Outage slip (turbine repairs)	15/12	10:00	640
Komati 04	Turbine bearing repairs	20/12	23:59	100
Duvha 02	High Pressure Heater repairs	TBA	TBA	575
	Total MW returning before end December			**6037**

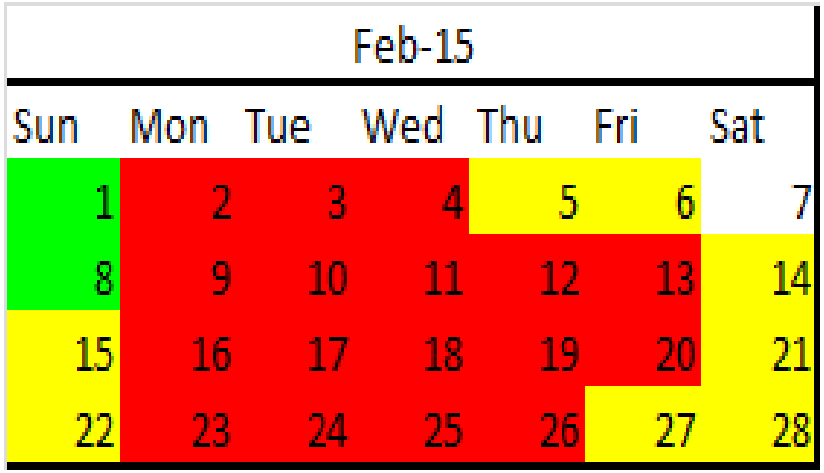
FY2015 System Outlook Calendar



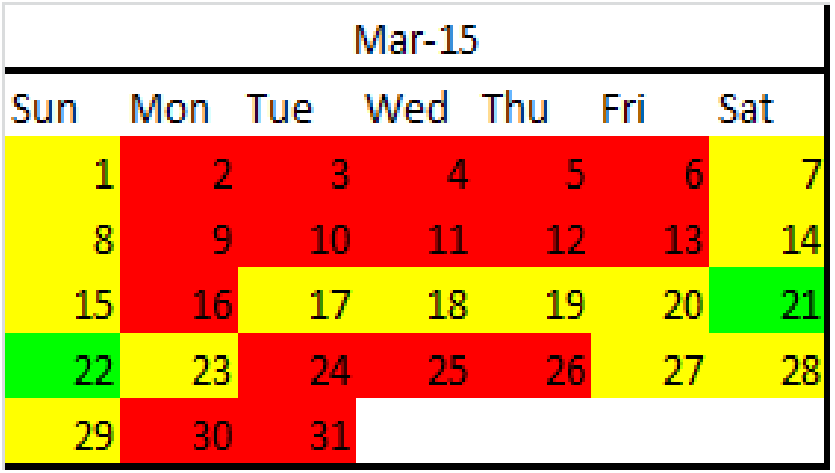
Dec-14						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			



Jan-15						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31



Feb-15						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28



Mar-15						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Prognosis summary

- The week ahead will be very tight with a medium risk of load shedding and a high risk on Thursday and Friday. Eskom will provide daily status updates and forecasts.

- The probability of load shedding remains medium up to 15 December 2014. We will be using the current week up until 15 December 2014 to undertake even more maintenance than usual

- The prognosis for load shedding will be low to medium from after 15 December 2014; until mid-January 2015, should no additional risks occur on the system - as electricity demand decreases with industries slowing or closing down for the festive season.

- We will continue to do maintenance on our power stations, the system will remain constrained, but manageable

Majuba recovery update

- An average of 1 800MW is being fed to the national grid per day. During peak periods Majuba is able to generate 2900 MW
- The immediate measures taken by the Majuba power station to restore power following the collapse of the silo are bearing fruit. Units 1, 2, 5 & 6 are running at full load at morning and afternoon peak times. At this point, these units cannot be maintained at full load consistently.
- Coal is being supplied to the units using trucks and mobile feeders.
- Demolition of the partially collapsed silo is in progress. This is being conducted in conjunction with the investigation into the root cause of the collapse. This demolition caused the interruption of power supply to the coal feeders
- Risks currently include breakdowns of the mobile feeders since there is no redundancy, rain which would make the coal wet leading to load losses and safety of personnel due to the increase in the usage of trucks. These risks are being actively managed.
- The investigation into the failure is still underway

Duvha power station investigation

- Eskom has completed the investigation into the Duvha unit 3 boiler explosion incident that occurred on 30 March 2014.
- A combination of factors have been identified as causing the boiler explosion.
- Following damage to the conveyer belt between Middelburg mine and Duvha in December 2013 Duvha changed its coal source resulting in a different type, grade and quality of coal being fed into the boiler. When put into the boiler, this coal resulted in more and different residue. The build-up of residue in the boiler was being managed by the power station. However, in conjunction with this there was a build-up of unburnt fuel and insufficient oxygen levels in the boiler.
- This factor, coupled with the condition of the boiler and operating practice resulted in the failure.
- Following these findings Eskom has implemented a strategy to ensure that a similar incident does not occur at Eskom power stations in the future.
- We’re finalising the way forward in terms of recovery of the boiler

