SMART Grid – Business Model

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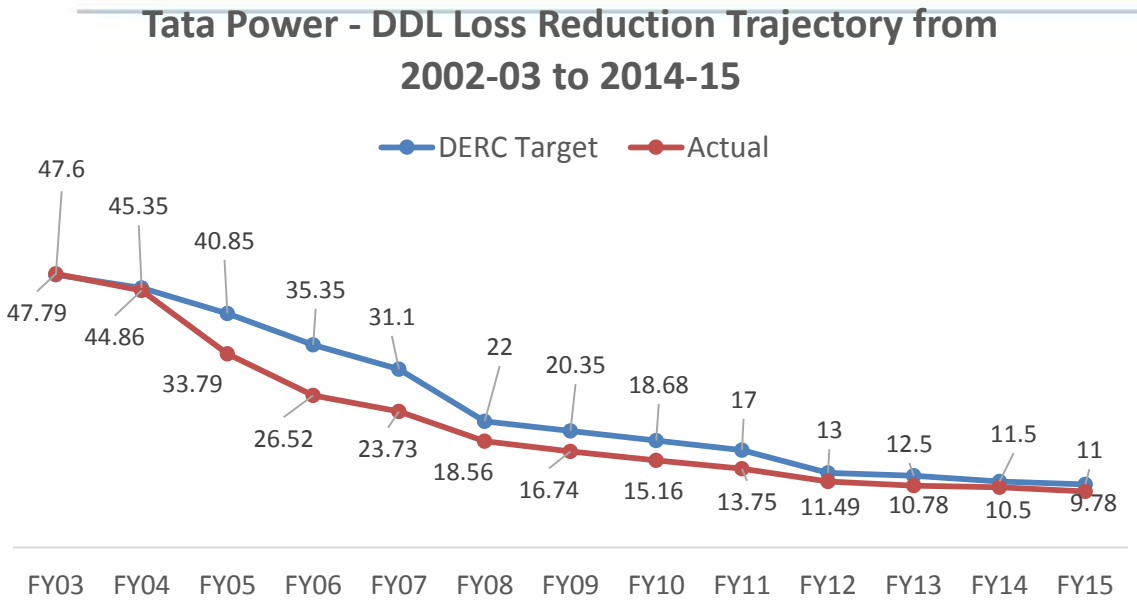
TATA POWER – DDL : A Successful PPP model leveraging Smart grid technologies



Consistently Exceeding Targets

- Highest availability and reliability indices with benchmark AT & C loss level.
- Saved over USD 1.8 billion for the Government, Facilitated development of other infrastructure, lower taxes;
- Paid dividends to Government and Tata power year after year
- 1:2 Bonus shares Issued in FY'09

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THEN (2002) ----------→ NOW

AT & C Loss >50%

No Concept of Consumer service and IT Interface

Electricity supply system on the verge of collapse

Lack of performance orientation

AT & C Loss- 8.88%

One stop Solution : State-of-the-art Call Centers and consumer care centers

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Remarkable improvement in system reliability : DT Losses <1%

Performance orientation through change management and Balanced scorecard approach

