Disruptive Technologies in Distribution Sector

AI & ML driven

Revenue Protection & Revenue Assurance (RP-RA)

Presented by

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Revenue Protection-Revenue Assurance (RP-RA) Journey

APDRP

Accelerated –Power Development & Reform Program

Focus on :
- Customer Service
- Metering
- RP-RA

2000

R-APDRP

Restructured -Accelerated Power Development & Reform Program

Focus on :
- Customer Service
- GIS
- SCADA
- Network
- RP-RA

IP-DRP

Integrated Power Development Scheme

Focus on :
- Customer Service
- Network Strengthen
- Transmission/Distribution /Feeder
- RP-RA

RDSS

Revamped Distribution Sector Scheme Reform based –Result Linked

Focus on :
- Customer Service
- Smart Metering infrastructure
- Revenue Protection – Revenue Assurance

current

Building Block for Augmented RP-RA

- Dynamic Energy Audit/Reconciliation
- Consumer segment analysis
- Finding out pilferage point

Transformer/DT

DT to LT-Feeder

Feeder to Pole (with distribution boxes)

Pillars to Consumer

Illustrating the Problem Statement-RP-RA

Problem Statement :- Dynamic Energy Reconciliation for Ring to establish relation to last mile consumer and find out network where losses are high for operation optimization

Current Scenario

DSS → DT → (Dynamics Energy flow) → Feeders → (Dynamics Energy flow) → Pillars → (Mapping to pole/pillar) → Customers

Industry/ high value –AMR 15 to 30 mins consumption

Domestic/LV – monthly consumption

Reconciliation of Energy with DT & consumer Billed units

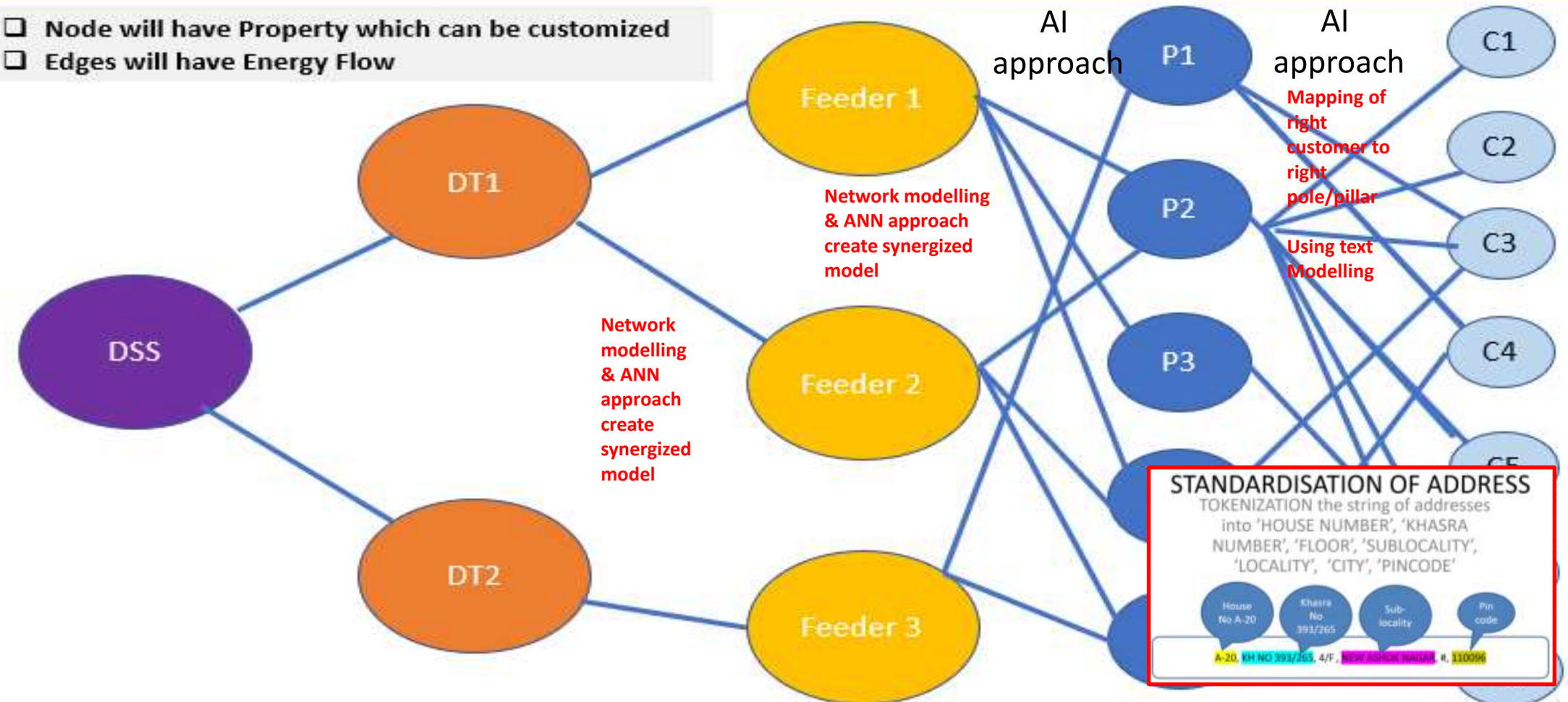
Revenue Assurance – payment received from billed customer

Pain Area for Energy Reconciliation

Establishing the stressed network- (1 of 3)

