



Electricity Usage at South Deep: 2016

Prepared by Chris van Heeswijk: Electrical Consultant, South Deep Mine

Tsakani Mthombeni: Group Head of Energy and Carbon, Gold Fields

23/09/2016



GOLD FIELDS

Our Value



These values define us

Safety 	If we cannot mine safely, we will not mine
Responsibility 	We act responsibly and we care for the environment and all of our stakeholders, including our employees, our communities and our shareholders
Honesty 	We act with fairness, integrity, honesty and transparency
Respect 	We treat each other with trust, respect and dignity
Innovation 	We encourage innovation, entrepreneurship, and acting like owners
Delivery 	We work together in teams and do what we say we will do

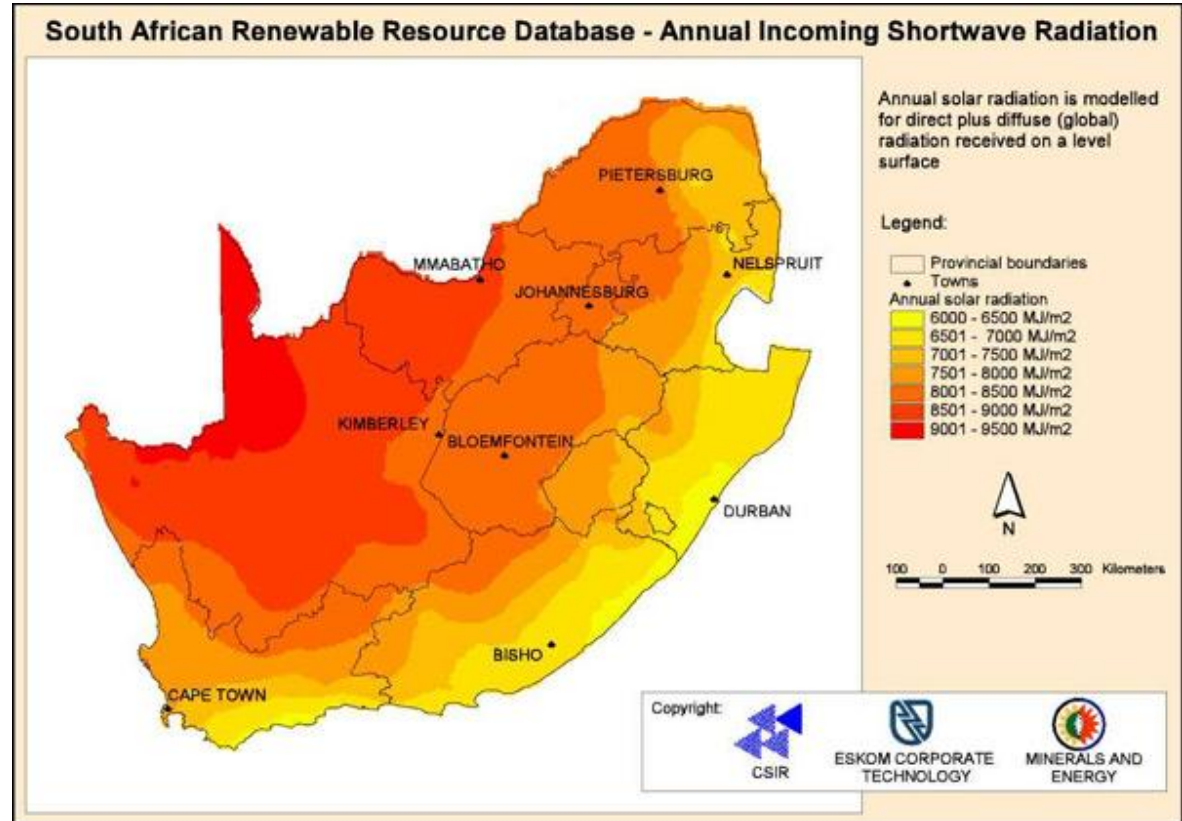
This Is Who We Are, What We Do, and How We Work