Performance…

EXCELLENCE

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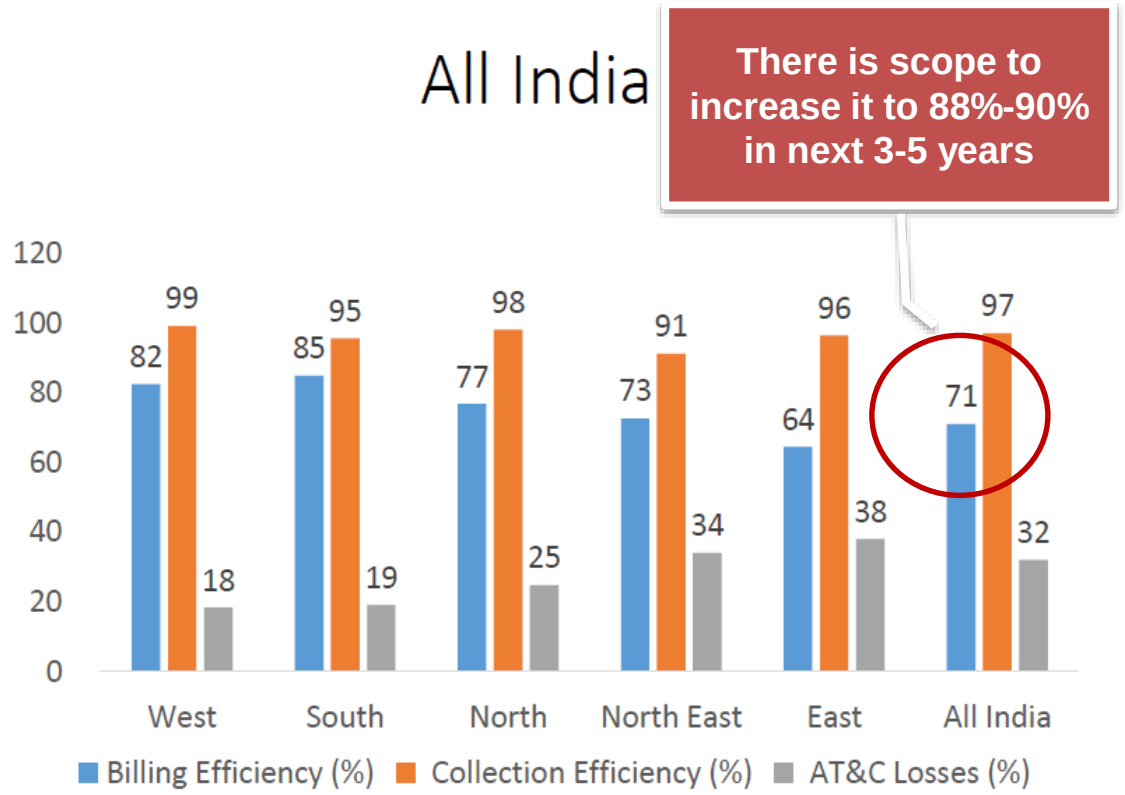
Where is the investment going ? High Losses & Low Billing Efficiency

Accumulated Loss ~ Rs. 3.8 lakh Crores (Mar 15) – Total Loss in last 6 years –Rs. 3.66 lakh Crores



BILLING EFFICIENCY NEEDS INSTANT IMPROVEMENT

Source: Audited DISCOM Accounts * 2014-15 figure is a projection based on provisional reporting by States

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Key Concerned Areas of Indian Utilities

KPI

- High AT&C Losses (>15% to 35%)
- Low Billing Efficiency (65% to 85%)
- High provisional Billing rate (3% to 15%)
- High Transformer Failure Rate (2% to 5%)
- No mechanism of monitoring reliability indices i.e. SAIDI, SAIFI

Processes

- Non-standard and Manual driven process of Quality checks on Reading, Billing and Data Analysis
- Multiple Billing and Reading Agencies
- Improper Consumer Indexing
- GIS Delta Change Management
- Low success rate of AMR

People

- Unexperienced and untrained Man-Power to handle latest systems and improvised effective processes
- Resistance for Radical organizational change for Business Process re-engineering
- Rapid change at senior level impact the long gestation period investment project

Technology

- Low Utilization of Implemented Technologies
- No proper roadmap of Technology Adoption
- Network backhaul is a constraint
- OEMS driving the need of technology adoption
- Emerging Technologies for Value-Added Services like Home Automation, Mobile, solar, etc.

How and up-to what level to adopt SMART GRID Technologies is another emerging concern

SMART GRID Key Components

Technology

- Foundational Technologies
  - **IT** – ERP, GIS, CRM, Billing software, MDM,
  - **OT** – S/S automation, Auto-reclosers, Sectionalisers, SCADA, OMS, DMS
  - **Advanced Energy Storage**
- Sensing and measurement
  - AMI
  - Phasor Measurement Unit
  - Distributed Weather Sensor
  - **Distributed power flow control**
- Communication and security
  - Integrated Communications and Security
  - Wireless Sensor Network
  - **Advanced control**

