2006 GRIDWISE EXPO

AMI Enabling Smart Grid Applications

Ali Ipakchi

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KEMA

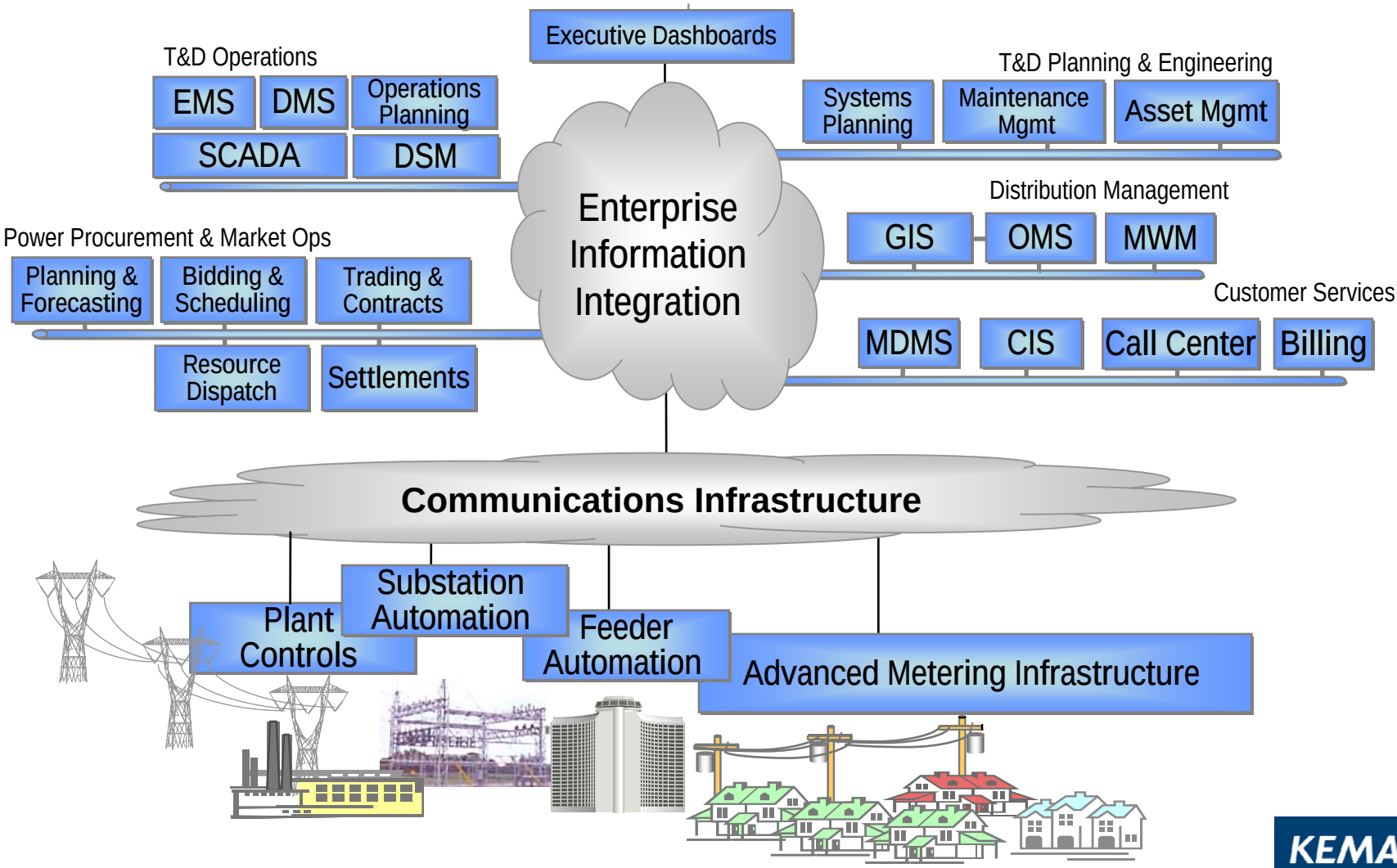
Technology Synergies Enable Smart Grid

- Traditionally, utilities work on piece-by-piece projects based on urgency of need areas
  - Often decisions are being made that only benefit a single user community
- Smart Grid applications require a holistic approach across utility business units
  - Technology and Automation
  - Cross Functional Teams – Horizontally Integrated Organization
  - Potential for a significant economic and reliability gains

Examples:

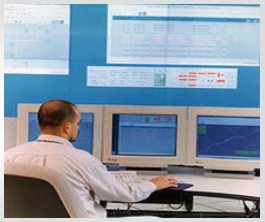
- 90%+ utilities are in various stages of implementing Intelligent Electronic Devices (IEDs) and considering substation automation
  - However, only 15% of the benefits are actually being realized
  - Enterprise Level Substation Information Integration is at its infancy
- Advanced Metering Infrastructure (AMI) is an Enabler for Distribution Automation and Customer-Side Services
  - Bi-directional Communications across distribution system enable improved forecasting, demand response, distribution automation, asset management, other automation and value-added services