Introduction to South Deep mine

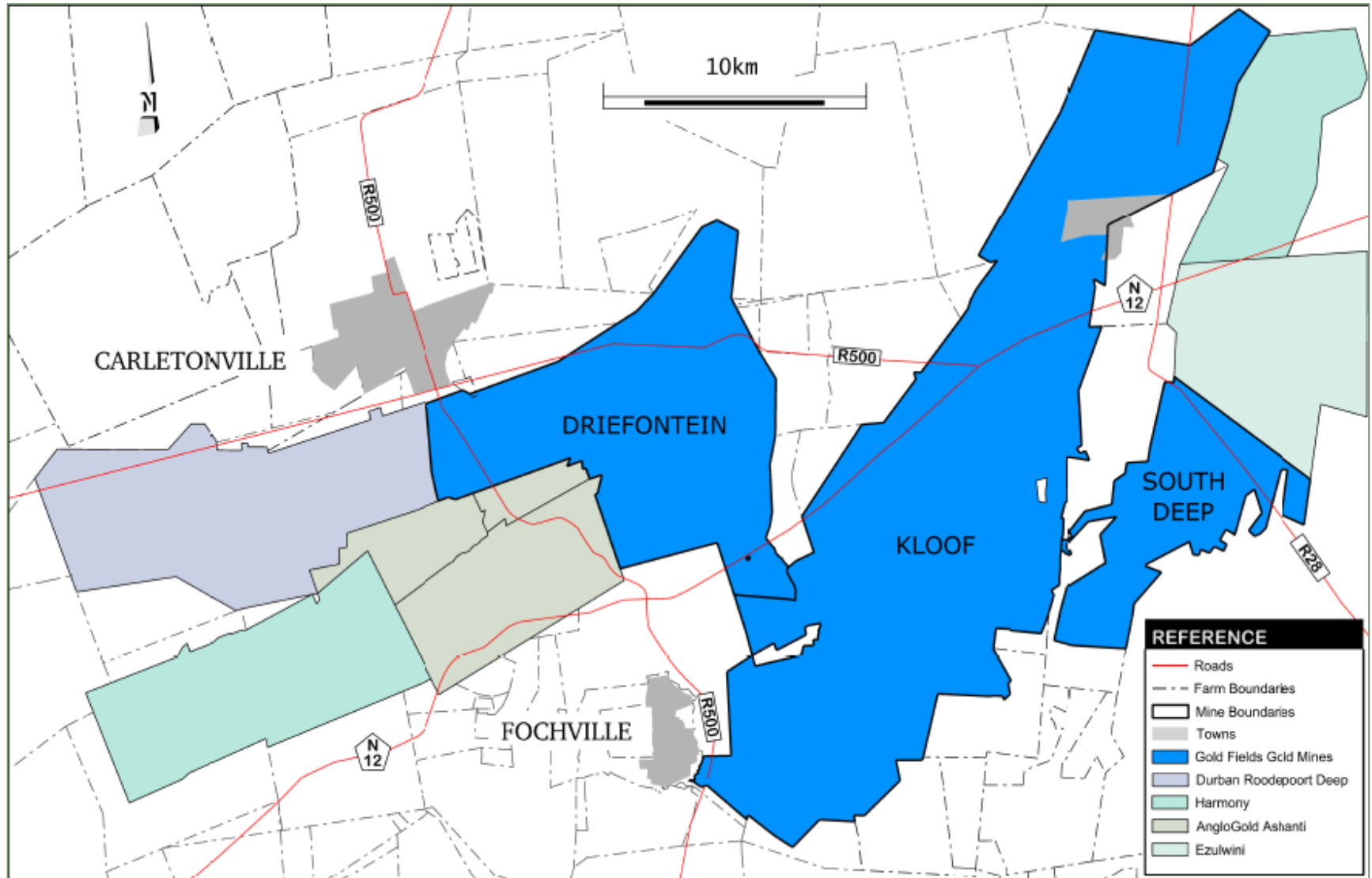
Energy spend and solar resource

- Grid connected (Eskom), 95% of electricity from coal
- Energy spend is 13% of operating spend (Group 22%)
- Average load 55 MW, to peak at 75 MW
- Global Horizontal Index (GHI) of 2 061 kWh/m²



