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Using AMR Data to Improve the Operation of the Electric Distribution System

Glenn Pritchard

Consulting Engineer

Exelon/PECO

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Objectives

This session will discuss and present techniques for using data collected by an Automatic Meter Reading System to improve the operation and management of an Electric Distribution System.

Specifically, several applications of PI System will be presented, they include:

- Dynamic Load Management Modeling

- Transformer Load Analysis

- Curtailment Program Applications

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Agenda

- PECO Background

- Applications

  ▶ System Load Management & Modeling

    ▪ Transformer & Cable Load Analysis

  ▶ Curtailment Program Applications

- Meter Data Management

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Exelon / PECO

- Subsidiary of Exelon Corp (NYSE: EXC)
- Serving southeastern Pa. for over 100 years
- Electric and Gas Utility
  - ▶ 1.7M Electric Customers
  - ▶ 470K Gas Customers
- 2,400 sq. mi. service territory

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Scope of AMR at PECO

- Cellnet provides a managed-AMR service which includes network operations, meter reading and meter maintenance

- PECO's AMR installation project lasted from 1999 to 2003

- A Cellnet Fixed-RF Network solution was selected.
  - 99% of meters are read by the network
  - Others are drive-by and MV-90 dial-up

- Services/Data Delivered:
  - All meters are read Daily (Gas & Electric)
  - Additional services include: Demand, ½ Hour Interval, TOU, SLS
  - Reactive Power where required
  - Tamper & Outage Flags (Last-Gasp, Power-Up Messages)
  - On-Demand meter reading requests

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Cellnet AMR Network

Exelon Applications

National Operations Center

System Controller

CellMaster

Wide Area Network

MicroCell Controller

Local Area Network

Endpoint devices w/CellNet Radio

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AMR Network Components

2,200,100 Meters

~1,625K Res. Electric

~455K Res. Gas

~135K Com. Electric

~42K Com. Gas

91 Cell Masters

8,400 MicroCell Controllers

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System Load Management

- **The current methods of identifying and assessing distribution system loading is labor intensive and often reactionary, in response to equipment failures/outages.**

- PECO's AMR System can provide accurate customer load data.
    - The data can be aggregated throughout the distribution grid to determine actual device loading.
    - The need for load models is eliminated, actual customer data is used.
    - By leveraging the capabilities of PI, the analysis process is streamlined and more effective.

- Benefits
    - Overloads and failures can be identified before they cause an outage and then problem can be corrected.
    - Reliability is increase and customer satisfaction is improved due to fewer outages and impact from construction projects

- Future Plans
    - This project will run through September 07, benefits and results will be compiled into a formal business case
   - Pending positive results, the pilot will be expanded and made permanent

