ELTEK VALERE
always on

GSMA
Associate Member

HYBRID ENERGY EFFICIENT SOLUTIONS & OPEX REDUCTION

PRESENTED BY:

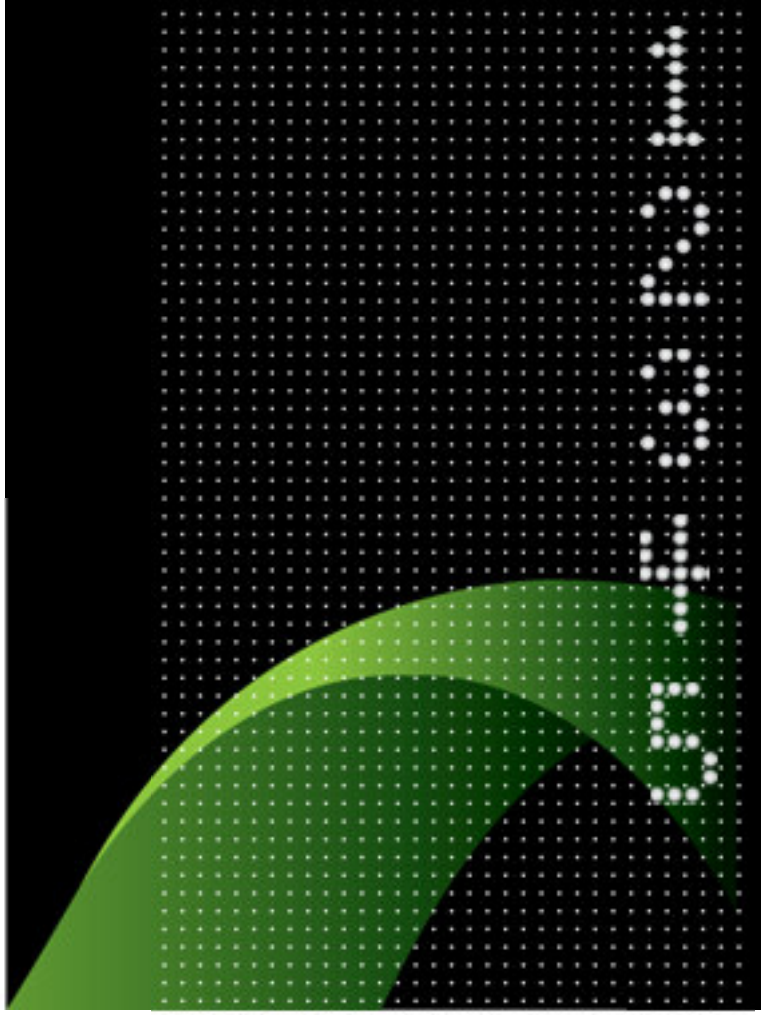
ROBERT POUNDER

ALTERNATIVE ENERGY DIRECTOR

TELECOM DIVISION

July 2011

CONTENT



WHO WE ARE

MARKET DYNAMICS & CHALLENGES

MARKET TECHNOLOGIES

SOLUTIONS & CONTROL

OPEX STUDIES

CONTENT

WHO WE ARE





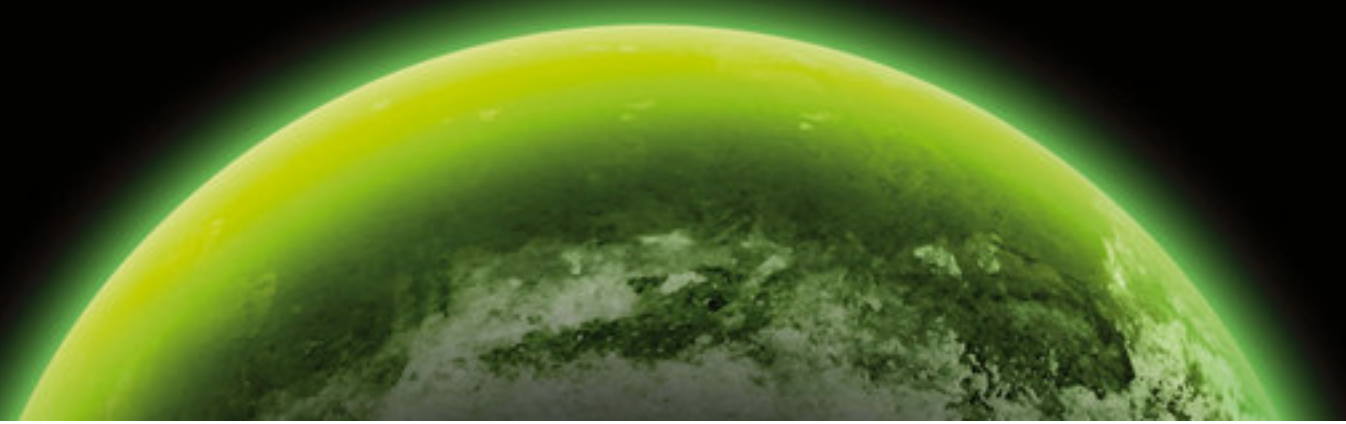




ELTEK VALERE

WHO WE ARE

- A world leader in High Efficiency Power Solutions & Energy Conversion
- More than 40 years of Solution experience
- We help customers save energy & money while reducing their environmental impact



TRUE GLOBAL REACH

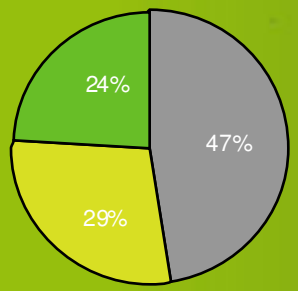
Strong presence in all major markets
Sales in over 100 countries

EMEA
1000 employees

Americas
300 employees

Asia Pacific
600 employees

Singapore



Revenue by region
4Q 2007

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WHAT IS ENERGY CONVERSION?

Energy conversion equipment

- Mains
- Solar panels
- Batteries
- Unstable DC sources…

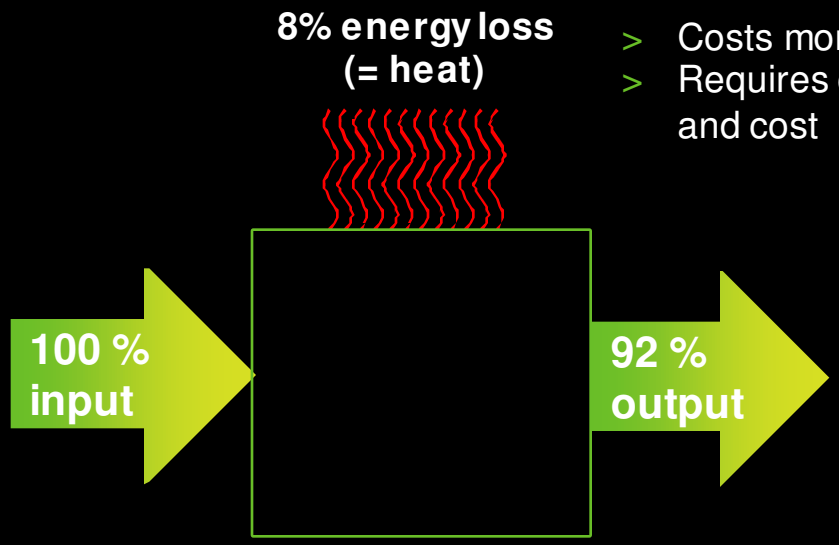


- Critical electronic equipment
- Batteries
- Mains

- AC → DC (rectifiers)
- DC → AC (inverters)
- DC → DC (converters)

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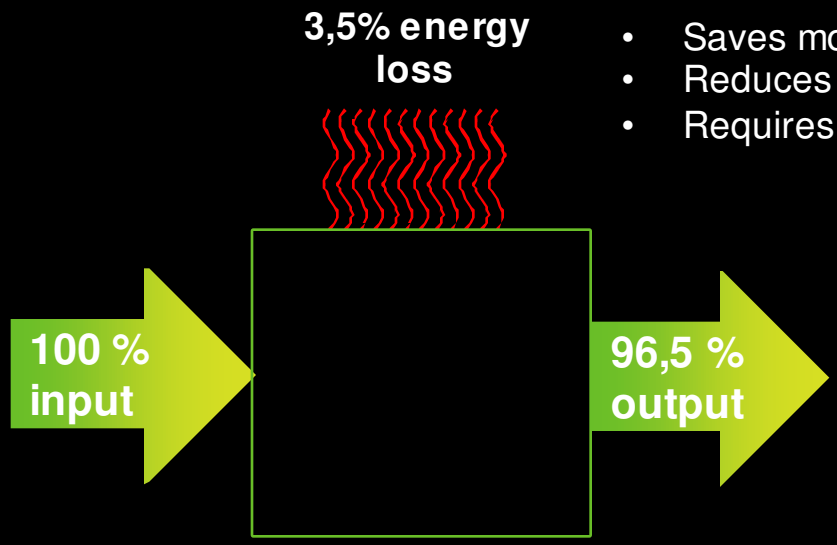
WHY ENERGY EFFICIENCY IS SO IMPORTANT..



- Costs money
- Requires cooling = more energy and cost

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WHY ENERGY EFFICIENCY IS SO IMPORTANT..



