SDGE PI Implementation

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San Diego Gas & Electric

PI T&D Users Group Meeting

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Sempra Energy

- Sempra Energy (a Fortune 500 company, over 12,000 employees)
    - San Diego Gas & Electric Co. (SDG&E)
    - Southern California Gas Co. (SoCalGas)
    - Sempra Energy Financial
    - Sempra Energy Int'l
    - Sempra Energy Resources
    - Sempra Energy Trading

Sempra Energy headquarters San Diego, CA

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SDGE & Power System

- 1.3 Million Customers (3 million population)

- 4,100 sq. mile service territory

- 3,960 MW System Peak Load (8/31/98)

- 120 Transmission RTUs (69kV, 138kV, 230kV and 500kV)

- 700 Distribution RTUs (12kV)

- Electric Transmission Division
  - Grid Operations Department
    - **GE Network Solutions XA21 EMS**

- Distribution Operations Division
  - Electric Distribution Operations Department
    - **Advanced Control Systems PRISM SCADA**
  - Electric Distribution Services Department

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PI Project Background

- Enhancing EMS real-time monitoring displays (advanced graphical representation, dynamic and effortless display building, …etc.)

- Improving/replacing EMS data collection and in-house developed historical data warehouse which has
  - 1-hour/30-minute collection frequency for most analogs
  - 2-second for only 500KV analogs
  - No digital/status collections
  - Tabular displays only, …etc.

- A joint project of combined effort from
  - Electric Transmission (30%)
  - Distribution Operations (70%)

Accomplishment

- Started implementation in April/May 2003

- Created 50,000 tags: 10,000 for EMS and 40,000 for DMS

- Fine-tuned point attributes (i.e. exception/compression/zero/span, 200+ digital states for EMS, 400+ for DMS)

- Backfilled EMS historical data since 1995

- Backfilled DMS historical data since 2000

- Built Module Database for EMS & DMS

- Created ProcessBook and ActiveView displays

- Implemented PI-ODBC & PI-OLEDB and mounted PI server as a linked server on our existing SQL server

- Defined daily backup's for PI databases

- Built "IT Monitor" for EMS infrastructure data

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Configuration and Security

- Three PI platforms
  - Development PI server/OPC
  - Primary PI environment at the Primary Control Center
  - Redundant PI environment at the Backup Control Center
- Web Server for ActiveView and SQL server for PI-OLEDB
- EMS, DMS and PI servers are placed in different DMZs
- PI-Interfaces (OPC servers) are located in EMS/DMS DMZs
- SSL enabled web server and user authentication enforced
- ActiveX control digitally signed by Verisign
- Created PI users & groups with different access rights to view data and modify point attributes