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Virtual SCADA Points

In-Line Step-Down/Interposer

Radial Spur

Circuit Tap

Typical Customers

Secondary Mains

More Customers

✳ = SCADA Monitored Points
✳ = AMR Monitored Points

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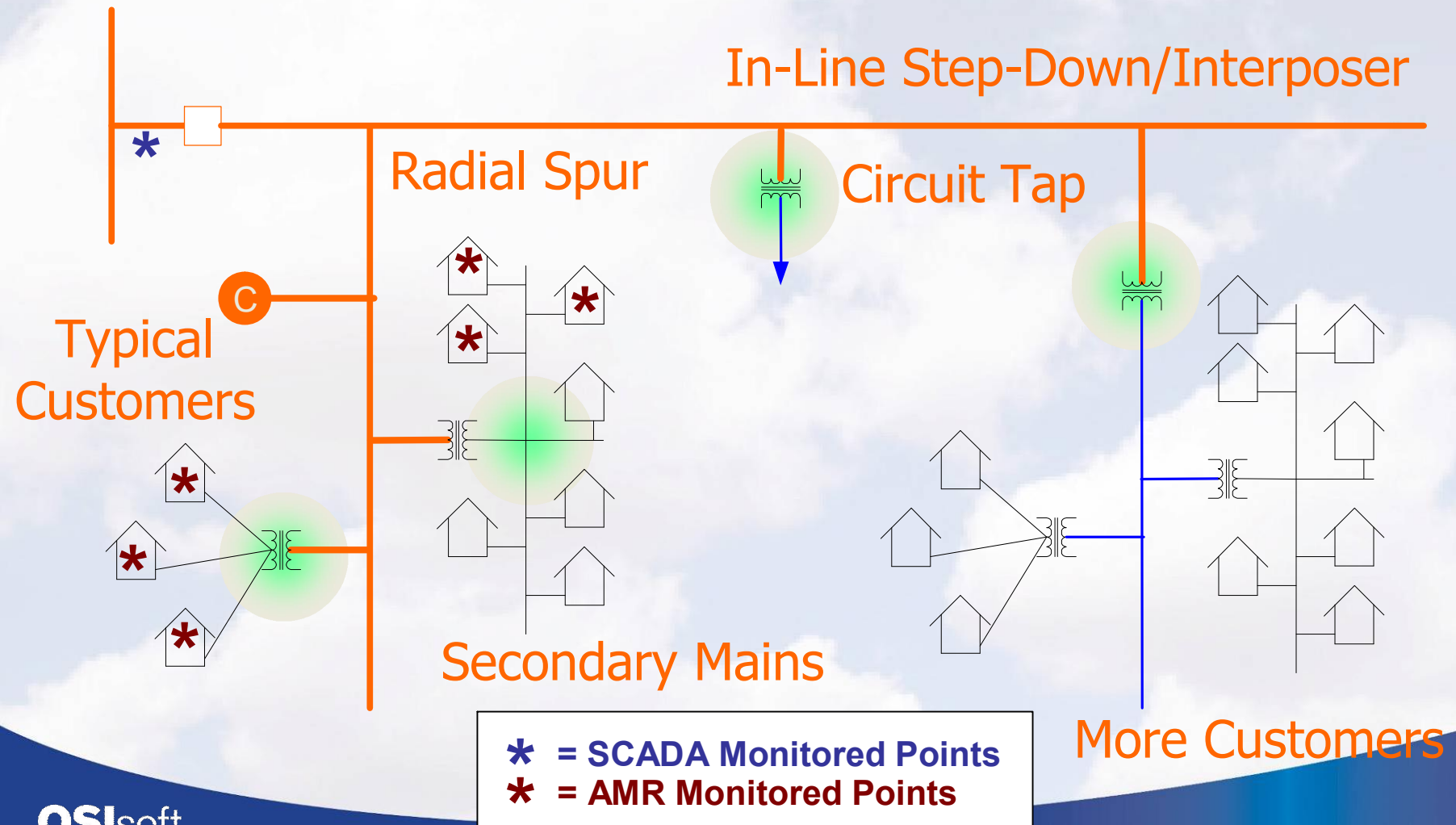
# Interval Data Pilot Details

- 4,500 customers were enrolled in the interval data service.

- 60 Minute Interval Data = 24 data points per day per meter is delivered to PECO

- The trial is set to last at least 120 days

- Details:

  ▶ Data is sent daily to PECO via an FTP process.

