North Anna/Surry PCS Data Diode Implementation

Dominion Energy®

R*Time Installation

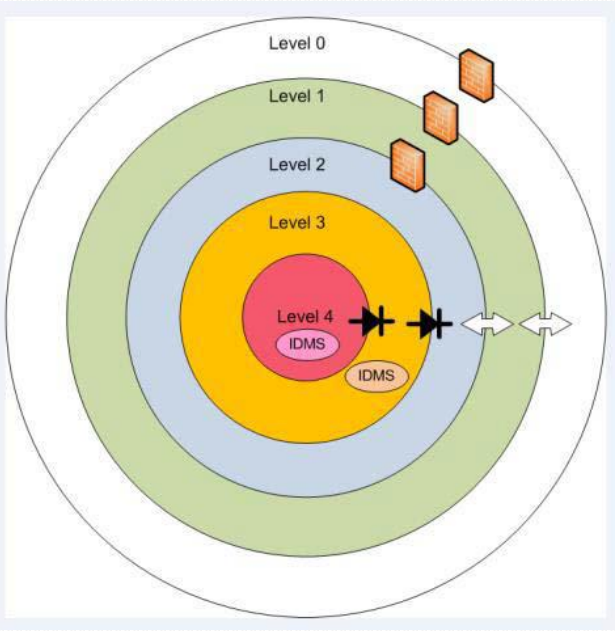
December 2017

- Installed Data Diodes at both Surry and North Anna Power Stations
- Implemented R*Time in Emergency Planning facilities
- Maintained the same Plant PCS (SAIPMS) within the Control Room
  - Created an isolated system

What drove us

Milestone 8

- Full cybersecurity plan implementation accompanied by continuous evaluation and monitoring.

