



# SITE DIMENSIONING FOR OPERATIONAL AND ENVIRONMENTAL EFFICIENCY

PRESENTED BY INALA TECHNOLOGIES (PTY) LTD.

## ABOUT INALA TECHNOLOGIES

Inala is a South African company with 15 years of experience in providing system integrated solutions to the telecommunications sectors of global emerging markets.

SAM RMS, developed, owned and supported by Inala, is the company's Remote BTS Management System which has been successfully deployed in 25 African countries, in India, central America and Indonesia.

SAM RMS stands for Site Asset Management – Remote Management System – which includes all its variations

With well over 17 000 units installed world-wide, SAM is rapidly becoming accepted as the best of breed in smart energy controllers.



Figure 1: SAM international footprint

### African Footprint:

South Africa	Benin	Burkina Faso
Burundi	CAR	Chad
CongoB	DRC	Gabon
Ghana	Guinea	Kenya
Liberia	Madagascar	Malawi
Mozambique	Niger	Nigeria
Rwanda	Sierra Leone	Sudan
Tanzania	Uganda	Zambia
Zimbabwe		

### Asian Footprint:

India  
Indonesia

### Central American Footprint:

Guatemala  
Haiti  
Honduras



## ENVIRONMENTAL EFFICIENCY

### Operational efficiency

BTSs are of strategic importance to the entire economies of countries and their dependability is crucial to the operation of most businesses – especially those that matter. But there's something about BTSs that is unknown by most of those who depend on them (but not by their operators): They are composed of costly, complex hybrid systems – and they are very numerous indeed. For example, a network could include more than 7 800 base stations in one country. This means that bad system management at one can be replicated thousands of times nationally to the detriment of the bottom line of their operators and network users alike. Good BTS asset management results in improved service availability and significantly reduced operating costs through decreased energy consumption – after all, 80% of the energy in a mobile network is used by the base stations.

Hundreds of new BTSs are being installed every year to cope with increasing traffic. A local network's traffic increased by nearly 320% between 2008 and 2010 while the company cut its energy consumption by 57% through the effective management of its resources and the implementation of initiatives such as SAM (Site Asset Management) from Inala Technologies.

### Looking after BTS assets

The complex BTS transceiver systems have two main requirements if they are to deliver the results expected of them: Constant performance monitoring and a suitable working environment.

Performance monitoring is achieved with integrated VRWR/return loss measurement facilities while a suitable working environment for this equipment is maintained, monitored and controlled with SAM. It's mandatory that all monitoring be done on a 24/7/365 basis and this is the first clue as to the reliability required of the supporting BTS infrastructure.

When we say a "suitable working environment" we mean a secure, temperature-controlled location with an uninterrupted supply of clean power. SAM's job is to help ensure that this is a reality rather than a specification. Air conditioners, for example, are there to maintain an ideal working temperature but if they fail, they can do more harm than good. The same holds true for utility grid power and standby generators. They all exist to provide a working infrastructure – until they fail.

Last but not least is the question of responsibility and responsiveness. Given that every key aspect of every BTS will be monitored and reported on, who will be responsible for actually doing something about the thousands of “alarm” conditions that can (and will) arise from normal operation? And then there’s the aspect of perimeter and shelter security ...

What’s needed is an intelligent approach to BTS alarm and equipment status monitoring that takes into account the key factors that contribute to an effective BTS supportive infrastructure and that can do something about rectifying problems without recourse to human intervention until absolutely necessary. In this way, problems can be addressed timeously and without imposing an unrealistic workload on human supervisors.

Looking after BTS assets properly results in some important benefits:

#### **Improved revenue**

- Maximised income from sustained traffic density
- Satisfied and therefore retained customer base through reduced network downtime
- Better competitive position and improved confidence in selling of services

#### **Reduced maintenance costs**

- The more routine the maintenance, the more cost-effective it becomes
- Early detection of malfunctions contributes to controlled rather than emergency situations
- Early detection of performance trends provides for the addressing of problems before they become service-affecting.

