NorthStar Battery



NorthStar business units

NorthStar is **two** business units under **one** common brand.

NorthStar

NorthStar BATTERY

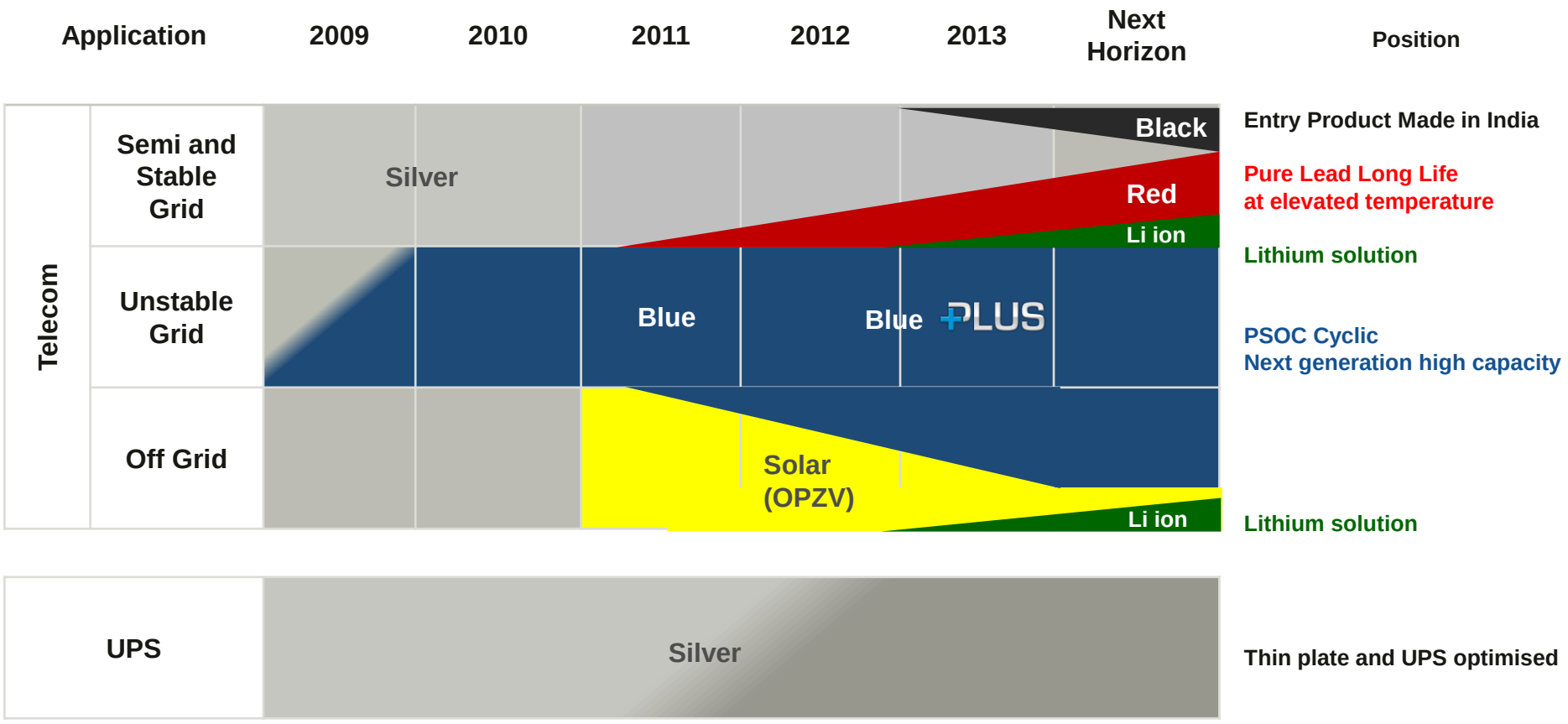


NorthStar SITETEL



NorthStar

NSB Road map for Telecom and UPS



Evolution of NSB

Gates AGM Technology

- Continuous manufacturing
- High purity
- Thin plates
- Minimal plate pitch, typically <1mm
- Very high pack compression



