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Pepco Holdings, Inc

A New Approach to Asset Monitoring and Management

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ELECTRIC GENERATION
ISSUES, TRENDS, and PRACTICAL SOLUTIONS

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PHI's Commitment to Asset Monitoring

- Investing in fault prevention can improve reliability and save money
- Remote DGA is more effective than lab analysis in identifying impending faults
- PHI plans to automate the monitoring of other assets in addition to transformers

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Transformer On-line DGA Monitors

- Remote monitoring of 8 fault gases;
  - hydrogen, oxygen methane, carbon monoxide, carbon dioxide, ethylene, ethane, and acetylene.
- PHI has about 100 monitors online by the end of 2012.

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Asset Monitoring Challenges

- Managing large amounts of monitoring data
  - Separating the important information
- Maintaining data security
  - NERC has established CIP standards
- Enabling broad access to data
  - Different levels of access for different personnel on the corporate network
  - Easy-to-use human interface

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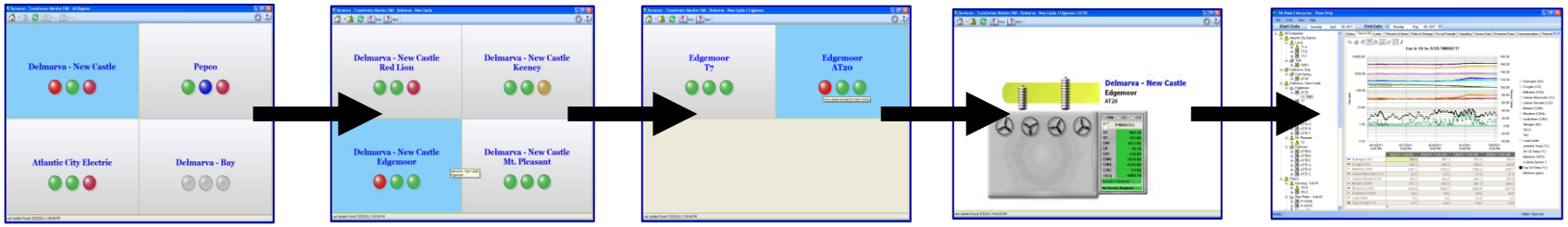
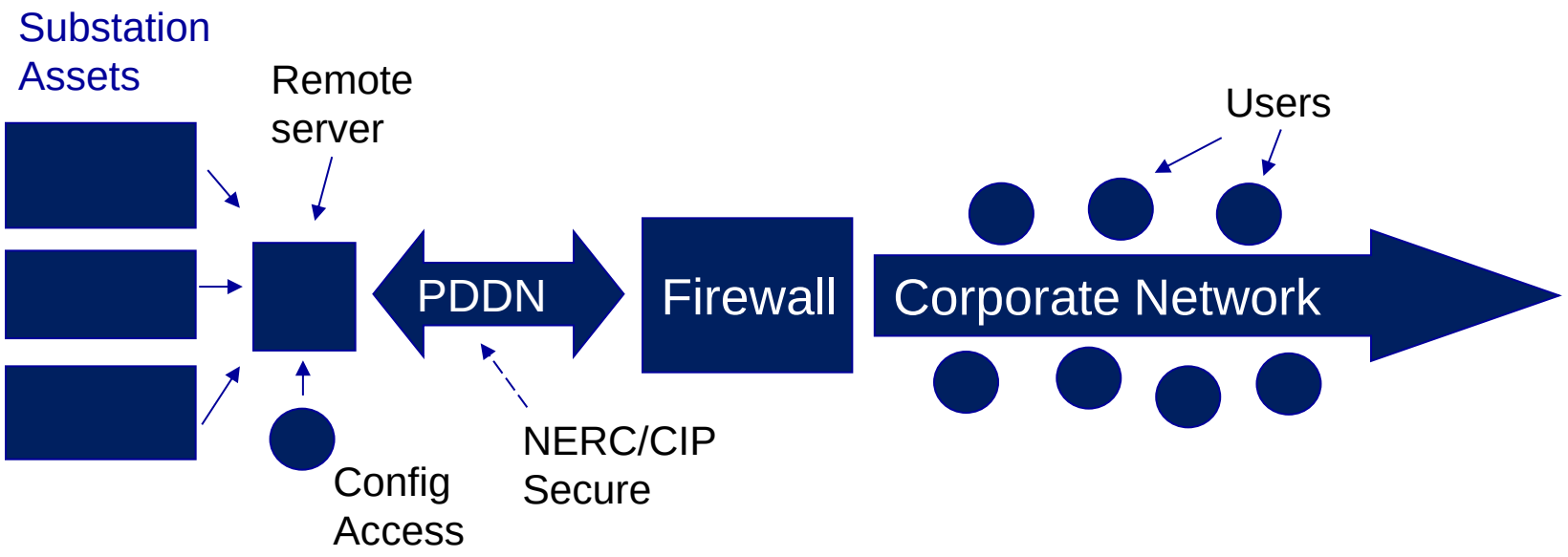
PHI's AMM System

