



**SAIPPA SEMINAR – June 2016**

**Clearwater Mall Embedded Generation**

**DeVilliers Botha**

# REIPP vs Embedded Generation

REIPP	SSEG
Grid Access	REFIT
Off-Taker Bankability	Design & Commercial Considerations
Permanence Secured	Risk of Expansion to Property
Remoteness	Space Limitation
Financial Operations	Engineering Operations
Competitive Bidding, EIA, Local Content	Regulatory Compliance / Uncertainty
	SSEG Rules; NRS097-2; SANS 10142-3;

# Background on Solareff



- South African based Solar Photovoltaic Specialist
- Serving on SAPVIA Grid Access and Embedded Generation Subcommittees
- Specialist speaker and panel member at various internationally attended Renewable Energy Conferences
- Subsidiary of Pinnacle Holdings Ltd





# Professional Key Staff

- Pr. Eng. Engineers – university graduated with Masters degrees
- Project Managers – most qualified and experienced in the industry
- Master Electricians
- Support teams
- Compliance, Legal and Financial support
- Installation teams – 10 qualified teams for national deployment



# Installed Capacity



Solareff focusses on Rooftop and (smaller scale) Ground Mounted solutions  
6.07 MWp total operational Rooftop installations (Grid Tied and -Interactive)

## Recent projects include:

**1,5MWp Clearwater Mall for Hyprop Group  
(largest in Africa)**

**510kWp Denlyn Mall for Safari Group (Rooftop)**

**300kWp Thaba Tholo (Ground mount)**

**300kWp Rossgro (Ground mount)**

**255kWp Alpha Plast (Rooftop)**

**200kWp Hentha Industrial Park (Rooftop)**

**120kWp Smollan (Rooftop PPA)**

**90kWp Netcare 911 Midrand (Rooftop)**

**91kWp Attacq's Novartis building (Rooftop)**

**60kWp Wika Industries (Rooftop)**

# Current Projects

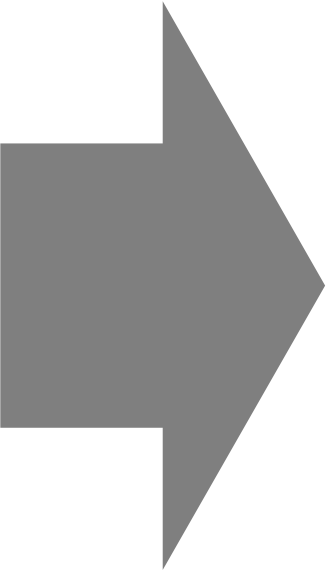
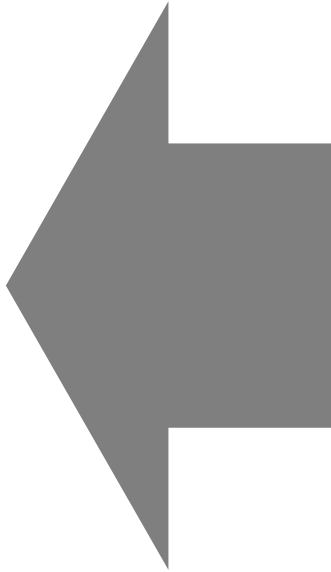
Largest rooftop installation in the Southern Hemisphere –  
Mall of Africa 4,755MWp



## Other major projects

Woolworths	-	1MWp
East Rand Mall	-	930kWp
Senwes	-	753kWp
Medicross	-	650kWp
Greenstone Mall	-	630kWp
Numerous projects under 500kWp		



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- ✗ Limited supply to the site of 7MW
  - ✗ Surrounding area expanding rapidly
  - ✗ Infrastructure limitations

Growth of Mall was stalled due  
to the above factors

Embedded Generation was the solution!

