

Safety & Integrity Practices in MGL



Table of Content

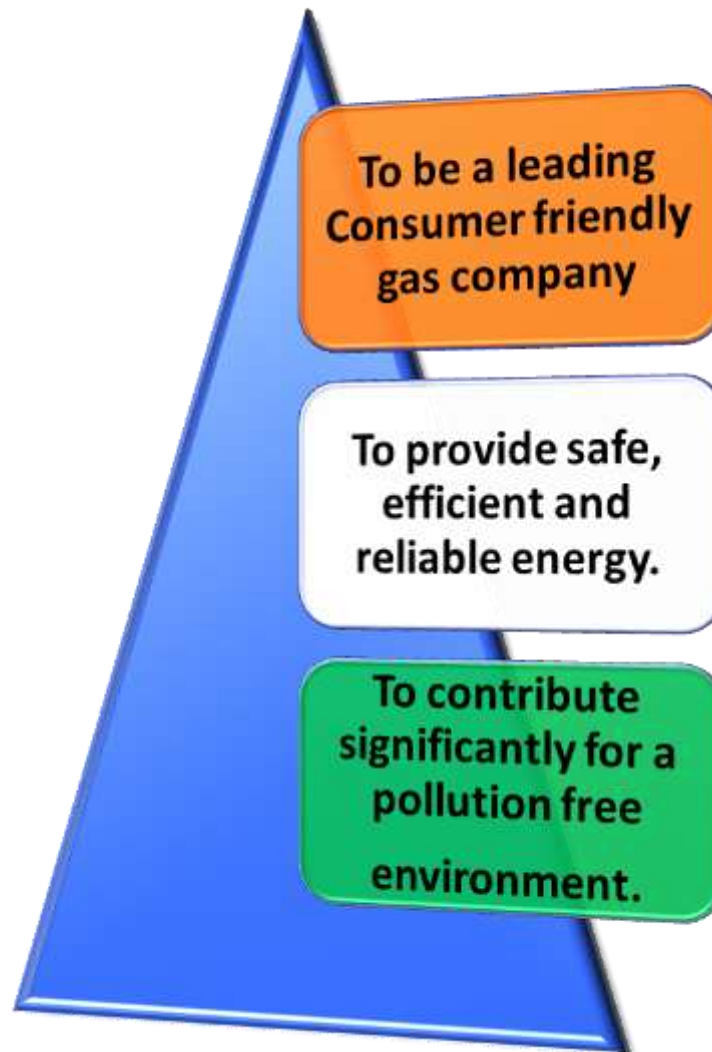
Sr. No.	Section
1	About MGL
2	MGL Gas Distribution Network
3	MGL Statistics
4	Safety & Integrity of Assets
5	Emergency Handling
6	Integrity Assurance Framework in MGL
7	Incidents Analysis
8	Lessons Learnt & Challenges

MGL – an Overview

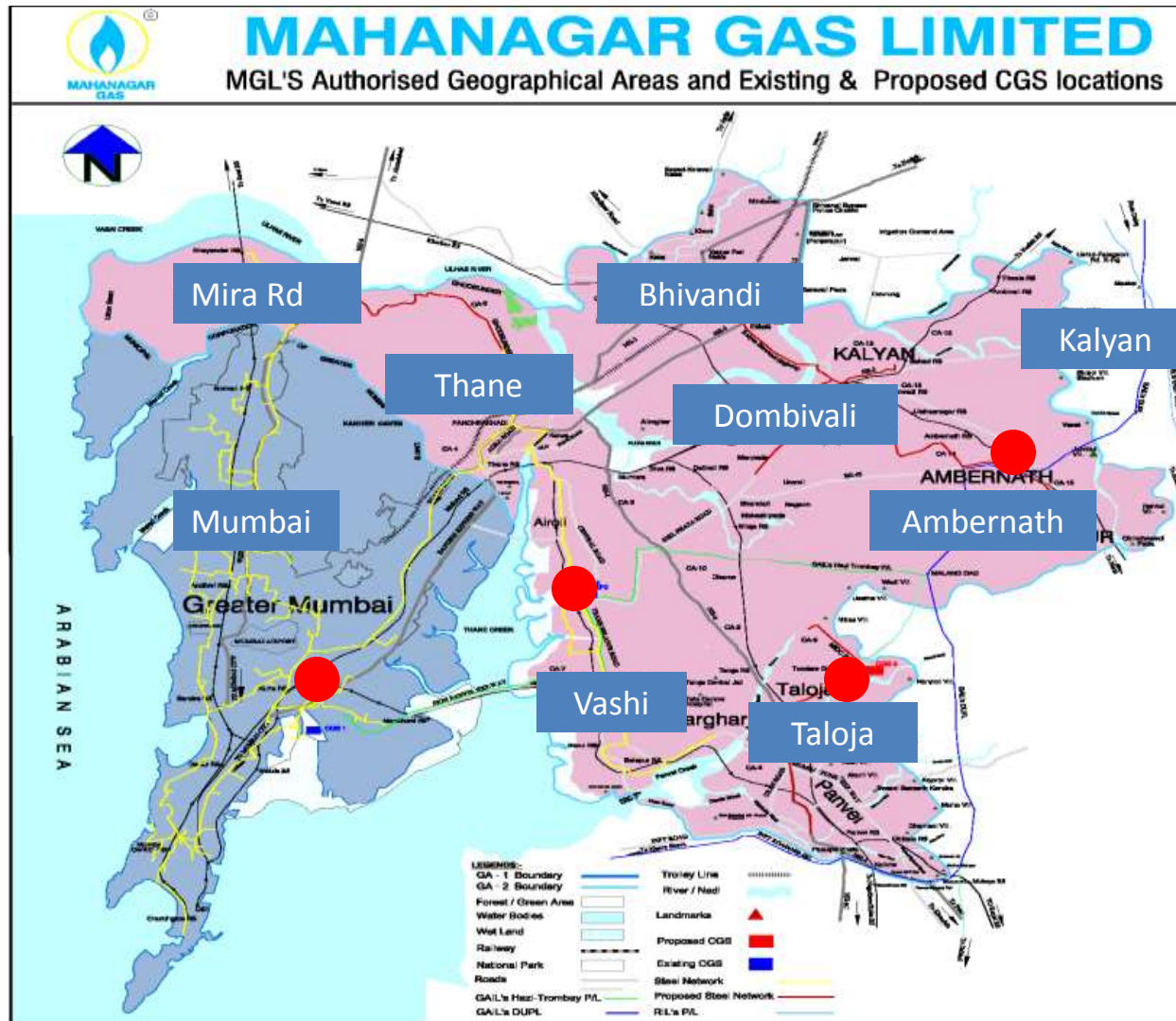
- Mahanagar Gas Limited (MGL) is a leading Piped Natural Gas Distribution company in India, currently operating in Mumbai & surrounding areas.
- A Joint Venture of GAIL, BG (UK) & Govt of Maharashtra, set up in 1995.
- MGL has till date laid a network of 389 Km of Steel & 3865 km of PE (MP & LP) pipelines covering a domestic potential of more than 1 million customers.
- ISO 9001, 14001 & OHSAS 18001 Certified.
- Safe & Successful 18 years of business so far.



