HYBRID'S, OPEX REDUCTION & TOTAL ENERGY EFFICIENCY

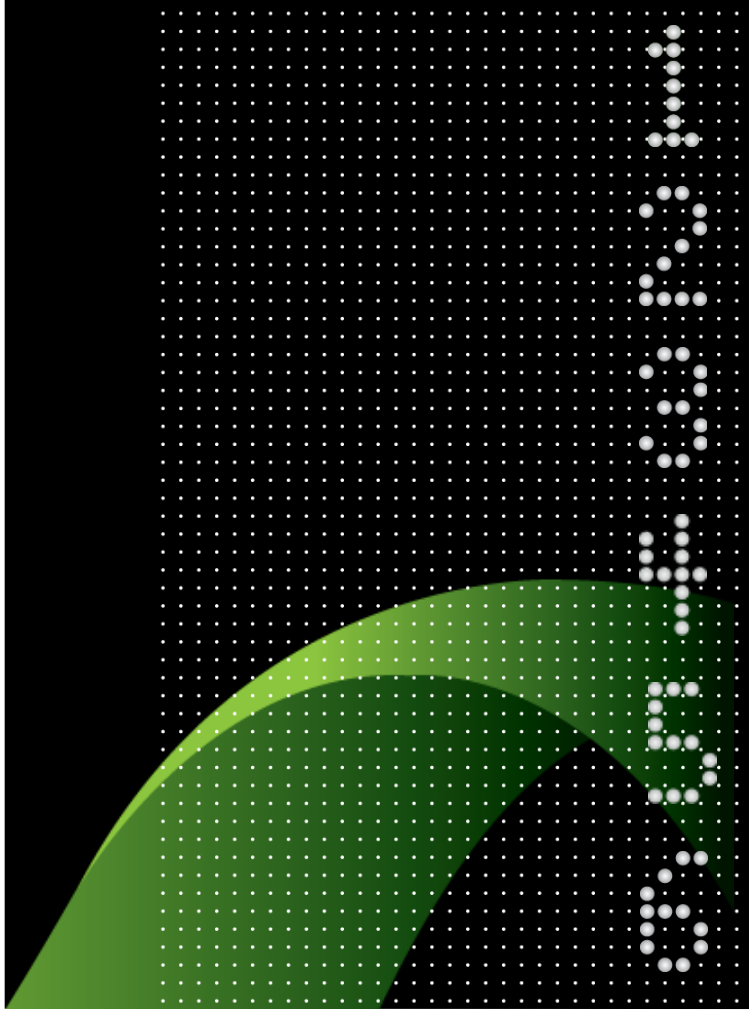
PRESENTED BY:

ALTERNATIVE ENERGY DIRECTOR

TELECOM DIVISION

MAY 2013

CONTENT



ELTEK – SAVINGS TO DATE

ENERGY EFFICEIENCY - END to END

TCO – GREEN ENERGY

MARKET TECHNOLOGIES

SW & PERFOMANCE MONITORING

SUMMARY

CONTENT

ELTEK– SAVINGS TO DATE









SUMMARY – TOTAL SAVINGS TO DATE!

9.7 MW of Eltek HE Solar Converters delivered to date: March 2013

724,

can power

7 @ 10,000Kwhr per home

28.8 M liters of

5,500 Telecom CDC si

$114 M USD – This can

Feed, cloth and provide basic health needs fo

Africa for One (1) year. (ref Hope for Africa)

529,366 tons CO2 = 144,241 tons of Carbon credits.

