HYBRID'S, OPEX REDUCTION & TOTAL ENERGY EFFICIENCY

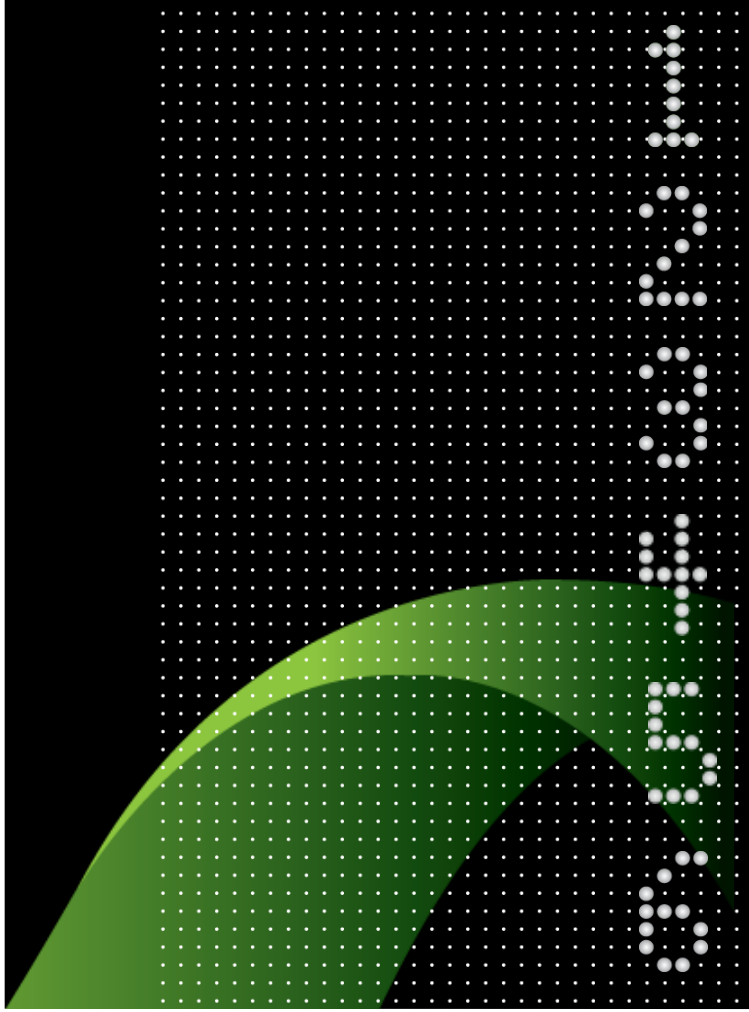
PRESENTED BY:

ALTERNATIVE ENERGY DIRECTOR

TELECOM DIVISION

DECEMBER 2012

CONTENT



ELTEK – ROLE & ACTIVITY

ENERGY EFFICEIENCY - END to END

TCO – GREEN ENERGY

MARKET TECHNOLOGIES

SW & PERFOMANCE MONITORING

SUMMARY

CONTENT

ELTEK– ROLE & ACTIVITY



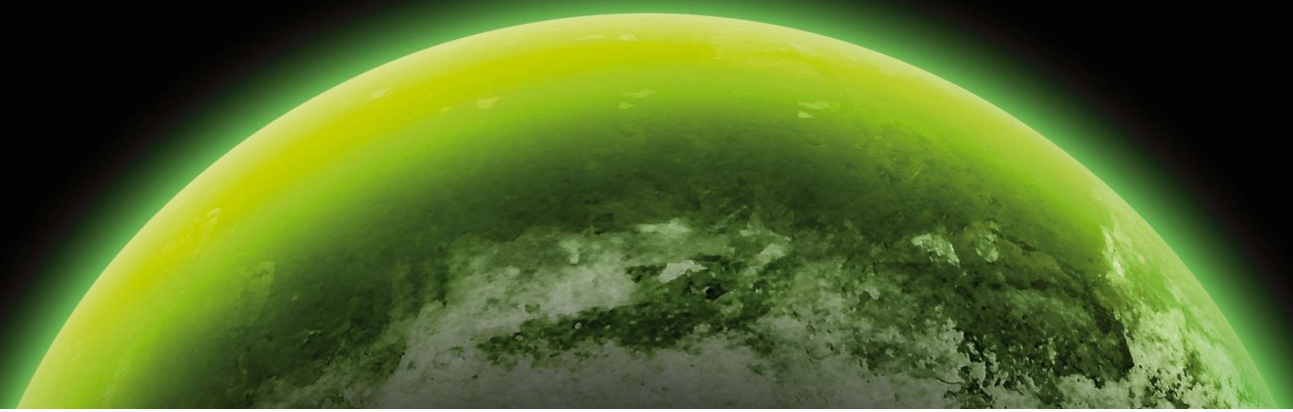






WHO WE ARE

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



SUMMARY – TOTAL SAVINGS TO DATE!

- 724,000 M WHR – This can power
  - **72,400 US homes** for one year @ 10,000Kwhr per home
- 28.8 M liters of DIESEL Fuel – This can power
  - 5,500 Telecom CDC sites for 1 year @ 2.4kw load
- $114 M USD – This can
  - Feed, cloth and provide basic health needs for 190,000 families in Africa for One (1) year. (ref Hope for Africa)
- 529,366 tons CO_2 = 144,241 tons of Carbon credits.

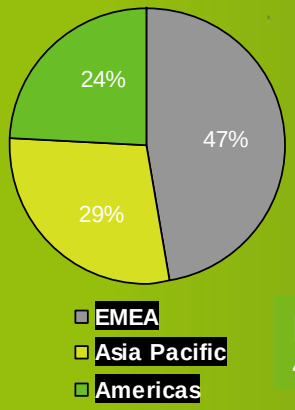
TRUE GLOBAL REACH

Strong presence in all major markets
Sales in over 100 countries

EMEA
1000 employees

Americas
300 employees

Asia Pacific
600 employees



Revenue by region
4Q 2007

ELTEK always on

CONTENT

ENERGY EFFICEIENCY - END to END









ENERGY EFFICIENCY

WHERE EVERY DROP COUNTS!

ENERGY EFFICIENCY, WHERE EVERY DROP COUNTS!

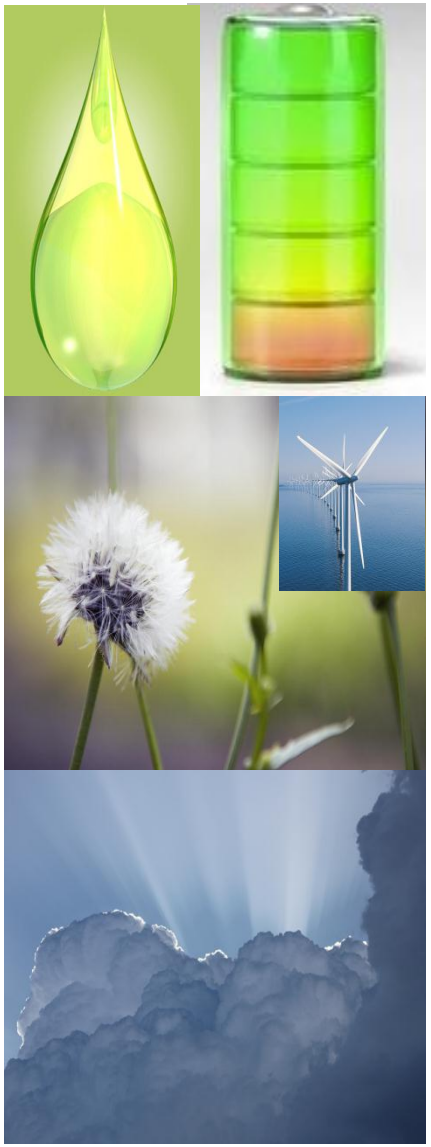
EVERY DROP of BIODIESEL

EVERY PUFF of WIND

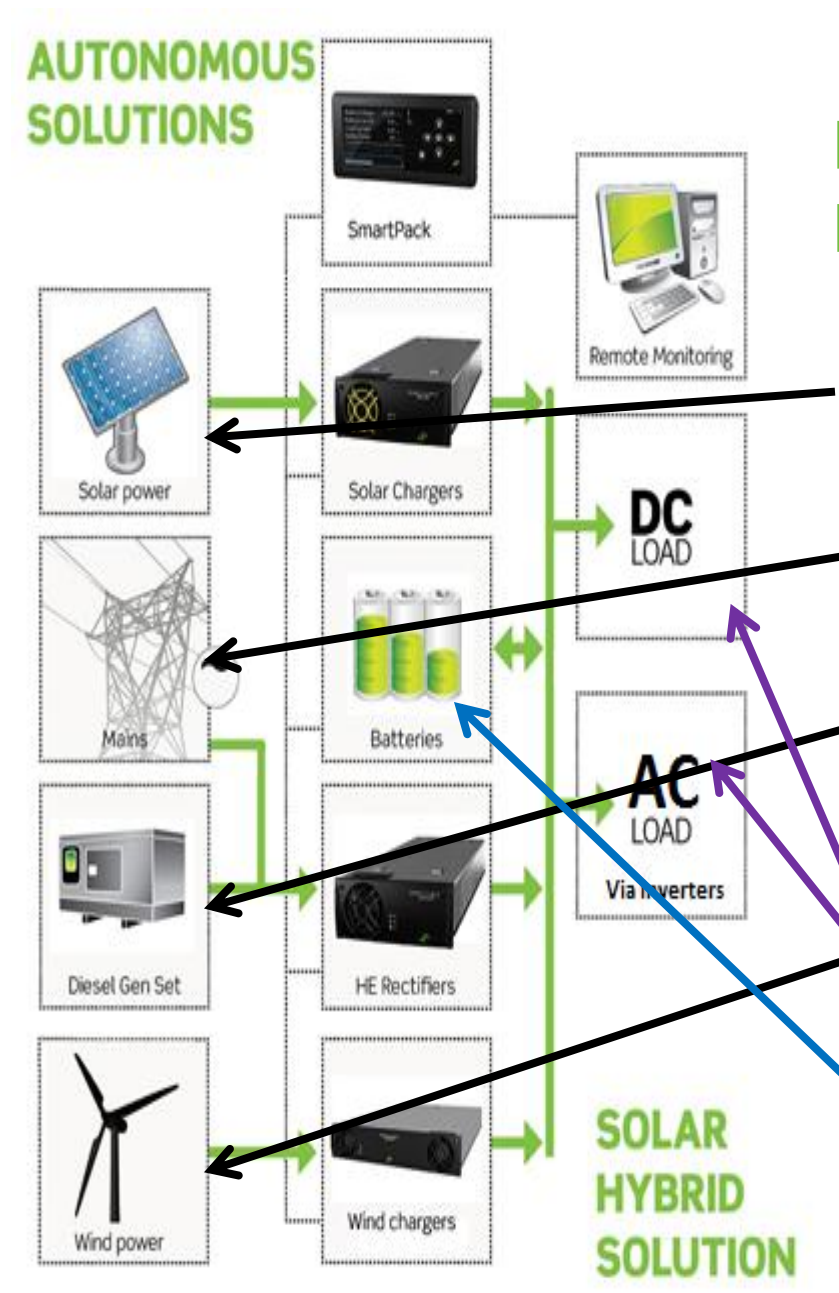
EVERY RAY of SUN

EVERY STORED KWhr

It is CRITICAL to have an "OPTIMISED" OFF-GRID POWER SOLUTION!







ENERGY EFFICIENCY MODULAR POWER SOLUTION

Energy from PV

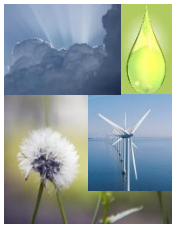
Energy from Poor Grid

Energy from Generator

Energy from Wind Turbine

Energy AC or DC

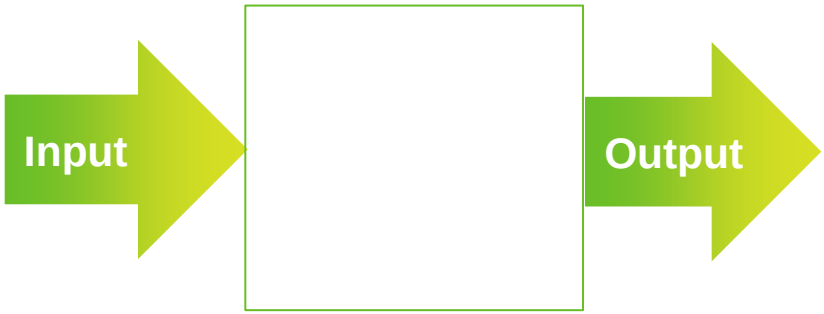
Excess Energy Stored



WHAT IS ENERGY CONVERSION?

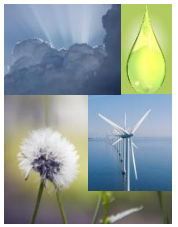
Energy conversion equipment

- > Unstable Grid
- > Genset
- > Solar panels
- > Batteries
- > DC sources...

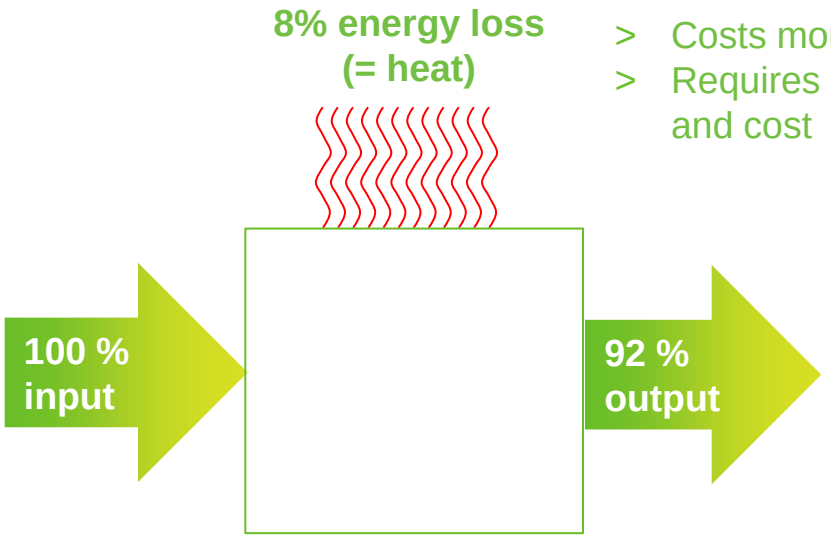


- > Critical electronic equipment
- > Batteries
- > Mains

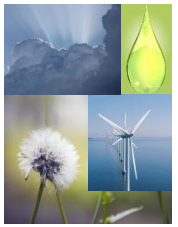
- > AC → DC (rectifiers)
- > DC → AC (inverters)
- > DC → DC (converters)



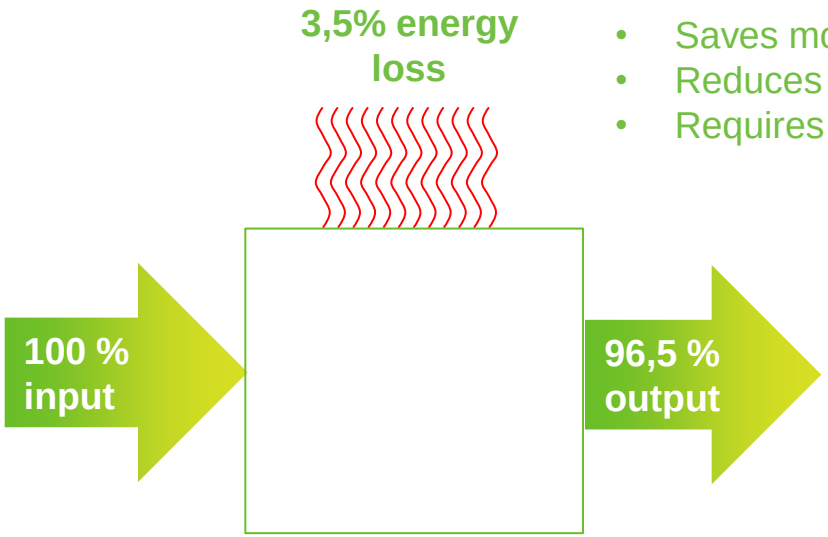
WHY ENERGY EFFICIENCY IS SO IMPORTANT..



- Costs money
- Requires cooling = more energy and cost



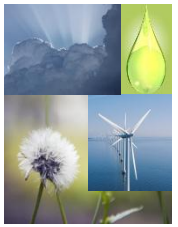
WHY ENERGY EFFICIENCY IS SO IMPORTANT..