MGL Vision



Gas supply area



Gas Distribution Network

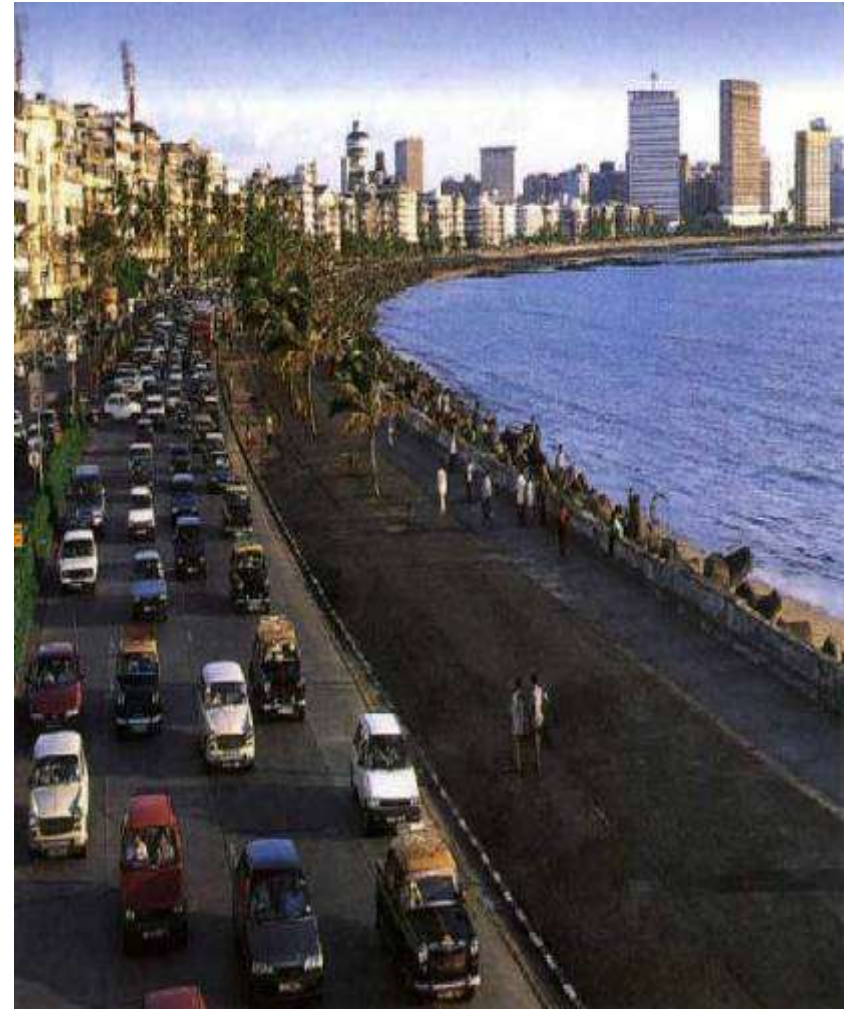


MGL Statistics

- CNG Outlets : 170 nos.
- Steel pipelines : 389 Km
- Polyethylene pipelines : 3865 Km
- District Regulating stations: 47nos.
- Daily Gas Sale volumes : ~ 2.3 MMSCMD

Customers (as on 30th June 2014)

- Domestic – 6.5 lacs
- Industrial units – 53 nos.
- CNG Vehicles – 3.78 lacs
- Hotels / Commercial – 2369 nos.



MGL – Core value

We believe that –

“Outstanding business performance requires outstanding performance in Safety”



Codes & Standards

Design, Construction, Operation and Maintenance conforming to applicable National & International standards – PNGRB technical standard, ASME, IGE/TD, API , AGA etc.



- Underground steel pipeline laying (B31.8)



- Steel pipe (API 5L Gr.B)
- Welding / Radiography on steel pipe (API 1104)



- CP Design & Monitoring

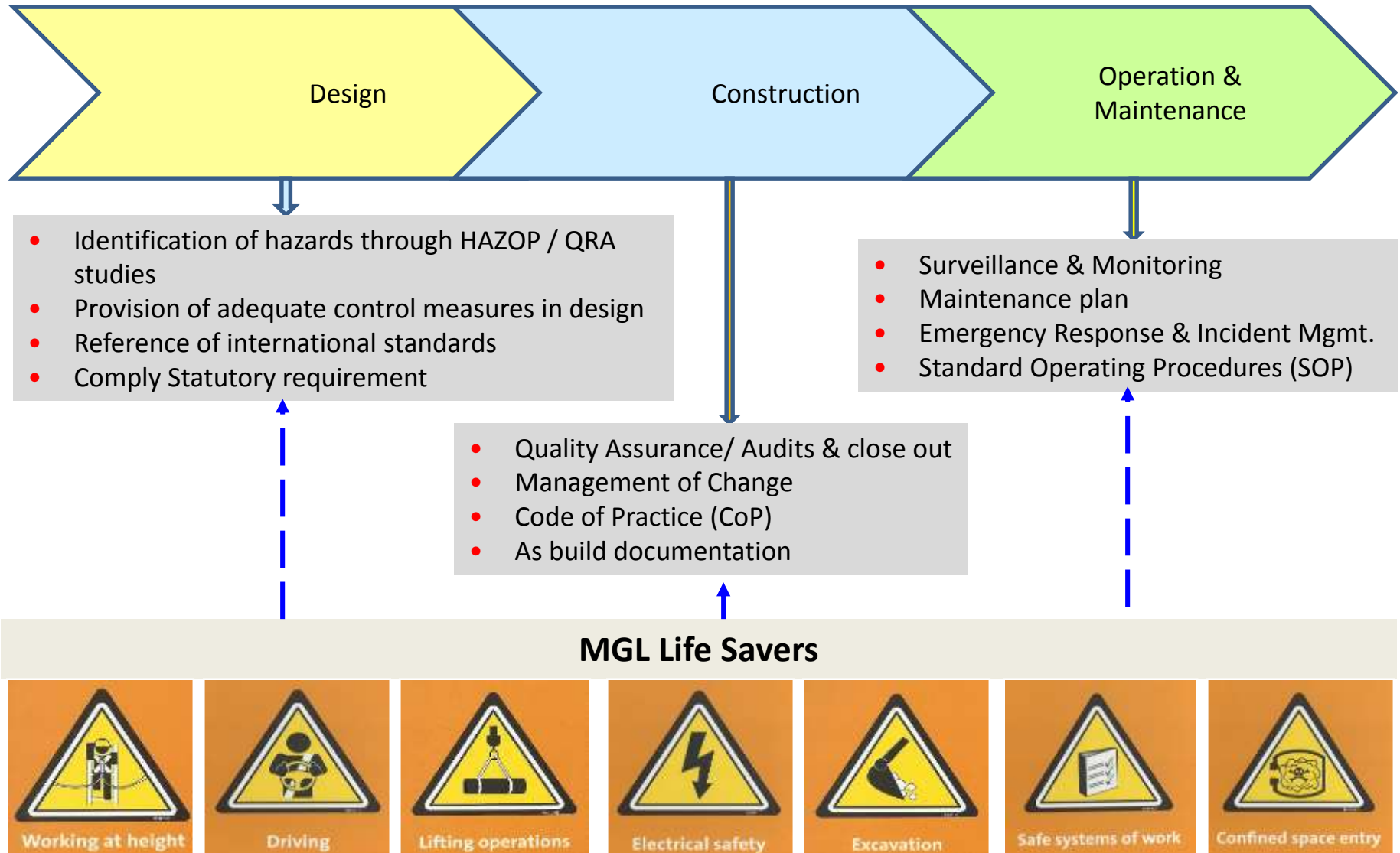


- PE distribution system (IGR TD 3)



- T4S for CGD
- IMS

Integrity assurance – Throughout life cycle



Safety & Integrity

Compressor – Design features



- Design conforms to international standards - API 618/ / API 11P.
- Electrical devices, control panel, instruments suitable for hazardous area classification Zone 1 (as per IS 5572), Flameproof electrical fittings
- Pressure transmitters / switches for automatic shut down of compressor in case of process deviation..
- Provision of GD / FD inside canopy.
- Complying PESO guideline
- ESD at three places – Compressor, Dispenser and Sales office
- Provision of CO2 flooding system

Compressor – Safety features



- 24 x 7 trained compressor operator available
- Regular audits by senior management
- “Permit to Work” system – to ensure safe isolation during maintenance

- Uninterrupted Gas Supply
- Detection of gas leak in advance
- Performing activity in safe manner
- Preventing incidents / accidents

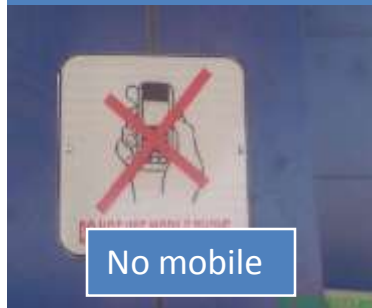
Safety & Integrity

Dispenser – Safety features



- Brake away coupling on filling hose - to prevent leak if hose pull out occurs
- Filling hoses are electrically conductive to avoid any static charge
- ESD at Dispenser
- Trained filler men equipped with adequate PPEs
- “No Metal plate - No Gas” strictly being followed.
- Dispenser Operator check metal plate for.....
 - Metal plate is clearly visible
 - There is no any correction / overwrite.
 - Vehicle Number is same as mentioned in metal plate.
 - Test date and next due date of cylinder is available

Pre-checks for safe CNG refueling



Safety & Integrity

Steel Pipeline – Safety Features



- CP Monitoring through RMU system
- DCVG survey prior to pipeline commissioning
- Corrosion rate analysis thru –
 - Testing Opportunistic Coupon @ IIT
 - ER Probes – on quarterly basis
- CP Parameters monitoring through RMU

Prevent Corrosion

Steel Pipeline – Safety features



- Surveillance (Patrolling) – Twice in a day
- Leak Detection survey – Once in a year
- Interaction with other utility
- 100% steel network mapped in GIS
- Awareness Campaigning (Dial before dig)
- Odorization level check at the network extremities

Avoid Third party damage

Safety & Integrity

DRS – Design features



- Twin Stream – 100% Redundancy.
- Active + Monitor Regulator in each stream
- SSV + SRV for over pressure shut off
- Auto switch-over incase of one stream malfunction
- Data logger in each DRS to monitor operating parameters

DRS – Safety features



- Maintenance – once in a year
- Risk audit of each DRS installation
- DRS network in loop

- Supply Continuity
- Prevent unplanned release

Safety & Integrity

PE Pipeline - Design features



- Laid with typically 1 meter top cover plus RCC tiles & warning tape
- Low pressure (100mbar) network inside residential premises
- PE pipe procured in coils to minimize number of joints
- Can be easily squeezed off for stopping gas supply during emergency
- Best method of PE jointing i.e., electrofusion fittings are used



PE Pipe – Safety features



- Extensive Patrolling - Twice in a day
- Use of GIS Software
 - 100% network mapped
 - Handheld devices with GIS system by patrolmen
- Use of VTS for effective monitoring of patrolling activity.
- Leak detection survey – once in a year
- Coordination meetings with other utility
- Use of anti rodent HDPE sleeve bends to safeguard PE crimp from rodent bite

- Damage Prevention
- Avoid rat bite
- Minimize joint failures

Safety & Integrity

GI Pipe - Riser

Riser Photo

- Powder coated pipe
- Welded joints in high rise building riser
- Use of Pre-sleeved hole piece for wall crossing
- Use of Aluminum clamps
- Installation - open to atmosphere
- Periodic maintenance of Riser pies.