- Saves money
- Reduces environmental impact
- Requires less cooling

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CONTENT

MARKET DYNAMICS & CHALLENGES

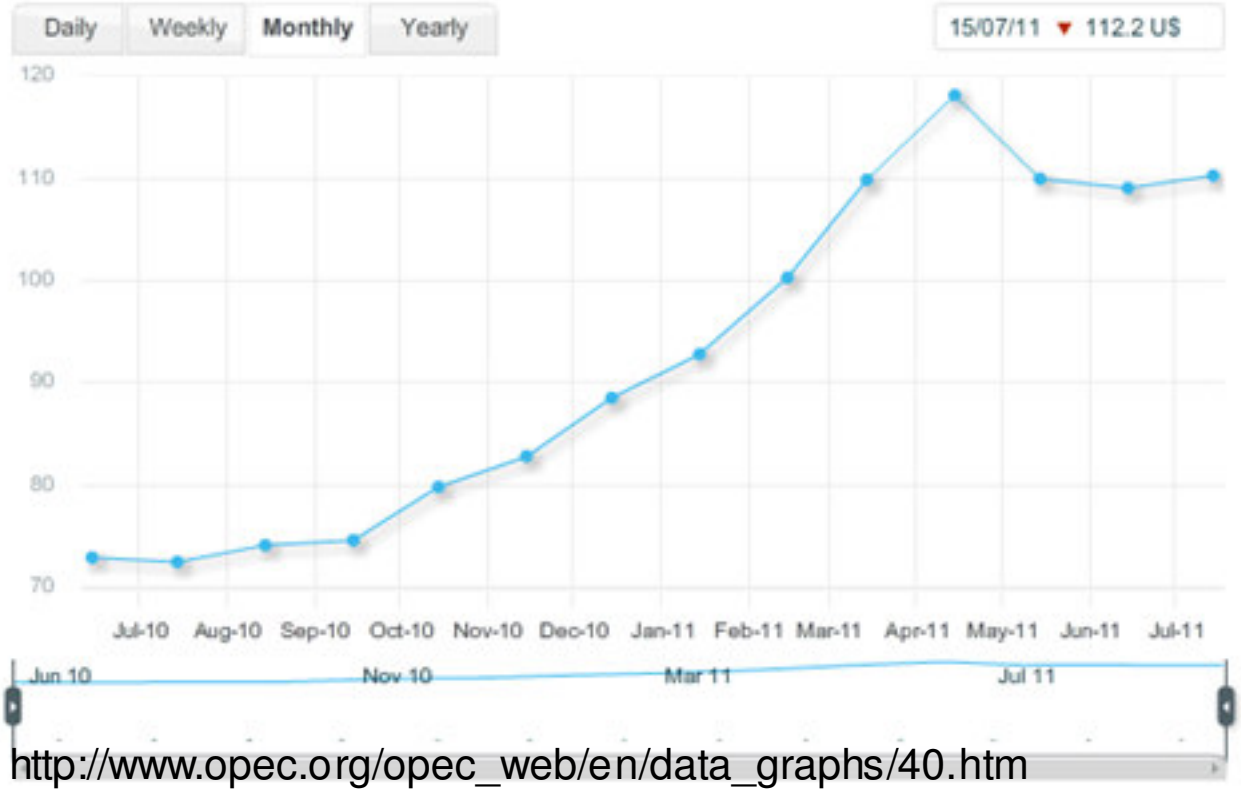


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UNCERTAINTY OF CRUDE OIL PRICE

OPEC Basket Price

OPEC fuel daily basket price USD



MONTHLY BASKET PRICE

Jul-11	110.25
Jun-11	109.04
May-11	109.94
Apr-11	118.09
Mar-11	109.84
Feb-11	100.29
Jan-11	92.83
Dec-10	88.56
Nov-10	82.83
Oct-10	79.86
Sep-10	74.63
Aug-10	74.15
Jul-10	72.51

1 2 Next

http://www.opec.org/opec_web/en/data_graphs/40.htm

rce: www.opec.org

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MARKET DYNAMICS

A GLOBAL PROBLEM !

As per an estimate 1.6 billion people live without electricity. An additional 1 billion people live in areas with unreliable access to power.

In order to expand mobile network coverage into areas without regular or poor electricity, mobile networks primarily use diesel Genset for power.

Power consumption represents one of the top five economic OPEX considerations for mobile network operators and is steadily becoming a major concern for them due to fast-rising electricity and diesel costs.

As diesel prices rise and mobile network infrastructure is built in increasingly inaccessible regions, mobile operators need a viable alternative to diesel





* GSMA GREEN POWER FOR MOBILE

OPERATORS CHALLENGES (INDONESIA)

- ARPU is declining **
  - Rp65K per month in 2007
  - Rp46K per month in 2008
  - Rp35K per month in 2010
  - Rp30K per month by 2013
- ** From FS report Aggregated Voice and Data



e. g. BTS with 4000 subscribers:

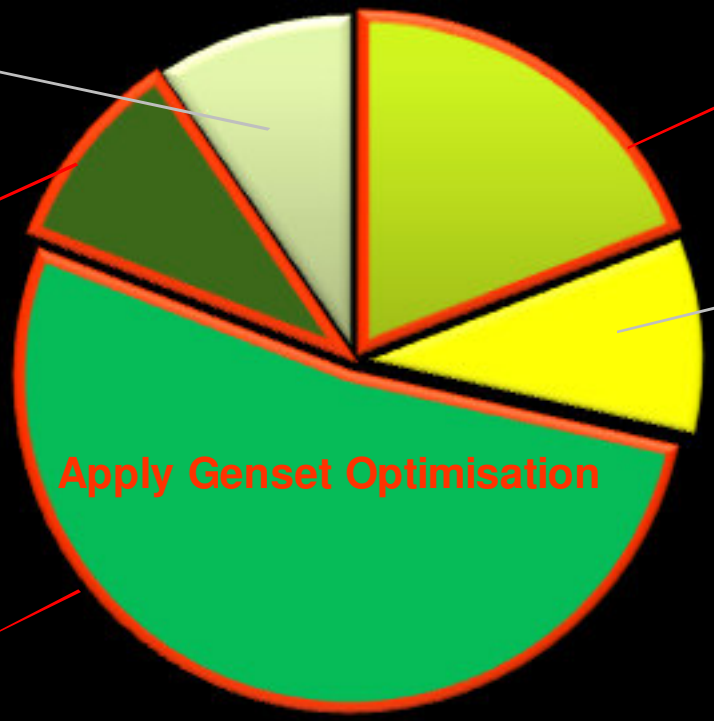
2007: Rp65K x 4000 = Rp260,000K
2011: Rp36K x 4000 = Rp144,000K
Reduction or revenue of Rp116,000K or $13,555USD/month

Approx 53% decline in revenue for 5 years

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BREAKDOWN OF SITE OPEX

By 2012 operators across the developing world will incur a US$14.6bn diesel bill from powering off-grid base stations



Site rental: 10%

Other (e.g Depreciation)