- 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





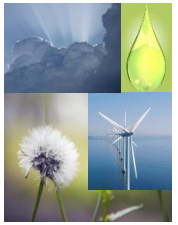








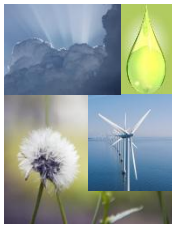




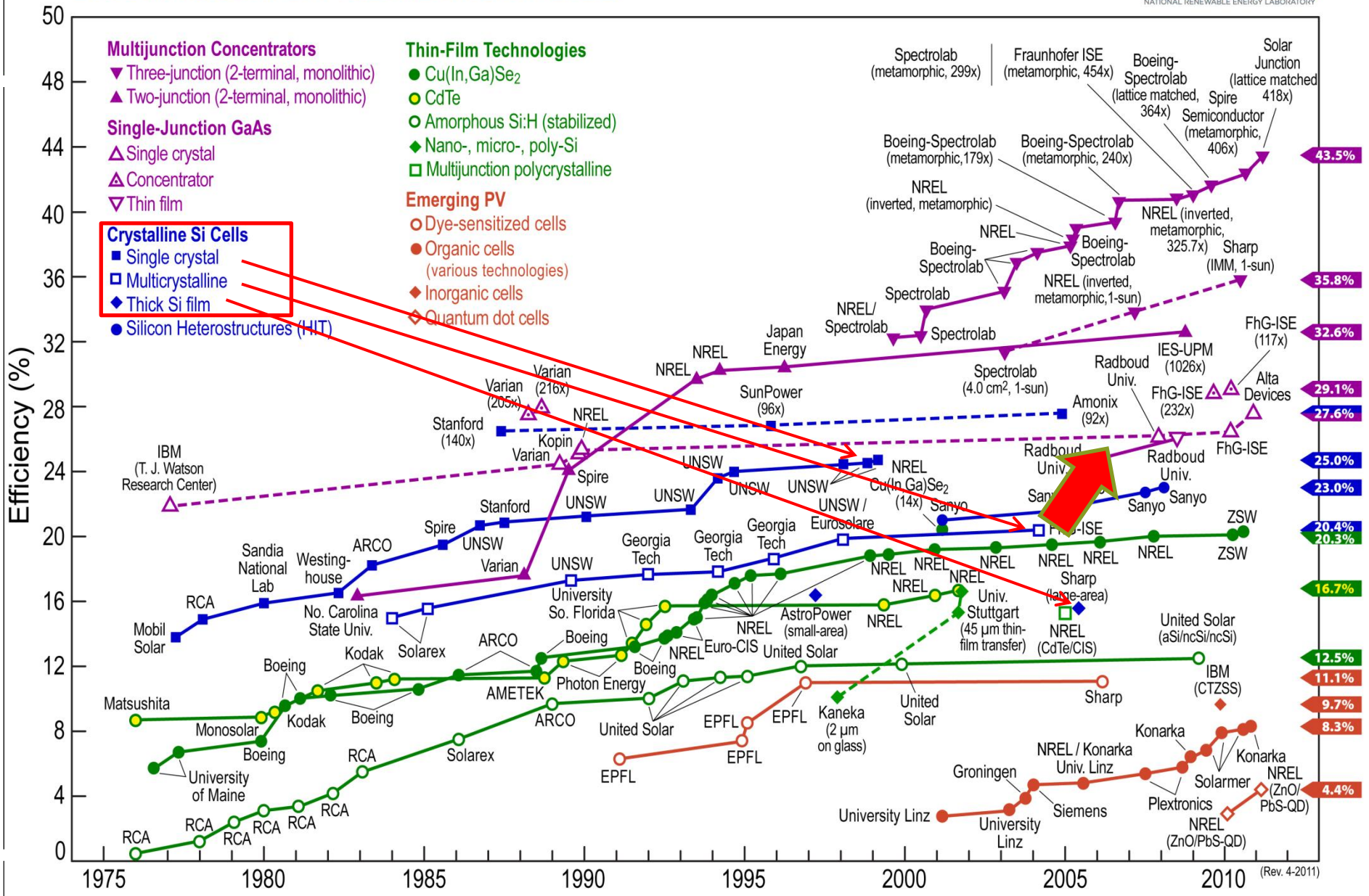
* Reference Eltek

ENERGY EFFICIENCY CYCLE

PV MODULE



Best Research-Cell Efficiencies



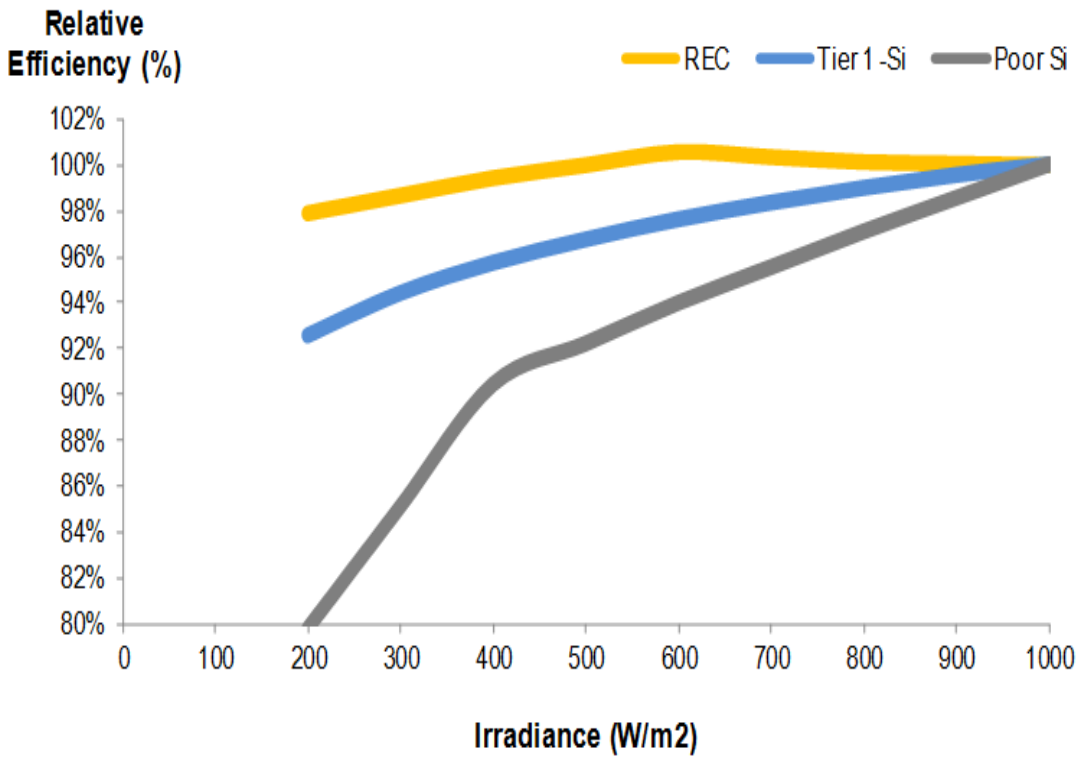
ENERGY EFFICIENCY CYCLE – PV MODULE *

PV Efficiency (CELL) = 17%

PV Efficiency (MODULE) = 15.1%

Losses from PV to Solar Converter due to , temperature, soiling, wiring, shading, miss match.

Approx. Total losses = ~ 25%
(Excludes Solar converter losses).



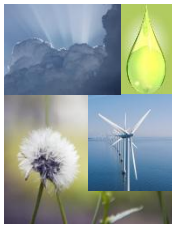
Important to correctly match **PV Modules** to the **Solar Converter** to maximise energy



* Reference REC Solar.

ENERGY EFFICIENCY CYCLE

STORAGE



ENERGY EFFICIENCY CYCLE – STORAGE OPzV / OPzS *

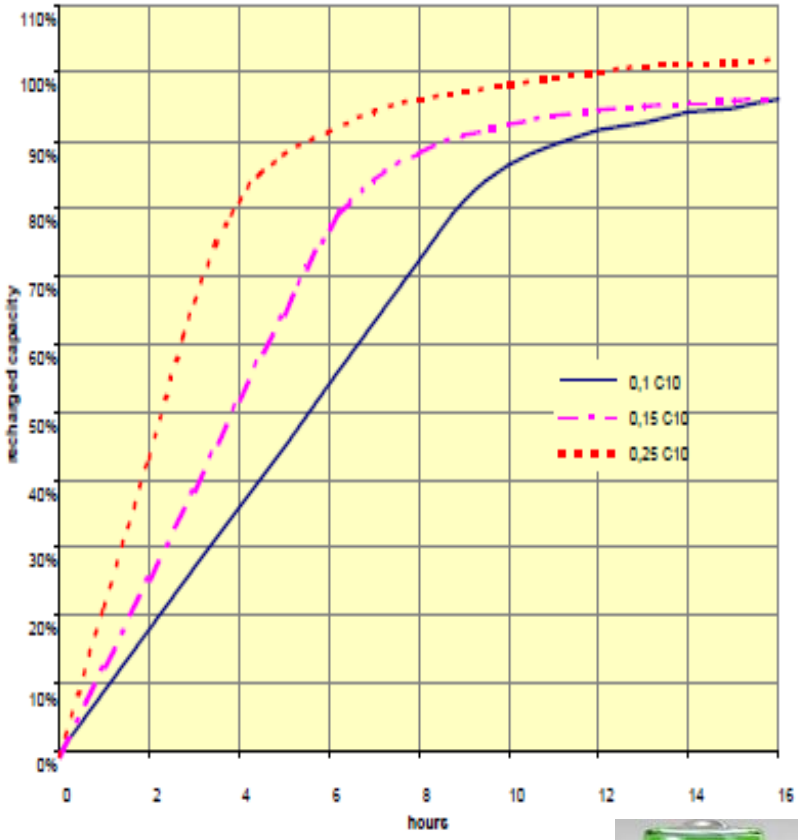
During Charge cycle =

Wh efficiency 0-80% SOC 83% - 93%

Wh efficiency 80-100% SOC 73% - 87%

No of Cycles @ 80% DOD = typically >1,200

(1500 cycles for OPzS)







BEST SOLUTION for MEDIUM to LARGE OFF-GRID POWER!! – MAINTENACE FREE

* Reference BAE & Hoppecke

ENERGY EFFICIENCY CYCLE – STORAGE LITHIUM ION*

During Charge cycle =

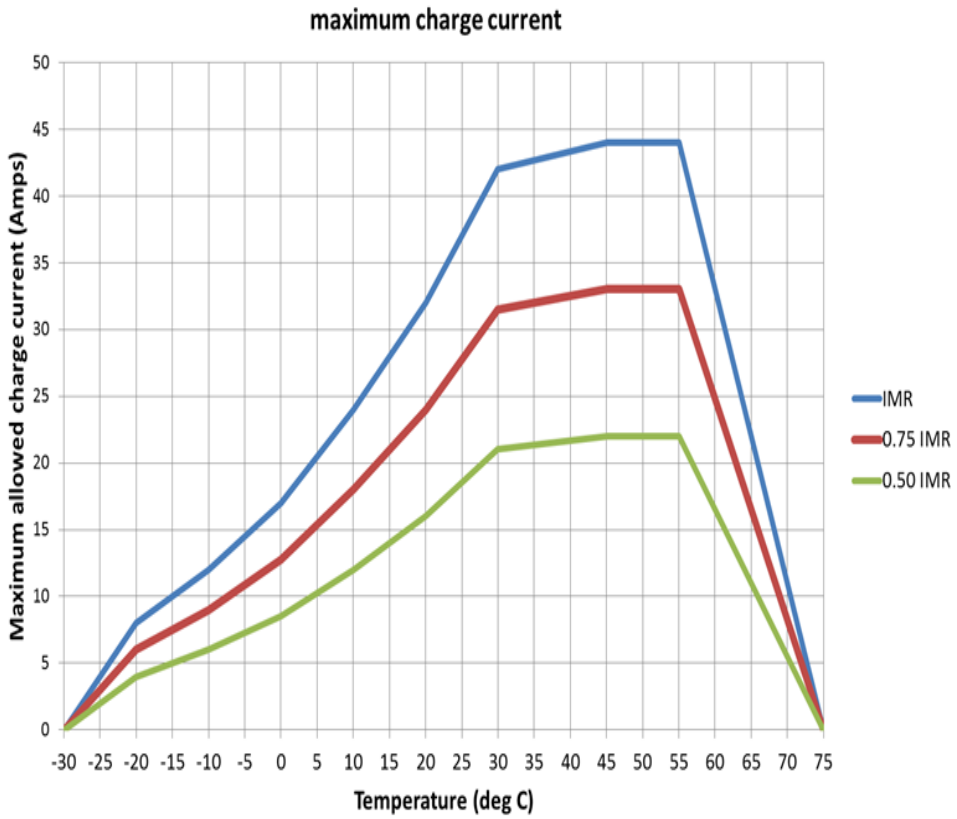
Wh efficiency 0-80% SOC 97%

Wh efficiency 80-100% SOC 95%

Typical Recharge 3.5hr** C3+

No of Cycles @ 80% DOD = >4,300+





BEST SOLUTION for SMALL OFF-GRID POWER!! – LONGEST LIFE – MOST ENERGY EFFICIENT

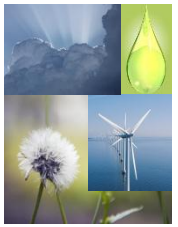




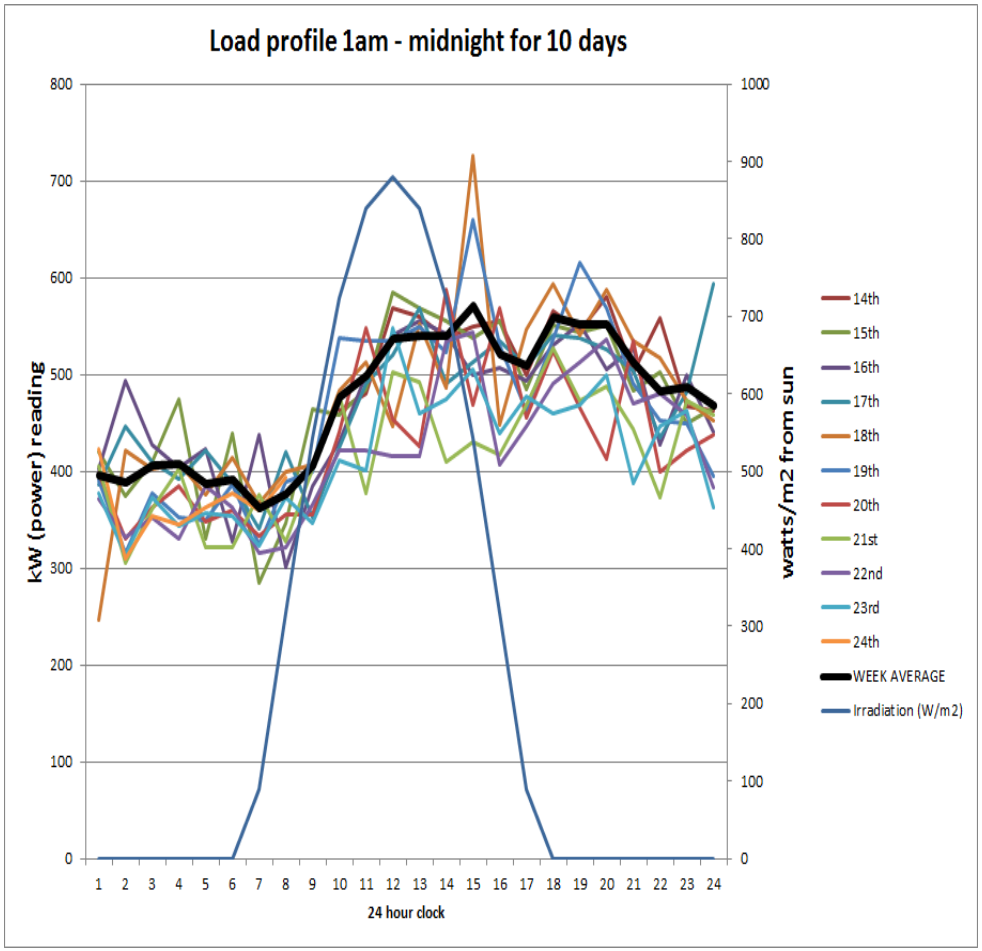
* Reference SAFT, ** Depending on SOC,

ENERGY EFFICIENCY CYCLE

END TO END!



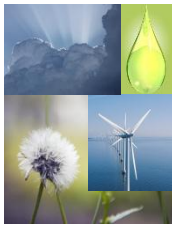
ENERGY EFFICIENCY CYCLE – END to END – SOLAR TO LOAD (DC or AC)



* Reference AC load profile

- TOTAL END to END EFFICIENCY WILL DEPEND ON
  - Total LOAD PROFILE OVER
  - 24hr &
  - 365days
- ALSO
  - TECHNOLOGY USED and
  - AMOUNT OF ENERGY FROM GENSET/s.