- Corrosion free riser
- Minimize joint failures



Pre Sleeved Hole Piece

Safety & Integrity

Domestic Meter Installation



- Meter Control Valve (MCV) at the entry point
- Meter installation in adequately ventilated area
- Preventive maintenance at regular intervals
 - Leak test

I&C Meter Installation

- Audit of every I&C installation by operation team
- NOC from Fire Brigade Officer for each I&C installation
- Dedicated isolation valve in PE network for individual I&C connection
- Meter reading – daily for Industrial customer and once in fortnight for small commercials (Hotels / Restaurants)
- Isolation valves provided at strategic locations



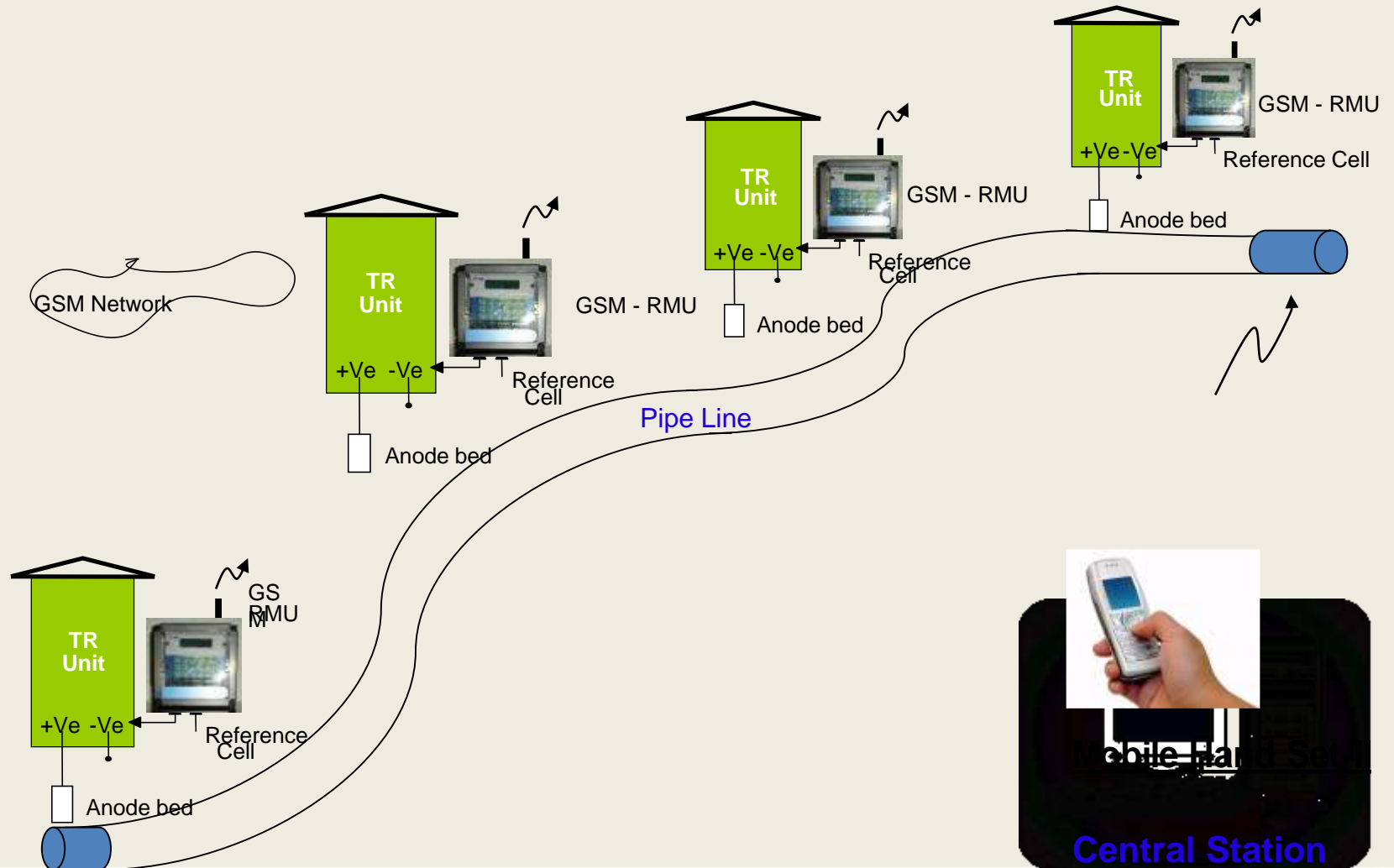
MGL CP System



- Temporary CP during construction stage, ICCP post commissioning.
- Remote Monitoring Unit (RMU) – Various data / information captured remotely
 - PSP, DC volt, AC volt, AC current
 - Various alarms – Under PSP, Over protection, All reference fail, TR unit door open etc.
- Diode Stations installed at Railway crossings to mitigate DC interference
- ER probes / corrosion coupons – ER probes to determine the corrosion rate and corrosion coupons to determine the ON and OFF PSPs
- DCVG survey – prior to commissioning to detect coating defect



Best Practice - Remote Monitoring Unit (RMU)



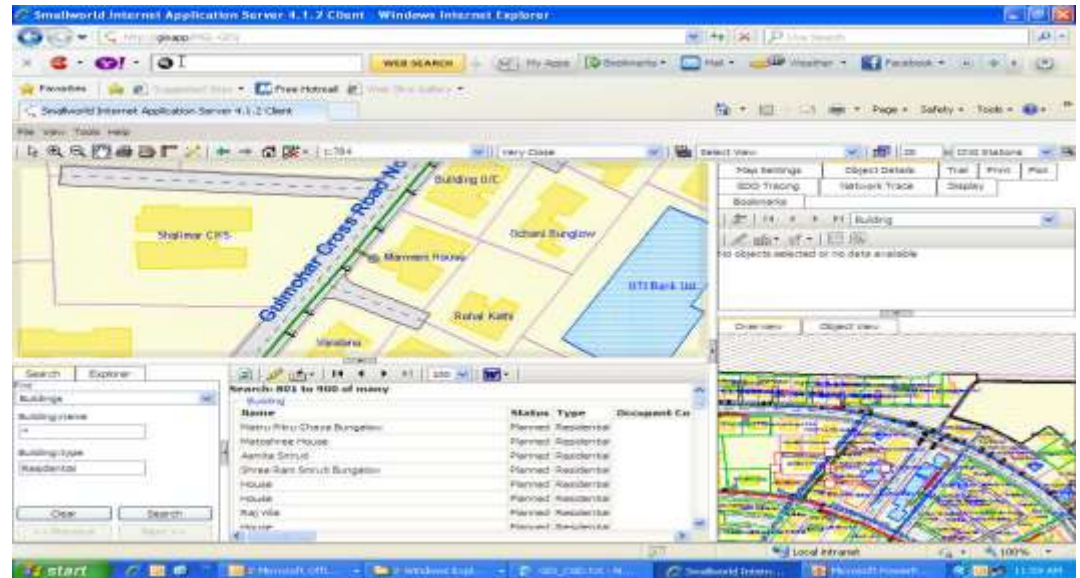
RMU Features

- 1 All Transformer Rectifier (TR) units configured in RMU system
- 2 Remotely configurable broadcast interval - 1 broadcast / 5 min to 1 broadcast / 24 hrs.
- 3 Alarm notification on configured mobiles & central station with exact time stamping of data.
- 4 Directly accepts TR signal without any signal transducers.
- 5 TR data can be requested from any TR form any time.
- 6 TR data can be viewed in graphical and analytical format at the central station.
- 7 Data Analysis & Monitoring



Best Practice - GIS

- Geographical Information System (GIS) – GE Smallworld with GDO.
- Making network information available in field – Tablets / Mobiles / handhelds
- Capturing lines while being laid - DGPS

