Uttar Gujarat Vij Company Limited Smart Grid Pilot Project
- **PoC studies**
23rd May 2016

Agenda

- Smart Grid Vision and Relevance

- Smart Grid Technology Matrix

- Pilot Project Overview

- Proof Of Concept (PoC)

- PoC Technological Experience

- Challenges
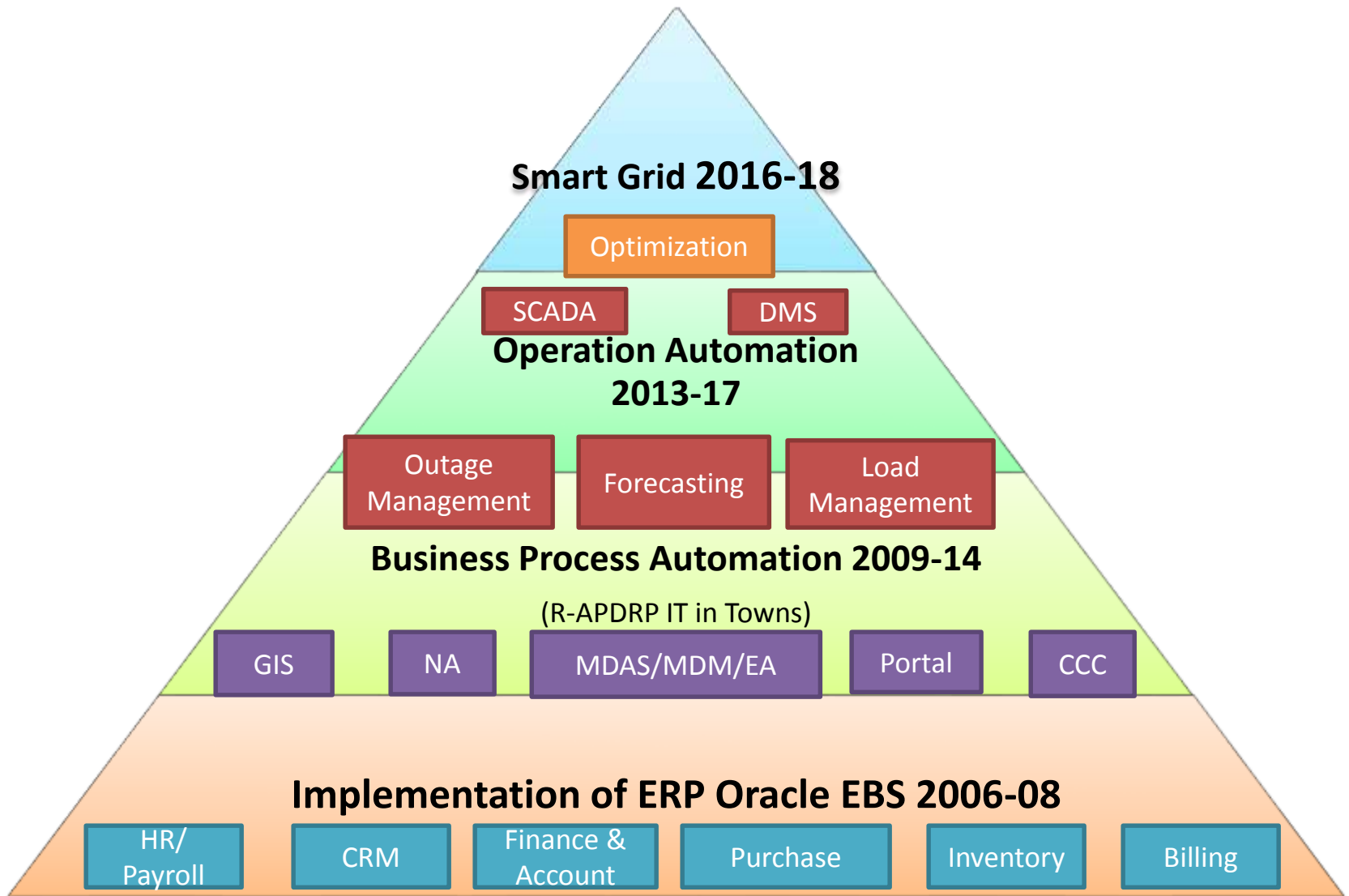
Smart Grid

Vision

Access,

Availability and

Affordability of Power for all

Relevance of Smart Grid

- Customer satisfaction

- Reduction in AT&C losses

- Self healing electrical network

- Peak load management

- Consumer demand response

- Integration of distributed generation

Smart Grid Technology Matrix

UGVCL

Smart Grid 2016-18

Optimization

SCADA   DMS

Operation Automation 2013-17

Outage Management   Forecasting   Load Management

Business Process Automation 2009-14

(R-APDRP IT in Towns)