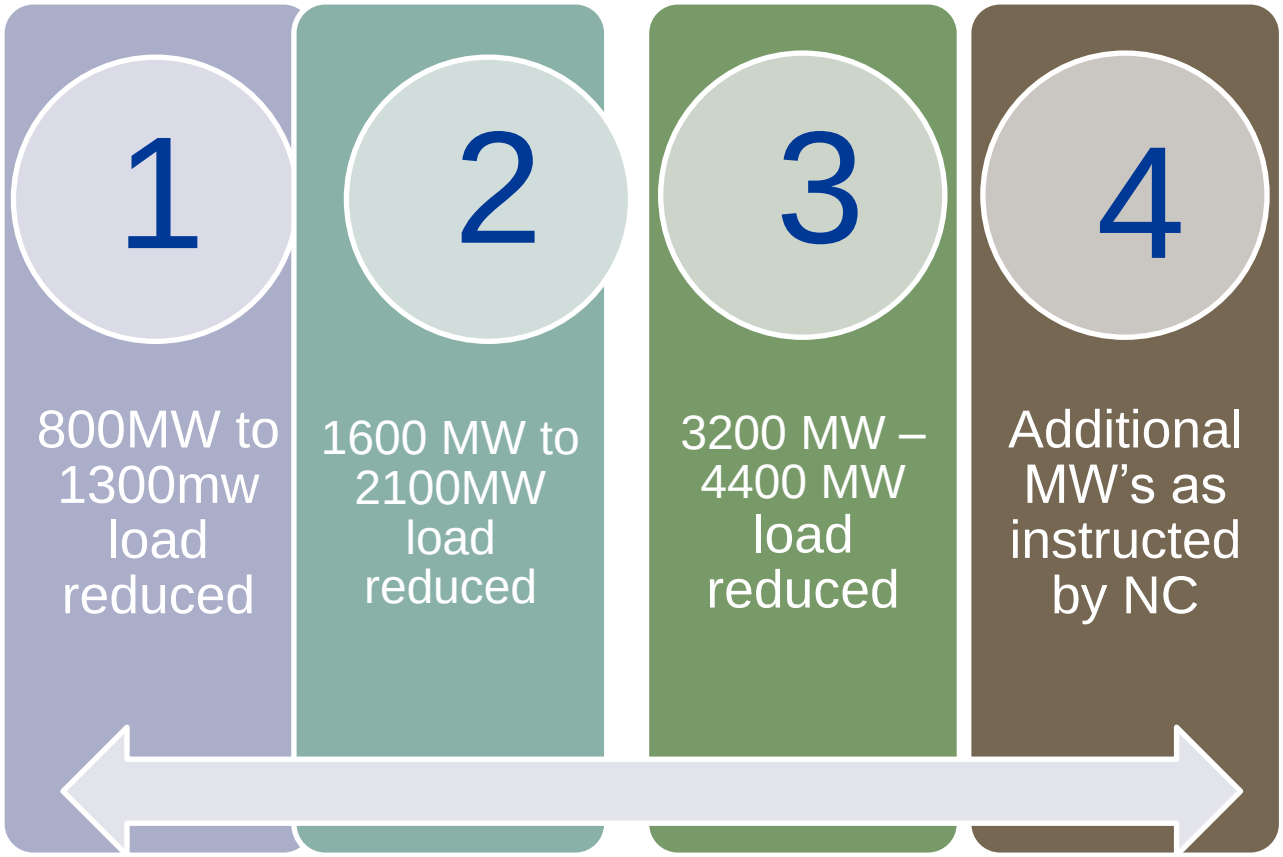
- Setting the context
- Current system status: Why are we load shedding?
- Prognosis
- **Load shedding schedules**
- Medupi PS update
- Recovery plan and conclusion

Load shedding explained

The result is that someone should be shed:

- Once every other day in Stage 1
- Once a day in Stage 2
- Twice a day in Stage 3

- **Even at stage 3, 90% of national demand is still met**



- Load shedding is a controlled and planned way to manage supply and demand and to balance the national grid
- It is done rotationally and to protect the South African power system from total collapse
- The greater the stage, the greater the amount of people impacted by load shedding at a given time

Load shedding

- A **dedicated situational nerve centre** has been set-up to manage the minute to minute load shedding process and to manage the communication and stakeholder experience
- Load shedding is painful yet necessary, however the **network was not initially designed** for load shedding
- Restoration is at times difficult as load has to be restored manually in certain areas, while unplanned technical errors sometimes occur during switch over, which extends power outages
- Customers complaints have been predominantly that they **do not have predictability** as load shedding schedules are not accurate or are not followed. In this regard schedules are reviewed on a daily basis and where **possible corrections are implemented overnight**
- Eskom has had to move from **one stage to the next, at very short notice**, as a result of additional risk on the system. Customers **are therefore encouraged to view load shedding schedules in all three stages** in the event that the transition is made at short notice on the day
- Customers are encouraged to report any problems with schedules so we can improve reliability.

Load shedding exceptions

Length of shedding period

- For various customer and operational reasons certain utilities prefer shedding for different lengths of time**:**
    - **4 hours- Jhb area (**City Power in conjunction with the Johannesburg Eskom network) sheds for four hours at a time. This is because of an extensive engagement with local commerce and other customer groups that indicated that the lower frequency of four hours, in spite of the longer duration, was better than 2 hours.
    - **3 hours-** Ekurhuleni has developed 3 hour schedules since they do not have a remote controlled network, and operators must be dispatched to disconnect and reconnect networks manually. The 3 hour choice is thought to be, for them, the ideal balance between the time needed to switch and the shortest down time for customers.
    - 2 hours – all other areas

Stage 3 shedding:

- Certain municipalities have indicated that the operational pressures of shedding in Stage 3 are better handled at a higher voltage by Eskom. These include: Ekhuruleni, Sol Plaatjie, Bloemfontein (Centlec)

Communication on the power system

- Eskom communicates via the national, regional and local media including social media regarding its intention to load shed and during the process.
- Load shedding information and schedules are available on Eskom's website for Eskom customers
- National and regional spokesmen continue to spread the message and share additional information to provide information and clarity
- Stakeholders and direct customers are informed predominantly via social media and text messages and are able to communicate via Eskom's customer contact centre
- The Power Alert on SABC and DSTV channels continue to provide real-time information on the power system status and encourages customers to switch off. An average of 350MW reduction in demand is observed during this flighting
- Eskom issues a system power bulleting twice a week, and holds a Quarterly system status media briefing to provide regular updates
- Face to face stakeholder engagements provide an opportunity for further dialogue on the status

Electricity users are encouraged to follow Eskom on twitter and Facebook and to download the free Eskom App 'Myeskom' from android and Apple stores. The App is in process of being updated to provide load shedding information

- Setting the context
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Six point plan
moving towards sustainability

1. **Additional capacity** - Bring new base load and peaking power station units on line – on time and within budget
2. **Maintenance** - Effectively execute maintenance plans to return plant to desired performance levels
3. **Major incidents** – safely and speedily return plant, such as Duvha Unit 3 and Majuba coal handling plant, to service
4. **DSM and energy efficiency** – A need to reintroduce the demand side management programme to lower demand in the country
6. **Load shedding schedule improvements** – bridge the gap with municipalities to ensure alignment and thereby predictability
6. **Energy conservation programme** – it is critical that the country revisits the option of introducing a national Energy Conservation Programme