CONTENT

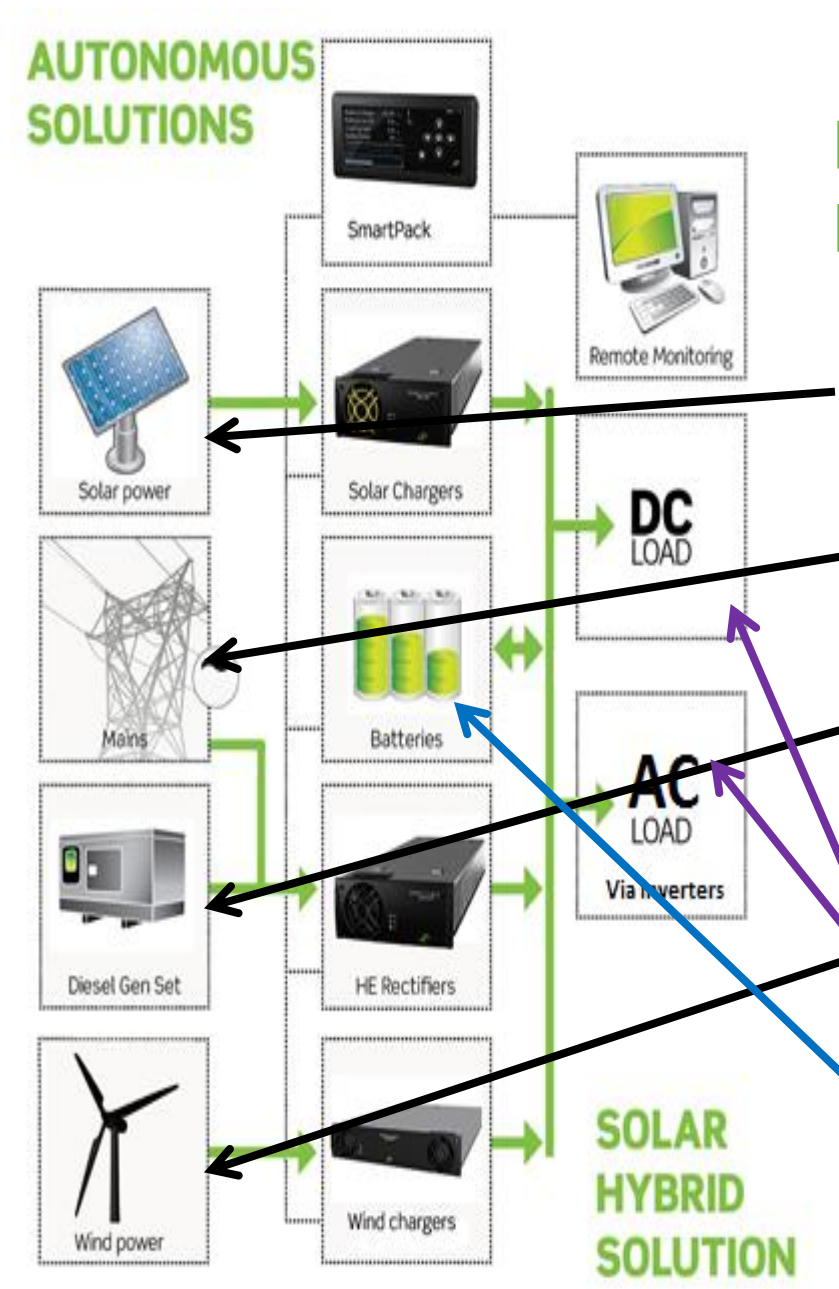
ENERGY EFFICEIENCY - END to END











ENERGY EFFICIENCY MODULAR POWER SOLUTION

Energy from PV

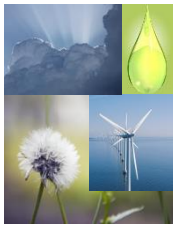
Energy from Poor Grid

Energy from Generator

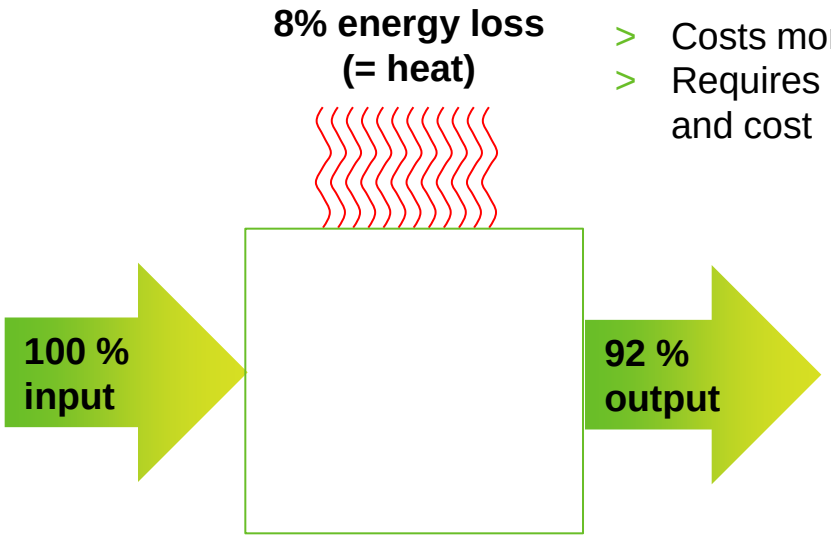
Energy from Wind Turbine

Energy AC or DC

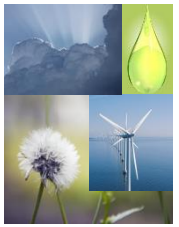
Excess Energy Stored



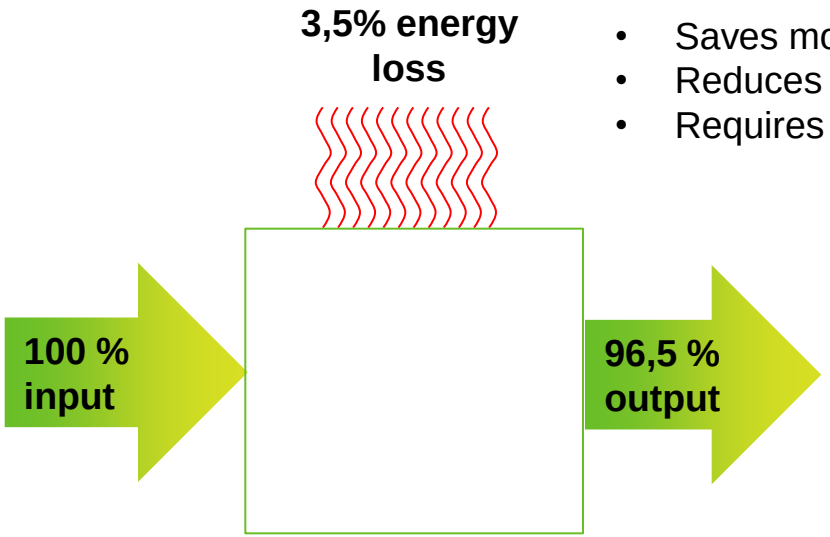
WHY ENERGY EFFICIENCY IS SO IMPORTANT..



- Costs money
- Requires cooling = more energy and cost



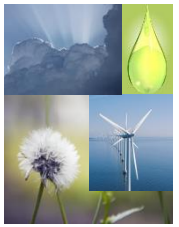
WHY ENERGY EFFICIENCY IS SO IMPORTANT..



- Saves money
- Reduces environmental impact
- Requires less cooling



~ HIGH EFFICIENCY ~



ENERGY EFFICIENCY CYCLE –

*RECTIFIERS / SOLAR CHARGERS / WIND CONVERTERS & DC TO AC INVERTERS

GENSET ENERGY – HE Rectifier = 96.5%

SUN ENERGY – HE Solar Charger = 96.5%

WIND ENERGY – HE Wind Converter = 96.5%

GENSET ENERGY – Inverter = 96% EPC

STORED ENERGY – Inverter = 92% On Line





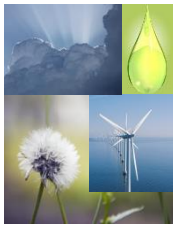












* Reference Eltek

CONTENT

TCO – GREEN ENERGY

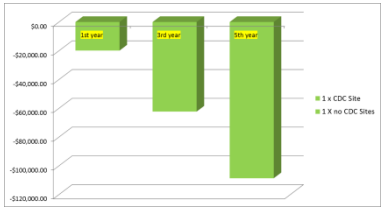


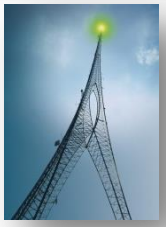
Alternative Energy – Telecom

MOTIVATION for introducing Alternative Energies



Energy cost – reduced OPEX & TCO





Improved network reliability

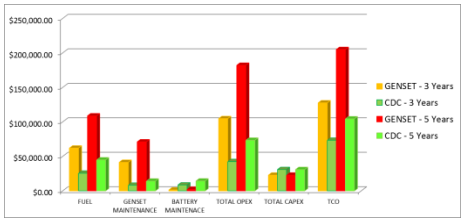




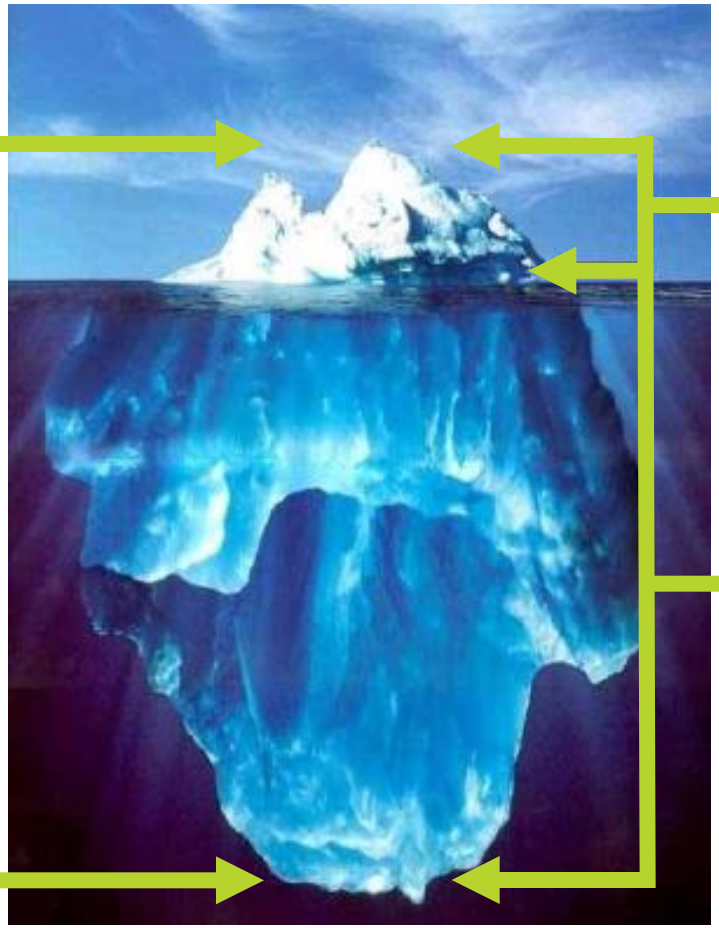
Off grid sites in rural areas

- Inaccessible
- Energy source redundancy
- Vandalism

ICEBERG SYNDROME – TCO – 24/7 GENSET



TRUE TOTAL COST OF OWNERSHIP
$128k



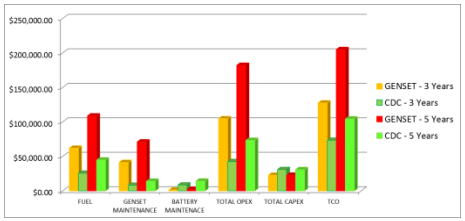
CAPEX $23KUSD

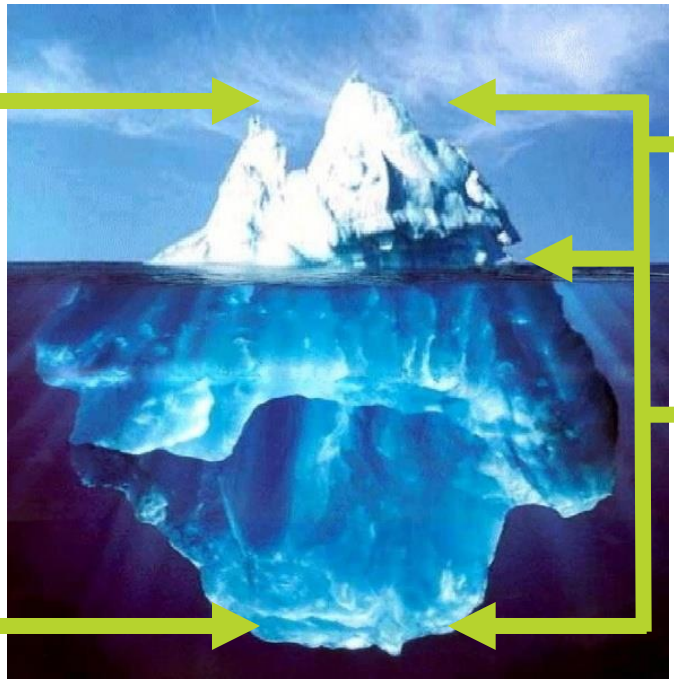
CAPEX includes,
goods, services, tax's etc.

OPEX $105KUSD
(3year period)

OPEX includes,
Diesel, Genset maintenance, replacement batteries, cooling tech maintenance, and all other periodic preventative maintenance.