# Air-Conditioning Load Match

1.4 MW

1.2 MW

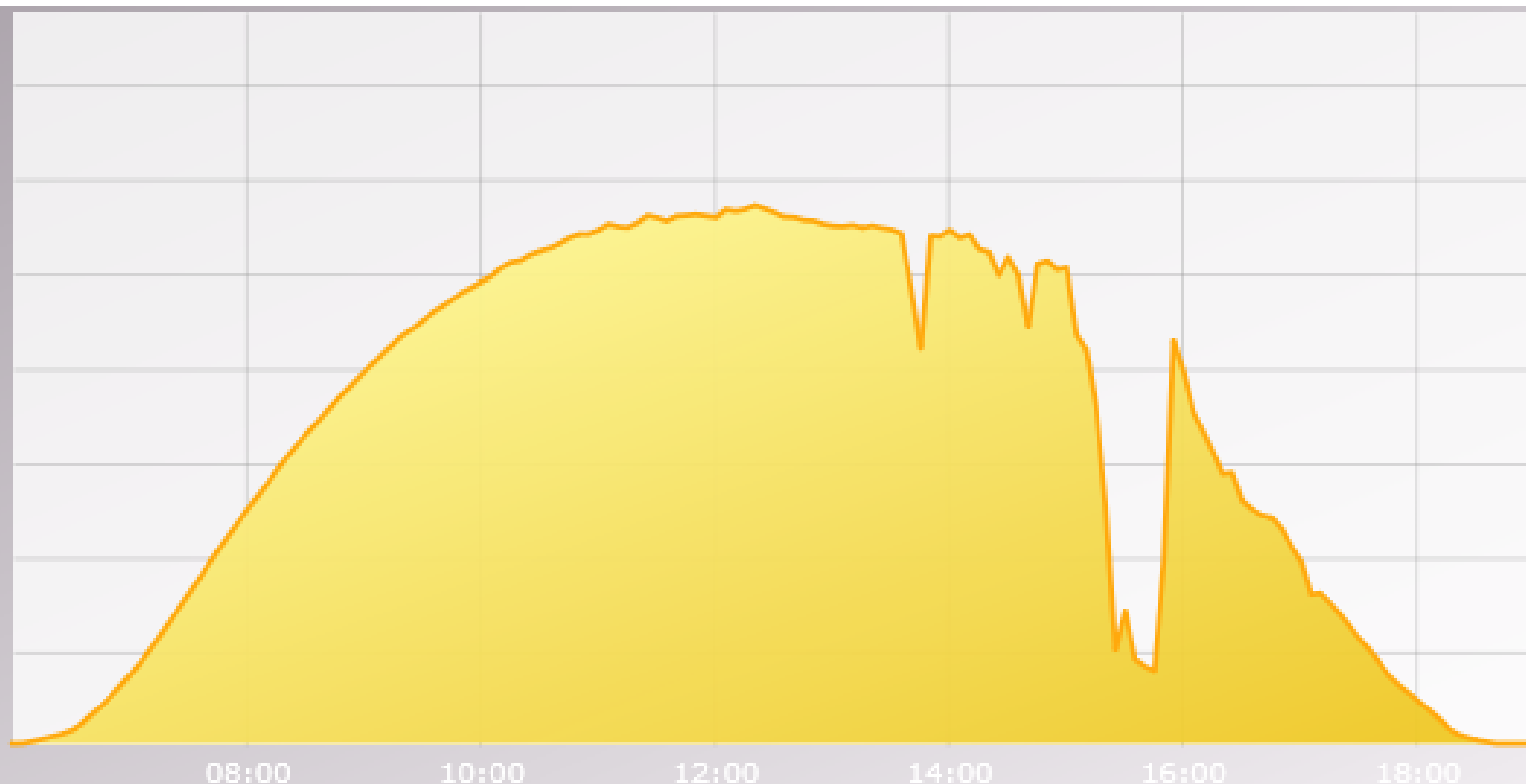
1 MW

800 kW

600 kW

400 kW

200 kW



## Current

Feed-in Power Pac	326.02 kW
Generator P1,P2,P3	108.86, 110.19, 115.5 kW
Inverter Efficiency $\eta$	97 %
Status	19x 4-MPP, 10x Offline ⓘ
Error	ⓘ