Enterprise Level Integration



Harvesting Benefits of AMI / BPL

System Operations



- Planning & Forecasting
- Monitoring & Dispatch
- Switching & Control

Customer Services

Distribution System

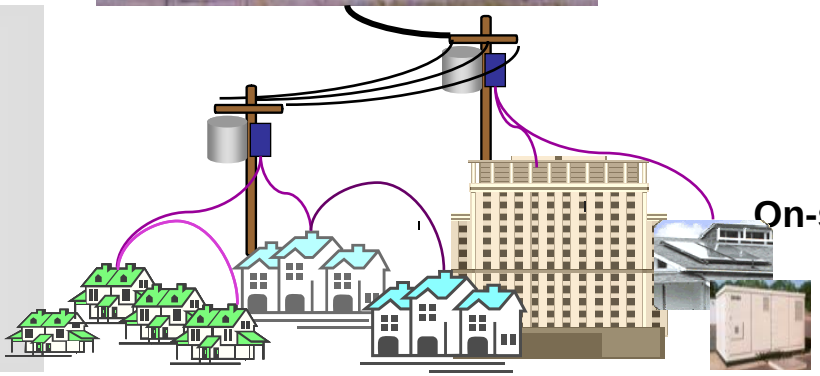
- Asset Management
  - Equipment Health Monitoring
  - Condition-Based Inspection / Maintenance
- Distribution and Feeder Automation
- Voltage/VAR Management
- Power Quality Management
- Surveillance Cameras

Outage Management

- Outage Detection & Management
- Fault Location & Restoration
- Improved Planning/Engineering

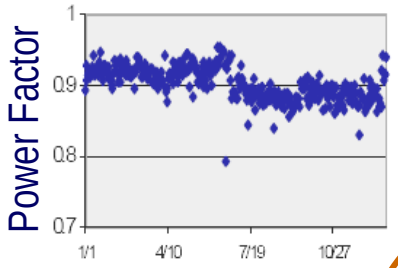
Customer Facing

- AMR
- Revenue Enhancement
- Direct Load Control
- Demand Response
- Remote Connect/Disconnect
- On-site Generation