  ▶ Data is stored in PI

  ▶ Transformer and Cable Loads are created within PI

  ▶ Data and analysis results are displayed in Process Book

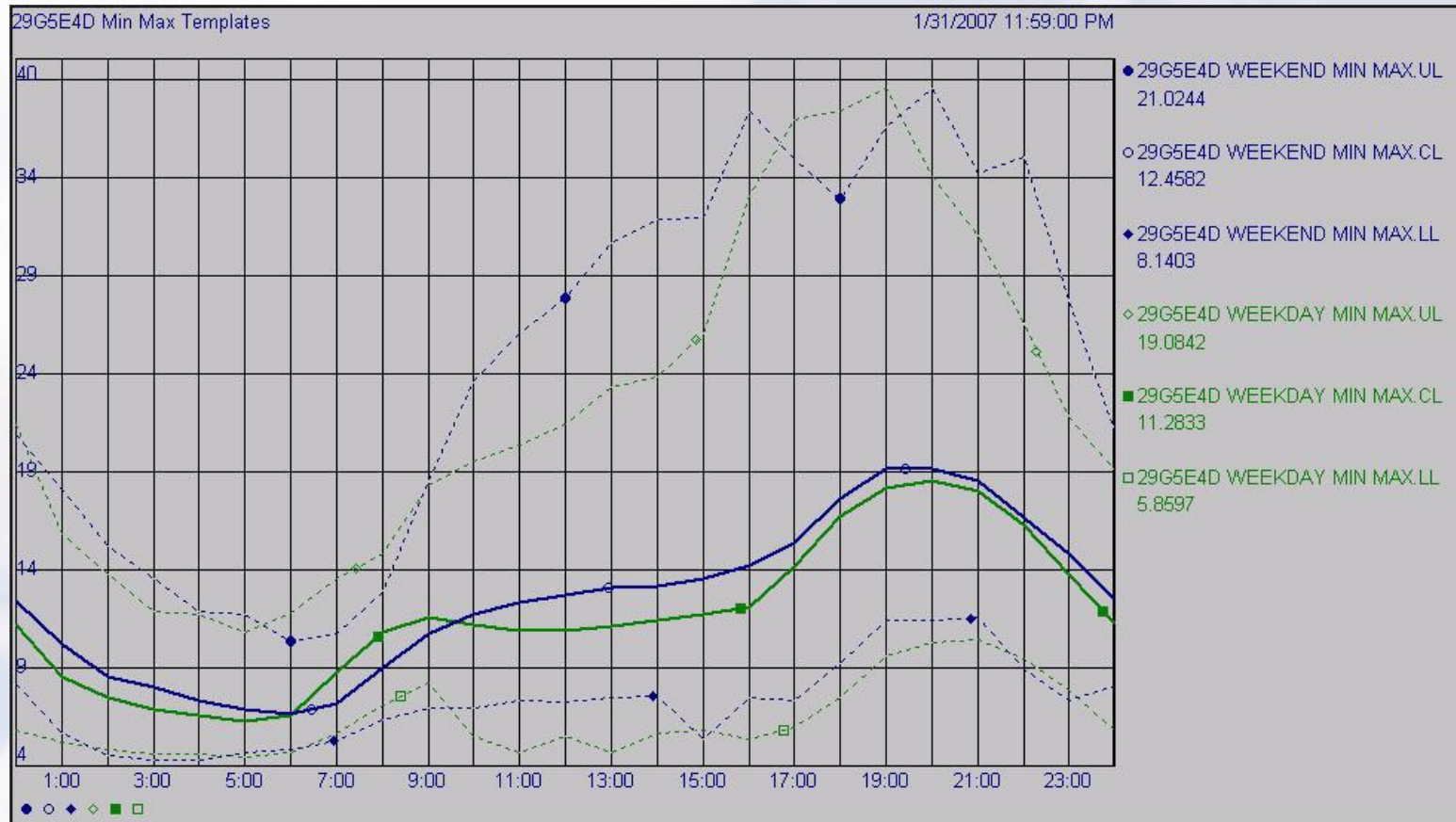- A formal business case will be developed to assess results and benefits of the project