#### **Improved asset management**

- Better use of costly BTS assets (high return to expenditure ratio)
- Performance tracking assists with equipment screening and selection
- Reduced number of weak links in the service delivery chain

### **Environmental Efficiency**

#### **Minimise**

Any strategy that is intended to minimise an industry’s footprint on the environment must include taking full responsibility for the entire lifecycle of products and their operation with regard to energy usage and environmental impact. This is often more wide-ranging than one might think and includes everything from the sourcing of raw materials to the disposal of assets at the end of their useful life (e.g. BTS batteries).

This philosophy can only work in practice if the entire supply chain subscribes to it. From design to manufacture to operations, the telecoms industry impacts more people than many others yet, thankfully, its environmental impact of is relatively small (producing only about 0.5% of global CO2 emissions) compared with the output from other industries. Many may not have cars but use cell phones on a daily basis (600 million cars versus 4.6 *billion* cell phones). And it turns out that most objections about the environmental impact of putting thousands of communication satellites into orbit are unfounded.

Rockets burn up in a few minutes but the telecoms infrastructure they help create lasts for decades and it’s the management of this lifecycle that is uppermost on the agenda of most operators because it makes good financial sense to stay green.

#### **Maximise**

This is the age of information and information is useless if it can’t be acted upon or communicated. Telecommunications helps to aggregate information into knowledge which, in turn, facilitates decision-making at all levels. Today, entire factories can be controlled from a cell phone and control systems can reach the right maintenance personnel in seconds in the case of equipment malfunctions. Emergency services and business itself couldn’t exist today without telecommunications.

Telecommunications helps people coordinate actions quickly, effortlessly and using far less energy than was previously required to do the same job. It also helps reduce packaging waste and paper by making goods such as music, magazines and books available digitally. According to ACEEE (USA), 1kW of energy used in ICT (Information and Communications Technology) means 10 kW less energy consumed globally.

But let’s not forget that, while some factories close overnight, the telecommunications “factory” never does. So while maximising the benefits it has to offer, it also needs to minimise any negative impact on the environment because it simply never stops.

#### **Combine**

Minimising waste while maximising traffic throughput helps network operators realise their business objectives. At the prolific BTS level, they can look forward to operational savings ranging from 30% to 80% and more using SAM combined with a sound approach to product lifecycle management.

There is no doubt that a sustainable and green telecommunications infrastructure combined with rapidly emerging technologies such as SAM that are designed to coexist with and support this philosophy, are perhaps some of the key contributions that we can make to continued prosperity today.

## DIESEL HYBRID / SMART CONTROLLER

### About SAM RMS

SAM RMS is a highly cost-effective cellular BTS asset management system designed to help customers maximise revenue from their network assets. Real-time alarm events help customers rectify malfunctions before they become service-affecting and alarm status reporting allows them to respond to emergencies as they occur.

In a nutshell, the SAM system achieves OPEX savings by automatically taking control of generator and commercial utility grid supply in order to reduce fuel usage and power costs. This is done by using the backup batteries until such a point where their threshold limits are reached and then switching back to a power supply source. This is known as Hybrid Control (see figure 2).

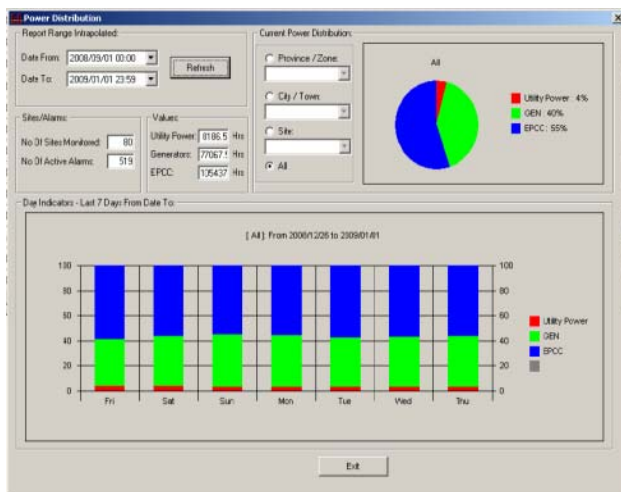


Figure 2: SAM RMS report showing utility power (red), generator power (green) and Hybrid Control (blue). These reports are available for a site, city or region.