- Setting the context
- Current system status: Why are we load shedding?
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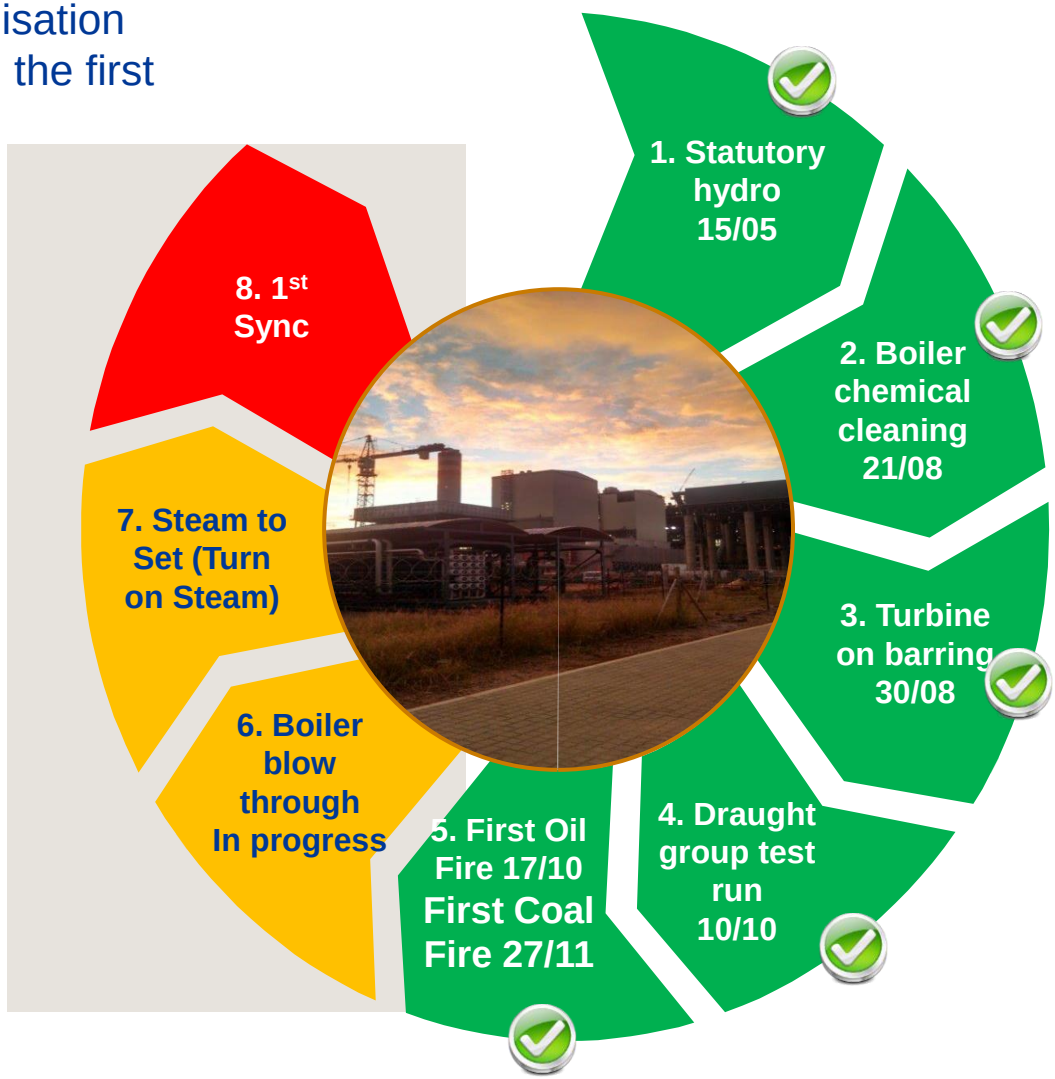
First unit – Medupi unit 6 progress

While the synchronisation is progressing well, the first unit will be synchronised later than 24 December, to ensure that no additional risks impact the progress made to date Full power will be received 6 months thereafter.



Significant milestones have been reached towards synchronisation of unit 6

Erratic power will flow to grid before full power is achieved by the first half of 2015

Source: Eskom

Boiler blow through is in progress

Main Milestone	Explanation	Key activities needed to reach milestone
Boiler Blow Through	▪ Cleaning of boiler and steam system of any debris accumulated during construction ▪ Achieving the steam quality required by turbine ▪ Confirmation that all control systems are working properly	1. First oil fire and burner commissioning 2. Oil firing and coal mill commissioning 3. Boiler blow through

Source: Eskom

Followed by Steam to Set

Main Milestone	Explanation	Key activities needed to reach milestone
Steam to Set	▪ Ensure steam in turbine is at the correct operating pressure, temperature and quality	1. Pipe work re-instatement 2. Hot vacuum test 3. ACC steam cleaning 4. Bypass operation (Safety valve testing period)

Source: Eskom

Conclusion

- The power system will be severely constrained and will begin to ease once at least 2 Units at Medupi and 1 Unit at Kusile are running
- The system will remain tight in Summer, as we have an ‘all-day Table Mountain profile.’ Risks of extreme weather related outages such as loss of supply from Cahora Bassa, wet coal, unplanned outage extensions and unavailability of primary energy (coal and diesel) may worsen the situation
- Cross border customers on un-firm contracts are also impacted by load shedding
- We thank all South Africans who have rallied to the call to reduce their energy consumption. We call on you again in the summer months to **Live Lightly by reducing demand from 06h00 to 22h00.**
- Eskom will continue to drive its maintenance plan and commit to deliver on the build programme
- In order to protect the system, costly open cycle gas turbines may be used beyond budget under emergency conditions
- This has not been easy for employees, yet many have gone beyond the call of duty and sacrificed critical family time to service South Africa
- Our responsibility is to ensure that we do not compromise the power system: Therefore we **will continue to safe-guard and protect South Africa’s power** system and will implement load shedding if absolutely necessary.

Less is more – Live Lightly!

"Live Lightly"

- Saving electricity **reduces pressure** on the grid, **cuts** your **electricity bill** and **reduces** South Africa's **carbon emissions**
- The power system **remains vulnerable** all day during summer

"Know your number"

1. **Use air conditioning efficiently**
   - Set air conditioning to 23°C
   - Close windows and doors to optimise air conditioning
   - Switch off 30 minutes before leaving the office
2. **Switch off all geysers and pool pumps** (all day until 9pm), and invest in a timer
3. If you use the pool frequently, **limit pool filtering cycles** to two cycles daily, and not between 5pm & 9pm
4. **Switch off all non-essential lighting**
5. **Respond to Power Alert messages** by switching off all appliances that are not being used