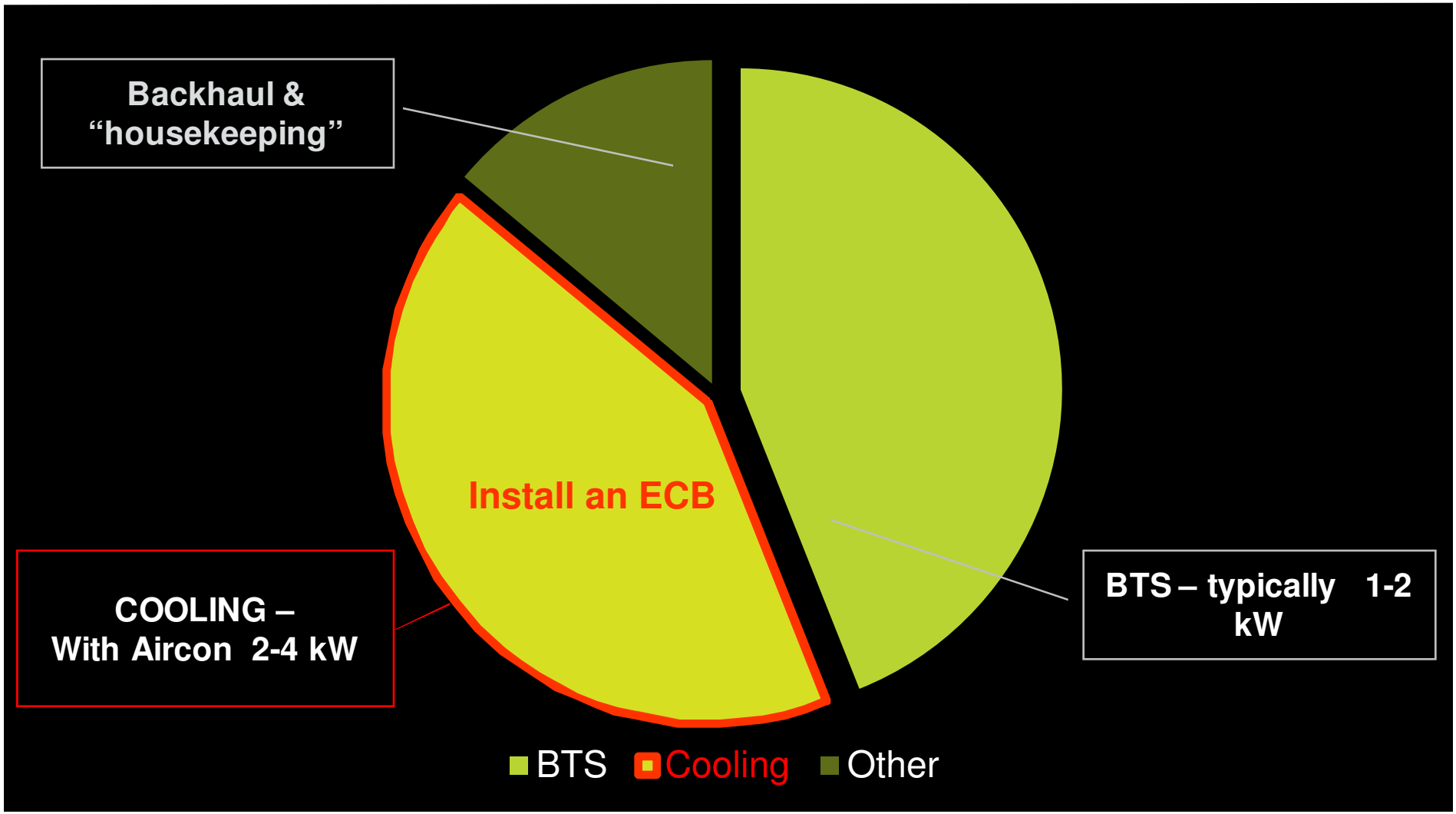
Diesel 50+%

Personnel (maintenance): 20%

Transmission 10%

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POWER CONSUMPTION BREAKDOWN



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HOW TO REDUCE OPEX !

1. Energy Optimization
   - Reduce "On Time" of the generator
   - Reduced diesel consumption
   - Reduced maintenance costs

2. Utilization of High Efficiency Converters
   - 96.5% efficient rectifiers
   - 96.5% efficient solar chargers

3. Use Passive Cooling
   - Reduce the dependency on ACU

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EV ROI & CONFIG TOOL

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CONTENT

MARKET TECHNOLOGIES



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SOLAR CONVERTER TECHNOLOGIES

Direct Feed

- ✓ 98-99% conversion efficiency
- x No MPPT(*)
- x No galvanic isolation
  between panels and batteries /telecom equipment
- x The battery clamps the output of the panels
- x Maximum 70-80% panel utilization

ELTEK VALERE Isolated MPPT

- ✓ Close to 100% panel utilization

WITH ELTEK VALERE'S MPPT SOLAR CHARGER YOU CAN GET AN EXTRA 20% – 30% EXTRA ENERGY

*over and above Direct feed designs

- ✓ Converter efficiency **96%**

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FLATPACK2 HE SOLAR – 48VDC



Based on Eltek Valere HE technology

Greater than 96% efficiency!

Features

- Maximum Power Point Tracking
- Galvanic isolation
- Supported by current Smartpacks

Characteristics

- Input voltage: 85 – 265 Vdc
  - Typical feed from one string of 4 to 6 solar panels
- Output power: 1500 W
- Output voltage: 48 – 58 Vdc
- Flatpack2 size
  - 1U high
  - 4 pos power shelf
  - 400mm deep

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SMARTPACK 2 MONITORING AND CONTROL



- 3.2” Screen TFT
- Touch pad operation
- Ethernet as default
- SD Memory Card slot

- System Configuration
- Alarming and Setup
- Rectifier/Charge control
- Testing
- Logging
- Web Server/SNMP
- Local display content and menu

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SMARTPACK 2 MONITORING AND CONTROL

- Standard Smartpack with expanded functionality for solar applications :
  - Power monitor
    - Logging of generated Wh/hour/day/week
    - Warning/alarms for unbalanced input (shaded/dirty panels)
  - Generator control
    - Fuel optimisation (controlled start/stop)
  - Battery monitor
    - Battery state of charge
    - Battery state of health
    - Time to disconnect
  - ECB - ACU control
    - Control of environment (shelters / cabins)



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CONTENT

SOLUTIONS & CONTROL



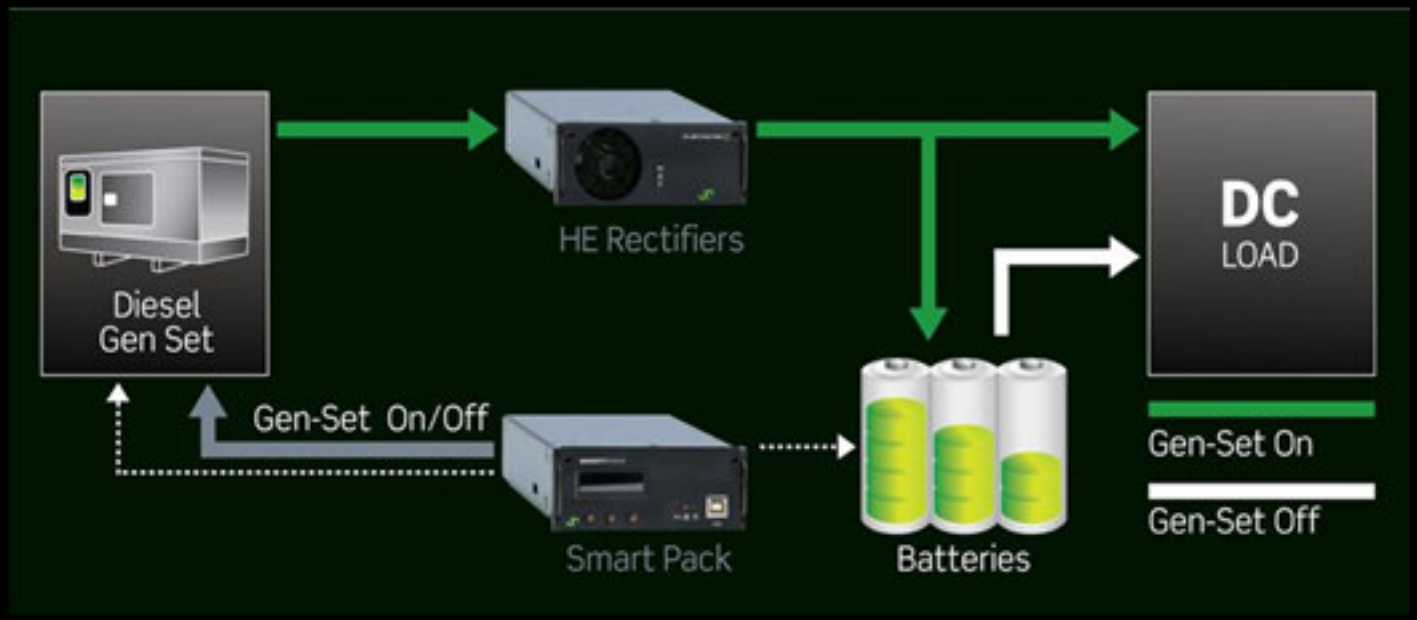
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CHARGE DISCHARGE CHARGE (CDC)

Utilizing Deep cycle battery technologies OPzV / NICAD / Other – Cyclic mode.

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CDC SOLUTION



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Generator Optimisation

ISSUES WITH "ALWAYS ON"



If the gen-set is run "24/7" , they will typically :

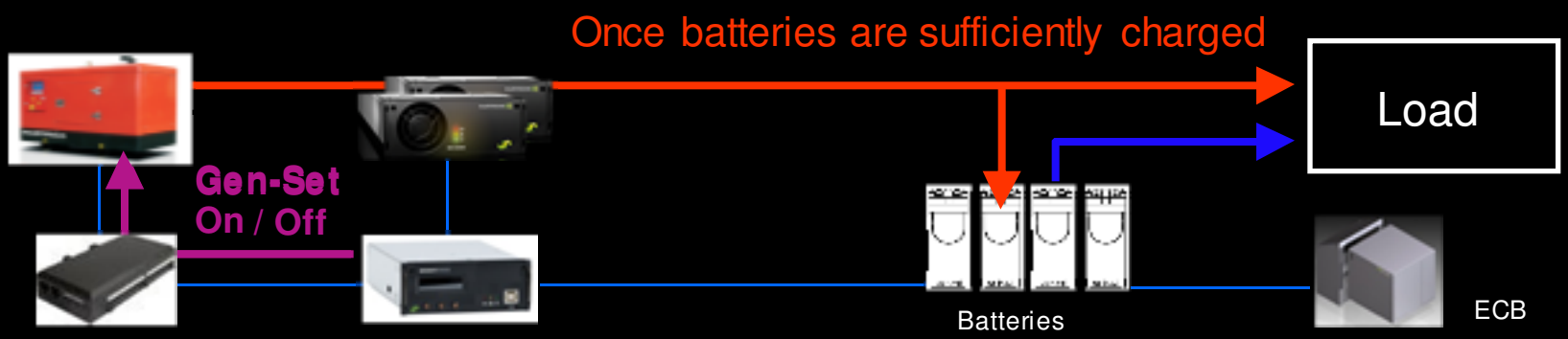
- x power a small load, thus being very inefficient per litre of diesel
- x add considerable Opex cost due to more frequent re-supply, maintenance, repair and replacement
- x Have a greater negative environmental impact