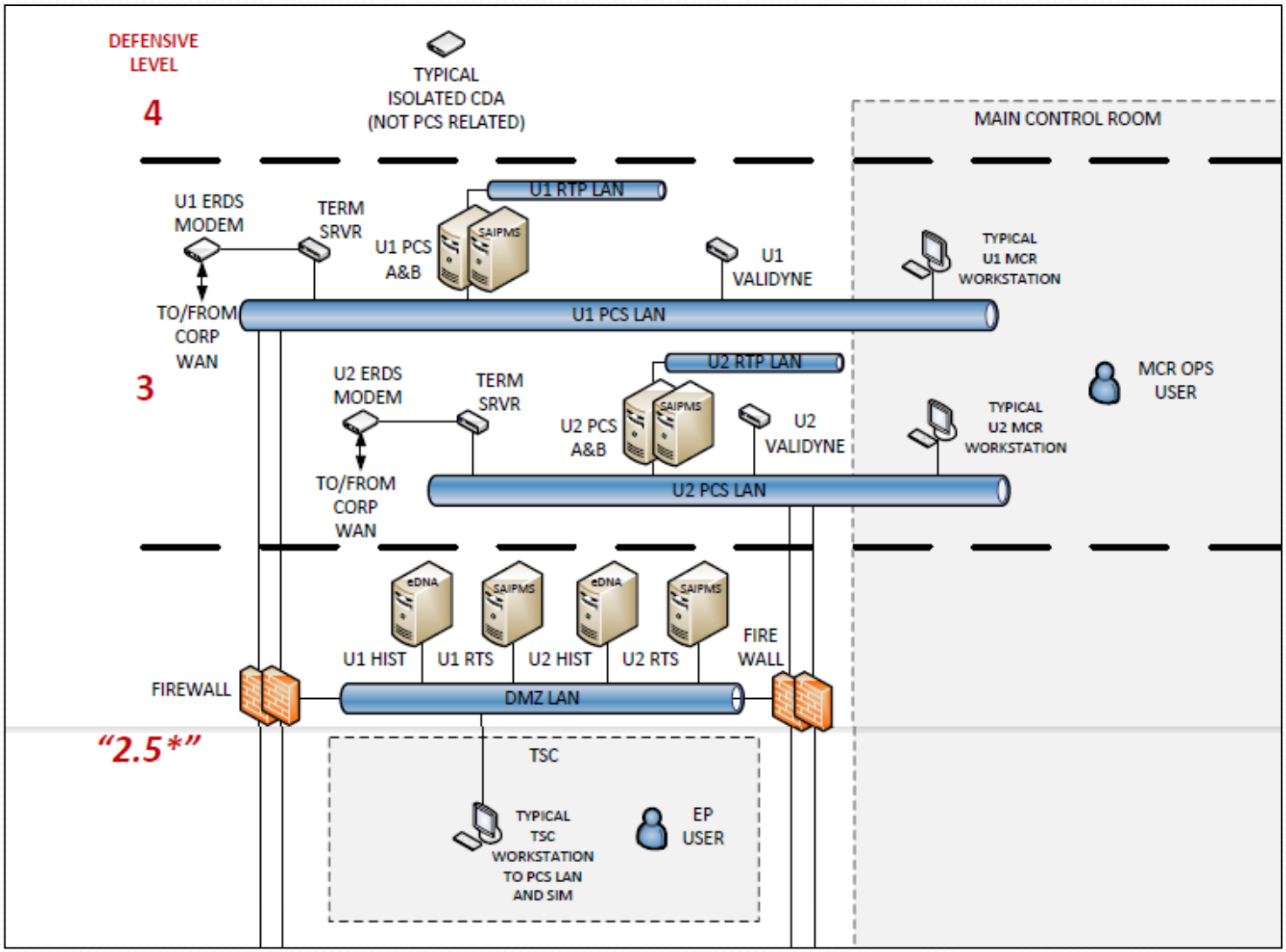


Level 0 – The Internet
Level 1 – Corporate WAN
Level 2 – Station LAN
Level 3 – Security/EP Infrastructure (PCS)
Level 4 – Safety and Security

What Drove Us

To improve the cyber security defensive architecture of the Plant Computer System (PCS), a deterministic one way data flow for critical networks was applied via data diodes. This enforced unidirectional data flow from the protected PCS LAN to server.

Configuration (pre Data Diode)