Introduction to South Deep mine

Locality – South Deep



Introduction to South Deep mine

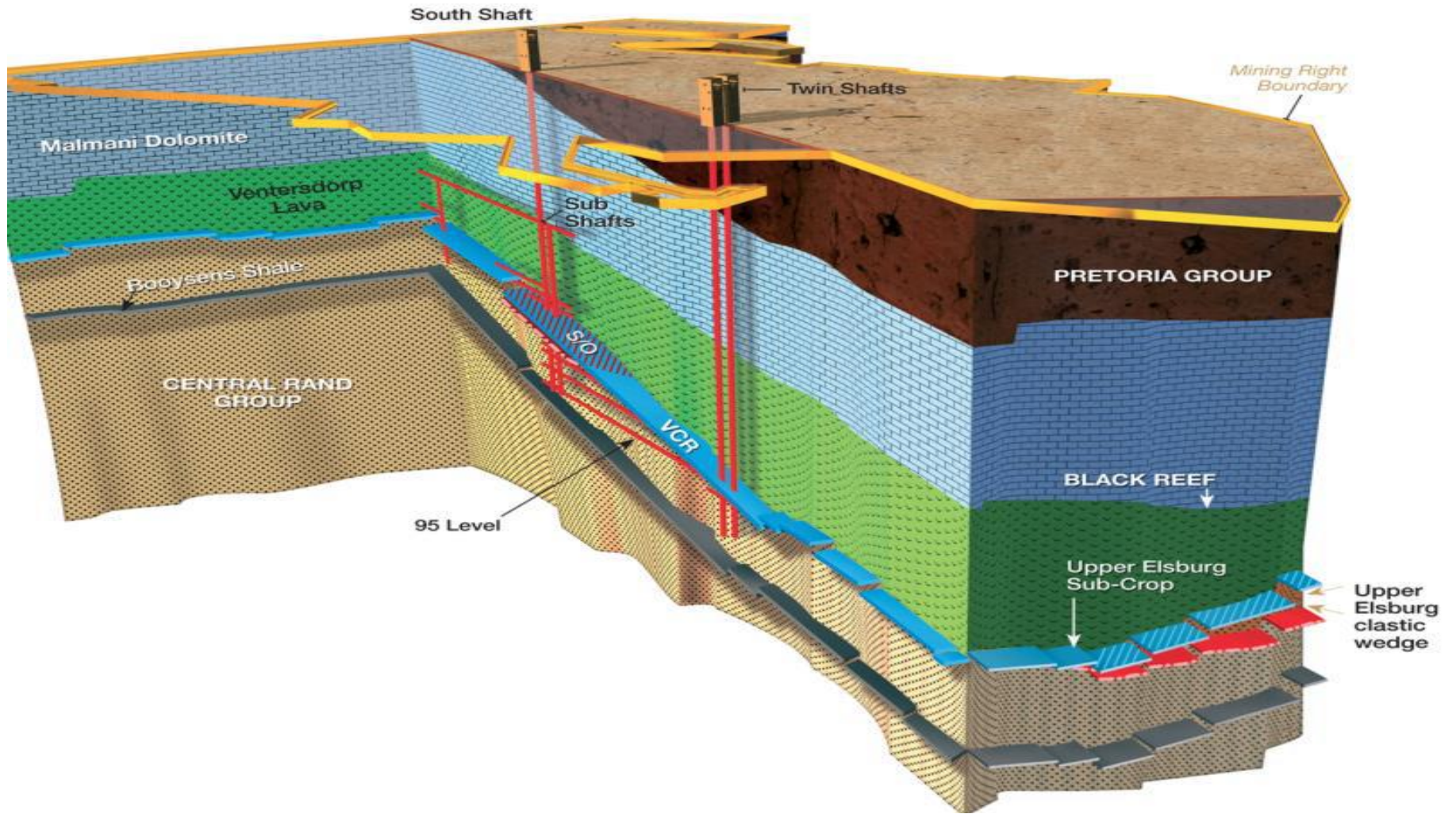


This mine dates back to the 50's

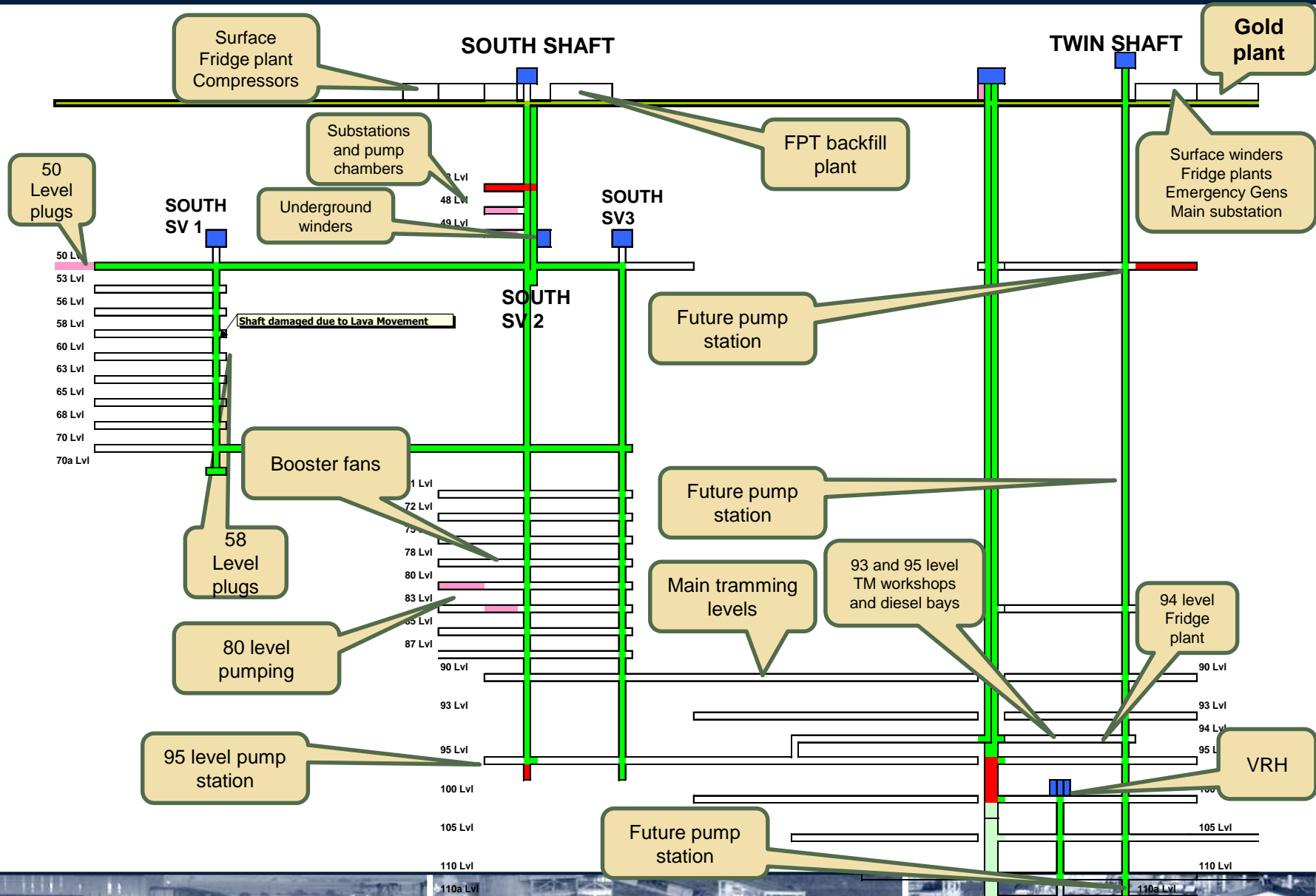
- **1950:** Prospecting in the area commenced
- **1959:** Mining lease application made, Western Areas Gold Mining Company Limited (WAGM) incorporated on 8 September 1959
- **1961:** Johannesburg Consolidated Investment Company Limited formed a prospecting consortium
- **1974:** The Elsburg Gold Mining Company merged with Western Areas Gold Mining Company Limited
- **1990:** Western Areas Gold Mining Company Limited shareholders approved the transfer, cession and assignment of certain land and mineral rights to South Deep Exploration Company Limited in exchange for its shares
- **1995:** WAGM and South Deep Exploration Company Limited merged on 1 January
- **1998:** Western Areas Gold Mining Company Limited changed its name to Western Areas Limited
- **1999:** Placer Dome Western Areas (PDWA) Joint Venture (JV) formed
- **2000:** Name changed to South Deep Gold Mine, Feb 2000
- **2001:** Sinking of the ventilation shaft was completed
- **2002:** Sinking of the main shaft was completed and a 7 200 tonnes per day capacity mill commissioned
- **2004:** The Mineral and Petroleum Resources Development Act promulgated into law on 1 May 2004
- **2005:** The Twin Shaft Complex officially opened
- **2006:** Gold Fields acquired Barrick's 50% JV interest in the PDWA JV
- **2007:** Gold Fields acquired all remaining shares to own 100%
- **2010:** New-order mining right granted to South Deep, including the area known as Uncle Harry's
- **2011:** Gold Fields Limited concludes a 10% BBBEE transaction
- **2012:** During 2012, South Deep signed a new collective agreement with organized labour to implement the 'New Operating Model'