Float voltage over time

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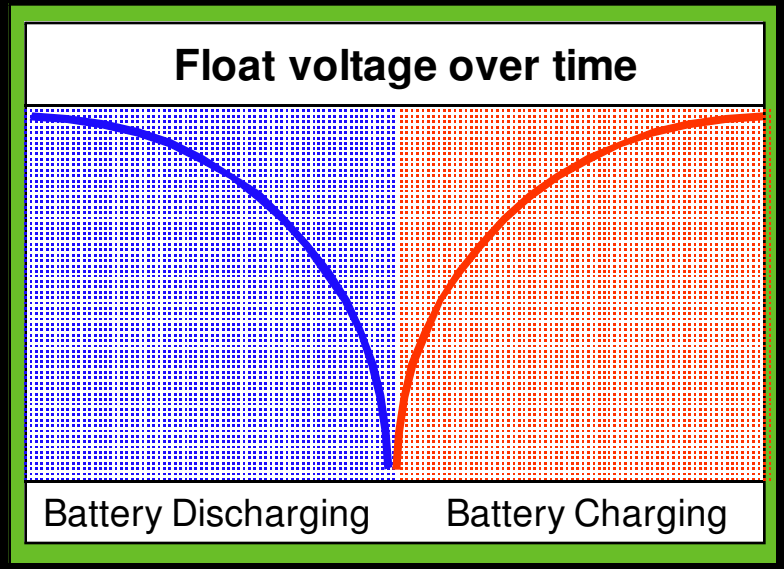
Generator Optimisation

CDC SOLUTION



By periodically running the load on batteries, you can :

- ✓ power a larger load, thus the genset will be more efficient per litre of diesel
- ✓ Considerably reduce OPEX cost due to less frequent re-supply, maintenance, repair and replacement
- ✓ Have less of an impact on the environment
- ✓ No gensets after 7pm.



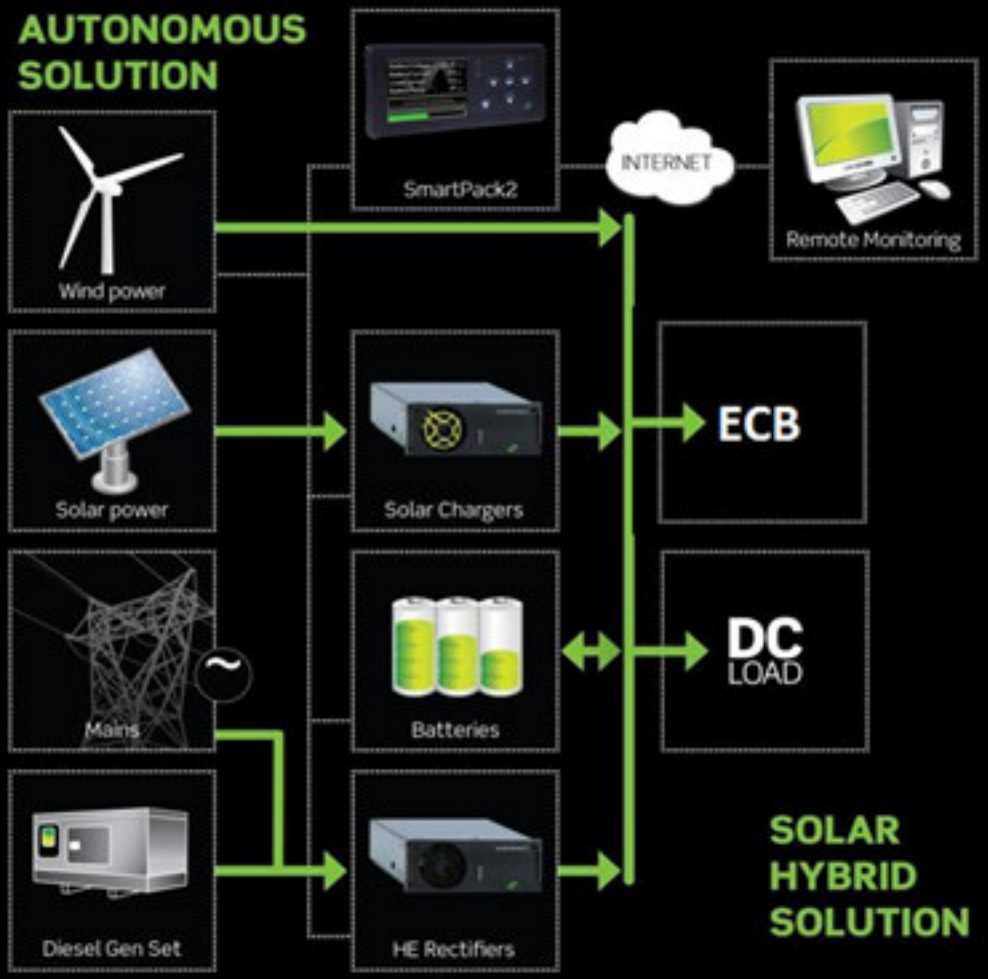
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HYBRID – SOLAR

Wind or Solar or combination available
Multiple Energy sources for site resilience.

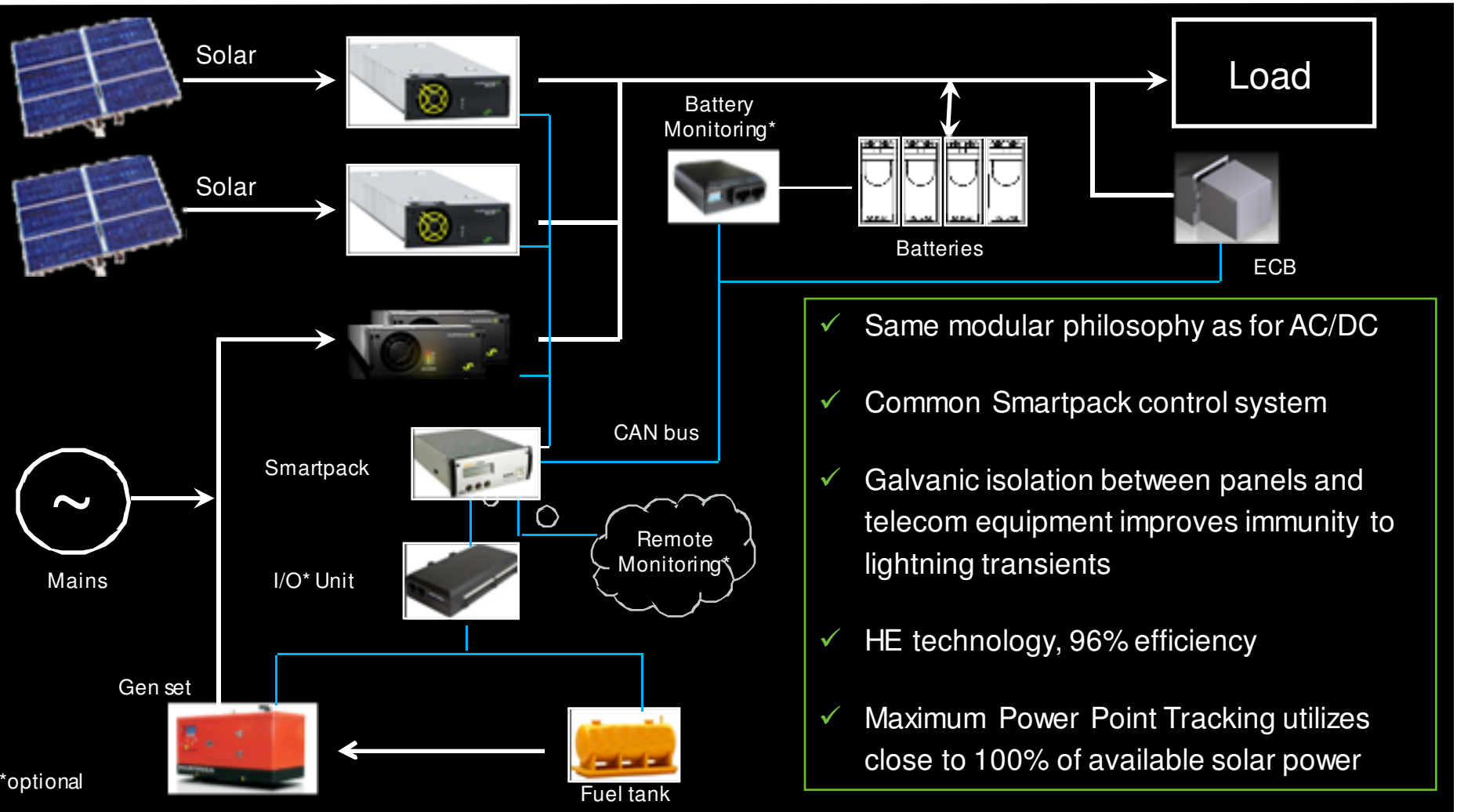
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HYBRID SOLUTION