ICEBERG SYNDROME – TCO – CDC





TRUE TOTAL COST OF OWNERSHIP
$94k

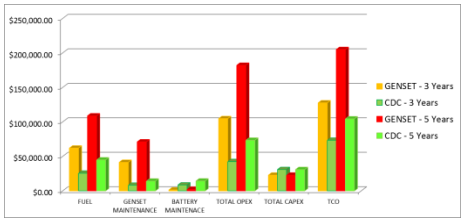
CAPEX $31KUSD

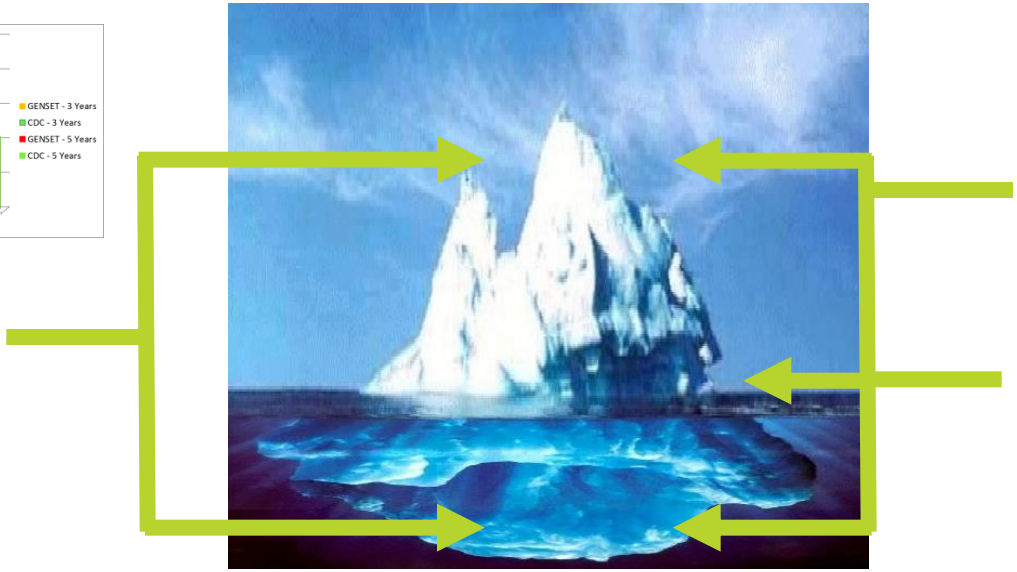
CAPEX includes,
goods, services, tax's etc.

OPEX $63KUSD
(3year period)

OPEX includes,
Diesel, Genset maintenance, replacement batteries, cooling tech maintenance, and all other periodic preventative maintenance.

ICEBERG SYNDROME – TCO – HYBRID SOLAR





TRUE TOTAL COST OF OWNERSHIP
$69k

CAPEX $42KUSD

CAPEX includes,
goods, services, tax's etc.

OPEX $27KUSD
(3year period)

OPEX includes,
Diesel, Genset maintenance, replacement batteries, cooling tech maintenance, and all other periodic preventative maintenance.

