

Title: Telecom Sector Green – Fuel pilferage and adulteration
Company: NEC Corporation
Purpose: Discussion and Approval
Doc number: GE-20100019
Meeting: GISFI#3, Pune, India, 13 – 16 Dec, 2010

1. Abstract

The growth in mobile networks over the next few years will come from remote parts of the world, where access to electric grids isn't always guaranteed. The service providers are under tremendous pressure to deliver the solutions in efficient manner and make availability of network. To overcome the electric grid supply problems, the widely deployed solution is base stations equipped with diesel-powered generators. It requires high level of maintenance and these are prime targets for fuel (diesel) pilferage. This document addresses the issue of fuel pilferage in Base stations and possible solutions. We propose that the discussion in this document is accepted for the deliverable 2 of Green Energy activity “Study on potential enhancements of ICT”.

2. Introduction

The telecom on rural India is playing a significant role for visible participation of rural India in main stream socio-economic growth. The majority of India's population is in rural areas (almost two-third), however with tele-density of 13%. With saturation of urban markets, rural India poses a huge opportunity to telecom operators. Setting up a telecom infrastructure in rural areas has its own challenges. The big challenges for rural telecom network are to maintain network uptime due to frequent power cuts, power problems and equipment maintenance. Immediate solution is running the base stations with Diesel Generator backup power adding high cost to the operations. Other long term solutions of these could be using of alternative power like solar power, wind power. At the same time, telecom companies need equipments that consume less power.

3. Pilferage and adulteration of fuels used in Telecom Sector

All the telecom providers in India run the base stations by providing the power from the local grid. The quality of power and availability is very poor in rural India. To run these base stations operators have to spend huge money for fuels. Fuel pilferage and Adulteration fuels is widespread throughout South Asia. Also the major problems are diesel transportation to remote rural areas and fuel pilferage which is making crores of rupees loss to operators. Adulteration of automotive gasolines and diesel fuels is also a problem widespread throughout India and South Asia.

4. Problems due to fuel pilferage and adulteration

This section explains about the problems due to fuel pilferage and adulteration.

- Some adulterants increase emissions of harmful pollutants significantly, whereas others have little or no effect on air quality. In some cases, health effects are indirect — for example, large scale diversion of rationed kerosene subsidized for household use to the diesel sector does not increase

emissions from diesel vehicles, but deprives the poor of kerosene which can otherwise be used for cooking. Lack of availability of subsidized kerosene forces the poor to continue to use biomass and exposes them to high levels of indoor air pollution [6].

- Stolen fuel is used in the market and no regulation on this
- It will increase Telecom operator OPEX
- When adulterated fuels are used, the DG engines are out of tune with the specifications set by the manufacturers, or are poorly maintained, they will emit substantially more pollutants

5. Proposed Solutions

This section mainly focuses about the possible solutions for diesel theft problem. The three possible solutions are explained below.

5.1. Remote Monitoring using BTS using SNMP agent

This proposed solution is based on GSM/GPRS network and same solution can be extended to UMTS, LTE. The BTS in the telecom network uses a SNMP (Simple Network Management Protocol) agent to communicate with service provider's NMS (Network Management System) or Operation Administration and Maintenance (OAM). Usually OAM manages most of functions related Fault Management, Configuration, Performance, Administration functions of the GSM Access network including BTSs. In our proposal OAM can maintain the additional parameters related fuel pilferage. But in India, the BTS towers are installed and managed by third party providers. These BTS towers are leased or rented to operators and it is not good to combine this solution with existing OMC. It is advisable to have a separate Remote Monitoring station server (NMS server) which maintains tower operation information.