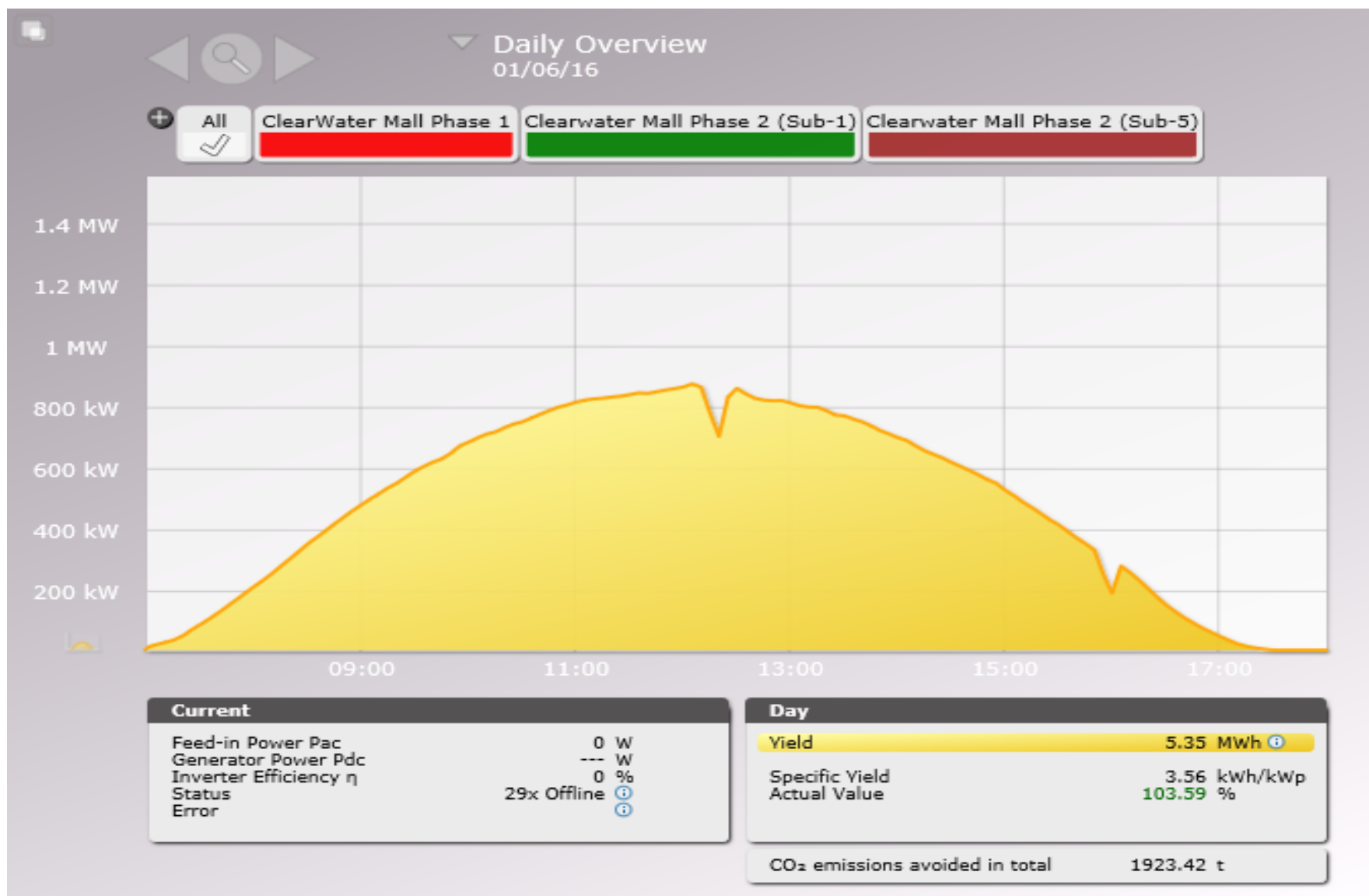
## Day

Yield	8.55 MWh ⓘ
Specific Yield	5.7 kWh/kWp
Actual Value	128.3 %

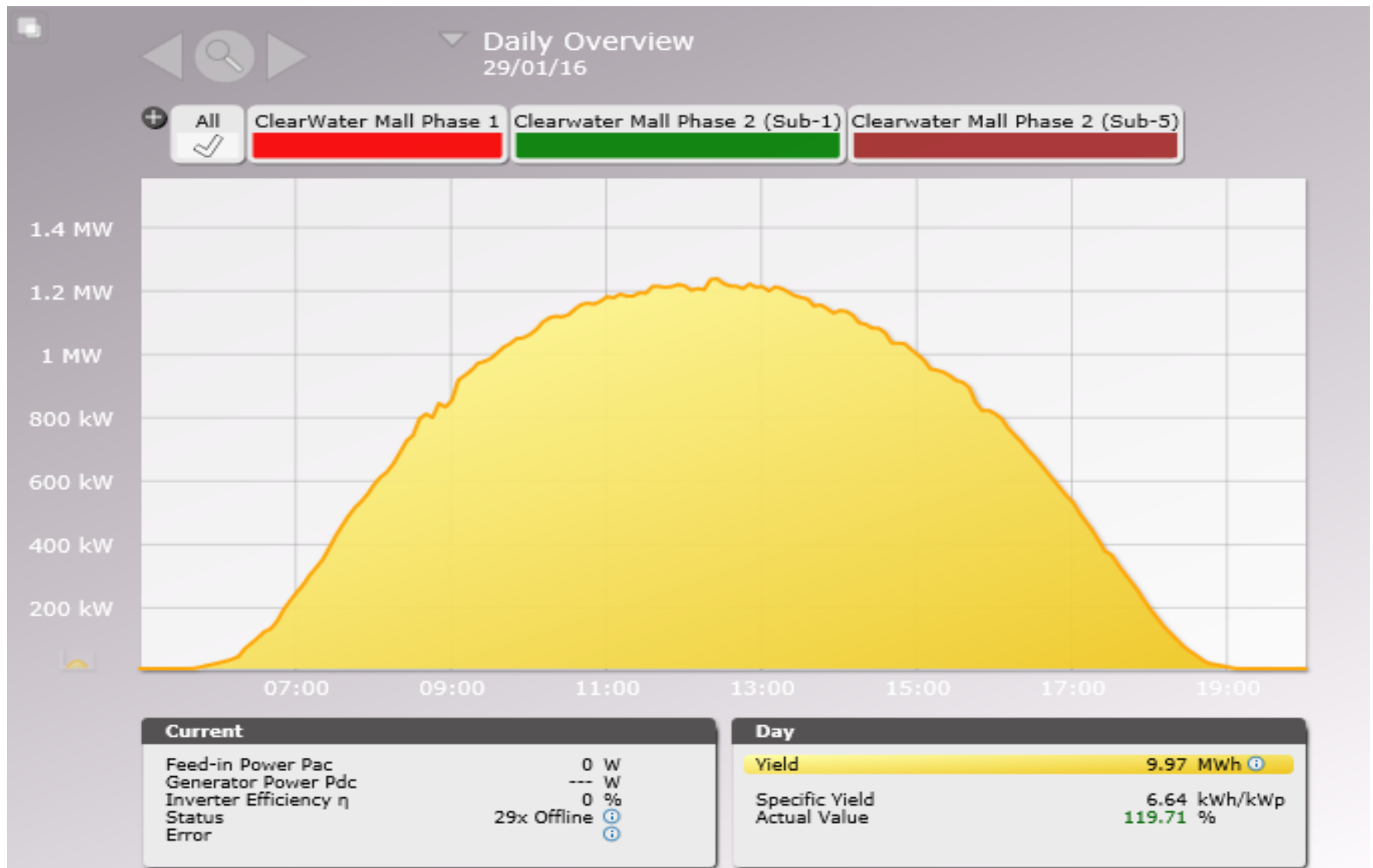
CO<sub>2</sub> emissions avoided in total 1578.6 t



