

eSure™ Rectifiers and
NetSure™ DC Power Systems

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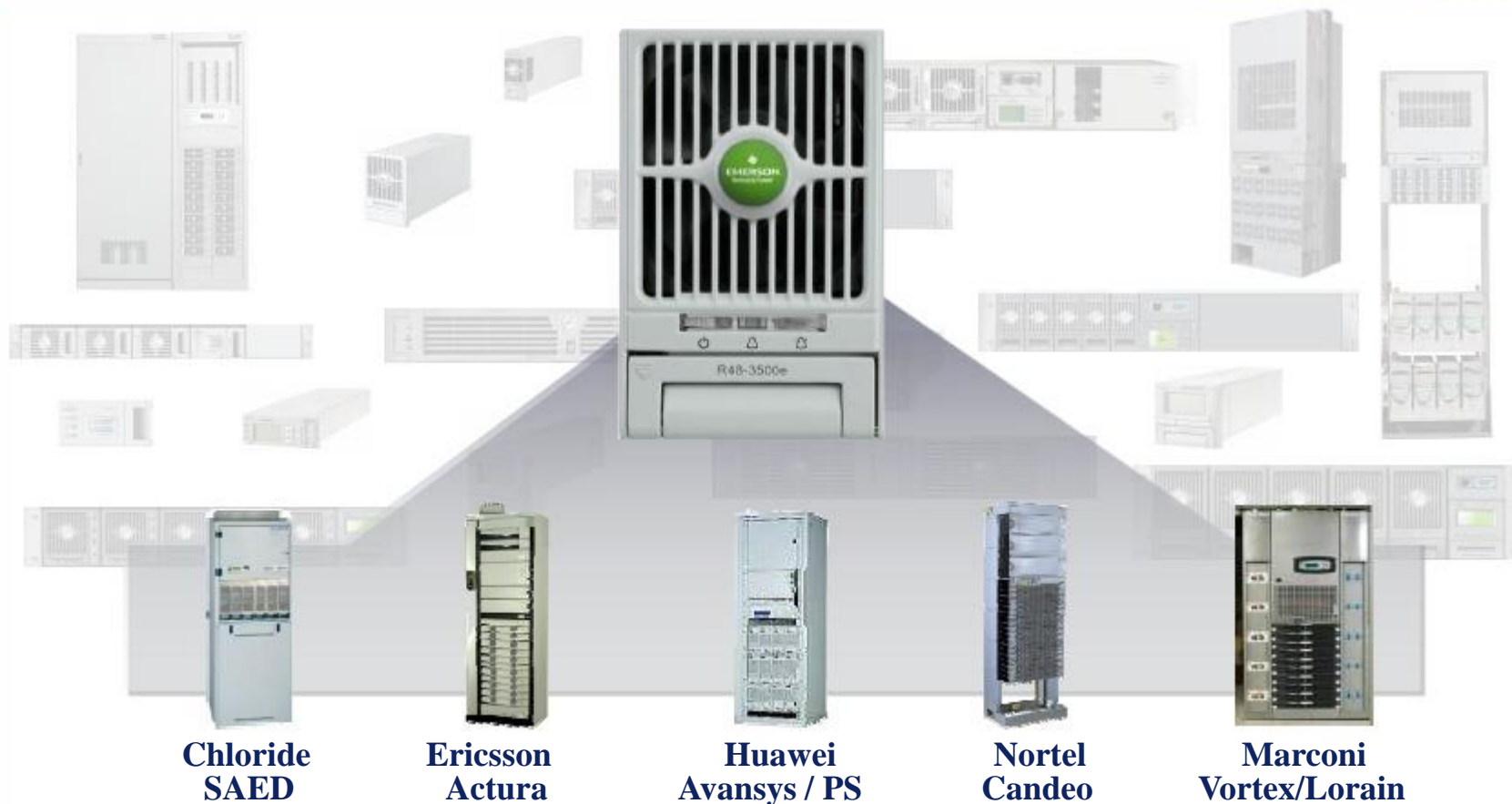
What are your site challenges?

- ..continuous secure operation of critical equipment?
- ..to limit your operational costs in the increasingly competitive environment?
- ..to reduce your energy costs and carbon footprint?
- ..unpredictable network expansion needs?



NetSure™ Series

The Most Reliable Rectifiers in the World



**Chloride
SAED**

**Ericsson
Actura**

**Huawei
Avansys / PS**

**Nortel
Candeo**

**Marconi
Vortex/Lorain**

> 300 Years of cumulative experience!

NetSure™ Series

The Most Reliable Rectifiers in the World



Uncompromised Reliability

- Over two million units operating today
 - Less than 0.5% return rate

Type	Market	Launched	Qty in operation	Return rate
Rectifiers	Global	2004-2011	>2 000 000	<0.5%