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

CONTENT







MARKET TECHNOLOGIES



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%**

PV HIGH VOLTS DC INPUT – CONTROLLED DC OUTPUT



SOLAR CONVERTER

TELECOM STANDARD 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

ELTEK always on

TOTAL SITE CONTROL

S P S or Smart Pack 1 or Smart Pack 2







GENSET
RECTIFIERS
SOLAR CHARGER
WIND CONVERTER
FUEL CELL
FUEL MONITORING
AIRCON
FREE COOLING
LIGHTS
OTHER I / O RELATED

CONTENT





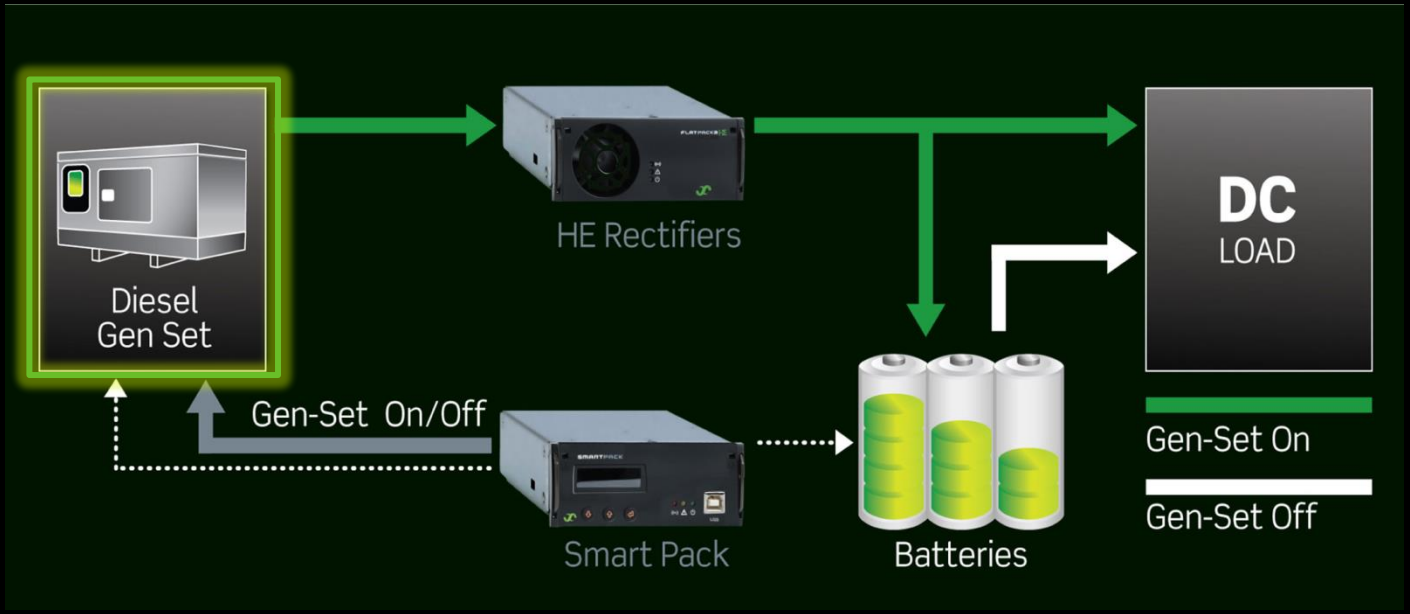


SOLUTIONS PART A

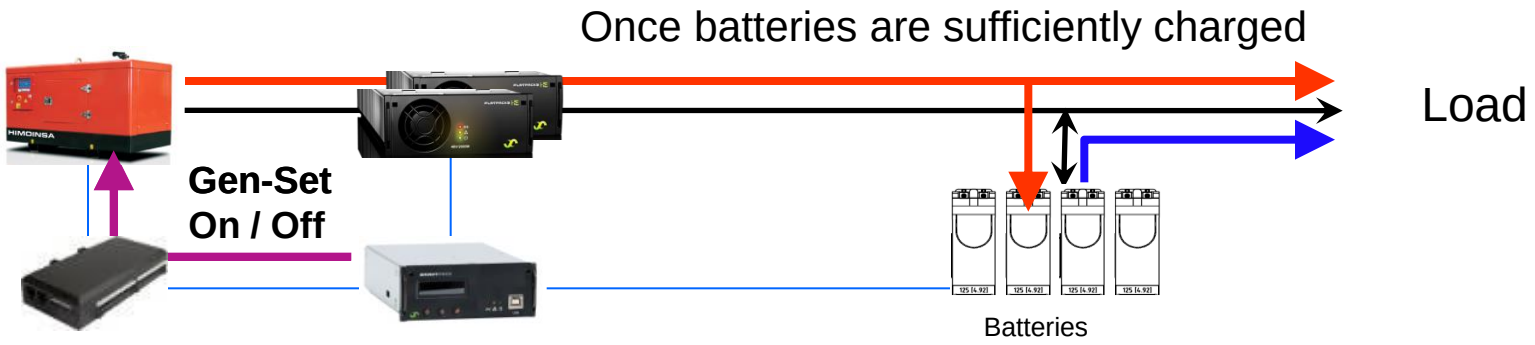


CHARGE DISCHARGE CHARGE CYCLIC - CDC

CDC SOLUTION

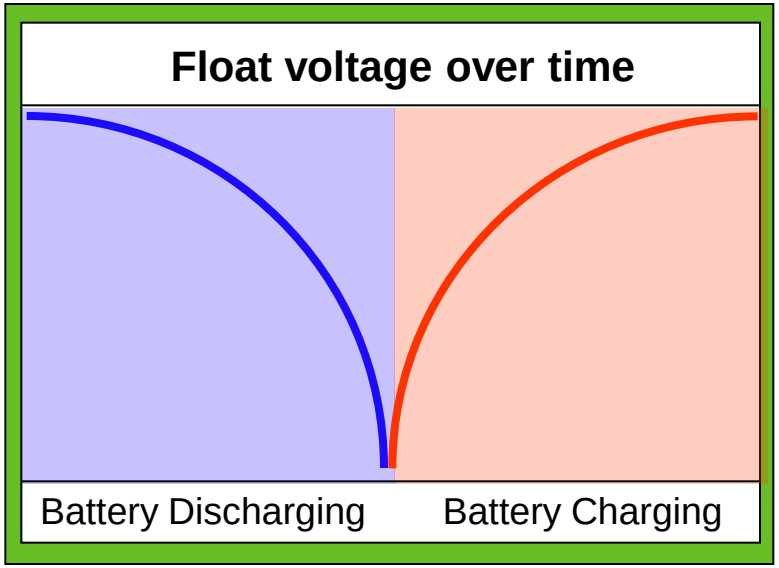


CDC SOLUTION

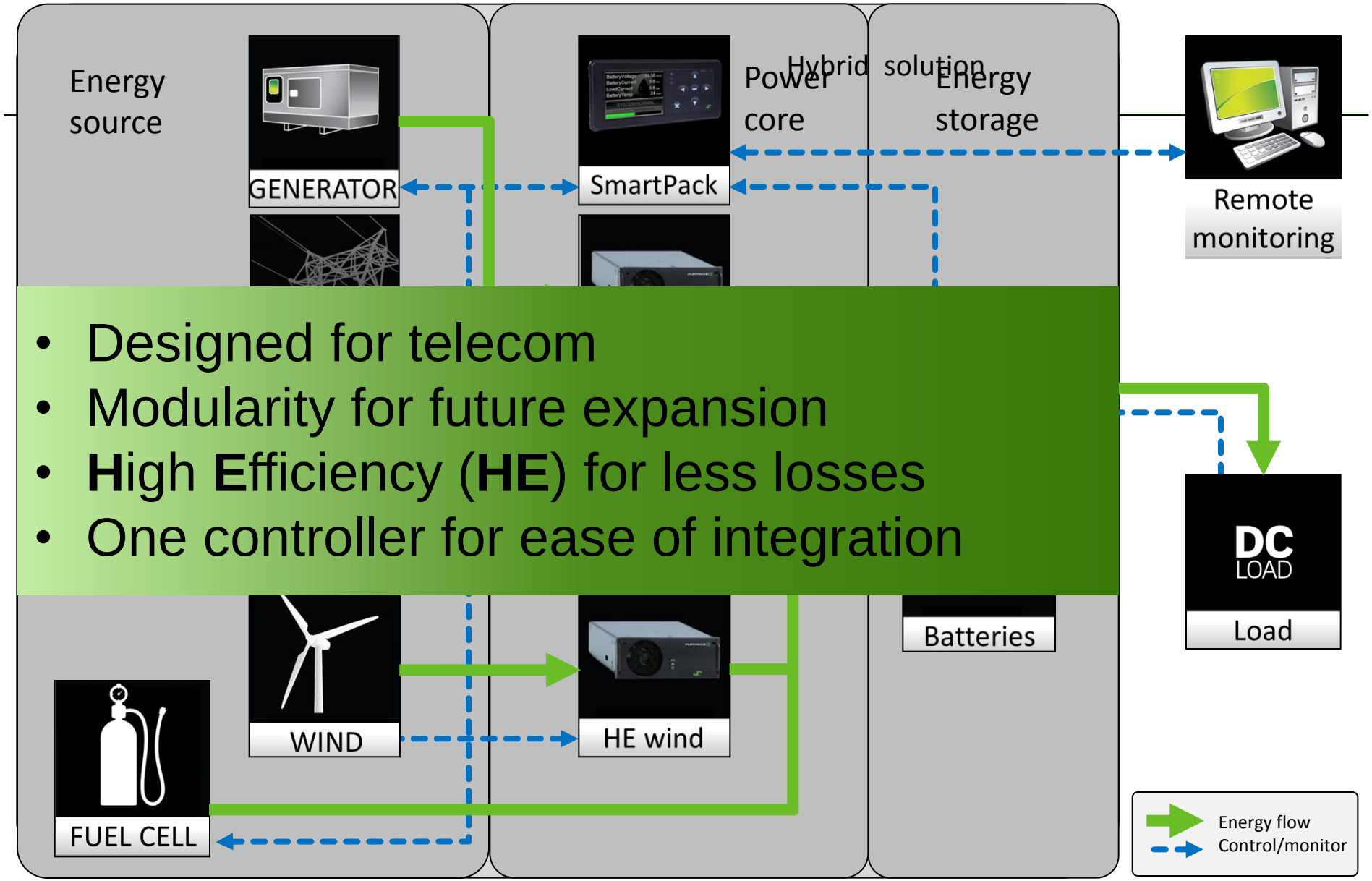


By periodically running the load on batteries, you can :

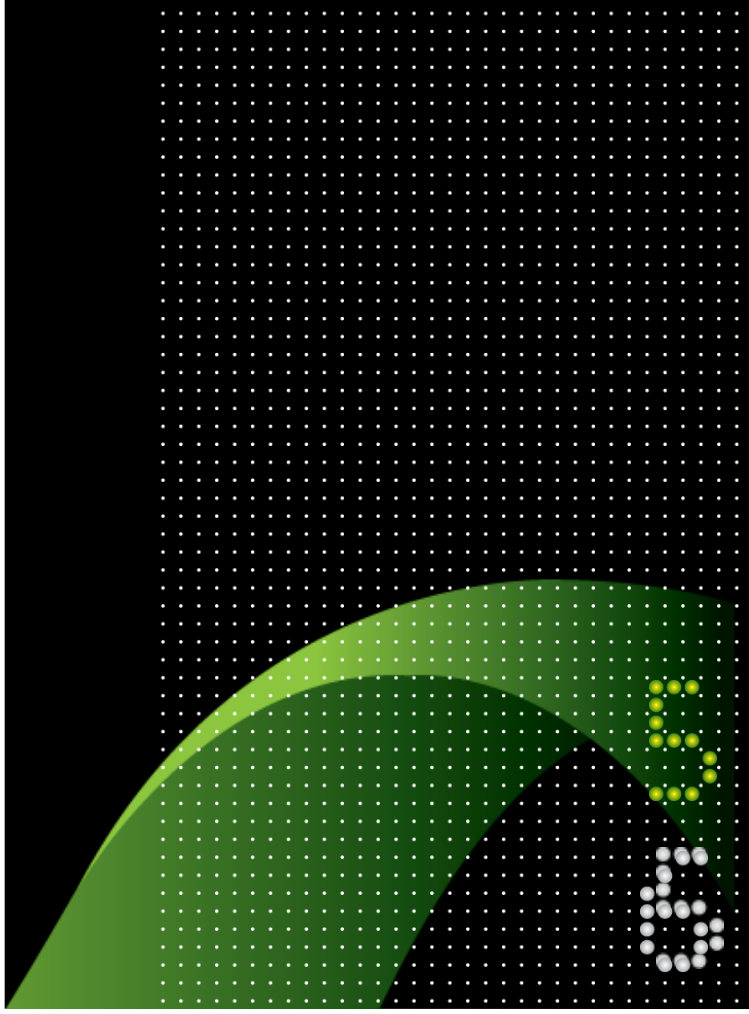
- ✓ power a larger load, thus the genset will be more efficient per litre of diesel
- ✓ Considerably reduce Opex cost due to less frequent re-supply, maintenance, repair and replacement
- ✓ Have less of an impact on the environment



HYBRID – SOLAR – WIND


Energy source
Power core
Hybrid solution
Energy storage
GENERATOR
SmartPack
Remote monitoring
Designed for telecom
Modularity for future expansion
High Efficiency (HE) for less losses
One controller for ease of integration
DC LOAD
Load
Batteries
WIND
HE wind
FUEL CELL
Energy flow
Control/monitor