CONTENT

TCO – GREEN ENERGY



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

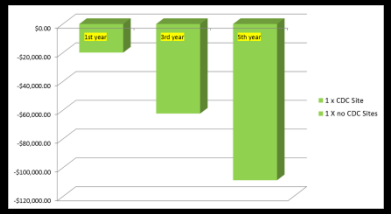
Approx 53% decline in revenue for 5 years

Alternative Energy – Telecom

MOTIVATION for introducing Alternative Energies



Energy cost – reduced OPEX & TCO





Improved network reliability

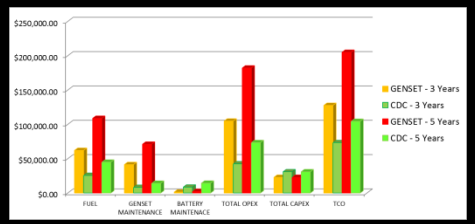




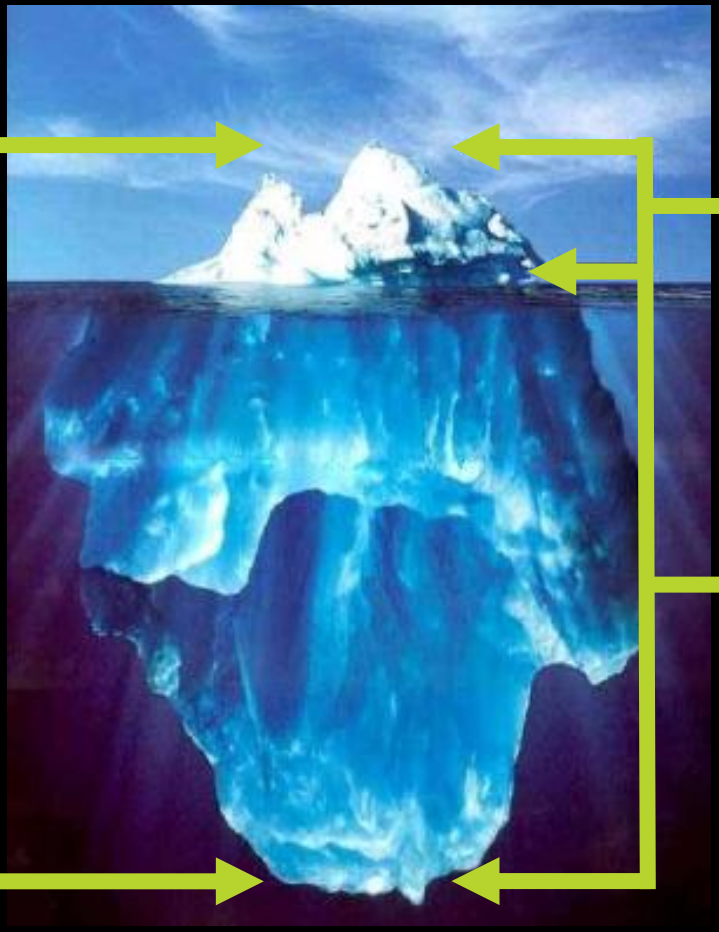
Off grid sites in rural areas

- Inaccessible
- Energy source redundancy
- Vandalism

ICEBERG SYNDROME – TCO – 24/7 GENSET



TRUE
TOTAL COST OF
OWNERSHIP



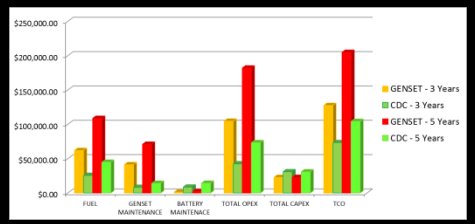
CAPEX $23KUSD

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

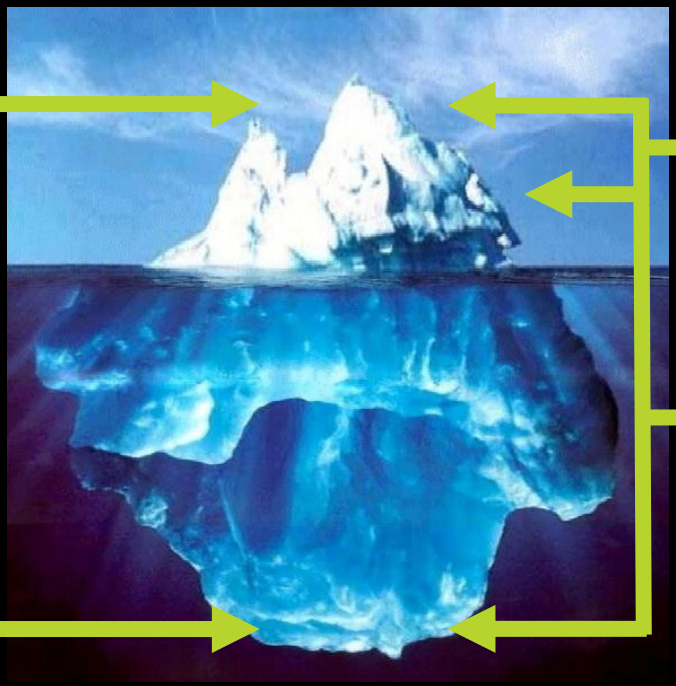
OPEX $105KUSD
(3year period)

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



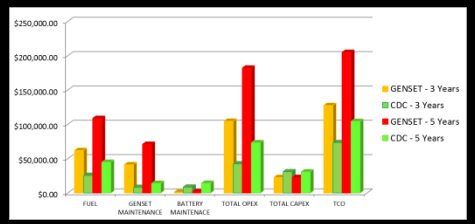
CAPEX $31KUSD

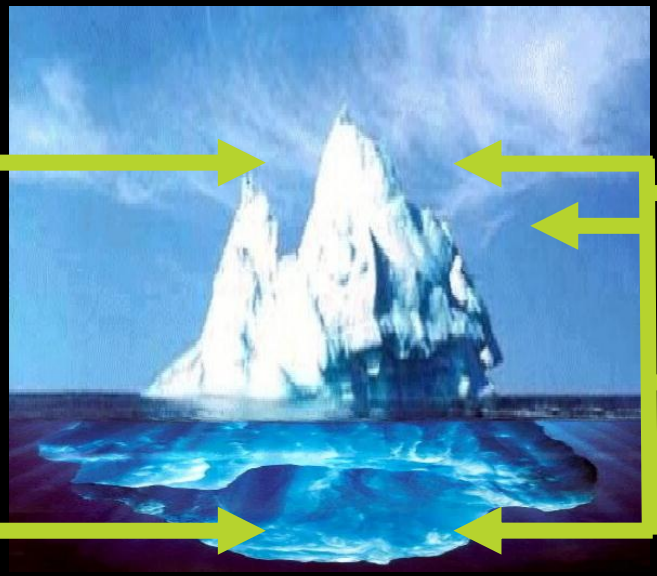
CAPEX includes,
goods, services, tax's etc.

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

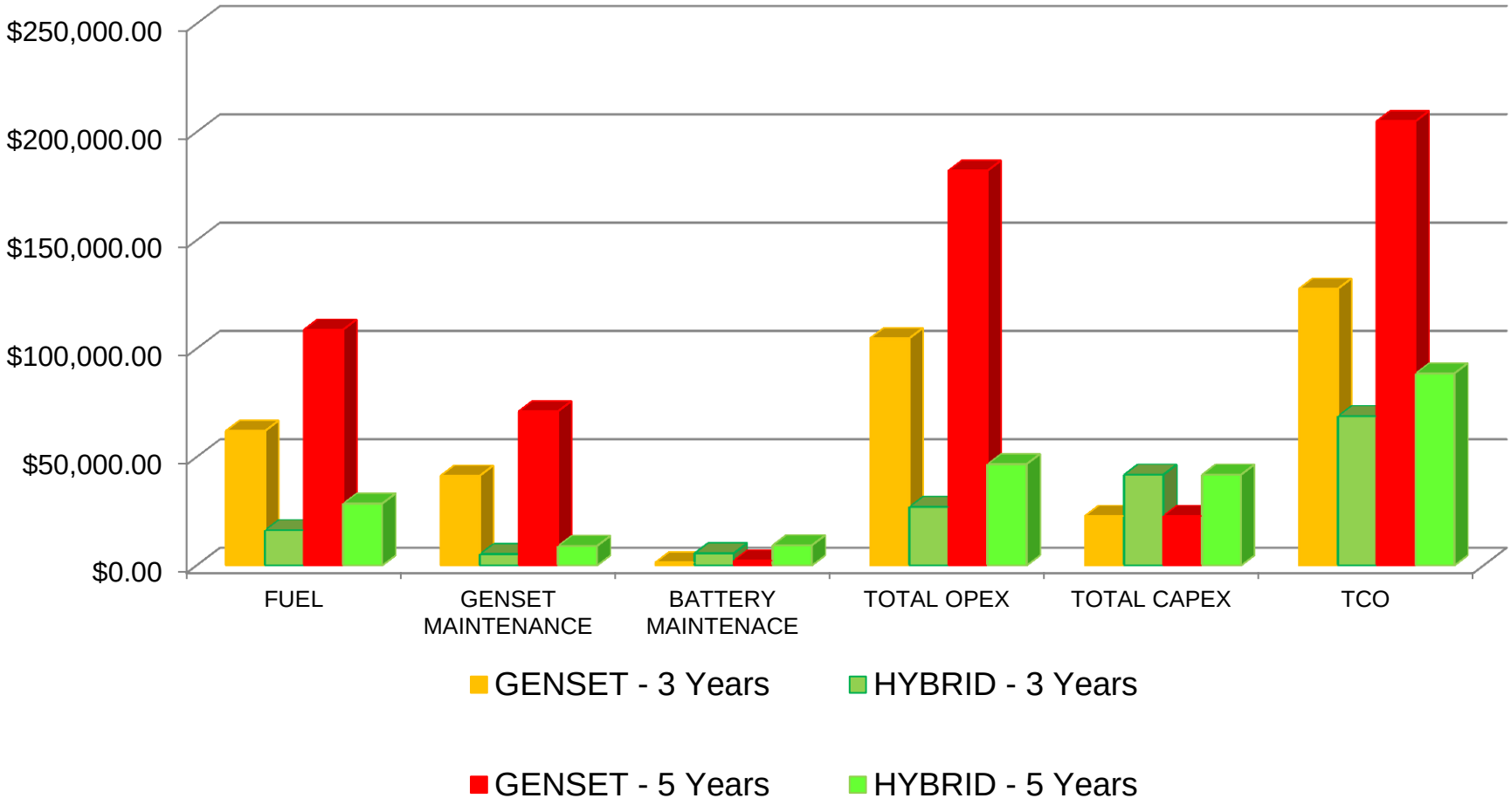
CAPEX $42KUSD

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

OPEX $27KUSD
(3year period)

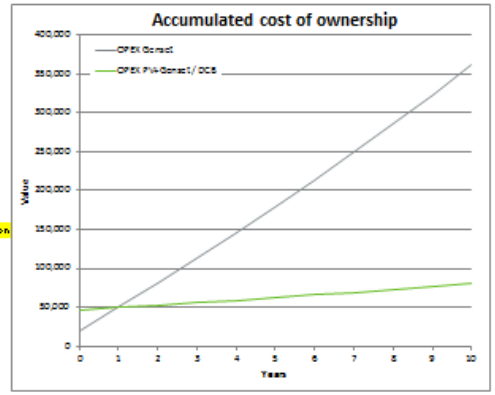
OPEX includes,
Diesel, Genset maintenance, replacement batteries, cooling tech maintenance, and all other periodic preventative maintenance.

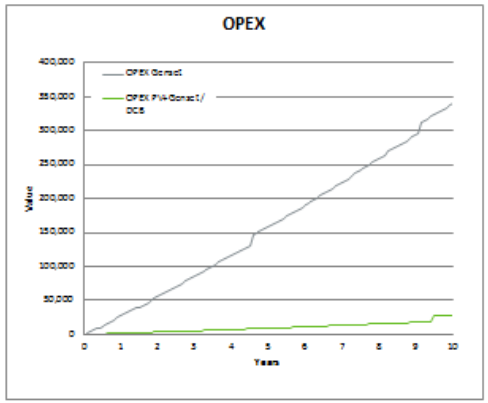
ICEBERG SYNDROME – TCO – HYBRID



IDENTIFY BEST TCO MODEL – ROI TOOL

Location	Country	Australia	
	City	Brisbane	
	Daily Irradiation	4,6	kWh/m2/day
	Global Irradiation	1685	kWh/m2/year
	Min. Temperature	5	C
	Average summer temp.	25	C
Load	Peak load power	1000	W
	Average load power	1000	W
Eltek Valere Hybrid Solution			
System	System type	Solar + Generator + DCB	
	Retrofit	No	
	System	Indoor Cabinet 16kW-42kW ac	ok
	Peak power	5,88	kWp
PV Panels	Type	REC245PE	
	PV Stand type	Tilted (fixed position)	
	No of Arrays	4	Batt.Cap. too small to store PV en
	PV in Array	6	pcs
	Qty need for Autonomy	49	pcs
	Qty of panels	24	pcs
	Area	39,6	m2
	Solar Fraction	79%	
Wind	No of wind turbines	0	pcs
	Turbine type	Skystream 3kW	
	Site elevation	260	m
	Average wind speed	3,5	m/s
	Tower height	10,0	m
	Site type	Inland	
	Yearly wind power		kWh/year
	Wind fraction	0%	
Battery	Type	600Ah OPzV	ok
	Number of strings	1	
	Current limit	120	A
	Cooling	Fan-Filter	
	Battery capacity C10	600	Ah
	Backup time	28	h
	Residual Backup	14	h
	Full cycle time	50	h
	Battery life time	9,4	years
	DoD	50%	
Rectifiers	Recommended rectifiers:	6	x FP2 2kW
	Number of rectifiers:	3	Check number of rectifiers !
Generator	Minimum size:	9,9	kVA
	Type	Generator 12,5kVA	ok
	Generator power	10,0	kW
	Fuel price	1,30	$/l
	Fuel price increase	5	%/year
	Generator runtime	6%	
	Generator runtime	534	h/year
	Fuel consumption	900	l/year
	Diesel theft	0	%
Generator running 24h/7days - for ROI comparism			
Generator (24h)	Type	Generator 17,1kVA	
	Generator power	13,7	kW
	Fuel consumption	11,675	l/year
Battery Generator 24h	Type	150Ah AGM	
	Number of strings	1	
	Backup time	6,9	h
Site Details: Poor Grid			
Grid	Power available	30	kW
	Duration	5	h/day
	kWh cost	0,10	$
	kWh cost increase	3	%/year
Other Commercial Information			
Other	AE Feed-in tariff	0,00	$/kWh
	AE Investment Grants	0	$
	Delivery cost	10%	
	Discount	0%	
	Currency	$	
Financing	Financing	Cash	
	Period		years
Date:		11/12/2012	
Customer:		Customer	
Project		Project name	
Note:			
1			
2			
3			
4			



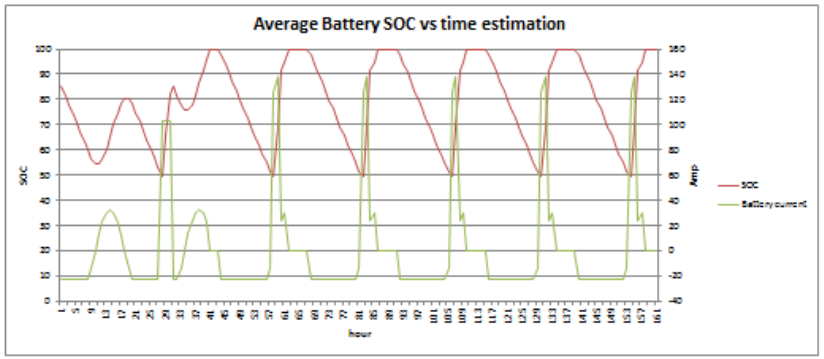


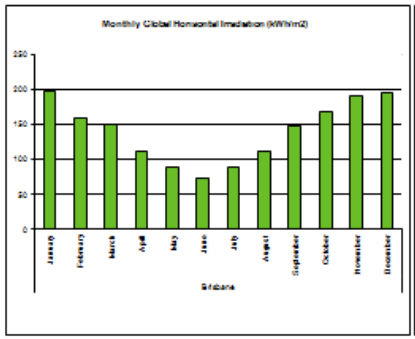
OPEX Component: Total

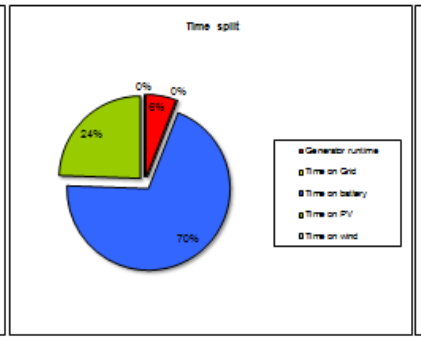
Calculations without rental options	
5 Years cost of ownership	
178,974 $ GENSET	
62,290 $ PV+GENSET/DCB	
116,684 $ SAVINGS - 65%	