- Developed AMM system with Serveron (BPL) to meet internal needs within PHI
- At-a-glance status checking and drill-down for quick problem identification

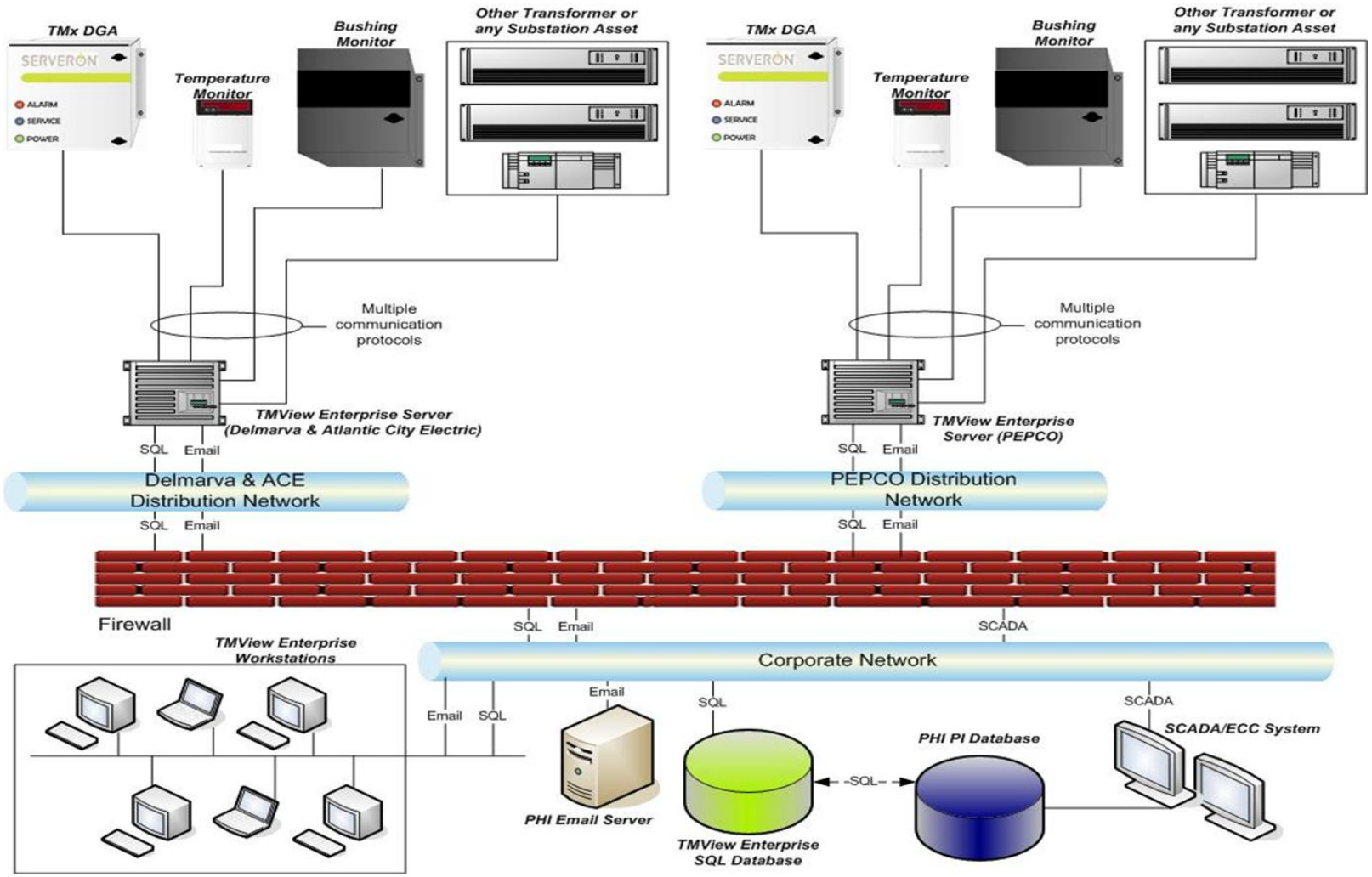


AMM System Architecture

- Monitoring data from Substation assets is delivered securely via PDDN
- Most users have read-only access over corporate network



AMM Architectural Detail



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Software Displays - Regional View