CONTENT



SW & PERFOMANCE MONITORING

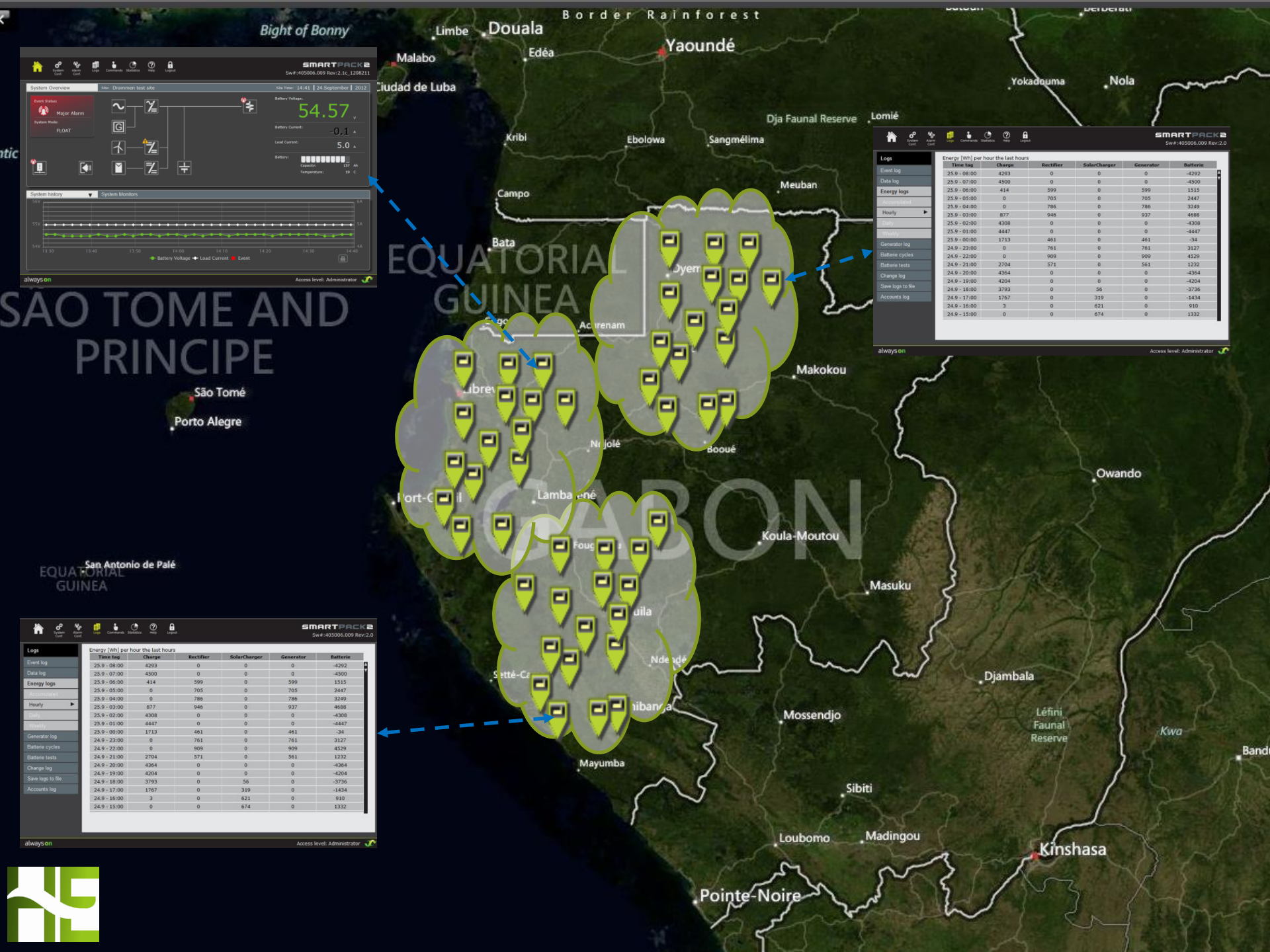
SOFTWARE TOOLS

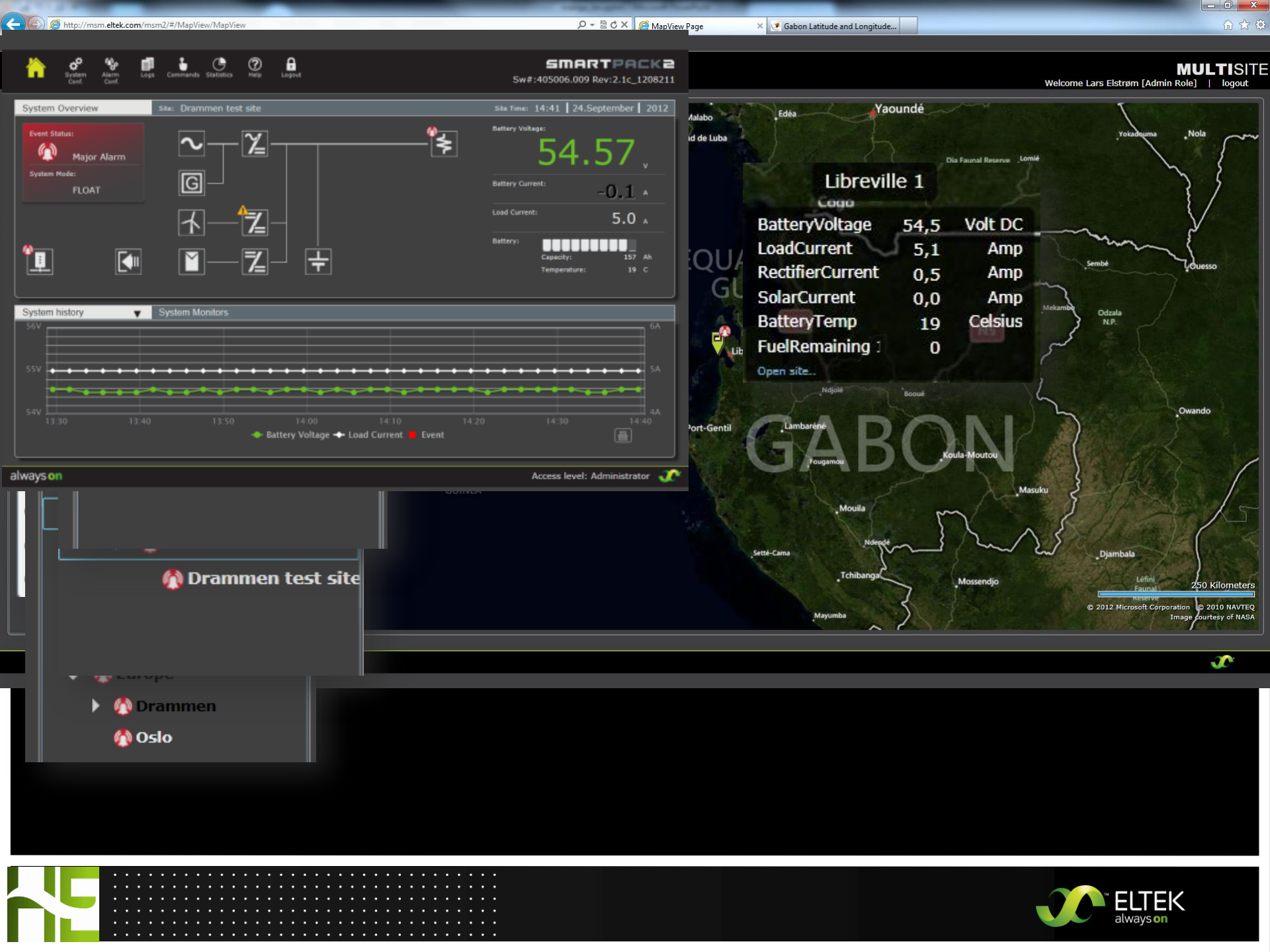
A) - Power monitoring

B) - Alarm monitoring

MULTI SITE MONITORING

A) - POWER MONITORING


Bight of Bonny
Limbe
Douala
Border Rainforest
Yaoundé
Malabo
Edéa
Ciudad de Luba
Yokadouma
Nola
Dja Faunal Reserve
Lomié
Kribi
Ebolowa
Sangmélima
Meuban
Campo
Bata
EQUATORIAL GUINEA
Oyem
Makokou
SÃO TOMÉ AND PRINCIPE
São Tomé
Porto Alegre
GABON
Owando
Koula-Moutou
San Antonio de Palé
EQUATORIAL GUINEA
Masuku
Djambala
Mossendjo
Lékini Faunal Reserve
Mayumba
Sibiti
Loubomo
Madingou
Kinshasa
Pointe-Noire
SMARTPACK2
54.57
-0.1
5.0
Energy [Wh] per hour the last hours


SMARTPACK2
Sw#:405006.009 Rev:2.1c_1208211
MULTISITE
Welcome Lars Elstrøm [Admin Role] | logout
System Overview
Site: Drammen test site
Site Time: 14:41 | 24.September | 2012
Event Status:
Major Alarm
System Mode:
FLOAT
Battery Voltage:
54.57
V
Battery Current:
-0.1
A
Load Current:
5.0
A
Battery:
Capacity: 157 Ah
Temperature: 19 C
System history
System Monitors
56V
55V
54V
6A
5A
4A
13:30
13:40
13:50
14:00
14:10
14:20
14:30
14:40
Battery Voltage
Load Current
Event
always on
Access level: Administrator
Libreville 1
BatteryVoltage 54,5 Volt DC
LoadCurrent 5,1 Amp
RectifierCurrent 0,5 Amp
SolarCurrent 0,0 Amp
BatteryTemp 19 Celsius
FuelRemaining 0
Open site...
GABON
Yaoundé
Edéa
Yokadouma
Nola
Dja Faunal Reserve
Lomié
Sembé
Ouesso
Mekambo
Odzala N.P.
Ndjolé
Booué
Owando
Lambaréné
Koula-Moutou
Fougamou
Masuku
Mouila
Ndendé
Setté-Cama
Djambala
Tchibanga
Mossendjo
Mayumba
Léfini Faunal Reserve
250 Kilometers
© 2012 Microsoft Corporation © 2010 NAVTEQ
Image courtesy of NASA
Drammen test site
Drammen
Oslo
ELTEK
always on