Thru Aug 2010

R48-500/1000

R48-2000

R48-2000e

R48-3200

R48-3500e

R48-5800



500/1000W



2000W



2000W



3200W



3500W

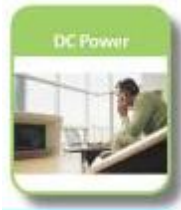


5800W

1) All data provided are based on rectifiers returned to Emerson. Field failure statistics can't be applied on a specific region, site, project, contract or customer. It should be seen as information only and performance up until specified date, not a warranty or prediction about future performance or expectations

eSure™ Rectifier

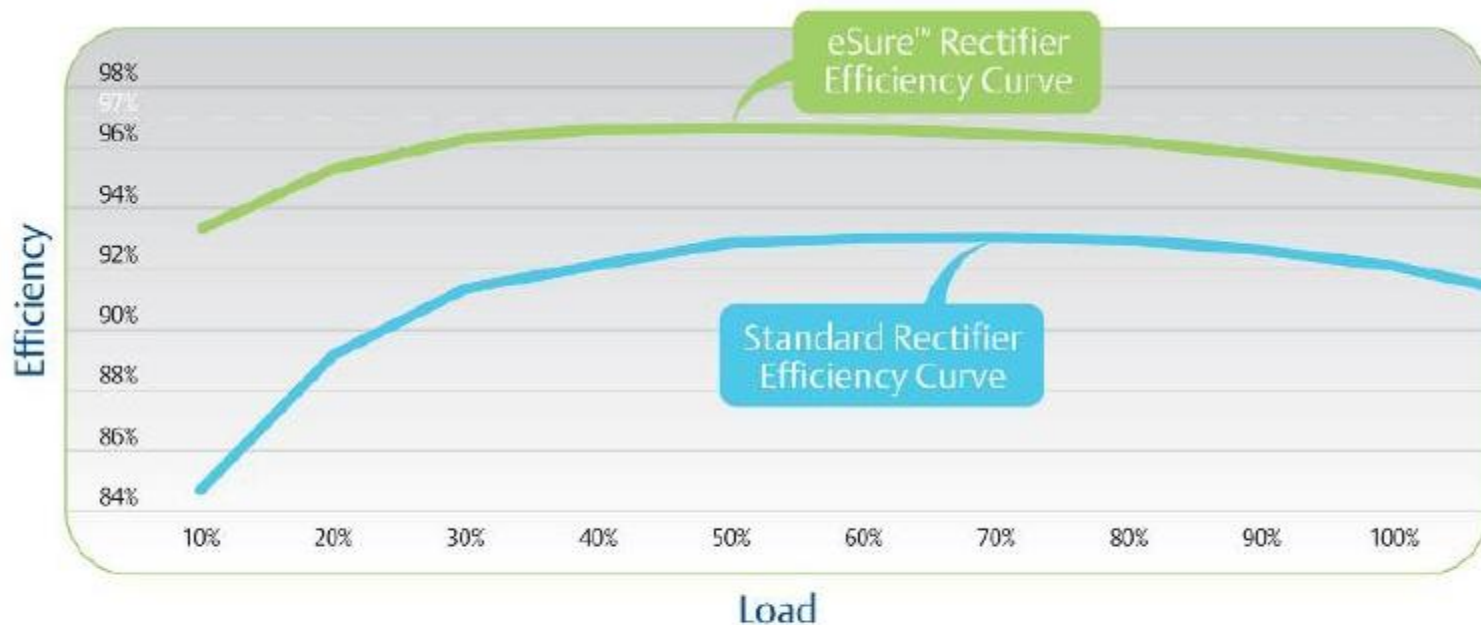
The most Efficient Rectifier in the world



Best in class sustained efficiency throughout a wide range of operating conditions

Efficiencies approaching 97% between 30% through 70% load

reduced energy consumption and CO₂ emissions
Single year payback



Energy Savings

Case study: eSure vs standard efficiency



Scenario:

At list price, a customer chooses to buy 1000 x 3200W eSure rectifiers vs standard efficiency (SE) rectifiers

At 60% load, the efficiency of the eSure is 96.7% compared to 92% for SE rectifiers

Assumptions:

Energy cost is \$0.1 per KWh

Rectifiers run at 60% load

Air Condition unit has EER rating of 10 and runs at 8 hours per day

0.60kg CO₂ emission per KWh consumed

Challenge:

What is the energy cost of ownership over a 10 year useful life of an eSure rectifier vs. a standard efficiency rectifier?

Cost Benefit

Case study: eSure vs standard efficiency



Energy loss cost for 1000 standard efficiency rectifiers @ 92% efficiency

Year	1	2	3	4	5	6	7	8	9	10
AC energy loss	166MW	166MW	166MW	166MW	166MW	166MW	166MW	166MW	166MW	166MW
SE Rect energy loss	1463MW	1463MW	1463MW	1463MW	1463MW	1463MW	1463MW	1463MW	1463MW	1463MW
Total energy loss	1629MW	1629MW	1629MW	1629MW	1629MW	1629MW	1629MW	1629MW	1629MW	1629MW
CO2 emission	977Mg	977Mg	977Mg	977Mg	977Mg	977Mg	977Mg	977Mg	977Mg	977Mg
Annual cost of energy loss	\$162 900	\$162 900	\$162 900	\$162 900	\$162 900	\$162 900	\$162 900	\$162 900	\$162 900	\$162 900
Grand Total:	\$1 629 000				9770 metric tons CO2					

Energy loss cost for 1000 eSure rectifiers @ 96.5% efficiency

Year	1	2	3	4	5	6	7	8	9	10
AC energy loss	69MW	69MW	69MW	69MW	69MW	69MW	69MW	69MW	69MW	69MW
eSure energy loss	610MW	610MW	610MW	610MW	610MW	610MW	610MW	610MW	610MW	610MW
Total energy loss	679MW	679MW	679MW	679MW	679MW	679MW	679MW	679MW	679MW	679MW
CO2 emission	407Mg	407Mg	407Mg	407Mg	407Mg	407Mg	407Mg	407Mg	407Mg	407Mg
Annual cost of energy loss	\$67 900	\$67 900	\$67 900	\$67 900	\$67 900	\$67 900	\$67 900	\$67 900	\$67 900	\$67 900
Grand Total:	\$679 000				4070 metric tons CO2					