GIS   NA   MDAS/MDM/EA   Portal   CCC

Implementation of ERP Oracle EBS 2006-08

HR/Payroll   CRM   Finance & Account   Purchase   Inventory   Billing

Project at a Glance

- Substation : 375 S/S

- Consumers : 20,524

- Distribution transformers : 18,898

- Quantum of Energy : 1700 MUS

- Area of Saving

  - Peak load Management/DSM

  - AT & C loss reduction

  - Reduced transformer failure

  - Reduction in meter reading cost

  - Cost saving in remote connect/disconnect

Project at a Glance (Tender 186)

UGVCL

Naroda area

- Substation : 1

- 11 KV HT feeder: 8

- Distribution transformers in Deesa : 291

- Consumers : 22230

- Quantum of Energy : 56.81 MUS Annually

- Area of Saving

  - Site meter reading cost

  - Remote connect/disconnect

  - Peak load Management/DSM

  - AT & C loss reduction

Naroda Details

| Type	Units
High Tension Industrial Consumer	3
LTMD Consumer Three Phase	44
Residential Single Phase	18050
Residential Three Phase	823
NRGP + GLP Consumer Single Phase	2117
NRGP + GLP Consumer Three Phase	895
Water works	215
Street Light	83
No. of feeders	8
No. of DTRs	291
Transformer failure (2015-16)	5.43 %

Project Details

Sr No.	Particular	Cost (in Crore)	Remarks
1	Proposed DPR	55.06	
2	Approved DPR	48.78	Initial approval DPR (Sep -12)
3	L1 bidder Wipro cost as per Tender no:135	85.24	Request to enhance DPR cost (Dec - 14)
4	Final approved DPR after enhancement	82.70	Final approval DPR (Feb -15)

Bid Evaluation Process

Stages	Tender no: 135 Process
1	Submission of Technical and 1st Financial bid
2	Meeting Eligibility Criteria & Selection of PoC Consortia
3	2nd Financial Bid & Beginning of Proof of Concept
4	3rd Financial Bid & Evaluation of PoC
5	Opening of Financial Bid and Techno-Commercial Evaluation