Network Analytics Predictive Modeling Approach

- Node will have Property which can be customized
- Edges will have Energy Flow



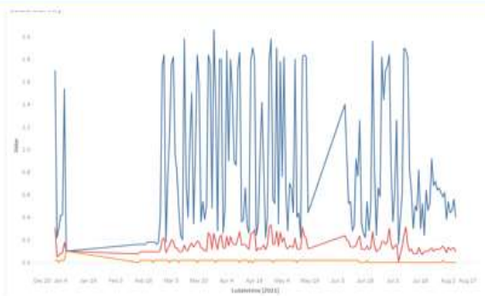
Learning Approach

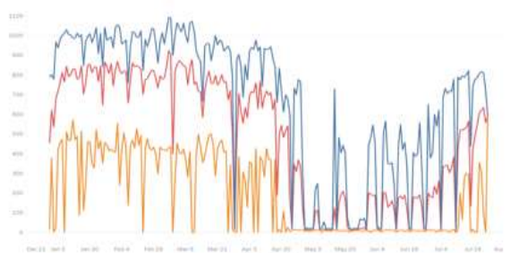
- Customer Monthly data , apportioned to daily/calendar month
- Historical data with neighborhood modelling establish daily level consumption trend and pattern

Establishing the stressed network- (2 of 3)

Verification of network map between DT-Feeder-Pole- Customer(network model)

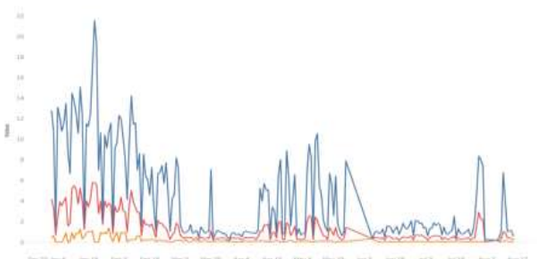
Descriptive & Diagnostics Model – Network Profiling





Load Survey Profile Analysis:

Sample Meters: 1. Meter1, 2. Meter2 3. Meter3

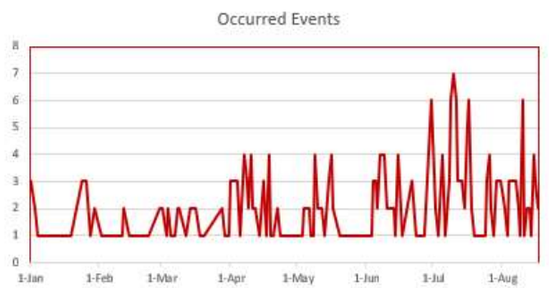


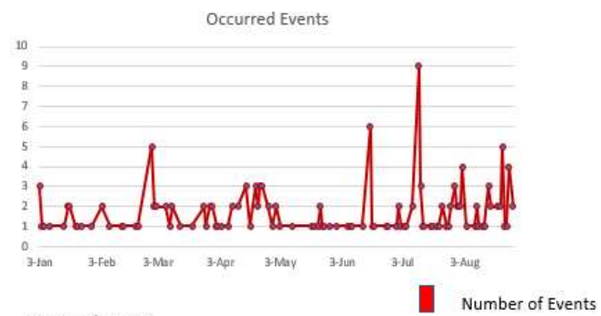
Minimum Active Total Demand

Average Demand

Maximum Active Total Demand

Descriptive & Diagnostics Model – Event Profiling





Events Analysis:

Sample Meters: 1. Meter1, 2. Meter2 3. Meter3

GAP ANALYSIS AT DSS

GAP ANALYSIS AT DT

GAP ANALYSIS AT FEEDER

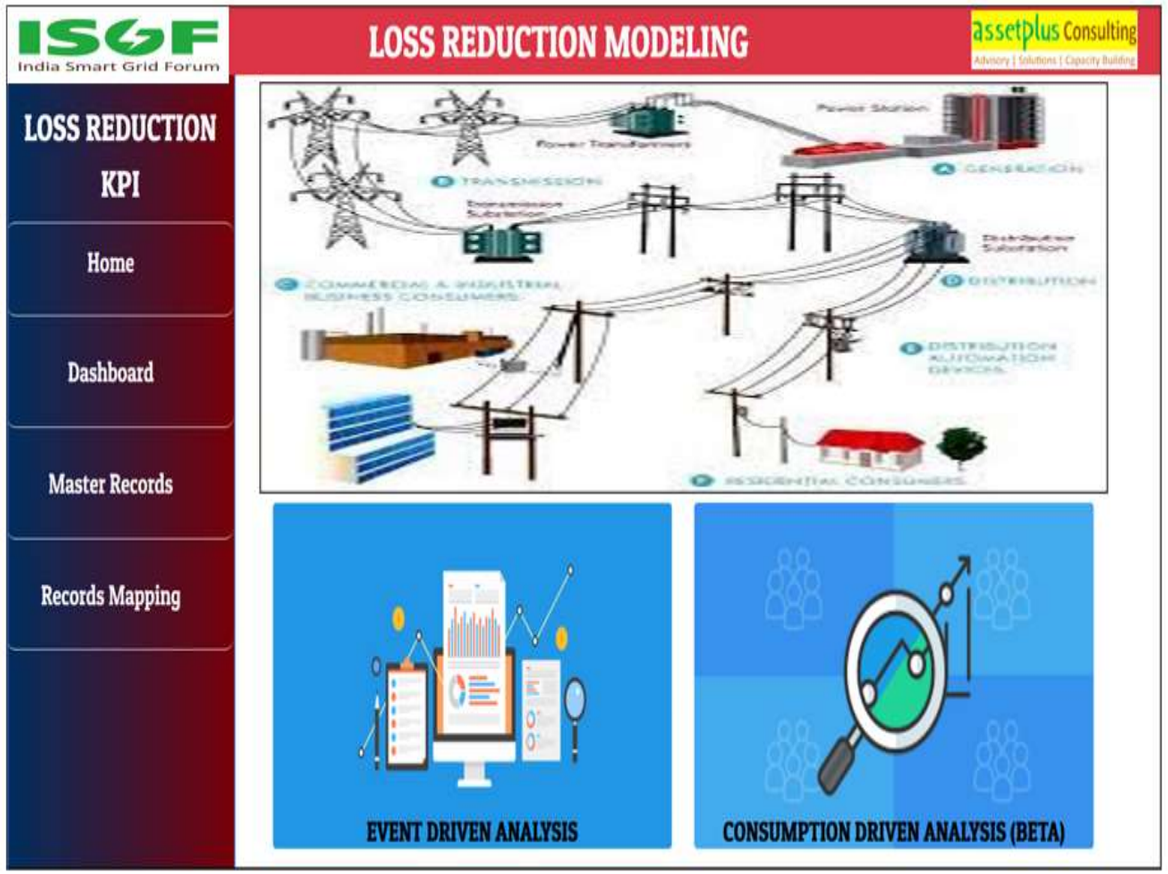
GAP ANALYSIS AT PILLAR

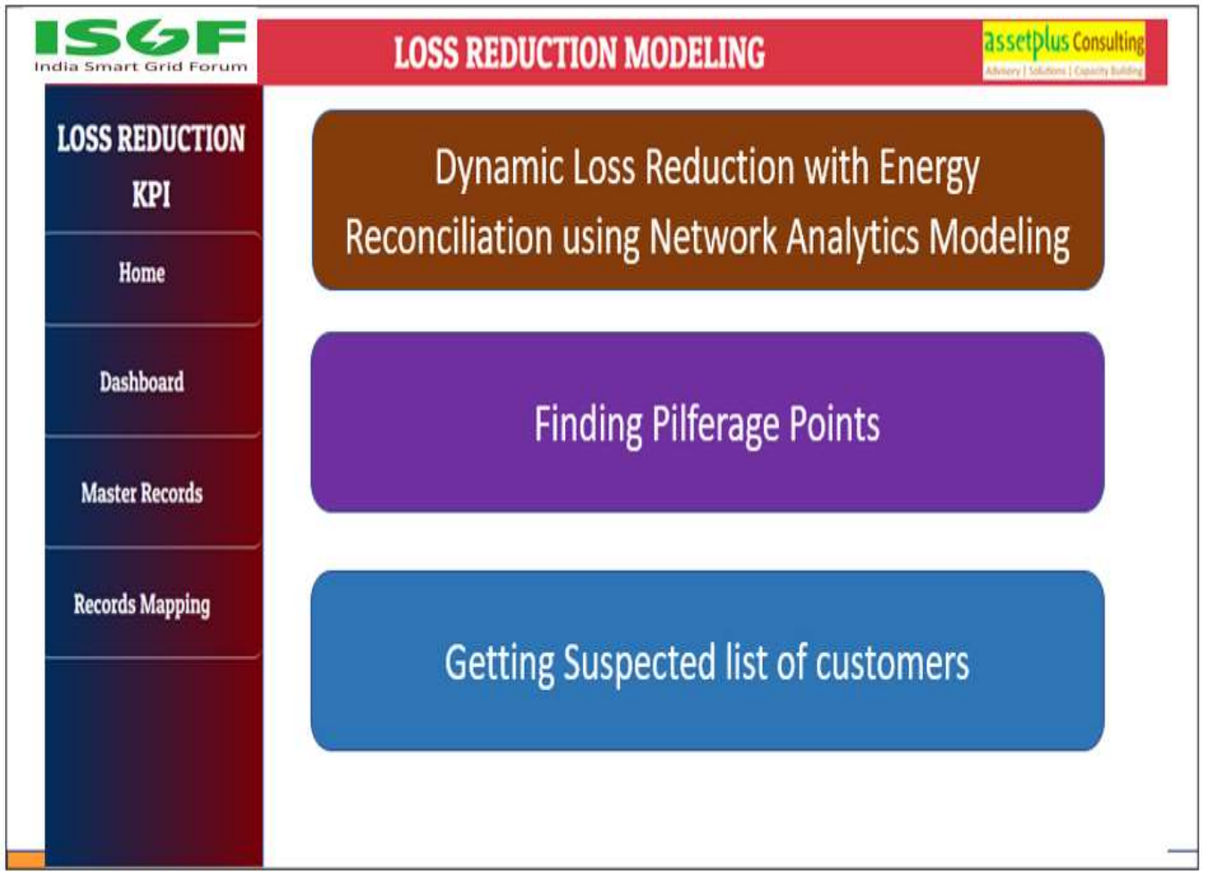
GAP ANALYSIS AT CONSUMER

Establishing the stressed network- (3 of 3)

Model improvement & refinement with comparison between billing-based Energy reconciliation to Model outcome