Inala's SAM RMS is a new concept of remote power management that allows operators to fully manage and maintain their network infrastructure remotely. It provides the ability to monitor all energy related issues including but not limited to:

- Generator monitoring and control
- Rigorous air conditioning plant monitoring and control
- Battery management
- Utility grid power management
- DC Reduced Energy Cooling (REC) (Free cooling)
- Fuel Management - Fuel levels and accurate consumption measurement
- Highlighting any anomalies with excessive usage (this includes detecting theft through fuel siphoning, for example)
- Identifying problematic sites before field staff is sent on what could be unnecessary call outs
- Energy efficient control

In addition, SAM RMS provides for:

- DC navigation light monitoring and control
- Security access to the perimeter gate and to the shelter – this is done with proximity tag readers and the system is configured for failsafe / fail secure operation.
- Video surveillance (4/8 channel CCTV DVR)
- Alarm surveillance – the system has the ability to filter and group alarms according to customised severity levels and to keep an audit trail of acknowledged alarms. Alarm history and trending is also available and the complete alarm status of a site is available prior to technician call-outs.
- Remote upgrading of its own software.

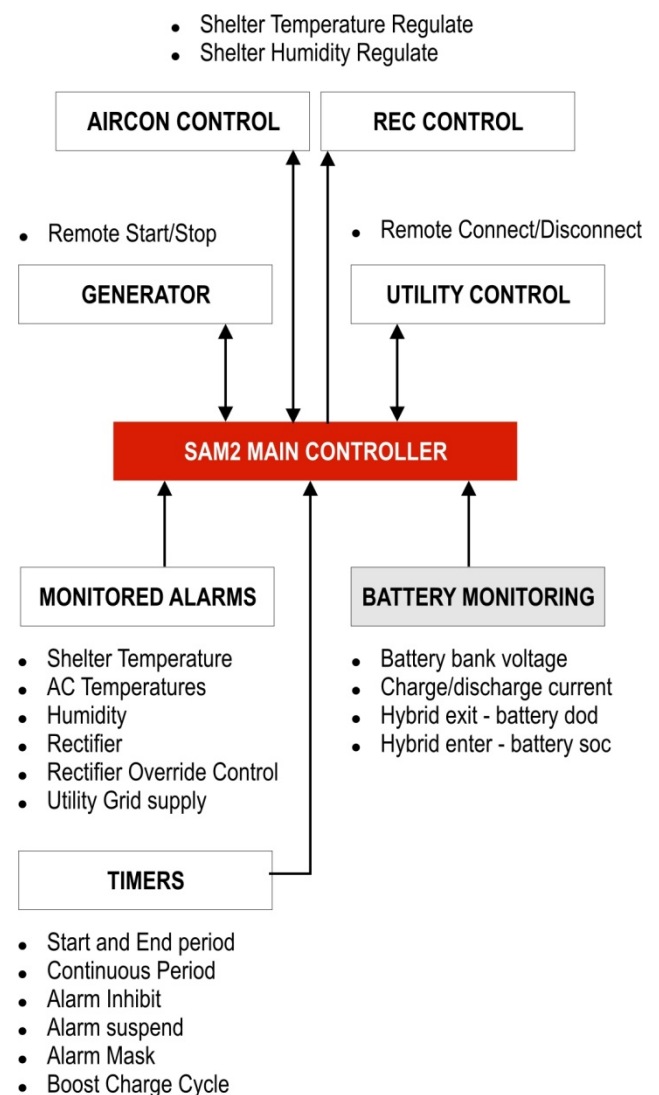


Figure 3: Overview of SAM RMS hybrid control possibilities

### SAM RMS Remote Management

- The SAM Hybrid system provides operators the ability to monitor each BTS site from a centralised Network Management Centre (NMC). This provides the NMC remote visibility in terms of performance, alarm trouble ticking and preventative maintenance.
- Various communication methods can be used to manage or retrieve data from the remote BTS sites dependent upon network availability.
- The first and most commonly used option (figure 4) due to its ease of installation and integration is GSM SMS messaging or GPRS. The SAM RMS controller is fitted with a GSM modem and is configured to communicate with the central management server using the operator SMSC server and SMPP connection.
- Optionally the GSM modem could be replaced with a CDMA modem should the network be CDMA-based.