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Interval Data Pilot

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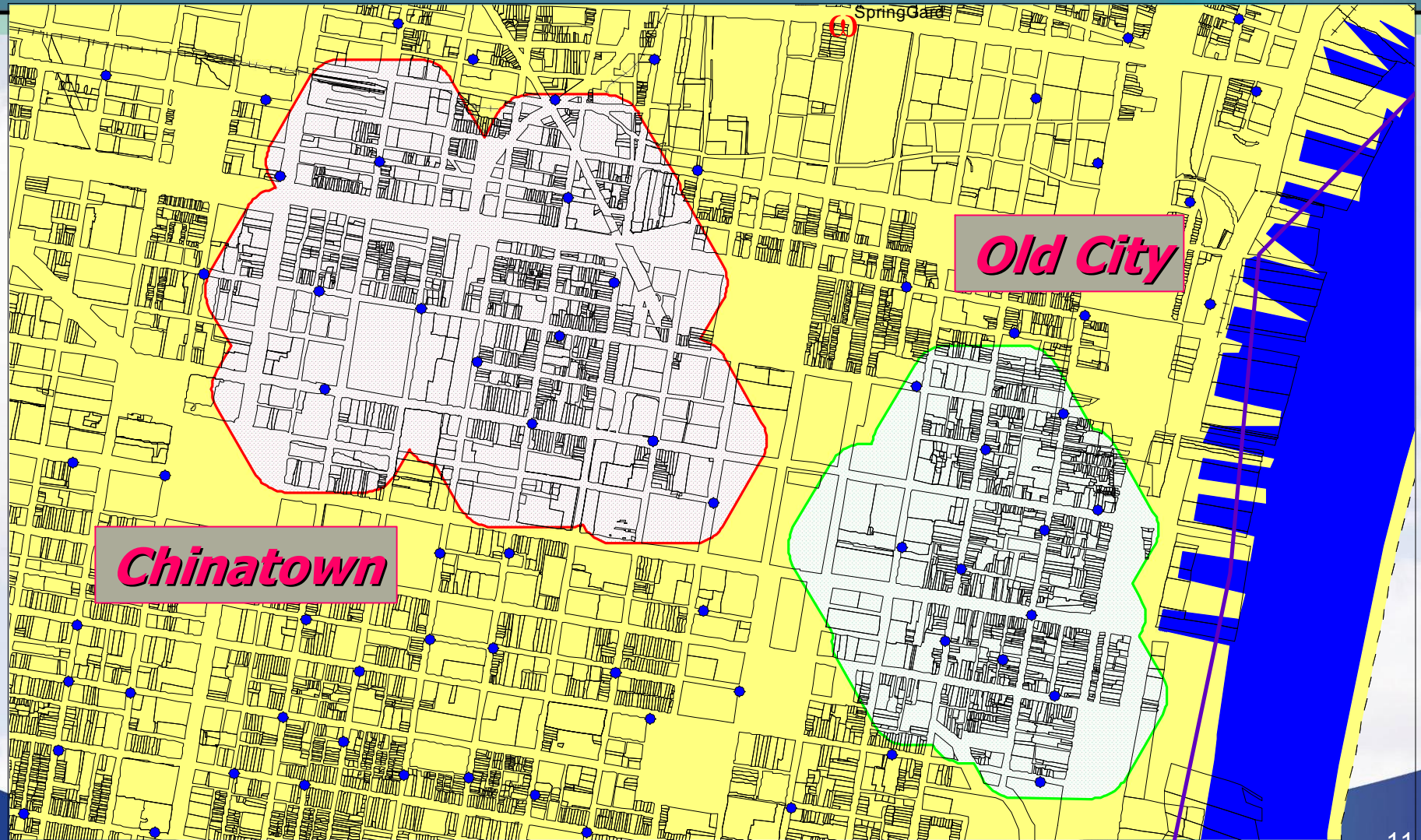