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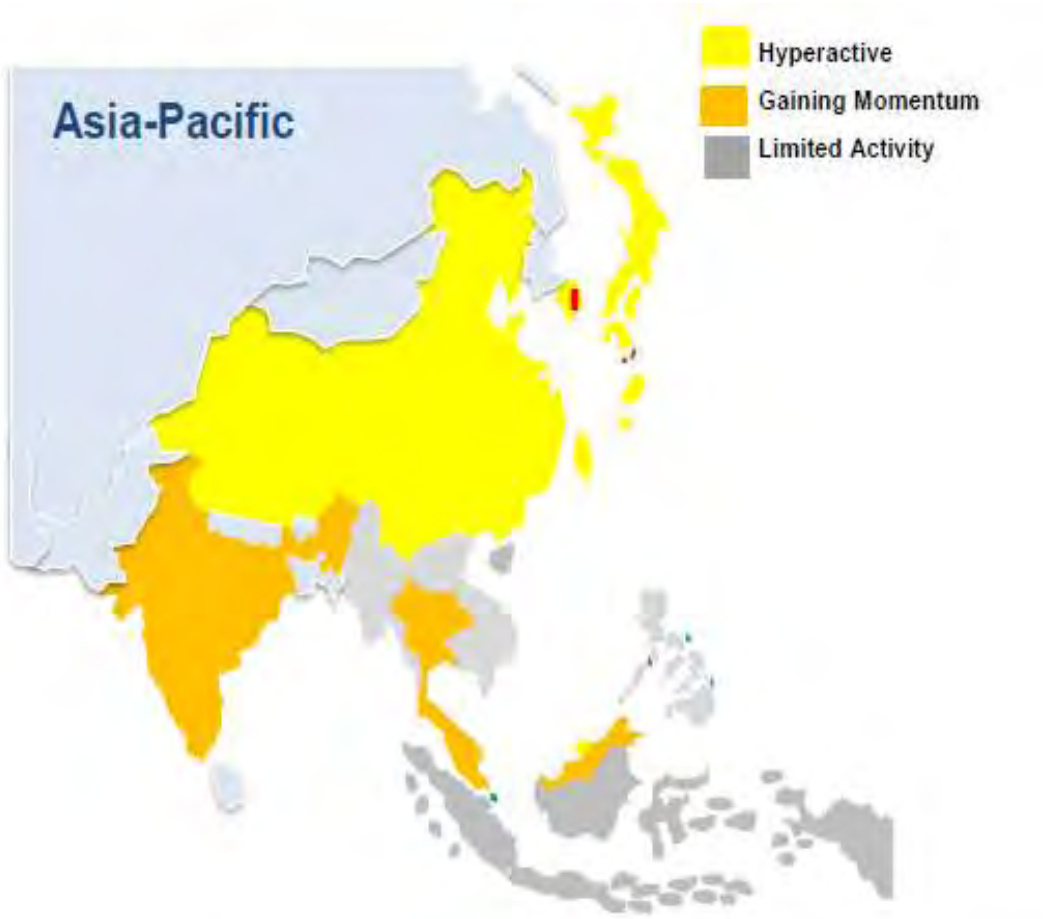
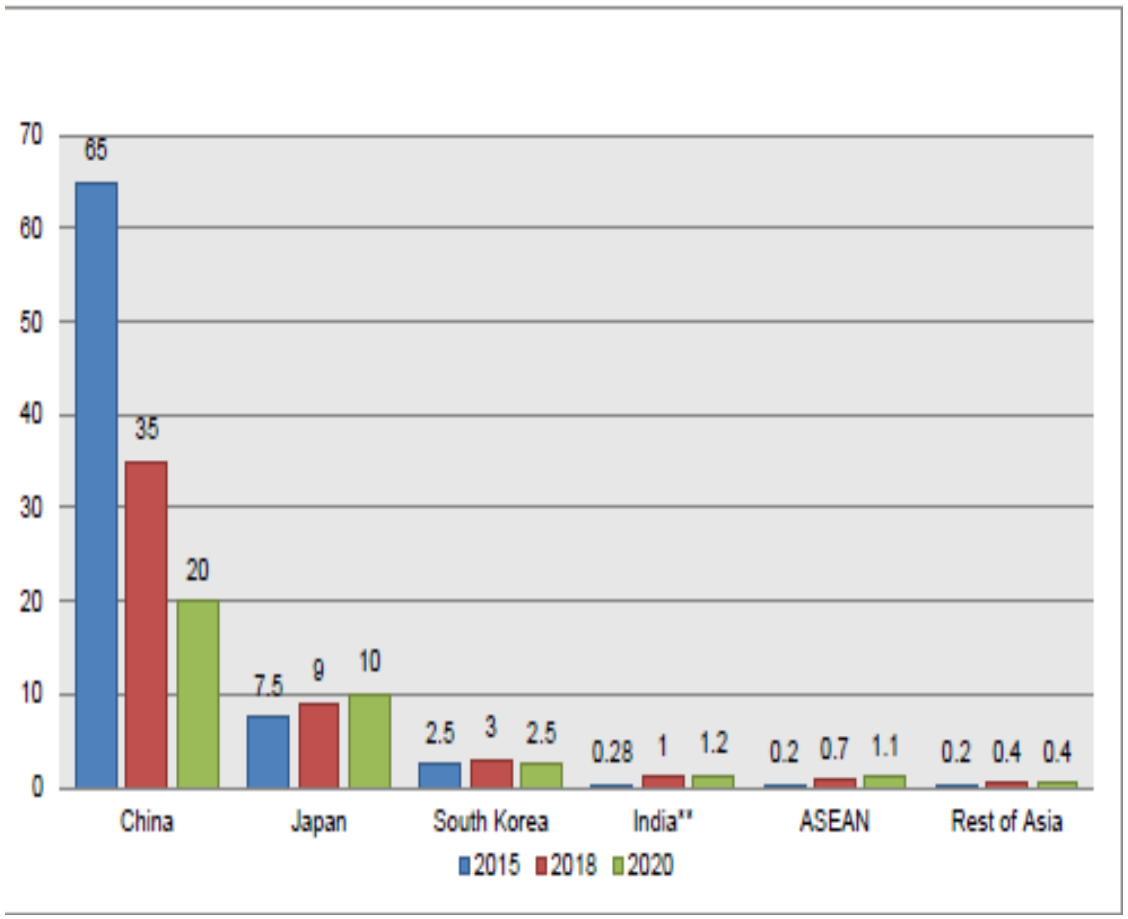
SMART Metering is gaining momentum in India



