Advanced Alternative Energy Solutions

HSS®

Hybrid Storage Solution

HYBRID ALTERNATIVE ENERGY STORAGE
COMBINED WITH INTELLIGENT CONTROLS

ENERGY SOLVED

Enhanced off-grid reliability.

BROUGHT TO YOU BY HYBRID ALTERNATIVE ENERGY MANAGEMENT

Advanced Control and Monitoring of Alternative Energy sources, integrated with the latest Battery Technologies, are essential for Telecoms Operators to reduce Life Cycle Costing and improve Quality of Service, resulting in increased Profit Margins.

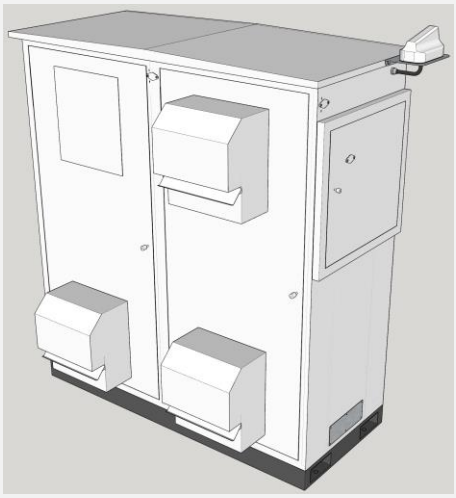
By Intelligently managing unreliable and unstable Grid Power, Generators and Renewable Energy sources with High Efficiency Hybrid Power Systems and Smart Battery Technologies, such as Li-Ion (NMC, $LiFePo_4$ or NCA technologies), help operators meet these needs today.

The **HSS® Hybrid Storage Systems** of NEC XON serves to optimise Generators for reduced runtimes, ensuring operation in its power band, hence reducing fuel consumption and glazing, which are side effects from using Lead Acid battery based storage systems.

The very fast and linear charge capabilities of the Li-Ion Battery Technologies, ensures smaller footprint and multiple cycles per day. High cycle life of Li-Ion technologies also contribute to high return on investment as well as a significant reduction in OPEX.

The high roundtrip efficiency of Li-Ion batteries ensures that no energy is wasted. Making it the ideal solution for Generator Optimisations.

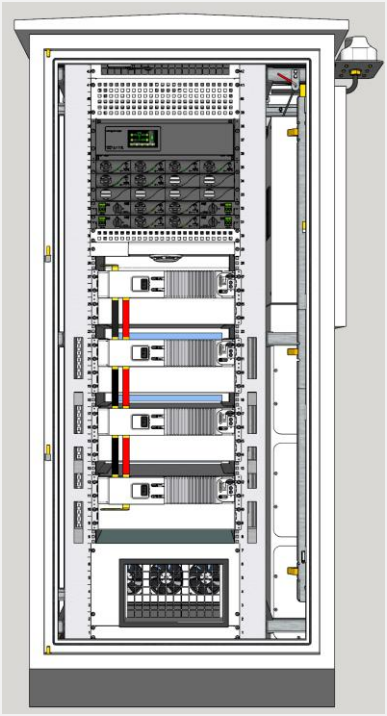
INTRODUCTION TO THE HSS®



Key Benefits

How can I reduce OPEX on my network and Guarantee up time?

