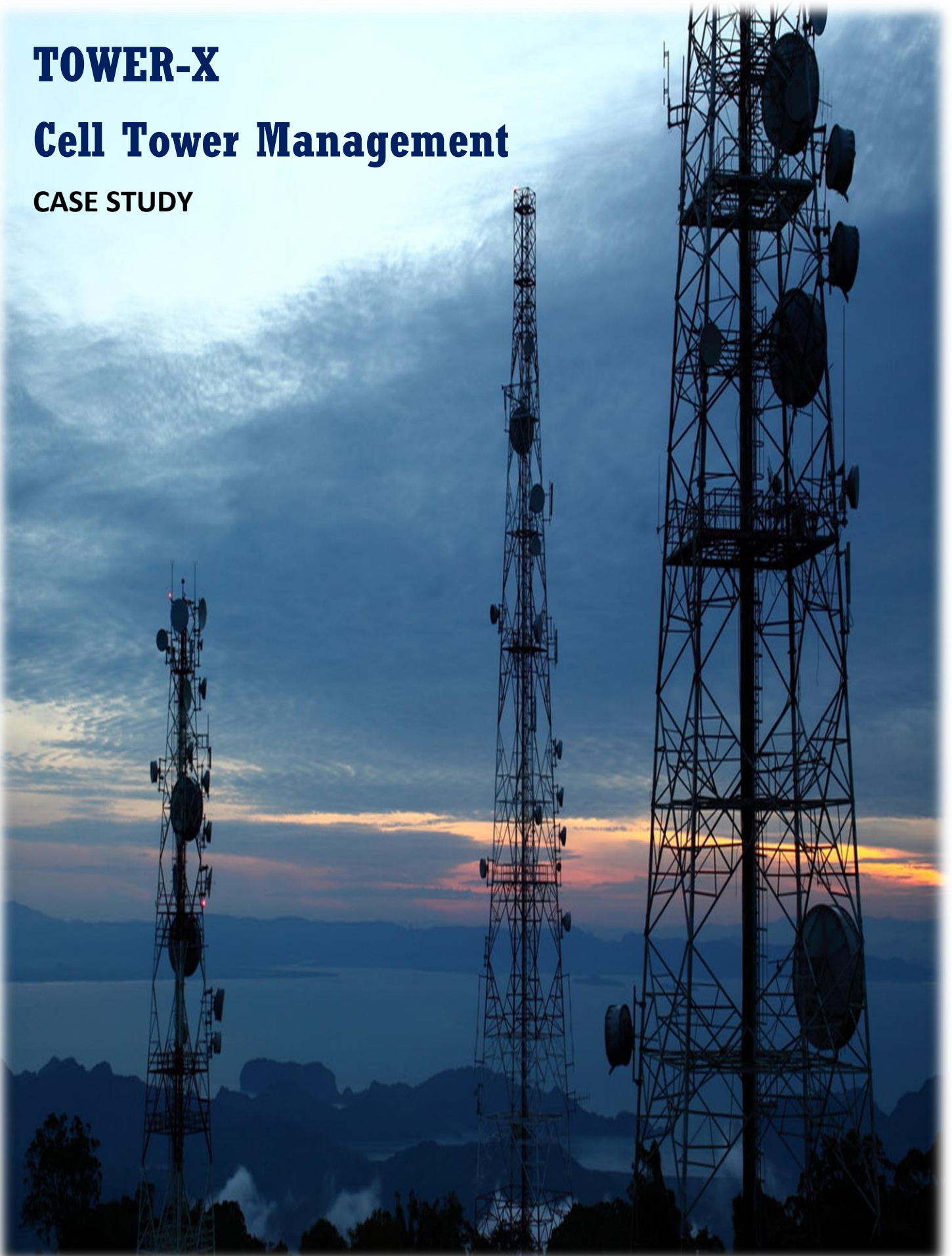


TOWER-X

Cell Tower Management

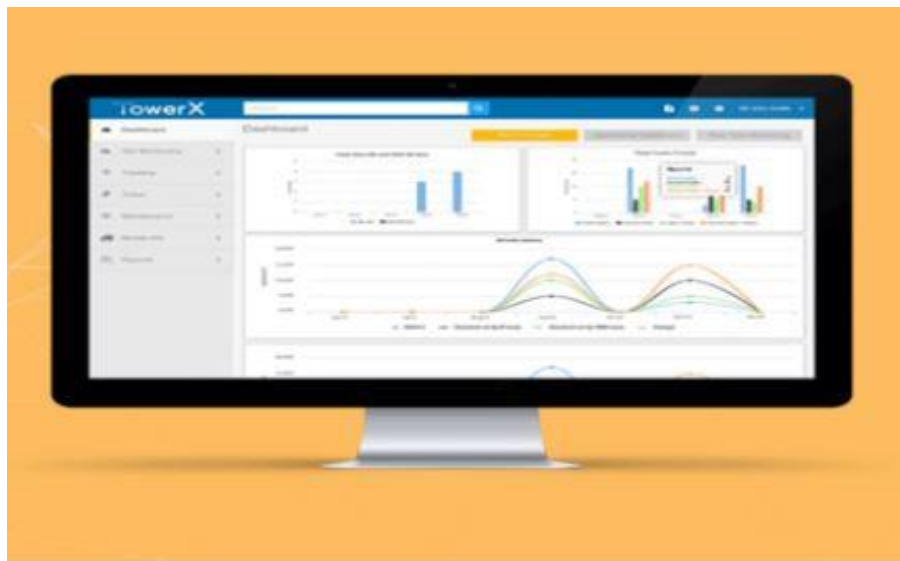
CASE STUDY



INTRODUCTION

Many tower players have invested in developing a state-of-art tower operations center from where they can monitor site performance across towers on real-time basis. Tower companies are also setting up well-structured maintenance programs in the form of preventive/ predictive and risk based maintenance activities. They are using live site monitoring data to ensure maximum uptime across its sites by having 24X7 Network Operations Center for Site and equipment maintenance. The tower companies are also focusing on training of its technical manpower to ensure minimum equipment breakdown and superior maintenance.

TOWER X- Our solution for TMS



The bottom line of Tower Monitoring Solution (Tower-X) is that telecom service providers can gain visibility into tower performance, transforming the way in which they operate by reducing operating expenditure and keeping profits up. Sensors mounted anywhere from door, fuel tank, to camera - collect and

transmit real-time data to the central management system, giving operators a complete picture of their current operational condition.

The real value of IoT for the telecom service industry is in gaining real-time insight into key operations and asset performance indicators. Tower-x offers a turn –key solution for remote monitoring of cell tower sites located in widely distributed geographical area. It's holistic solution that enables remote site management, energy efficiency, maintenance, and security of the entire site. Tower-X provides a proactive approach in managing the infrastructure by leveraging remote site intelligence that allows operators to anticipate, identify, and mitigate issues faster.

Features of Tower-X:-

- | | | |
|--------------------|--------------------------|------------------------|
| ➤ Asset Management | ➤ Fuel Management | ➤ Workforce Management |
| ➤ Alarm Management | ➤ Predictive Maintenance | |

With TMS (Tower-X), you can do the following:

- **Maintain Service Level Agreements(SLAs) with minimal capital expenditure**
- **Ensure smooth operations of asset-intensive remote sites**
- **Monitor fuel filling and avert fuel pilferage**
- **Cut opex to remain competitive**
- **Reduce environmental damage by cutting down carbon emission.**

TOWER-X SOLVING BUSINESS PROBLEMS

➤ Power Management

Cell tower sites rely on three major power sources: an often undependable grid, diesel generator, and battery bank (solar/wind power in few cases). With TMS, operators can swap between power sources and they can remotely switch to battery backup when the grid goes down thus optimizing battery lifetime. The solution also enables telecom operators to obtain the information required for strategic planning. For instance, detailed reports on power consumption of devices and outages facilitate operators to plan additional load requirements.

➤ Monitoring asset conditions

As cell towers operate in remote conditions with capital-intensive fixed assets, asset underutilization poses a threat of loss for companies in terms of downtime. Obviously, it is vital to monitor real-time health of assets to predict maintenance need and to identify the underperforming assets. For instance, the quality of power generated by the diesel generator is ascertained (in kWh) to define generator runtime and to measure the cost per kwh, enabling telecom operators to classify genset for replacement. TOWER-X allows operators to create custom views through custom dashboard feature. Wherein, a user can create a custom view of the status of all the assets at a particular cell tower site.

➤ Smart workforce and connected logistics

TOWER-X app brings in transparency within the supply chain and streamlines the workforce. When a remote cell site goes down, the field technicians will receive an emergency alert with details on device glitches, troubleshooting chores and accurate information on site location. By implementing CTM, telecom service providers can save 30% in maintenance and 20% of fuel costs on an average.