Navigation Guide of Load Shedding Website

Powering your world

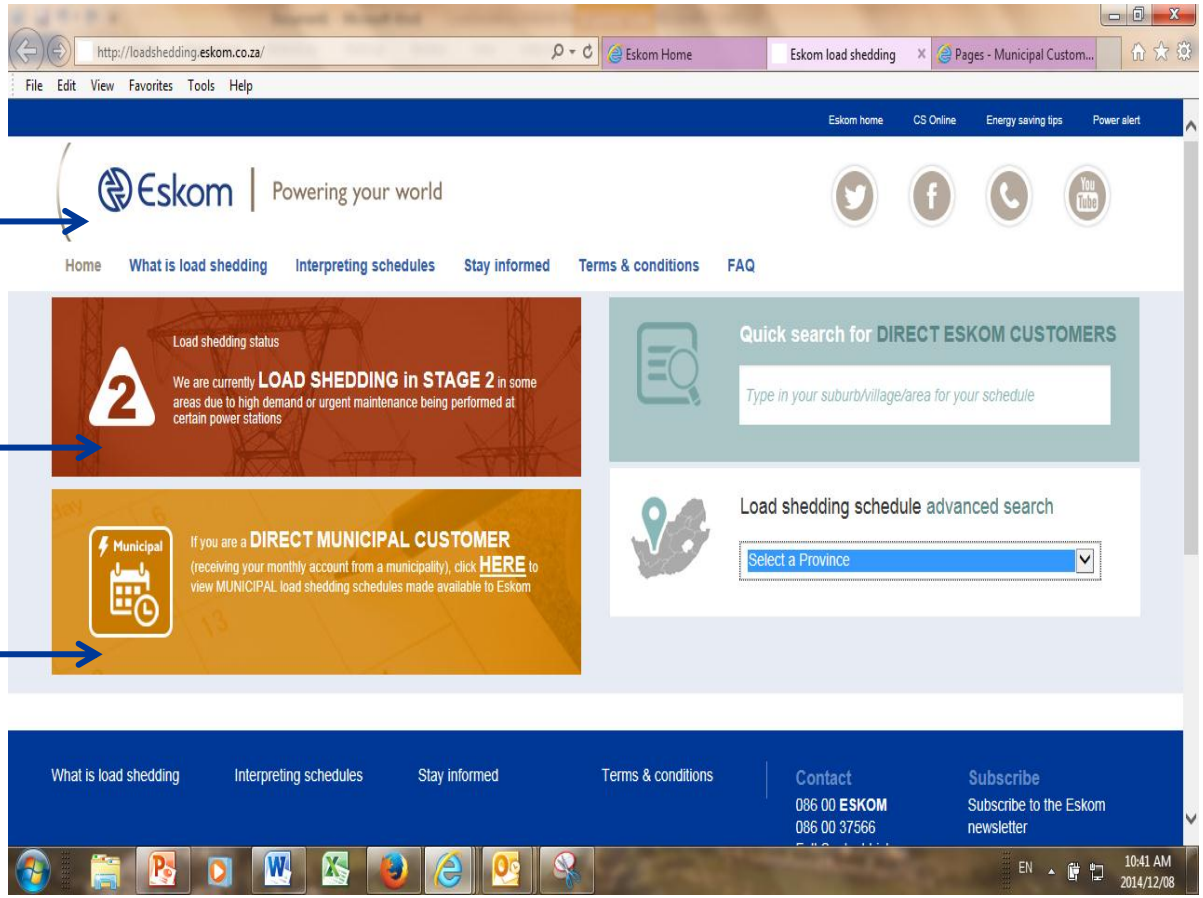
Accessing Eskom's Website

1. Log onto: http://www.eskom.co.za
2. You will land on the Eskom homepage
3. This is what you will see
4. Click here if you are an Eskom Supplied Customer
5. Click here if you are an Municipal Supplied Customer.

Eskom Load Shedding Website Look and Feel

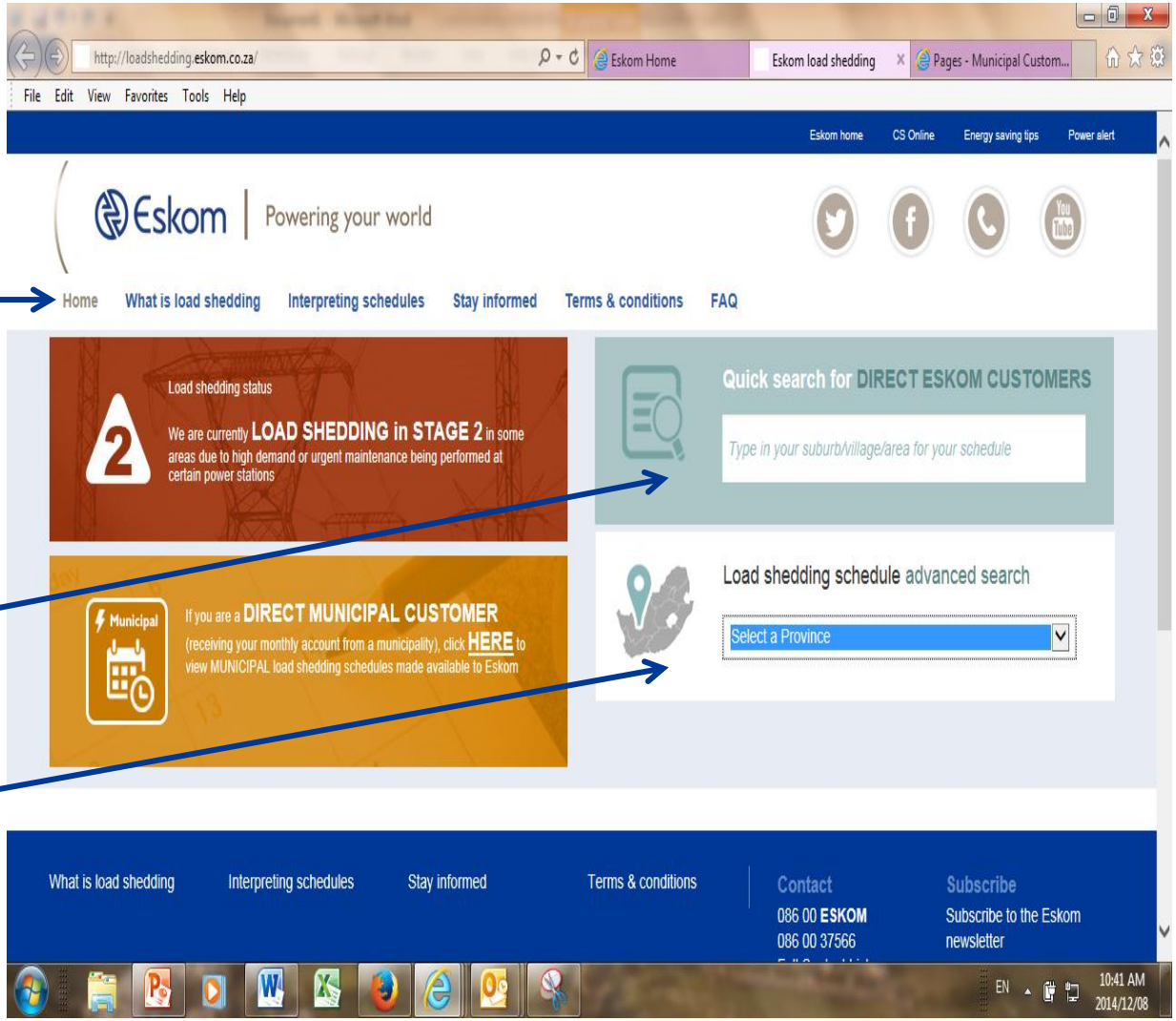
1. You will land on the Load Shedding page http://loadshedding.eskom.co.za/
2. This is what you will see
3. You will be informed here whether Load shedding has been implemented.