Tender Methodology
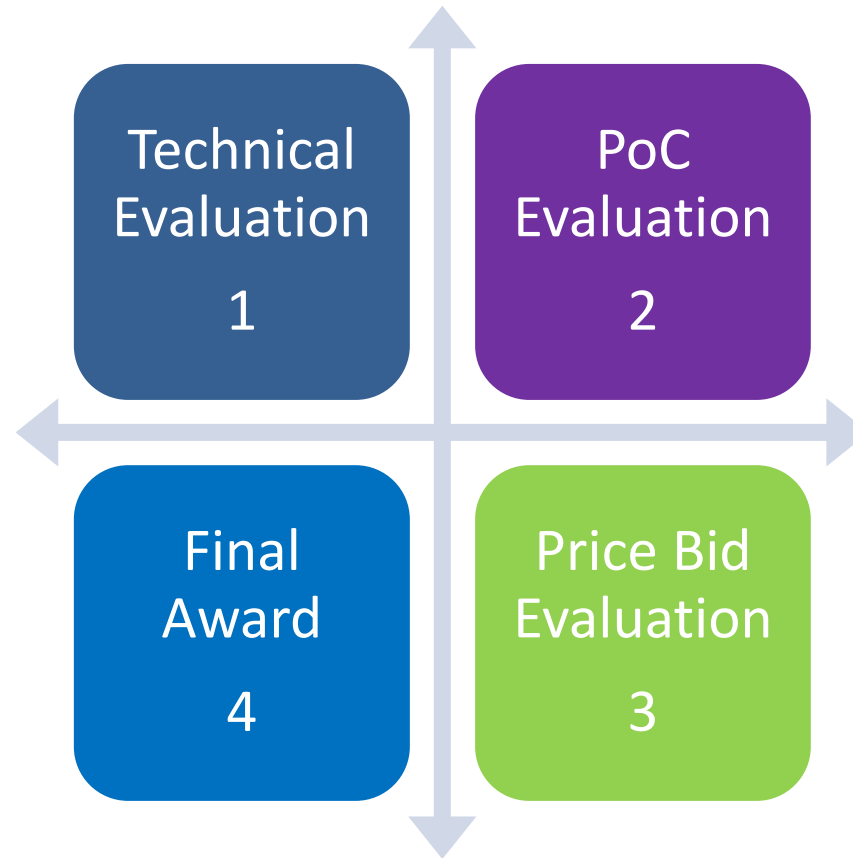
PoC Experience

POC Allotment

1. Equal consumer profile & geography
2. Allotment through lottery system (5 Test area)
3. Residential society, Flats (individual & base area), Road side Commercial and Industries & individual
4. 290 -300 single phase meters (each)
5. 10 three phase meters (each)
6. All type mix LT line (overhead, cable)

POC Evaluation Parameters

1. Meter data acquisition (Reliability)

2. Interoperability (Protocol, API & DCU)

3. Data acquisition time (speed from meter to application)

4. Events and alerts notifications

5. Implementation approach & methodology

Consortia Selected for Proof of Concepts (PoC)

Sr No	Lead Bidder	Meter Partner	System Integrator	Technology used	
				1 phase	3 phase
1	Wipro InfoTech	JnJ Powercom & Nation Power	Wipro	PLC	GPRS
2	Reliance Infra	EDMI & L&G	Accenture	RF (865-867 MHZ)	GPRS
3	L&T Automation	EDMI & L&T	L & T	PLC & RF (Cyan Techno infra)	GPRS
4	Crompton & Greaves	ZIV & SOGECAM	Infosys	PLC	GPRS
5	Tapesh Energy	Genus	Tapesh Energy	PLC (Broad band over powerline-BPL – Corinex infra)	GPRS

PoC Evaluation Criteria

Criteria-1

Sr.	Description	Requirement	% Data Availability	Score
1	Reliability	Reliability- will be measured by success rate of **instantaneous and load survey** data transfer from meter to Head End System through DCU/ MODEM	99 - 100	15
			98 - 99	14
			97 - 98	13
			96 - 97	12
			95 - 96	10
			94 - 95	8
			93 - 94	6
			92 - 93	4
			91 - 92	2
			90 - 91	1
			< 90	Disqualify

PoC Evaluation Criteria

Criteria-2

Sr.	Description	Requirement	Criterion	Score
2	Interoperability	Self- forming mesh among meters	Different make of meters with same API through common DCU	10
			Different make of meters with different API through common DCU	4

PoC Evaluation Criteria

Criteria - 3

Sr.	Description	Requirement	Speed in Minutes	Score
3	Data Reading Speed in Minutes	Minimum time interval for meter data reading in push mechanism irrespective of technology used in minutes. (from meter to server) Parameters to be received at the Head End: Meter Time Stamp, kW, kWh, Voltage, Current, Frequency and PF.	< 5	10
			5 – 10	8
			10 - 15	6
			15 - 20	4
			20 - 25	2
			25 - 30	1
			> 30	0

PoC Evaluation Criteria

Criteria - 4

Sr.	Description	Requirement	Time in Minutes	Score
4	Events & Alerts notifications	Time required to receive system exception alerts in minutes.	< 1	5
			2 - 4	4
			4 - 6	3
			6 - 8	2
			8 - 10	1
			> 10	0

PoC Evaluation Criteria

Criteria - 5

Sr.	Description	Requirement	Score
5	Implementation Approach	AMI	1
		Transformer Monitoring System	1
		Energy Audit	1
		DSM/ DR/ Load Management	1
		Load Monitoring & Forecasting	1
		Consumer Portal	1
		Power Quality	1
		Analytics & Report	1
		Renewable Integration	1
		Outage Management	1