1.26
year payback

78%
ROI on
eSure
premium

Energy loss reduced by 58% with eSure vs. standard product lines!



eSure – Annual savings per 8 kW site

25% load	kW	Efficiency	kW	Watt	\$ ¹⁾	per Year
0 R48-2000	2,2	90,6%	2	208	182 €	
1 R48-2000e	2,1	95,7%	2	90	79 €	103 €

50% load	Input kW	Rectifier Efficiency	Load kW	Losses Watt	\$ ¹⁾	Savings per Year
0 R48-2000	4,3	92,3%	4	334	292 €	
1 R48-2000e	4,1	96,5%	4	145	127 €	165 €

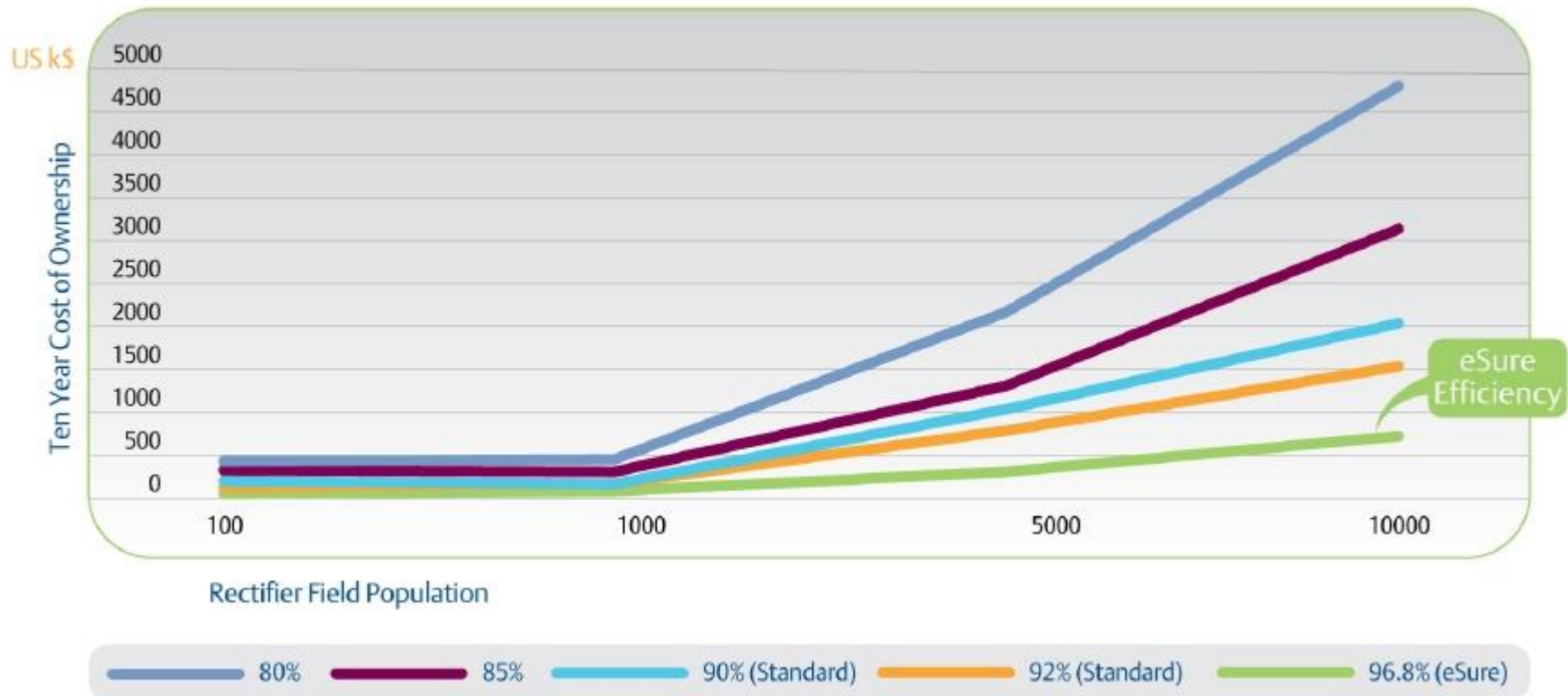
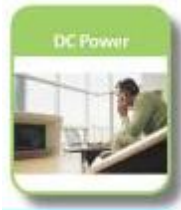
75% load	Input kW	Rectifier Efficiency	Load kW	Losses Watt	\$ ¹⁾	Savings per Year
0 R48-2000	6,5	92,1%	6	515	451 €	
1 R48-2000e	6,3	96,0%	6	250	219 €	232 €

100% load	Input kW	Rectifier Efficiency	Load kW	Losses Watt	\$ ¹⁾	Savings per Year
0 R48-2000	8,8	91,2%	8	772	676 €	
1 R48-2000e	8,4	95,4%	8	386	338 €	338 €

¹⁾ @ 0,10€/kWh

Efficiency Cost Impact

Case study: eSure vs standard efficiency





DC Power Systems

Leading **global** manufacturer of -48V network power systems

Modular system architecture facilitates optimal investments

Low installation and commissioning cost with pre-assembled and pre-tested units

NetSure™ DC power systems provide **technology platform** of indoor and outdoor **integrated systems**

Industry-leading reliability (return rate of $< 0.5\%$) with over 2M units deployed

Near **97%** efficiency with rectifiers

Products



NetSure 211
Mini systems



NetSure 501
Small systems



NetSure 701
Medium systems



NetSure 801
Large systems



NetSure 211

Mini systems





NetSure™ 211 Series

Our most compact DC Power system, targeted for street cabinet applications. Also suitable for integration in any outdoor enclosure, shelter or cabinet solution thanks to its high power density and efficiency levels greater than 92%.