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SOLAR HYBRID



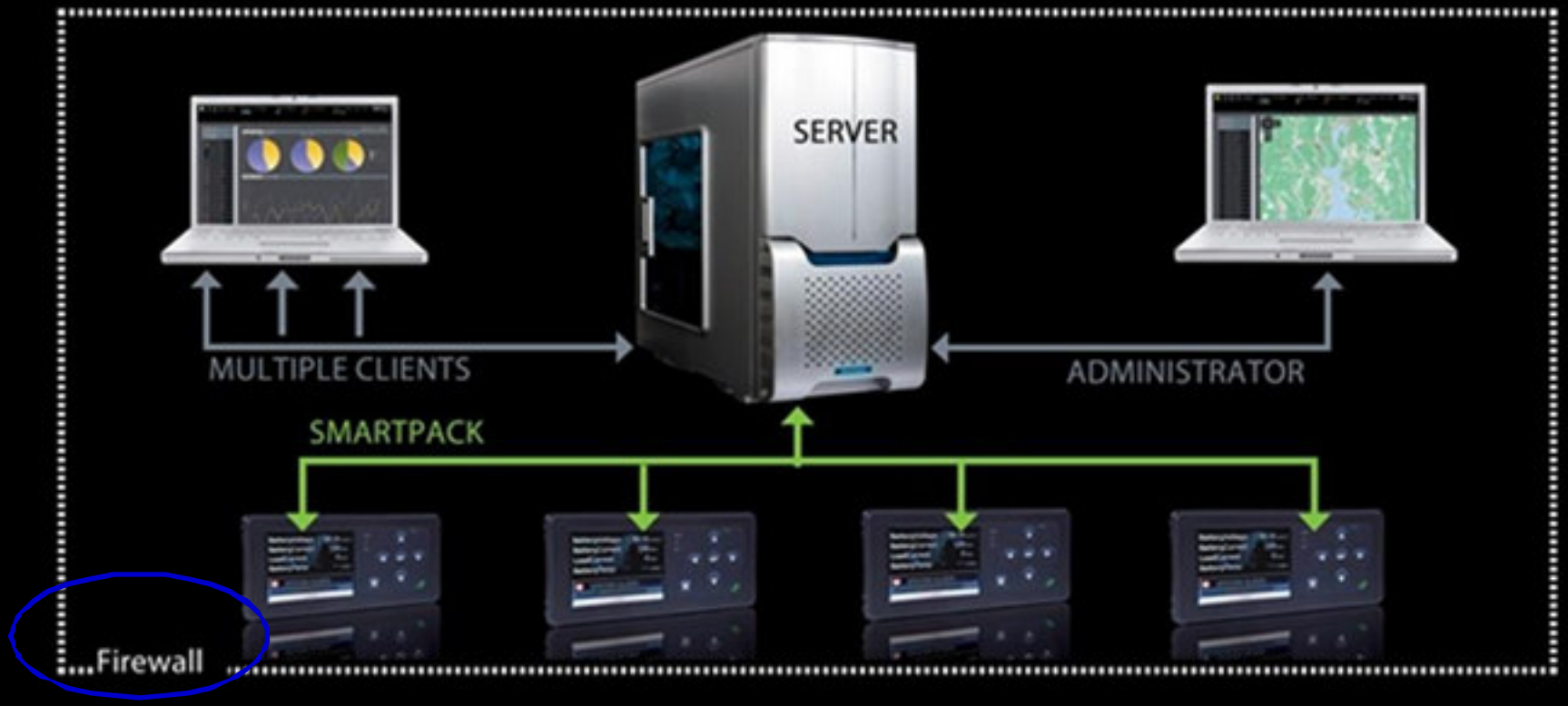
- ✓ Same modular philosophy as for AC/DC
- ✓ Common Smartpack control system
- ✓ Galvanic isolation between panels and telecom equipment improves immunity to lightning transients
- ✓ HE technology, 96% efficiency
- ✓ Maximum Power Point Tracking utilizes close to 100% of available solar power

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MULTI SITE MONITORING

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MULTI SITE MONITORING



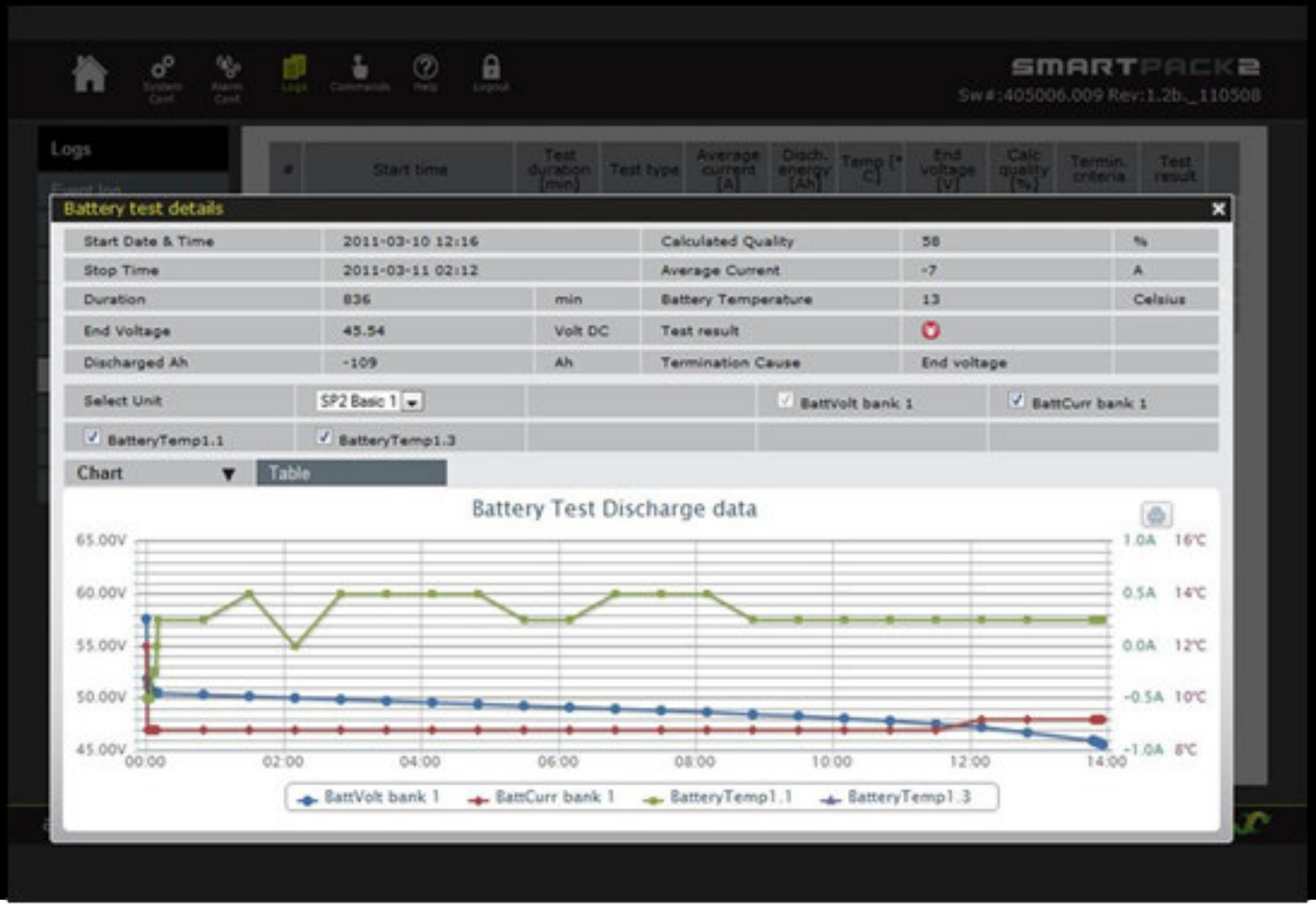
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FUNCTIONALITY – Smartpack 2



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FUNCTIONALITY – Battery test Data – SP2



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INFRASTRUCTURE REQUIREMENTS

- TCP/IP-JSON based communication
  - Firewall friendly traffic between controllers and DB server
- The network owner has to provide an IP address on the site that may be reached by the server
  - Ethernet-GPRS/EDGE/3G/LTE router
  - Utilizing the BTS/BSC service channel as a communication link.
  - Utilizing fixed line broadband
  - Satellite link
- Secure communication between node and server can be achieved by introducing additional HW (IPSec)