Identifying the Pilferage Point on the stressed network





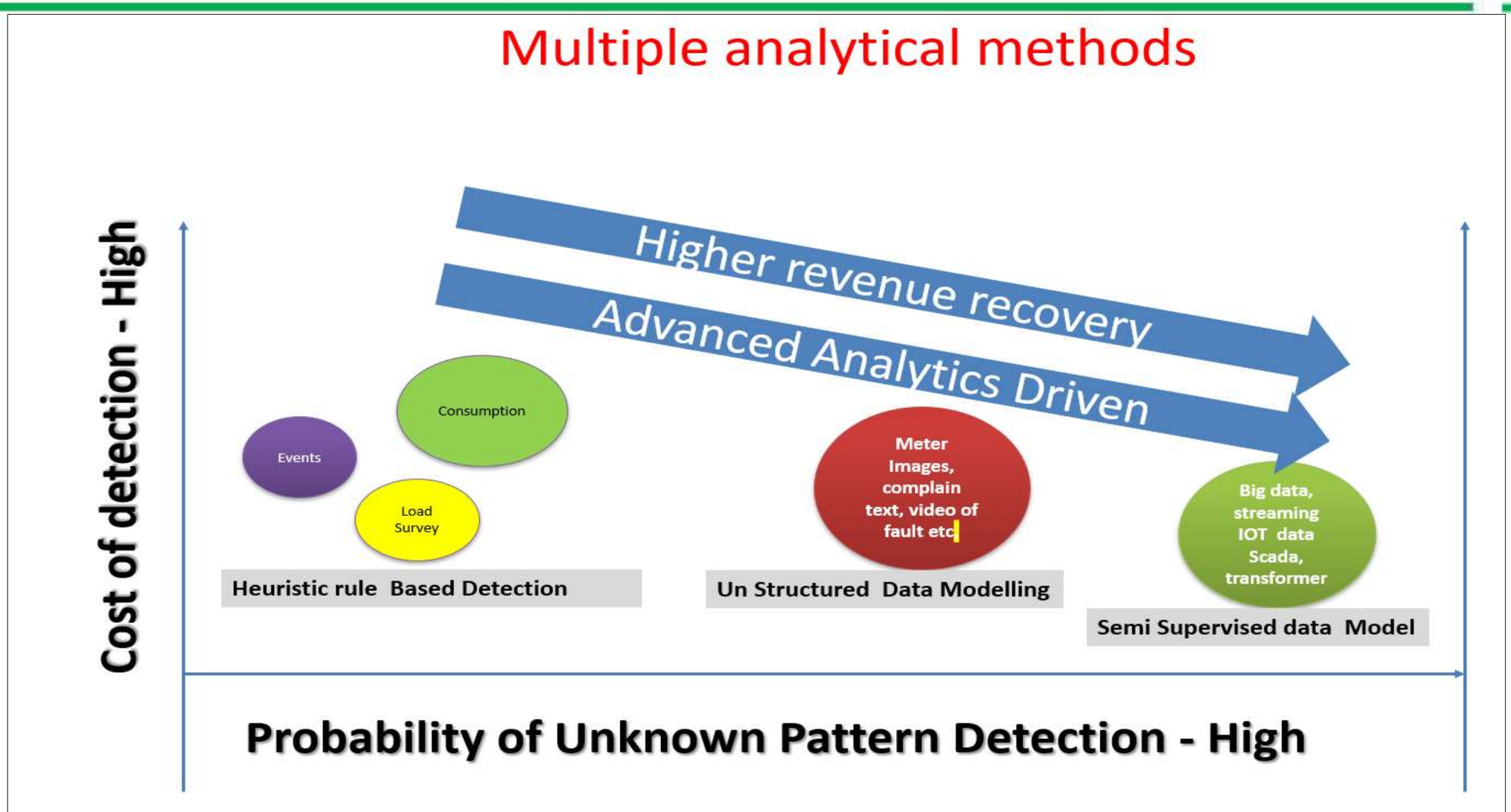
Data points

- **Consumption data /Energy Data**
- **Billing Data/customer master/Grid mapping/ payment Data**
- **Load Survey/DT/Feeder/HT consumer**
- **Tamper Events**