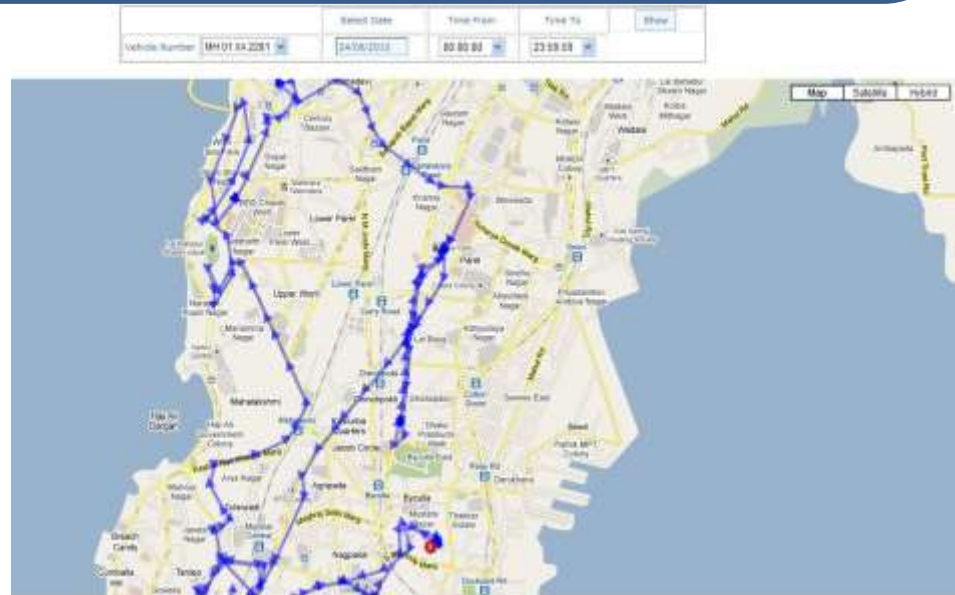


Best Practice - VTS

- Ability to track Vehicles from Point to Point in real time
- Visual representation of the geographical location
- Real time two-way communication between the base, Operations and vehicles
- Ability to provide accurate network wide location information of the entire fleet
- Grouping of Vehicles by user



VTS installed on Patrolman's motor bike



VTS shows route taken by Patrolman

Best Practice - AUT

- Automated Ultrasonic Testing – NDT technique
- Used to check soundness of weld joints
- Alternative to Radiography to avoid radiation hazard



Performing AUT at site



Results Interpretation

Emergency Handling

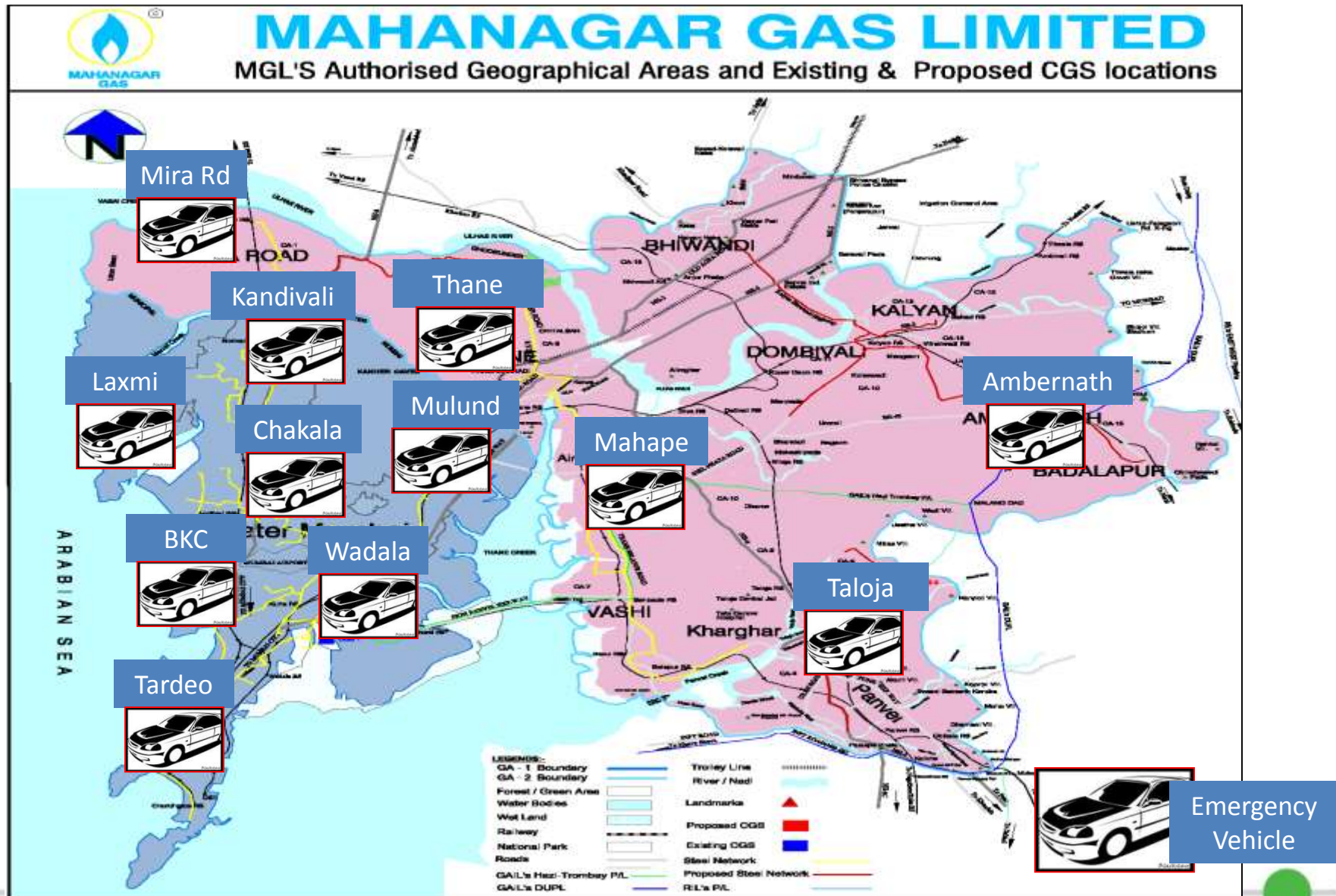
Preparedness is the Key.....

- Doing all we can to prevent incidents
- Having robust response system to tackle

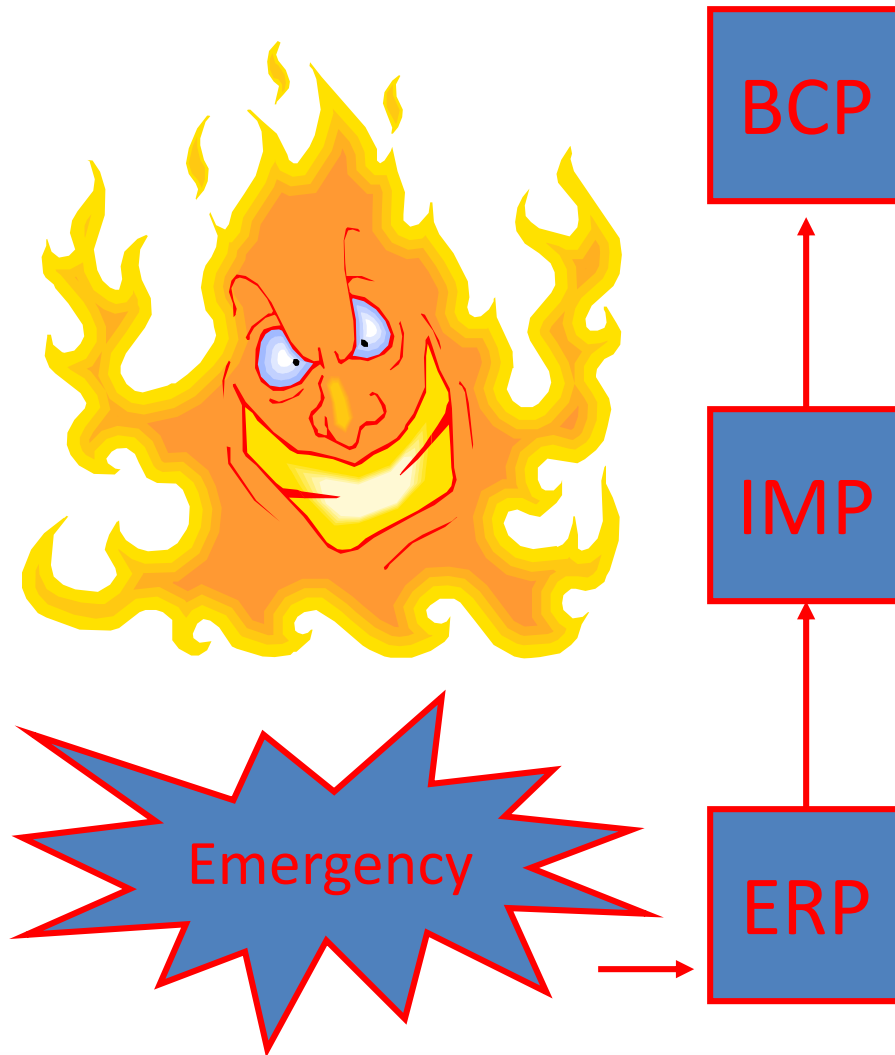
- Adequate number of PE stop off valves in network.(500 mtrs)
- Major part of PE network in loop.
- Internal bench mark response time of 30 min.
- Patrolmen equipped with pipeline route map, valve key.
- Regular update of charged SR loop list.
- Valve closure analysis gives instant information of number and location of SRs, downstream of any PE valve.
- MCC support after office hours.
- Mock drills



Emergency Vehicles placed at Strategic locations



Emergency Response – Three Tier system



(3) Business Continuity Plan

Alternate arrangements to enable business continuity.