PoC Evaluation Criteria as per RFP

- Reliability of data – Maximum 15 marks

- Inter operatibility – Maximum 10 marks

- Data reading speed – Maximum 10 marks

- Events and alert notifications - Maximum 5 marks

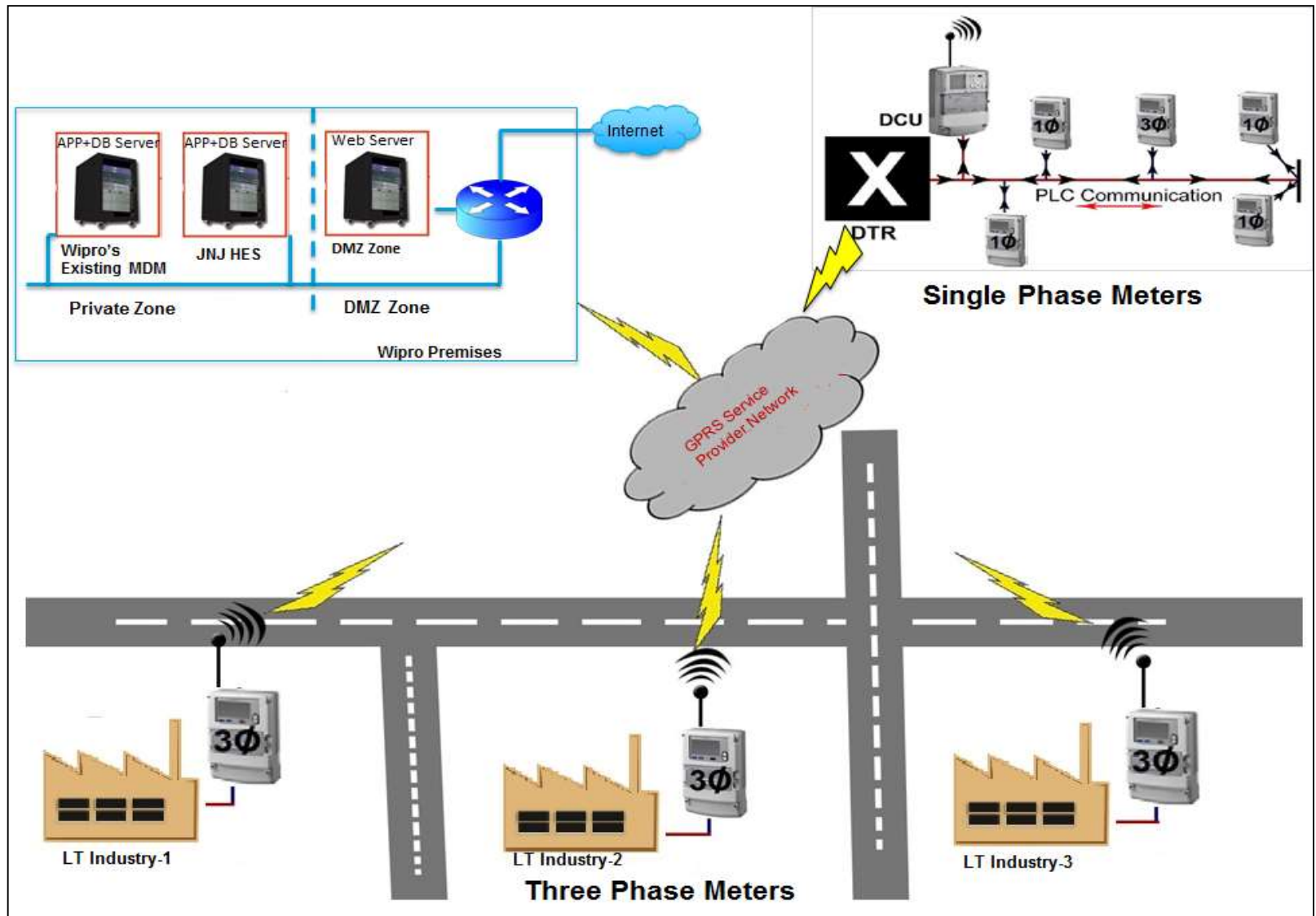- Implementation approach and methodology - Maximum 10 marks