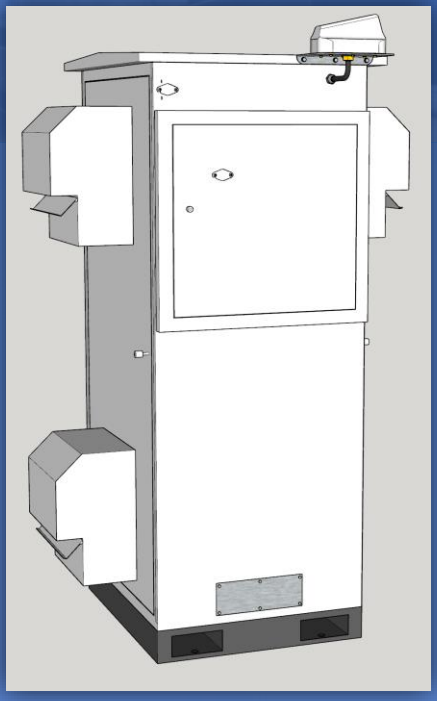
- 130 Years plus of combined brand success between NEC and XON ensuring sound engineering principles.
- Highly modular and customizable Hybrid Power Solutions tailored to customer needs.
- Smart battery Technologies used – PLC or PC controlled and monitored via high-speed Modbus RS485 communication.
- Proprietary protection mechanisms implemented to ensure uptime under adverse conditions.
- Li-Ion Charge rates 0.5C and Discharge rates up to 1.0C - Application depended.
    - 0.5C to 1C – Incell/Polarium Li-ion – (NMC).
    - 0.5C to 1C – Incell/Polarium Li-Ion– ($LiFePo_4$).
- Up to 9 x faster charging than Lead Acid technologies due to linear charge acceptance rate.
- Multiple deep cycles per day – smaller footprint required.
- Linear charge curves – Loading gensets in their powerband for the entire charge cycle – ensuring most efficient L/KWH conversion rates.
- Up to 15-year Life span depending on cycle rate.
- Scalable and modular.
- More temperature tolerant than Lead Acid – less cooling required.
- Industry leading Generator and rectifier control with patented Maximum Power Point Tracking and Anti-stall algorithms.
- Generator is dynamically optimized for optimum power utilization.
- Generator can be kept alive by the HSS® controller in “Limp-Mode” in cases of drastic loss of power. Anti stalling – Generator running at reduced power.
- Fuel efficient - DG run shorter increments - above 60% loading – maximum efficiency possible, no glazing, no dummy loads and no PSOC.
- 3-phase balanced.
- Less wear and tear - Less maintenance.
- Less re-fueling and site visits.
- Full remote control and alarming.
- Intelligent cooling – PLC or PC controlled – Forced feed cooling on batteries.
- Charge with Grid, Solar, Wind or DG or any combination of all.



Though the HSS® Hybrid Storage Systems are customized to customer needs , they come in 3x main categories:

1. Energy HUB

- Ideal for small Wi-Fi, Transmission site power supply, catering for loads in the order of less than 1kW.
- Scalable for up to 15hrs autonomy (70x Battery modules).
- Modular system to allow seamless load expansion.
- Integrated cell management, protection & reporting.
- Unique hot pluggable/cold terminal battery interface.
- Light-weight, scalable and easy to handle.