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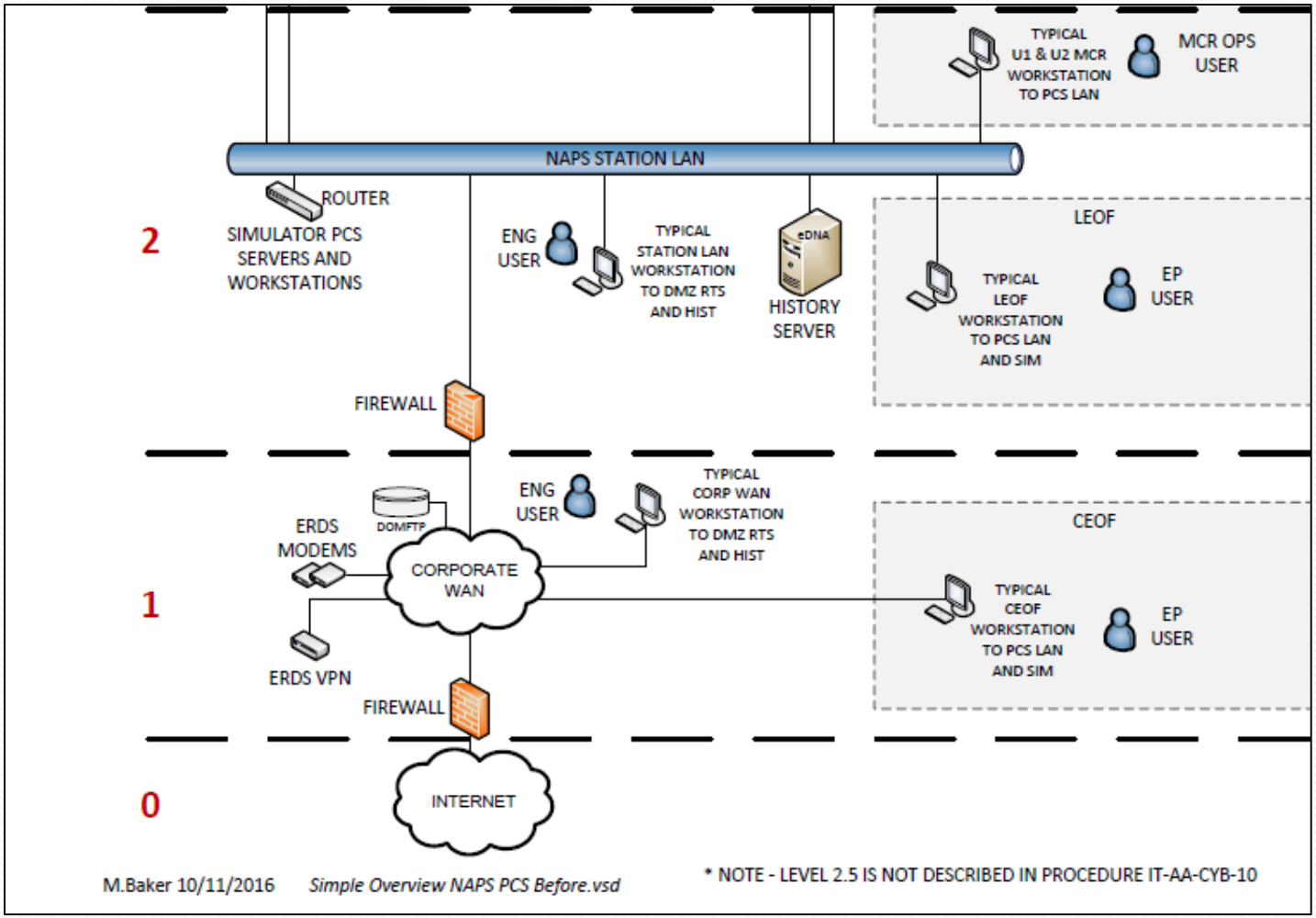
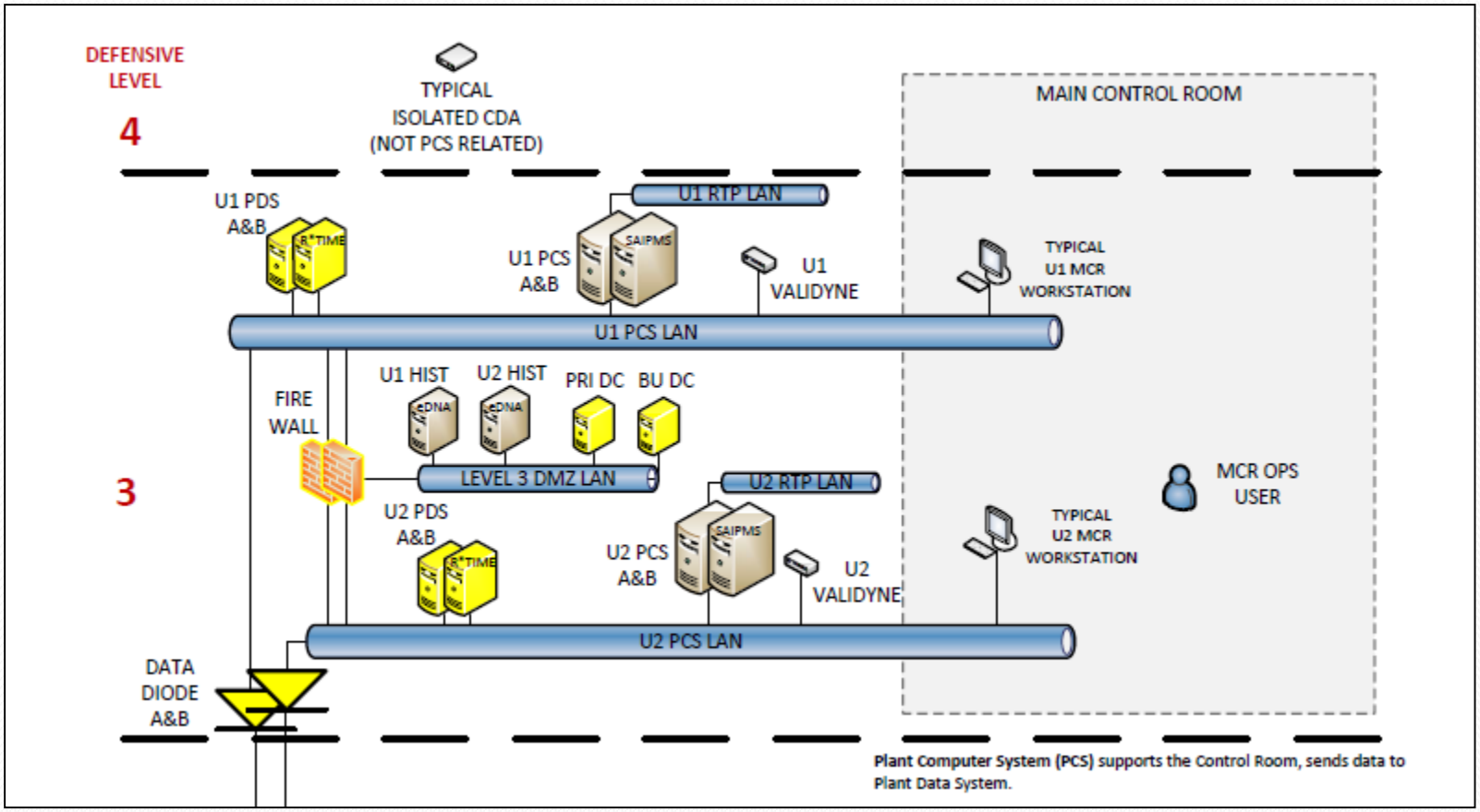