- Left light indicates gassing alarm status
- Middle light indicates monitor service status
- Right light reflects communications status

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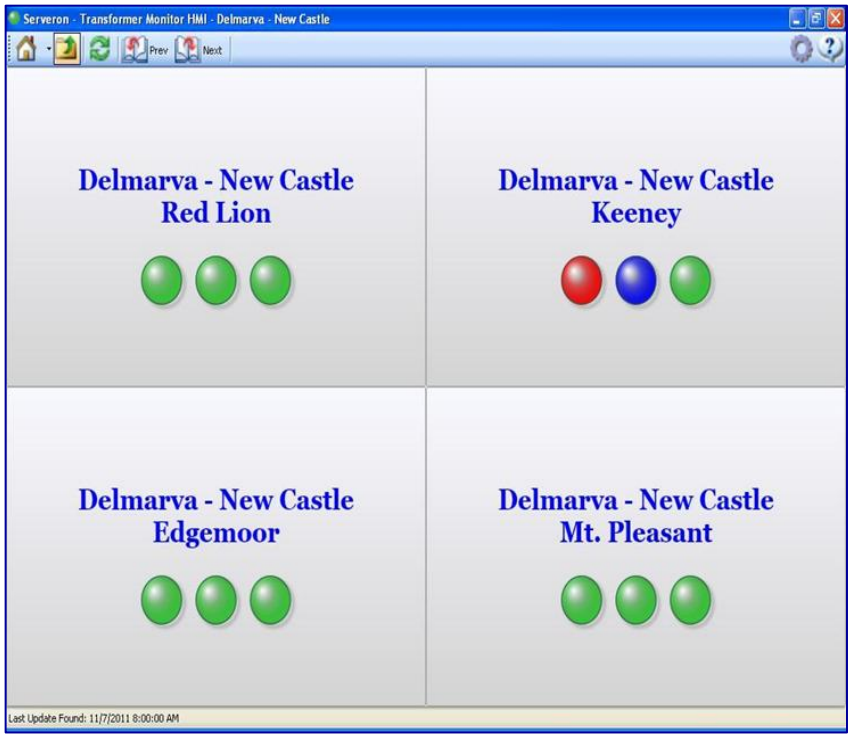
Software Displays - Substation View

- Left light indicates gassing alarm status
- Middle light indicates monitor service status
- Right light reflects communications status