AMI Market Heat Map: Asia, 2016



Smart Electricity Meter Market: Annual Unit Shipment Forecast, Asia Pacific, 2015-2020

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Public Private Partnership Model (OPEX MODEL)

- Utility to pay per bill for all connections
- No Upfront Capex for the Utility
- Minimum Engagement period is 8 to 10 Years for Project Life-cycle
- Additional Revenue Generated to be shared between Utility and SGIA
- Utility to ensure the payment of capital expenditure made by SGIA by Escrow account

Utility Contribution

20% of the project value will be contributed by the Utility. Equal to the Utility OPEX in 8 years for billing, metering and other process

NSGM Contribution (As Grant)

30% of the project value will be funded by NSGM in first 3-4 years period.

SGIA Contribution

Remaining 50% will be Funded by the SGIA and will be recovered from the Additional Revenue

Improvement of Billing Efficiency and reduction in Opex will fund the project.

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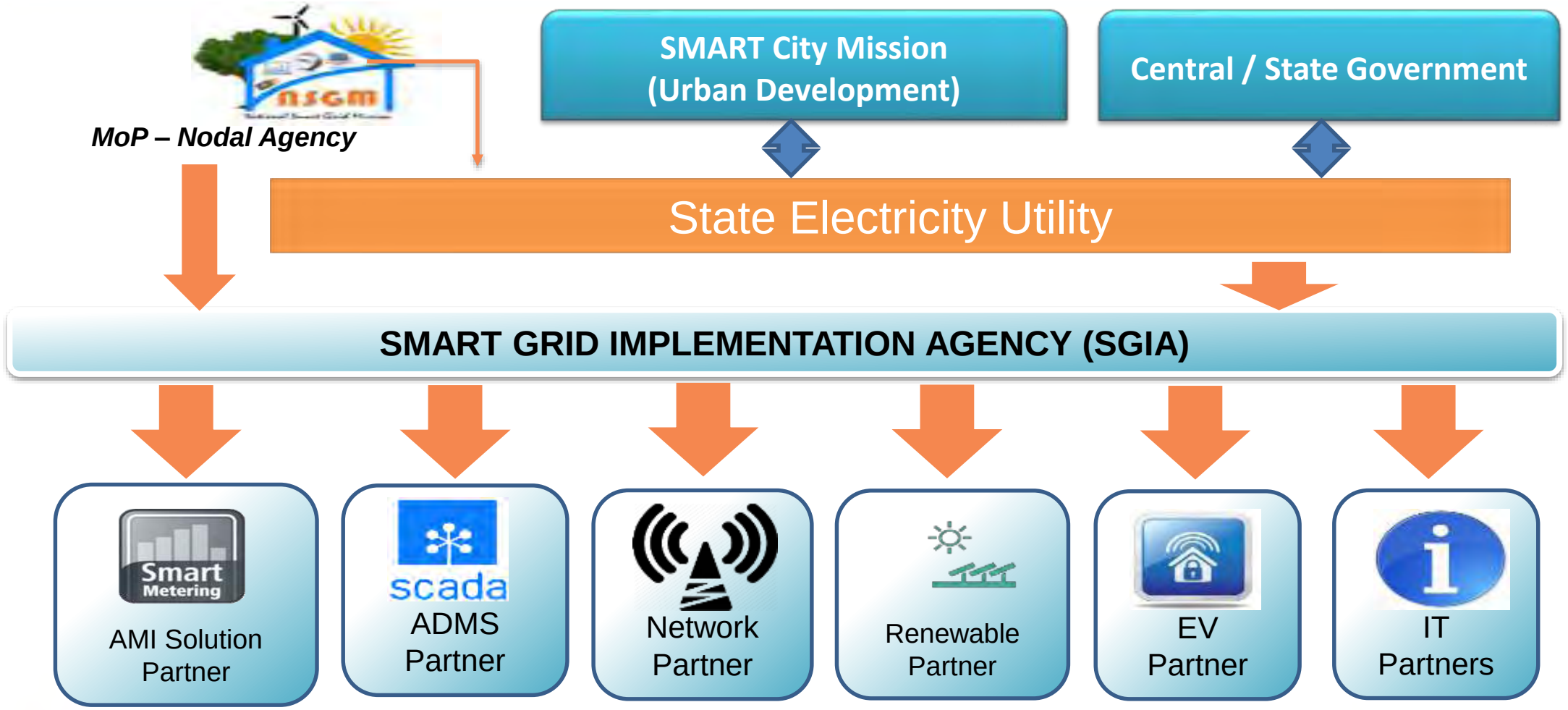
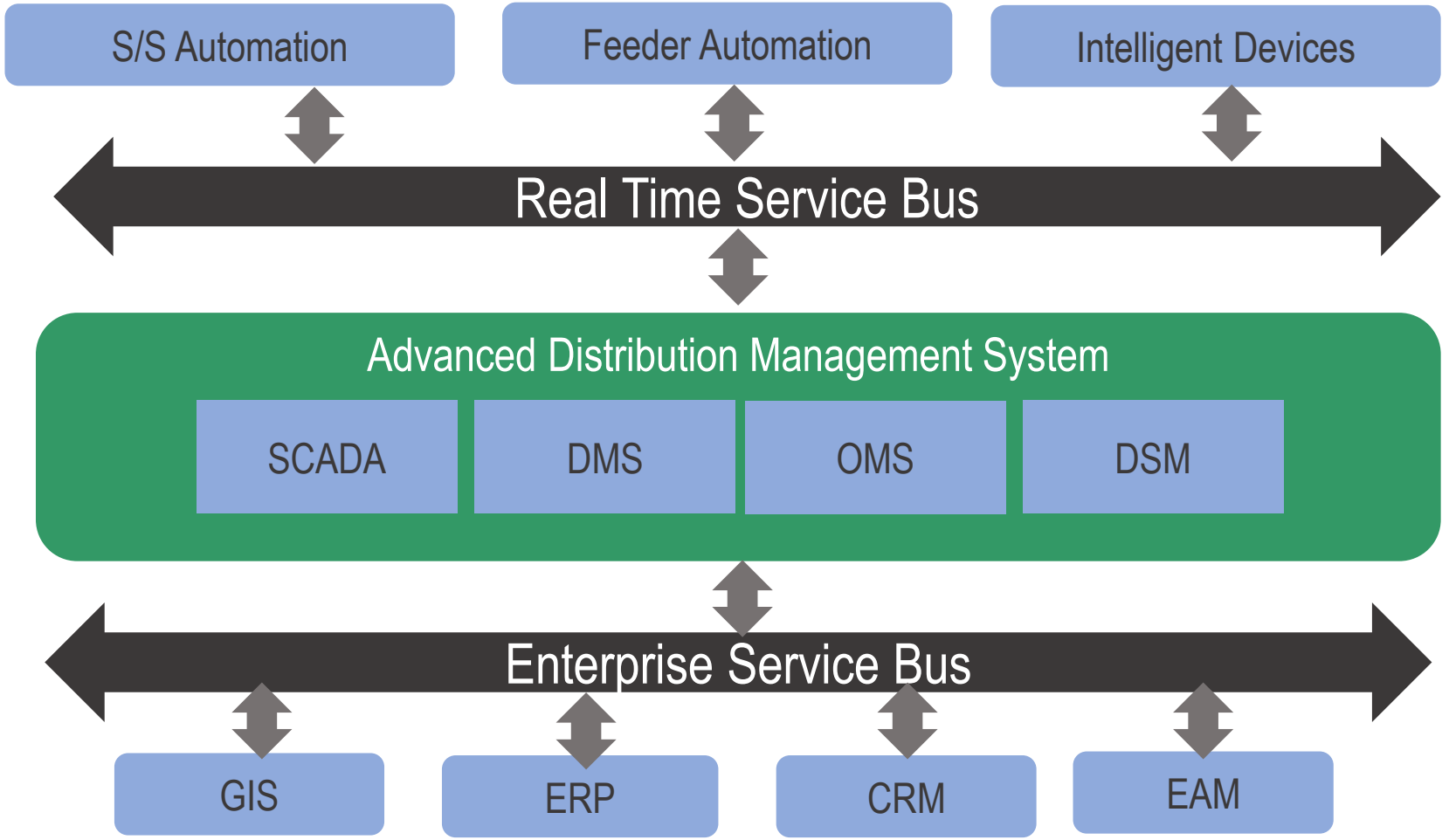
Project Governance Model