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PI Architecture Overview

EMS/ICCP

DMS/OPC

DMS DMZ

EMS/ICCP

DMS/OPC

AXS4 ICCP OPC

AXS4 ICCP OPC

EMS DMZ

PI MCC

Development PI Server/OPC

PI BCC

PI DMZ

Web Server ActiveView
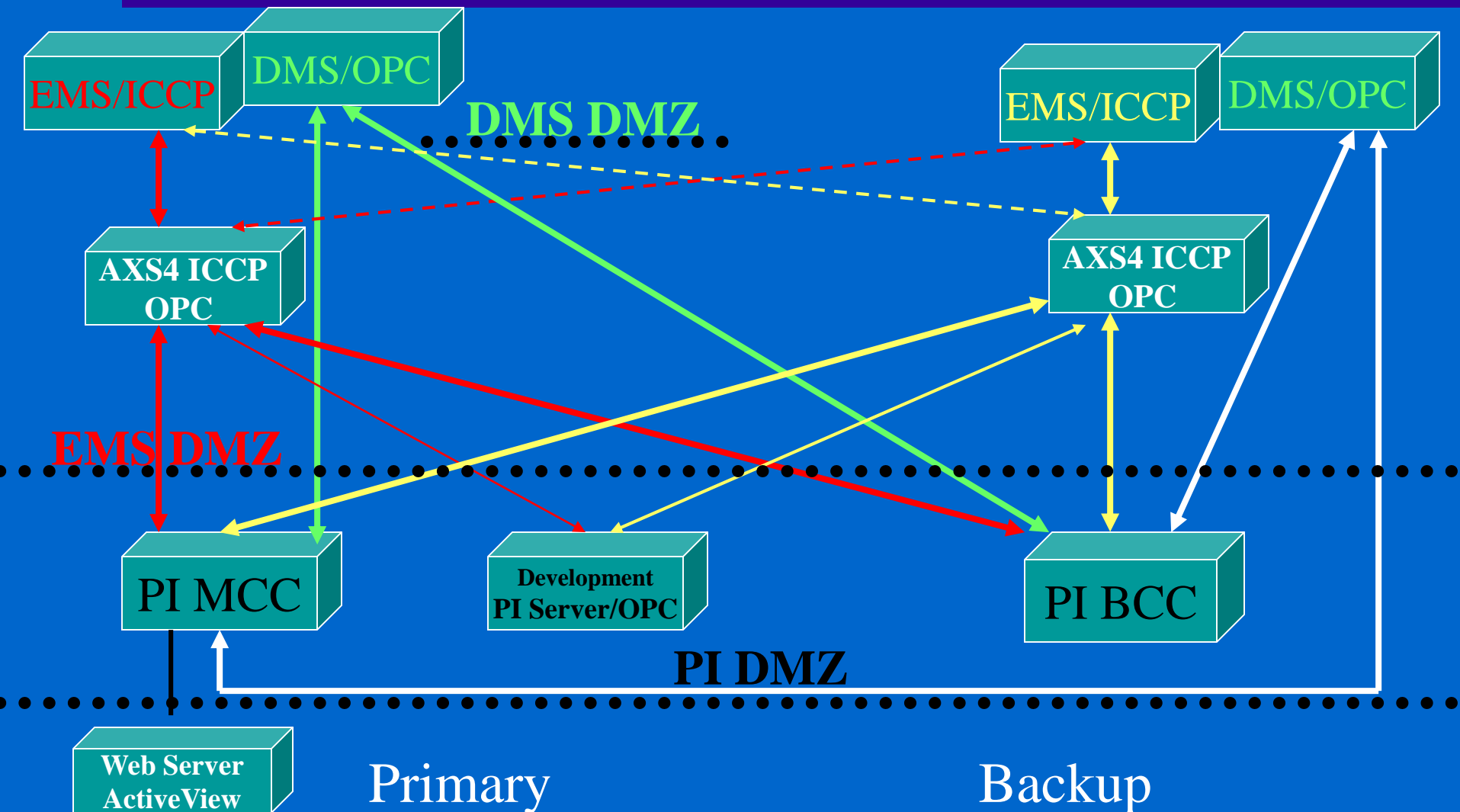
Primary

Backup

PI at Primary Control Center
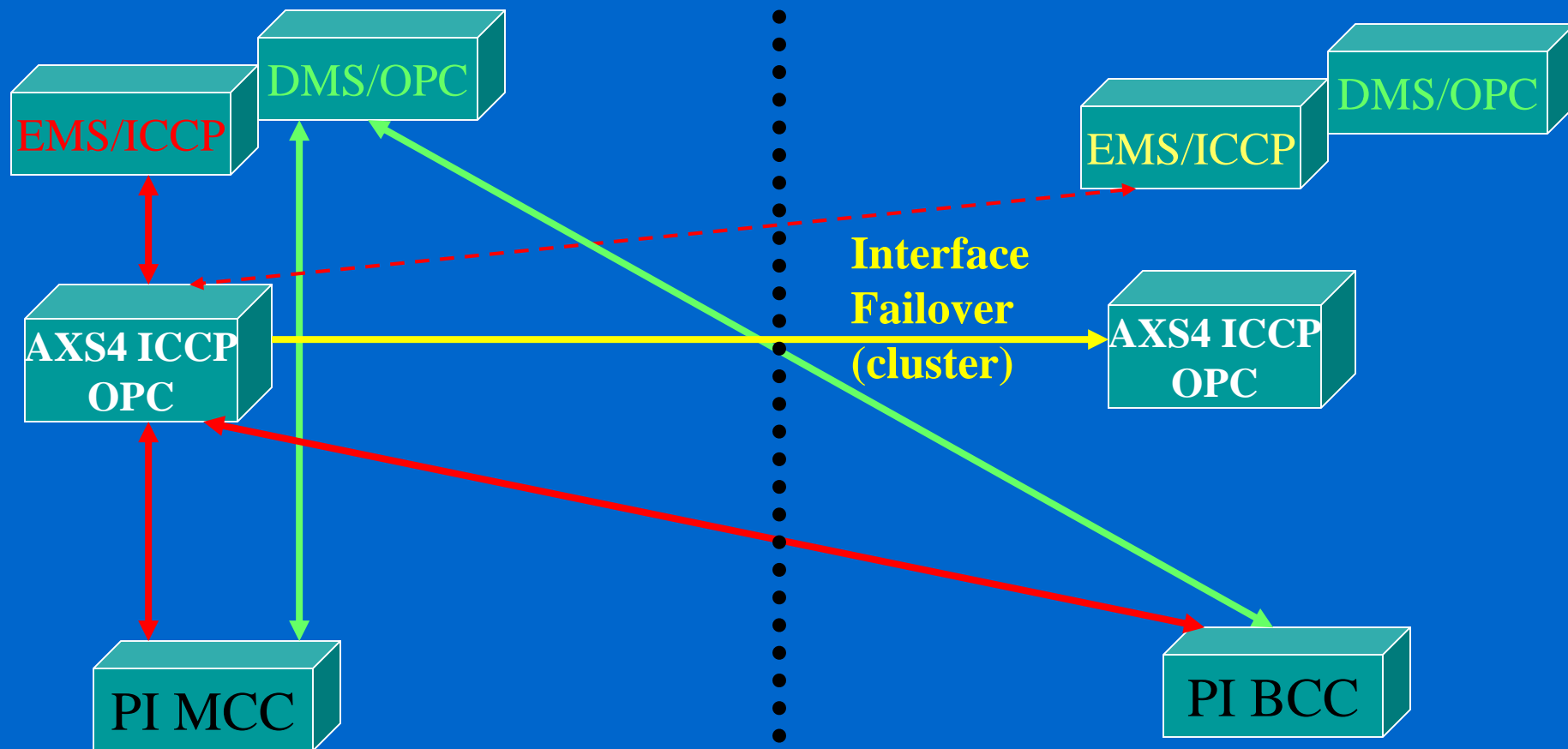
PI in Backup Control Center
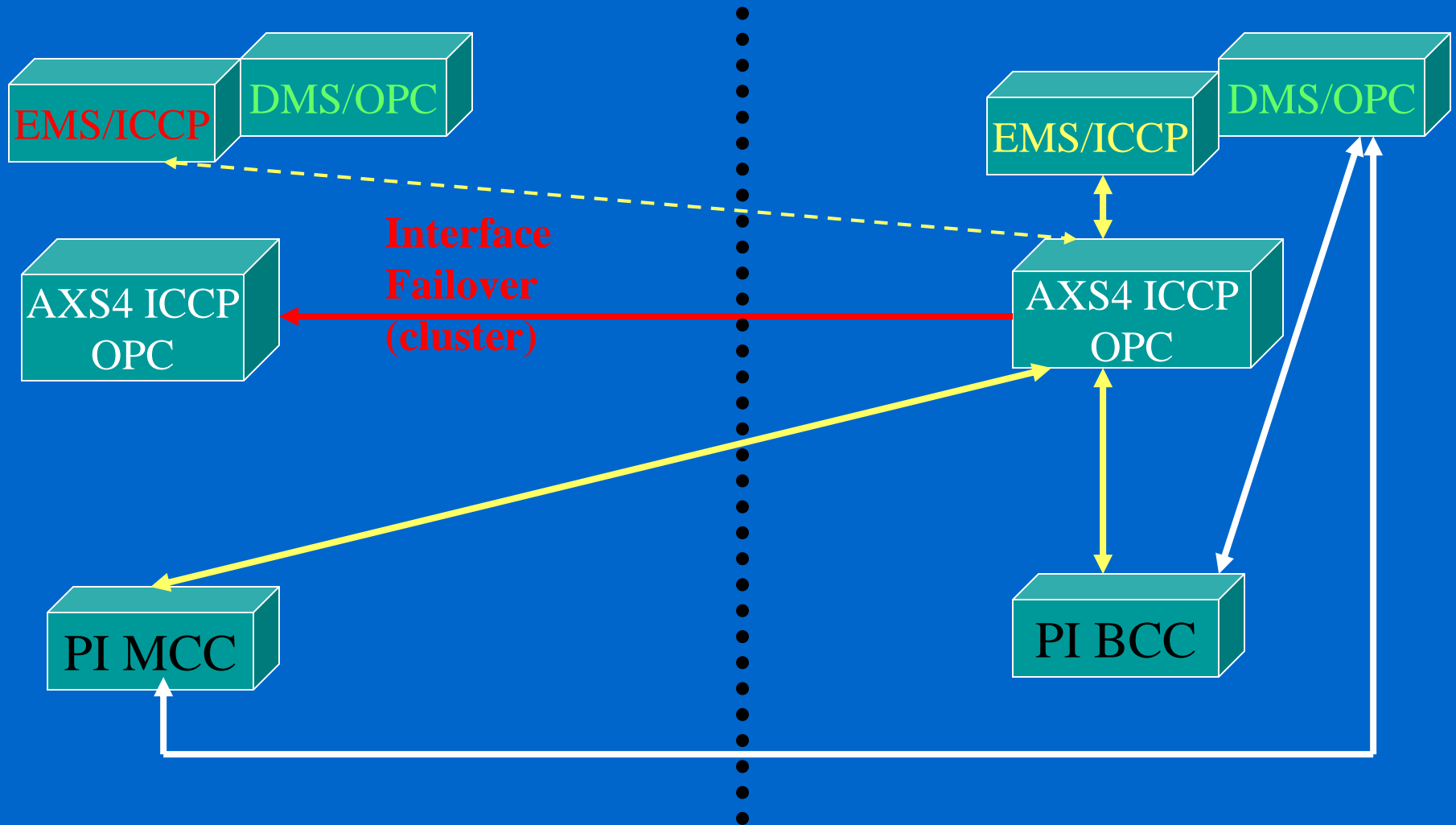
SISCO AXS4 ICCP OPC Server