Total 50 Marks

Technological Experience - PoC
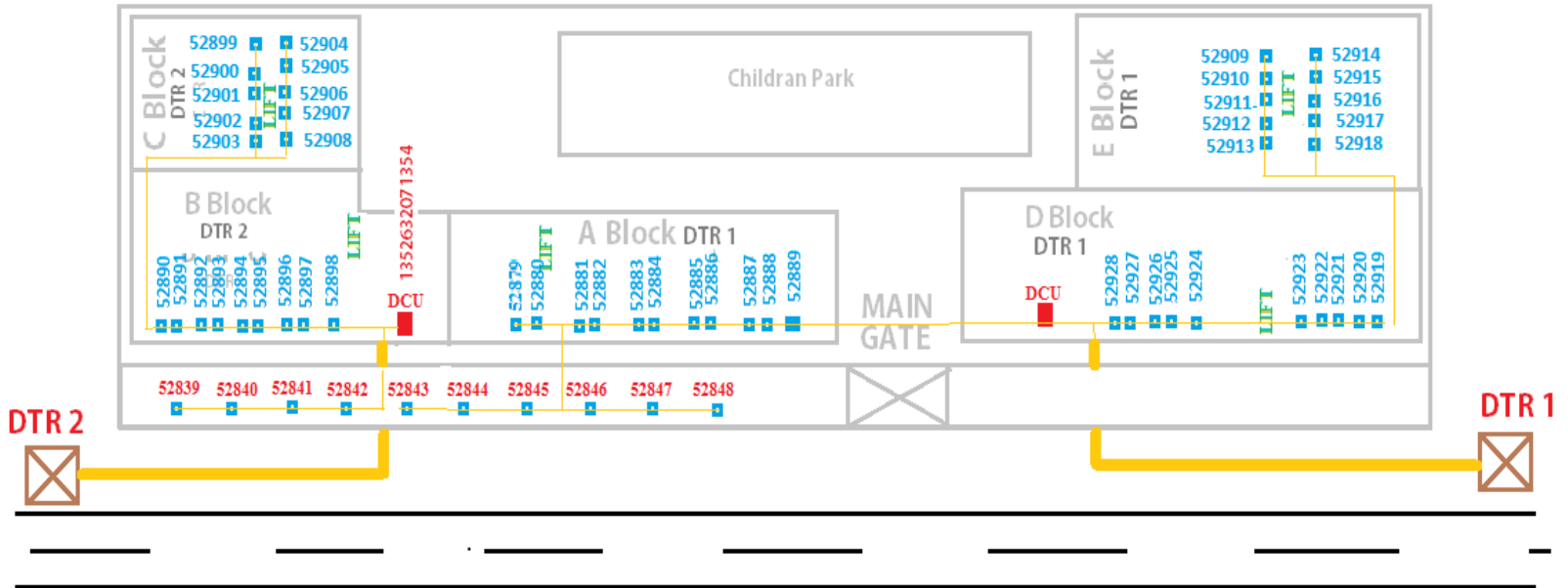
PLC (Power Line Communication)