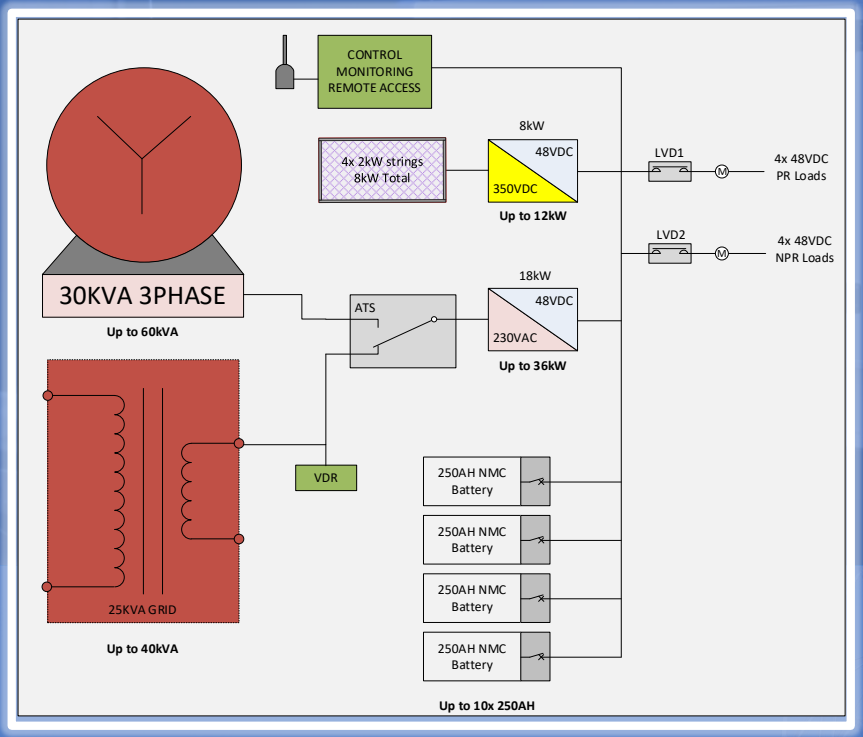
2. HSS® Outdoor Cabinets

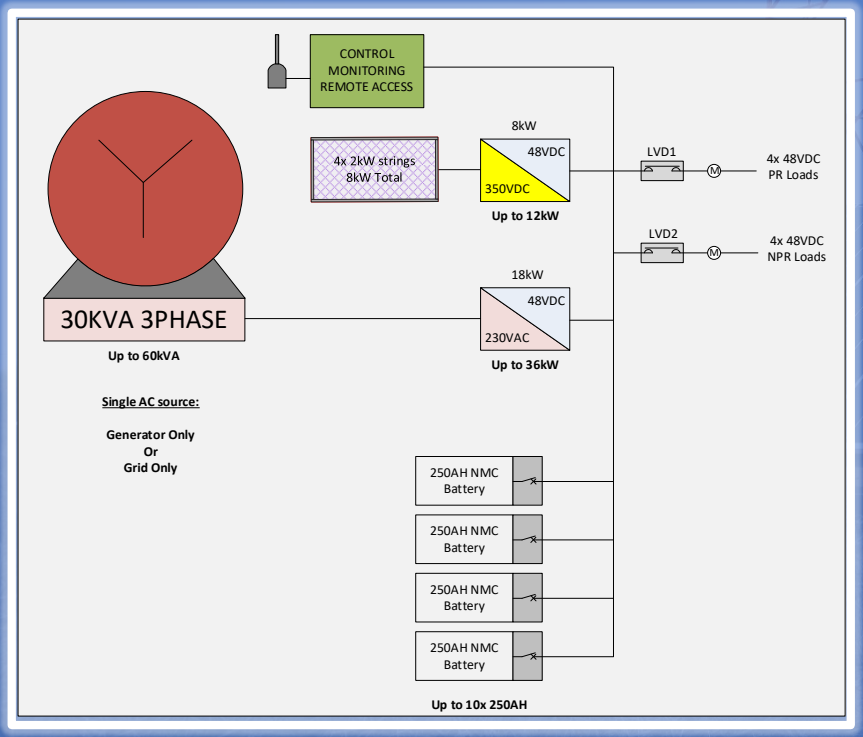
- Ideal for Generator optimised sites due to constant generator loading for the entire charge cycle, ensuring best fuel efficiency possible.
- Ideal for Sites with unreliable grid and several short failures per day. Due to fast recharge times, generator runtime could be eliminated.
- Ideal for sites with limited space – due to high power density, deep cycling ability and multiple cycles possible per day. A relatively small battery bank can drive quite large loads, provided a generator or partial grid is available to recharge.
- Ideal for larger telecom sites, single or multi-operator
- 8x DC breakers with energy metering and fuse fail detection for billing purposes.
- Single outdoor cabinet – suitable for loads up to 8kW with 4x 250AH batteries **41.4kWH** usable storage capacity at 80% D.O.D.
- Dual outdoor cabinet – suitable for loads up to 16kW with 10x 250AH batteries **103.6kWH** usable storage capacity at 80% D.O.D.

3. HSS® Indoor Cabinets

- Similar advantages as for outdoor HSS®, but mounted inside an equipment room, shelter or container.
- Cooled by air conditioners in the shelter, which can be controlled by the HSS®.
- DC systems – up to 36kW rectifiers and up to 12kW PV solar.
- Single cabinet 4x 250AH batteries with forced feed cooling and 1U spacing
- Dual cabinet with 10x 250AH batteries with forced feed cooling and 1U spacing
- Forced feed cooling with narrow spacing – up to 12x batteries.
- Complete **3-Phase AC** systems for broadcast applications also part of this range.
- Dual Indoor Cabinet AC solutions normally fitted with up to 36KVA Inverters in 3-Phase configuration and up to 36kW of rectifiers for charging the batteries
- Up to 12 x 250AH batteries in a dual cabinet system = **139kWH** of usable storage.
- Custom solutions on request.