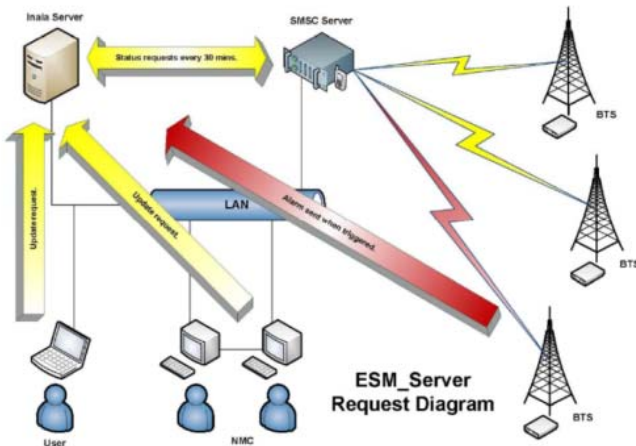


Figure 4

- The second option (figure 5) is fitting the RMS controller with an E1 controller. Communications with the central network management server is done using a dedicated E1 timeslot though a nailed-up connection. A grooming mux is used to convert the E1 into TCP-IP for connection to the customer LAN/WAN network.

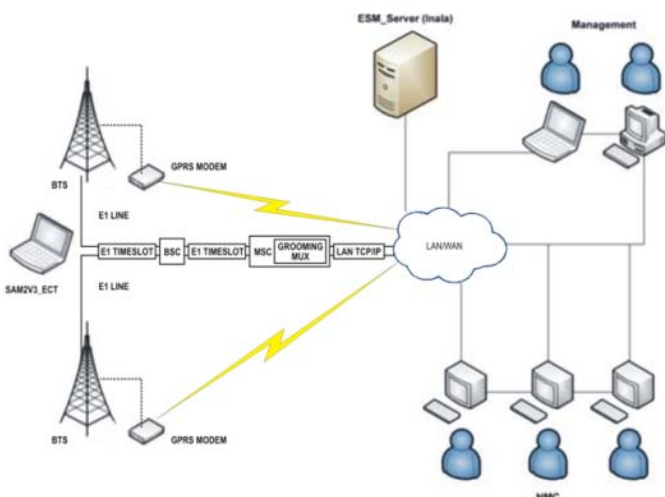


Figure 5

- The third option (figure 6) is fitting the RMS controller with a TCP-IP controller. Communications with the central network management server is done using the customers TCP-IP LAN/WAN network.

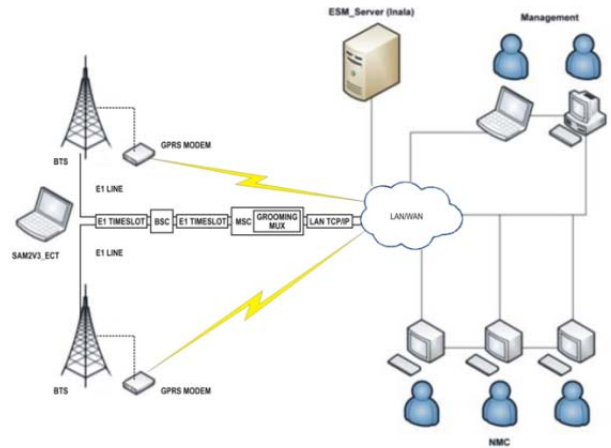
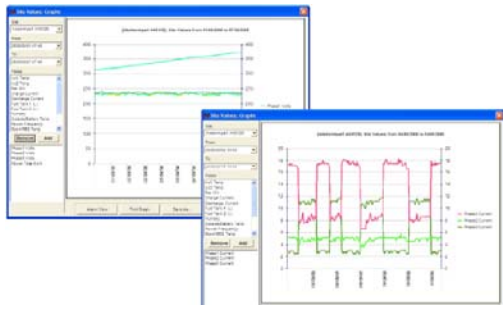