Meter to Transformer Rollup
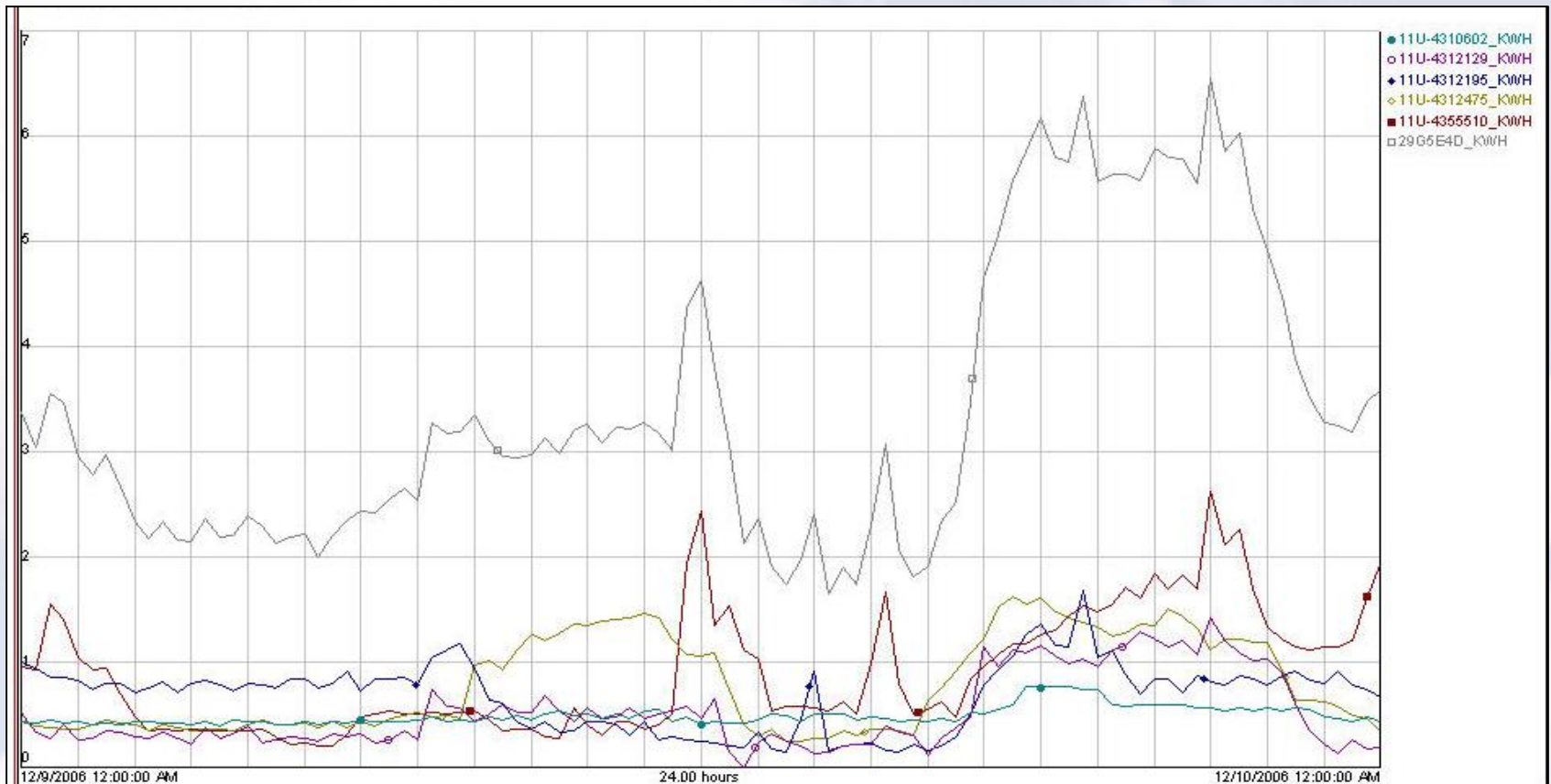
Transformer Loading
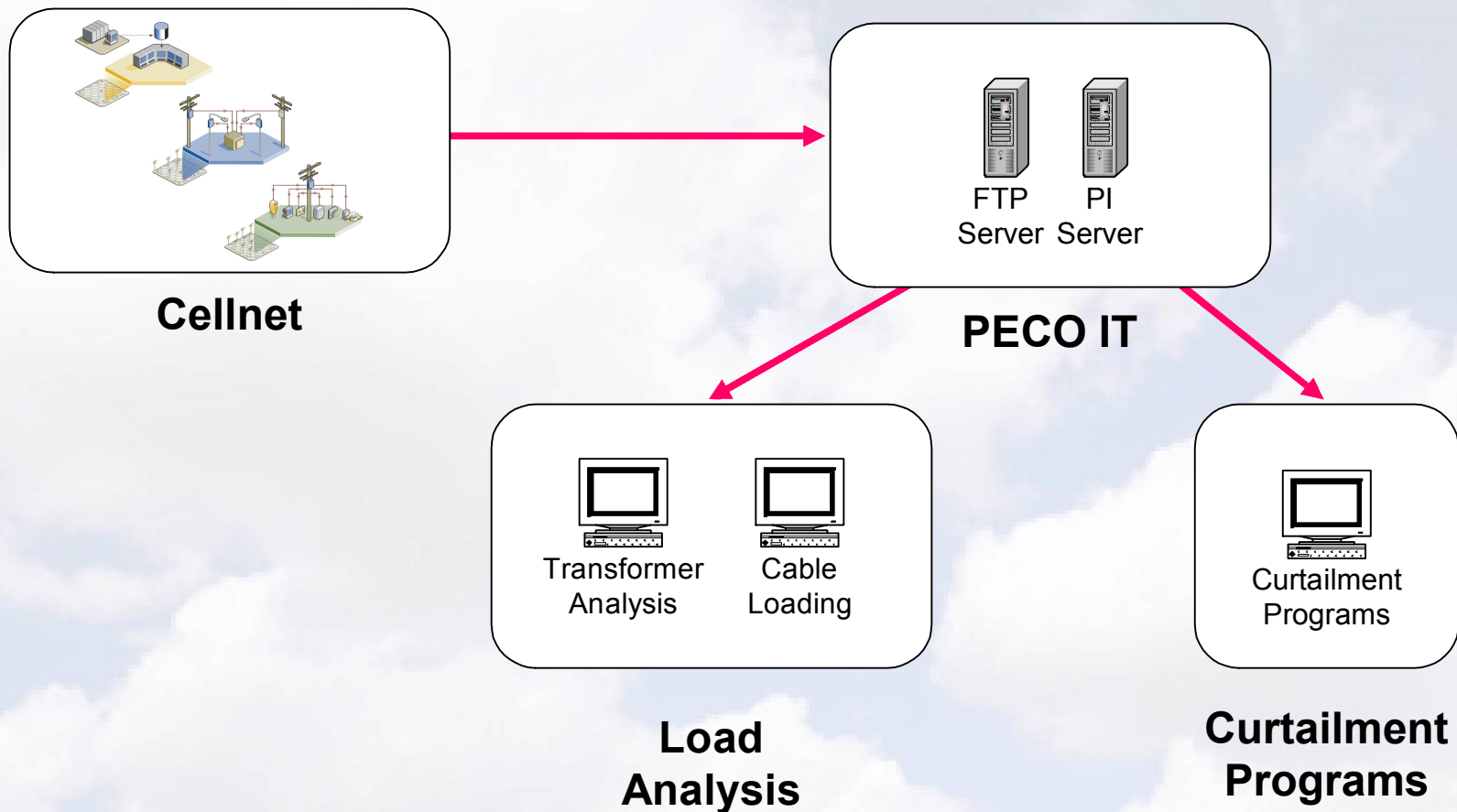
Typical Customer Profile