1. Li-Ion Storage – DC systems



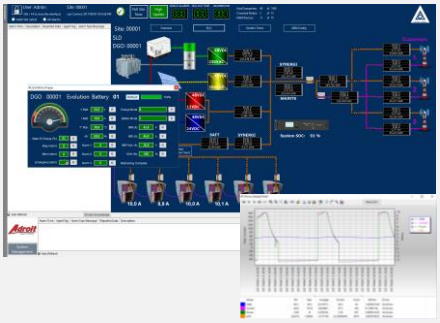


- In the standard single outdoor cabinet, up to 4 x Incell 250AH NMC modules can be fitted for a Total capacity of 1000AH at $51.8V_{nom.}$ **$51.8kWH_{TOTAL}$ / $41,4kWH_{USABLE}$.**
- In the standard dual outdoor cabinet up to 10x 250AH NMC modules can be fitted for a Total capacity of 2500AH at $51.8V_{nom.}$ **$129.5kWH_{TOTAL}$ / $103.6kWH_{USABLE}$.**
- In both cabinet versions, the standard power rack configuration caters for up to **36kW** of Rectifiers and up to **8kW** of PV modules.
- Another 4kW of PV modules can be added as an optional extra. **(Total 12kW PV).**
- 2x Types of power distribution DBs are available: **Generator-only** configuration or **Generator & Grid** configuration with Automatic Transfer switching and Grid quality monitoring.
- 8x 125A User circuit breakers, each monitored for fuse fail and kWH recording for billing purposes.
- Li-Ion batteries have several built-in protection mechanisms, against overloading, over charging, overheat, over or under voltage, short-circuit protection etc.
- Dynamically variable charge algorithms ensure that battery charge rates are automatically reduced if certain battery temperature thresholds are exceeded, to prevent thermal shut down.
- Optional Inverters can be installed for DC sites that also have AC loads. Up to 4x 3kVA modules in a 2U shelve. (Total 12kVA).
- The system is also fitted with a Modem-Router and Raspberry Pi PC, to provide remote access, remote control and remote monitoring

The HSS Hybrid Storage Solution

A FULLY INTEGRATED AC OR DC OR AC AND DC HYBRID ENERGY STORAGE PLATFORM

NEC/XON HSS® Hybrid Storage Solution is a flexible, configurable and fully integrated turnkey solution with modular and scalable design that can be rapidly deployed to enable Telecommunications Operators and Tower Companies to reduce costs and increase plant efficiency. With multiple energy storage technology options scaling to approximately 30kW loads, the NEC/XON HSS® Hybrid Storage Solution can be easily configured to meet customer's exact power and energy requirements. For the Tower Companies, we provide independent power feeds for up to 8 operators, with independent energy measurements on each power feed. Extensive data logging on site as well as off site is done, and reports and trending is available at the click of a button if our NEC XON Software platform is used at the NOC. The HSS® systems are remotely configurable and our Engineers can provide remote assistance from anywhere in the world.



NEC/XON Control System

- Several Generator Controllers, as long as they have a Modbus RS485 port, can be made to work with HSS®.
- The Generator Controller and Modbus based Fuel sensors are connected to a Modbus RS485 to Modbus TCP converter and can either connect to the HSS® controller via WiFi or Modbus TCP by cable.
- The Li-Ion batteries are connected directly to the High-Speed Modbus RS485 port of the controller.
- The Rectifier controller connects to the Modem Router directly via Modbus TCP.
- If Inverters are supplied, their controller connects directly to the Modem Router.
- A small Raspberry Pi PC in the system also connects to the Modem Router to provide remote access for support Engineers.
- All controllers have web browsers.
- The Modem Router is the gateway to the NOC. This gateway can be established either by a WAN connection or by two sim cards.