- Dependent on power lines

- DCU pulls meter data at regular interval

- DCU Configuration required

- Transformer wise energy accounting

- Preferable choice for under ground, new and secure electrical network

- Star topology

Installation SLD – Agman Society

2 DCUs installed for 60 nos. Smart Meters

Installation SLD – Somnath Society


SOMNATH SOCIETY
100Nos of Single Phase
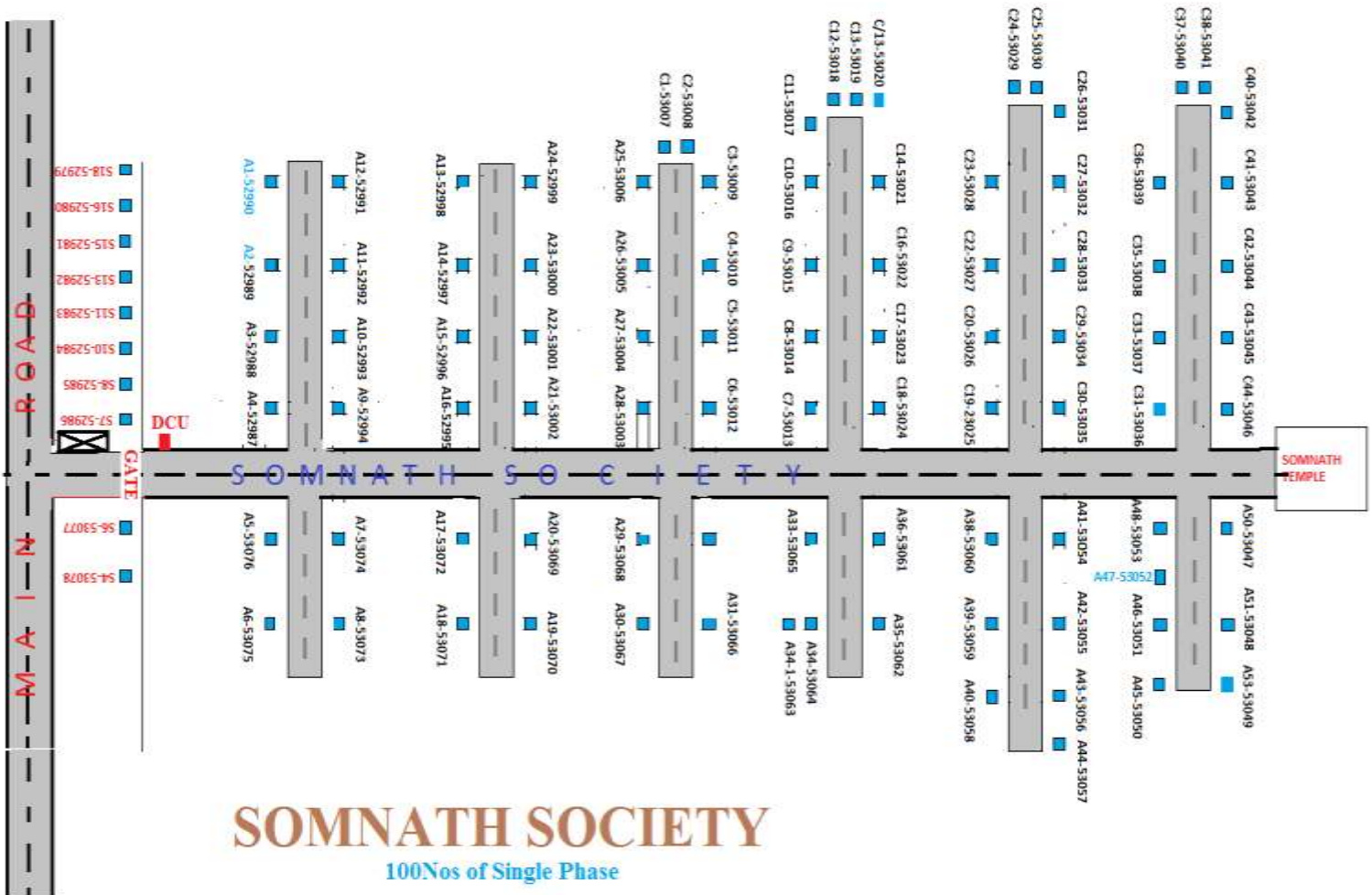
1 DCUs installed for 100 nos Smart Meters

Technological Experience - PoC

RF (Radio Frequency 865-867 MHz)

