# Renewable / Sustainable / Carbon Reducing Technologies


And Now ?


I don’t understand ?


Whoops was that the roof !!


Duhva power station turbine smash
Where are your hard hats?

# ENERGY CRISIS……?

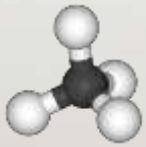
# Ice Breaker

- 1kg Wood ~ 12MJ

- 1kg Petrol/Diesel ~ 48MJ

- 1kg Wood Pellet ~ 16MJ

- 1kg Coal ~ 22-28MJ



- 1kg Methane ~ 55MJ (hydrogen 142MJ)

# Ice Breaker

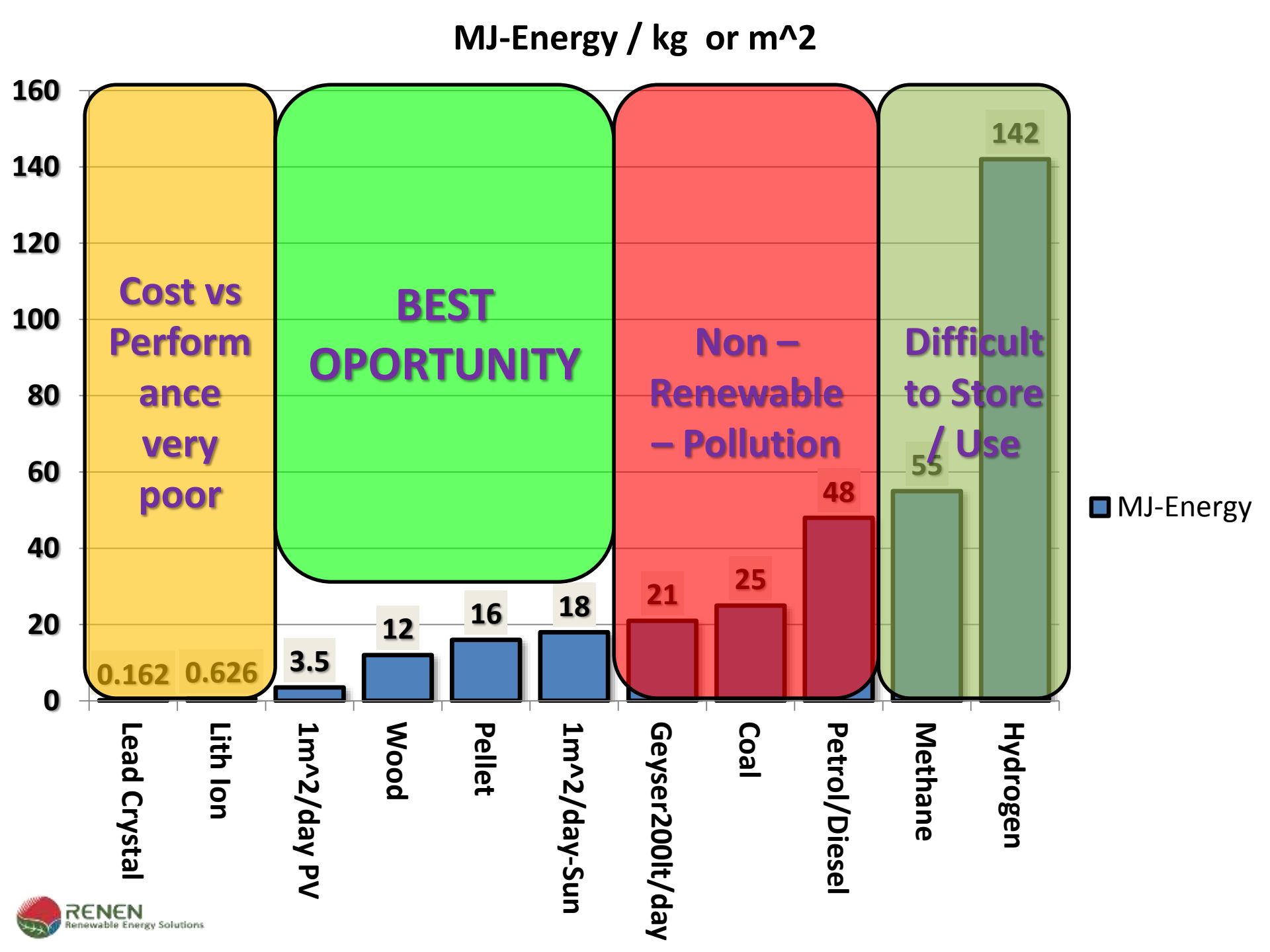
- 1m² Solar Radiation ~ 18MJ/day

- 1m² Silicon ~ 3.5MJ/day

- 1day normal use ~ 21MJ

- 1kg Lead Acid Battery ~ 0.126MJ

- 1kg Lithium-ion Battery ~ 0.626MJ


MJ-Energy / kg or m^2
160
140
120
100
80
60
40
20
0
Cost vs Performance very poor
BEST OPORTUNITY
Non – Renewable – Pollution
Difficult to Store / Use
0.162
0.626
3.5
12
16
18
21
25
48
55
142
MJ-Energy
Lead Crystal
Lith Ion
1m^2/day PV
Wood
Pellet
1m^2/day-Sun
Geyser200lt/day
Coal
Petrol/Diesel
Methane
Hydrogen
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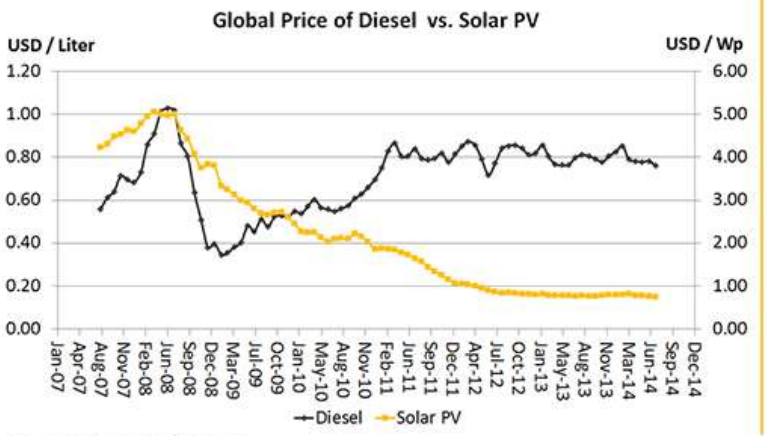
# The Basics of Solar - PV

- Solar PV vs. Solar Thermal
- Working hours (sunshine 7hrs / day)
  - Requires behaviour change and/or integration

## Solar is now cheaper than diesel




Source: Indexmundi; Solarserver

- Diesel prices are rising
- Solar prices are falling

Solar power is cheaper today than diesel generators in places with abundant sunshine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SOLAR
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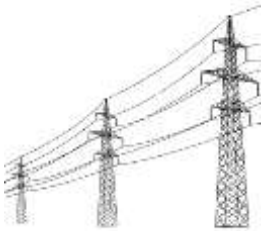
# System design – GRID TIED