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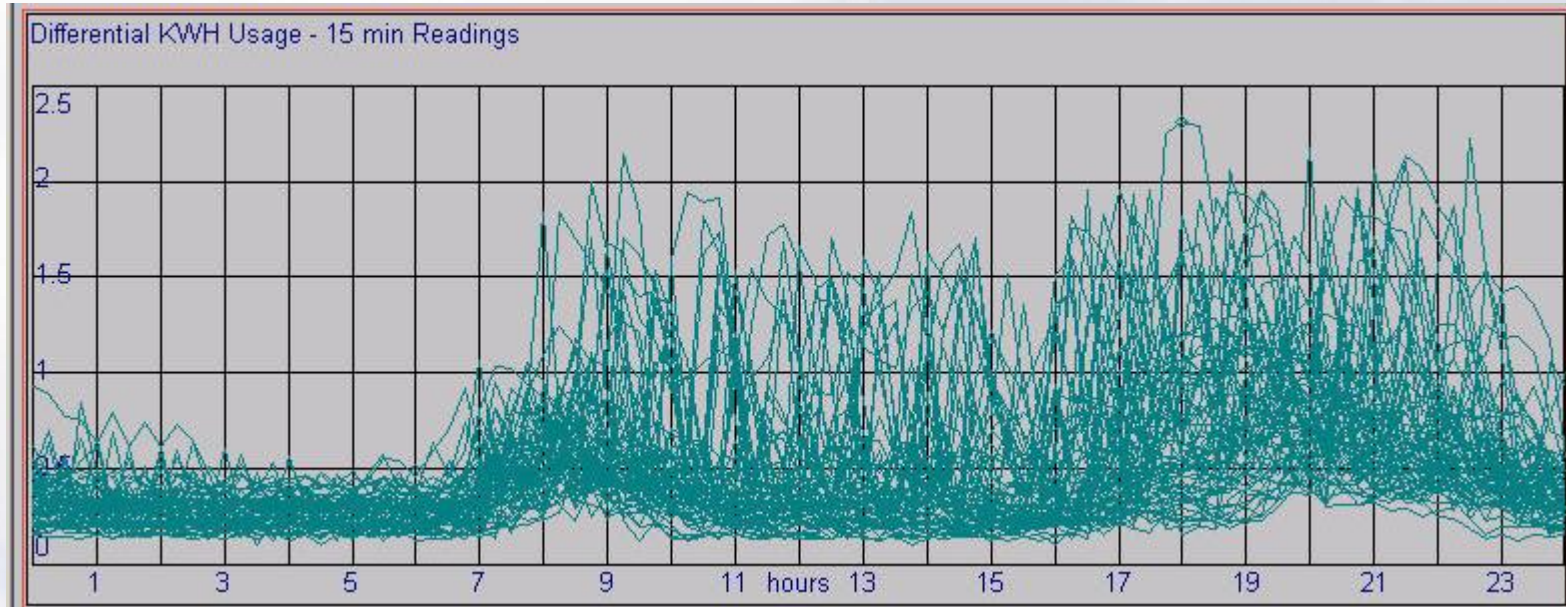
Applications Used