500W or 1000W plug-n-play rectifiers

Up to 6kW / -48V power system

Standard or advanced controller

1U or 2U high power shelf

Fits in 300mm ETSI cabinet

Circuit breakers are standard in most configurations

Easily accessible, plug-in design with front cable terminations

Wide operating temperature range -40 to +75°C

Rectifier efficiency >92%



Space for 1-2 rectifiers (500 or 1000W)

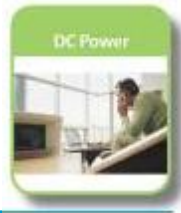


19" Space for 1-4 rectifiers (500 or 1000W)

23" Space for 1-6 rectifiers



19" Space for 1-4 rectifiers (500 or 1000W)



NetSure 211 – Rectifier R48-1000

Maximum Output Power: 500W, 1000W

High efficiency, >92% (R48-1000)

Wide input voltage range

(85-300 VAC)

Wide temperature operating range

(-40 to +75 deg C)

EMC, (EN 300 386:2001) Class B

Dimension: 2 x 1 U, Fits in ETSI 300



NetSure 501

Small systems





NetSure™ 501 Series

A highly flexible DC Power system for all types of access applications, available as cabinets or compact, cost-effective subrack solutions.

2000W plug-n-play rectifiers, available as standard or eSure rectifiers with 96.5% efficiency

Up to 24 kW / -48V system

Available as

Subrack (from 3U high)

Wall-mounted or battery rack-mounted

Standalone cabinet

Standard or advanced controller

Front access (cable exit front or up)

High power density

Wide AC input range, single phase (85 - 300 VAC)