NSB products adopted by Major Telecom OEM's

2010



NSB opens second facility

2000



NSB opens first facility

Gates sell business to Hawker

HAWKER

Gates patents expire

1990



Gates develop 'sealed' aircraft battery



Gates invent thin plate technology and utilize gas recombination

1980



Gates license technology to Optima (JCI)

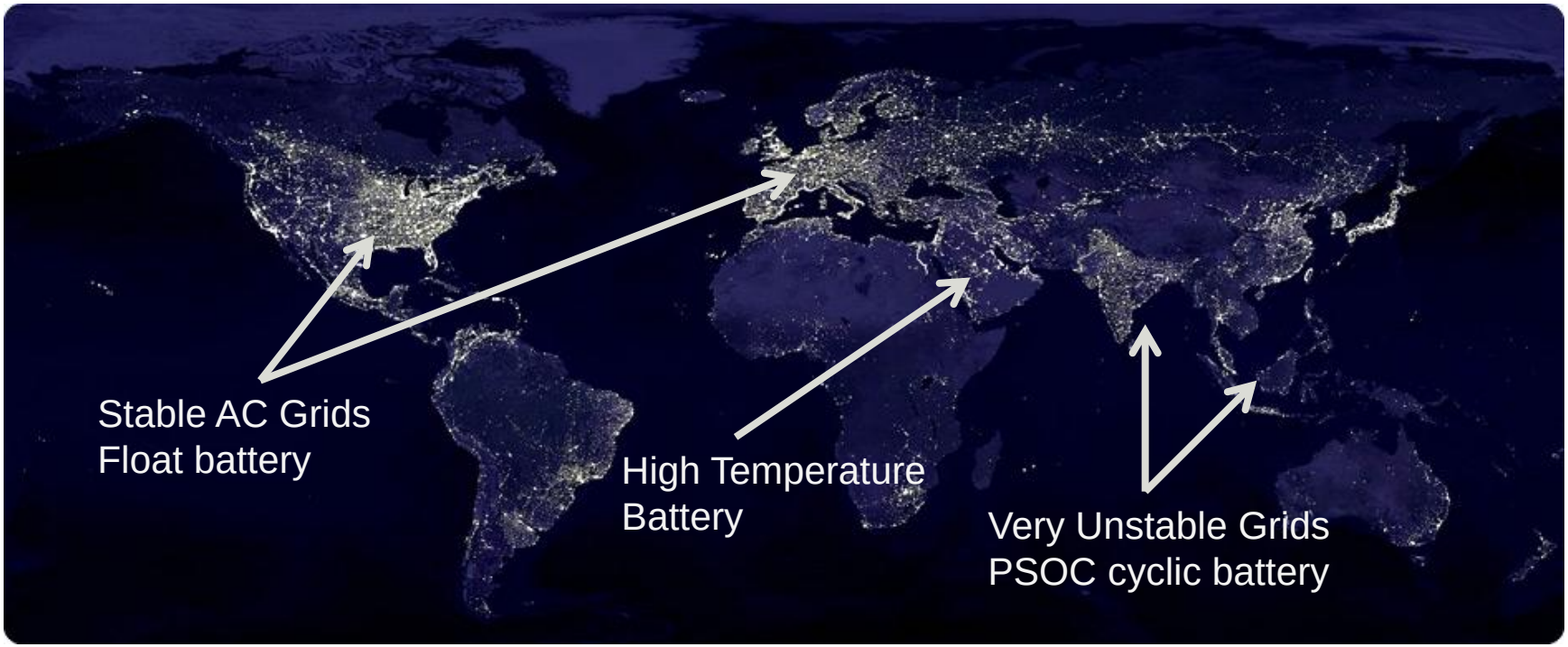
Gates patent technology

1970

NORTHSTAR BATTERY COMPANY
Nothing is more reliable

- Evolution of the Gates technology
- Enhanced polymers and alloy
- Advanced automated manufacturing
- Application specific electrochemical design

The global power challenge



Each country poses a unique challenge in terms of grid availability, operating temperatures and power availability.