Proposed SG Technologies

- Advanced Metering Infrastructure
- Power Management and Power Quality Management
- Robust Network Backhaul
- Energy Storage and Renewable Integration



Case Study – Snapshot

Sr. No	Parameter	Unit	Value
1	Consumer Base	Nos.	200000
2	AT&C Loss %	%	20%
3	Annual Energy Input	In Mus	1500
4	Annual Revenue	In Rs. Crs.	650
5	Area of Coverage	In Sq. Km.	150
6	Peak Load	In MW	350
7	Billing Efficiency	%	77%
8	Base-Line IT	Presence	Not Available
9	SCADA/DMS	Presence	Not Available

Estimated Project Costing

Sr. No	Parameter	Value (in Rs. Crs.)
1	SMART Metering with Network	150
2	Network Automation (ADMS)	30
3	IT Applications & Infrastructure	30
4	Project Implementation and Integration	20
5	Maintenance Services (7 Years)	70
Grand Total		300

SGIA Funds Contribution # 50% of the Project Cost

NSGM Contribution # 30% of the Project Cost

Utility Contribution # 20% of the Project Cost (Firm)

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Cash Flow

1. **NSGM funds (30% of Project Cost) shall be released during the project implementation phase**
    1. 10% Mobilization advance
    2. 20% on Project Design Finalization
    3. 50% on Provisional Acceptance of System Implementation
    4. 20% on Final User Acceptance

2. **Utility shall release 20% of the project cost to SGIA in similar pattern i.e.**
    1. 10% Mobilization advance
    2. 20% on Project Design Finalization
    3. 50% on Provisional Acceptance of System Implementation
    4. 20% on Final User Acceptance

3. **Remaining 50% of the project Cost shall be released by Utility to SGIA based on the Pre-defined KPI achievements (Billing efficiency, AT&C Losses) on per consumer per month basis during the project operation phase.**

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KPI Agreement

Sr. No	Year	SAMPLE # Target Billing Efficiency
1	Year 3	80%
2	Year 4	83%
3	Year 5	85%
4	Year 6	87%
5	Year 7	88%
6	Year 8	90%
7	Year 9	90%
8	Year 10	90%

1. Yearly target of the KPI can be defined.
2. Based on the system performance, the variable cost of the project (50%) shall be paid to the SGIA.
3. On yearly basis, Third Party Agency can audit the system performance.
4. Percentage of incremental revenue will be used to fund 50% investment of SGIA

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Reduction in AT&C Losses from 22% to 10% in 8 years

Case Study - Tangible Benefits

Year		Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Billing Efficiency (Projected)	%	77%	77%	80%	83%	85%	87%	88%	90%	90%	90%
Collection Efficiency (Projected)	%	98%	98%	99%	99%	99%	100%	100%	100%	100%	100%
AT&C Losses	%	25%	25%	21%	18%	16%	13%	12%	10%	10%	10%
Annual Sales	in Rs. Crores	679.14	713.10	777.92	847.45	911.27	979.34	1,040.13	1,116.96	1,172.80	1,231.44
Additional Revenue	in Rs. Crores	-	-	36.37	68.51	93.16	129.90	148.22	180.45	189.47	198.95
Annual Opex Saving *	in Rs. Crores	-	6.13	6.44	6.76	7.10	7.45	7.82	8.22	8.63	9.06
Total Savings	in Rs. Crores	-	6.13	42.80	75.27	100.26	137.35	156.04	188.67	198.10	208.00
Total Savings Cumulative	in Rs. Crores	-	6.13	48.93	124.20	224.46	361.82	517.86	706.53	904.63	1,112.63

A Third Party Audit will be done to define the baseline KPI

Total benefit to the Utility (in Rs. Crores)