Figure 6

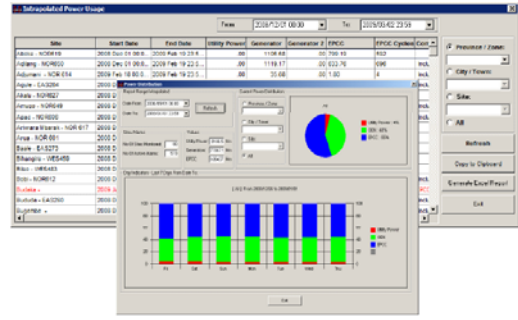
### Reports

Reports are available remotely on any aspect of SAM's monitored parameters and on an intuitive "drill down" basis starting at the country level and working down to individual BTS sites. This hierarchical approach allows for the logical grouping of sites according to the region or the city to which they belong.

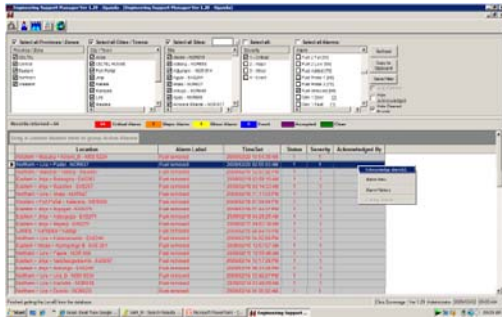
From these (Excel) reports, statistical data is extracted and displayed in various formats for rapid analysis and overview as shown in figure 7.