FREE COOLING - ECB

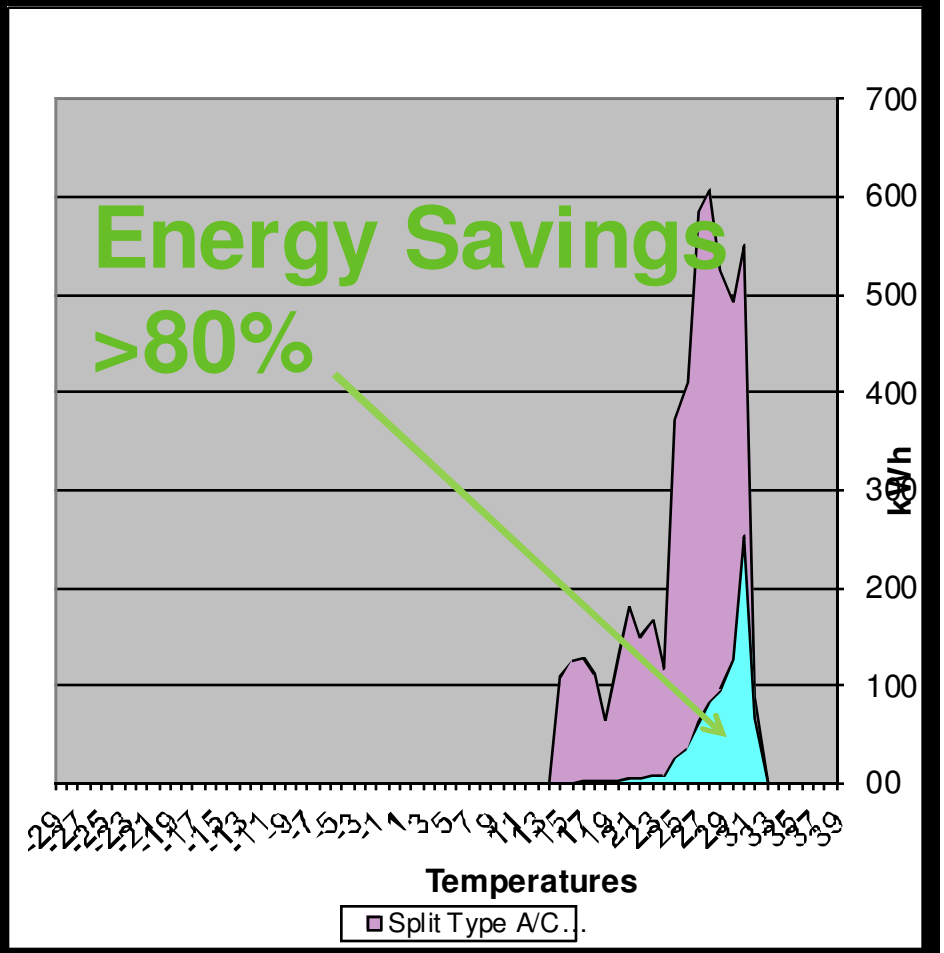
ELTEK COOLING BOX

- One Product for all Sites of installations
- EV Integrated controller functions
- Split Aircon & Genset control
- Standalone operation
  - (none EV sites)
- No outside access or protruding screws – Security!

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ECB - FREE COOLING & SAVINGS

- Energy Savings up to >80%*
- Duel Filter option
- High Capacity Fan
- Temperature & Humidity Control
- * savings are based on Heat Load, External Temp



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DIESEL GENSETS

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DIESEL GENERATOR



- Ideally diesel engines should run at 70-80% of maximum rated capacity.
- Carbon build-up due to prolonged periods of low load. Carbon also forms from poor combustion.
- Poor combustion causes the injectors to become clogged with soot, causing further deterioration in combustion and efficiency and causes increased pollution.
- The above leads to high maintenance- and repair cost, badly impacting the OPEX

GENSET EFFICIENCY



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FUEL MONITORING

ADVANTAGES

- ✓ Fast Fuel level monitoring.
- ✓ High accuracy of measurement.
  - ✓ 0.1% , 0.25% or 0.5% FS accuracy
- ✓ Detect Theft as it is happening!
- ✓ Just in Time fuel delivery.
- ✓ Reduce total network Fuel Inventory.
- ✓ Galvanic Isolation
- ✓ Remote access of fuel level with Multi Site Monitoring



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CONTENT



LIVE SITES – COUNTRY A

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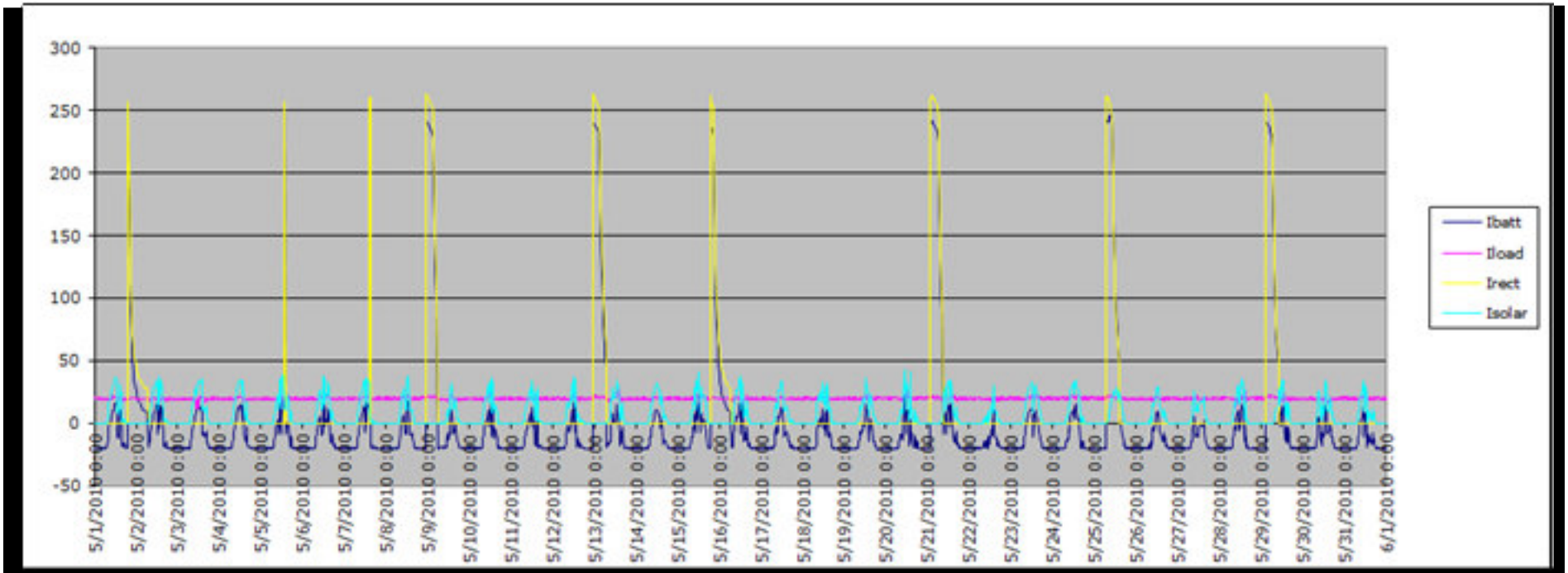
HYBRID SITE ANALYSIS

- 12 Solar Hybrid sites in Country A
  - 31KvA Himoinsa Generator
  - 50% DOD
  - 260A Recharge current available.
  - Peak Load 3Kw
  - Average Load 1Kw
- Breakdown of Analysis
  - Generator – 4Hrs
  - Battery – 15Hrs
  - Solar – 5hrs
  - 3 days for 1 cycle



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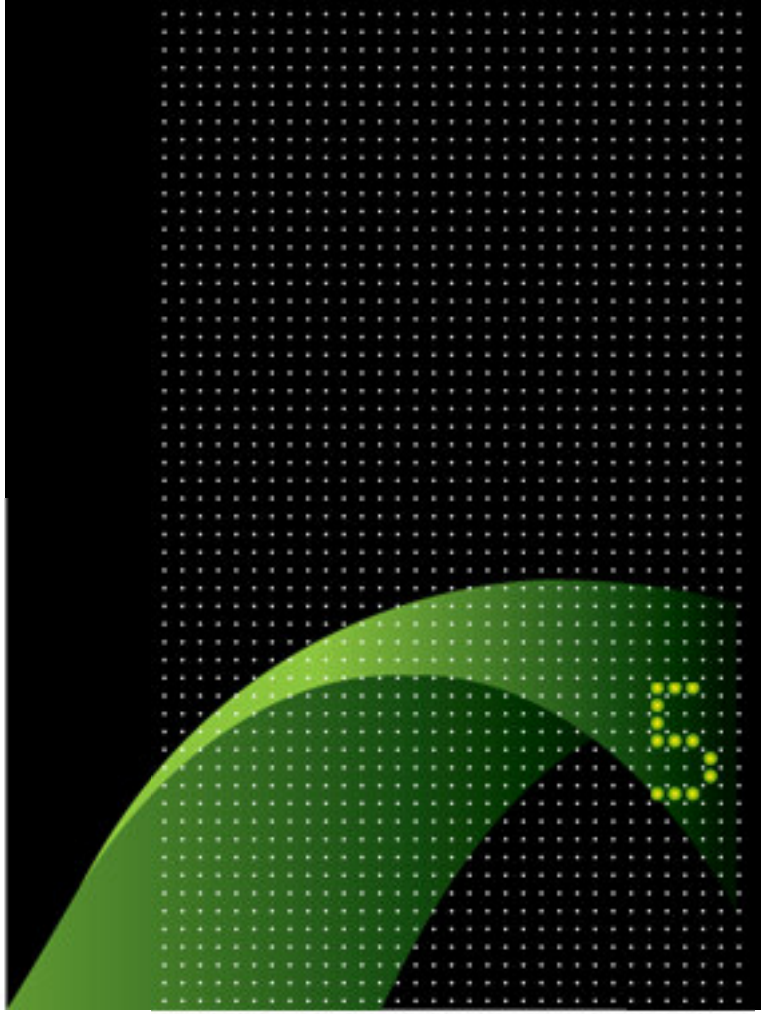
INSTALLED HYBRID SITE ANALYSIS - GRAPHS



- Diesel Savings: 7400 liters per month (12 sites) = approx. $9000 per month ($1.2 per liter delivered to site)= approx $108,000 per annum
- OPEX Savings : 62%

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CONTENT



LIVE SITES – COUNTRY B

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HYBRID SITE ANALYSIS

- Solar Hybrid sites in Country B
  - 8.5KvA Generator
  - 80% DOD
  - 56A Recharge current available.
  - Peak Load 1.2Kw
  - Average Load 625w
- Breakdown of Analysis
  - Generator – 4Hrs / 2 days
  - Battery – 15Hrs / day
  - Solar – 5hrs / day
  - 2 days for 1 cycle