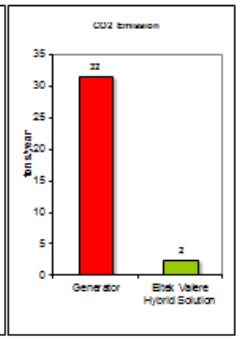
Payback:	1.0 years		Energy cost:
ROI 3 years:	206%	3 Years:	2.12 $/kWh
ROI 5 years:	409%	5 Years:	1.42 $/kWh
ROI 10 years:	919%	10 years:	0.92 $/kWh

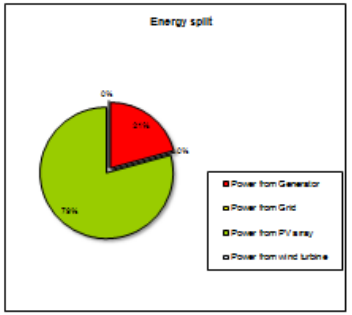
OPEX include:
1. Fuel cost
2. Generator maintenance
3. Generator overhaul
4. Generator replacement
5. Battery replacement











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

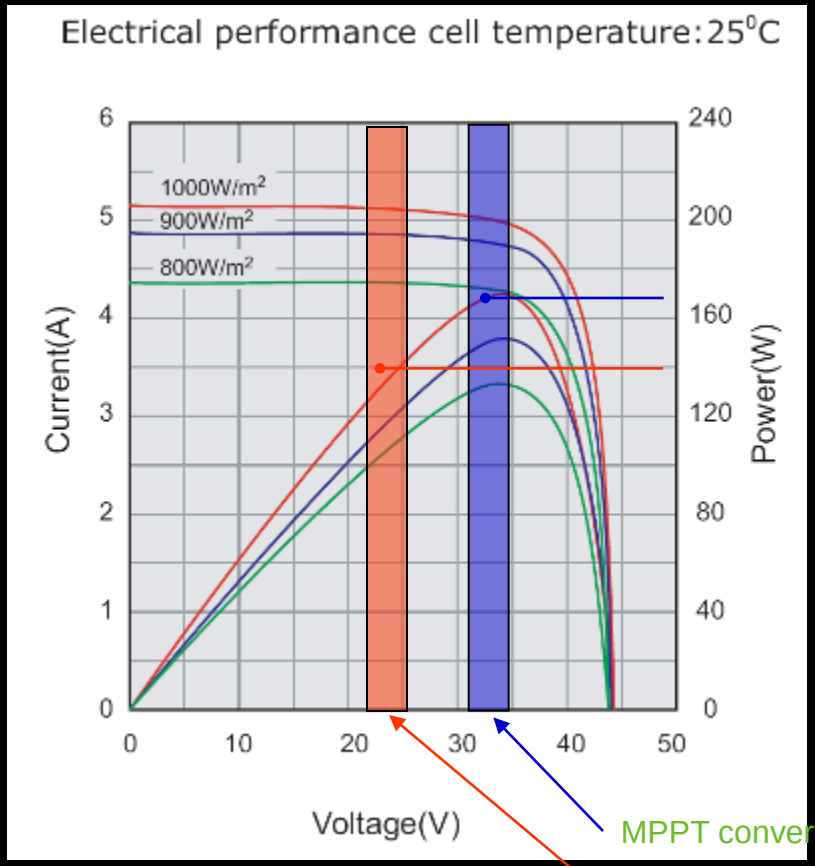
- ✓ Close to 100% panel utilization

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%**

DIRECT FEED CHARGE CONTROLLER VS MPPT CONVERTER



> Charge controller

- Connects the panels directly to the batteries (and telecom equipment)
- Disconnects the panels when the battery voltage reaches a defined upper limit
- Panel operating voltage between 23.5 and 28Vdc (47 and 56 Vdc on the battery), depending of the battery state of charge

> MPPT converter

- Dc/dc converter with controlled output
- Continuous charging according to programmable profile
- MPPT algorithm finds the panel voltage that generates maximum power

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

TOTAL SITE CONTROL

Compac 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





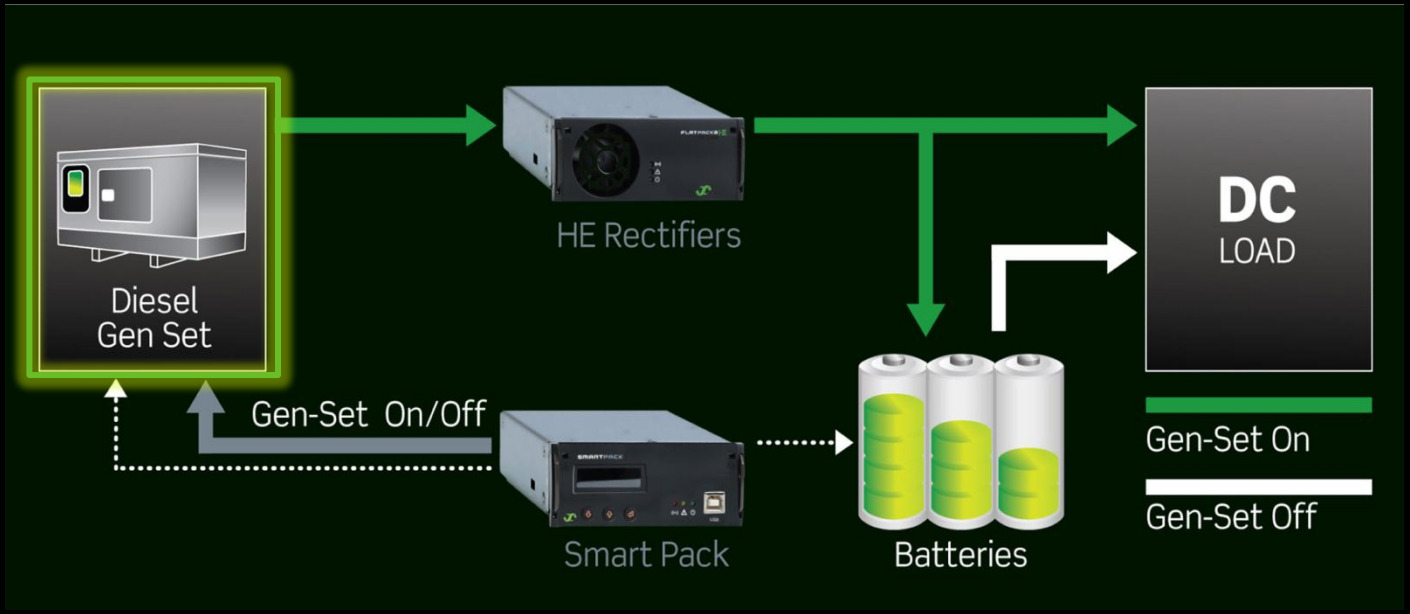


SOLUTIONS PART A



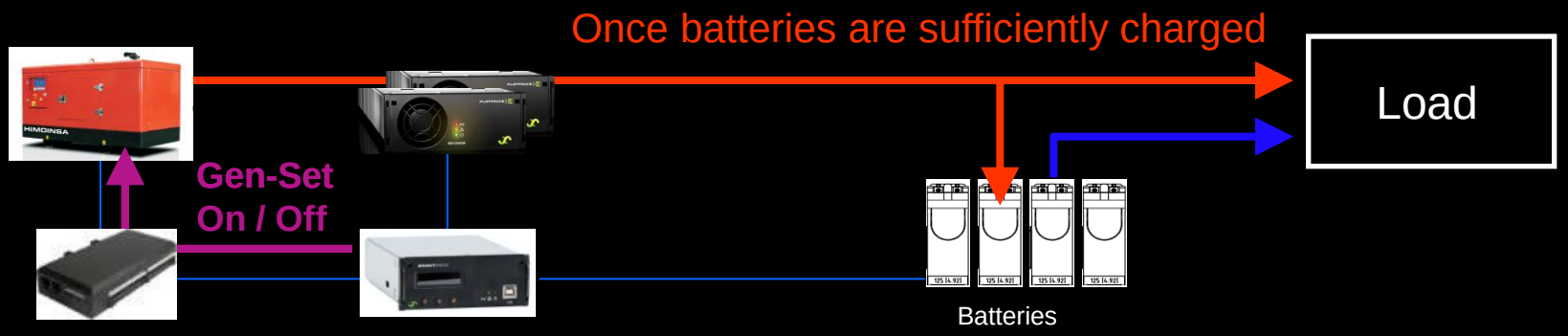
CHARGE DISCHARGE CHARGE CYCLIC - CDC

CDC SOLUTION



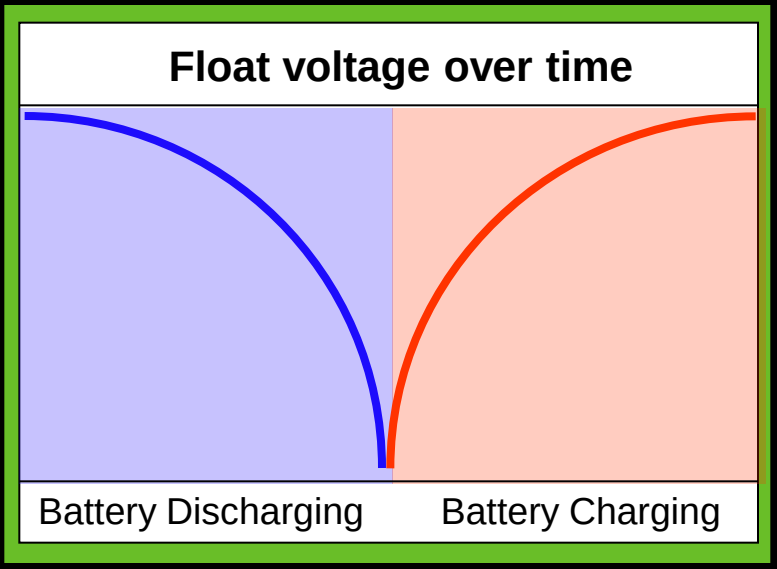
Generator Optimisation

CDC SOLUTION

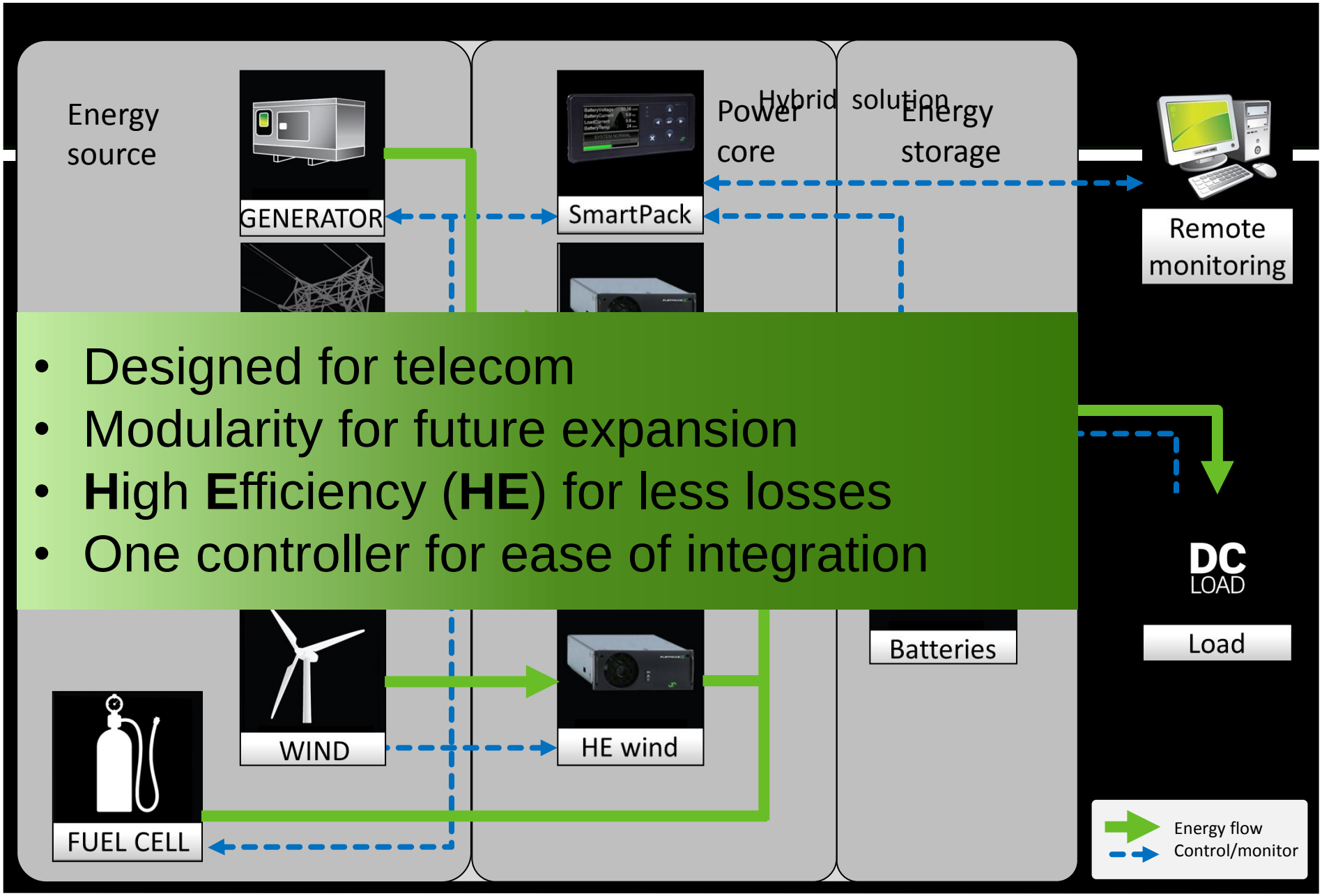


By periodically running the load on batteries, you can :

- ✓ 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



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

BATTERY TECHNOLOGY
CYCLES & PSOC

Alternative Energy – BATTERIES



- With a cyclic operation batteries plays a new and active role in the system.
- Larger capacity is needed to maintain security backup time as a discharge is part of a normal operation mode.
- New battery technology is needed, technologies that allows hundreds or even thousands of discharge cycles.
- Useful battery technologies are i.e.
  - OPzV
  - OPzS
  - NiCd
- Future battery technology CAPEX dependant for deployment.
  - Lithium
  - sodium–sulfur battery
  - VRB

PARTIAL STATE OF CHARGE
- PSOC -

UNDERSTANDING C10 over C100 or C120



CELL TYPE	DIN 40742		CAPACITY AT 20°C (Ah)			DIMENSIONS (mm)			WEIGHT
	DESIGNATION	NOMINAL CAPACITY (Ah)	5 hrs to 1.77 VPC	3 hrs to 1.75 VPC	1 hr to 1.67 VPC	L	W	TH	(kg)
SMG 200	4 OPzV 200	200	172	150	106	103	206	406	17
SMG 250	5 OPzV 250	250	215	188	133	124	206	406	21
SMG 300	6 OPzV 300	300	258	225	159	145	206	406	24
SMG 350	5 OPzV 350	350	300	263	185	124	206	523	26
SMG 420	6 OPzV 420	420	360	315	222	145	206	523	32
SMG 490	7 OPzV 490	490	420	368	259	166	206	523	36
SMG 600	6 OPzV 600	600	516	450	312	145	206	698	45
SMG 800	8 OPzV 800	800	688	600	416	210	191	698	63
SMG 1000	10 OPzV 1000	1000	860	750	520	210	233	698	78
SMG 1200	12 OPzV 1200	1200	1032	900	624	210	275	698	88
SMG 1500	12 OPzV 1500	1500	1260	1116	744	210	275	848	104
SMG 2000	16 OPzV 2000	2000	1680	1488	992	214	399	824	140
SMG 2500	20 OPzV 2500	2500	2100	1860	1240	214	497	824	176
SMG 3000	24 OPzV 3000	3000	2520	2232	1488	214	576	824	205

C10

UNDERSTANDING C10 over C100 or C120

CELL TYPE	CAPACITY (Ah) at 20°C	SHORT CIRCUIT CURRENT (A)	INTERNAL RESISTANCE (mohm)	WEIGHT (kg)	DIMENSIONS (mm)			TERMINALS
	120 hrs to 1.85 VPC	IEC 60896 21-22			Length	Width	Height*	+/-
SMG/S 265	265	2800	0.714	20.4	103	206	406	1 / 1
SMG/S 330	330	3650	0.571	23.5	124	206	406	1 / 1
SMG/S 400	400	4250	0.476	27.5	145	206	406	1 / 1
SMG/S 460	460	3560	0.572	29.6	124	206	523	1 / 1
SMG/S 570	570	4200	0.476	35.7	145	206	523	1 / 1
SMG/S 660	660	4950	0.409	40	166	206	523	1 / 1
SMG/S 860	860	6200	0.322	51	145	206	698	1 / 1
SMG/S 1150	1150	7100	0.285	68	210	191	698	2 / 2
SMG/S 1440	1440	8800	0.228	84	210	233	698	2 / 2
SMG/S 1720	1720	10500	0.190	98	210	275	698	2 / 2
SMG/S 2000	2000	11700	0.170	118	210	275	848	2 / 2
SMG/S 2600	2600	15700	0.128	164	212	397	824	3 / 3
MG/S 3300	3300	20000	0.102	201	212	487	824	4 / 4
MG/S 3900	3900	23500	0.086	235	212	576	824	4 / 4

C120

IEC 61427 – PSOC

- The test starts with a fully charged battery and discharge down to 10% state of charge (SOC). Then 50 “winter cycles” with 30% charge and 30% discharge are performed.