Configuration (post Data Diode)



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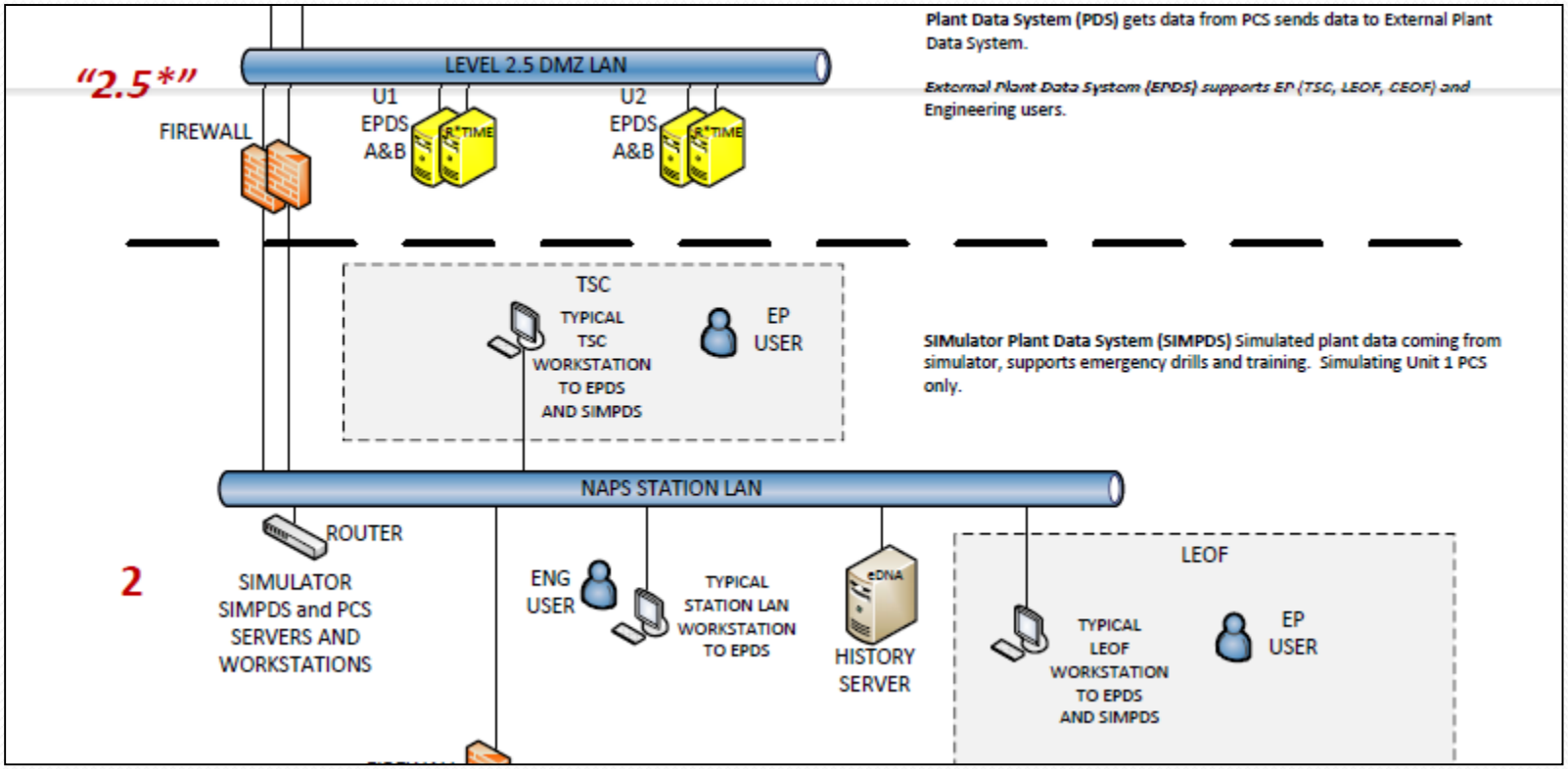