UNIFIED SITE DASHBOARD

localhost/Tower-x/Site/SiteMonitoring/SiteDetails/4

lowerX Search 15:47 17-02-2016 Welcome, t1 Admin | Log off

INDUS04 Last updated: 17-02-2016 15:40:23

Status Ticket Power Lithium Tenants Tracking Maintenance Diesel Log Remote Command Information Reports

Dashboard ETECH1004 BANKA BANKA Bhagalpur MH GBT 1000 Mr. Anandi Prasad yadav, ... Current Source BATTERY Site Mode AUTO

Generator	AC	Shelter	DG Battery	Battery Bank	EB	Power Plant	Solar
DG On	AC1Faulty	Door Alarm	RECTIFIER_OVER_VOLT	Rectifier Fail	Mains Fail	DGFuelLevelLowOne	SolarEnable/Disable
DG Failed To Start	AC1 And 2 Failure	HighTemperature	RECTIFIER_AC_INPUT_FAIL	On Battery	MainsLow	Load4LVDTrip	PV_Voltage_High
DG Failed To Stop	AC2Faulty	HighRoomTemperature	RECT_FAN_FAIL	Battery_Over_Discharge		Load3LVDTrip	PV_Voltage_Low
DG Fuel Level Low		FireAndSmoke	MAINS_ON_BATTERY_DISCHARGE	Battery_Over_Temperature		Load2LVDTrip	Charge_Controller_Fault
DGHighHeadWaterTemp			RECTIFIER_COMMUNICATION_FAIL	Communication_Error		ControllerTampered	Amsy_Fault_1
LowLubeOilPressure			DG_SENSING_FAIL	Over_Load_Current		LPF_DG	Amsy_Fault_5
DGAndEBRunning			BAT_LVD_TRIP	Site_On_VRLA		DCDGRunning	Amsy_Fault_4
FuelTheft			HIGH_BATTERY_TEMP	Site_On_Li_Ion		SimMissing/Tampered	Amsy_Fault_3
FuelRefil				DOD_80		Load1LVDTrip	Amsy_Fault_2
DGFault				BMS_1_Comm_Error		LPF_EB	Amsy_Fault_8
Renewable Active				BMS_4_Comm_Error		RectifierMissingAlarm	Amsy_Fault_7
				BMS_3_Comm_Error		LVDBypass	Amsy_Fault_6
				BMS_2_Comm_Error			CC_Fault_4
				Module_short_circuit			CC_Fault_3
				Auto_Test_Failure			CC_Fault_2
				Fuse_Blow			CC_Fault_1
				BMS_Emergency_Alarm			SOLAR PV Theft

localhost/Tower-x/Site/SiteMonitoring/SiteDetails/6

lowerX Search 15:48 17-02-2016 Welcome, t1 Admin | Log off

INDUS06 Last updated: 17-02-2016 15:45:23

Status Ticket Power Lithium Tenants Tracking Maintenance Diesel Log Remote Command Information Reports

Dashboard ETECH1006 BHAGALPUR BHAGALPUR Bhagalpur MH GBT 1000 Mr. Birendra Kumar Verma, ... Current Source BATTERY Site Mode AUTO

Grid/Generator	Generator	Battery
<p>1000 100 1</p> <p>800 80 0.8</p> <p>600 60 0.6</p> <p>400 40 0.4</p> <p>200 20 0.2</p> <p>0 0</p> <p>Freq Hz Voltage V Current A Power Factor</p>	<p>100</p> <p>80</p> <p>60</p> <p>40</p> <p>20</p> <p>0</p> <p>Fuel Lts Battery V</p>	<p>100</p> <p>80</p> <p>60</p> <p>40</p> <p>20</p> <p>0</p> <p>Charge % Voltage V</p> <p>12.3 1000AH Cell Info</p>

Why TOWER-X for Tower Management

- IoT deployments are extremely complex involving massive number of sites to be monitored and connecting a mix of devices, networks, and applications.
- The out of the box TMS functionality from TOWER-X enables a simplified implementation and minimizes the time required for configuration.
- Backed by deep expertise, highly extensible IoT Platform, and broad ecosystem of partners, TOWER-X functionality plays a key role in providing end-to-end cell tower monitoring solution.

Tower-X is helping operators to boost profits through:-