Solar PV - Modules

Loads



Grid

DB

Grid Tied Inverter

Grid Tied Inverter

Meter

ICE- Generator

DC-Breaker

AC

DC

Change over

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# System design – OFF GRID -

Solar PV - Modules

Low Load Circuit Appliances

Balance of Loads

Battery Inverter

Grid Tied Inverter

DB

Battery bank

DC-Breaker

AC

DC

Change over

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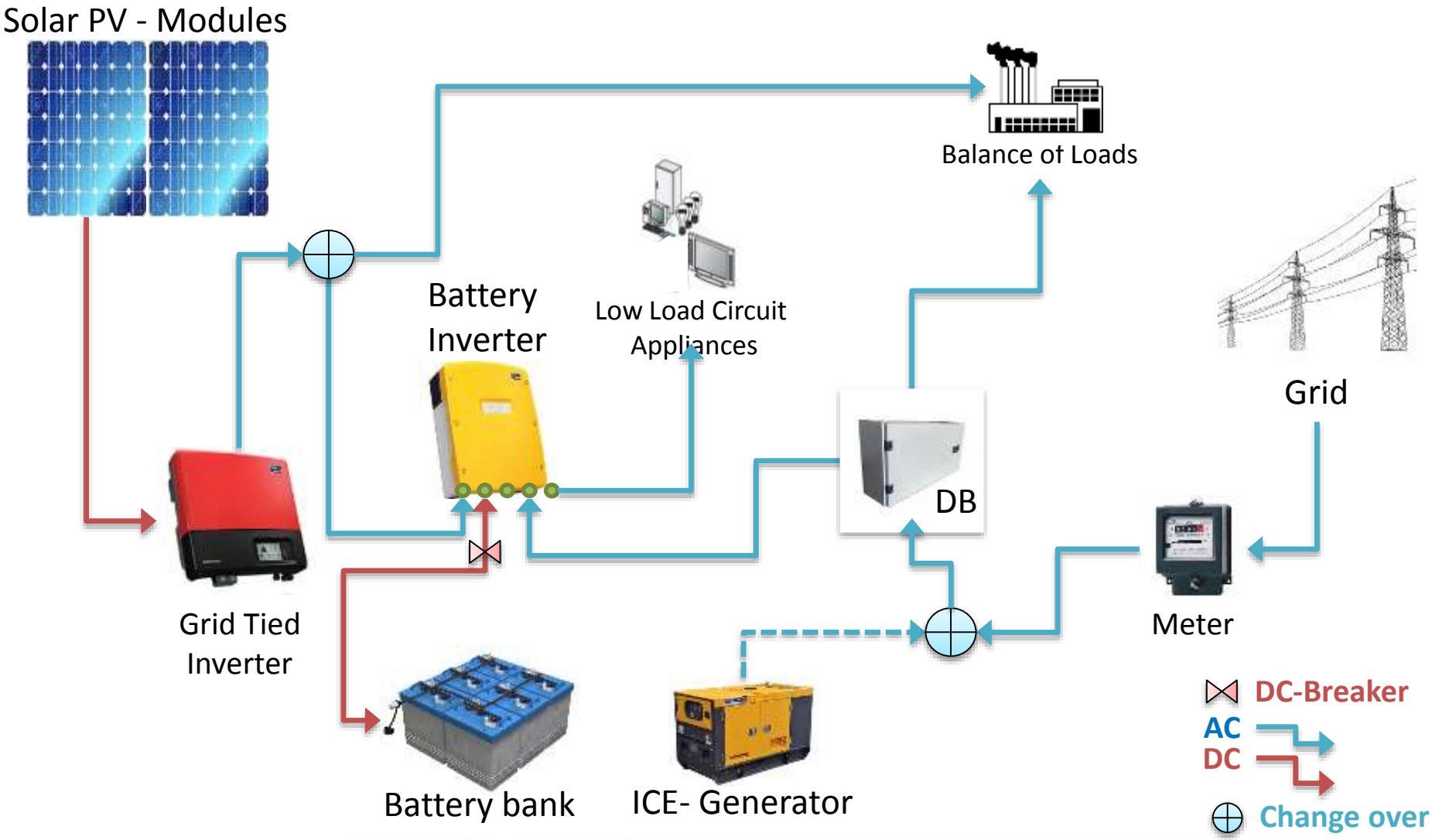
# System design – OFF GRID HYBRID