- Failover/redundant capability

- Bi-directional association (client & server): sending calculated data back to EMS

- Auto-Point-Sync capability with OPC

- Quality code and value can be mapped to single tag without creating separate quality tag (saving tags and $$$)
  - ICCP quality mapped to OPC Quality
  - Capture of all ICCP Quality values requires a separate tag

- Option of utilizing EMS/DMS timestamp to store data on PI server (currently using NTP to source EMS T&F)

- Automatic creation/ICCP object synchronization

- User-Friendly GUI ICCP Configuration Utility

AXS4 Failover/Redundancy

Cluster or Fault Tolerance

NODE_1

NODE_2

OPC-INT

OPC-INT

Interface Failover (cluster)

OPC

OPC

DCOM

AX-S4 ICCP
ACCESS FOR...

AX-S4 ICCP
ACCESS FOR...

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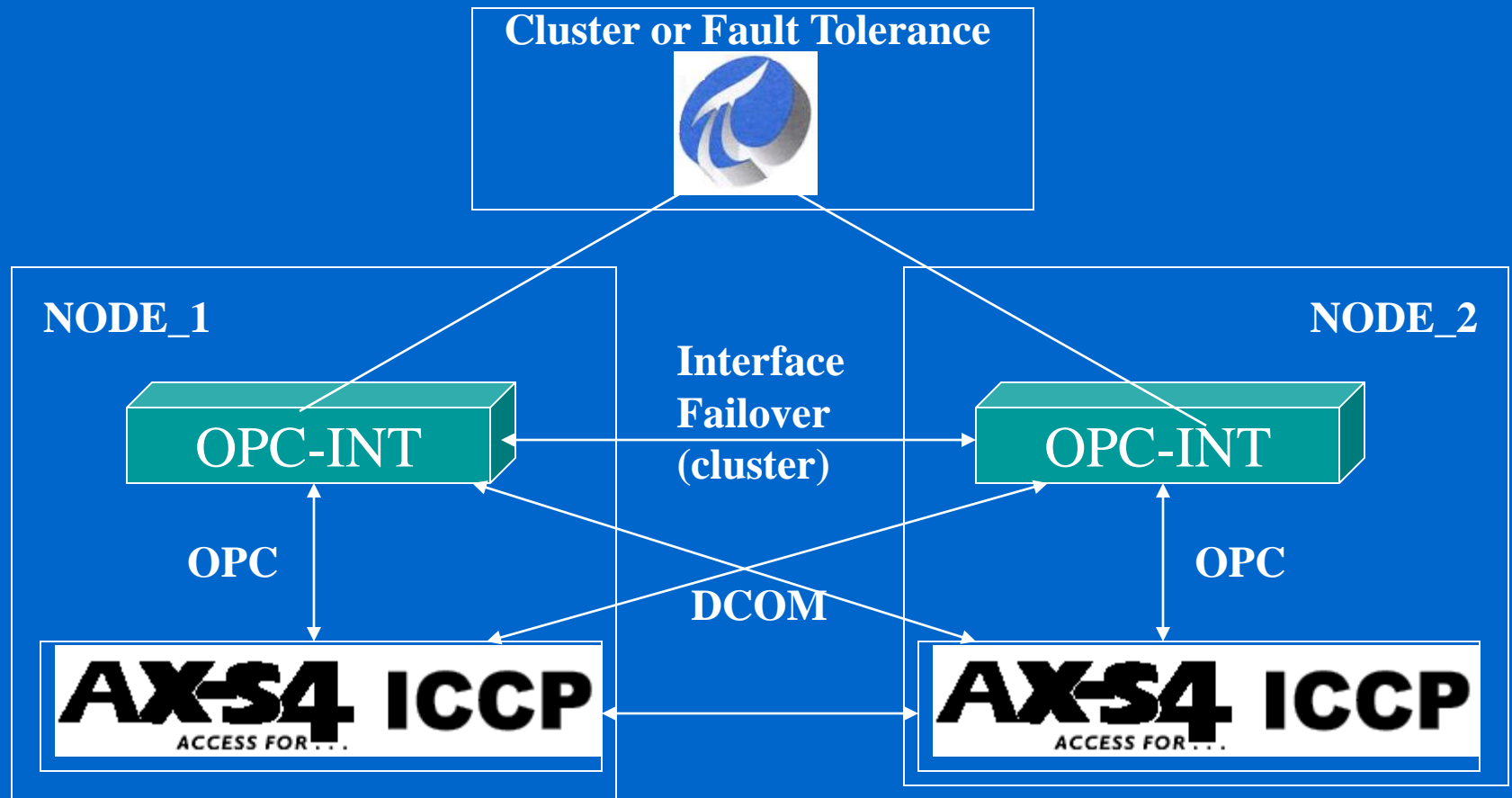
PI Project Plans