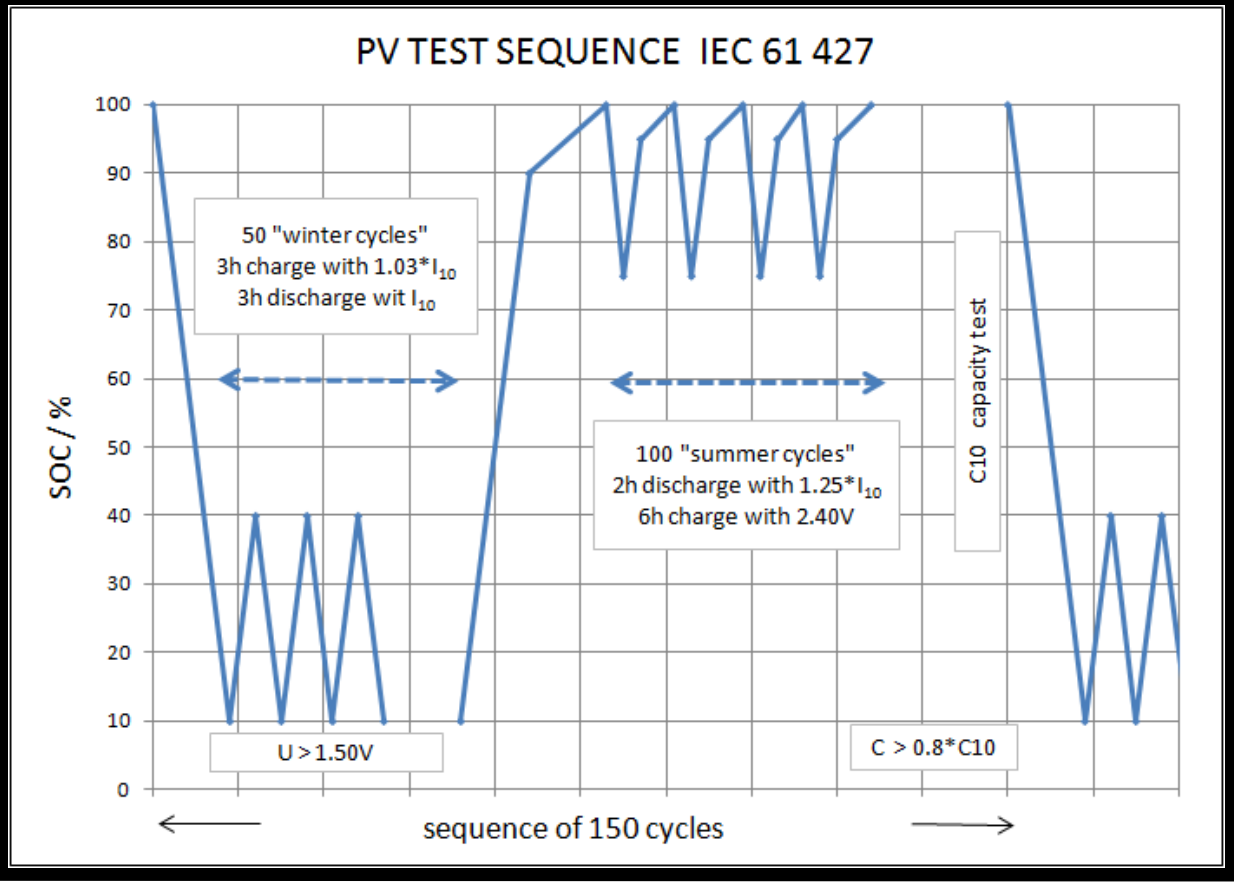
  After charging passing the 50 cycles a recharge to 100% SOC has to be done, followed by discharge to 25% depth of discharge (DOD) alternates with 6-hour charging with I10h.

  After 100 such “summer cycles” a C10h capacity test is performed.

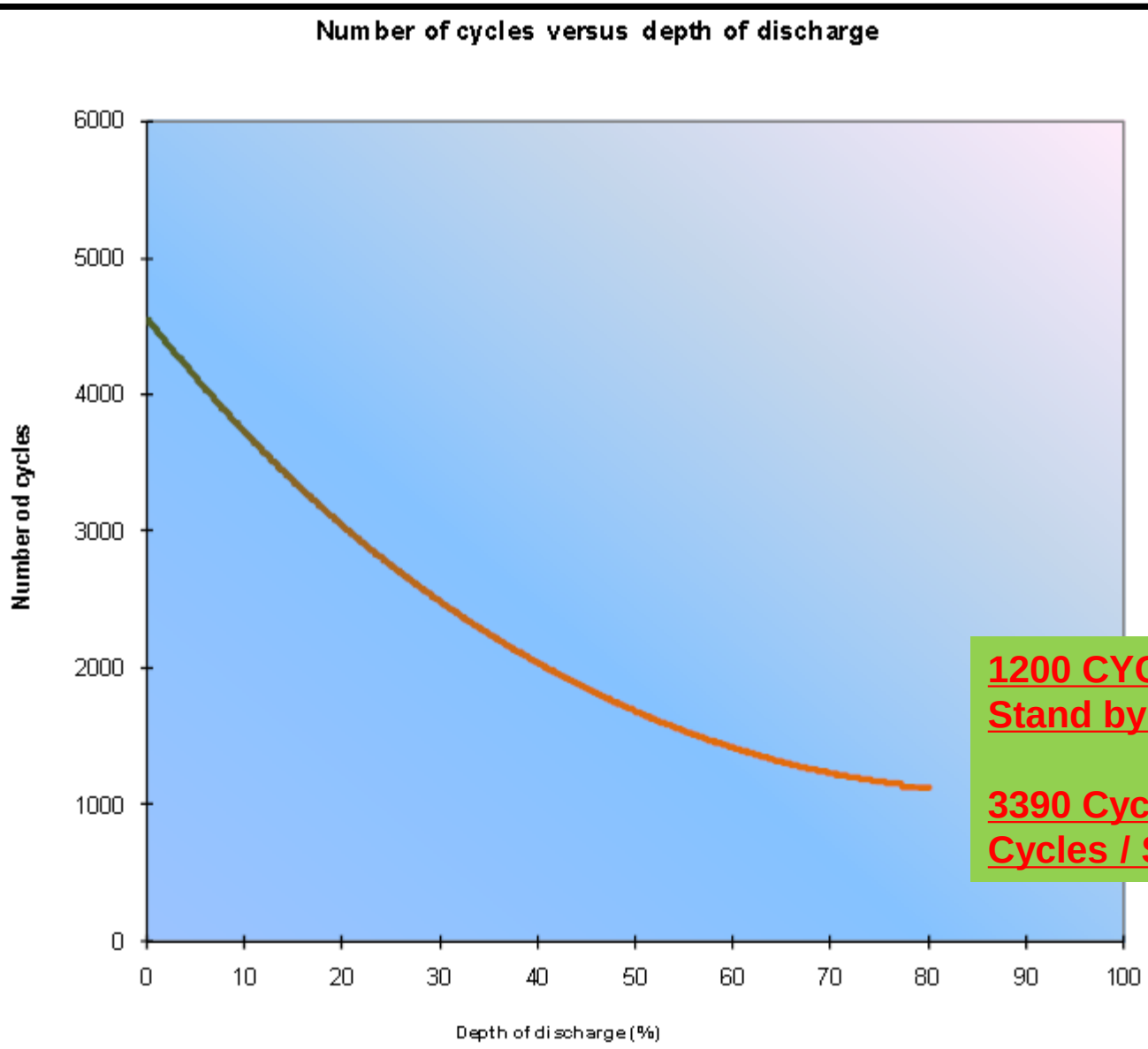
  This test sequence with 150 PV-cycles is repeated, until the actual capacity is lower than 80% of nominal capacity.
  The capacity test takes place at reference room temperature, while the cycling takes place at 40°C to get an accelerating effect of the test.

IEC 61427

> Endurance test for PV applications (PSOC operation).



CYCLES over DOD



1200 CYCLES at 80% DOD in Stand by application

3390 Cycles at 20% DOD in Cycles / Solar application

ELTEK always on

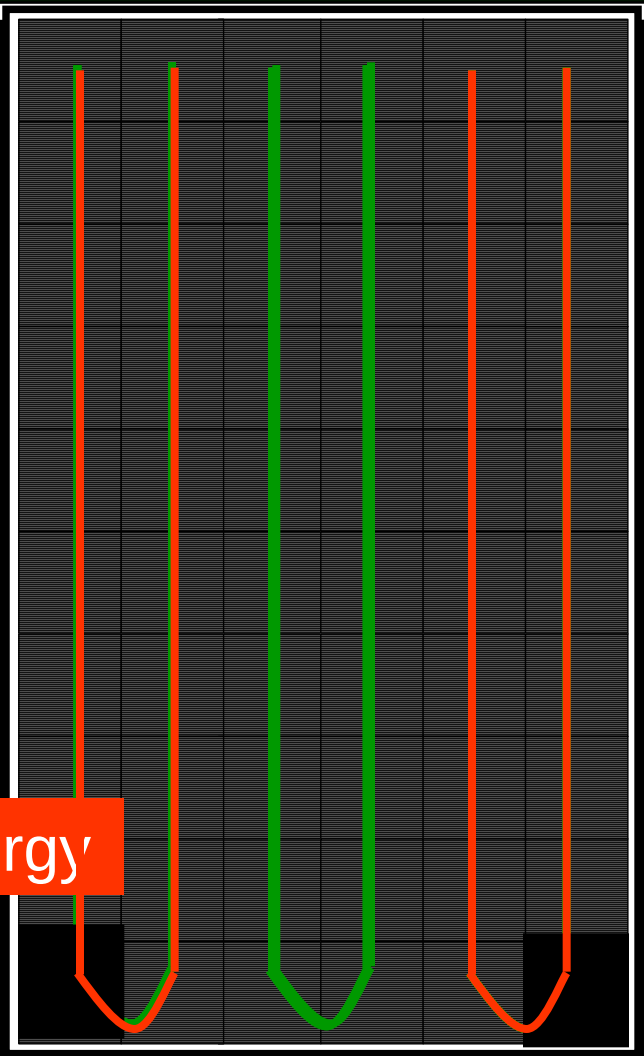
EFFECTS OF SHADING

DIRECT FEED OVER

MAXIMUM POWER POINT TRACKING (MPPT)

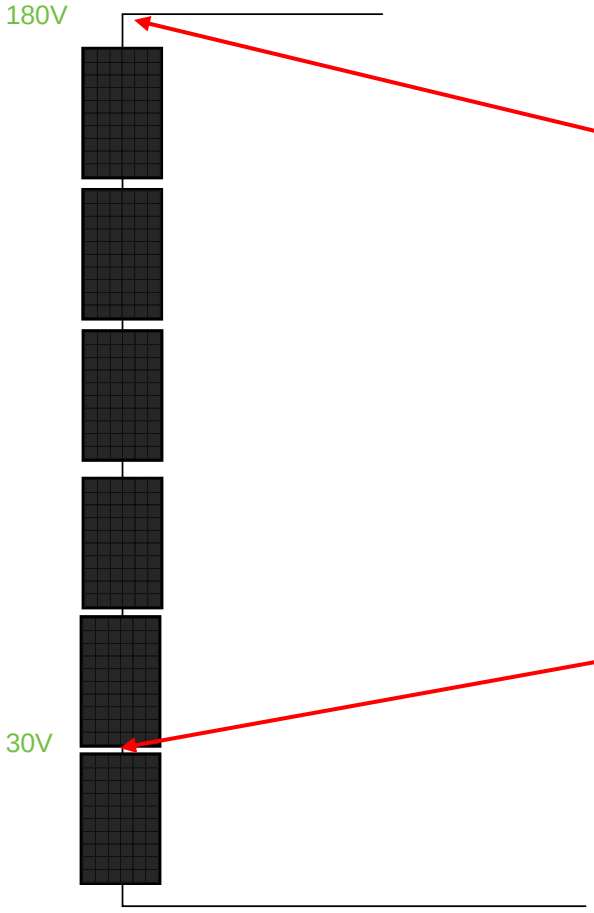
PV PANELS BASICS

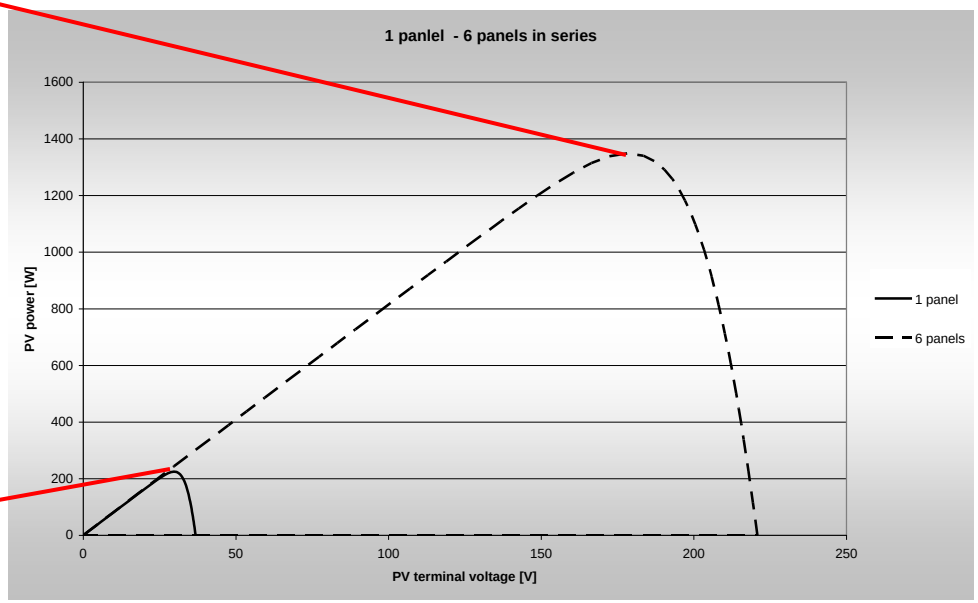
- 3 strings of 20 cells
  - V_{MPPT} ~30V
  - P_{MPPT} ~225W
- One shaded cell
  - V_{MPPT} ~20V
  - P_{MPPT} ~150W