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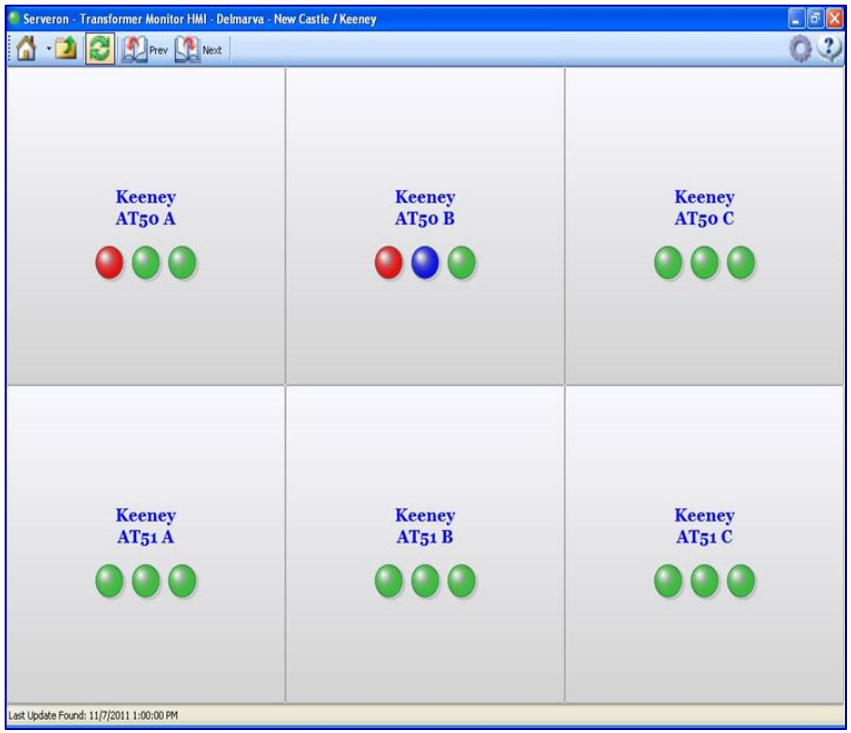
Software Displays - Asset View

- Left light indicates gassing alarm status
- Middle light indicates monitor service status
- Right light reflects communications status



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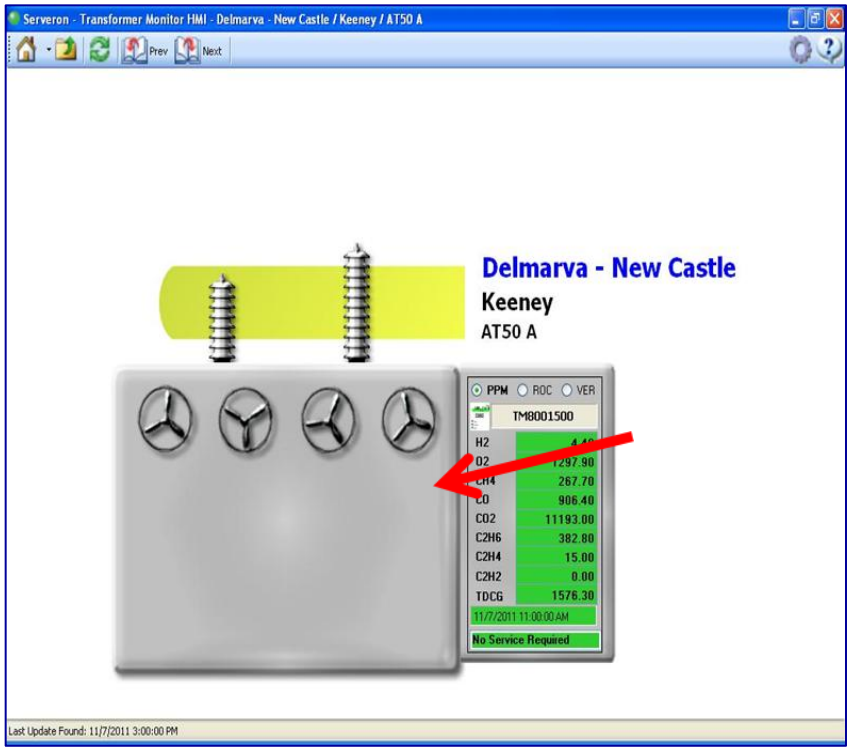
Asset Specific Detailed Drill-Down

- Gassing levels at transformer
- Clicking on the monitor or any of its values launches TM View