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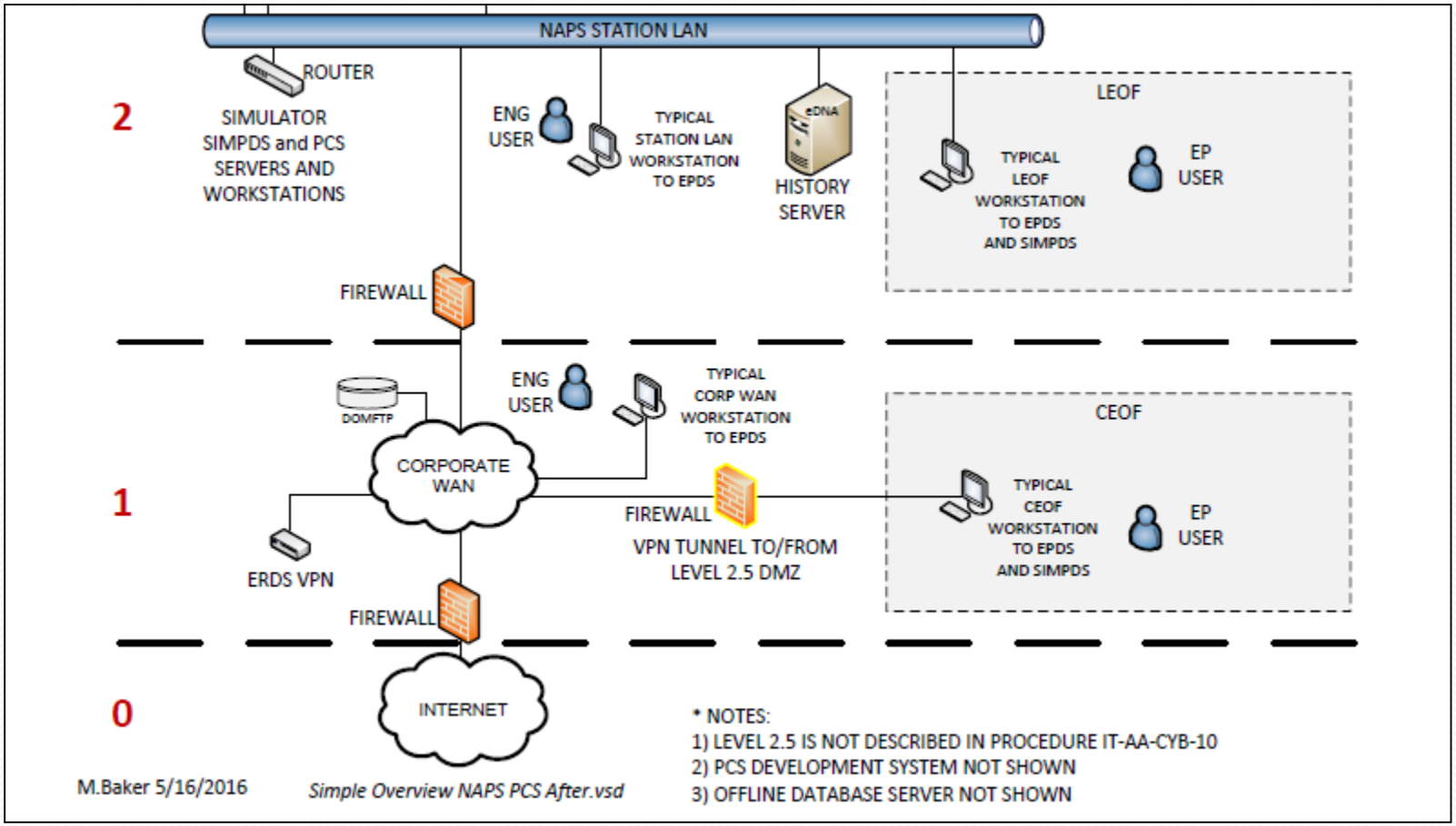