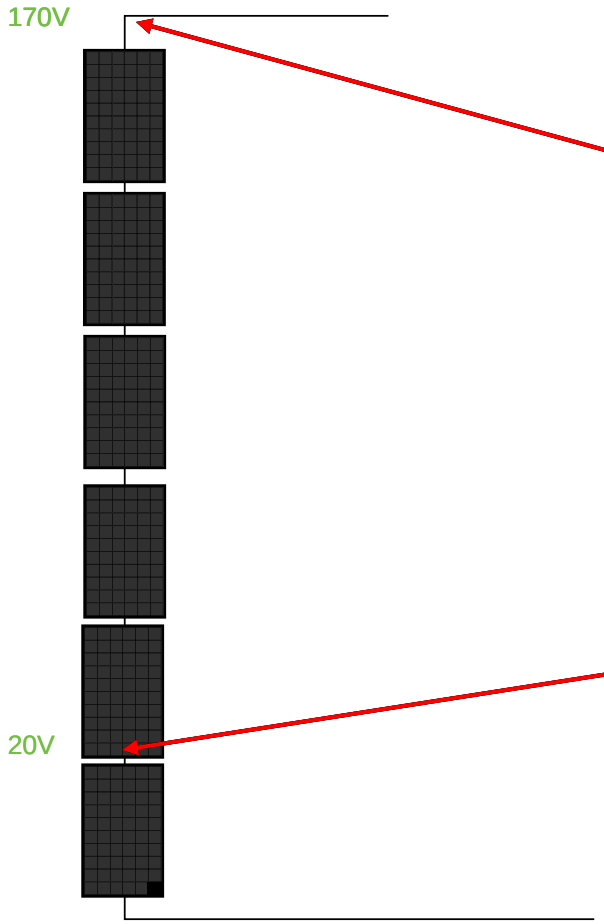
LOSS of 1/3 to 2/3 of available energy

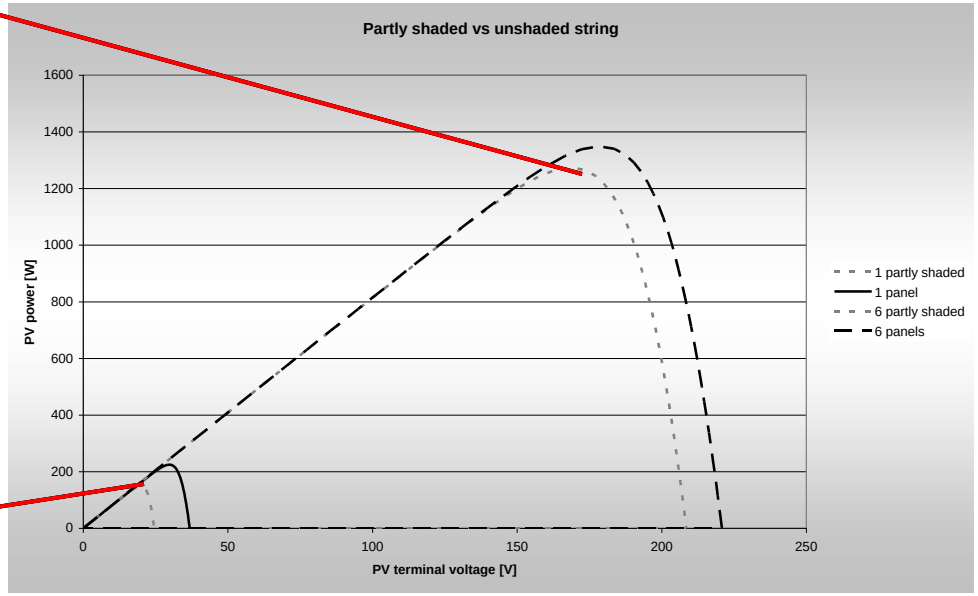
PV PANELS BASICS – Partly shaded



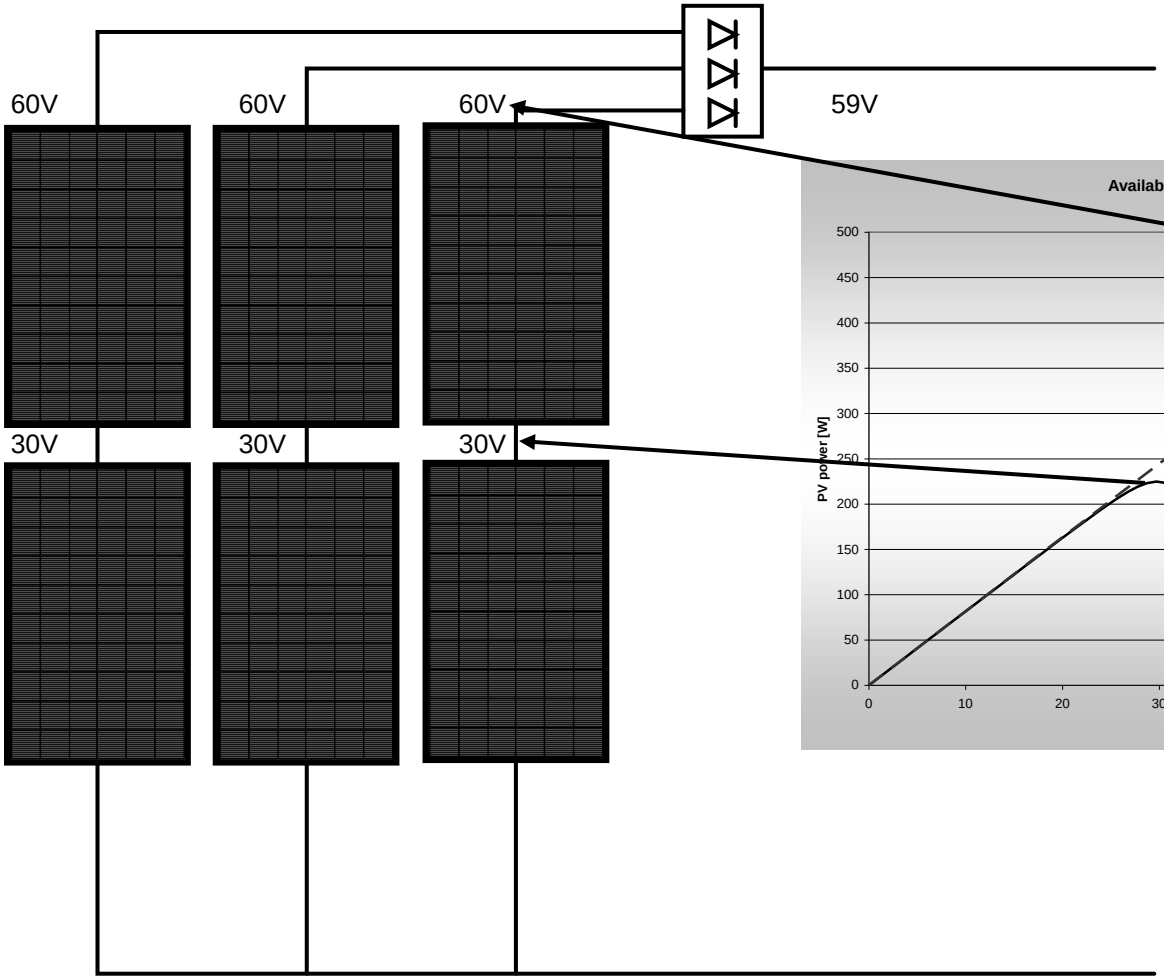


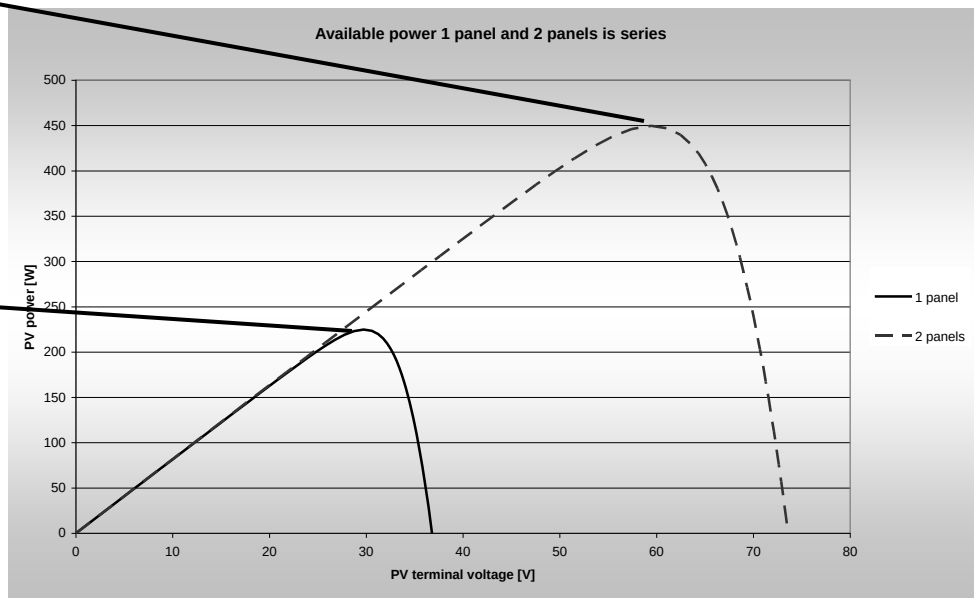
PV PANELS BASICS – Partly shaded



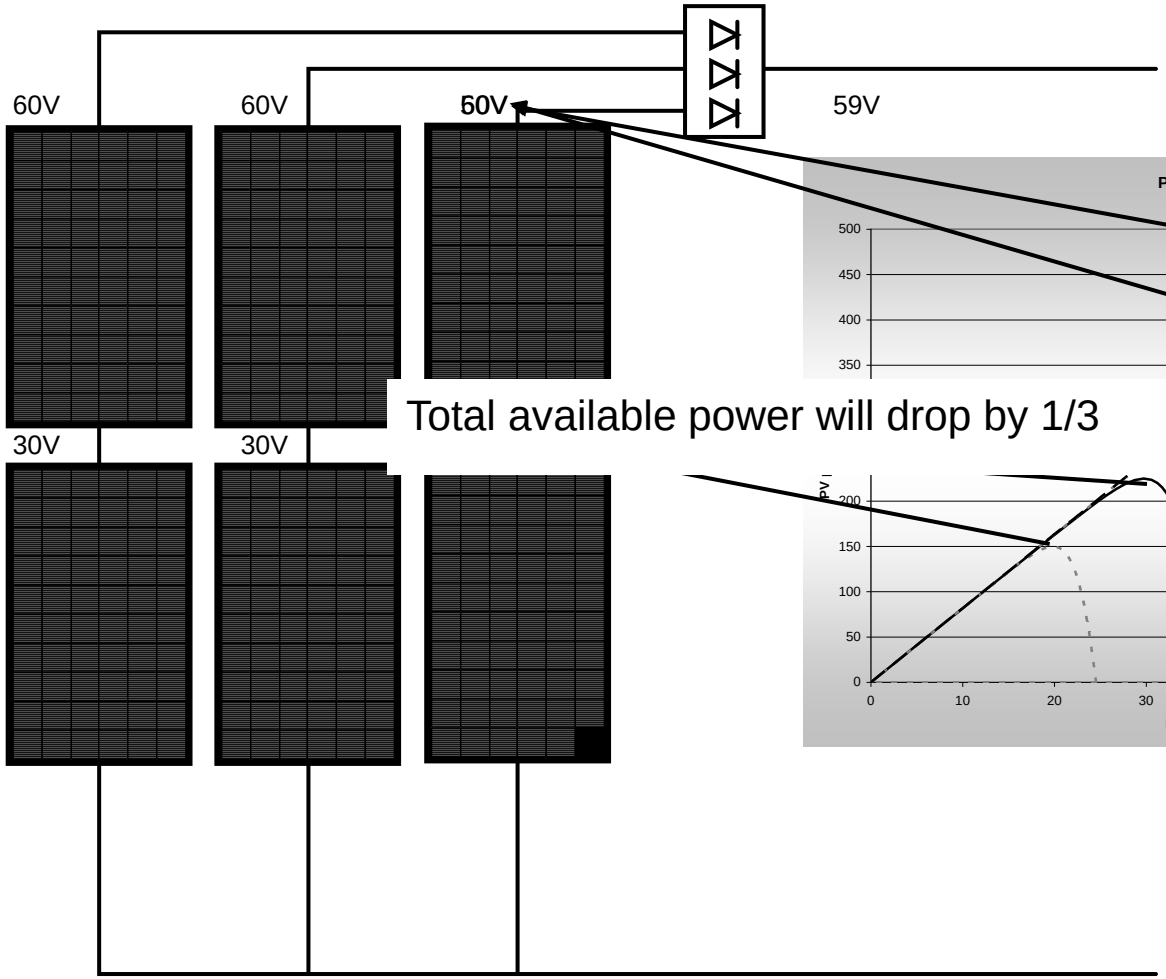


PV PANELS BASICS – Partly shaded

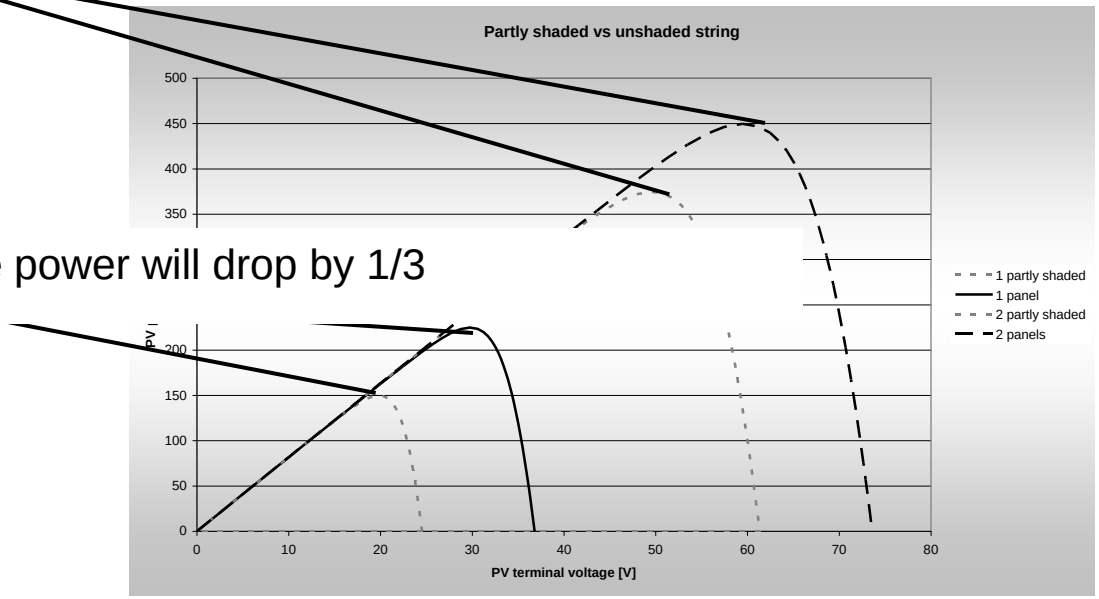




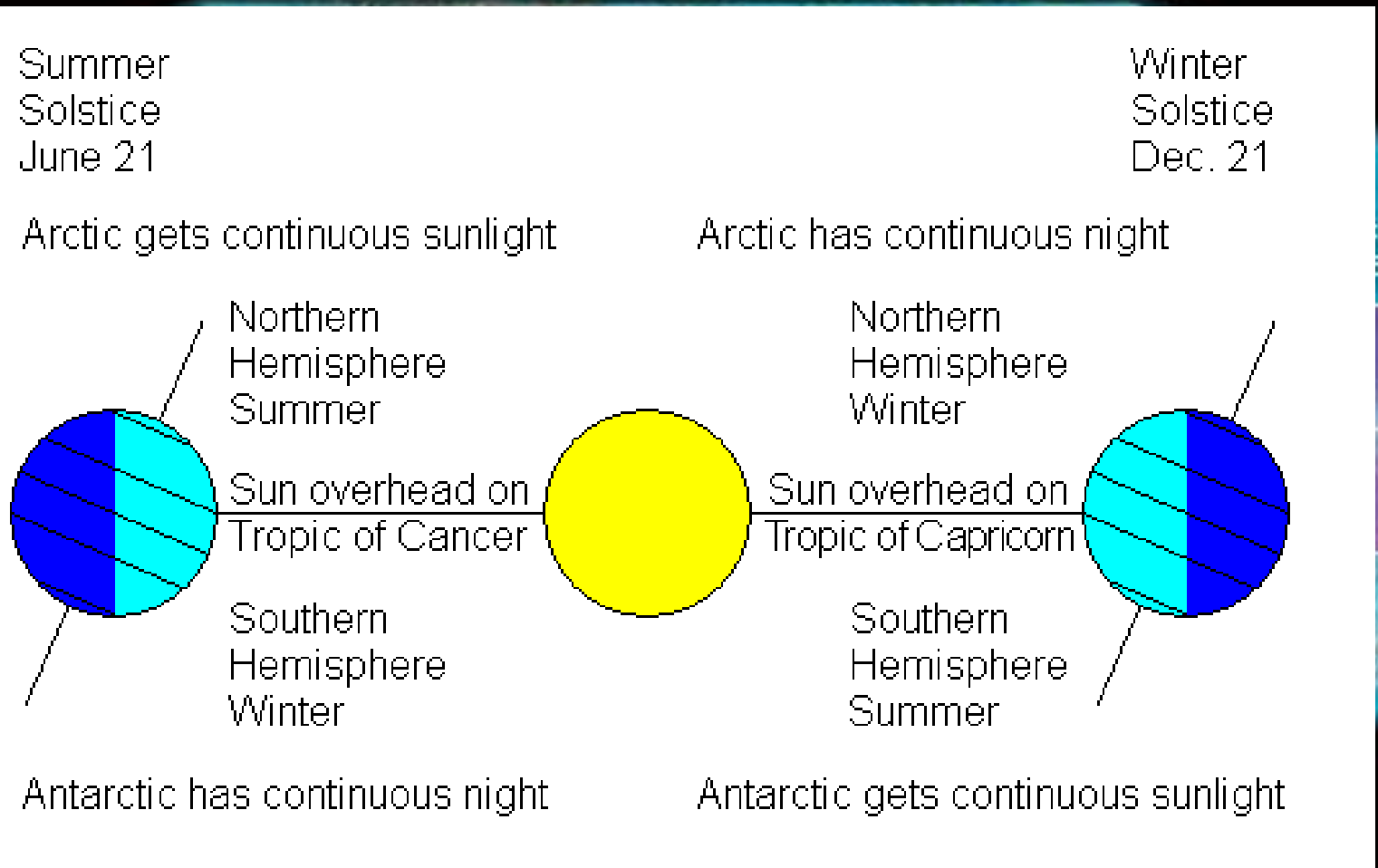
PV PANELS BASICS – Partly shaded



Total available power will drop by 1/3

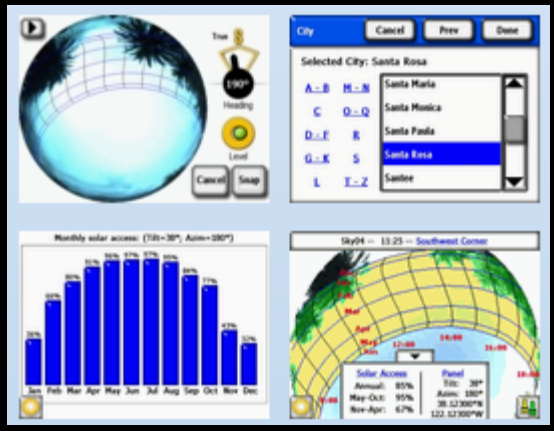


BEST LOCATION FOR PV



SOLMETRIC TESTER



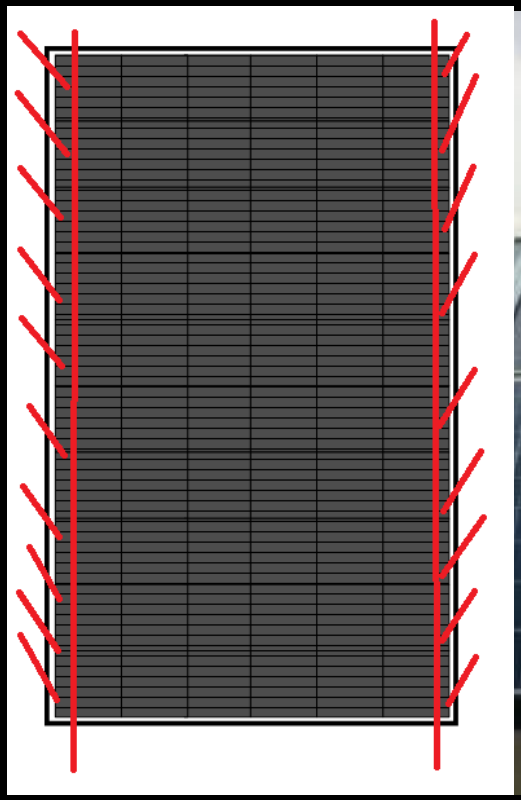


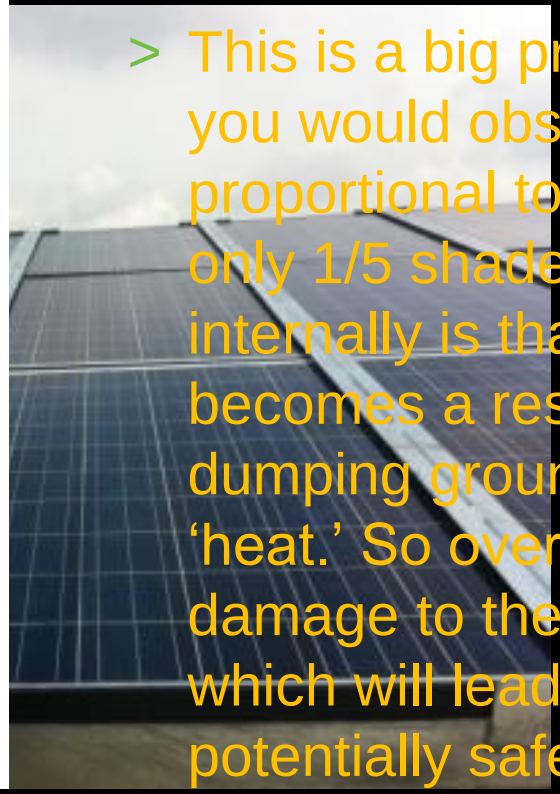
> http://www.solmetric.com/pva600.html

> Training Videos - Part 1 & 2

> http://www.youtube.com/watch?v=LbJzX-x0Xzs

> http://www.youtube.com/watch?v=DnitoEI9qdU



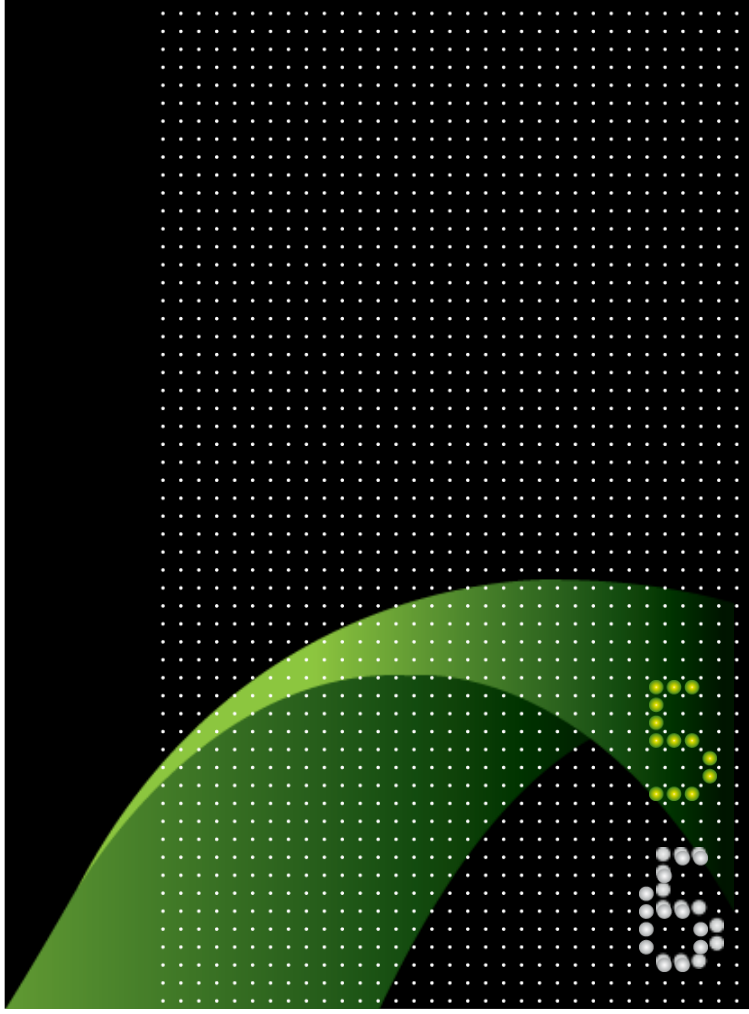


- This is a big problem. On the surface you would observe a current drop proportional to coverage (assuming only 1/5 shaded). What is happening internally is that the shaded area becomes a resistive load and a dumping ground for electricity as ‘heat.’ So over time this causes damage to the EVA, backsheet etc, which will lead to warranty issues and potentially safety to be compromised.

CHAD



CONTENT



SW & PERFOMANCE MONITORING

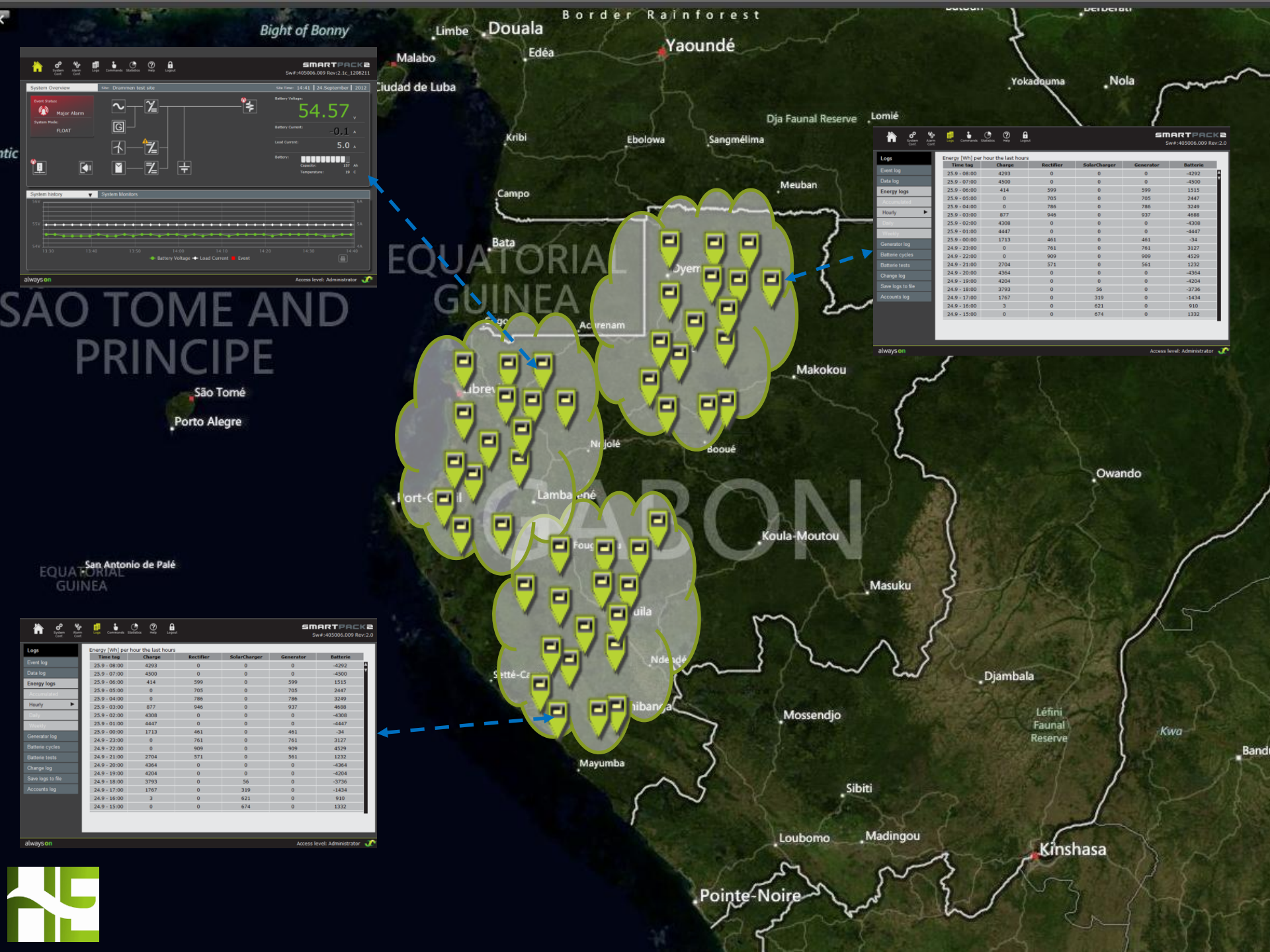
SOFTWARE TOOLS

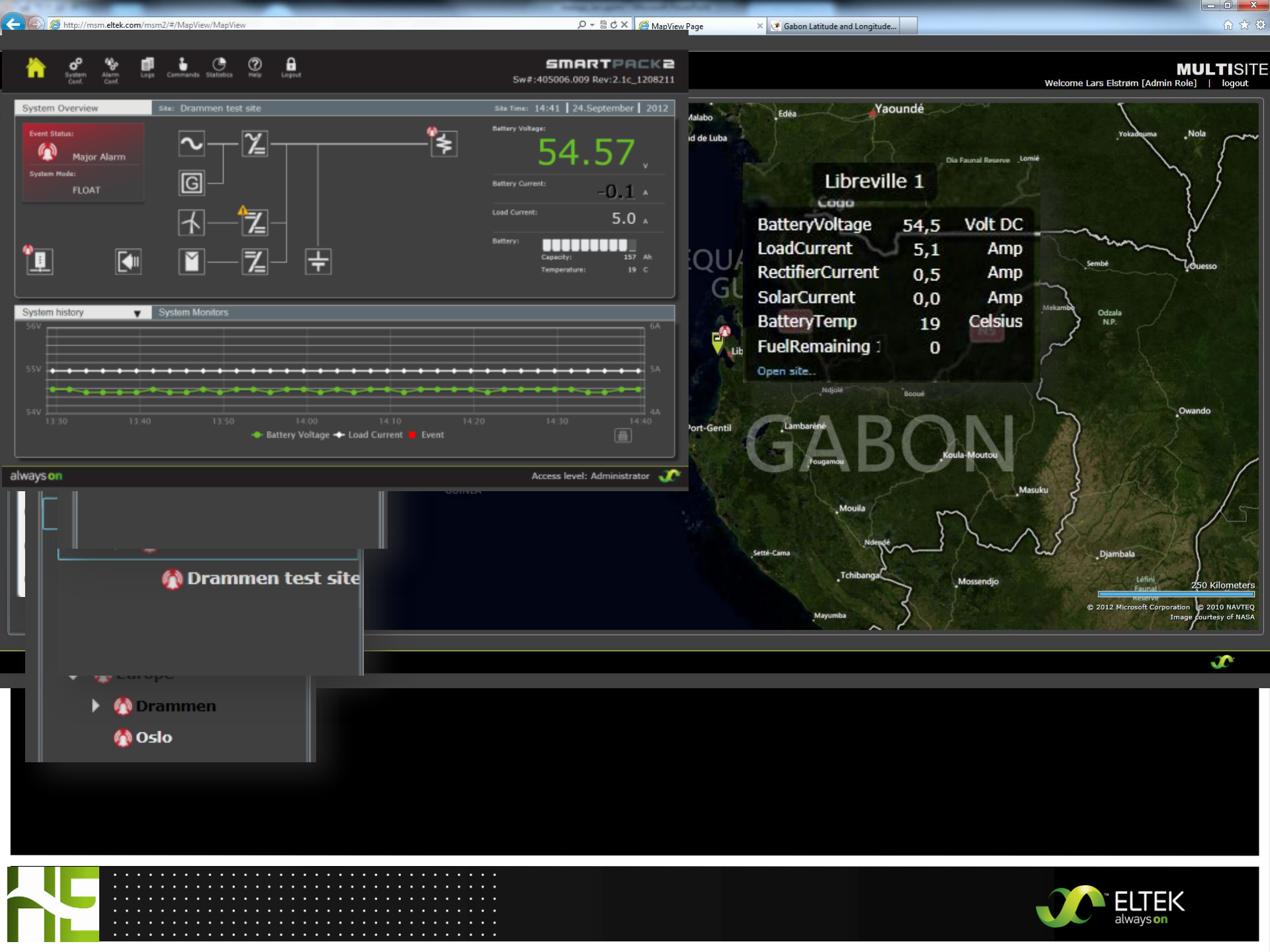