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TM View Software Analytics

- Gassing levels over selected time:

TM View Enterprise

File Tools View Help

Start Date Friday , May 06, 2011 End Date Monday , November 07, 2011

All Companies
- Atlantic City Electric
  - Cardiff
    - T1
      - TM8
    - T2
      - TM8
  - Lewis
    - T1-A
    - T1-B
    - T1-C
- Delmarva - Bay
  - Cool Spring
    - AT20
- Delmarva - New Castle
  - Edgemoor
    - AT20
      - TM8
    - T7
  - Keeney
    - AT50 A
    - AT50 B
    - AT50 C
      - TM8
    - AT51 A
    - AT51 B
    - AT51 C
  - Mt. Pleasant
    - T2
  - Red Lion
    - AT50 A
      - TM8
    - AT50 B
      - TM8
    - AT50 C
      - TM8
    - AT51 A
      - TM8
    - AT51 B
      - TM8

Status | Gas in Oil | Limits | Percent of Alarm | Rate of Change | Duval Triangle | Sensor Data | Sampling | Communications | Extractor Data | Retenti

Gas in Oil for AT50 C.TM8001517

	5/6/2011 12:00 AM	5/6/2011 12:00 PM	5/7/2011 12:00 AM	5/7/2011 12:00 PM	5/8/2011 12:00 AM
Hydrogen (H2)	12.4	12.8	12.5	12.8	13.2
Oxygen (O2)	1327.3	1308.9	1318.7	1283.4	1306.8
Methane (CH4)	290.1	287.4	290.2	286.7	288.0
Carbon Monoxide (CO)	573.0	569.5	571.8	559.4	566.2
Carbon Dioxide (CO2)	5809.0	5797.1	5823.4	5759.2	5784.5
Ethane (C2H6)	753.1	753.5	755.4	754.2	750.3
Ethylene (C2H4)	23.1	22.9	24.0	23.1	23.0
Acetylene (C2H2)					
Load Guide	65.1	60.6	54.1	66.9	58.8
Ambient Temp (°C)	13.6	24.4	15.6	28.6	17.6
Moisture (PPM)	9.0	8.2	9.7	10.1	10.3

Ready Poller: Idle

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TM View Software Analytics

- General transformer monitor status:

TM View Enterprise

File Tools View Help

All Companies
Atlantic City Electric
Cardiff
T1
TM8
T2
TM8
Lewis
T1-A
T1-B
T1-C
Delmarva - Bay
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AT50 B
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AT50 C
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TM8

Status | Gas in Oil | Limits | Percent of Alarm | Rate of Change | Duval Triangle | Sensor Data | Sampling | Communications | Extractor Data | Retenti