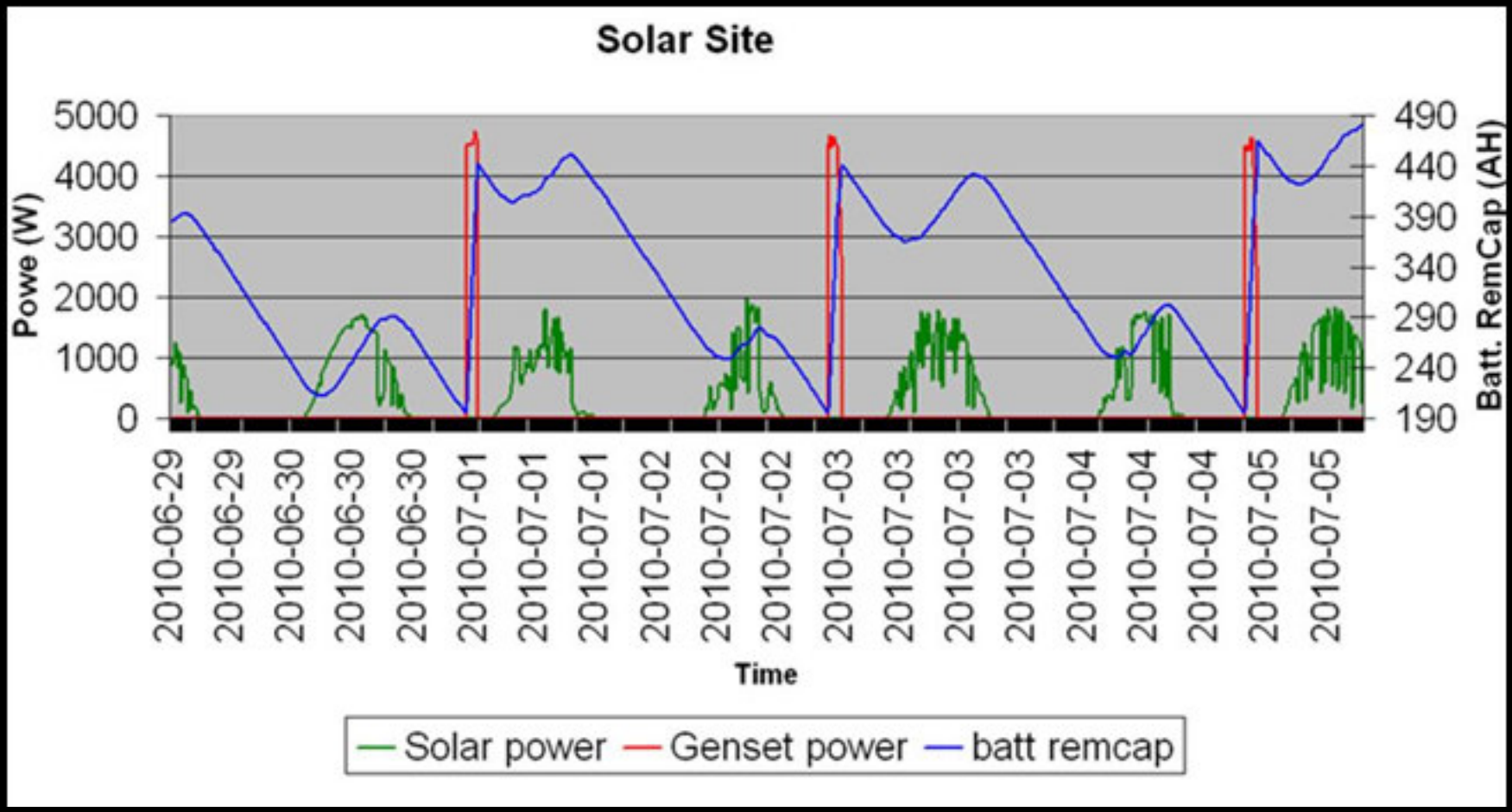


2 strings of 5 x Poly- Crystalline 215Wp PV

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INSTALLED HYBRID SITE ANALYSIS - GRAPHS

Hybrid 1200W BTS site running at 640W load



The Actual Genset Run Time = 4 hrs instead of 6 hrs (CDC).

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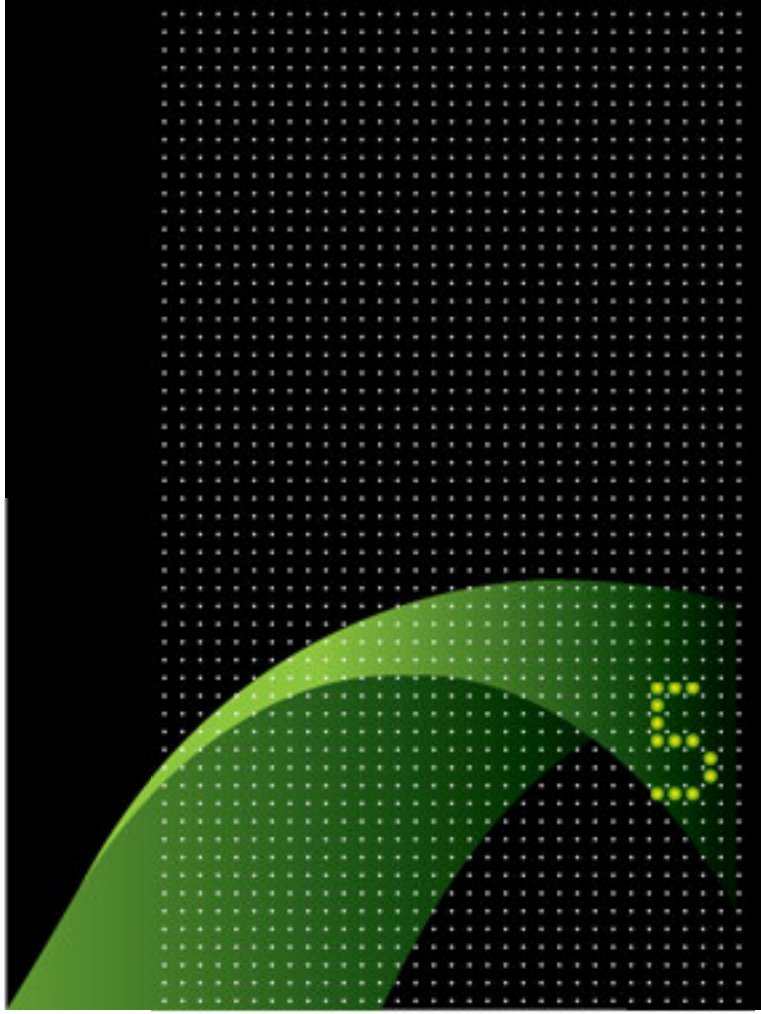
HYBRID SITE ANALYSIS

- **Diesel Savings: 91,000 = $109,320USD per annum.
  - ($1.2 per liter delivered to site)
- OPEX Savings : >73%
- ** based on 20 sites



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CONTENT



LIVE SITES – COUNTRY D

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HYBRID SITE ANALYSIS

- Site: Before Installation

  - 25 kVA and 35kVA Denyo Generator
  - Generator run time – 2 X 12Hrs
  - Peak Load 1550W
  - Average Load 1450W
  - Aircon running 2 x 12Hrs
  - Site Lights on 0.6Kw
  - Battery run time – Back-up