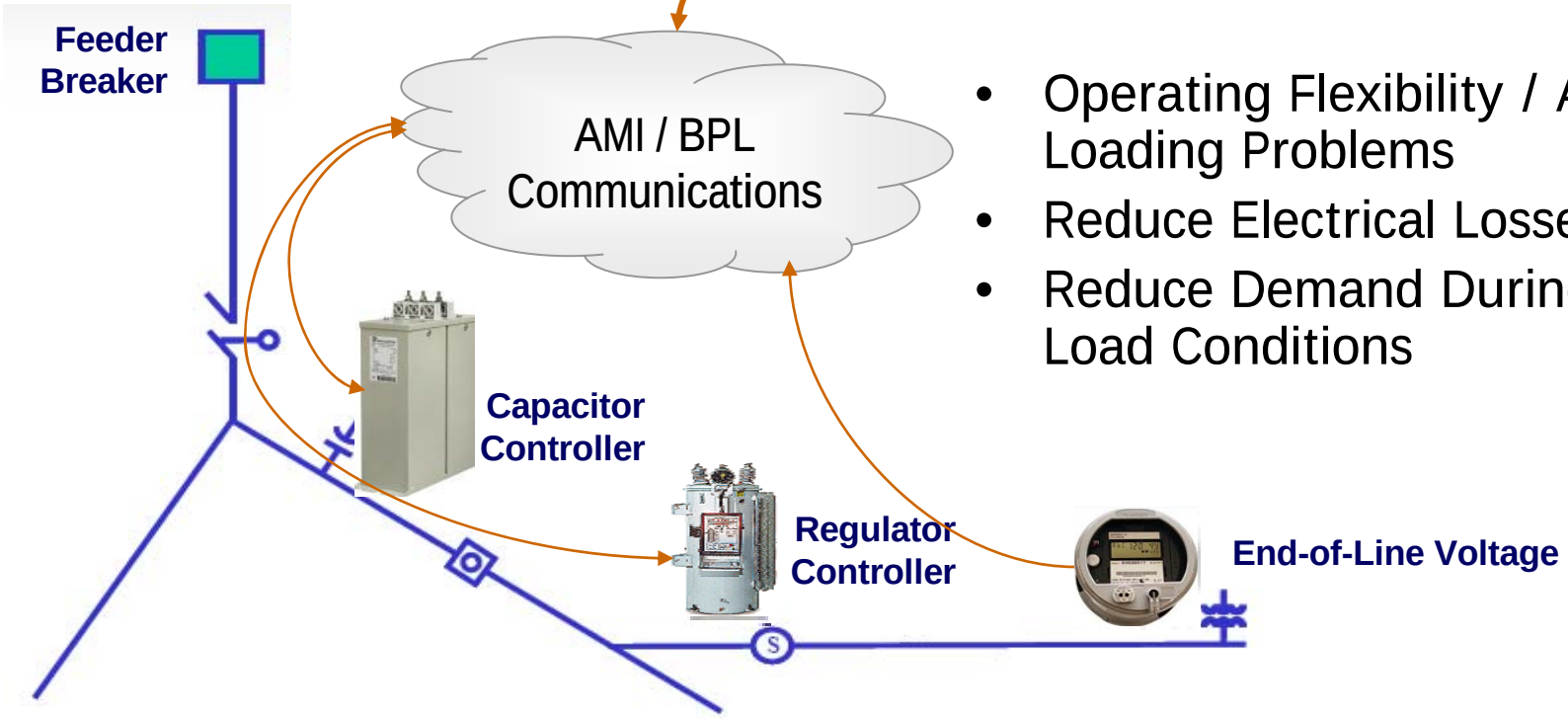


On-site DG

Example: AMI Enabled Feeder Automation



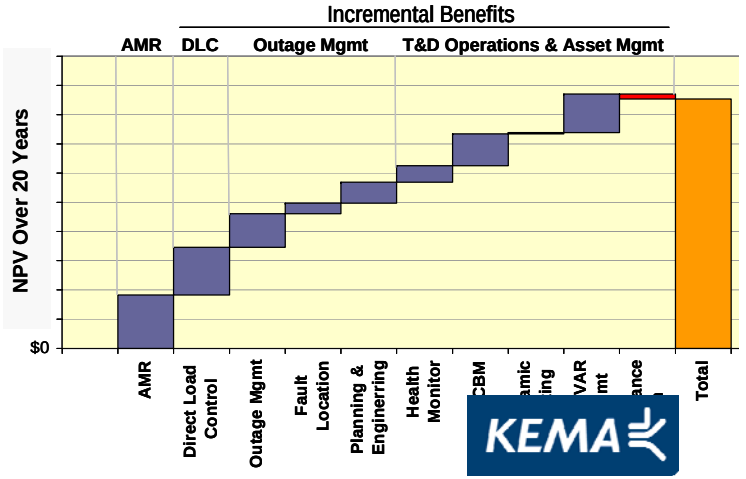
Integrated Voltage & VAR Control



- Operating Flexibility / Address Loading Problems
- Reduce Electrical Losses
- Reduce Demand During Peak Load Conditions

Cost Benefit Analysis

- Benefits Can be Characterized in the Following Categories:
  - Increased Worker Productivity
    - Reduced Labor Costs Due to Automation
  - Improved Service Reliability and Quality
    - Reduced Outage Frequency and Duration (SAIFI - CAIDI/SAIDI)
    - Improved Power Quality
  - Increase System Efficiency
    - Reduced Technical Losses
    - Lower Cost of Supply
    - Improved Engineering and Planning Process
  - Reduce/Defer/Eliminate Capital Costs
    - Improved Asset Management
    - Avoided Capacity Additions
  - Other

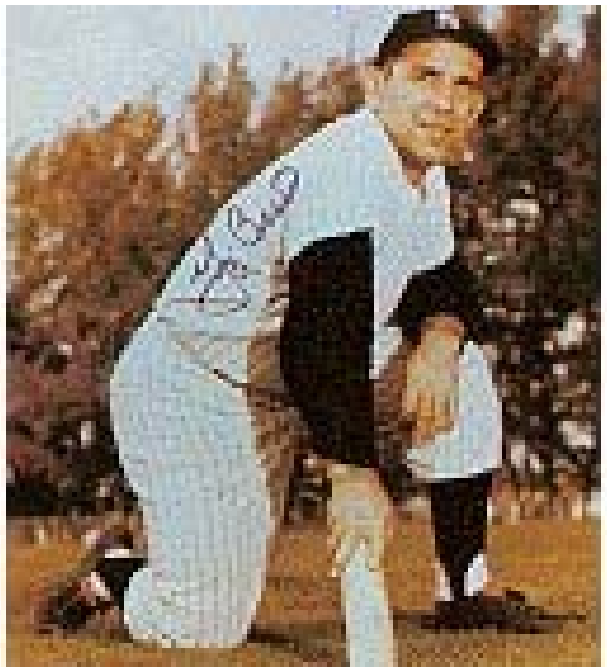


Predictions of a not so Distant Future

- Holistic solutions will emerge through collaborative efforts across utility functional units
  - Reducing business 'boundaries'
  - Many processes that are disjointed will be integrated and automated
- T&D equipment will have embedded communications and monitoring modules
  - Intelligent devices will be prolific, economical and widely used
  - Home automation and demand side management will be the norm
- Network connectivity will be universally available, at a low cost, with high reliability and security/integrity
  - Real-time communications infrastructure will provide the utility and the customers with timely information and control

As Yogi Berra says

"If you don't know where you are going, you will wind up in the wrong place."



Thank You

Ali Ipakchi
ali.ipakchi@kema.com
(650) 339-2130