   If Load Shedding has been implemented, the Stage of Load Shedding is indicated.
4. You can also access the Municipal Schedules that has been provided to Eskom by the Municipalities here.



Eskom Load Shedding Website How to navigate

1. The menu bar can be used to navigate and find out:
   - What is Load Shedding
   - How to interpret the Schedule
   - The latest information
   - Answers to Frequently asked Questions
2. This is the search functionality where as a Customer you will be able to search for you suburb and view the schedule.
3. This is the advanced Search Functionality – allows the user to search by province and Municipality.



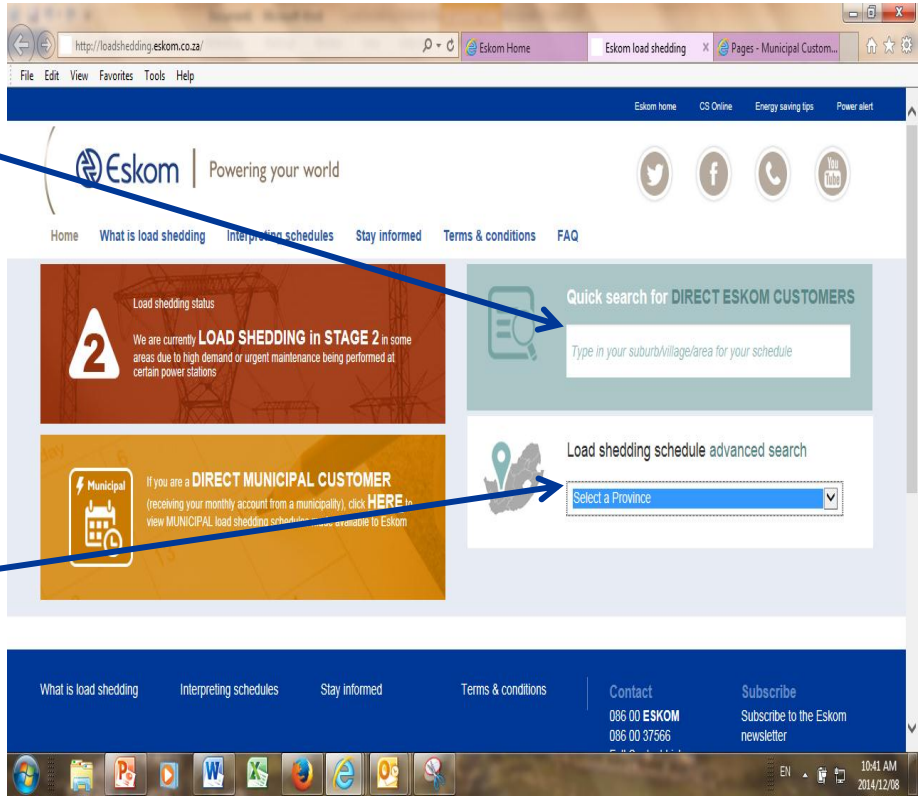
Eskom Supplied (Direct) Customers Searching for your Schedule

Quick Search Functionality

1. Enter your suburb here
2. A list of matching areas will become available.
3. Select the appropriate Area
4. A Schedule will reflect
5. Now select the Stage (1,2 or 3)
6. Your correct schedule will now reflect.

Advanced Search Functionality

1. Select your Province
2. Select the Municipality that you are serviced by
3. Select your suburb
4. A Schedule will reflect
5. Now select the Stage (1,2 or 3)
6. Your correct schedule will now reflect.



Example: Midland Schedule – Stage 1

Mon, 08 Dec	Tue, 09 Dec	Wed, 10 Dec	Thu, 11 Dec	Fri, 12 Dec	Sat, 13 Dec	Sun, 14 Dec
-	-	18:00 - 22:30	-	-	-	-
Mon, 15 Dec	**Tue, 16 Dec**	**Wed, 17 Dec**	**Thu, 18 Dec**	**Fri, 19 Dec**	**Sat, 20 Dec**	**Sun, 21 Dec**
06:00 - 10:30	-	-	-	10:00 - 14:30	-	-
Mon, 22 Dec	**Tue, 23 Dec**	**Wed, 24 Dec**	**Thu, 25 Dec**	**Fri, 26 Dec**	**Sat, 27 Dec**	**Sun, 28 Dec**
-	-	14:00 - 18:30	-	-	-	-
Mon, 29 Dec	**Tue, 30 Dec**	**Wed, 31 Dec**	**Thu, 01 Jan**	**Fri, 02 Jan**	**Sat, 03 Jan**	**Sun, 04 Jan**
18:00 - 22:30	-	-	-	06:00 - 10:30	-	-
Mon, 05 Jan						
-						

Eskom Supplied (Direct) Customers
Select your Schedule Stage

Selecting the correct stage

1. Once your schedule appears it will be defaulted to Stage 1
2. Scroll up until you see the menu below.

3. Select the appropriate Stage (for this exercise we have selected Stage 2)
4. The schedule should have changed accordingly.