Wide operating temperature range: -40 to 75° C



NetSure™ 501 Series

Available in many different shapes



Subrack

19" or 23" wide

<400mm deep

Suitable for embedded applications



Hardtop

23" wide

400 mm deep

4U, 7U, 9U, 13U high

Wall- or battery-rack mounted



Stand-alone cabinet

23" wide

400mm or 600mm deep

1200 mm – 2200 mm high

With or without doors

Earthquake proof cabinets as options

Suitable for different numbers

and sizes of batteries



eSure



High efficiency

In industry top segment with 96.5% efficiency

Fully backwards compatible

Highest reliability

Nearly 2M NetSure rectifiers deployed
with a return rate of >0.5%

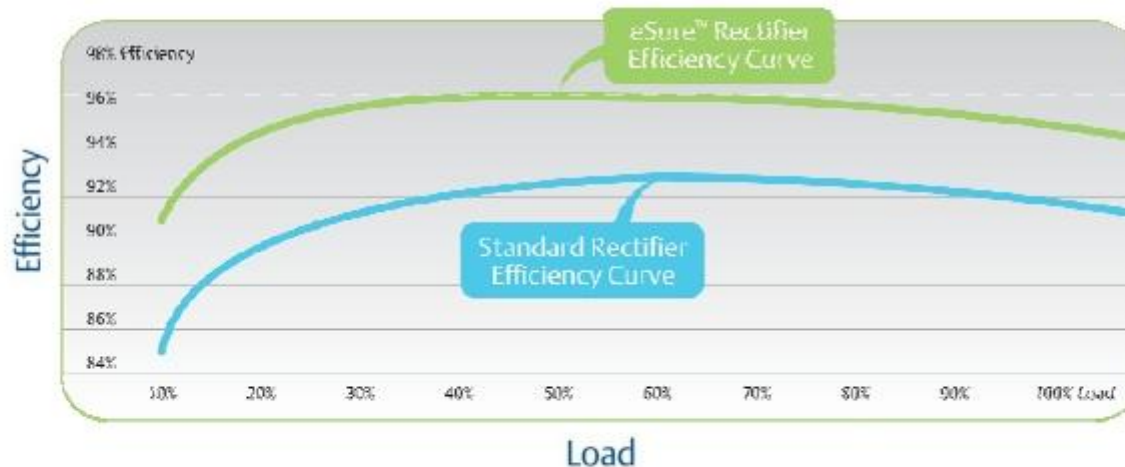
Highest temperature rating

Full power at 55 degrees C

1500W @ 75 degrees C



eSure™ R48-2000e



Efficiency Without Compromise™

NetSure 701

Medium and Large Systems





The most **efficient** rectifier in the world

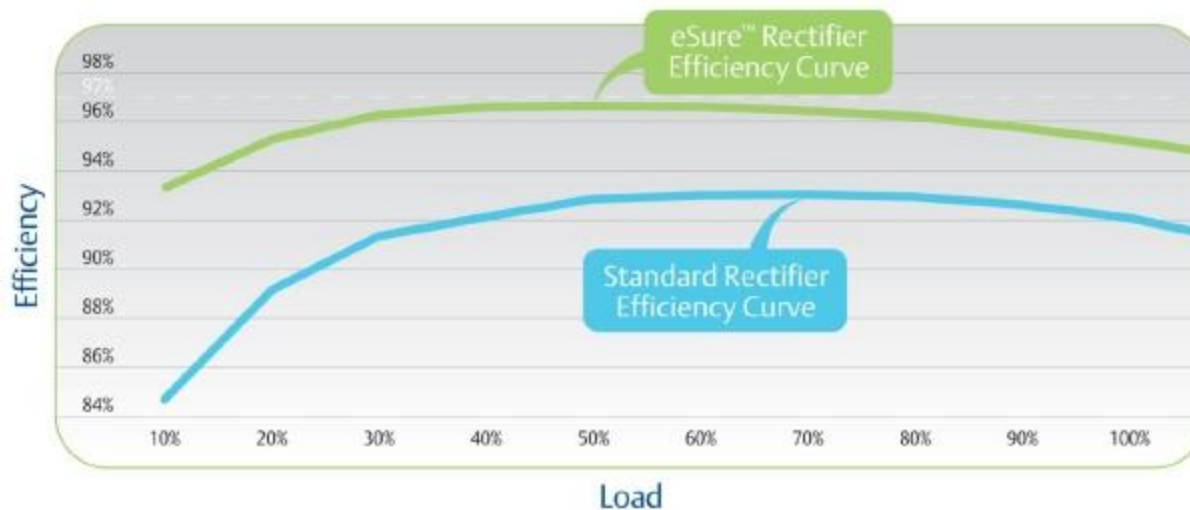
- Near 97% efficiency for loads at 30% - 70%
- Backwards compatible with existing NetSure DC Power Systems

The most **reliable** rectifier in the world

- NetSure world-class reliability:
Nearly 2M units deployed with a return rate of <0.5%



eSure™ R48-3500e



Efficiency Without Compromise™



NetSure™ 701 Series

The most efficient DC power system with rectifier efficiency near **97%**. A modular system available in distributed and bulk configurations.

3200W plug-n-play rectifiers, available as standard or 3500w eSure rectifiers with efficiency near 97%

System capacity 840 kW (16000A)

High power density systems with up to 126 kW per cabinet

System available in distributed or bulk configuration

Top or bottom cabled

Configurations with batteries included in main cabinet obtainable

High and low ohmic DC distribution alternatives



NetSure™ 701 Series

NetSure 701 – The Family



One platform for various network infrastructure needs,
the NetSure 701 Series is available as:



Single cabinet
systems including
batteries



Multi Cabinets



Bulk- and semi bulk
systems with
separate distribution



NetSure
systems
for AC/DC
applications



NetSure systems for
retrofit applications

Suitable for applications up to 840kW of installed power



NetSure system

A **Semi-bulk system** consists of one or several cabinets with both power and distribution. Each cabinet includes:

- Up to 24x3500W rectifiers per cabinet for NetSure 701
- Advanced Control Unit (ACU+)
- AC circuit breakers
- A battery unit (BU) including 4 x NH3 fuses (up to 630A) for battery connections, a BLVD with automatic reconnection and a shunt
- Two different types of distribution units (DU) (both units available with 1 load shunt per DU as option):

5 x NH3 (up to 630A) unit for large DC load connections

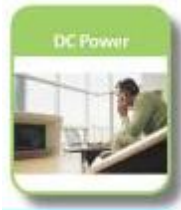
Circuit breaker unit for small DC load connections (LOD or HOD)

Cabinet dimensions are 2000 x 600 x 600 mm



NetSure™ 701 Series

NetSure for AC and DC applications



A compact and space saving solution with NetSure rectifiers and integrated TSI inverters

Transfer time reduced to zero

Easier and more cost efficient installation compared to separate systems for AC and DC

Fully tested integrated solutions

Near 96% system efficiency with 2500VA inverters and eSure rectifiers

Choice of 750VA or 2500VA TSI inverters

Suitable for applications where reliable power for both DC and AC loads is required



EMERSON
Network Power

NetSure 801

Uninterruptible power at its best!





NetSure™ 801 Series

A reliable DC Power system with 3-phase rectifiers for large power -48VDC sites. NetSure 801 is available as distributed and bulk configurations.

5800W rectifiers (only 8 kg)

3-phase rectifiers

System capacity up to 1,4MW (28800A)

High power density

Up to 8 rectifiers (46.4 kW) per cabinet for distributed system

Up to 20 rectifiers (116 kW) per cabinet for bulk system

Rectifier efficiency 93%

Advanced controller unit as standard

Top and bottom cabled configurations available

High and low ohmic DC distribution alternatives

Quick and easy extension

New cabinets can be added to a live system

Rectifiers and distribution units can be added in a live system



NetSure 801 – Rectifier,



- **380/480Vac, 3-phase Input Voltage**
- **Output Power 5800 Watt**
- **High Power Density:**
 - Low profile: 2U height
 - Rack power density: 5800W/RU
 - Module power density: >800W/dm³
- **Wide Input Voltage Range, 260-530 VAC**
- **High Efficiency, 93%**
- **Low THD, < 5 %**
- **Weight: < 8.0 kg**



R48-5800

New eSure, 96%
efficient rectifier
will be **launched** in
June 2012!