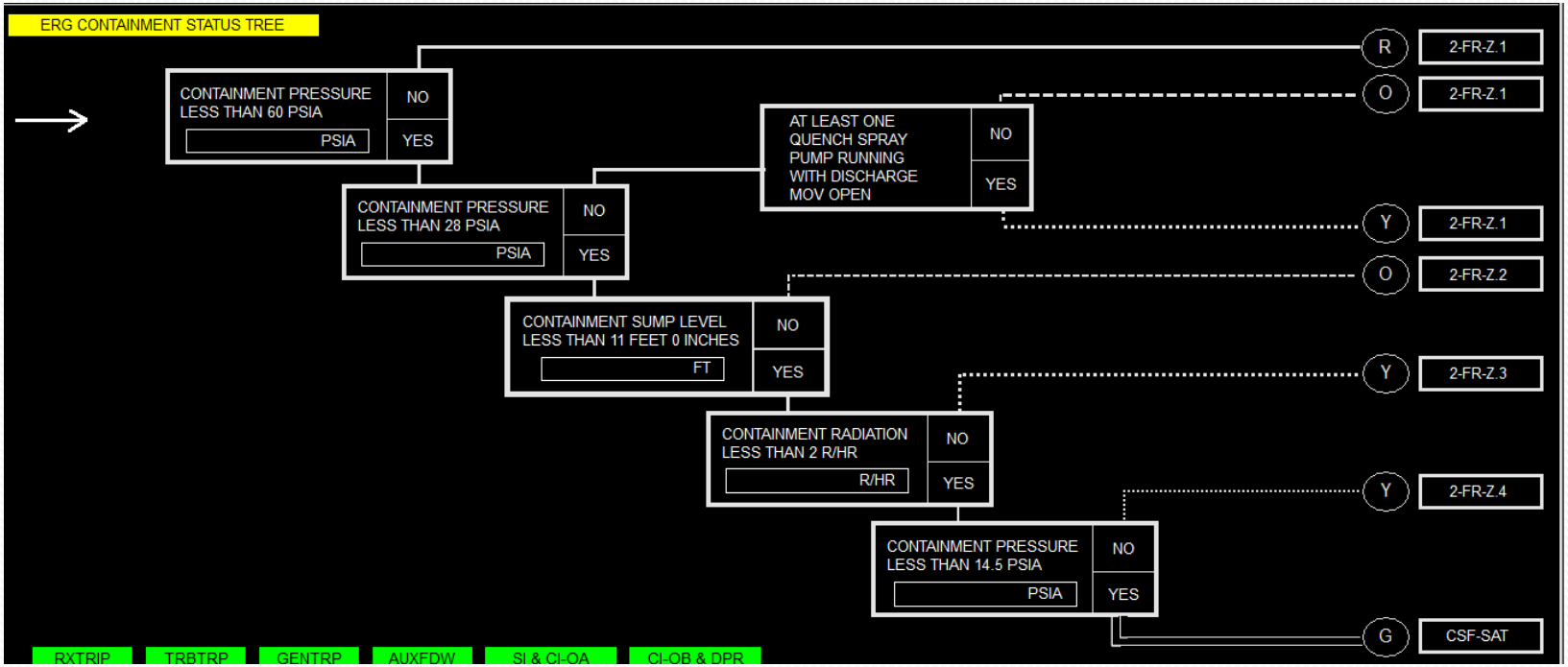
What PCS functions were impacted?

An evaluation was done to determine what processes would be lost by implementing Milestone 8:

- Flux Map Data
  - Files not available for analysis on the Corporate LAN
- Logs and reports
  - Logs that were stored on level 3 server could no longer be accessed outside the PCS LAN (72 hour Power History, Equipment Run Time, Post Trip, Integrator, etc.)
- MIDAS
  - Data no longer sent via FTP from the Plant PCS server