- Phase I - 2003
  - Data warehouse for Transmission EMS and Distribution DMS

- 2004 and after
  - A potential component of Company T&D EDW-Engineering Data Warehouse for all time series data
  - Implement APS Auto-Point-Sync
  - Develop advanced applications using ACE (VB.net)
  - Develop applications for messaging and notification
  - Purchase and implement ICE?

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Module Database Creation Utility

Module Database Sample

Transmission Substation Trending
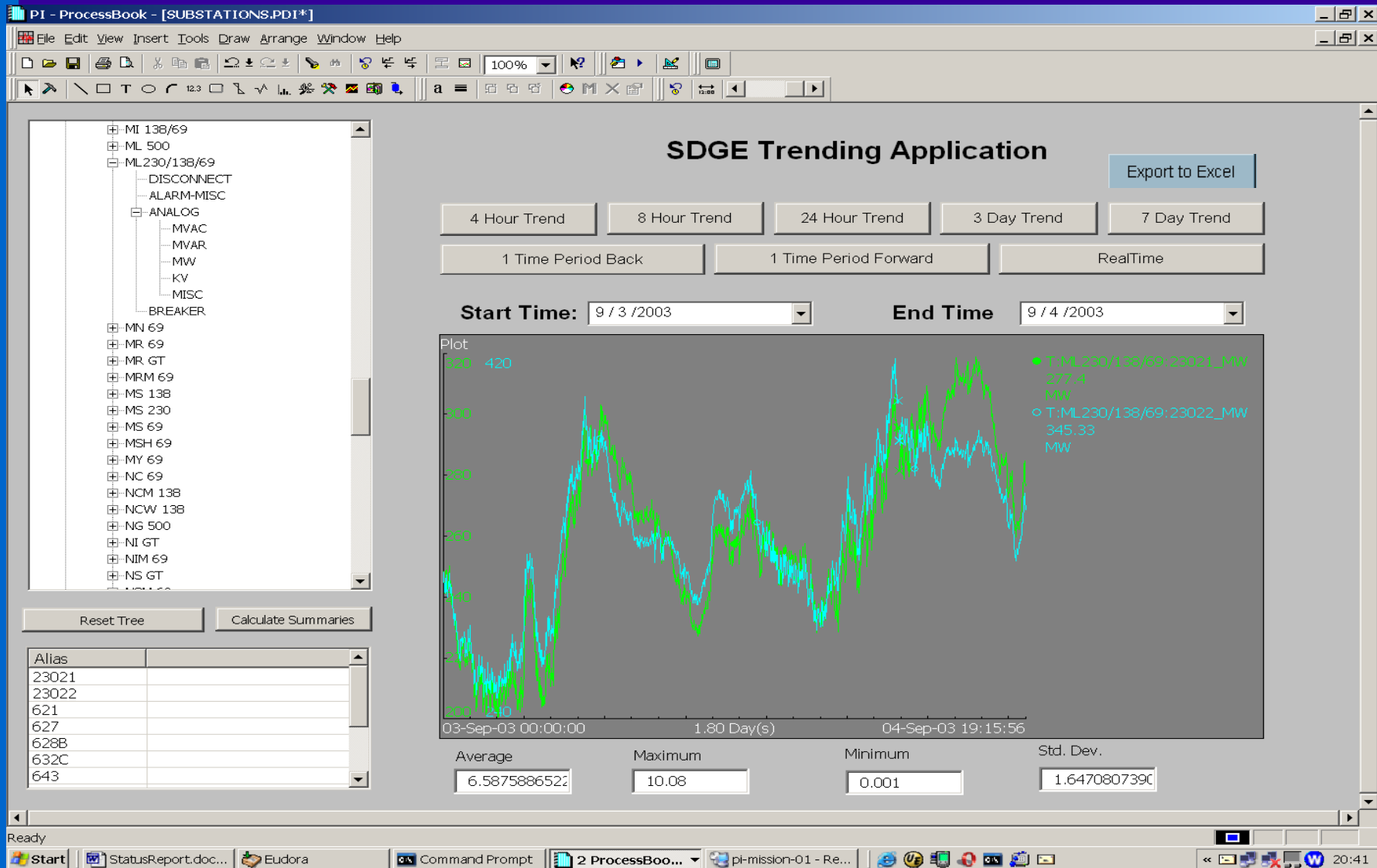
Distribution Substation Trending
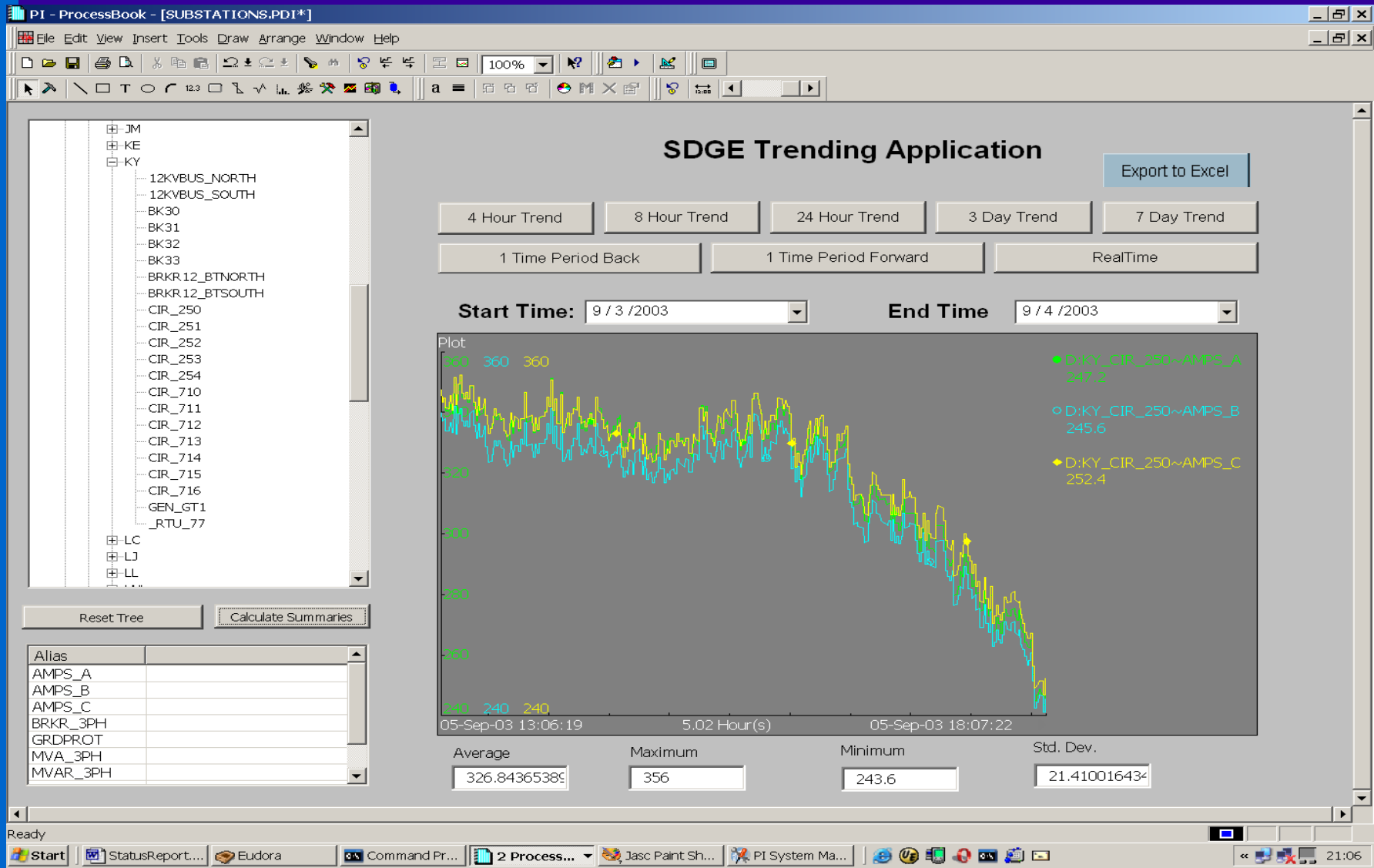
Transmission System Summary