Geology



Surface and underground infrastructure



Surface Infrastructure

Vent shaft equipment



Surface Infrastructure

Metallurgical plant expansion



Eskom yard



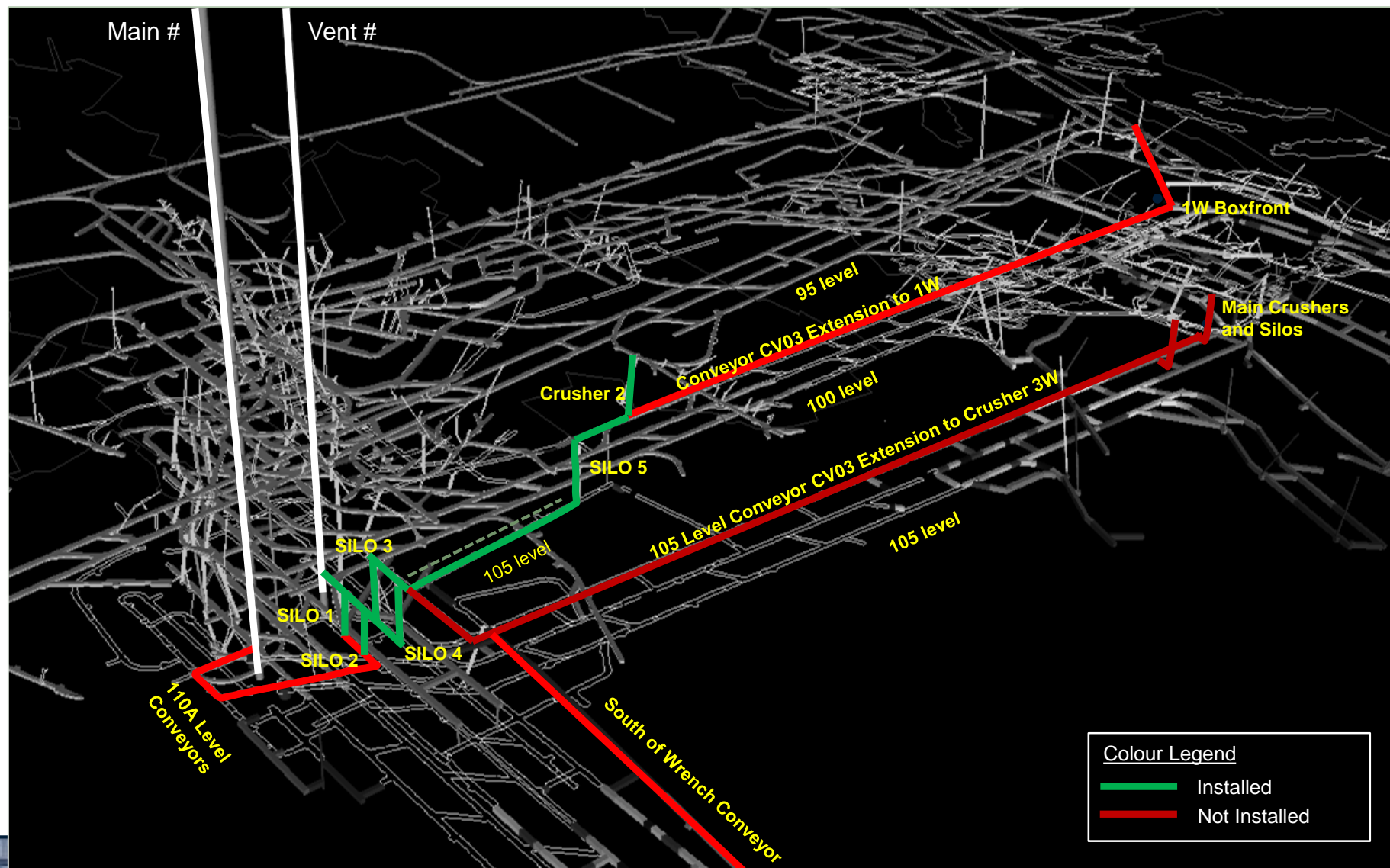
Surface Infrastructure

Doornpoort tailings storage facility



Underground infrastructure

Life of Mine ore handling



Community Projects

Community projects in progress in 2016



Pilani Clinic – Eastern Cape (Umtata – OR Tambo)

- Class B clinic (mini hospital – maternity, trauma)
- Target: 1,800 patients per month



Thusanang Clinic

- Primary health care, referrals
- Target: 800 patients per month



Community Projects

Community projects in progress in 2016



- **Simunye High School**
- Convert existing distribution warehouse
- Targeting: 1,200 learners



- **Bakery Project: (South Deep Incubation)**
 - Commissioned December 2015 (5 people employed)
 - Produced 2 297 bread to dat.

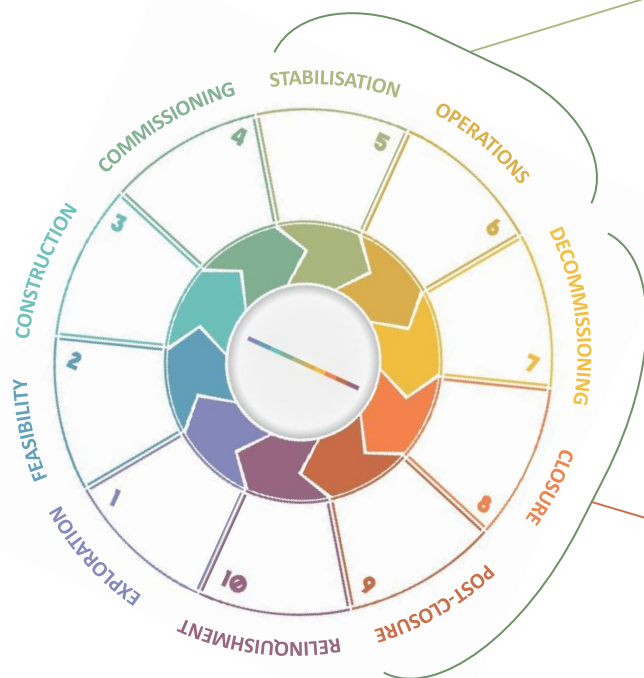


- **Poortjie 14th House Project**
 - Planned completion date : December 2015



Electricity and mines: over a mining life cycle

A typical underground mine life cycle, with summary of power demand activities



Mining activities:

- Break rock
- Cartage and haulage
- Grind/crush
- Mill
- Separate
- Waste rock management
- Transport

Power requirements:

- Hoisting (men & material)
- Conveyance
- Ventilation
- Pumping
- Lighting
- Mill drives

Mining activities:

- Site dis-establishment
- Monitoring
- Rehabilitation
- Transport
- Office admin
- Waste pumping

Power requirements:

- Lighting
- Dewatering (pumping)
- Ventilation (limited)
- Hoisting of equipment, men and material
- Continuous inspection
- Irrigation



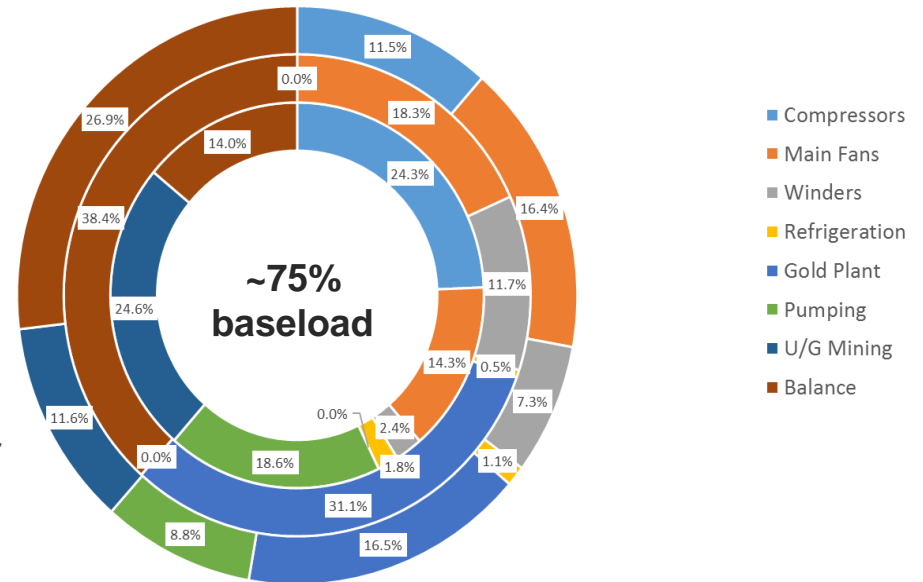
South Deep Electrical Power

Electricity makes up 95% of the energy consumed at South Deep. The balance is provided by diesel, LPG and petrol

- Operates on a “full calendar cycle with mining on a 24 hour per day basis and only stopping for Easter and Christmas
- Typical summer (August) and winter (May) monthly profiles are shown in the next slides
- Electricity is supplied by Eskom at two points of delivery, viz South Shaft and Twin Shaft
- Twin Shaft: primary shaft complex for men, material and all ore hoisting and transported by conveyor to the gold plant. Scheduled loads
- Cooling is provided by surface and underground refrigeration plants and ventilation is provided by four main fans (Only 2 running currently), for 24 hour loads
- South Shaft: service shaft complex providing service water, ventilation, compressed air, backfill, and refrigeration. Transportation of men and material are transported underground, and services water and fissure water are pumped.