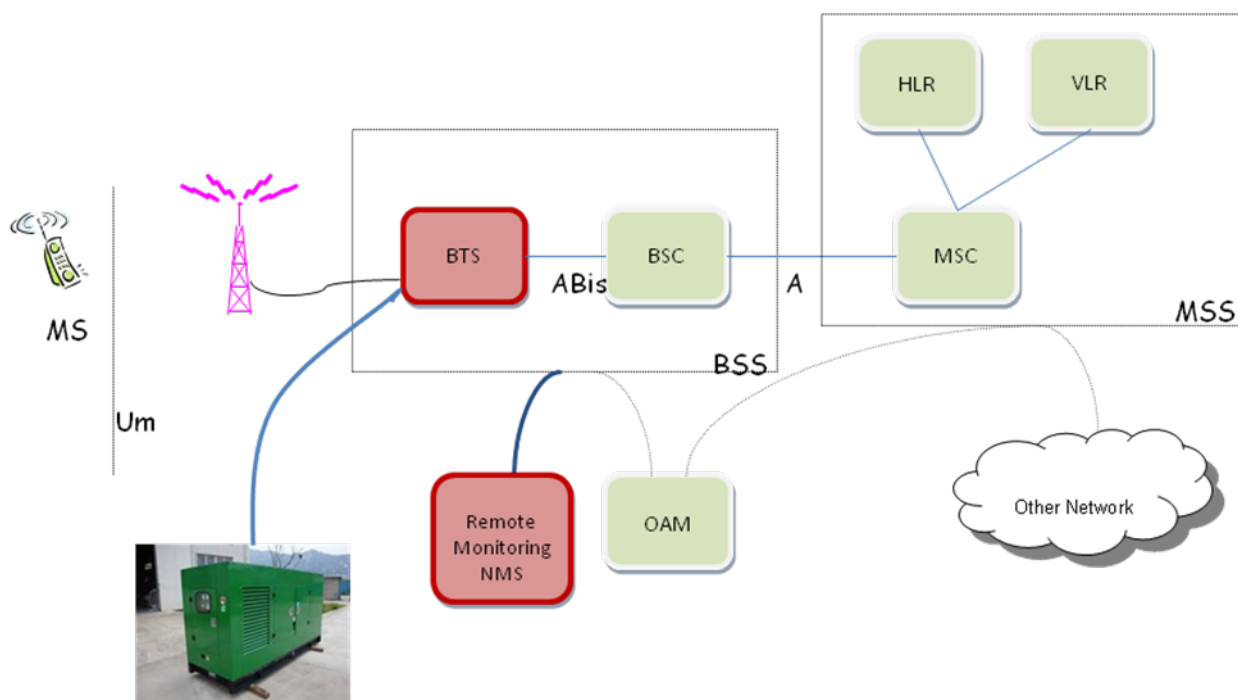


Fig 1: DG Parameters Monitoring by BTS

In the proposed solution, BTS uses a SNMP agent to communicate with OAM or Remote Monitoring network.

1. Normally Base stations provide health status to OAM through SNMP and signaling.
2. Similar concept can be used in for monitoring the incoming power
 - a. Base station periodically (say 1 minute interval) check the power is coming from Grid or Diesel Generator. For this additional sensing circuit needed.
 - b. Is there any changeover in power, it can sense and send information to Central location.
 - c. The logs can be collected in central station and can be used for further analysis
 - d. Also sensor circuit can be extended to measure the diesel quality, health check and efficiency of Diesel Generator.

Advantages:

1. Measurement is part of Base station and no additional equipment required. Maintenance cost of the system is low.

Dis-Advantages:

1. For any change in requirements software/ up gradation is needed.
2. Existing Base station replacement is difficult

5.1.1.What can be standardized

In this solution the following items should be standardized

1. The input parameters to be measured and controlled
2. Measurement Procedure need to be standardized
3. Interface between RAN and Remote monitoring NMS
4. Define Remote Monitoring NMS

5.2. Remote Monitoring using Site Monitoring Equipment

The second proposed solution is similar to solution 1. But Site Monitoring equipment is separate entity.

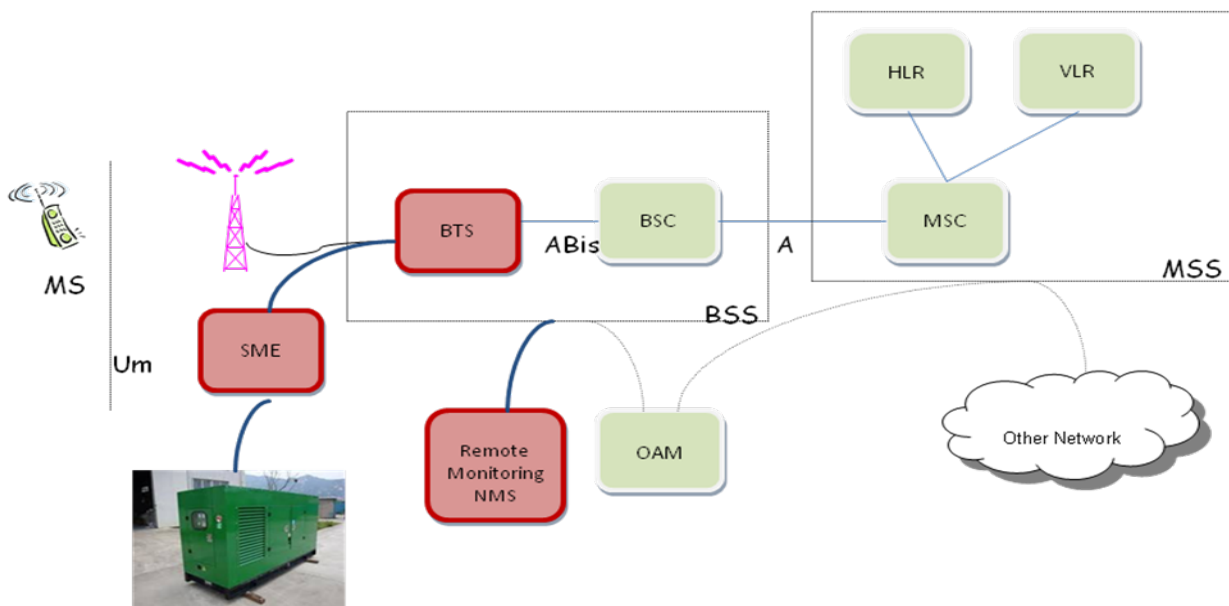


Fig 2: DG Parameters Monitoring by SME

For this Separate system need to be build which monitor the various parameters and send the information along with BTS data. This system will have Ethernet interface which will be connected optical link through the switch. The measurement and event information is transmitted to Central station.