Example: Midland Schedule – Stage 1 (default)

Mon, 08 Dec	Tue, 09 Dec	Wed, 10 Dec	Thu, 11 Dec	Fri, 12 Dec
-	-	18:00 - 22:30	-	-
Sat, 13 Dec	**Sun, 14 Dec**	**Mon, 15 Dec**	**Tue, 16 Dec**	**Wed, 17 Dec**
-	-	06:00 - 10:30	-	-
Thu, 18 Dec	**Fri, 19 Dec**	**Sat, 20 Dec**	**Sun, 21 Dec**	**Mon, 22 Dec**
-	10:00 - 14:30	-	-	-
Tue, 23 Dec	**Wed, 24 Dec**	**Thu, 25 Dec**	**Fri, 26 Dec**	**Sat, 27 Dec**
-	14:00 - 18:30	-	-	-
Sun, 28 Dec	**Mon, 29 Dec**	**Tue, 30 Dec**	**Wed, 31 Dec**	**Thu, 01 Jan**
-	18:00 - 22:30	-	-	-
Fri, 02 Jan	**Sat, 03 Jan**	**Sun, 04 Jan**	**Mon, 05 Jan**	
06:00 - 10:30	-	-	-	

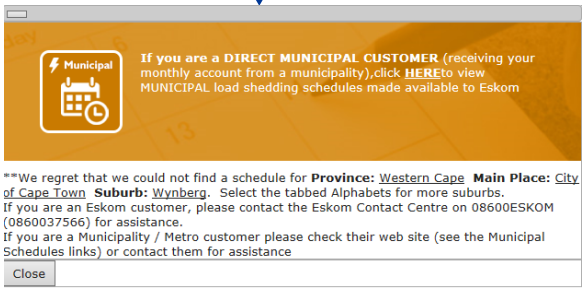
Example: Midland Schedule – Stage 2 Selected

Mon, 08 Dec	Tue, 09 Dec	Wed, 10 Dec	Thu, 11 Dec	Fri, 12 Dec
-	18:00 - 22:30	18:00 - 22:30	-	-
Sat, 13 Dec	**Sun, 14 Dec**	**Mon, 15 Dec**	**Tue, 16 Dec**	**Wed, 17 Dec**
06:00 - 10:30	06:00 - 10:30	06:00 - 10:30	-	-
Thu, 18 Dec	**Fri, 19 Dec**	**Sat, 20 Dec**	**Sun, 21 Dec**	**Mon, 22 Dec**
10:00 - 14:30	10:00 - 14:30	-	-	-
Tue, 23 Dec	**Wed, 24 Dec**	**Thu, 25 Dec**	**Fri, 26 Dec**	**Sat, 27 Dec**
14:00 - 18:30	14:00 - 18:30	-	-	18:00 - 22:30
Sun, 28 Dec	**Mon, 29 Dec**	**Tue, 30 Dec**	**Wed, 31 Dec**	**Thu, 01 Jan**
18:00 - 22:30	18:00 - 22:30	-	-	06:00 - 10:30
Fri, 02 Jan	**Sat, 03 Jan**	**Sun, 04 Jan**	**Mon, 05 Jan**	
06:00 - 10:30	-	-	-	

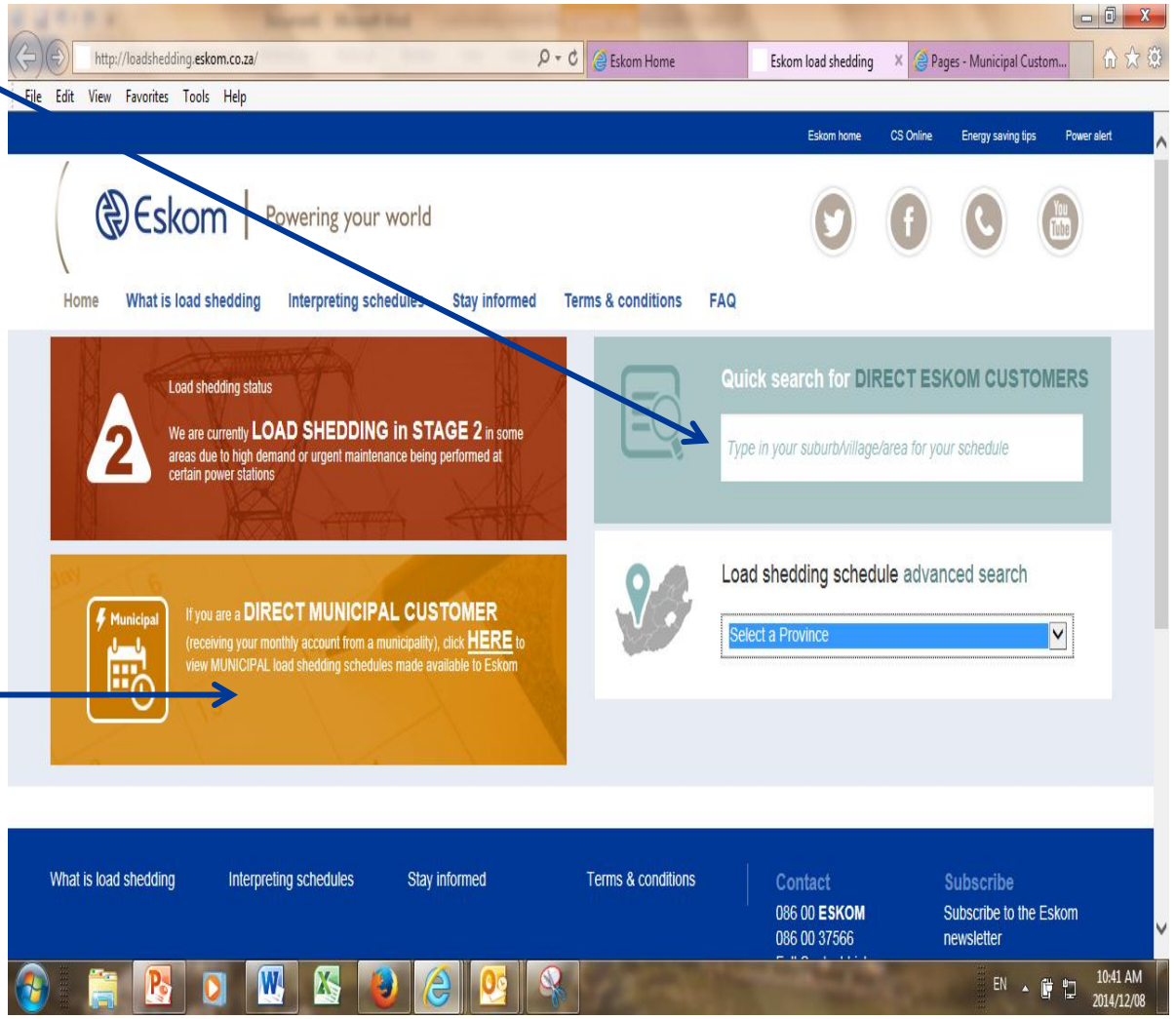
Municipal Supplied (Direct) Customers Searching for your Schedule