NetSure™ 701 Series

NetSure for retrofit applications



Innovative solution to upgrade and expand an existing power system – for increased reliability and boosted performance

Keep existing infrastructure (cabinet, distribution, cabling etc)

Old rectifiers removed, replaced
with retrofit subrack:

- New rectifiers
- New controller
- Distribution and battery connection if needed (optional)



Reliable new technology at a lower cost compared to investing in a complete new system

Increased system efficiency (up to 96% system efficiency with eSure rectifiers)

Install systems live without service interruption

Eliminate expensive and problematic rectifier legacy support issues

Gain access to new functionalities via the ACU+



Increased system efficiency



Legacy System

4,7kW
energy loss



29,7kW @ 84% average
rectifier efficiency



System retrofitted with eSure rectifiers

0,97kW
energy loss



25,9 kW @ **96,5%** average
rectifier efficiency



Output power 25kW

80% reduction of energy losses! Normally <2 years pay back!
(based on DC savings only, additional savings in cooling)

Controllers





SCU+ Controller - Common Features

Advanced battery management

- Temperature controlled charging
- Boost charging
- Battery discharge test
- Battery capacity prediction
- Battery current limitation

Advanced alarm monitoring

- Programmable severity setting
- Alarm log (200 last entries)
- Programmable alarm grouping & relay activation

Local language support

Remote monitoring

System voltage setting & management

Support for 2 LVD (mono- or bi-stable)

Web/SNMP option

ECO mode support

Setting file definition, upload and remote download

Firmware remote downloading

Connection of Extension Boards





ACU+ Controller

Advanced battery management including battery capacity prediction

ECO mode – advanced energy savings function

Remote control connections/protocols including web & SNMP

2 analog inputs for temperature sensors

Remote and onsite download & upload of configuration file and firmware

Supports master/slave & power split functionality for system expansion

Connection of site monitoring units for management of other equipment (SM BAT, SM AC, SM IO)

Local language support



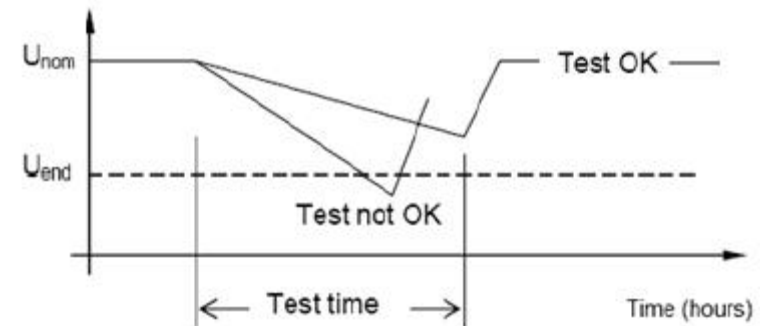


Advanced Battery Management

Temperature compensation

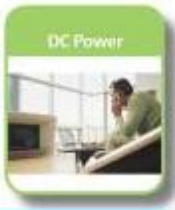
Automatic battery test

- End test by voltage/time/capacity
- Scheduled battery test (up to 12 times)
- Constant-current discharge test results in higher precision
- *Cyclic Short Test* exposes battery trouble timely



What is Short Test?

A cyclic short discharge of battery, e.g. 5 minutes, can be enabled via local or remote settings. The controller will detect the current difference between two battery strings during the discharge. If the difference is bigger than a set value, an alarm will be triggered to show possible trouble in battery.



ECO Mode - Energy Optimization Function

A patented energy optimization software
Boosts the efficiency
of already installed
NetSure systems
by simply replacing
some standard efficiency
rectifiers with eSure rectifiers



Original system with
standard efficiency
rectifiers



System upgraded with
eSure high efficiency
rectifiers required for
normal load



ECO Mode: at normal
load the eSure rectifiers
run, standard efficiency
rectifiers in standby for
redundancy.



Control and Monitoring

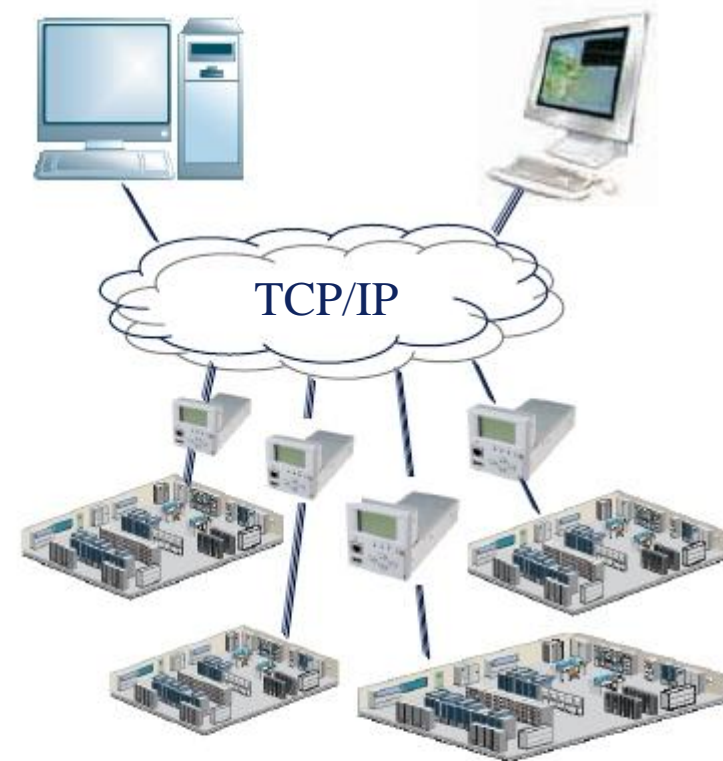
An advanced controller enables:

Enhances monitoring locally:

- Advanced battery management
- Advanced energy saving functions
- Site monitoring
- Web and SNMP support

Enables possibility for remote monitoring

- Reports and Statistics
- Remote or local software upgrade





Monitoring – an enabler for efficiency

Provide information about site status (alarms)

- Identify failing devices and the reason to fail



Perform remote maintenance routines

- Battery tests
- Systems parameters
- Alarms thresholds settings
- Diagnose/reset of key system components

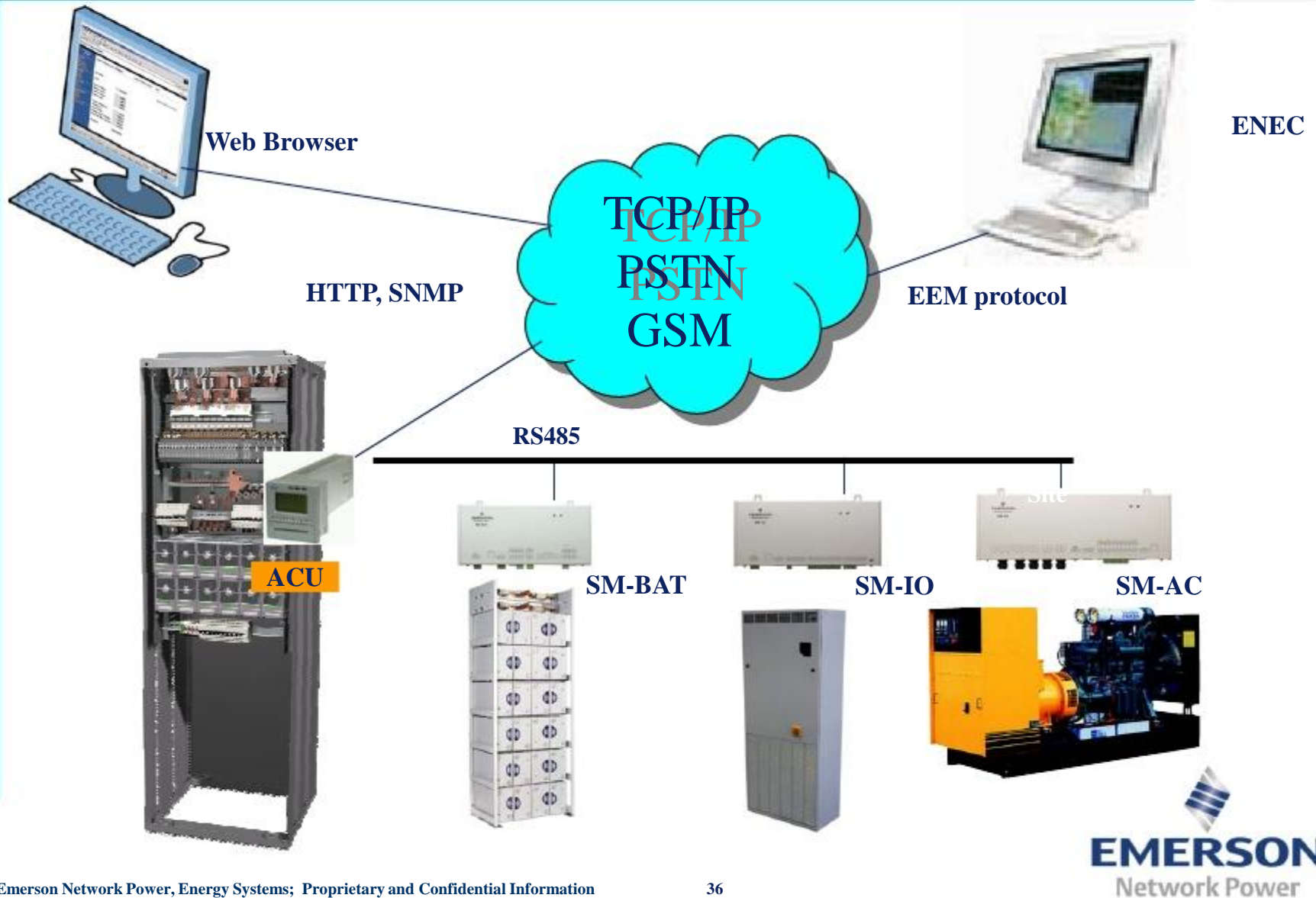
Store tons of data about the network...