A sample Business Continuity Plan form from Mahanagar Gas Ltd. The form is titled "BUSINESS CONTINUITY PLAN" and includes sections for "FILE OF DOCUMENT", "REVIEWED/REVISION", "APPROVED", and "REVISIONS". It contains various fields for details, dates, and signatures, with a table at the bottom for tracking revisions.

(2) Incident Management Plan

Manage & limit the impact on Business & surroundings.

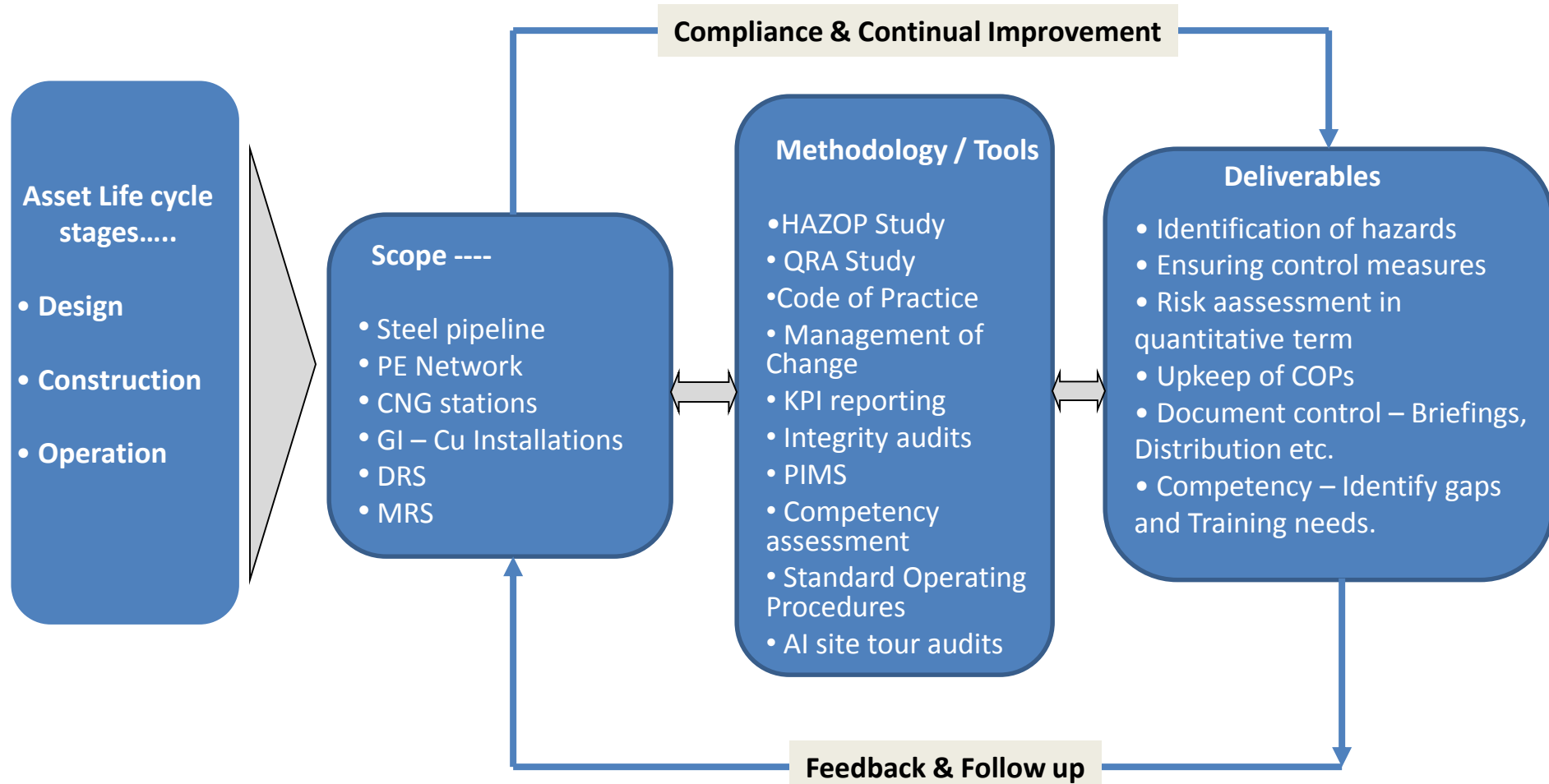
A sample Incident Management Plan form from Mahanagar Gas Ltd. The form is titled "INCIDENT MANAGEMENT PLAN" and includes sections for "FILE OF DOCUMENT", "REVIEWED/REVISION", "APPROVED", and "REVISIONS". It contains various fields for details, dates, and signatures, with a table at the bottom for tracking revisions.

(1) Emergency Response Plan

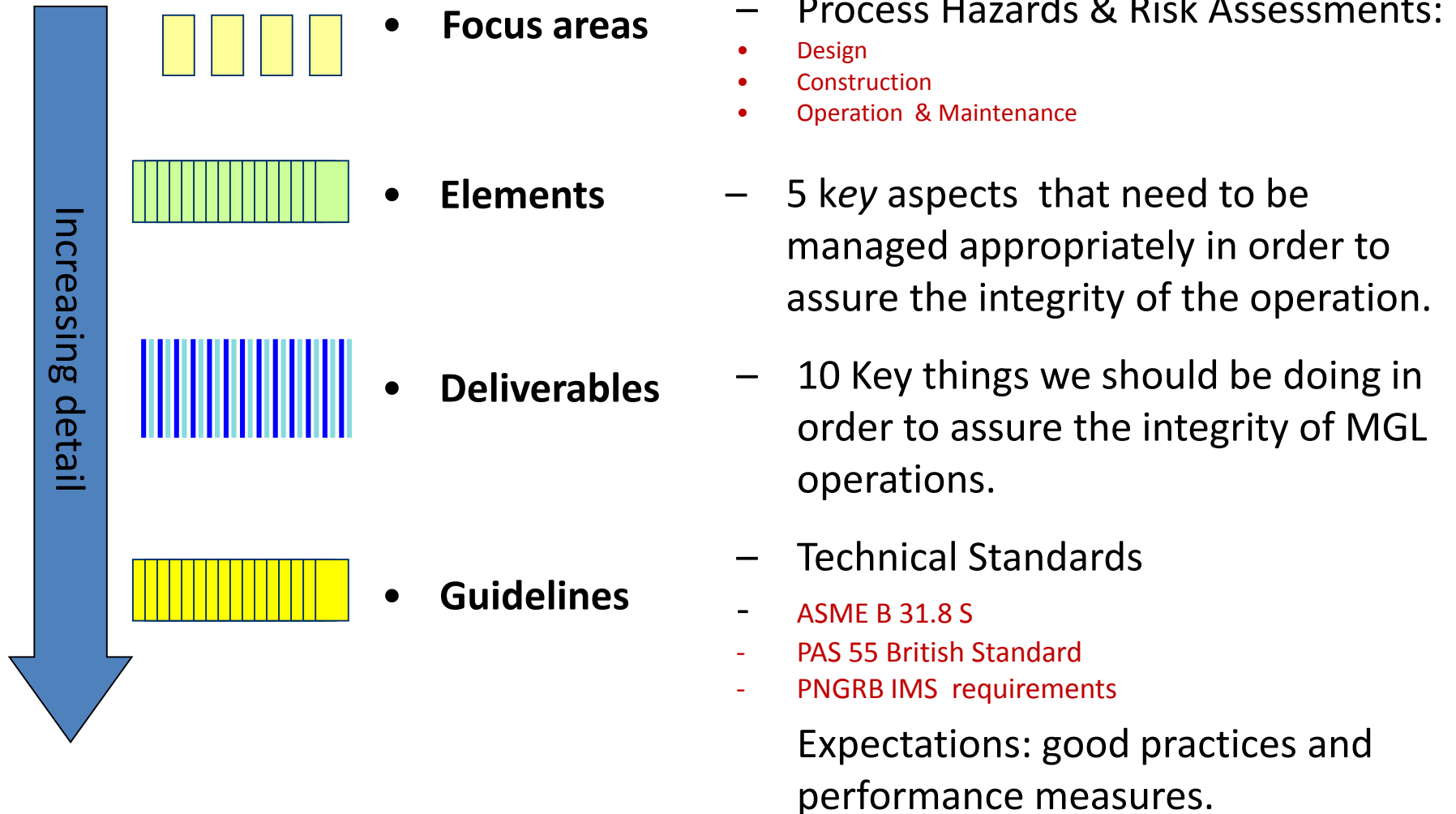
Immediate action to tackle the incident

A sample Emergency Response Plan form from Mahanagar Gas Ltd. The form is titled "EMERGENCY RESPONSE PLAN" and includes sections for "FILE OF DOCUMENT", "REVIEWED/REVISION", "APPROVED", and "REVISIONS". It contains various fields for details, dates, and signatures, with a table at the bottom for tracking revisions.