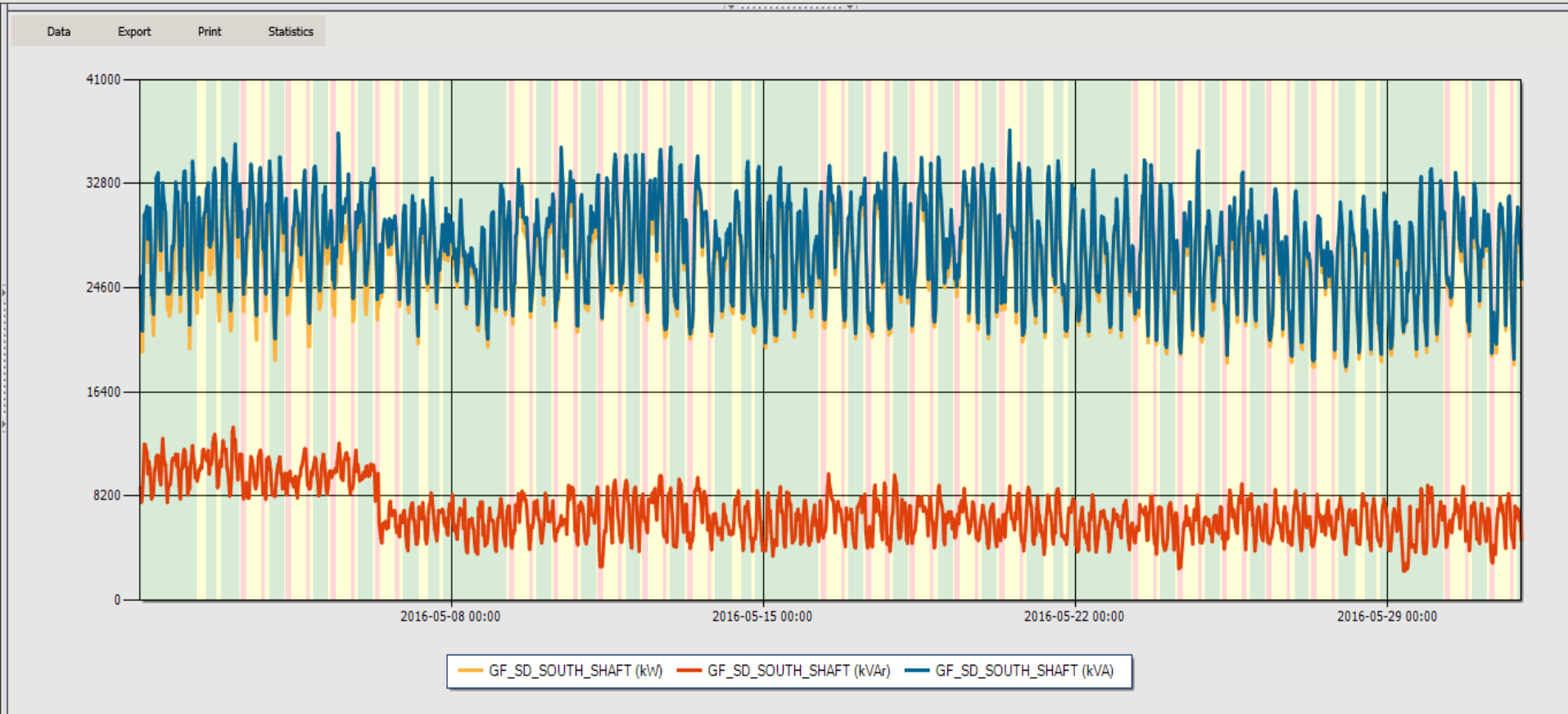
August 2016 Energy Insights Power Split

SD Outer pie; T# middle pie; S# inner pie



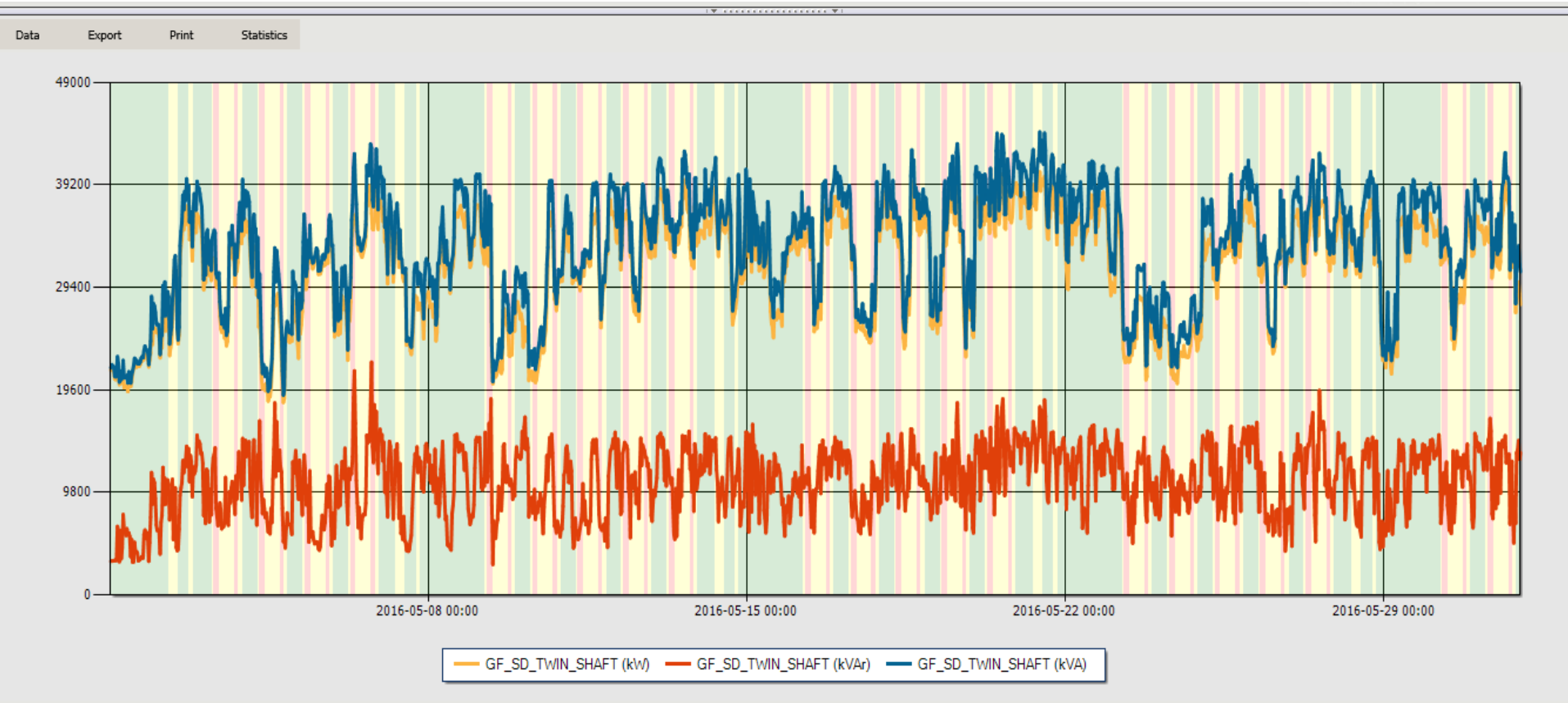
South Shaft May

- Maximum Demand 39.9MVA
- Average power consumption 26.6MW
- Power factor control operated effectively from 6th May