A) - Power monitoring

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
Owando
GABON
Koula-Moutou
San Antonio de Palé
EQUATORIAL GUINEA
Masuku
Djambala
Mossendjo
Léfini Faunal Reserve
Mayumba
Sibiti
Loubomo
Madingou
Kinshasa
Pointe-Noire
SMARTPACK2
54.57
-0.1
5.0
FLOAT
Major Alarm
Energy [Wh] per hour the last hours
Time tag | Charge | Rectifier | SolarCharger | Generator | Batterie
25.9 - 08:00 | 4293 | 0 | 0 | 0 | -4292
25.9 - 07:00 | 4500 | 0 | 0 | 0 | -4500
25.9 - 06:00 | 414 | 599 | 0 | 599 | 1515
25.9 - 05:00 | 0 | 705 | 0 | 705 | 2447
25.9 - 04:00 | 0 | 786 | 0 | 786 | 3249
25.9 - 03:00 | 877 | 946 | 0 | 937 | 4688
25.9 - 02:00 | 4308 | 0 | 0 | 0 | -4308
25.9 - 01:00 | 4447 | 0 | 0 | 0 | -4447
25.9 - 00:00 | 1713 | 461 | 0 | 461 | -34
24.9 - 23:00 | 0 | 761 | 0 | 761 | 3127
24.9 - 22:00 | 0 | 909 | 0 | 909 | 4529
24.9 - 21:00 | 2704 | 571 | 0 | 561 | 1232
24.9 - 20:00 | 4364 | 0 | 0 | 0 | -4364
24.9 - 19:00 | 4204 | 0 | 0 | 0 | -4204
24.9 - 18:00 | 3793 | 0 | 56 | 0 | -3736
24.9 - 17:00 | 1767 | 0 | 319 | 0 | -1434
24.9 - 16:00 | 3 | 0 | 621 | 0 | 910
24.9 - 15:00 | 0 | 0 | 674 | 0 | 1332


http://msm.eltek.com/msm2/#/MapView/MapView
MapView Page
Gabon Latitude and Longitude...
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
250 Kilometers
© 2012 Microsoft Corporation © 2010 NAVTEQ
Image courtesy of NASA
Drammen test site
Drammen
Oslo
ELTEK
always on