Electric AC grids and applications drive the need for different batteries

The NorthStar Telecom Battery Range

Built around grid reliability with **specific battery electrochemistry**.



NSB *Red Battery*™
AGM

- Designed for semi-stable grids
- Cost-effective solution
- Extended float life of 15 years at 20ºC
- Pure lead positive grid alloy
- Operating -40ºC to +65ºC



NSB *Blue Battery+*™
AGM

- Designed for unstable grids
- Advanced PSOC cyclic performance
- Fast recharge and charge acceptance
- High potential fuel savings when used with gensets
- Operating -40ºC to +65ºC

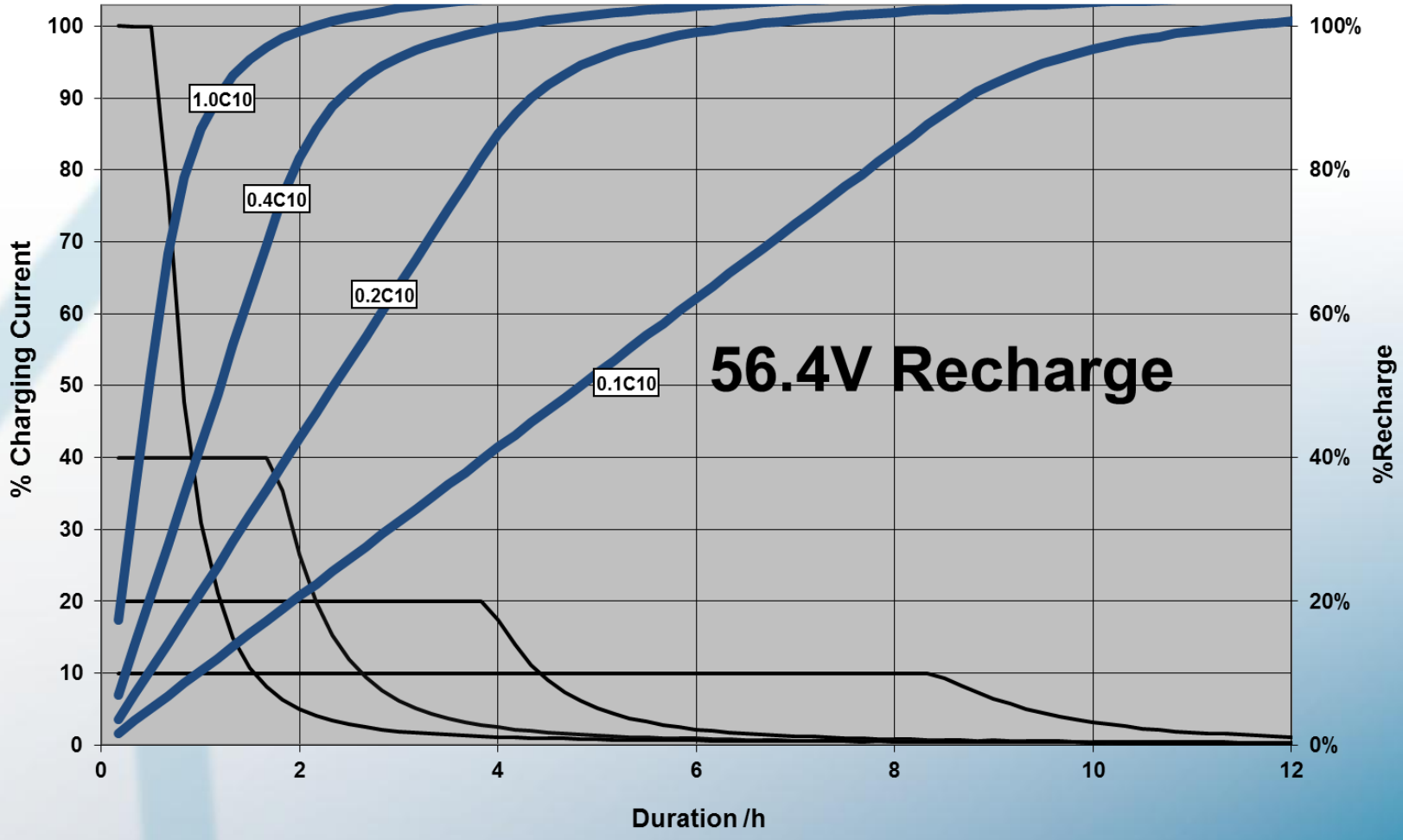


NSB Solar Battery
OPZV

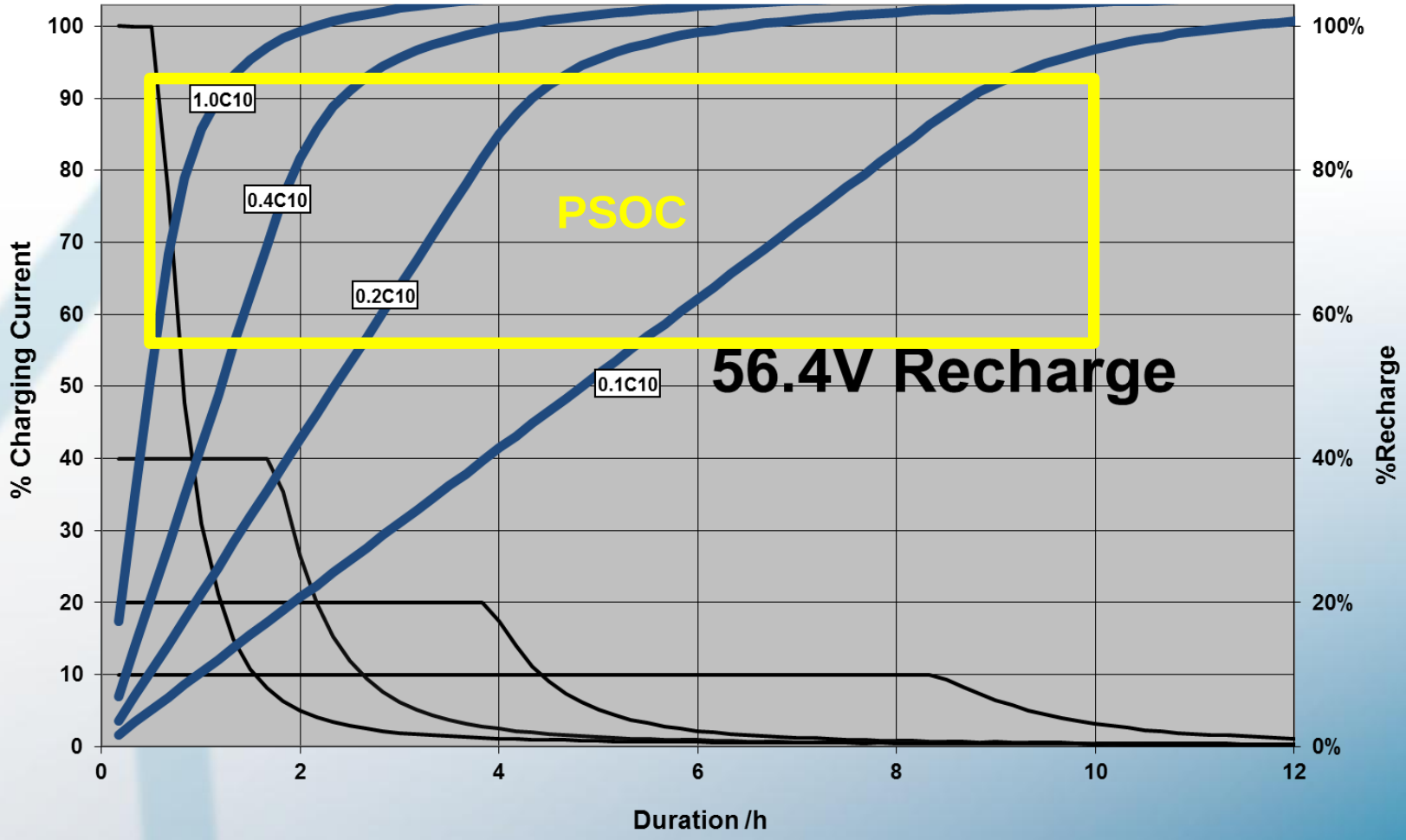
- Designed for off grid
- OPZV tubular gel plate technology
- Deep cyclic performance
- Ideal for use with solar power system