Status for AT20.TM8002711

Gas PPM Level Status
Alarm
Caution
Normal

Gas ROC Status
Alarm
Caution
Normal

Duval Region: T3

Monitor Status
Service Required
Normal

Data Age
24 Hrs or Older
16 - 24 Hrs Old
0 - 16 Hrs Old

Event History -- WARNING: Viewing Historical Data

7/13 7/14 7/15 7/16 7/17 7/18 7/19 7/20 7/21

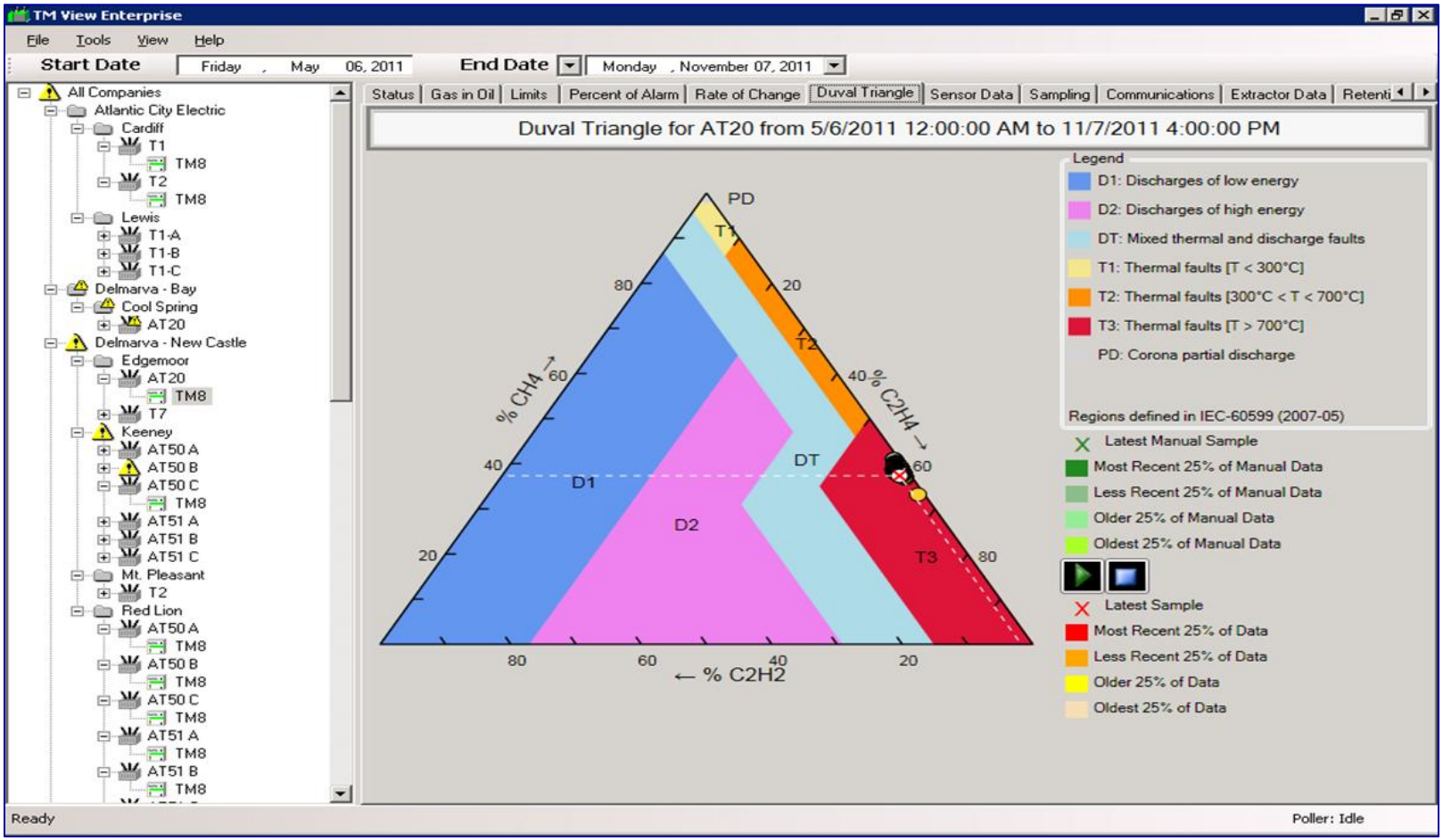
Latest Monitor Timestamp: 11/7/2011 11:00:00 AM
Monitor Serial Number: TM8002711 - F/W: 3.12.9 kernel 3.12.3
Monitor Type: Serveron Monitor Model TM8
Most Recent Service Required: 9/10/2011 8:00:00 PM

Ready

Poller: Idle

TM View Software Analytics

- Duval Triangle for fault analysis :



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Positive Results

- One potential failure was averted at a Delaware substation;
  - Autotransformer had overheating and arcing due to core grounds.
  - Attempted fixes were unsuccessful as shown by continuous AMM monitoring.
  - Load was reduced/shifted as gassing became unstable to nurse transformer to replacement.
- Another large transmission transformer was removed from service as gassing rose rapidly. The transformer was the replaced as a result of problems with the core.

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Lessons Learned

- Continuous asset monitoring improves reliability and increases cost effectiveness of maintenance
- Broad dissemination of asset health information is good policy
- An easy-to-use human interface for monitoring prevents data overload and unnecessary time spent trying to find a problem

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QUESTIONS ?

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