http://msm.eltek.com/msm2/#/EnergyView/Hybrid/HybridEnergySingle?TYPE=Hybrid
Hybrid Energy View
Gabon Latitude and Longitude...
Statistics
KPI
System
Help
Total nr of sites:
13
Sit
1
MULTISITE
Welcome Lars Elstrøm [Admin Role] | logout
Site Statistics
Compare Sites
Hybrid
Grid
Battery
Energy
Generator
Battery
Filter:
Search
My Network
Libreville 1
Last 50 weeks
Solar
Wind
Zoom:
Select time frame:
Last 30 hours
Last 30 days
Last 30 weeks
Run time
Libreville 1
Last 30 days
Run time Minute
600
500
400
300
200
100
0
28.08.2012 30.08.2012 01.09.2012 03.09.2012 05.09.2012 07.09.2012 09.09.2012 11.09.2012 13.09.2012 15.09.2012 17.09.2012 19.09.2012 21.09.2012 23.09.2012 25.09.2012 27.09.2(
Date
Log
Target
Rect. capacity:
4%
Zoom:
Select time frame:
Last 30 days
Last 30 weeks
Last 30 months
Fuel consumption[l]
Last 30 days
Liter
Percentage
Fuel consumption Liter
5000
4000
3000
2000
1000
0
28.08.2012 30.08.2012 01.09.2012 03.09.2012 05.09.2012 07.09.2012 09.09.2012 11.09.2012 13.09.2012 15.09.2012 17.09.2012 19.09.2012 21.09.2012 23.09.2012 25.09.2012 27.09.2(
Date
Log
MaxLevel
Select group compare type:
Group Summary
Group Average
Efficiency[kWh/l]
Last 30 days
Efficiency kWh/Liter
1
0,5
0
-0,5
Efficiency
ELTEK
always on

http://msm.eltek.com/msm2/#/EnergyView/Hybrid/HybridEnergyCompare?MM=False

Citrix XenApp - Applications | Clue in many languages - Clue | Hybrid DC System Energy C...

Statistics | KPI | System Conf | Help

Total nr of sites: 17 | Sites offline: 1 | Sites in alarm: 14 | Solar power yesterday: 42 kWh

MULTISIT

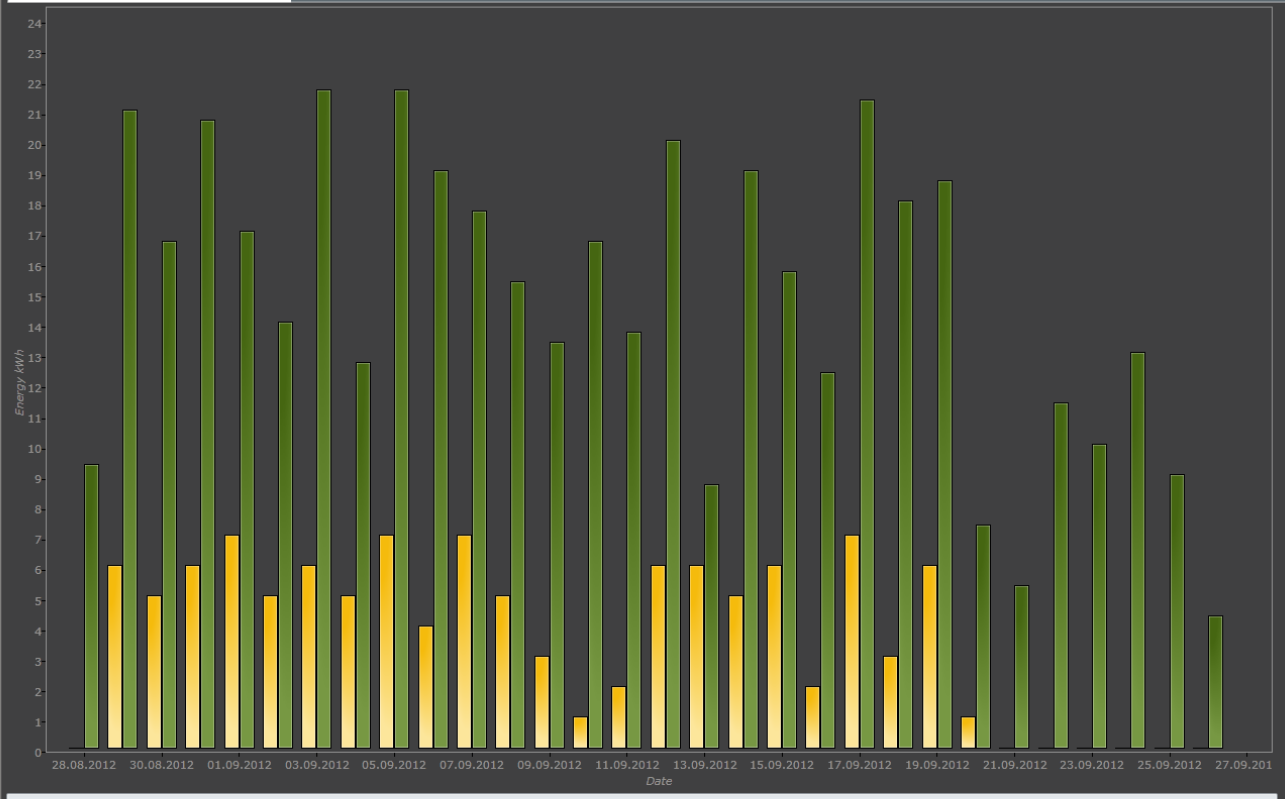
Welcome Lars Elstrøm [Admin Role] | logout

Filter: Hybrid

Search:

- My Network
  - Africa
    - Cape Town
    - Gabon
      - Gamba area
        - Gamba 1
        - Gamba 2
        - Gamba 3
      - Libreville aera
  - America
  - Asia
  - Australia
  - Europe

Hybrid DC System Energy Compare



Select data:
- Solar energy
- Wind energy
- Renewable energy
- Ren. energy in % of total

Zoom:

Select time frame:
- Last 30 hours
- Last 30 days
- Last 30 weeks

Select group compare type:
- Group Summary
- Group Average

Gamba 2 (1/1) Remove

Gamba area (3/3) Remove

always on

ELTEK always on

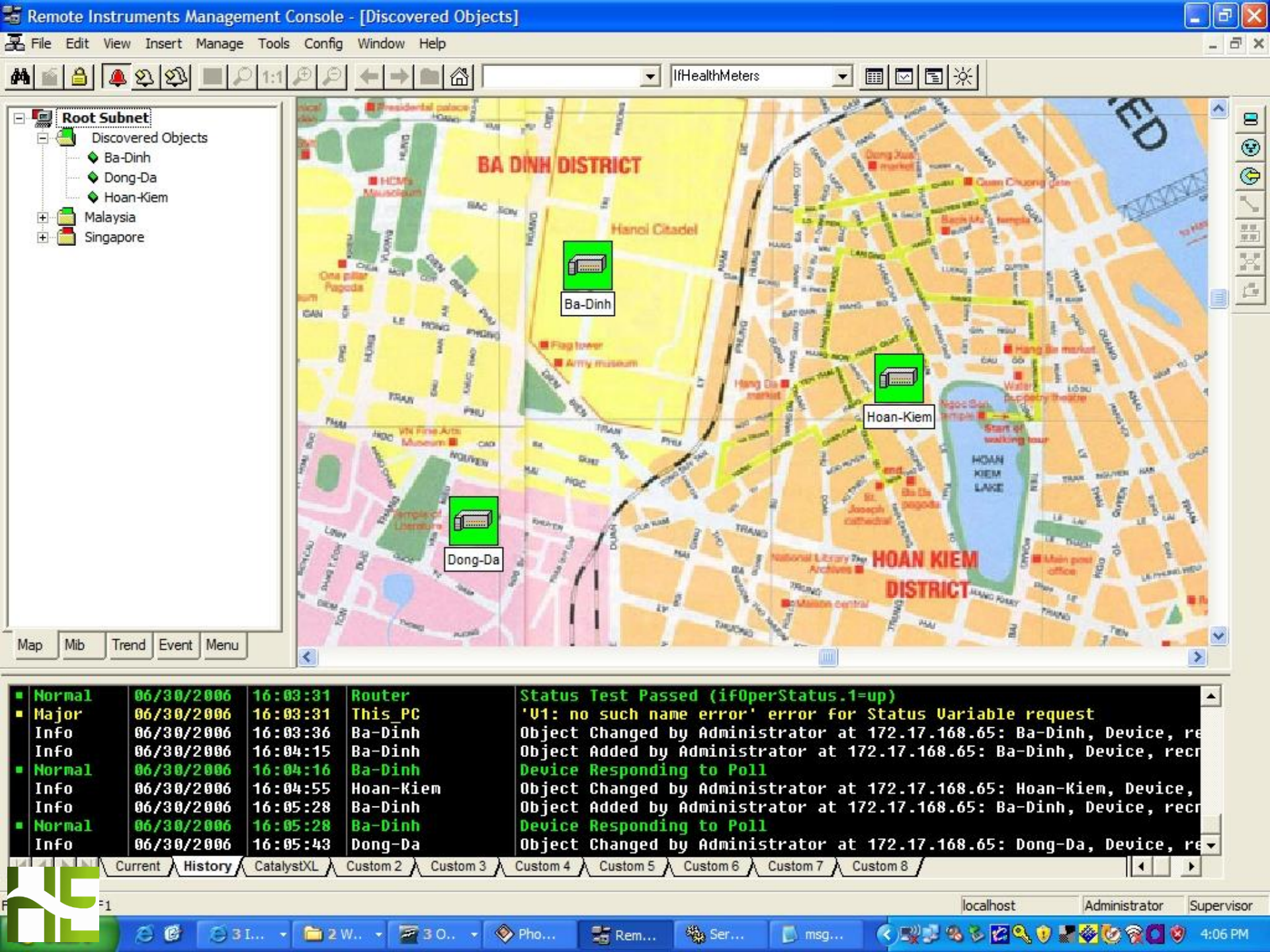

http://msm.eltek.com/msm2/#/EnergyView/Hybrid/HybridGeneratorCompare
Hybrid Generator Compare
Gabon Latitude and Longitude...
Citrix XenApp - Applications
Statistics
KPI
System Conf.
Help
Total nr of sites:
16
Sites offline:
1
Sites in alarm:
14
Solar power yesterday:
29 kWh
MULTISITE
Welcome Lars Elstrøm [Admin Role] | logout
Filter:
Hybrid - generator
Search:
My Network
Africa
Gabon
Gamba area
Libreville aera
Libreville 1
Libreville 2
America
Europe
Hybrid Generator Compare
Run Time Deviation
Last 30 days
Run Time Deviation Minute
400
200
0
28.08.2012
30.08.2012
01.09.2012
03.09.2012
05.09.2012
07.09.2012
09.09.2012
11.09.2012
13.09.2012
15.09.2012
17.09.2012
19.09.2012
21.09.2012
23.09.2012
25.09.2012
27.09.2
Date
Libreville aera (2/2) Remove
Libreville 1 (1/1) Remove
Rect. capacity:
Zoom:
Select time frame:
Last 30 days
Last 30 weeks
Last 30 months
Select group compare type:
Group Summary
Group Average
Fuel consumption
Liter
Percentage
Fuel consumption Liter
1
0,5
0
-0,5
-1
Libreville aera (2/2) Remove
Libreville 1 (1/1) Remove
Average Remove
Efficiency
ciency kWh/Liter
alwayson
SKIP
ELTEK
always on

Fuel consumption - generator runtime – efficiency (*)



SITE MONITORING – SNMP

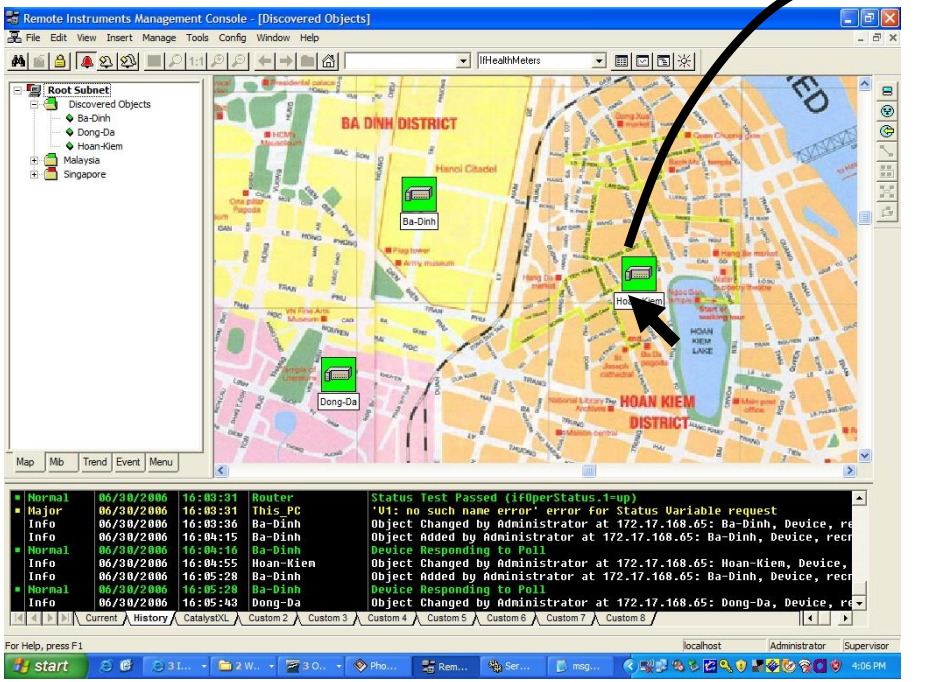
B) – ALARM MONITORING

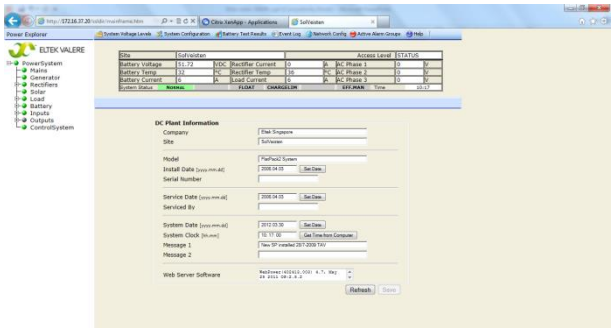

Remote Instruments Management Console - [Discovered Objects]
File Edit View Insert Manage Tools Config Window Help
IfHealthMeters
Root Subnet
Discovered Objects
Ba-Dinh
Dong-Da
Hoan-Kiem
Malaysia
Singapore
BA DINH DISTRICT
Hanoi Citadel
HOAN KIEM DISTRICT
HOAN KIEM LAKE
Ba-Dinh
Hoan-Kiem
Dong-Da
Map Mib Trend Event Menu
Normal 06/30/2006 16:03:31 Router Status Test Passed (ifOperStatus.1=up)
Major 06/30/2006 16:03:31 This_PC 'V1: no such name error' error for Status Variable request
Info 06/30/2006 16:03:36 Ba-Dinh Object Changed by Administrator at 172.17.168.65: Ba-Dinh, Device, re
Info 06/30/2006 16:04:15 Ba-Dinh Object Added by Administrator at 172.17.168.65: Ba-Dinh, Device, recr
Normal 06/30/2006 16:04:16 Ba-Dinh Device Responding to Poll
Info 06/30/2006 16:04:55 Hoan-Kiem Object Changed by Administrator at 172.17.168.65: Hoan-Kiem, Device,
Info 06/30/2006 16:05:28 Ba-Dinh Object Added by Administrator at 172.17.168.65: Ba-Dinh, Device, recr
Normal 06/30/2006 16:05:28 Ba-Dinh Device Responding to Poll
Info 06/30/2006 16:05:43 Dong-Da Object Changed by Administrator at 172.17.168.65: Dong-Da, Device, re
Current History CatalystXL Custom 2 Custom 3 Custom 4 Custom 5 Custom 6 Custom 7 Custom 8
localhost Administrator Supervisor
4:06 PM

Remote Configuration

- Launch by double-clicking on a network icon
- Password protected

Double-click on a network icon to launch





Screenshots and device photos are for illustration only. Subject to change without notice.

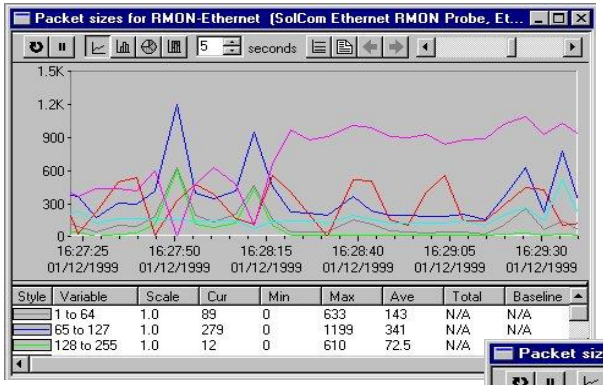
Fault Management

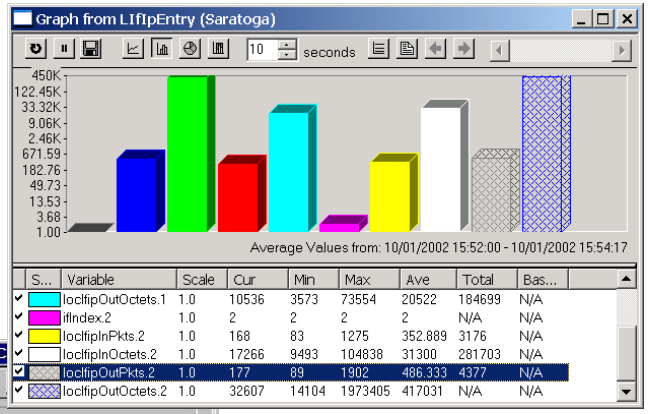
- Alarms such as
  - Battery Low/High Voltage, Breaker Open
  - AC Mains, Rectifier etc.
- Time-stamped Event Log
- Sophisticated Alarm Management
  - Eliminate duplicate alarms
  - Correlate alarm (auto-acknowledgement)
  - Notification via email or audio
- SMS Notification (optional)