STABLE GRID **UNSTABLE GRID** **OFF GRID**

NorthStar Blue+ Recharge Properties



NorthStar Blue+ PSOC Recharge Properties



NorthStar Battery Summary

Technology	Design optimized for	AC Grid	Typical AC outage	Outage frequency	Float life in stable grid @ 25°C
Red	Cost effective solution for max float life High temperature	Stable to semi-stable	Any outage	Monthly	12
Blue+	PSOC operation in demanding conditions High Temperature	Unreliable	Any outage	Daily	10

NSB Red Battery®

Red Star Technology® uses pure lead plates to deliver
exceptionally long float life even at elevated temperatures.

- High energy density
- 15 year float life at 20°C and 2 year shelf life at 25°C
- High modulus Polyphenylene Oxide (PPO) plastic materials designed to withstand extended elevated operating temperatures
- Operating temperature range -40°C to +65°C
- Available in 60 Ah, 92 Ah, 100 Ah, 150 Ah, and 180 Ah Front Terminal configurations



NorthStar

NSB Blue + Battery®

The proven performance of *Blue Star Technology*® now enhanced to deliver **more power, high cycling and fast recharge.**

+ Designed for demanding environments with unstable AC power
+ 2 year shelf life
+ High cycling and fast recharge performance
+ Modified electrochemistry delivers high capacity and high power density
+ High potential fuel savings when used with hybrid genset applications
+ High modulus Polyphenylene Oxide (PPO) plastic materials designed to withstand extended elevated operating temperatures
+ Operating temperature range -40°C to +65°C
+ Partial State of Charge (PSOC) cycling technology



+ Available in 92 Ah, 100 Ah, 170 Ah Front Terminal and 2V 400 Ah Top Terminal configurations

Thank You For the Attention!!



NorthStar

Northstar Green Hybrid Solution for Off-Grid Sites

Northstar Asia Pacific
December 2012

STC Site Z29003



One of a number of solar powered sites constructed in the As Suman desert N.E. of Riyadh, Saudi Arabia.

This site uses multiple series/parallel solar modules for a total of 12kWp.

Northstar “Green” Hybrid Power System

- NorthStar's opinion is that most future renewable energy sites will use two or more complimentary power sources and advanced storage devices

- Northstar Asia Pacific is pleased to introduce its “Green” hybrid power system for typical small outdoor BTS sites

- The system utilizes complementary power sources in order to deliver a high availability, efficient and totally green site solution. There is zero production of greenhouse gasses or particulates at any time

- On an annual average approximately 90% of energy is produced from sunlight or wind power, the balance is produced by the fuel cell