- ## PI Historian & ProcessBook
  - ▶ To display customer usage, equipment loading and analysis results
- ## PI ACE
  - ▶ Use to improve the efficiency of the customer, transformer and cable load analysis
- ## PI Batch
  - ▶ Used to compare customer usage over days/weeks to establish baselines and identify abnormal conditions
- ## Universal File Loader Interface
  - ▶ Used to load the 24-hour interval data files as they are received from Cellnet. (Files are received daily)

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System Architecture

Cellnet → PECO IT (FTP Server, PI Server)

PECO IT → Load Analysis (Transformer Analysis, Cable Loading)

PECO IT → Curtailment Programs

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Curtailment Programs

- **Due to an issue with PECO's CIS system, new C&I curtailment program customers cannot be enrolled in the interval data service at PECO.**

- By leveraging the Load Analysis Pilot, curtailment data can be processed by PECO's PI System and made available to the curtailment program manager.
  - ▶ 50 C&I customers currently have the curtailment data flowing into the PI Application
  - ▶ Specific Process Book screens to display the load curtailments have been developed.

- Resulting Benefits
  - ▶ PECO is able to process and analyze load curtailments and regulator's reporting requirements

- Future Plans
  - ▶ This functionality can be expanded to residential demand response initiatives as those programs are defined and implemented.