*** Annual Opex saving is on account of**

1. *Saving in meter reading cost*
2. *Capex in Meter Faulty and Meter Replacement Cost*
3. *Reduction in Back-office team for commercial activities*
4. *Reduction in Outage Management Efforts*
5. ***Saving due to efficient power Procurement Process and reduction in penalties***

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Opex Model – Project Stages

Build Phase (2.5 Years)

- Utility will appoint the Smart Grid Implementation Agency.
- A Third Party Audit Agency to establish Baseline of KPIs
- SGIA to Establish a Project PMU
- Utility to establish a Task Force.
- SGIA will provide a extensive Training to Utility Task force before system establishment
- SMART Grid System Establishment.
- Acceptance by the Utility and Sign Off to enter in the Maintain Phase

Maintain Phase (7 Years)

- SGIA will maintain the complete system for 7 years and will provide performance as per agreed KPI
- Utility to ensure action on identified theft prone areas
- Utility to pay on per bill basis
- Third Party Audit Agency to provide a KPI Audit report after each quarter

Transfer Phase (6 Months)

- After the engagement period, the established system will be handed over to the Utility.
- Utility Task force can take the system Handover.

FAST Project Operations Commencement Period ~ 6 Months

Build – Maintain – Transfer Model.

Key Recommendations for implementing SMART Grid Projects in India

Back-Office SMART Grid Infrastructure should be capable for handling at-least 5-7 towns of a Discoms to cater at-least next 10 years

Establishment of dedicated technology (IT/OT) Cell for each Utility

Development of SMART Grid Road-map including renewable, EV Street-Light and Storage of each Discom

Engagement of single agency for SMART Grid in a Discom to avoid Integration issues

NSGM can define minimum criteria for Town / Discoms to consider SMART Grid**. Smart Cities can be default selection.**

Project Implementing Agency should maintain the system for next 7-10 years till project life-cycle

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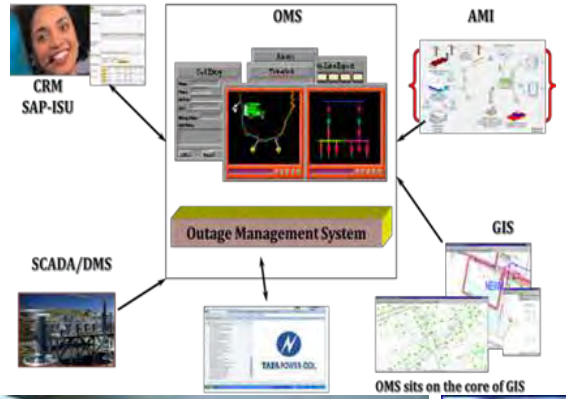
TATA POWER – DDL : Technical Expertise

- Information Technology (IT)
- Operation Technology (OT)
- Supervisory Control and Data Acquisition (SCADA)
- Outage Management System (OMS)
- Demand Side Management (DSM)
- Geographic Information System (GIS)
- Automatic Meter Reading (AMR)
- SAP's Industry Specific Solution (SAP-ISU)
- 24*7*365 Centralized Call Center
- Automated Demand Response (ADR)
- Solar Rooftop PV Projects
- Project Management Consultancy
- Capacity Building



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TPDDL – Presence across the reforms schemes and geography

GOA
R-APDRP (PART-A) IT Implementation
Project Management Consultancy Work under IPDS

CHHATTISGARH
IT Consultancy under R-APDRP (Part-A)
Capacity Building Roadmap

KARNATAKA
PMC Work for HESCOM, GESCOM, CESCOM, MESCOM, BESCOM

MADHYA PRADESH
PMC Work under IPDS and SCADA Consultancy under R-APDRP Part-A

ORISSA
PMC Work for Puri SCADA Project for OPTCL
IT Consultancy for CESU under R-APDRP (Part-A)
SCADA Consultancy under R-APDRP (Part-A)