- Healthy communication in specific range

- Wire free network

- Meter addition/ replacement is auto detected

- Remote configuration possible

- Concrete structure, Road traffic, metal object reduce RF signal strength

- Multiple communication points per meter

- Works in Mesh Topology
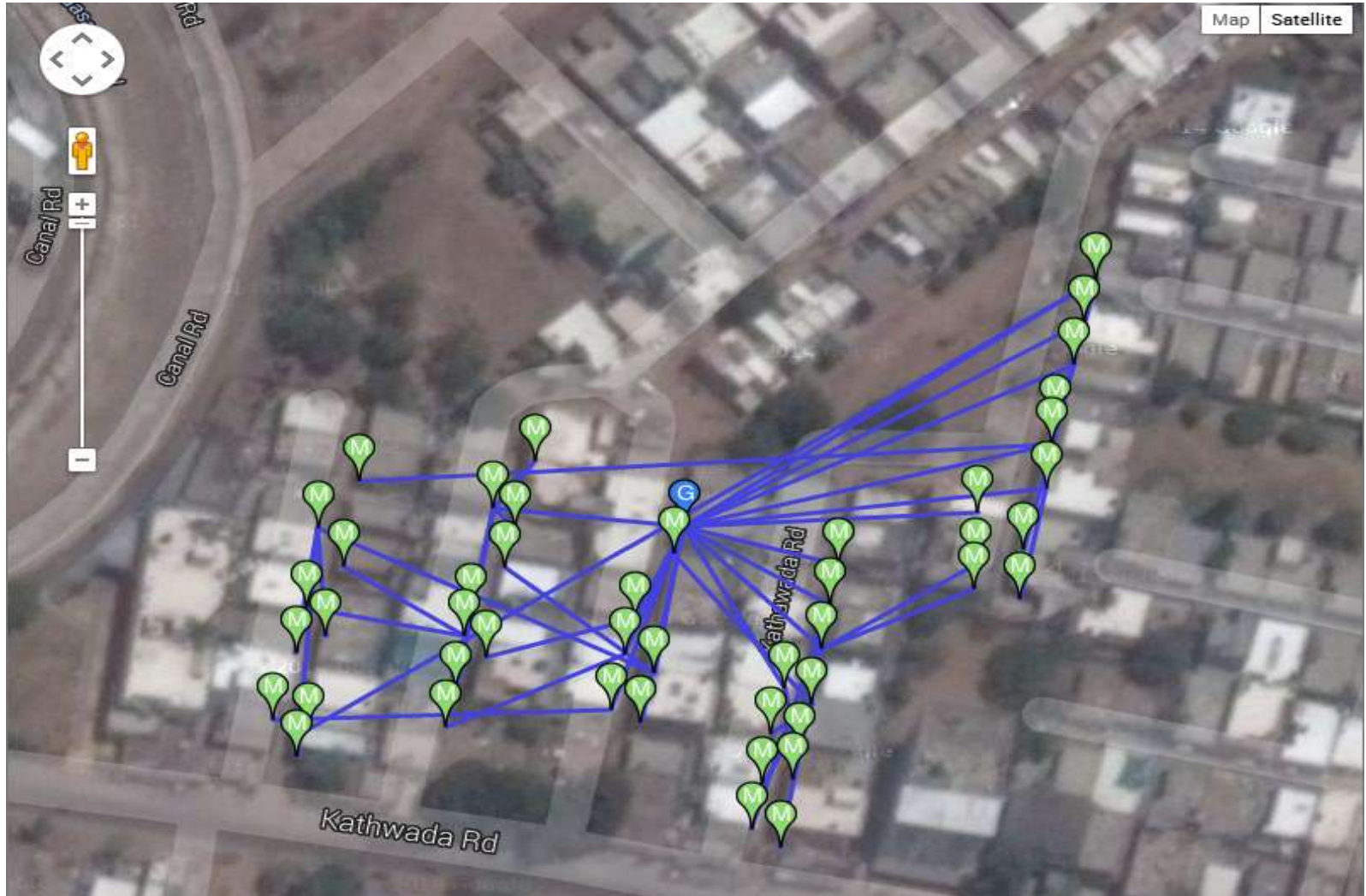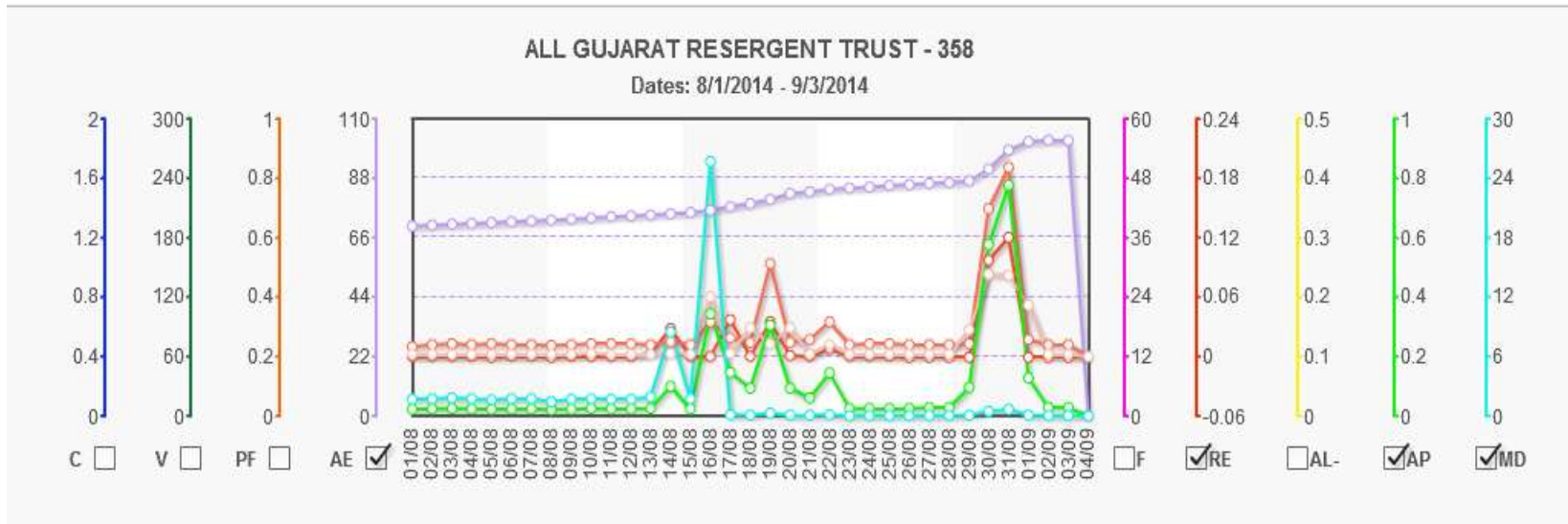
PoC : Shreyansh