## OPTION 1

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# Energy Audit Aims

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## Shaw Research Centre

- Accounts Overview
- Top 10 users
- Tariff check
- First Actions

PV SIZING

HEAT REPLACEMENT

LIVE MONITORING

EQUIPMENT UPGRADE

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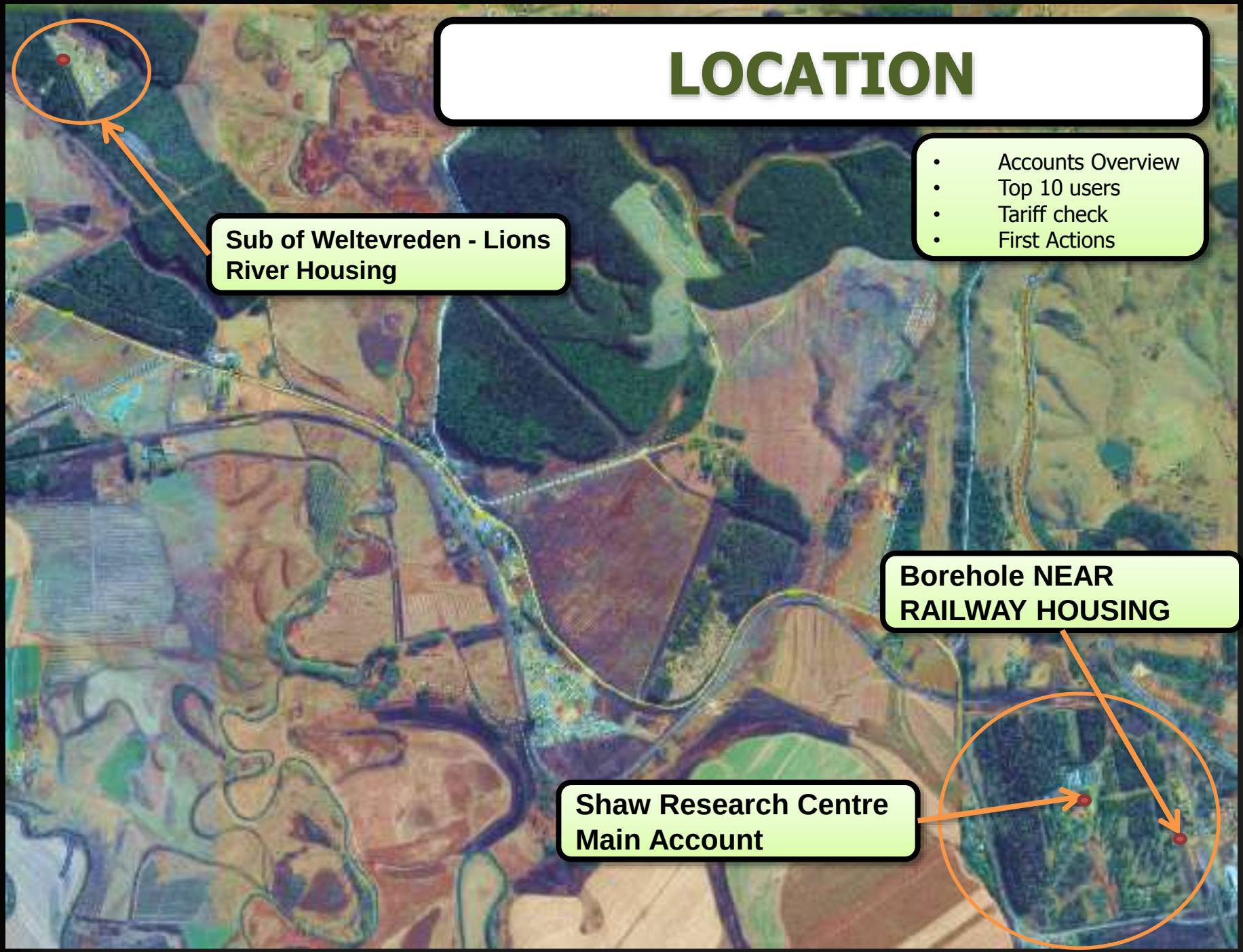
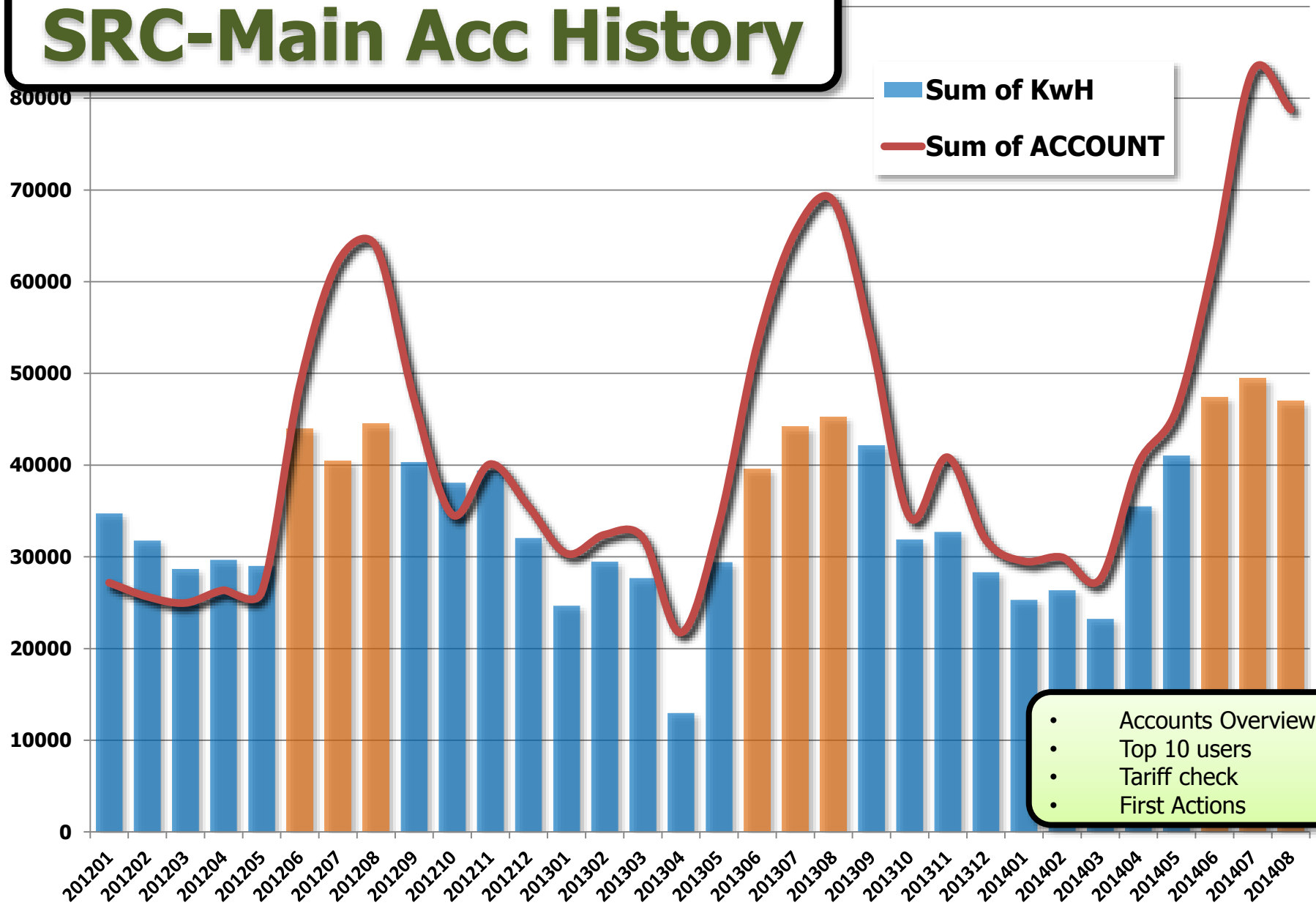

LOCATION
Accounts Overview
Top 10 users
Tariff check
First Actions
Sub of Weltevreden - Lions River Housing
Borehole NEAR RAILWAY HOUSING
Shaw Research Centre Main Account