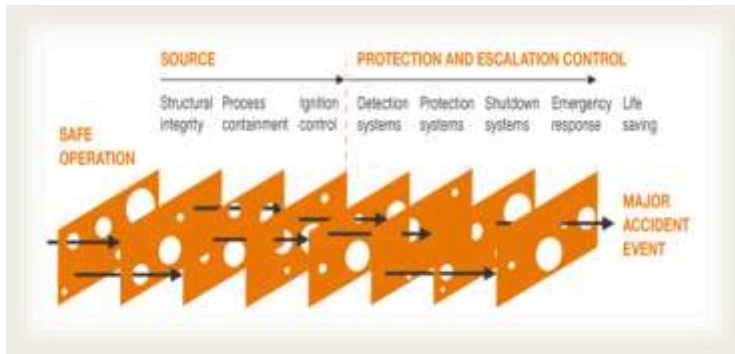
Integrity Assurance Framework in MGL



AI – Approach



Elements of Asset Integrity in MGL



- Risk audits (1)
- SCE performance audits (2)
- Non process installations audits(3)

Process Safety Assurance

- MOC Procedure (4)
- Risk assessment
- Documentation and Close out(5)

Management of Change

- QRA study – Pipelines, CGS, CNG stn (6)
- HAZOP studies
- KPIs monitoring, (7) Maintenance Plan

Assessment , Control & Monitoring

- COP custodian (8), Briefings
- Standards and Guidelines
- Incident investigations & LLB(9)
- Safety Case

Document Control & communication

- Competency Matrix
- Competency assessments (10)
- Training on Gap areas

Competency Assessment & Training

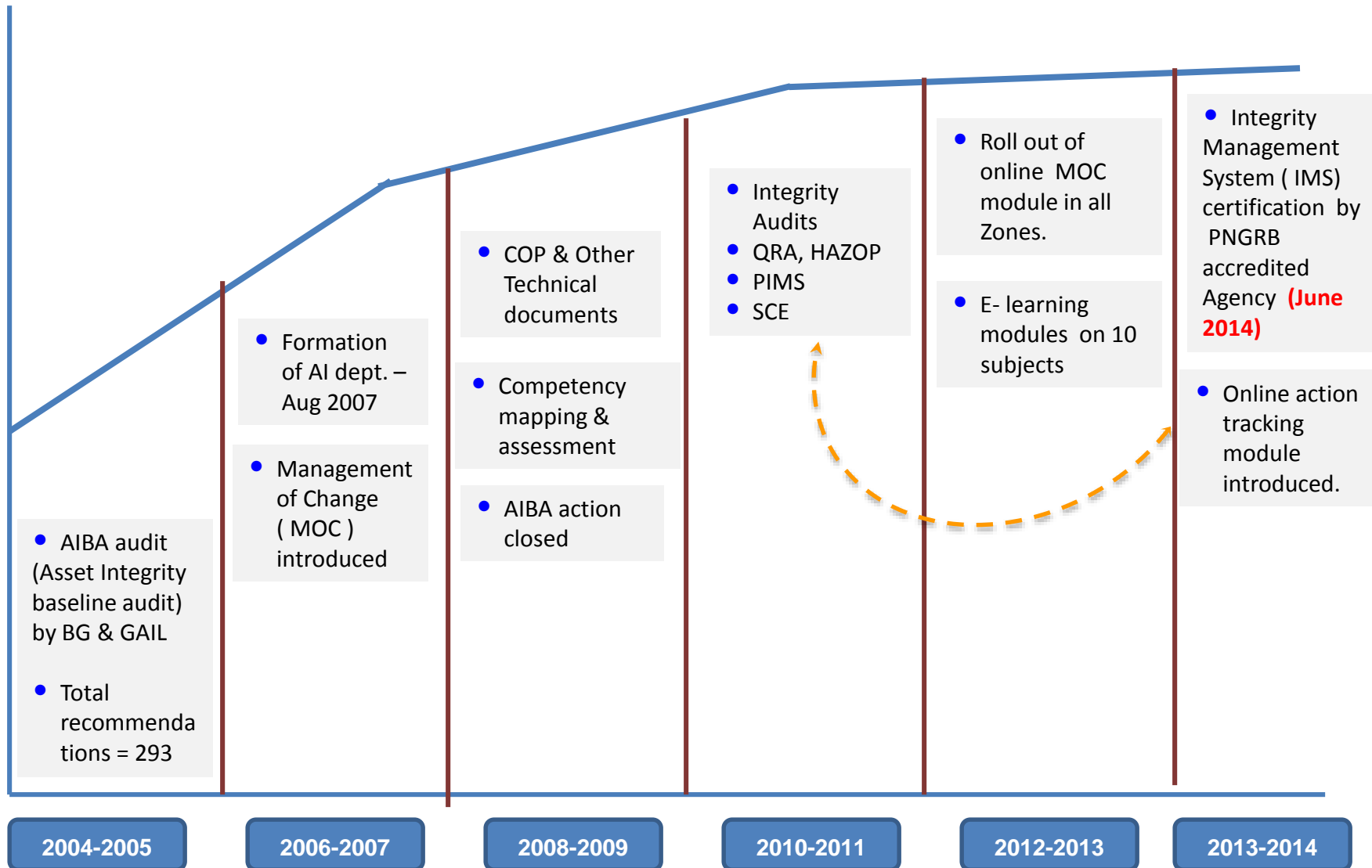
Asset Integrity Audits

No.	Audit Type	Frequency	Remarks
1.	Risk Based Inspections (RBI) • DRS, MRS, CNG, SR	<ul style="list-style-type: none"> Each installation/ year; 5 SR / DRS area 	----
2.	SCE performance Audits • SRVs, SSV, GD, FD, Earth Pit, Fire Fighting etc.	<ul style="list-style-type: none"> 5 % of total SCEs in a year 	----
3.	Non Process Installation Audit • RF Tower, DG Set, HT & LT equipments, VAM etc.	<ul style="list-style-type: none"> Each equipment/ month 	-----
4.	Integrity Audits (Emergency Readiness Review) • All districts	<ul style="list-style-type: none"> 1 District/ month 	-----
5.	Meter Audits for I & C Customers	<ul style="list-style-type: none"> 4 cyles/ annum/ meter 	2 cycles by O& M
6.	AI management Tour	<ul style="list-style-type: none"> 2 audits/ annum/ HOD 	Technical Function

Asset Integrity - KPI

AI KPI – BG Reporting		Element Description	June'14	TARGET
Challenges to Safety system	(AIKPI 2G)	Supply failure of any duration due to operational problem to i) I&C customer of nominated gas qty > 1000 scmd ii) 500 or more customers in a single incident iii) CNG station under breakdown for > 24 hrs	0	0
Maintenance	(AIKPI 4A1)	Maintenance of Safety Critical elements not completed by their original scheduled completion date (number of such WO)	11	0
Management processes	(AIKPI 6A)	AI improvement plan - % Compliance against progress of activities i) Steel PL diversions ii) Development of Vendors for Rodent Repellent iii) MOC close out iv) Installation of Spark Arrestor	88 %	100%
	(AIKPI 6C)	MOCs approved but not closed out - execution, documentation (nos)	0	0
	(AIKPI 6D)	Progress compliance in Competency assessment (%)	92.70 %	100%
Loss of Primary Containment	(AIKPI 1A)	Total nos. of damages having gas release more than 500 kg	0	0
	(AIKPI 1B)	Total no of damages having gas release between 250 to 500 kg	0	0
	MGL KPI	Total no of damages having gas release between 0 to 250 kg	9	0
	(AIKPI 1E (i))	Rate of damages (for the last 12 months) exclusively due to Third Party Agencies per 1000 kms of mains in steel network .	0	0
	(AIKPI 1E)	Rate of of damages (for the last 12 months) exclusively due to Third Party Agencies per 1000 kms of mains in PE network.	10	10 (0)*
	(AIKPI 1E (II))	Number of gas escapes incidents resulted in fire	0	0
	(AIKPI 1D)	Rate of damages excluding Third Party Damages per 1000 kms, (e.g. damages due to corrosion, joint failure, rodent bites etc) on entire network	1	2 (0)*
* - Internal target		MGL Score	66.66%	90%