Run time
Libreville 1
Last 30 days
600
Rect. capacity:
4%
Zoom:
Select time frame:
Last 30 days
Last 30 weeks
Last 30 months
Select group compare type:
Group Summary
Group Average
Statistics
KPI
System
Help
Total nr of sites:
13
Site Statistics
Compare Sites
Hybrid
Grid
Battery
Energy
Generator
Battery
Filter:
Search
My Network
Log
Target
012 21.09.2012 23.09.2012 25.09.2012 27.09.2(
Fuel consumption[l]
Last 30 days
Liter
Percentage
5000
4000
3000
2000
1000
0
Fuel consumption Liter
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
Efficiency[kWh/l]
Last 30 days
1
0,5
0
-0,5
Efficiency kWh/Liter
Efficiency
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

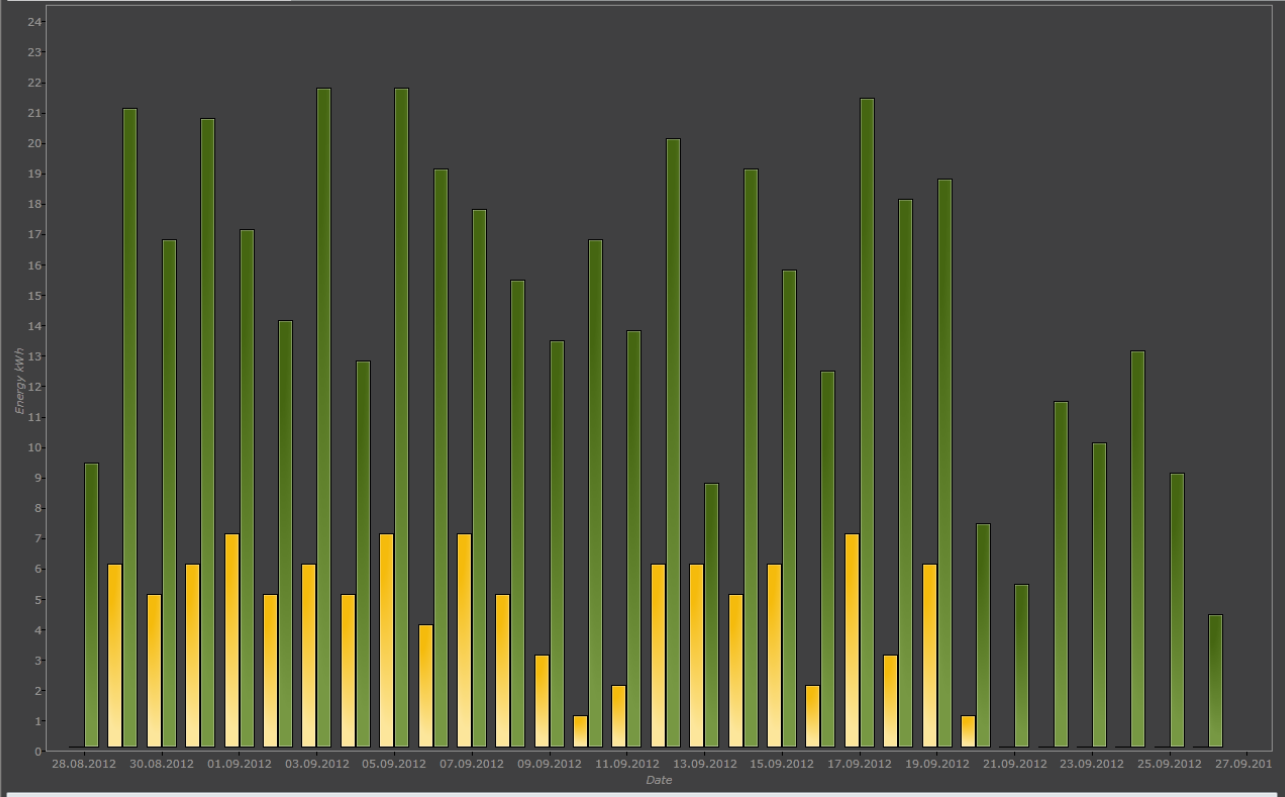
Welcome Lars Elstrøm [Admin Role] | logout

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

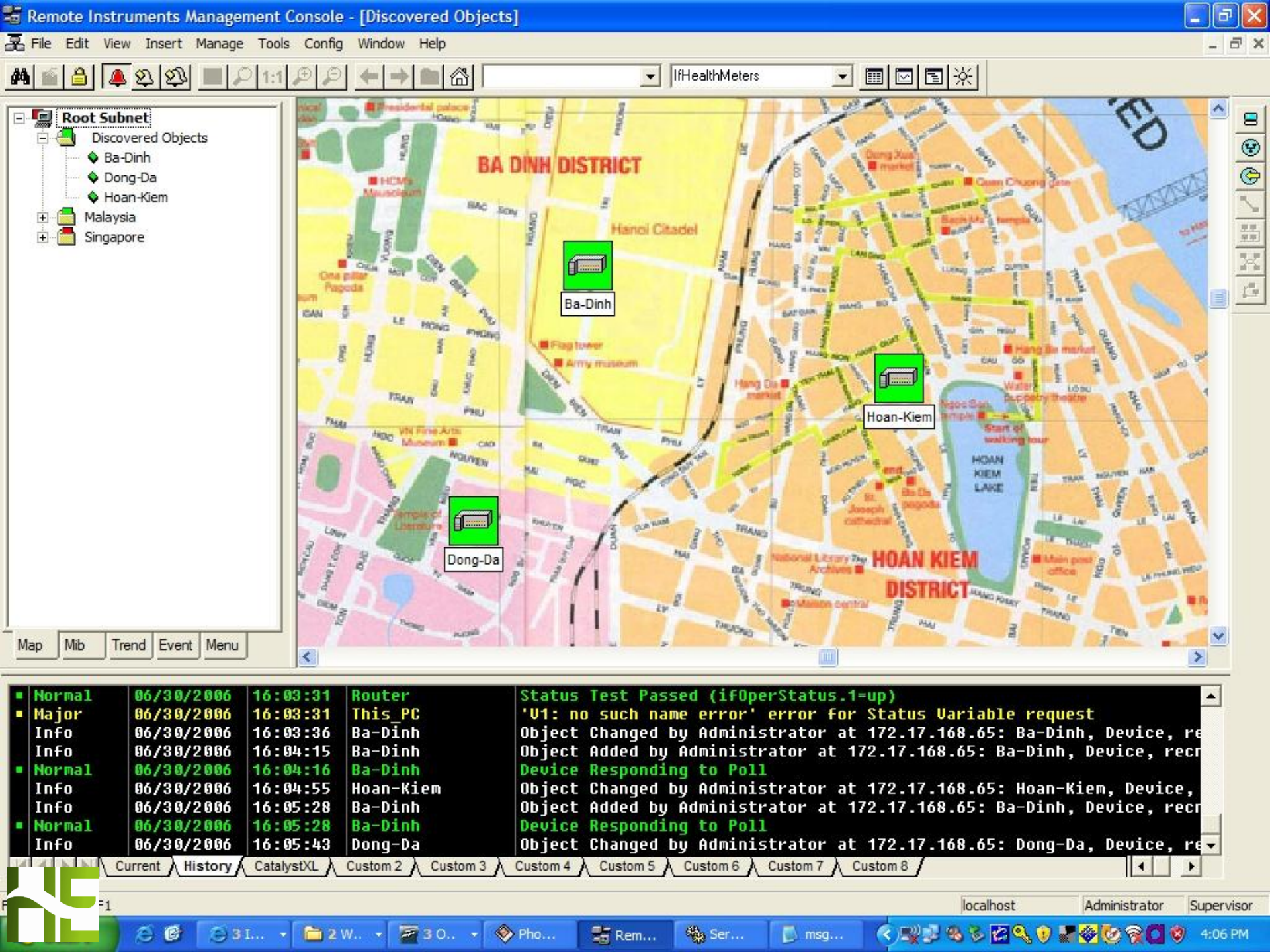
always on

Fuel consumption - generator runtime – efficiency (*)



SITE MONITORING – SNMP

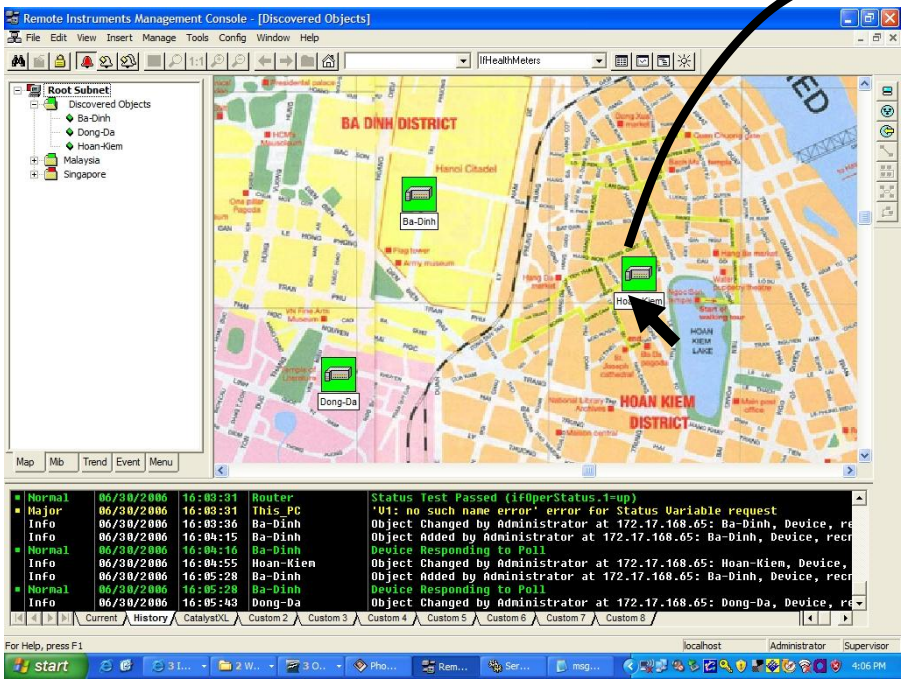
B) – ALARM MONITORING

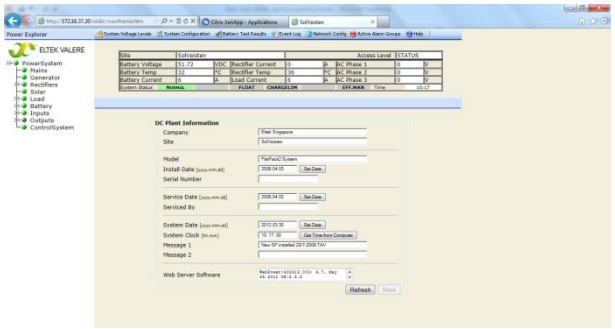

Remote Instruments Management Console - [Discovered Objects]
File Edit View Insert Manage Tools Config Window Help
IfHealthMeters
Root Subnet
Discovered Objects
Ba-Dinh
Dong-Da
Hoan-Kiem
Malaysia
Singapore
BA DINH DISTRICT
Hanoi Citadel
HOAN KIEM DISTRICT
HOAN KIEM LAKE
Map Mib Trend Event Menu
Normal 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.

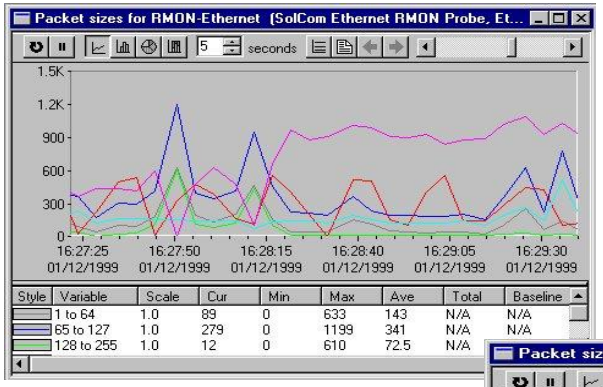
Fault Management

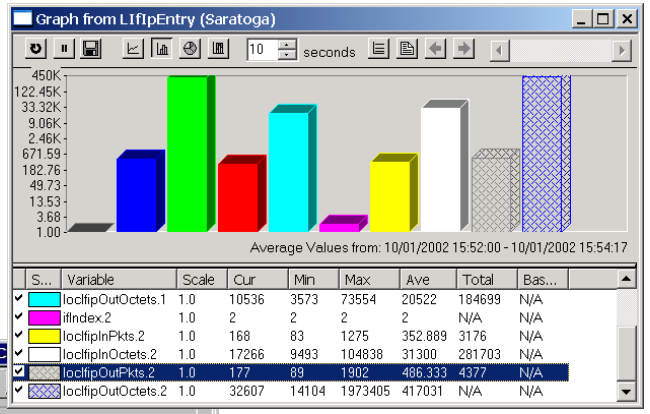
- Alarms such as
  - Battery Low/High Voltage, Breaker Open
  - AC Mains, Rectifier etc.
- Time-stamped Event Log
- Sophisticated Alarm Management
  - Eliminate duplicate alarms
  - Correlate alarm (auto-acknowledgement)
  - Notification via email or audio
- SMS Notification (optional)

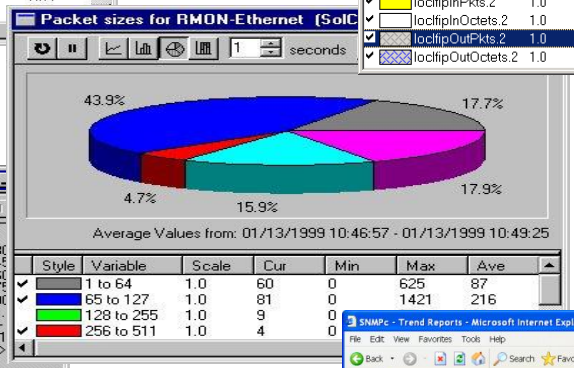
Requires a GSM Terminal

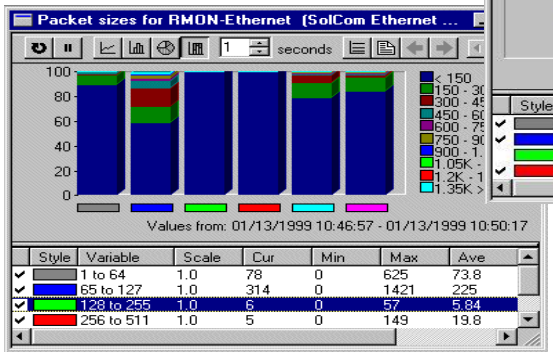


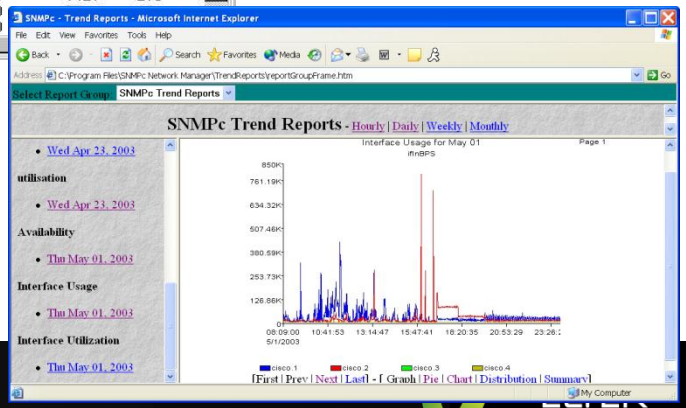
Graphical Report Views











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.
- Local Service and support



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FROST & SULLIVAN
2010 BEST PRACTICES AWARD

GSMA
Associate Member