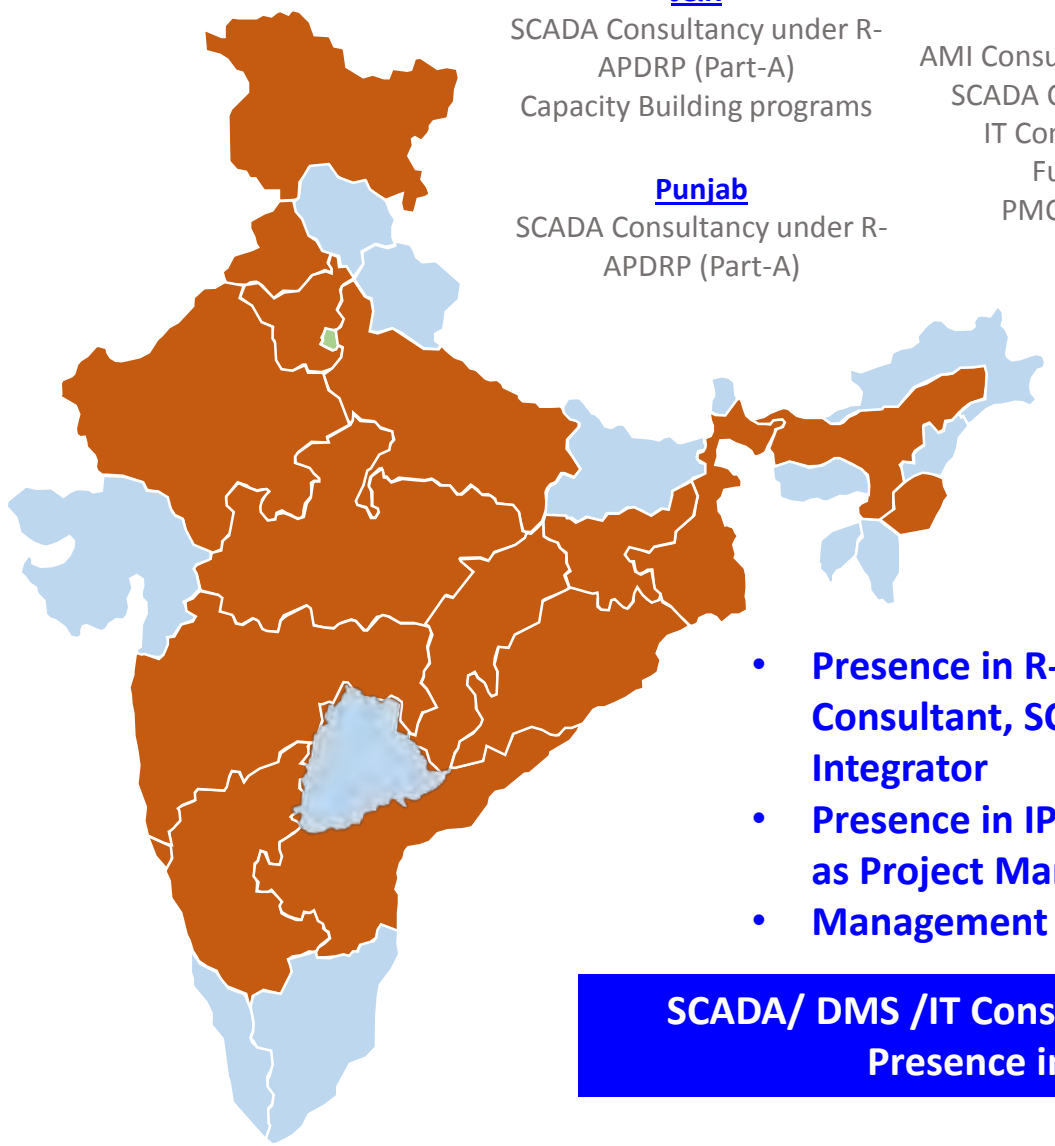
UTTAR PRADESH
SCADA Consultancy under R-APDRP (Part-A)
Project Management Consultancy for Lucknow and Firozabad Town under IPDS
Project Management Consultancy for Saifai and Tirwa Towns
Functional Consultancy in DVVNL

J&K
SCADA Consultancy under R-APDRP (Part-A)
Capacity Building programs

Punjab
SCADA Consultancy under R-APDRP (Part-A)

HARYANA
AMI Consultancy for World Bank Funded Project,
SCADA Consultancy under R-APDRP (Part-A)
IT Consultancy under R-APDRP (Part-A)
Functional Consultancy Project,
PMC Work under NEF with RECPDCL

WEST BENGAL
PMC-Work Under IPDS



- **Presence in R-APDRP (Part-A) as IT Consultant, SCADA Consultant, System Integrator**
- **Presence in IPDS, NEF and R-APDRP (Part-B) as Project Management Consultant**
- **Management Consultancy in Haryana and UP**

SCADA/ DMS /IT Consultancy under R-APDRP
Presence in 13 Utilities

Developing SMART Grid Roadmap for EPDCL-AP under World Bank Project

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Thank You

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