Advantages:

1. No Changes required to Base station and same concept can be expended to BS using Solar Energy
2. Usually, in India third party will be maintaining the towers and other equipments. In this case the monitoring equipment didn't depend on type of BS manufacturer.

Dis-Advantages:

1. Additional cost of monitoring equipment

5.2.1. What can be standardized

In this solution the following items should be standardized:

1. The input parameters to be measured and controlled
2. Measured parameters between Site Monitoring Equipment and Remote monitoring station.
3. Specification of Site Monitoring Equipment
4. Interface between RAN and Remote monitoring NMS
5. Define Remote Monitoring NMS

5.3. Remote Monitoring through GPRS

The below solution is easy to implement and doesn't need any modifications to existing network. This system can monitor the inputs from Diesel Generator parameters, power inputs and other environment parameters. Basically these parameters are analog inputs and will be converted to digital using A/D converters in the Monitoring Equipment. The digitised data will be sent to Remote Monitoring server using GSM/GPRS Modem.

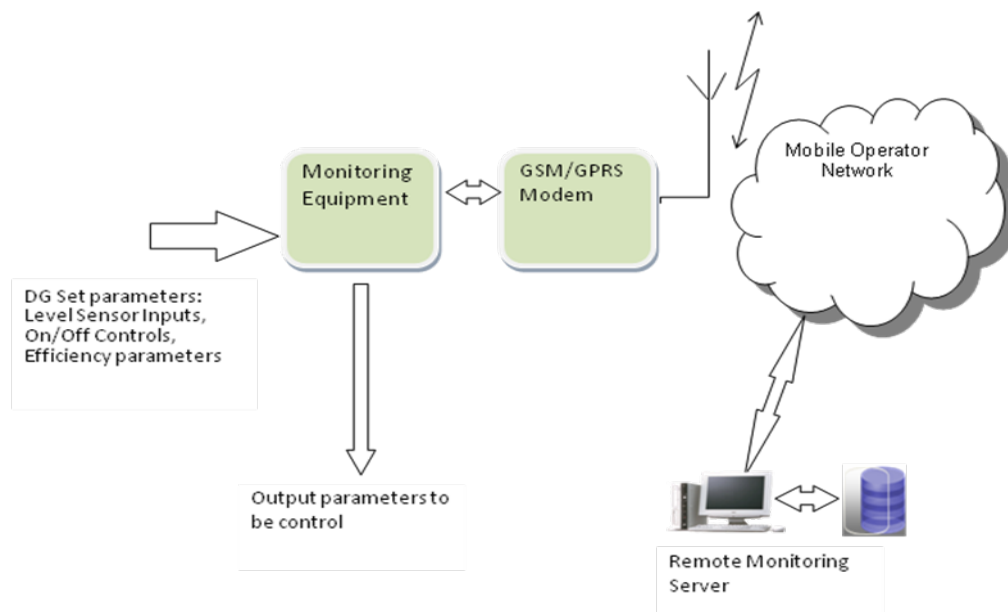


Fig 3: Remote Monitoring DG parameters through GPRS

5.3.1. What can be standardized

In this solution the following items can be standardized

1. The input parameters to be measured and controlled
2. The protocol to format and send the measured parameters between Monitoring Equipment and Remote monitoring station.

6. Conclusion

In this document, we described about possible solutions to identify fuel pilferage. Telecom companies have conventionally relied up Diesel Generators for powering Base stations. But the rising cost of diesel and diesel pilferage, adulteration increasing the OPEX. Identifying and checking fuel adulteration, fuel pilferage is a difficult challenge. This proposed solution can help in telecom sectors to fix the problem. Hence, many telecom companies are evaluating the option of augmenting Diesel Generator sets with environment friendly solar PV systems. But at the same the immediate solution to deploy the online management of diesel usage is mandatory. Identifying and checking fuel adulteration presents a difficult challenge in the face of enormous incentives involved.

References

- [1] www.cs.berkeley.edu/~brewer/ict4b/ICT_and_Power_Electricity__Lecture_5.ppt
- [2] http://www.witura.com/GSM_Server_and_Equipment_Room_Monitoring_and_Control_System.html
- [3] http://www.alarmspro.com/products/system2000_3000/System2000_3000_Brochure.pdf
- [4] <http://asentria.com/products/s410.aspx>
- [5] http://www.cisco.com/en/US/docs/voice_ip_comm/bts/6.0/maintenance/guide/Access.html
- [6] <http://meerutup.tripod.com/diesel.pdf>

Abbreviations:

SME	- Site Monitoring Equipment
BTS	- Base Transceiver Station
BSC	- Base Station Controller
BSS	- Base Station Subsystem
MSC	- Mobile Switching Center
MSS	- Mobile Switching system
OMC	- Operation Maintenance Center
OAM	- Operation Maintenance and Administration
NMS	- Network Management systems
HLR	- Home Location Register
VLR	- Visitor Location Register
SME	- Site Monitoring Equipment