Asset Integrity – MGL Journey

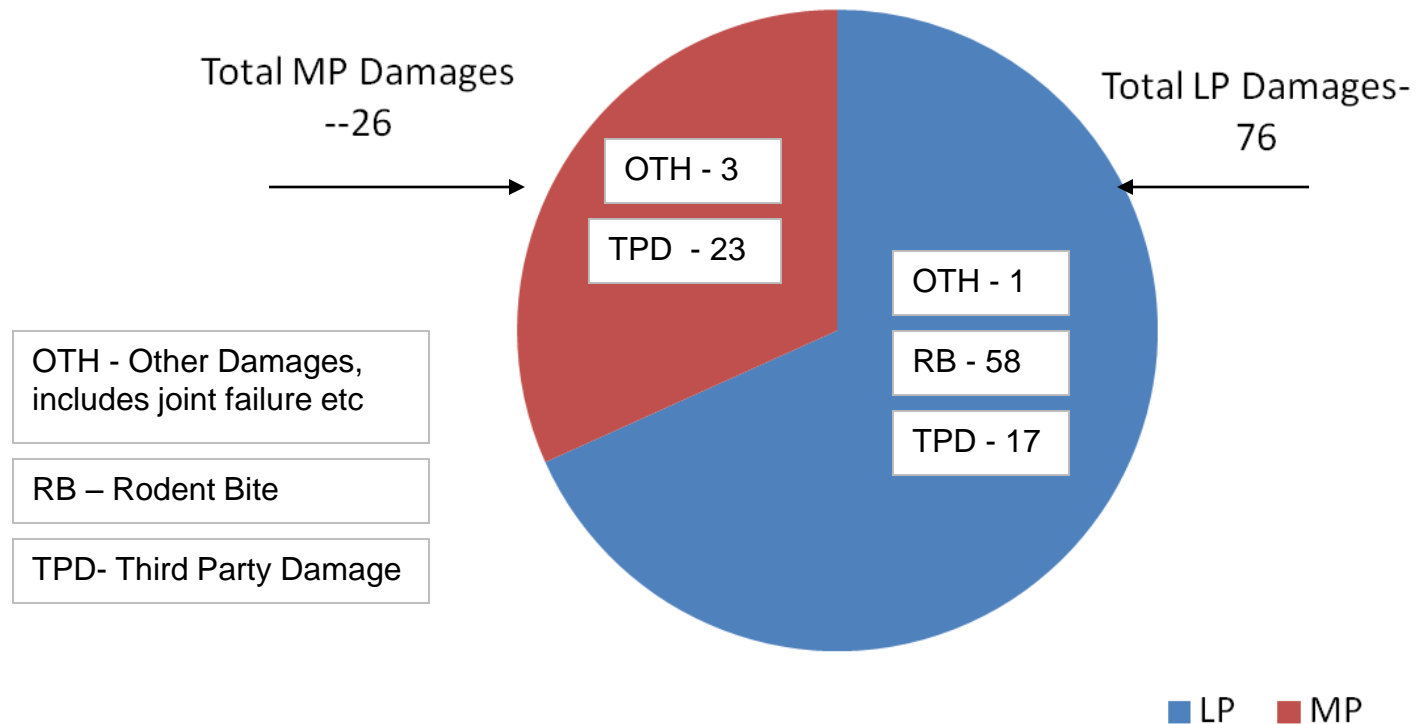


Past Incident Analysis

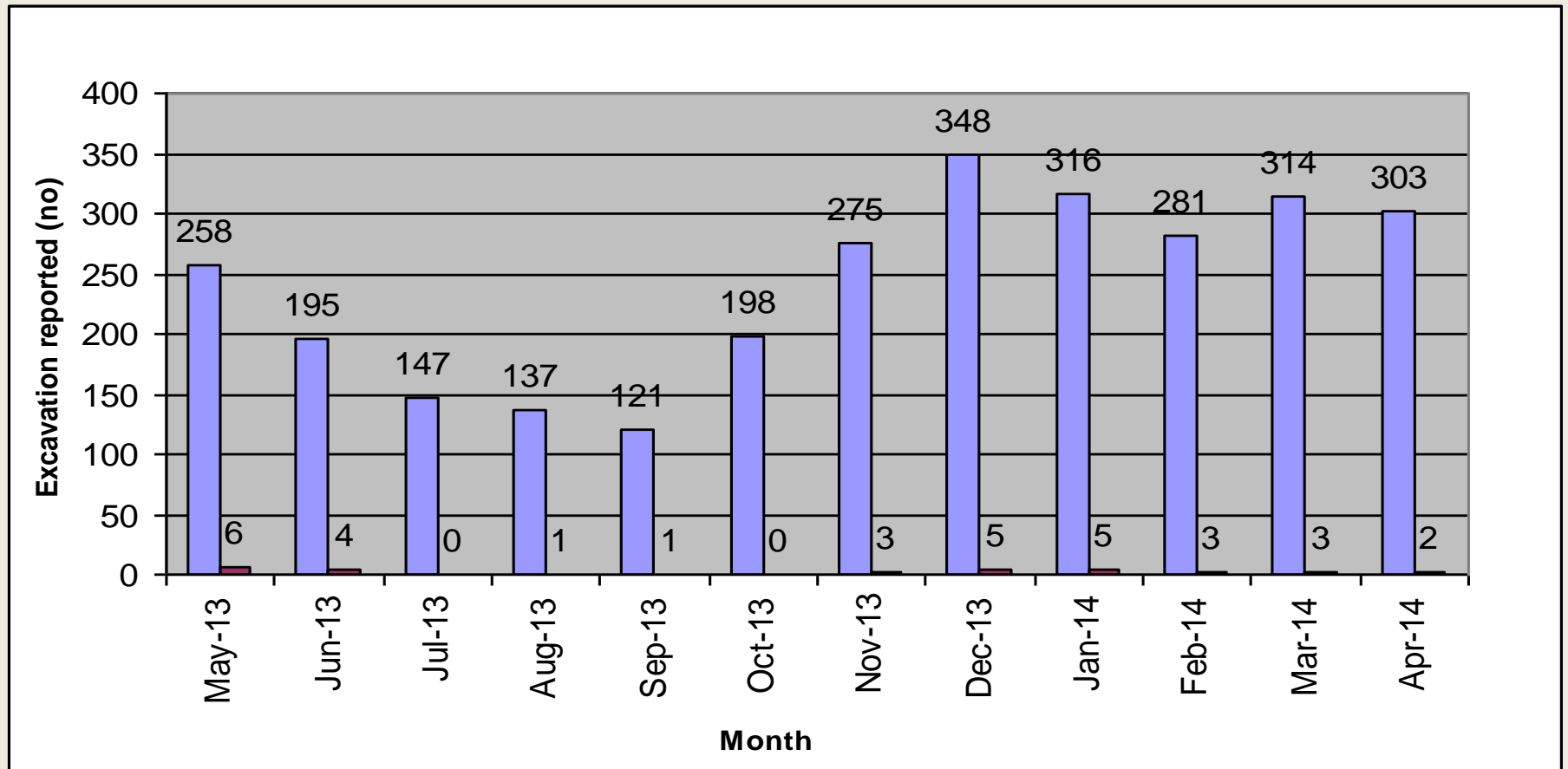


PE Damage statistics

PE Damages July 2013 to June 2014



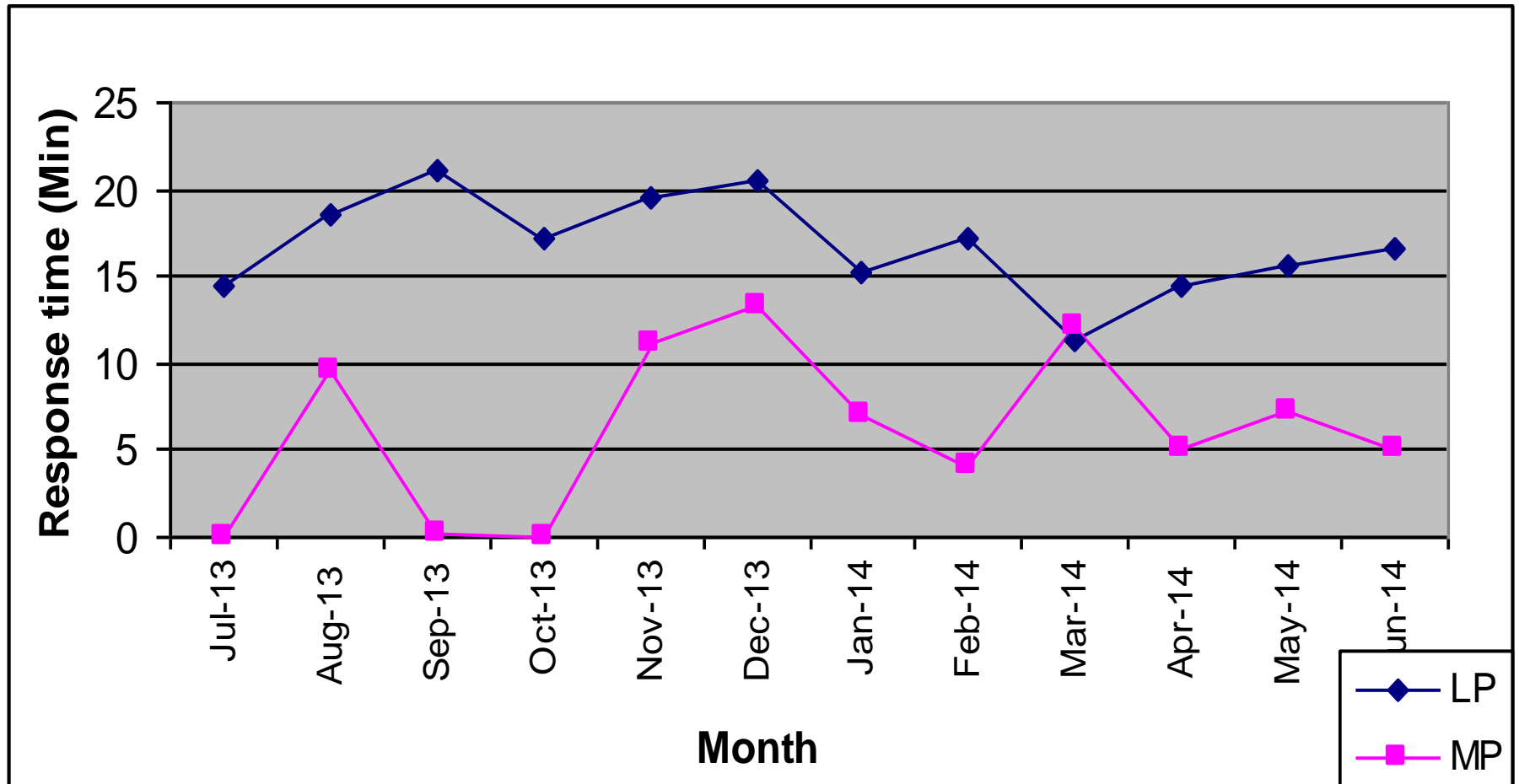
Comparison — Excavation reported v/s Third Party Damage



PE Damages Excavation reported v/s Third Party Damage

Sr.	Date	Location	Incident Details
1	28.01.2013	Kopar Khairne, Navi Mumbai	PE pipe size - 63 mm, Damaged due to trench collapse during NMMC-Sewerage work. Ignition Source - Excavator engine spark
2	28.02.2014	Kasarvadavli Nallah, Ghodbundar Rd, Thane	PE pipe size - 90 mm, Damaged during HDD by MSEB contractor. Ignition source - Open cooking stall.
3	30.03.2014	Bhandup (W)	PE pipe size – 63mm PE was touching electric cable & melted due to over heating of cable. Ignition Source - Heating of power cable.
4	13.05.2014	Andheri (E)	PE pipe size - 63 mm Damage during HDD activity. Ignition Source: Cigarette lighting.

PE Damages – Response time



Damage Analysis – Observations

- Third party damage is a major threat to gas network
- Third party Damages are generally less during off construction season.
- Lesser diameter of PE pipe (20, 32 mm) - more prone to damage.
- Rodent bite damage – occurs close to property on small diameter pipes.
- Number of PE Joint failures are very small.
- Not a single incident of steel pipeline failure due to corrosion



Lessons Learnt

- During off days / holidays, additional phone calls to utility contractors
- Frequency of site visits at critical site to be increased
- Ensure COP compliance during construction – mainly top cover, proximity, clearance between utility etc.
- Dial Before Dig campaign – wide publicity