Tie Line/Breaker Status
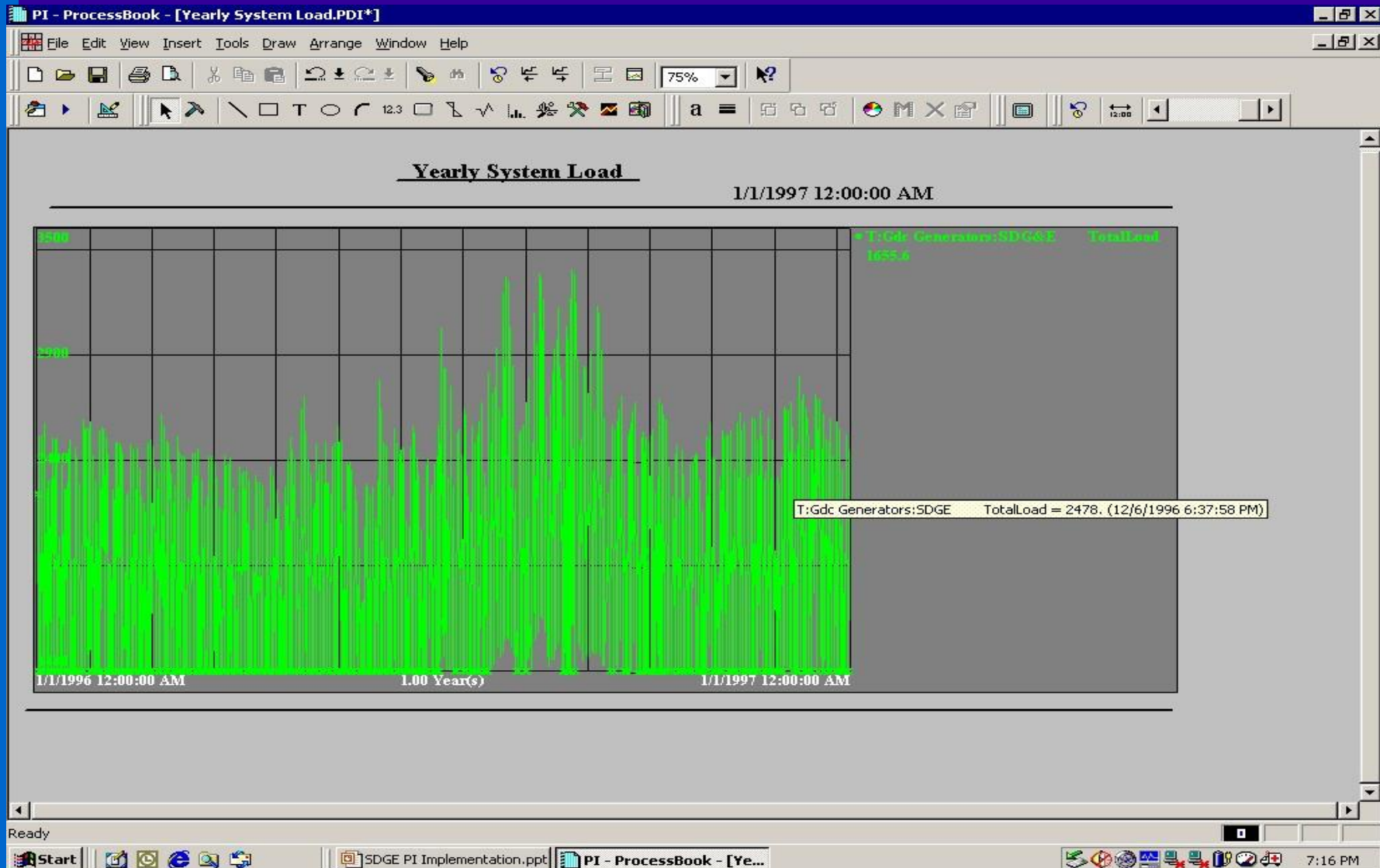
Load Forecast vs. Actual