# SRC-Main Acc History




- Accounts Overview
- Top 10 users
- Tariff check
- First Actions

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- Accounts Overview
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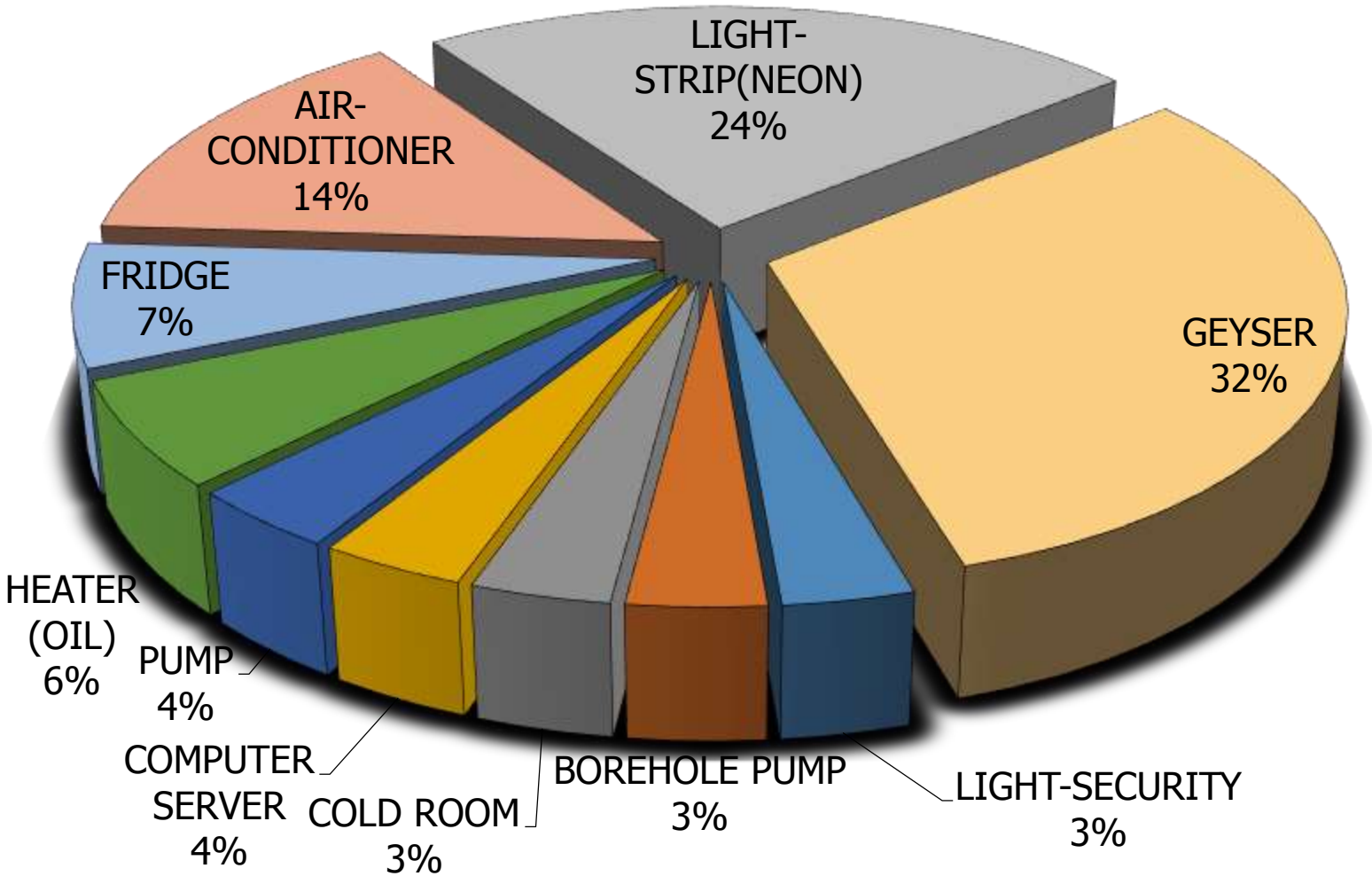
- First Actions

# TOP 10 USERS - kWh MAIN ACCOUNT

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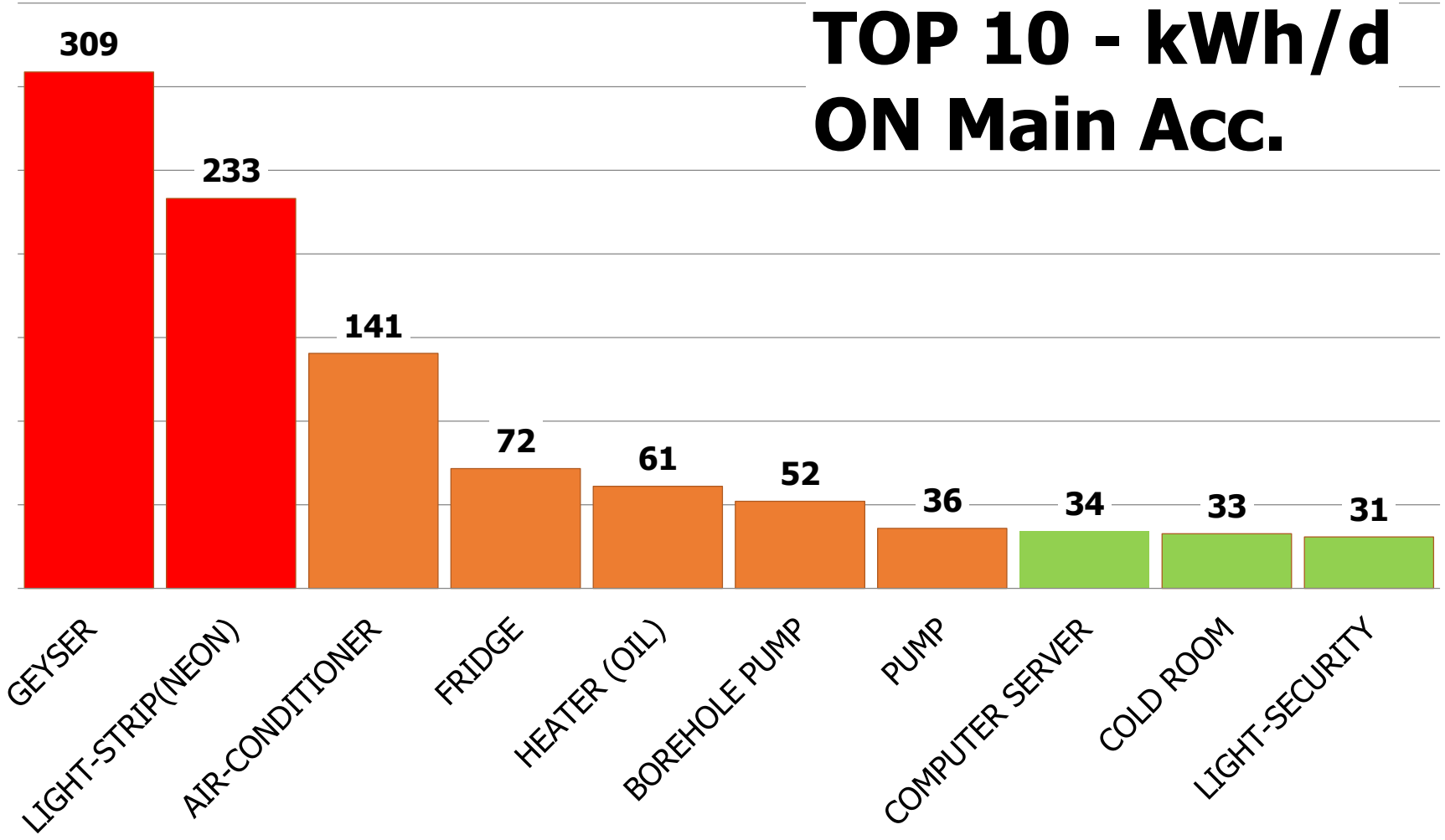
# TOP 10 users – per Account.