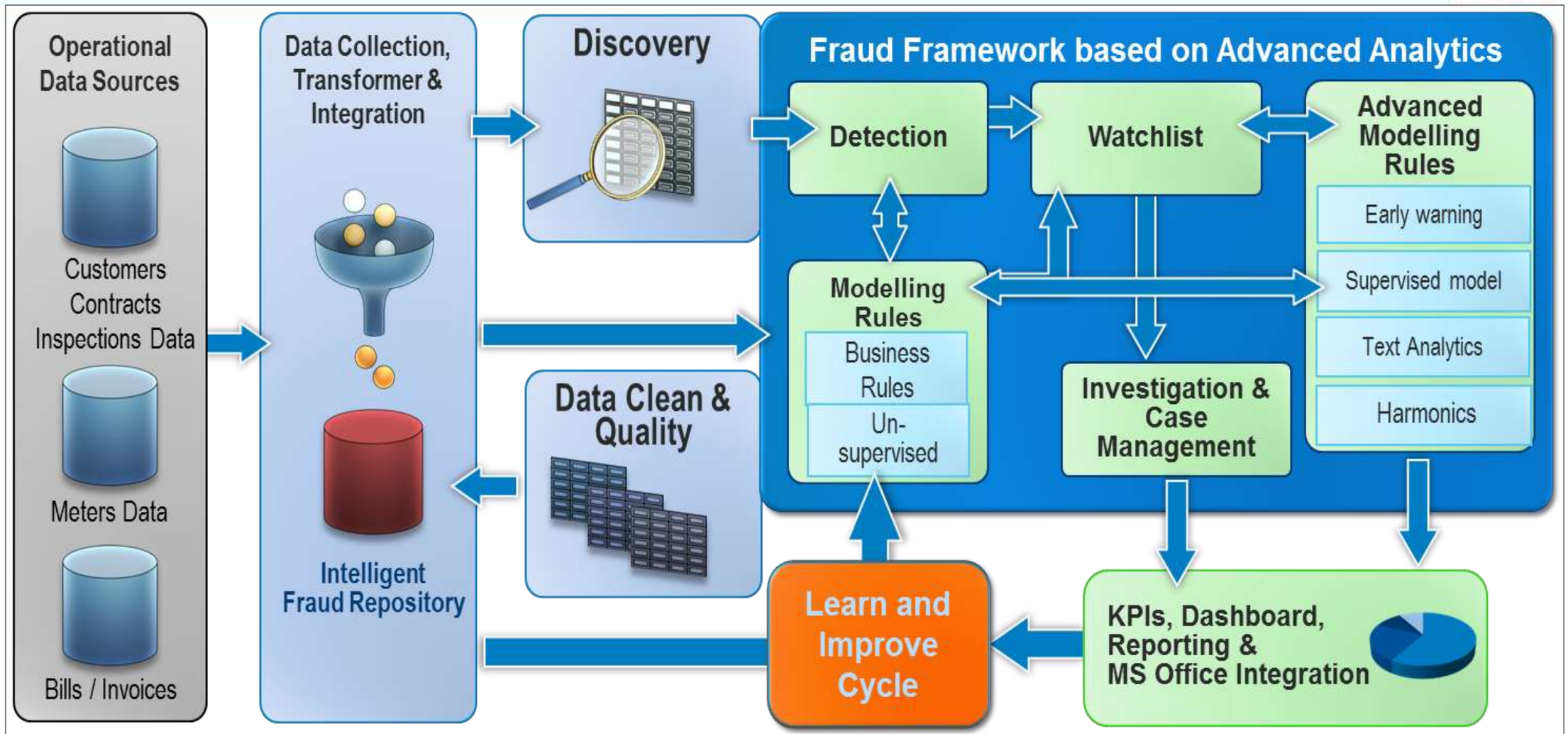
Pioneering Initiative by

- **Delhi & NCR based Power Distribution Utility**
- **Mumbai based Power Distribution Utility**
- **Gujarat Based Power Distribution Utility**

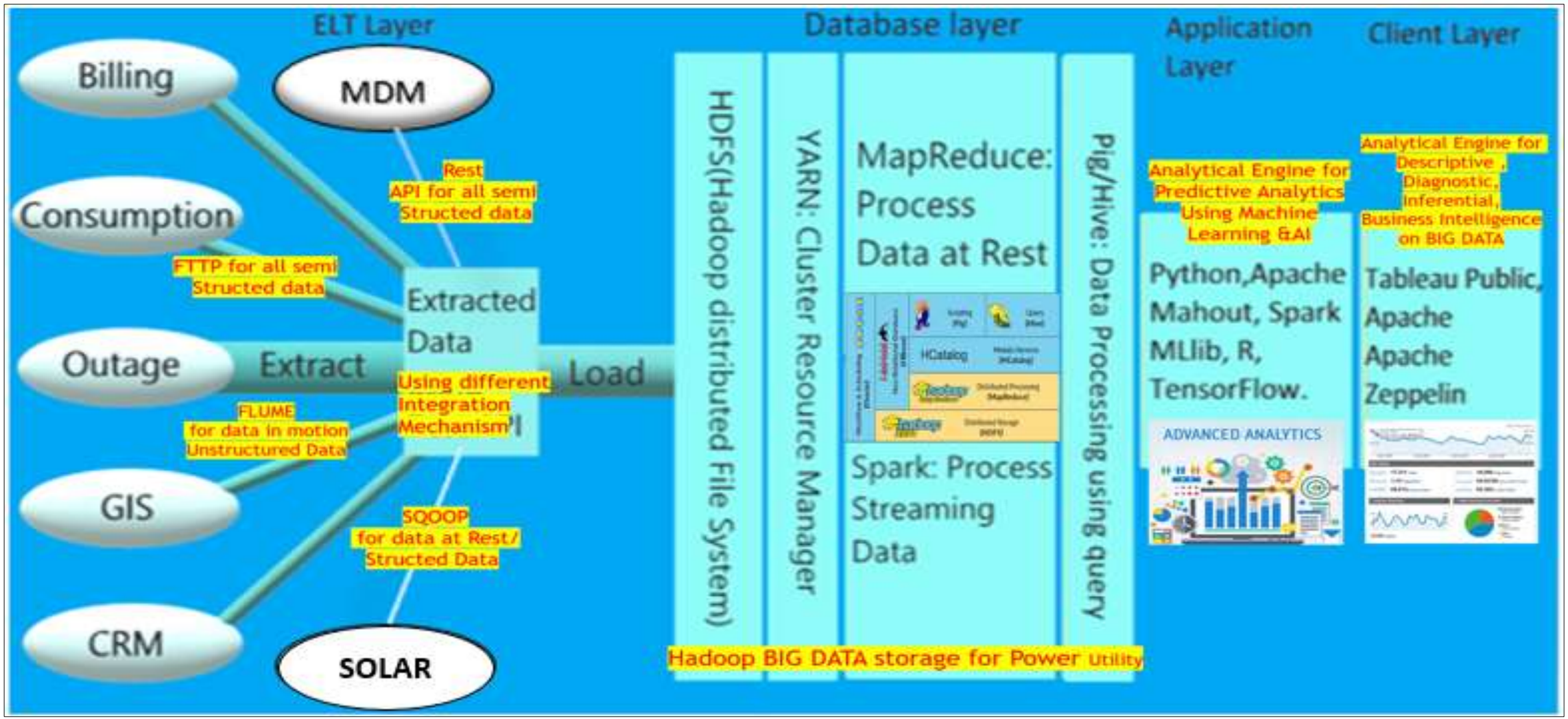
Creating Analytical Approach (1 of 4)