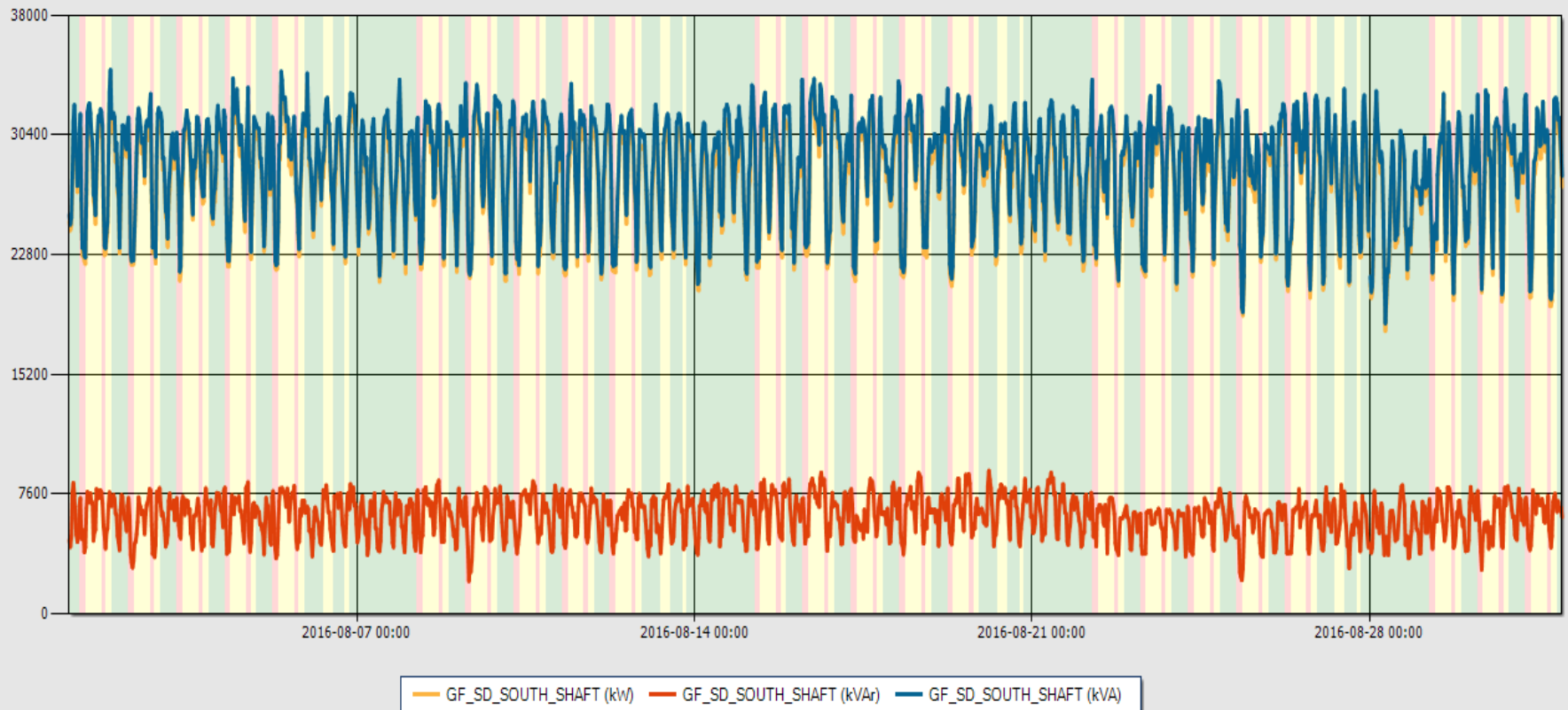
Twin Shaft May 2016

- Maximum Demand for May was 44.24MVA
- Average demand 31.32MW
- Power factor control not optimised and will be when capital is available
- Large variability due to gold plant which runs in “batch mode” at present due to insufficient ore. The mine is in a ramp-up phase



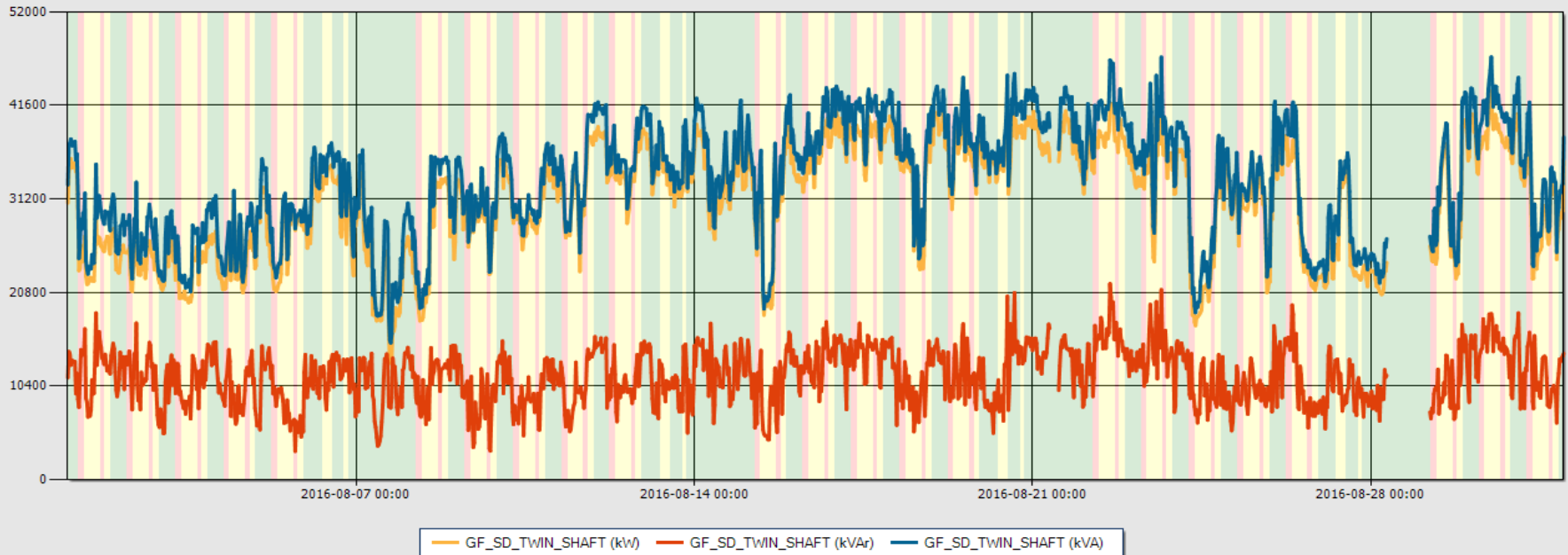
South Shaft August 2016

- Maximum Demand was 39.55MVA
- Average demand was 27.43MW.
- Power factor control operated effectively for the whole month.