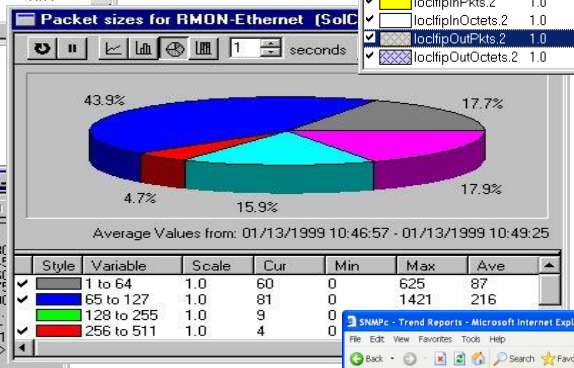
Requires a GSM Terminal

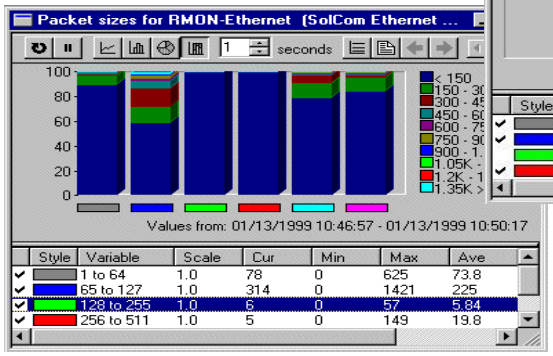


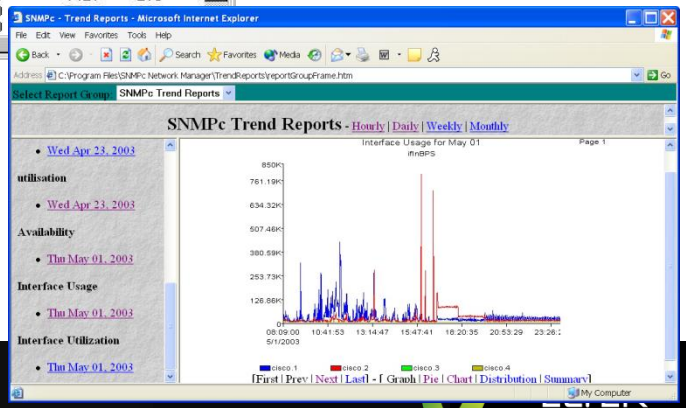
Graphical Report Views











CONTENT









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 CO2 emissions **>78%**

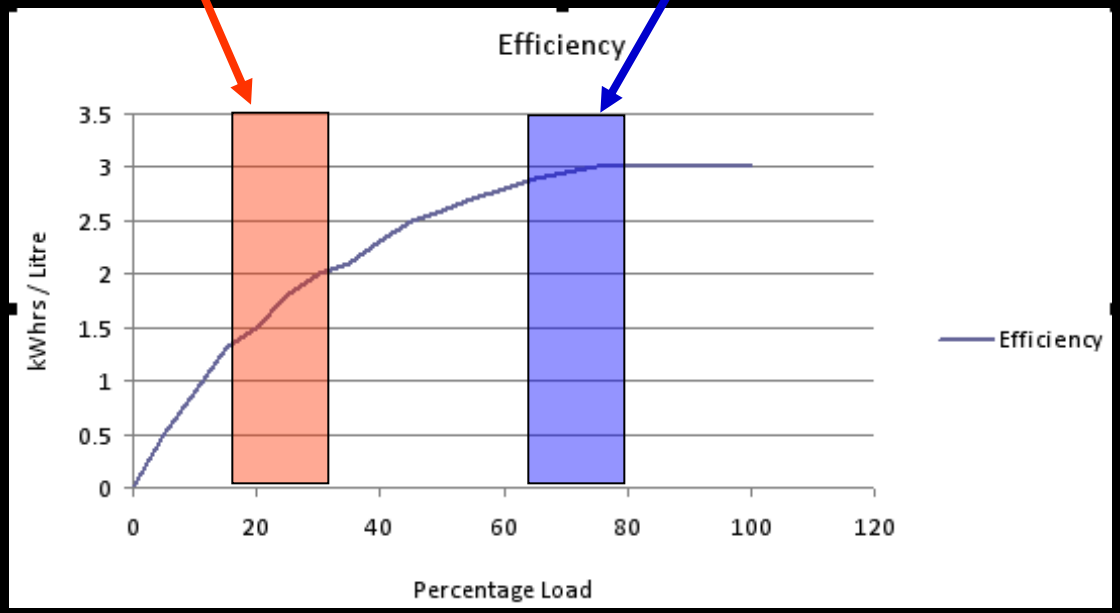
- **20% to 30% more**
  - Converter Energy = MPPT
- EXTRA PV Energy 10%+ at low irradiation MIN.
- Local Service and support



ELTEK always on

Bangladesh- Present Scenario of Solar PV Hybrid for BTS in Terms of Efficiency

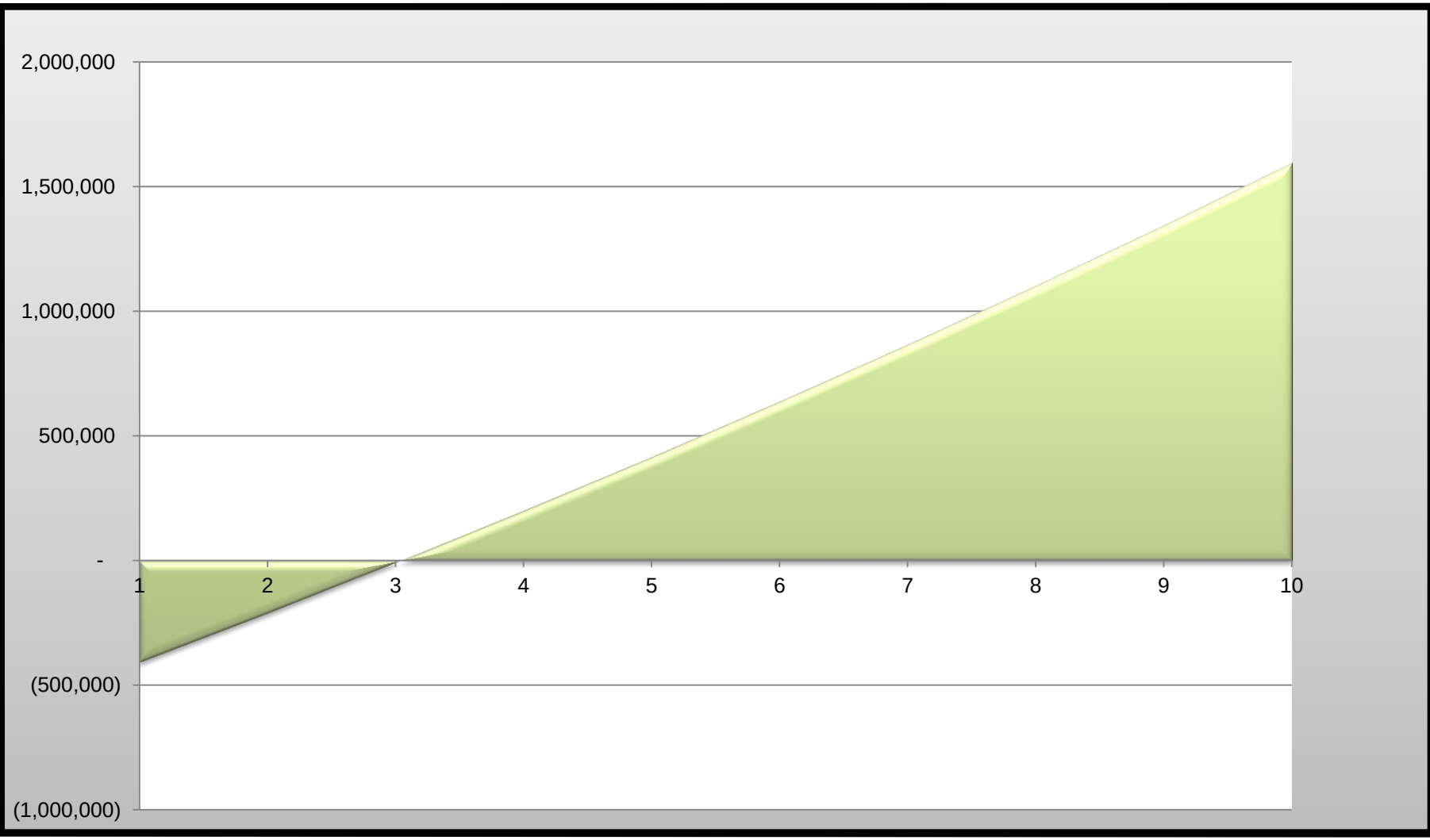
Generator Optimization-





ELTEK
always on

Break Even Point Based for On Going Solar Hybrid System in Bangladesh



ELTEK always on

Financial Breakdown and Assumption





ELTEK
always on

bizSAFE 4

FROST & SULLIVAN
2010 BEST PRACTICES AWARD

GSMA
Associate Member