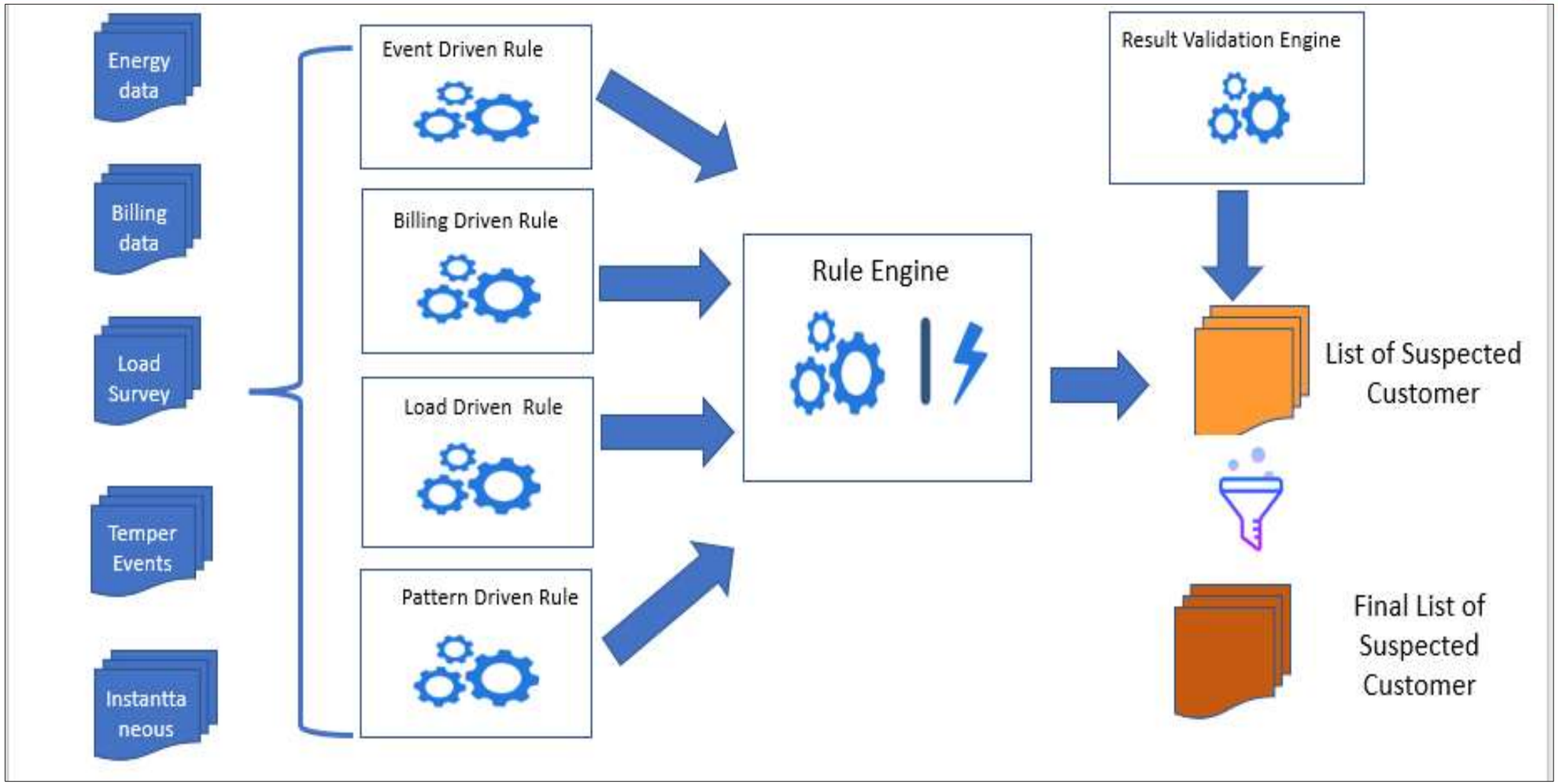
Creating Analytical Approach (2 of 4)