Quick Search Functionality

1. Enter your suburb here
2. If you are not an Eskom Customer, the following message will pop-up.

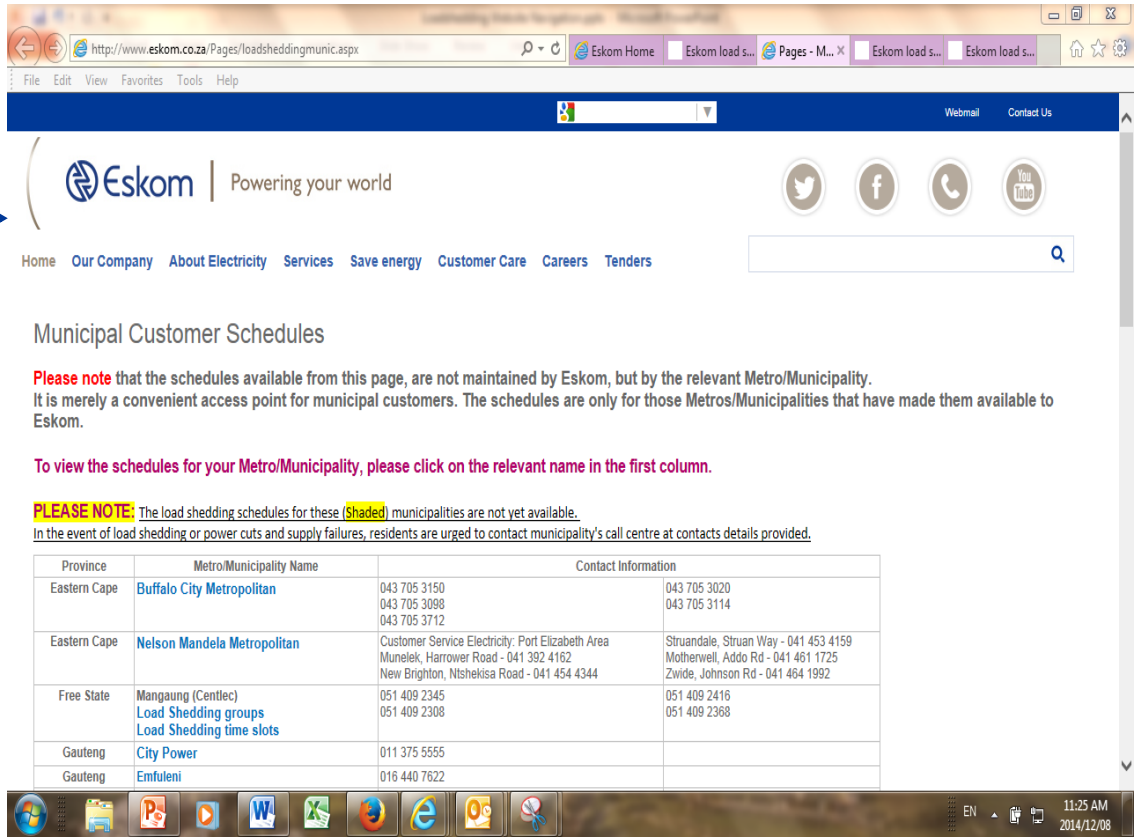


3. You can now either navigate to the Municipal Schedule using this link, or
4. You can log into the appropriate Municipal Website



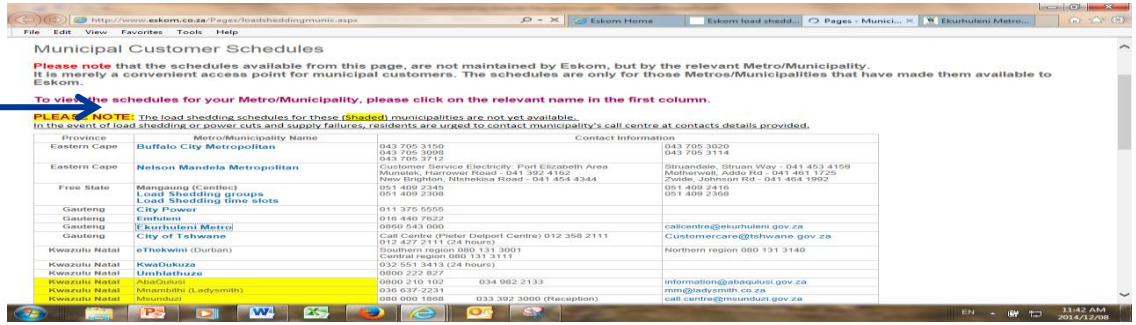
Municipal Schedules Link

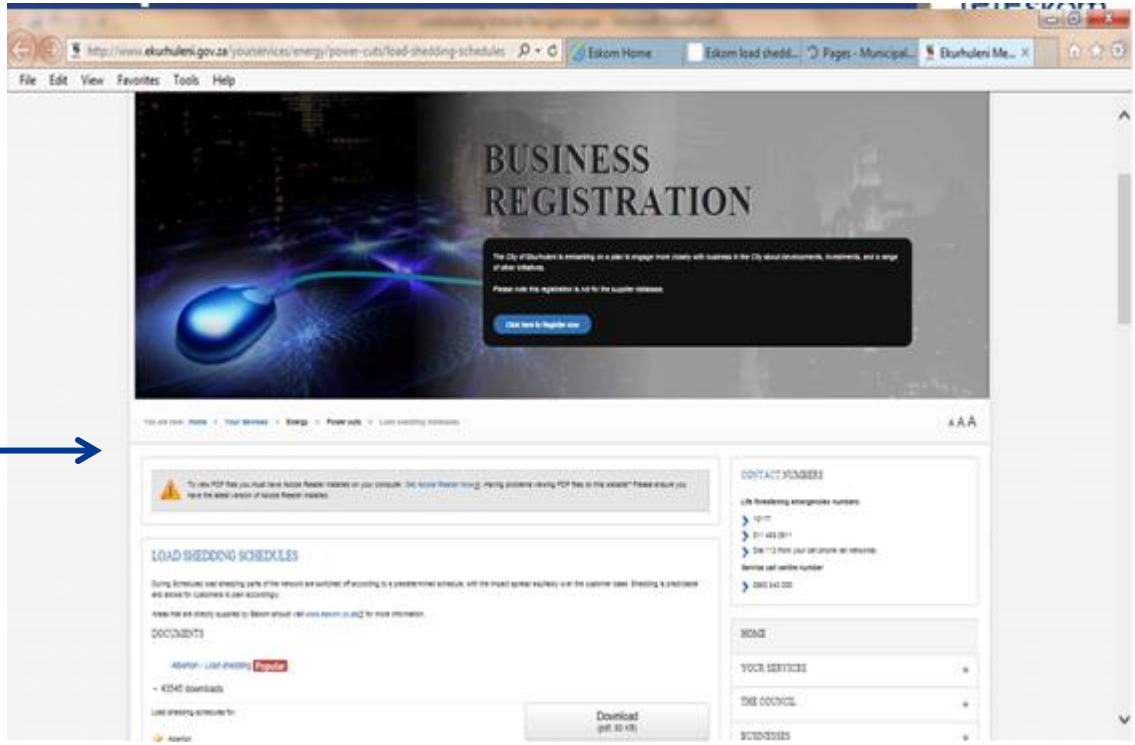
1. If you select this link on the Eskom website http://www.eskom.co.za or the Eskom Load Shedding Website http://loadshedding.eskom.co.za/ you will be directed to the following link http://www.eskom.co.za/Pages/loadsheddingmunic.aspx where you will be able to view the Municipal Schedules provided to Eskom by the Municipalities.
2. Select the Municipality that Services you
3. You will now be redirected to the appropriate Municipal Site or a download of the schedule will be available.