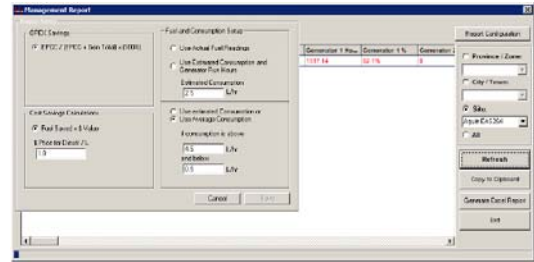
Utility grid



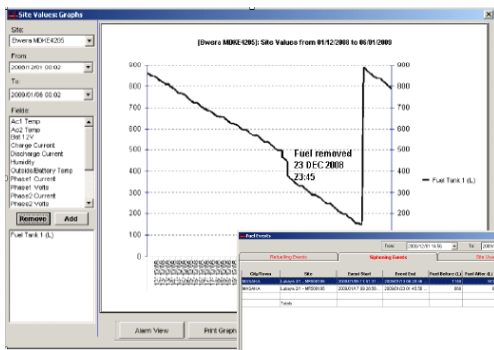
Power distribution



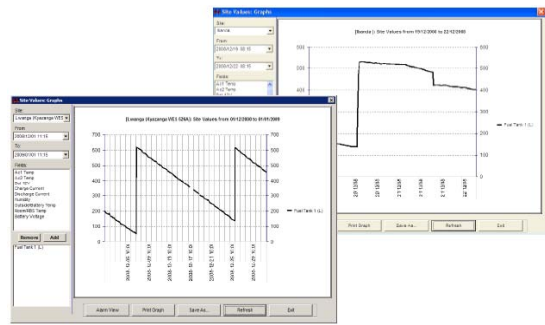
Alarm surveillance



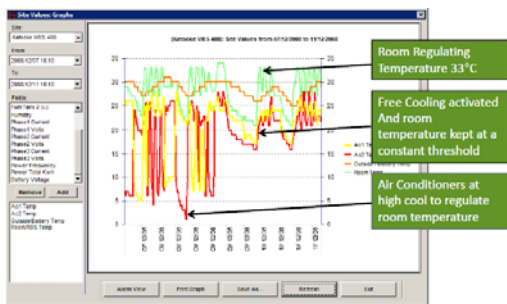
Fuel consumption



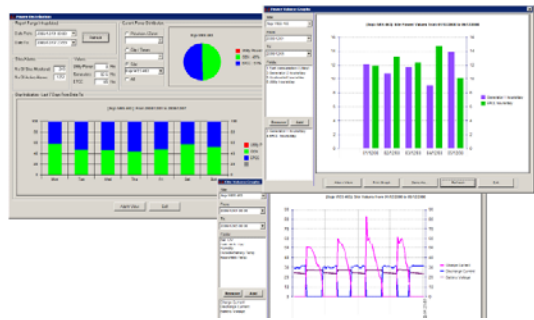
Fuel siphoning



Fuel filling



Reduced Energy Cooling (REC)