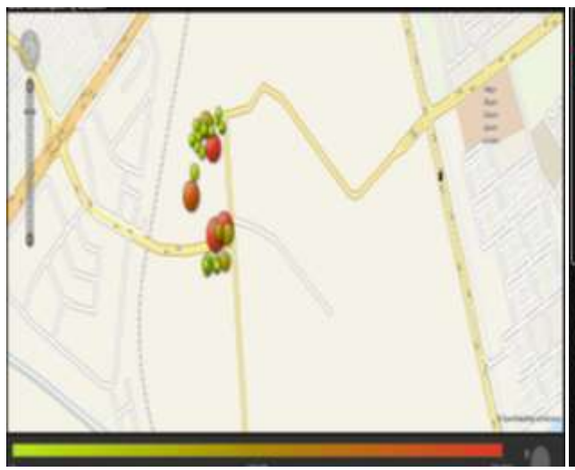
Creating Analytical Approach (3 of 4)

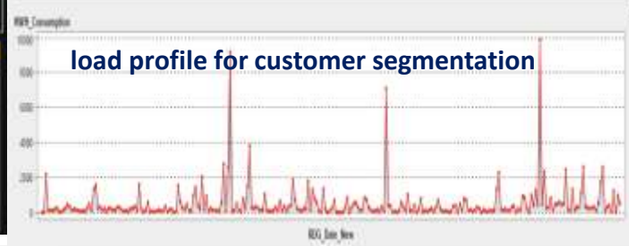


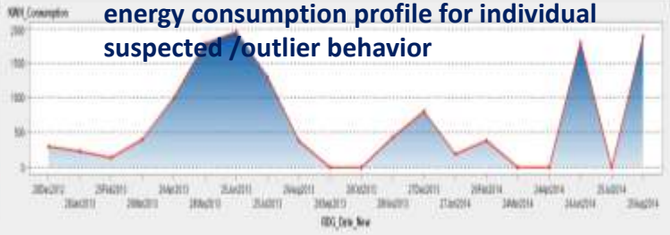
Creating Analytical Approach (4 of 4)

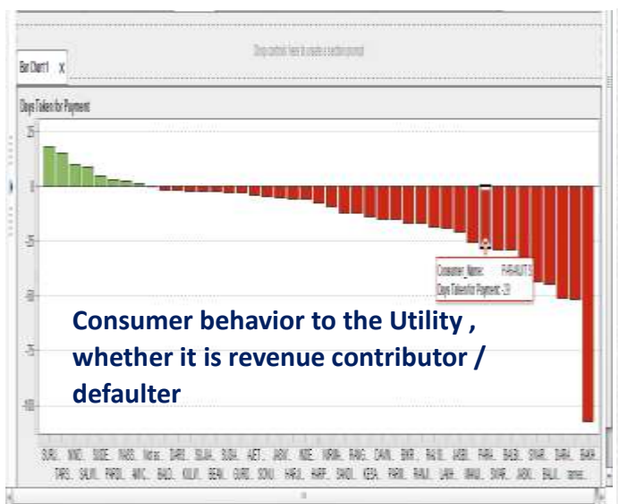


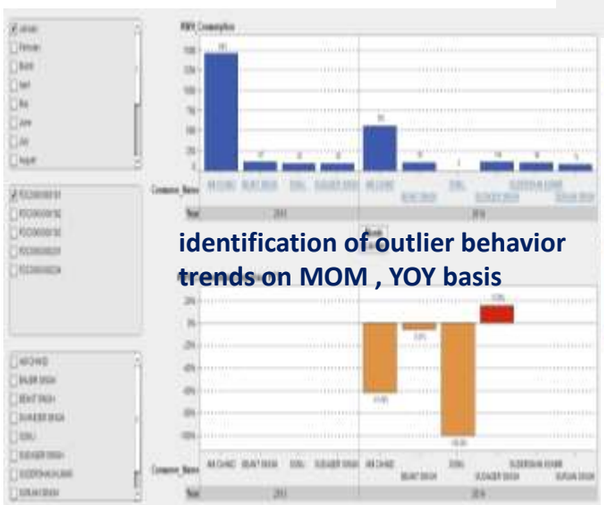
Identifying the Pilferage Point(1 of 2)