Example: Ekurhuleni Munic

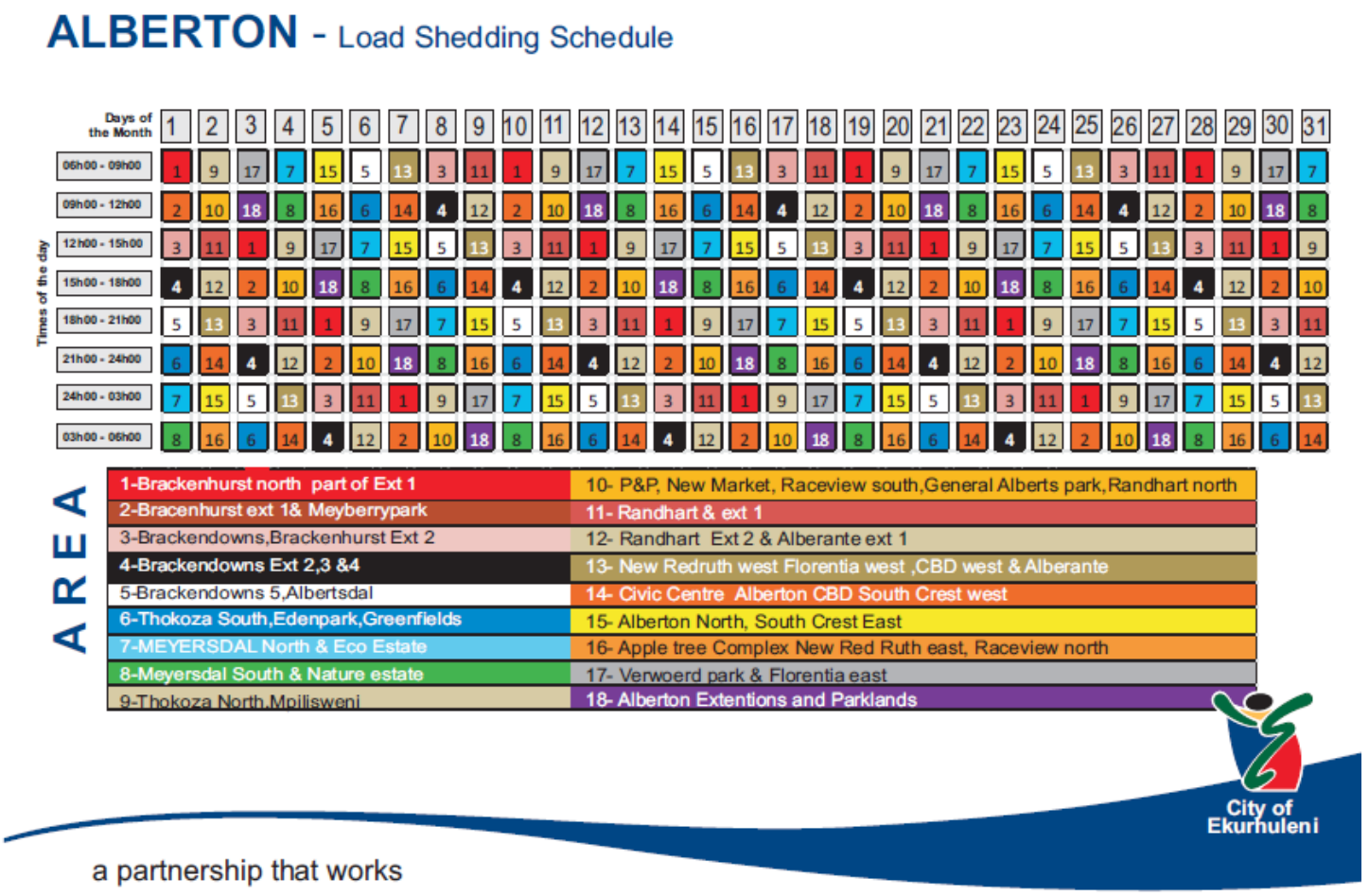
1. Select the Municipality that Services you
2. You will now be redirected to the appropriate Municipal Site or a download of the schedule will be available.
3. Example: Ekurhuleni Munic
4. You will be redirected to the Municipality's Website http://www.ekurhuleni.gov.za/yourservices/energy/power-cuts/load-shedding-schedules .
5. Navigate down the page and select the Area you need.
6. The schedules are available to download in PDF format.





Example: Ekurhuleni Munic

1. Once you have selected you Area and downloaded your schedule, this is an example of what you will see (Area selected Alberton)



Tips & Hints

- Quick Search - identify your Area or the Area closest are to you (Correct spelling)
- Select the stage once the initial schedule appears
- Print or save to your Laptop / smart phone / desktop
- This schedule is applicable for a month - now request the schedules for the remaining stages and do as above, as Stages may change.

For any queries and assistance on Load shedding, visit the Eskom Load shedding Website http://loadshedding.eskom.co.za/ or call our Contact Centers at **0860037566**

Eskom

Thank you