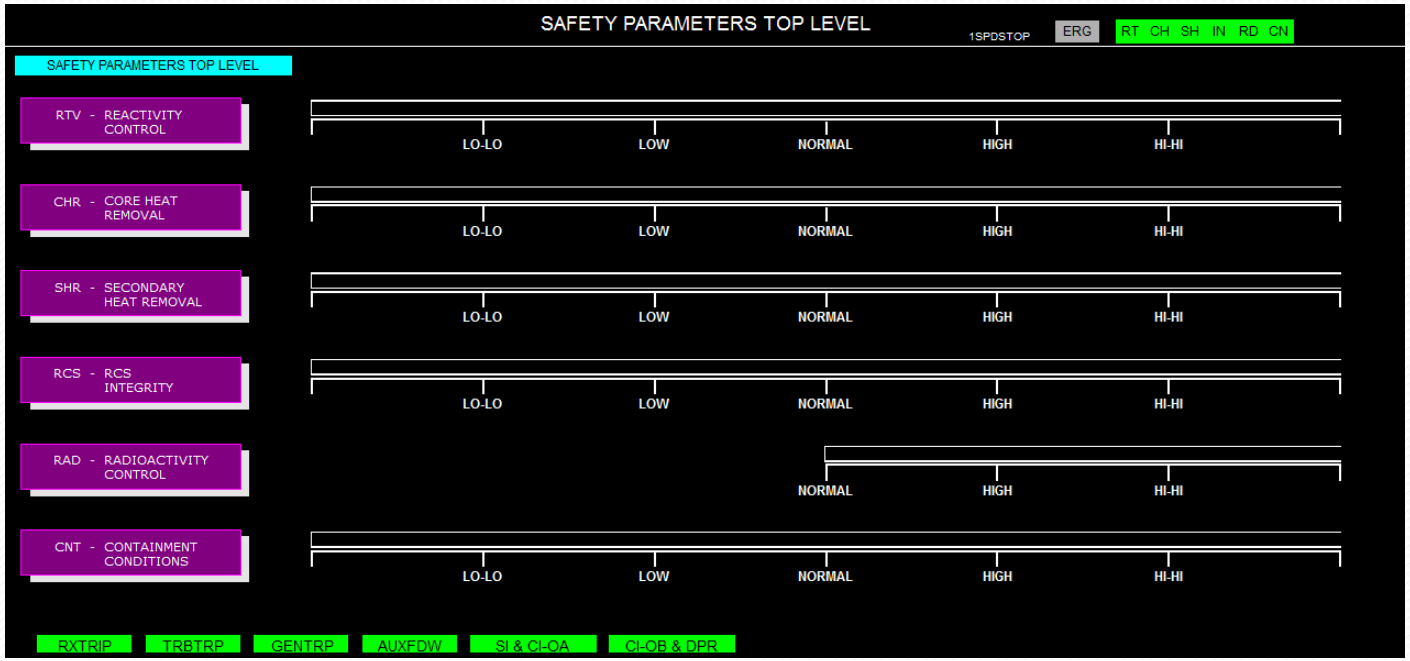
What PCS functions were impacted?

- ERG status tree
  - Impacted embedded calculations



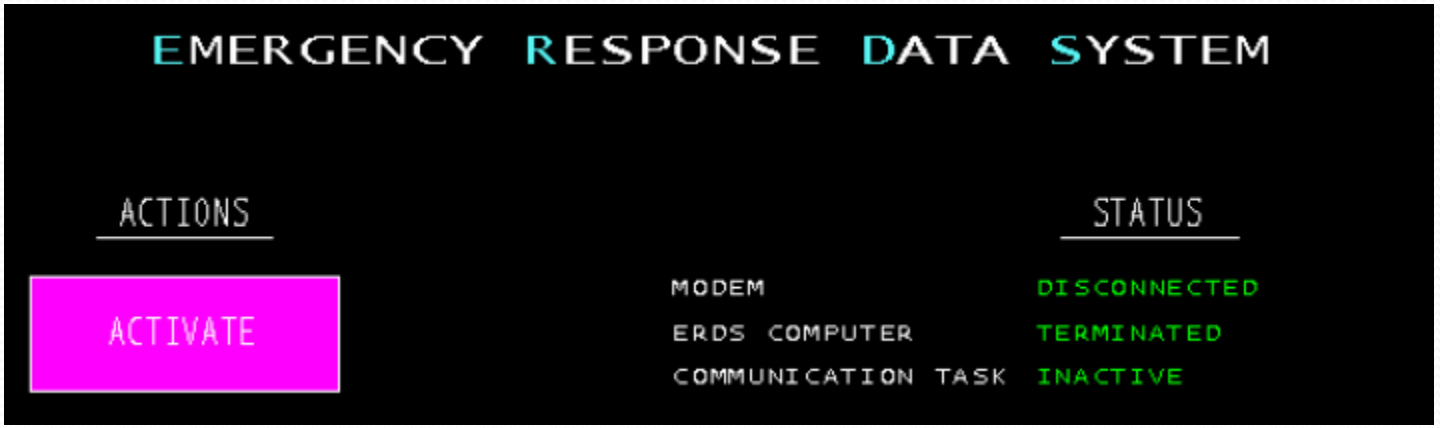
What PCS functions were impacted?

- Safety Parameter Display System
  - Dynamic bars would need to be recreated
  - Workstation monitoring could not track by IP address



What PCS functions were impacted?