- Accounts Overview
- Top 10 users
- Tariff check
- First Actions

## TOP 10 - kWh/d ON Main Acc.

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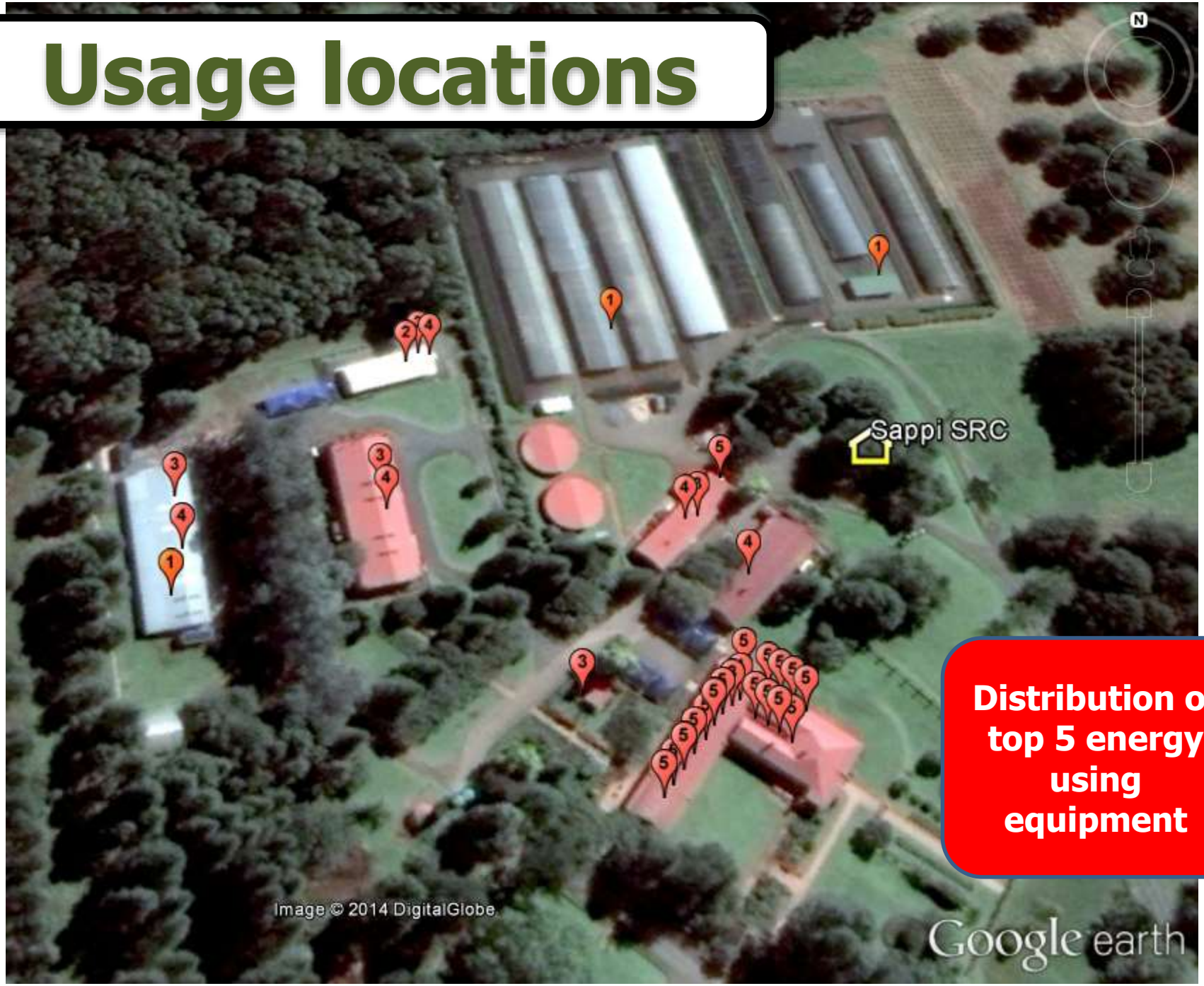
# Usage locations