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Curtailment Programs

Sample Curtailment

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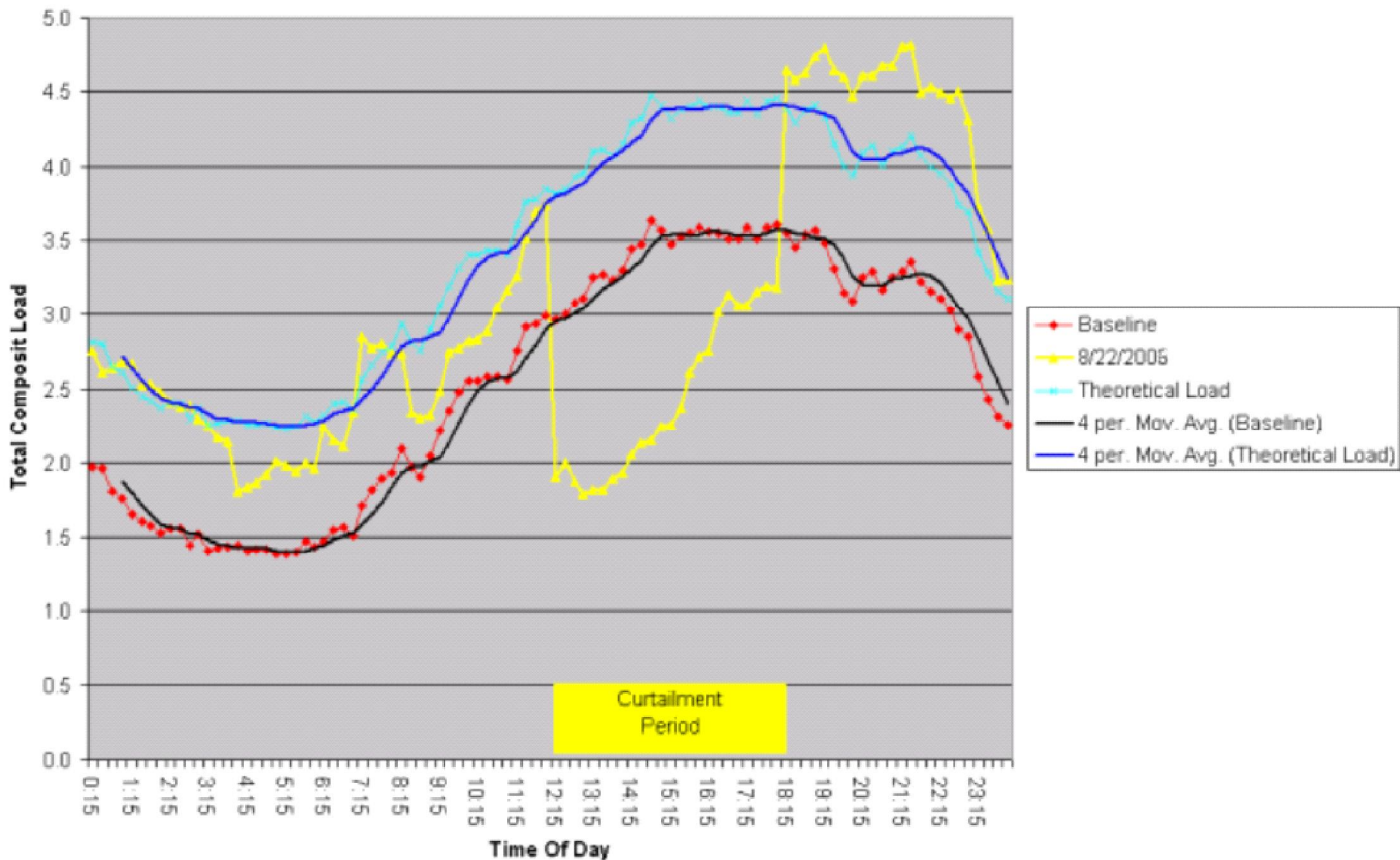
Meter Data Management

- **AMR/AMI Systems are capable of generating vast volumes of data. New programs & regulations are requiring the collection & storage of such data. This data can benefit all parts of a distribution company. Convenient solutions are required**

- Current MDM Systems are geared to AMR deployments and managing account data.
  - The PI System is well capable of processing and storing energy usage data
  - PI can fulfill the need for a technical data management system

- Resulting Benefits
  - A MDMS that is tailored to energy consumption data will enable benefits that typically require extensive data analysis
    - Examples include load management, curtailment programs, and rate analysis.

- Future Plans
  - Exelon (PECO & ComEd) is documenting the potential benefits of deploying a MDMS.
  - Once a positive business case is achieved, the selection process may be initiated.

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Conclusion

- The suite of PI applications are well suited to process meter reading/energy consumption data.

- By leveraging the application's capabilities, AMR/AMI benefits can be achieved in an efficient manner, rather than traditional bute-force modeling and analysis.

Any Questions ?

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