HYBRID SITE ANALYSIS

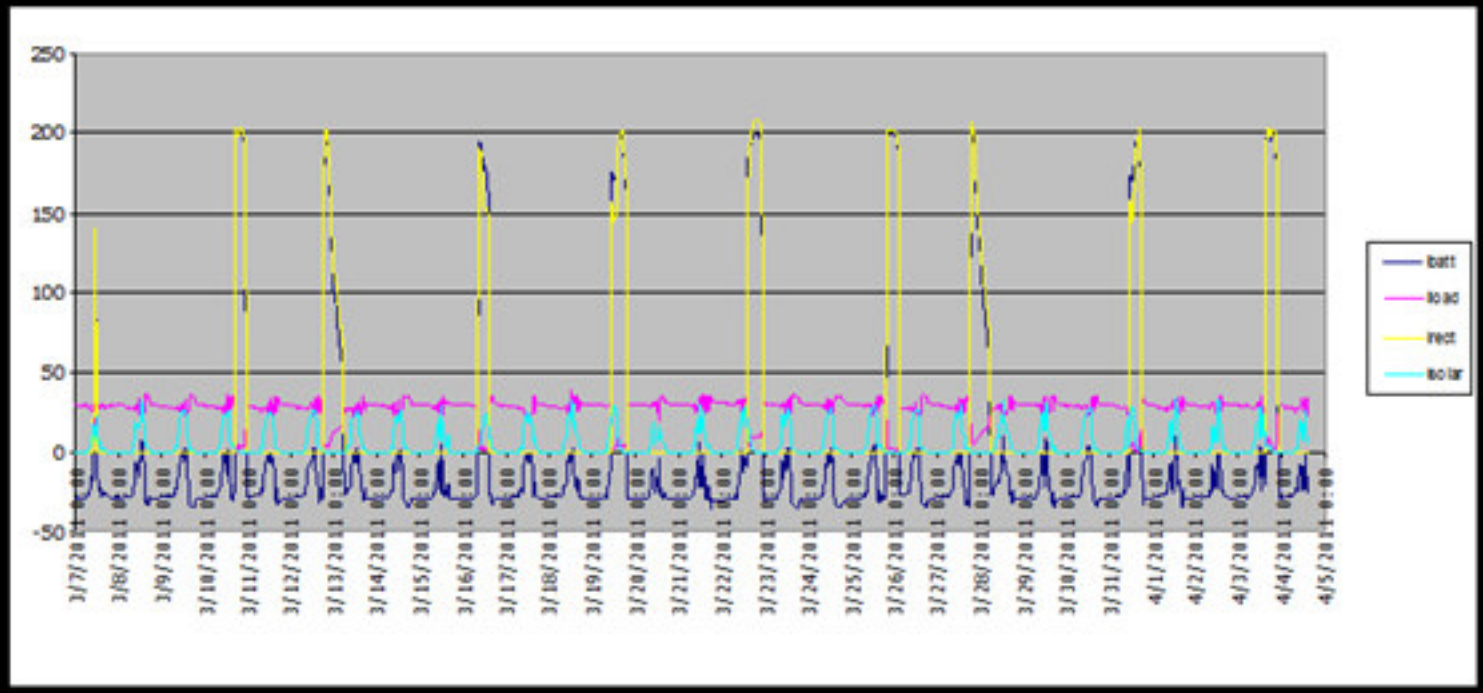
- Site: After Installation

  - 35kVA Denyo Generator
  - 60% DOD
  - 210A Charging Current
  - Peak Load 1550W
  - Average Load 1450W
  - Aircon replaced by ECB
  - Site Lights on 0.6 Kw
  - Generator run time – 6 - 8Hrs
  - Average Battery run time – 48 Hrs
  - 1 Cycle every two days



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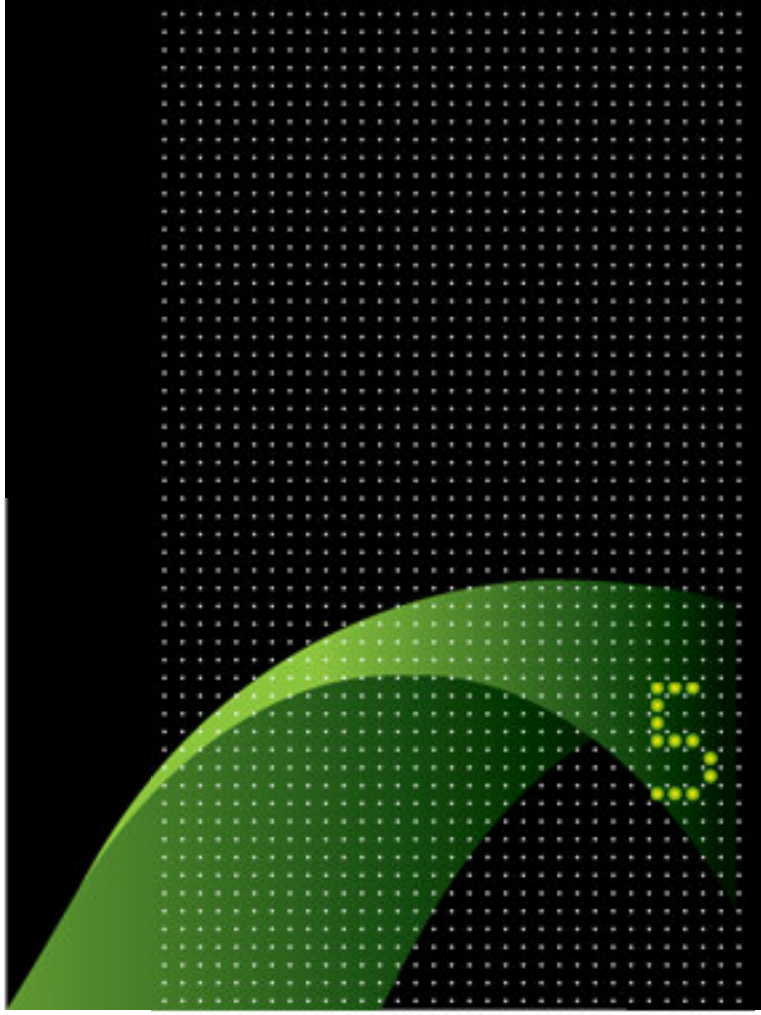
INSTALLED HYBRID SITE ANALYSIS - GRAPHS



- Diesel Savings: 2,002 liters per month = $3,783 per month ($1.89 per liter delivered to site)
- OPEX Savings : >75%

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CONTENT



LIVE SITES – COUNTRY E

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HYBRID SITE ANALYSIS

- ** Sites in Country E
  - 10KvA Generator
  - 56% DOD
  - 90A Recharge current available.
  - Peak Load 1 Kw
  - Average Load 0.8Kw



- Breakdown of Analysis
  - Generator – 4.3Hrs
  - Battery – 14.9Hrs
  - Solar – 4.8Hrs
  - 1 cycle per day

- ** Average configuration

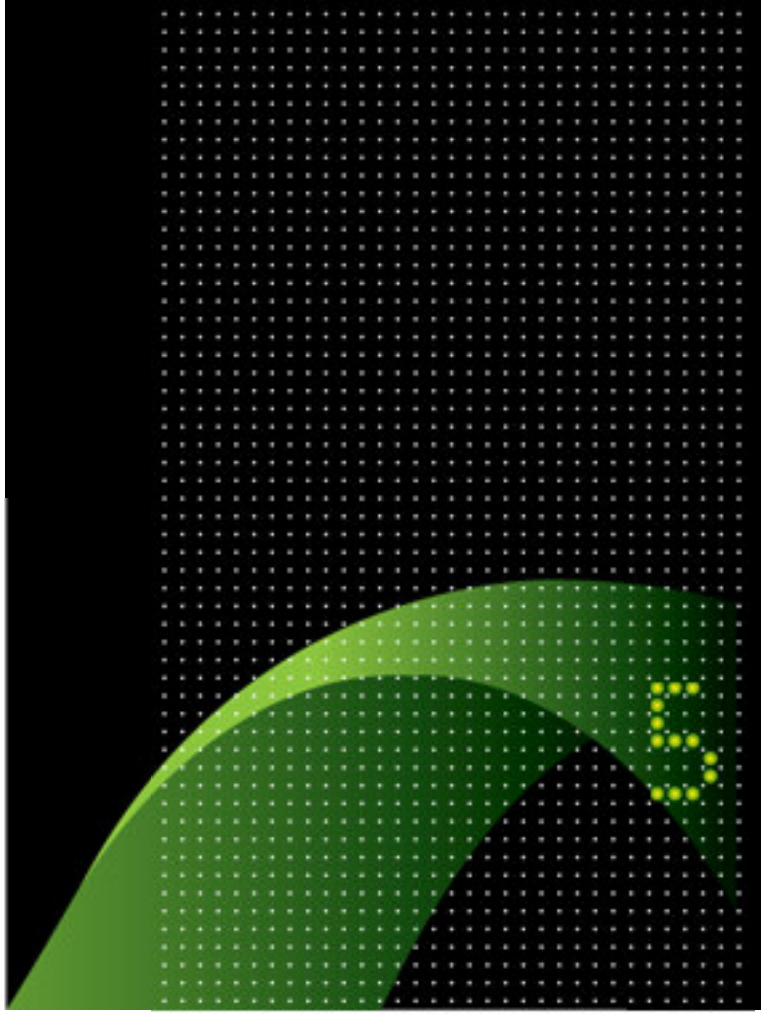
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Installed Hybrid Site Analysis - Graphs

- **Diesel Savings per site: 6,797 liters per annum = approx. $7,035 USD per annum
  - ($1.035 per liter delivered to site)
- **Diesel Savings 50 sites: 339,855 liters per annum = approx. $351,750 USD per annum
- OPEX Savings : >72%
- ** Based on 50 sites



CONTENT



LIVE SITES – COUNTRY F

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HYBRID SITE ANALYSIS

- 18** Solar Hybrid sites in Country F
  - 12,5KvA Generator
  - 65% DOD
  - 120A Recharge current available.
  - Peak Load 1000w
  - Average Load 500w



- Breakdown of Analysis
  - Generator – 7Hrs every 3 days
  - Battery – 72Hrs
  - Solar – 5Hrs / day
  - 3 days for 1 cycle

> **Multiple site design with different Loads and configurations

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HYBRID SITE ANALYSIS

- **Diesel Savings: 167,294 liters per annum = approx. $200,753 USD per annum
  - ($1.2 per liter delivered to site)
- OPEX Savings : >63%

** projected savings based on 18 sites



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SUMMARY

SUMMARY – HYBRIDS / CDC / ECB

- **96,5%** Converter Efficiency
- Fully integrated Single Controller
- Reduced Service Requirements
- Remote Monitoring & Control
- Diesel reduction up to **80%**
- Total **OPEX Reduction** up to **75%**
- Reduced CO_2 emissions **>78%**
- Reduced Cooling energy ECB up to **85%+**

Green site deployment to date:

- Hybrid / CDC / Pure Solar / ECB <10,000 sites

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bizSAFE 4

FROST & SULLIVAN
2010 BEST PRACTICES AWARD

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Associate Member

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