Northstar “Green” site



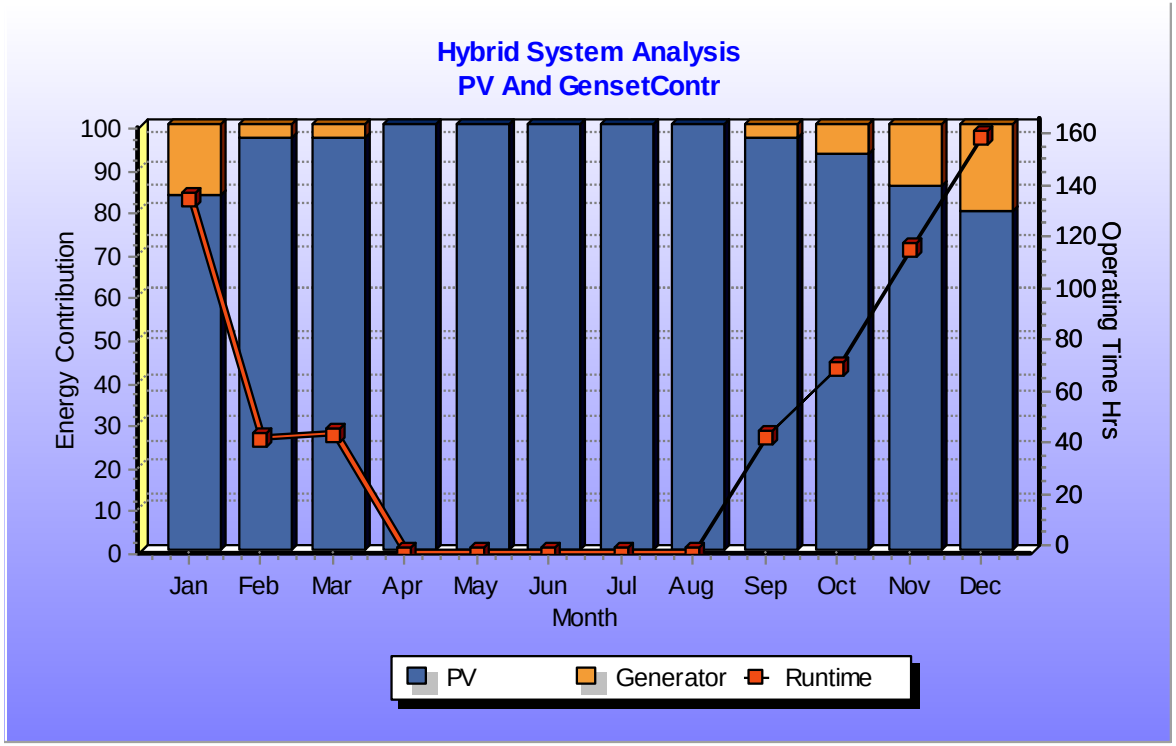


System Components

- Solar Array
- System Battery (Advanced AGM for very small systems, OPzV for larger)
- Water/Methanol Fuel Cell (Proven technology in Indonesia)
- Charge Control and Monitoring / Supervision System
- Equipment accommodation
- Security Measures

Solar Power Prime Power Source

- The prime power source is a solar array of approximately 12kWp. This will provide 100% of the energy requirement during much of the year.



- During those periods of reduced solar insolation, the array is augmented by a fuel cell. This is expected to operate less than 500 hours per year.

Ballard Fuel Cell



MPPT Charge Control and Monitoring / Supervision

- Energy transfer from the solar array to the system battery is managed by an MPPT (maximum power point tracking) controller. The MPPT controller is controlled by an algorithm which ensures that battery charging is always correctly managed and the maximum energy is transferred to the battery. The controller is also able to provide the boost voltage required for periodic equalise charging of the system battery.

- The charge controller and an associated GPRS modem used to send monitoring and supervision data to the NOC are housed in an auxilliary cabinet cooled by a fan/filter arrangement.

Equipment Accommodation

- System Battery cabinets, Fuel Cell and auxilliary cabinet are contained in weatherproof cabinets, which are located on a concrete plinth underneath the solar array. The equipment cabinets are shaded from sunlight by the solar array.

- The area under the solar array may optionally be protected by a hardened steel security fence.

- Sufficient space is available under the solar array to also accommodate the BTS cabinet.

- In some high risk areas, battery vaults have been constructed underground, beneath the equipment plinth.

The equipment is shaded from sunlight by the solar array



Equipment Accommodation (2)

SiteStar™ Anti-Theft Kit

Secure your site against theft and vandalism



NorthStar

Thank You For the Attention!!



NorthStar