Twin Shaft August 2016

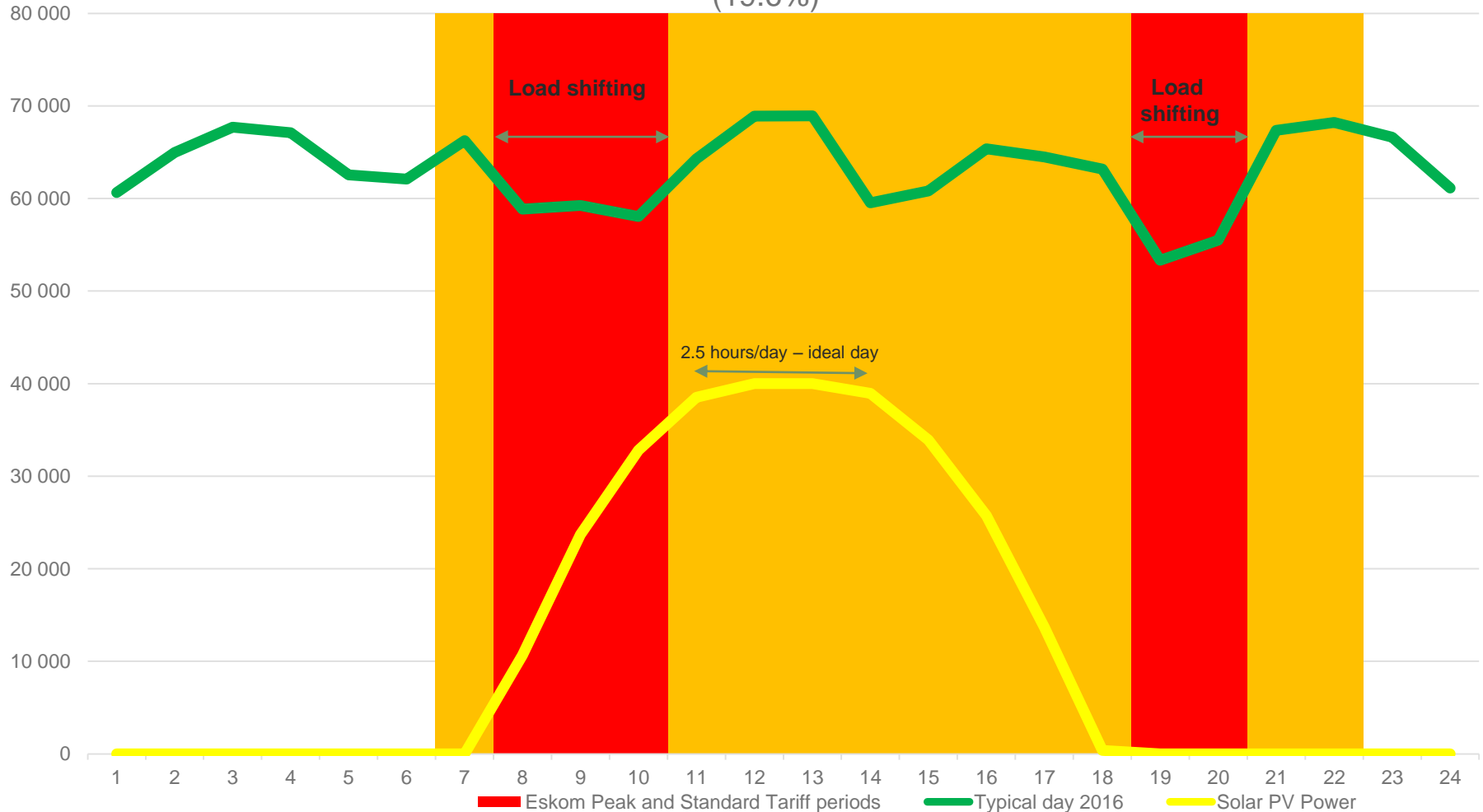
- Maximum Demand for August was 46.72MVA
- Average Demand 31.16MW
- Large variability due to gold plant



Value of the PV Plant on a Typical Day

Without storage, South Deep to benefit from low sun-hour electricity tariffs

Typical day 2016: Average demand: 63 175kW; Average solar expected 12 4431kW (19.6%)



LDS = low demand season, HDS = high demand season



An investment opportunity for EGP

A highly de-risked captive PPA

An investment case for this project :

- Long term PPA, 25 years
- Well known investment model: build-own-operate model
- +50 years Life of Mine – the only mine in RSA with such LoM
- Great solar resource (average 2000 kWh/m²)
- The mine operate a 24 hours shift, partial shutdown for Easter and Christmas days, however, power demand remains above PV plant capacity
- South Deep is open for a ‘take or pay’ PPA structure
- Land belongs to South Deep
- Land lease and access agreement not a barrier
- Potential PV sites ideally located on the “outside” of the sensitive gold plant zone
- Current and future power demand above the PV plant capacity
- The PV plant would connect through mine owned transmission network
- PV plant is on-site, eliminating external transmission line risks

Salient features:

- LoM supposes solar module lifespan and PPA period
- The mine is at ramp-up phase, i.e., aiming to increase production → future higher power demand
- Mine will not take ownership of the PV plant, at the end of the PPA
- Opportunity to partner with the mine on socio-economic investments:
 - Skills development;
 - Job creation;
 - Social initiatives; and
 - Promotion of local procurement
- The first such project in RSA – first mover advantage
- Mine is open for a secondary off-take discussions
- Potential for PPA renewal
- Potential to expand the PV plant and add storage
- Future wheeling policies expected to be more enabling, alleviating the stranded asset scenario





Thank You



GOLD FIELDS