HSS® Energy Storage

- Several container options available – from small 2 door cabinets to large 12m x 2.4m x 2.4m Containers.
- Customised according to customer requirements.
- All equipment can also be mounted in equipment rooms utilising indoor cabinets or customised battery racks.
- Several Li-Ion technologies can be integrated with HSS®, but NEC XON for now, has standardised on the Incell/ Polarium product range.
- Custom Power system Controller software provides the Interface between various devices such as Rectifier system, Generator controllers, Battery BMSs, Inverter controllers
- Information about our technology partners available upon request.
- Though the HSS® system is perfectly suitable for utilising lead Acid battery technologies, we don't recommend the use of lead acid battery storage when generators are involved.
- We would however consider building lead acid systems on request.

HSS Power Conversion System

- The Power Conversion System of the HSS® is based on the Enatel Synergi Power System.
- High Efficiency 2kW or 3kW Rectifier modules can be fitted – 4 modules per 1U shelve and multiple shelves can be combined .
- High Efficiency 2kW Solar MPPT modules can be fitted – 4 modules per 1U shelve and multiple shelves can be combined. 400VDC solar input possible.
- High Efficiency 2kW Wind modules can be fitted – 4 modules per 1U shelve and multiple shelves can be combined. Units are paralleled to achieve the correct capacity required per wind turbine.
- DC output voltages available are - 48V Optional: +24V and +12V.
- Various modular Inverter types can be integrated for AC loads.
- Extensive Analogue Inputs, Digital inputs and outputs available.
- Synergi controller used on generator sites. Standard SM36 controller used for other configurations.

Support from START to FINISH!

WE WILL MAKE YOUR PROJECT A SUCCESS

NEC XON Alternative Energy, have extensive experience in designing, manufacturing, configuring, installing, and commissioning Off-grid Hybrid Storage Systems across Africa, at all levels in the Telecommunications Industry, and we can deliver the right Hybrid Storage Solution, at the right location, on budget.

APPLICATIONS ANALYSIS AND DESIGN

Determining what is right for your application is not as simple as it sounds. Our Li-Ion products can replace your existing lead acid batteries while increasing the safety of the battery system in a smaller footprint and provide a longer service life.
On the off-grid side, we can design, build, configure and optimise the HSS® for your specific situation. Our team can dig into the toughest applications requirements and provide recommendations for moving forward.

- **Technical Requirements Analysis and Modelling**
- **Business Case Analysis and Modelling**
- **Application Specific Life Time Projection**
- **Guide Lines on Site optimisation Strategies**
- **Storage Operational Guide Lines**
- **Analysis of Risks and Mitigation Strategy**

INSTALLATION AND COMMISSIONING

Hybrid Storage Solutions project success – on time, first time – is assured with complete turnkey project services from NEC XON. Years of proven off-grid Hybrid Power integration experience enables high-quality, on-time, on-budget, and safe project implementation, from contract execution through project completion. NEC XON can complete commissioning in a matter of weeks from the date equipment is delivered on site.

- **Project Management**
- **Installation Supervision**
- **Commissioning**
- **Training**
- **Project Handover**
- **As-Built documentation**

MONITORING, SERVICE AND MAINTENANCE

In addition to the standard product warranty and preventative maintenance plans offered with each HSS® Hybrid Storage Solution, a range of extended service programs and performance assurance plans are available to assure long-term, successful operation across the desired applications. Since many sites expand, ongoing optimisation may be required. NEC XON can host a NOC for customers not having their own facilities. Historical trend analysis can be analysed to further optimise equipment configurations for maximum efficiency.

- **Remote Monitoring and optimisation**
- **Remote Assistance via AnyDesk**
- **Scheduled Routine Maintenance**
- **Warranty Service Support**
- **Comprehensive Service Agreements**
- **Performance Assurance Plans**

Advanced Alternative Energy Solutions

Though **HSS®** targets Combined AC and DC system up to **30kW average load**, NEC XON also provides larger solutions not described in this brochure.

NEC XON has supplied 3-Phase AC UPS systems to TV broadcasters on very unreliable and challenging grid supplies. Please enquire about our Inverter offerings should you have such a requirement.

Please contact our engineers for information on our Commercial Industrial and Data Centre power solutions – not covered in this brochure.

For customers not hosting their own NOC, NEC XON could provide the Service via our own NOC - based in Midrand RSA – as well as provide Web Browser Access via AnyDesk from anywhere in the world where Internet access is available.