- Emergency Response Data System (ERDS)
  - Data originates from Plant PCS and is transferred through a modem connected to a phone line
  - ERDS Modem/VPN Repeater was designed by Curtiss Wright to auto answer the incoming call and connect to the NRC through the NRC VPN.



What PCS functions were impacted?

- Real Time Server (RTS)
  - Used for MMI users on the Station LAN and Emergency Response Facilities (LEOF/TSC/CEOF)
  - Relied on bidirectional communications between Primary Servers and workstations on the Station and Corporate LAN.
  - Replicated Control Room displays as read only

Post Data Diode Installation

- R*Time allowed the display of plant data through the data diodes, replacing the function of the Real Time Server
- Majority of Plant PCS displays were replicated and validated in Factory Acceptance Testing (FAT)
- MIDAS
  - Now originates from R*Time servers
  - Reduction in connectivity issues

Post Data Diode Installation

- Owl Data Diode FTP function configured to FTP to the Level 2 Corporate Network Share
  - Flux Map files, logs and reports are manually transferred from the Plant PCS through the data diode on demand
- ERDS function moved to R*Time for better troubleshooting
  - Elimination of dial up modem and VPN Converter workstation
  - ERDS Data streamed directly to ERDS VPN appliances

Post Data Diode Installation

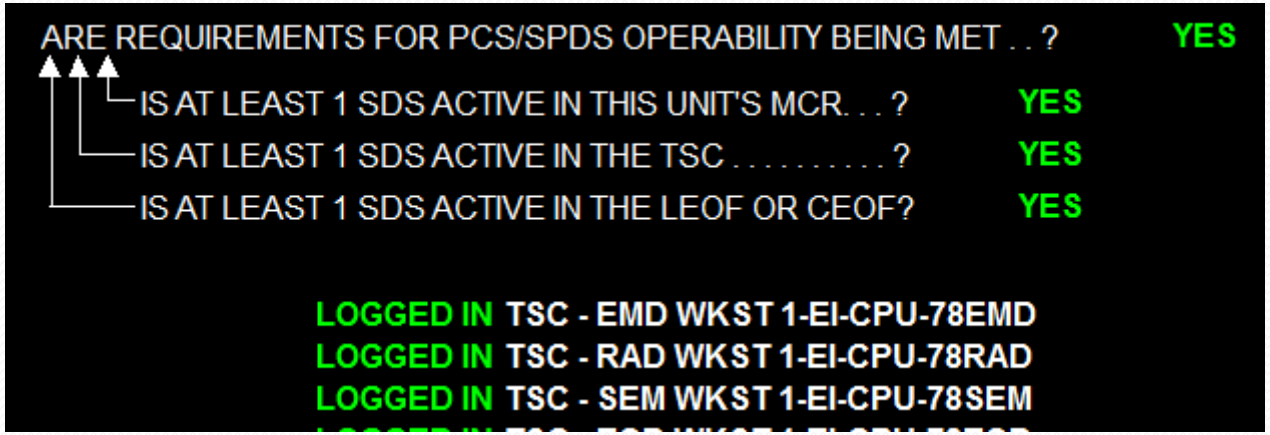
- Real Time Server (RTS) elimination
  - R*Time replaced the function of the RTS
  - R*Time made available to users on the Corporate WAN and all Emergency Facilities
- Simulator Archive Replay
  - Ability to replay pre-recorded archive data from drill scenarios
  - Display recorded data in emergency response facilities without requiring direct connection to Simulator

Issues

- Operator Rounds
  - Access to Plant PCS no longer available on
  - Cannot compare plant versus PCS indications in the field
- I&C technicians
  - Not able to use R*Time for PCS point Calibrations
- Reactor Engineering
  - R*Time data cannot be used for Reactivity Calculations
  - Log collection requires Plant PCS access

Issues

- R*Time display screens took longer to load compared to PCS.
- SPDS Workstation Monitoring required workstation names versus ip addresses



Lessons Learned

- More stakeholder participation from the start of the project was necessary
  - Operations, Engineering, Emergency Preparedness, Simulator Support
  - Site Acceptance Testing is not a proper place to modify functionality (multiple screens, function keys, basic screen design)
- Multi-departmental review of documentation needed
- Reviews of R*Time displays conducted in a more timely manner

Lessons Learned

- Ensure timely training is conducted prior to implementation
  - Engineers were not familiar with the functions available until 2 months after implementation

Questions?