Hybrid battery cycles

Figure 7: An example of some of SAM's reports

## SAM RMS Facts

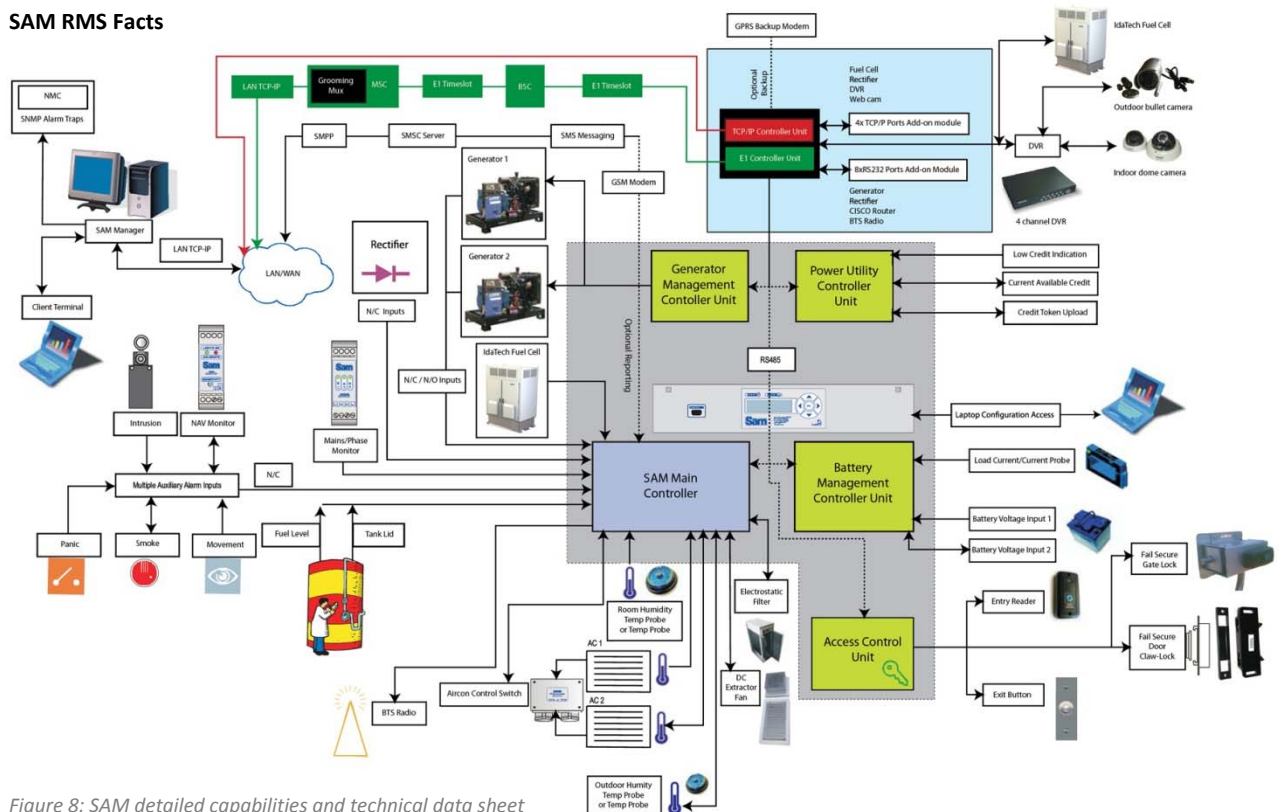


Figure 8: SAM detailed capabilities and technical data sheet

## System Capabilities:

- Environmental
  - Intelligent monitoring and regulation of cabin temperature and humidity.
  - Intelligent monitoring and control of air conditioning system.
  - Intelligent free-cooling ventilation system.
  - Air conditioning socket continuity testing - detects unplugged leads.
- Power
  - Fuel cell Monitoring (Idatech)
  - Generator monitoring and control.
  - Generator bulk fuel tank capacity monitoring.
  - Utility Pre-paid credit token management.
  - Utility Post-paid power consumption management.
  - Battery bank supply voltage monitoring, both 24Vdc or 48Vdc
  - Battery bank temperature monitoring.
  - Battery charge and discharge current monitoring.
  - Monitoring of utility or generator Mains, Phase and Frequency supply input.
  - Intelligent generator and air conditioner control through Hybrid Control mode.
- BTS Infrastructure
  - An adjustable current monitor is used to detect aircraft warning light and/or site security light failure (threshold can be set to detect even a single globe failure).
- Multiple analogue and digital alarm input and control functions.
- General
  - Password protection on all applications - Alarm and Environmental Controller.
  - RS232 serial interface for onsite control and configuration.
  - On-site or remote upgrading of SAM firmware depending on the management option.
  - On-line alarm FIFO alarm log
  - Technician diagnostic terminal for onsite configuration and commissioning is the same as the above serial RS232 port. New units use USB
  - Events are automatically forwarded to the management platform from each site depending on the management option chosen.
  - Statistical data in terms of power distribution (utility, generator or battery) and fuel consumption all computed on the controller in such a way as to overcome information loss or inaccuracies due to network downtime

## Management option features

- Remote management Options
  - Through GSM SMS messaging or GPRS connectivity
  - Through TCP-IP or E1 connectivity
  - Through CDMA and satellite
- Common features to all management options:
  - Connectivity to the SAM unit.
  - Near real time management of remote cellular BTS assets
  - Ability to remotely reset the generator AMF panel, during fault condition
  - All activity (alarms, events, analogue values) are entered into a database for post analysis and statistical reporting
  - Ability to enter additional information manually to the database:
    - Invoiced fuel amounts per site (statistical comparison to system measured values)
    - Technician call-out incidents
    - Maintenance activities and inventory control
  - Graphical user interface automatically updated upon receipt of event
  - Geographical map overlay of monitored region
  - Various automated or customized reports based upon database information:
    - Alarms per site, date, time, set or clear
    - Alarms critical versus alarms non critical, per site, region, date, time
    - Generator fuel consumption, per site, region, date
    - Fuel siphoning per site, region, date, time
    - Fuel billing per site, region, date, time
    - Hybrid Control activation per site, region, date, time
    - Free cooling activation per site, region, date, time
    - Temperature and humidity during free cooling per site, date, time
    - Air conditioning total run time per site, date, time
    - Generator total run time per site, date, time
  - Audit trail of all user activity
  - Multiple simultaneous client terminal access
  - Multi-layer password protection by users belonging to pre-defined user groups
  - User groups created for viewing rights and user group configuration rights
  - User friendly methodology of data analysis
  - Generator service interval notification
  - Air conditioner service interval notification
- Exclusive TCP-IP or E1 connectivity features
  - Access control with entry and exit log function (possible with SMS and GPRS)
  - Auto arm and lock function associated with bypass and un-bypass of intruder and movement sensors (possible with SMS and GPRS)

- Connectivity to rectifiers, generator AMF panels, fuel cells, BTS Radio, digital video recorders and web cameras.

## Conclusion

Seamless and consistent quality communication delivery is today's differentiator between the winners and the losers in the GSM field. As we've seen, this needs a far more in-depth look than simple coverage and requires a more responsible and logical approach to safeguarding and maintaining a vast, complex and expensive infrastructure. SAM RMS from Inala Technologies has proved itself in this important role both locally and internationally.

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