Technological Experience - PoC

GPRS (General Packet Radio Service)

- Point to point communication

- More dependent on signal strength

- Proven solution for large data transfer

- Technology is preferable where nodes are less per DCU/DTR

Sample Load Curve for a 3Ph LTCT meter

Load Curve from 1st Aug till date

POC Result

Sr No	Name of Bidder	Nos. of meter installed	Data Availability
1	Wipro	300	98.57%
2	Reliance Infra	300	96.99%
3	L & T Automation	300	92.03%
4	CG Global	300	91.89%
5	Tapesh Energy	300	97.03%

PoC Performance - Wipro

Meter make	System Integrator	Protocol & Frequency	Technology					
			1 phase				3 phase	
			Meter to DCU		DCU to Central server		Meter -Modem to Server	
			Technology	Meter	Technology	Meter	Technology	Meter
JnJ Powercom & Nation Power	Wipro	DLT 645 2007 & 25 KHZ to 478 KHZ	PLC	295	GPRS	5	GPRS	10

Data Availability – 98.57 %

- The interoperability is achieved for different meters through same DCU and Protocol
- Star network communication topology

PoC Performance – Reliance

Meter make	System Integrator	Protocol & Frequency	Technology					
			1 phase				3 phase	
			Meter to DCU		DCU to Central server		Meter -Modem to Server	
			Technology	Meter	Technology	Meter	Technology	Meter
EDMI & L & G	Accenture	OFDM PRIME PHY & 865 MHZ to 867 MHZ	RF	298	GPRS	4	GPRS	10

Data Availability – 96.99 %

- The interoperability is achieved at application level
- Transparent modem and plug - play communication of meters in mesh
- Star & Mesh network communication topology

PoC Performance – L&T

Meter make	System Integrator	Protocol & Frequency	Technology					
			1 phase				3 phase	
			Meter to DCU		DCU to Central server		Meter -Modem to Server	
			Technology	Meter	Technology	Meter	Technology	Meter
EDMI & L & T	L&T	For RF- 865 MHZ to 867 MHZ	PL C & RF	PLC-235 & RF-55	GPRS	PLC-5 & RF-1	GPRS	10

Data Availability – 92.03 %

- Same version meter is used for PLC & RF communication with detachable modem
- Star network communication topology (PLC)
- Mesh network communication topology (RF)

PoC Performance – CG Global

Meter make	System Integrator	Protocol & Frequency	Technology					
			1 phase				3 phase	
			Meter to DCU		DCU to Central server		Meter -Modem to Server	
			Technology	Meter	Technology	Meter	Technology	Meter
ZIV & SOGECAM	Infosys	OFDM Modulation with signal loaded on 97 & 41.992 KHZ to 88.867 KHZ	PLC	297	GPRS	5	GPRS	10

Data Availability – 91.89 %

PoC Performance – Tapesh Energy

Meter make	System Integrator	Protocol & Frequency	Technology					
			1 phase				3 phase	
			Meter to DCU		DCU to Central server		Meter -Modem to Server	
			Technology	Meter	Technology	Meter	Technology	Meter
GENUS	Tapesh Energy	2 MHZ to 12 MHZ	PLC-Broad band over powerline - BPL	280	GPRS	5	GPRS	10

Data Availability – 97.03 %

KEY Challenges

- Ageing of electrical network

- Inter-operatibility

- Imported meters used in PoC are without BIS

- Retrofit type solution not available for existing static meters

- Alerts and critical events are not push type from meter

- Meters with different provision from DISCOM practice

  (1) Sealing and neutral circuit
  (2) Wiring sequence at meter terminal
  (3) Discom having different requirement for meters in addition to Standars (IS)

UTILITY Challenges

- Use of different applications for different vendors

- Integration with e-Urja, Billing, R-APDRP, SCADA/DMS will be separate for all systems

- Consumer portal will be different vendor wise causing difficulty at consumer level

Cost Bifurcation Challenges

- How to segregate FMS charges

- Segregation issues of Data center cost

- Segregation of sub-station communication cost is difficult

- Wide variation in meter and communication cost amongst vendors

- Different applications will be in different clouds

- Multiple Integration, cloud, implementation , application cost

- Multiple bandwidth charges