# Winter Generation



# Summer Generation



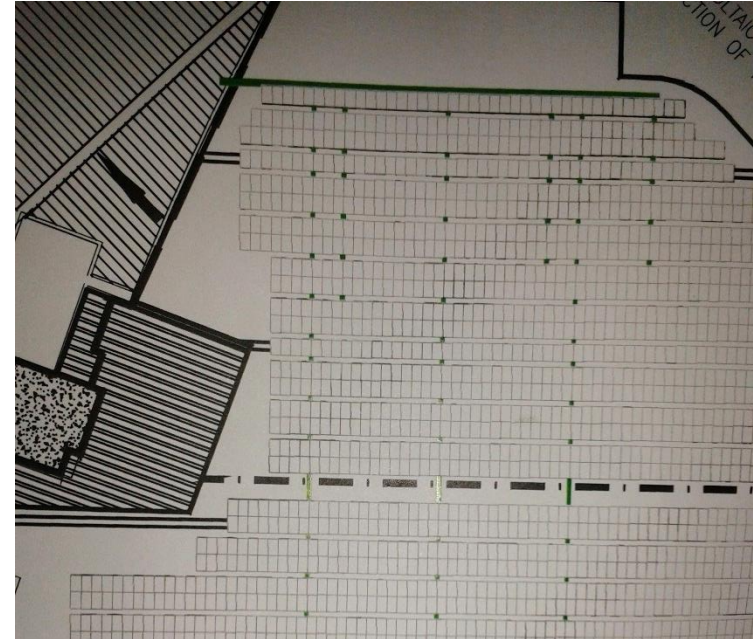
# Design Considerations for SSEG

- Roof angle – structure vs parallel to roof
- Overall loading – spread of phases 1, 2 and 3
- Generator integration
- Loadshedding and anti-islanding
- Power production guarantees and impact of loadshedding
- Permanence of building / structure – shading challenges
- Construction in live public spaces – Health & Safety, Public Liability
- NERSA requirements – licensing (“own use” principle)
- Engineering & project management skills



# Planning for Renewable Energy

- Substation location and layouts
- Regulatory aspects – Grid connection, FIT
- Generation profile limited to match to consumption profile – TOU tariffs – generation not at fixed beneficial tariff
- Excess generation and weekend use
- Energy Saving vs “Bricks & Mortar” expansion
  - Rates & Taxes; Management; Services





# Clearwater Mall System Data

- Installed Capacity: 1.5MWp / 1.447MW(AC)
- 3 Systems of 500kWp each
- Connected to 3 different subs at Mall which in turn connects to the MV ring
- 12,000m<sup>2</sup>
- Parallel to Roof – 100mm from structure
- Non-penetrative roof clamps
- Phase 1 – 500kWp - Nov 2014
- Phase 2 – 1MWp - Aug 2015
- Expected payback = 4.25 years (No demand (KVA) saving)
- Diesel Generator integrated



# SSEG Market Expansion



- ✓ Attractive finance solutions
- ✓ Clear regulatory framework
- ✓ Financial model to secure municipalities (PPA may only be for 3 years)





# Questions