System Load Day Comparison
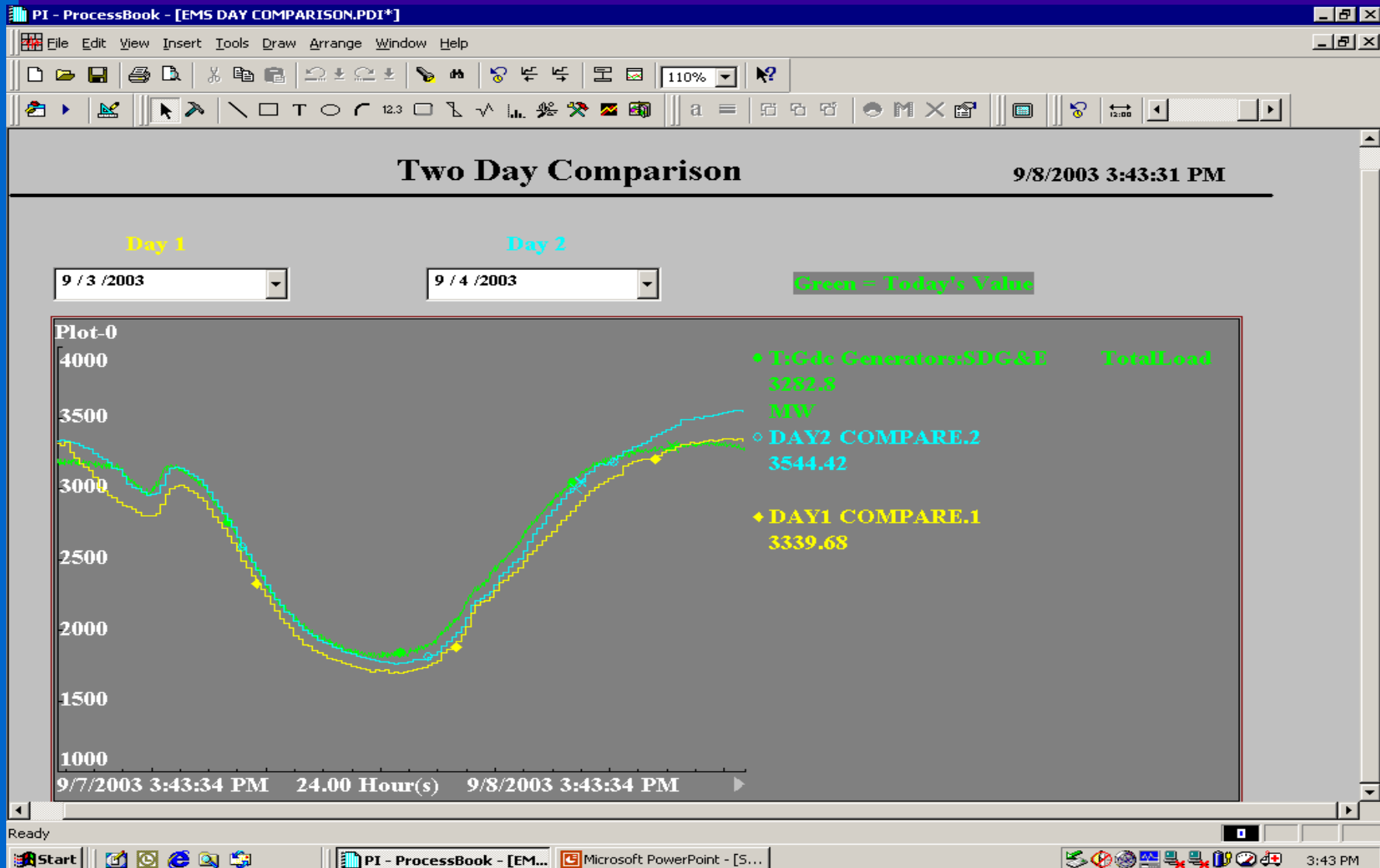
System Load Yearly Summary

Looking Forward….

- Module database performance improvement

- PI client software enhancements to utilize module database automatically (ProcessBook 3) to reduce coding

- Million-tag PI server

- Exchanging ideas via PI user group
    pi_td_users@yahoogroups.com

    To join/subscribe, email to

    lee@osisoft.com

    or   amoore@semprautilities.com

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