- Temperatures, voltages, currents, gen-set fuel consumption, working hours, etc...
- Alarms and events



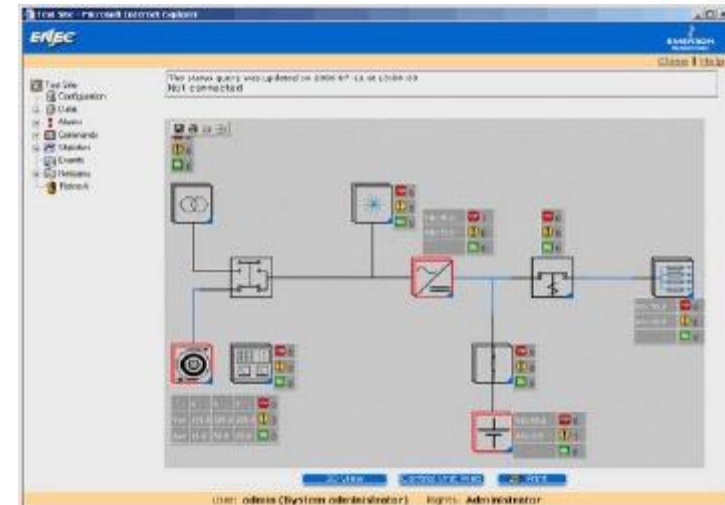
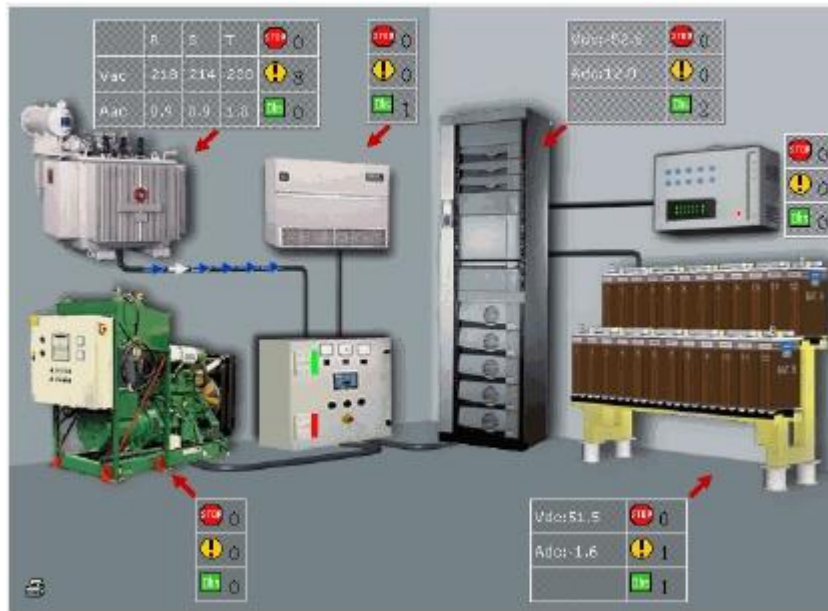
EMERSON
Network Power

Remote monitoring





ENEC Enterprise: Site visualization





Remote Battery Management

Remote battery test

Rectifiers are in stand by

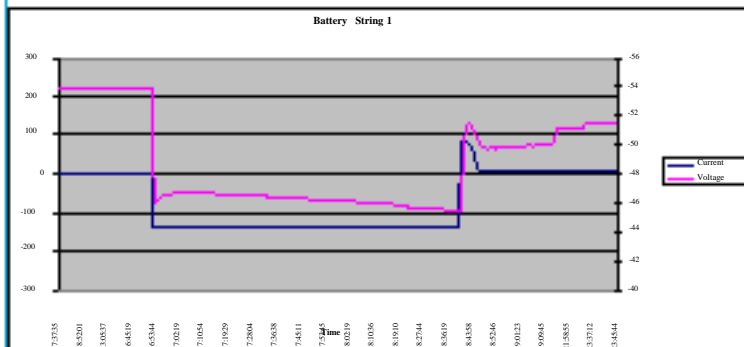
Battery discharged using the load

Discharge sequence monitored in real time and analyzed

Battery predictions provide

Back up time on each location

Remaining life (corrected for temperature & cycling variations)



Battery maintenance general report

CUSTOMER: Emerson

AREA: Europe

Customer/Area:		Emerson Europe																													
Report number:		Contract number:																													
								Battery capacity		Autonomy (Minutes)					Culge events																
Site/System name						Last battery test date																									
Customer/Area		Batt.		Load																											
OPU - 1st floor 201 BWP B3 2nd floor system ACU-3		1		19.6		21/04/2010		90%		00		55		54		53		54		125		54		10		01/12/2009		0.5		20/01/2010	
Emerson Europe																															
MOTIE 201 BWP B3 2nd floor system ACU-3		1		11.9		01/05/2010		90%		00		57		54		53		54		171		101		5		01/11/2009		0.5		01/01/2010	
Emerson Europe																															
OPU - 1st floor 201 BWP B3 2nd floor system ACU-3		1		00		21/04/2010		90%		00		55		54		53		54		125		54		12		01/12/2009		0.5		31/03/2011	
Emerson Europe																															
MOTIE 201 BWP B3 2nd floor system ACU-3		1		11.9		01/05/2010		90%		00		57		54		53		54		171		101		5		01/11/2009		1		31/03/2011	
Emerson Europe																															

Gives a good indication of battery status with up to 70% cost reduction
Early detection of bad batteries extend operative battery life



REMOTE BATTERY TEST -savings

Cost saving based on:

- working hours
- traveling cost reduction
- cars investment
- energy consumption

Cost saving example (working hours only)

2 Tehnicians, 8 hours for battery string
Working and traveling hours total =20h

1hour cost =20\$

1 battery string = 20h x 20\$ or 400\$ (labour cost only)

2000 sites x 2 battery strings =4.000x400 or 1,6 mil\$

cars, fuel, equipment, energy consumption are extra cost

Thank You!