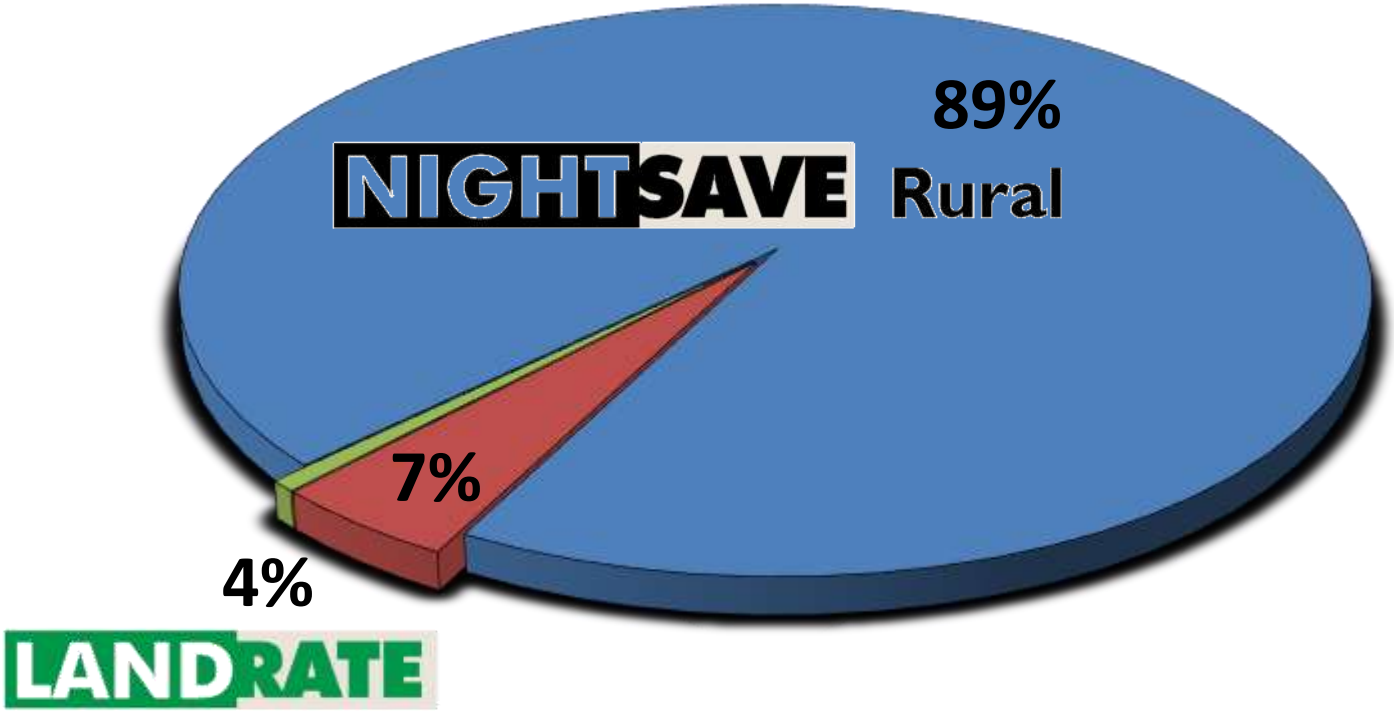



**Distribution of top 5 energy using equipment**

# Rate / Tariff Discussion

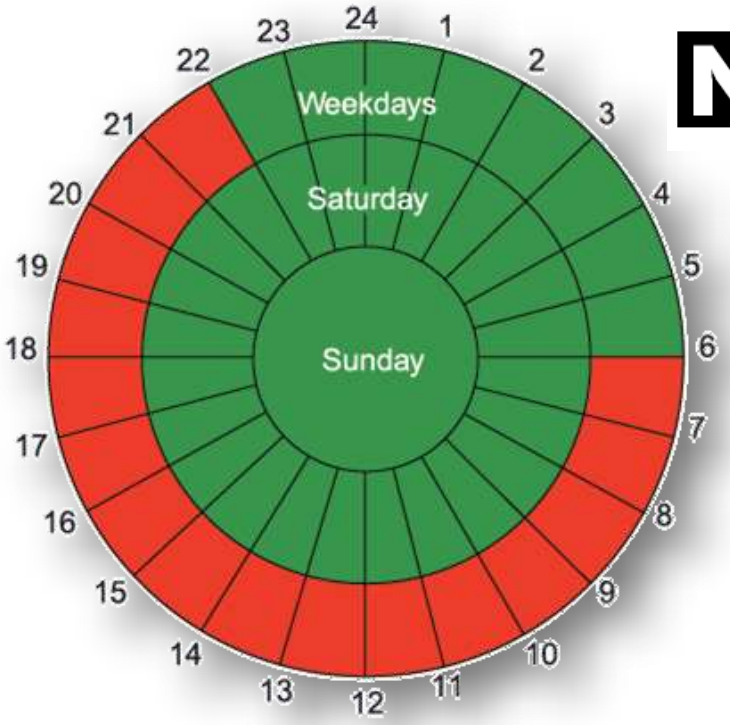
# ACC. DISTRIBUTION (predicted usage per pole)
# TARIFF TYPE

- Accounts Overview
- Top 10 users
- Tariff check
- First Actions




- 5341073544-Shaw Research Centre Main Account-IN USE
- 8046499075-Sub of Weltevreden - Lions River Housing-IN USE
- 8224730132-Borehole NEAR RAILWAY HOUSING-IN USE

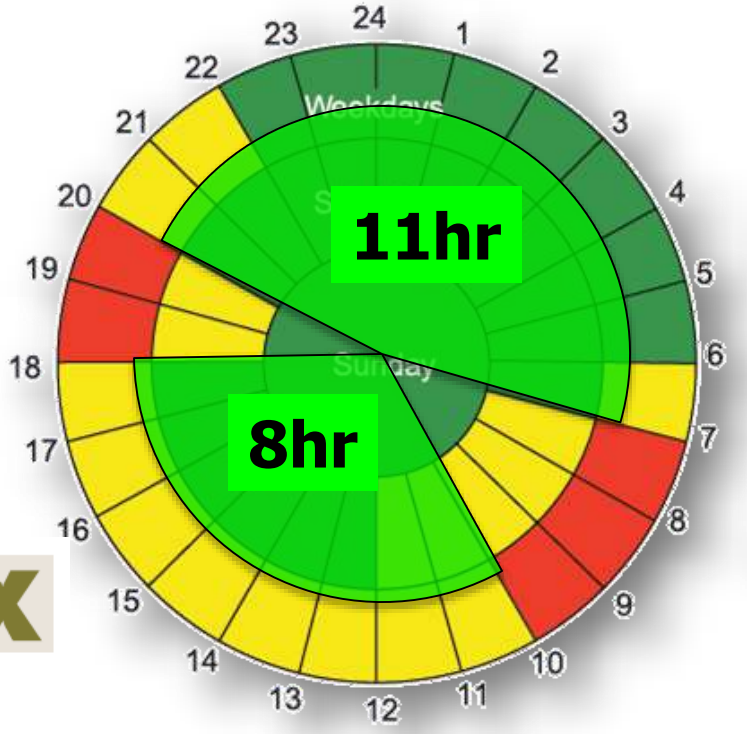
# NIGHTSAVE Rural




Peak

Off-peak

- Accounts Overview
- Top 10 users
- Tariff check
- First Actions




Peak

Standard

Off-peak

RURAFLEX

# Nightsave Rural

- Accounts Overview
- Top 10 users
- Tariff check
- First Actions

## NIGHTSAVE Rural – Non local authority rates

MENU

| NIGHTSAVERURALT1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| | Excl. VAT | | Active Energy Charge (R/kWh/m) | | Energy demand charges (R/kVA/m) | | |
| | Transmission zone | Voltage | High demand season(Jun-Aug) | Low demand season (Sep- | High demand season (Jun-Aug) | Low demand season (Sep-May) | Network access charges (R/kVA/m) |
| <300km<500 | <300km | <500 | 0.5579 | 0.4355 | 186.94 | 98.94 | 9.45 |
| <300km>500 & <22kV | <300km | >500 & <22kV | 0.5513 | 0.4287 | 181.14 | 95.42 | 8.68 |
| >300<600km<500 | >300<600km | <500 | 0.5634 | 0.4387 | 189.19 | 100.31 | 9.48 |
| >300<600km>500 & <22kV | >300<600km | >500 & <22kV | 0.557 | 0.433 | 183.36 | 96.75 | 8.72 |
| >600<900km<500 | >600<900km | <500 | 0.5691 | 0.4422 | 191.46 | 101.66 | 9.57 |
| >600<900km>500 & <22kV | >600<900km | >500 & <22kV | 0.5624 | 0.4373 | 185.55 | 98.09 | 8.78 |
| >900km<500 | >900km | <500 | 0.5747 | 0.4466 | 193.78 | 103.06 | 9.58 |
| >900km>500 & <22kV | >900km | >500 & <22kV | 0.5679 | 0.4415 | 187.82 | 99.46 | 8.79 |

| NIGHTSAVERURALT2 | 2 | 3 | 4 |
|---|---|---|---|
| | Excl. VAT | | |
| | Customer Catergory | Service Charge R/Account/da | Administration Charge R/POD/Day |
| < 100kVA | < 100kVA | 12.99 | 3.69 |
| > 100kVA & < 500kVA | > 100kVA & < 500kV | 44.32 | 20.54 |
| > 500kVA & < 1MVA | > 500kVA & < 1MVA | 136.33 | 31.53 |
| > 1MVA | > 1MVA | 136.33 | 58.51 |
| Key customers | Key customers | 2671.9 | 58.51 |

| NIGHTSAVERURALT3 | 2 | 3 | 4 |
|---|---|---|---|
| | Excl. VAT | | |
| | Voltage | Reliability Service Charge R/kWh | Network Demand Charge R/kWh |
| <500 | <500 | 0.0029 | 0.188 |
| >500 & <22kV | >500 & <22kV | 0.0029 | 0.188 |

| NIGHTSAVE RURL Non Local Authority | | |
|---|---|---|
| Transmission zone | >300<600km | >300<600km<500 |
| Voltage | <500 | |
| Customer Catergory | > 100kVA & < 500kVA | |

| NSRNLART | High | Low |
|---|---|---|
| Active Energy Charge (R/kWh/m) | 0.5634 | 0.4387 |
| Energy demand charges (R/kVA/m) | 189.19 | 100.31 |
| Network access charges (R/kVA/m) | 9.48 | 9.48 |
| Service Charge R/Account/day | 44.32 | 44.32 |
| Administration Charge R/POD/Day | 20.54 | 20.54 |
| Reliability Service Charge R/kWh | 0.0029 | 0.0029 |
| Network Demand Charge R/kWh | 0.188 | 0.188 |