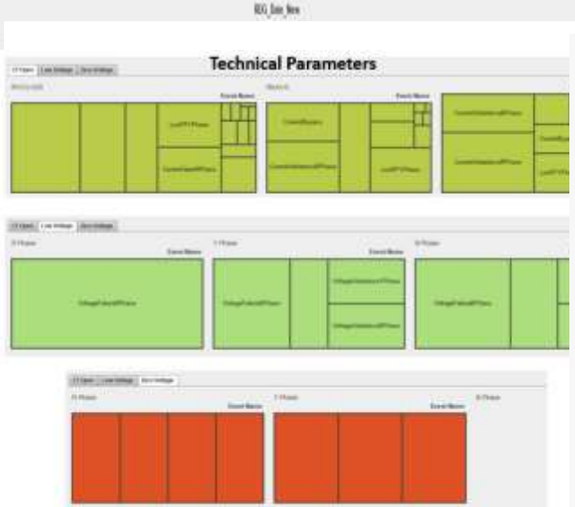


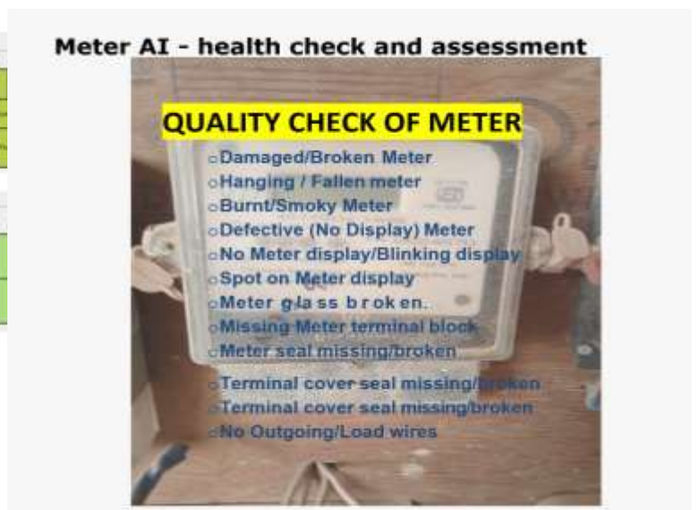






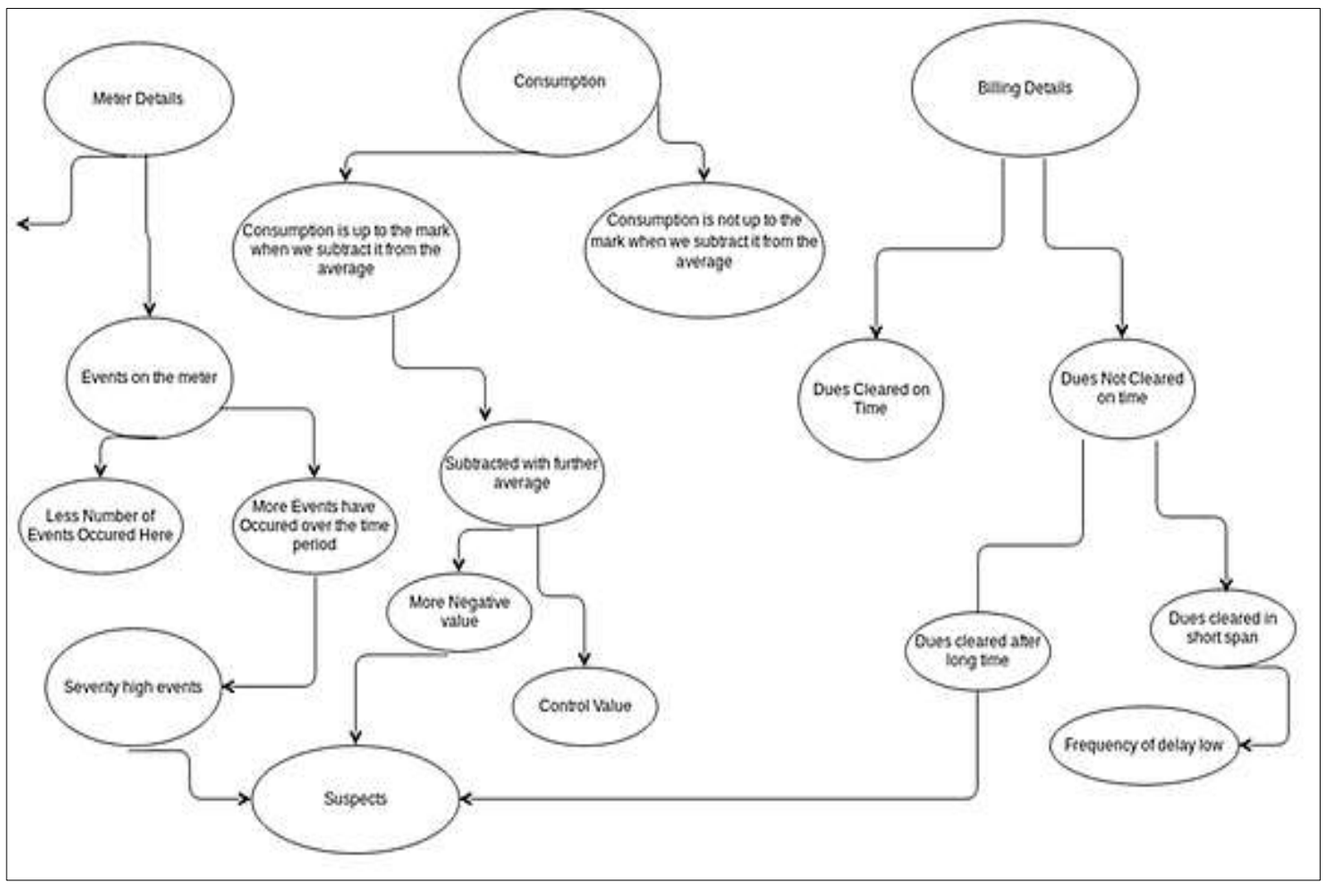






Identifying the Pilferage Point(2 of 2)

Applying Models example Random forest



Model Output (as suspected list of Customers)

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[['666704', 1, '2', '1', 'October', 0],
 ['8919913', 1, '1', '1', 'October', 1],
 ['381801', 1, '2', '0', 'October', 1],
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 ['12122230', 1, '2', '1', 'October', 0],
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 ['12083097', 1, '2', '1', 'October', 1],
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```

Key Take Away

- Energy Accountability & Reliability in the Network from s/s to customer with Energy gap dynamic reports
- Identification of stressed network & pilferage point
- Building the REVENUE PROTECTION dynamic frame work with enterprise wide data lake
- Carving REVENUE ASSURANCE with
  - Environment parameters – load, event , instantaneous
  - Surround parameter – billing, payment , complain, customer data
  - Meter Health – Meter installation conidiation

Enhancing Data Driven Transformation

Thank You

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