- Temporary (by pass line) line laid aboveground – need close supervision
- Regular interaction with other utilities – briefings etc.
- Emergency & awareness training at User / Ground level



Challenges & Way forward

- No separate corridor – limited space
- Infrastructure development – Road, Flyovers
- Presence of other utilities.
- Reinstatement cost
- Railway traction system
- Change in as build references



Challenges & Way forward

- Third party damages continues to be a major challenge across the CGD (T&D) sector.
- Validation of CNG Cylinder kit





THANK YOU

Back up Slides



CP Monitoring Plan.....

Sr.	CP Component	No. of components	Monitoring Frequency
1	Transformer rectifier Units	35	Quarterly
2	Diode Stations	22	Quarterly
3	Test Stations	830	Quarterly
4	Electrical Resistivity Probes (external)	47	Quarterly
5	Corrosion coupons	52	Quarterly
6	Cased crossings	35	Six-monthly
7	Sectionalizing Valve assemblies with IJ	74	Six-monthly
8	PE-Steel nallah crossings	179	Six-monthly

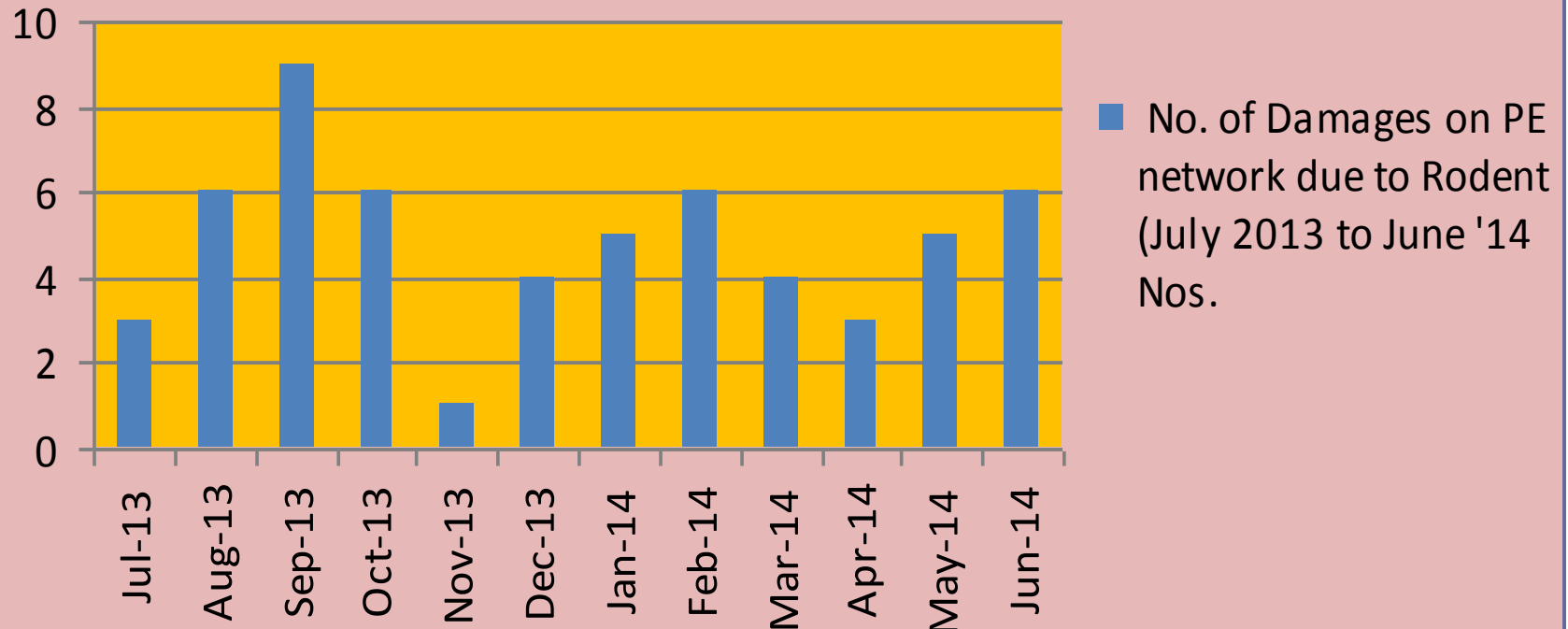
CP Monitoring Plan.....

Sr.	CP Component	No. of components	Monitoring Frequency
1	Anode Ground Beds	17	Six-monthly
2	Interference Free reading at TLPs	830	Annually
3	Instantaneous ON/OFF PSP	830	Annually
4	AC parameters of test stations	830	Annually
5	CIPL Survey	310 Kms	One in 5 years
6	DCVG survey	-	Once in 5 years based on CIPL results
7	Coating evaluation and rectification	-	Based on results of DCVG survey and on need come basis



PE Damage due to rodent bite

No. of Damages on PE network due to Rodent (July 2013 to June 2014)



Back up slide.....

- Section wise CP Details
- Coating Defect Locations based on Latest DCVG Survey