| | | Active energy charge (c/kWh) | | | | Energy demand charges (R/kVA/m) | | | | Network access charges (R/kVA/m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Transmission zone | Voltage | High demand season (Jun-Aug) | | Low demand season (Sep-May) | | High demand season (Jun-Aug) | | Low demand season (Sep-May) | | | |
| | | VAT excl. | VAT incl. | VAT excl. | VAT incl. | VAT excl. | VAT incl. | VAT excl. | VAT incl. | VAT excl. | VAT incl. |
| ≤ 300km | < 500V | 55.79 | 63.60 | 43.35 | 49.42 | R 186.94 | R 213.11 | R 98.94 | R 112.79 | R 9.45 | R 10.77 |
| | ≥ 500V & ≤ 22kV | 55.13 | 62.85 | 42.87 | 48.87 | R 181.14 | R 206.50 | R 95.42 | R 108.78 | R 8.68 | R 9.90 |
| > 300km and ≤ 600km | < 500V | 56.34 | 64.23 | 43.78 | 49.91 | R 189.19 | R 215.68 | R 100.31 | R 114.35 | R 9.48 | R 10.81 |
| | ≥ 500V & ≤ 22kV | 55.70 | 63.50 | 43.30 | 49.36 | R 183.36 | R 209.03 | R 96.75 | R 110.30 | R 8.72 | R 9.94 |
| > 600km and ≤ 900km | < 500V | 56.91 | 64.88 | 44.22 | 50.41 | R 191.46 | R 218.26 | R 101.66 | R 115.89 | R 9.57 | R 10.91 |
| | ≥ 500V & ≤ 22kV | 56.24 | 64.11 | 43.73 | 49.85 | R 185.55 | R 211.53 | R 98.09 | R 111.82 | R 8.78 | R 10.01 |
| > 900km | < 500V | 57.47 | 65.52 | 44.66 | 50.91 | R 193.78 | R 220.91 | R 103.06 | R 117.49 | R 9.58 | R 10.92 |
| | ≥ 500V & ≤ 22kV | 56.79 | 64.74 | 44.15 | 50.33 | R 187.82 | R 214.11 | R 99.46 | R 113.38 | R 8.79 | R 10.02 |

| Customer categories | Service charge (R/Account/day) | | Administration charge (R/POD/day) | |
|---|---|---|---|---|
| | VAT excl. | VAT incl. | VAT excl. | VAT incl. |
| ≤ 100kVA | R 12.99 | R 14.81 | R 3.69 | R 4.21 |
| > 100kVA & ≤ 500kVA | R 44.32 | R 50.52 | R 20.54 | R 23.42 |
| > 500kVA & ≤ 1MVA | R 136.33 | R 155.42 | R 31.53 | R 35.94 |
| > 1MVA | R 136.33 | R 155.42 | R 58.51 | R 66.70 |
| Key customers | R 2 671.90 | R 3 045.97 | R 58.51 | R 66.70 |

| Voltage | Reliability service charge (c/kWh) | | Network demand charge (c/kWh) (All time of use periods) | |
|---|---|---|---|---|
| | VAT excl. | VAT incl | VAT excl. | VAT incl |
| < 500V | 0.29 | 0.33 | 18.80 | 21.43 |
| ≥ 500V & ≤ 22kV | 0.29 | 0.33 | 16.48 | 18.79 |

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# Ruraflex

- Accounts Overview
- Top 10 users
- Tariff check
- First Actions

| RFNLALART | High | Low |
|---|---|---|
| Active Energy Charge (R/kWh/m)Peak | 2.3103 | 0.7536 |
| Active Energy Charge (R/kWh/m)Standar | 0.6999 | 0.5186 |
| Active Energy Charge (R/kWh/m)Off-Pea | 0.3801 | 0.3291 |
| Reliability Service Charge R/kWh | 0.0029 | 0.0029 |
| Network Demand Charge R/kWh | 0.188 | 0.188 |
| Network access charges (R/kVA/m) | 13.25 | 13.25 |
| Service Charge R/Account/day | 136.33 | 136.33 |
| Administration Charge R/POD/Day | 31.53 | 31.53 |
| Reactive Energy Charge (R/kVarh) | 6.35 | 0 |

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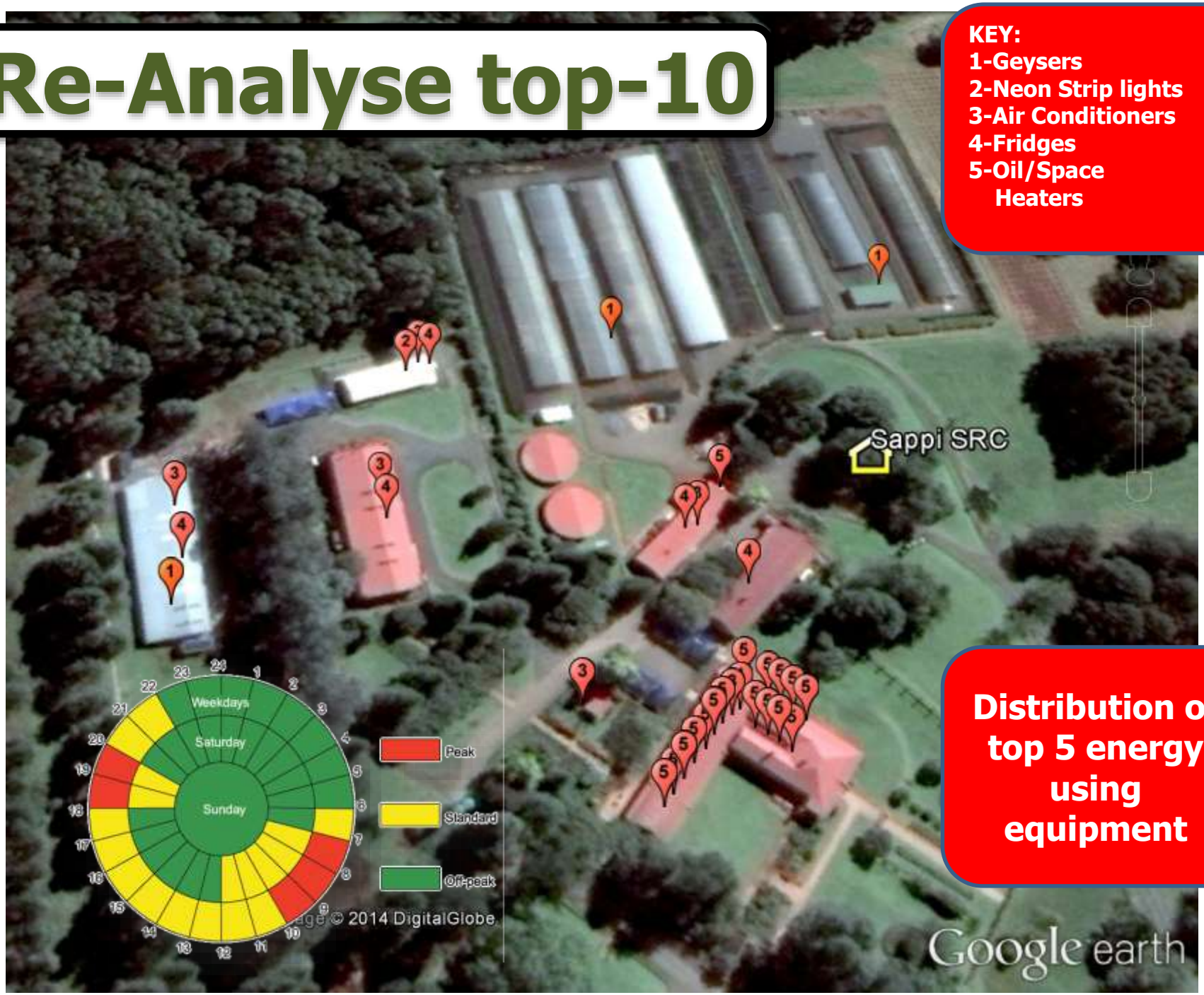
# Re-Analyse top-10

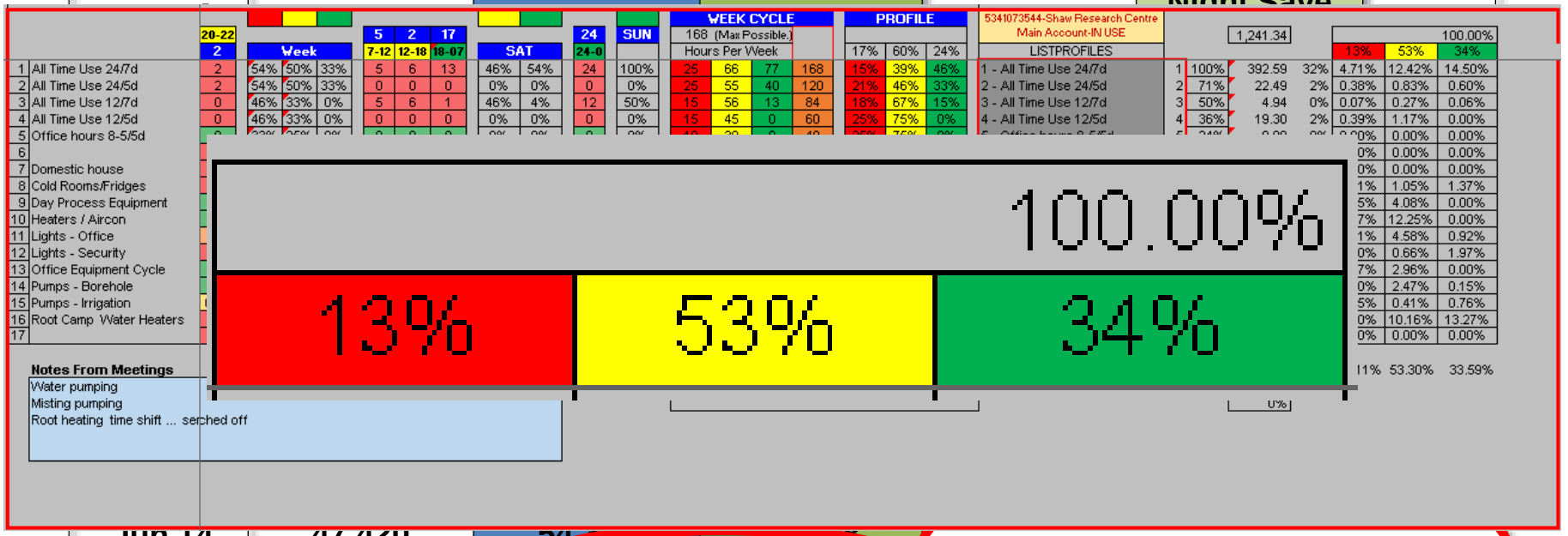



**Distribution of top 5 energy using equipment**

# Rate / Tariff saving PREDICTION

- Accounts Overview
- Top 10 users
- Tariff check
- First Actions

## SUMMARY




| | | | |
|---|---|---|---|
| Jun 14 | 47,420 | | |
| | 423,472 | R 437,961 | R 395,408 |
| | | | 10% |
| | | | 42,554 |

**Predicted Savings moving to Ruraflex Per Year (No Change of Behaviour)**

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# POSSIBLE ACTIONS

## Shaw Research Centre

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1. **Account Tariff Conversion (Ruraflex)**
2. **Behaviour Adjustment (Time of use restriction)**
3. **Efficiency orientation (hardware) – (LED conversion)**
4. **Hot Water, Conversion to Solar – (Root Zone Heat)**
5. **PV – Base Size -100kWp (limited re-feed options)**
6. **Pump System - VSD Pump control / Backup**
7. **Office Insolation (roof / door / window)**
8. **Live monitoring on High Users**
    1. **Root Zone Heat**
    2. **Office consumption**
    3. **Steam room**

- Accounts Overview
- Top 10 users
- Tariff check
- First Actions

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# Solar energy

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## Roof-mount

## Ground-mount

Belgotex®


**Africa's first 1MW**
**roof-top, grid tied solar installation**

GRID TIED | PROJECT MANAGEMENT | POWER MONITORING | SOLAR

# Biogas

**Domestic**

**Agricultural / industrial**

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BIOGAS BIOGAS

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# Fires

calore
SUSTAINABLE ENERGY

## Wood



## Pellet



# ISITOFU

**Powered by Renewable Biomass Pellets**

Renen

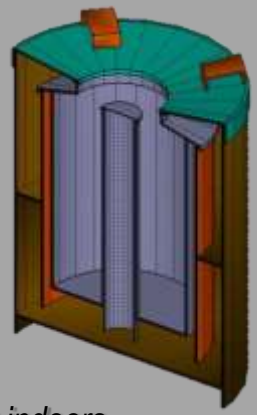
## Stove Technical Specifications:

- Stove Mass – 3.5kg
- Fuel: Biomass(wood shavings or small diameter and or wood pellets)
- Materials – Composite
  - Stainless Steel Burn chamber
  - Heat shield
  - Mild Steel Housing
  - Aluminum or Stainless steel Lid
- Fuel chamber size 1-1.4kg
- Average Gas burn time 120min (using 8mm pellet)
- Average Char burn time 90min (using 8mm pellet)
- Adjustable oxygen settings for heat control
- No additional fans or battery are required !!!
- Technology TLUD (Top Lit Up Draft)

**Biomass Wood Pellet –**
**Safe**
**Sustainable**
**Renewable**
**Carbon Neutral**
**Low cost Fuel / Energy**

## System Information:

- TLUD – Two stage burn system. Once the fire is lit the wood will give off gas (gas burn)
- When the gas is finished the remaining charcoal will also burn (char burn)
- Wood Pellet Fuel Energy is typically 18MJ/kg @ 8%MC
- 1.8kg Wood Pellet equals 1lt Paraffin
- Cost of operation of wood pellet is R6-8 per 32MJ(1liter Paraffin)
- Cost of operation of a paraffin stove is R10-12 per 32MJ(1liter Paraffin)
- Adding additional fuel during a burn will cause some smoke (must be done outside)
- Stainless Steel burn chamber construction will last two to three years
- Stove will extinguish if knocked over making it extremely safe
- Wood Pellet will not burn unless in the burn chamber
- Burn Chamber prevents the fuel from exiting if knocked over
- As with all open fires (wood, LPG) good room ventilation is required for safe operation when burning indoors.



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**Thank you**

**See you at Tea**


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