AEP ENERGY℠

Use less. Spend less.

Using Energy Analytics to Increase Value to Your Organization

Energy & Energy Information Management to Control Costs

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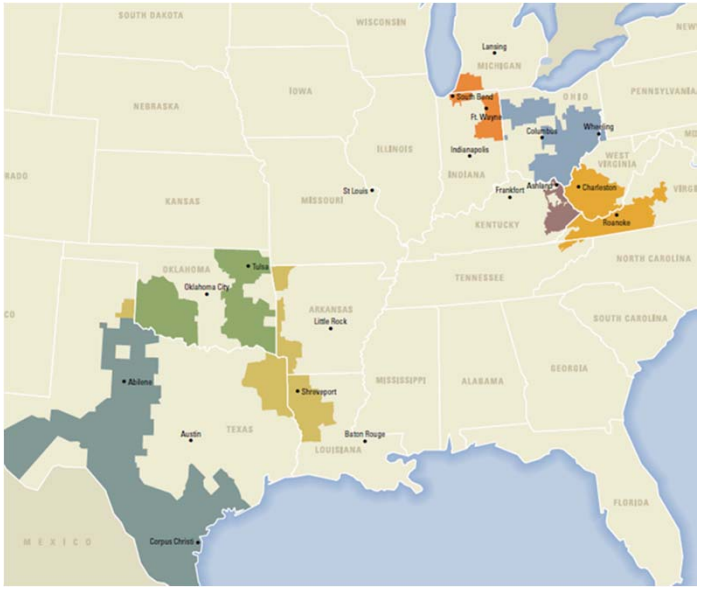
Agenda

- **A little about engineering, finance and communication**
- **Data Analytics**
- **How to Communicate back in financial terms**

American Electric Power

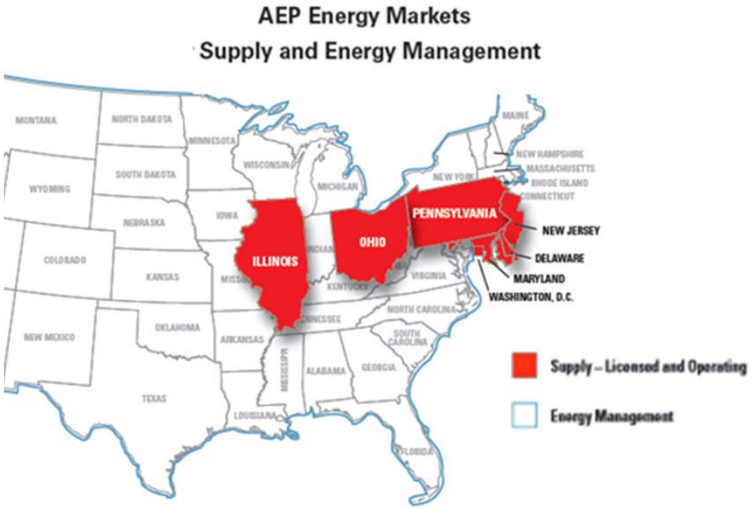
Delivering Power since 1906

- **Generation -** 38,000 MW – One of largest generators in U.S.
- **Transmission** –
  - Nearly 40,000 miles of transmission lines – Largest in U.S.
- **Distribution** - 223,000 miles of distribution lines
- **Market Cap** - ~ $26B
- **Dividend** – Over 400 consecutive quarters; Currently 3.70%
- **Investment Grade Credit Rating** – BBB



AEP Energy Supply – Competitive Subsidiary

- Wholesale Power – Largest in U.S.
- Retail electric supply
- Energy management operations
- Over 9,000 MW of competitive generation backing retail and wholesale positions
  - Gavin, Cardinal, Mitchell, Conesville, Waterford, Darby, Racine, Zimmer, Stuart, Oklaunion, Texas Wind Farms



Engineers and Finance

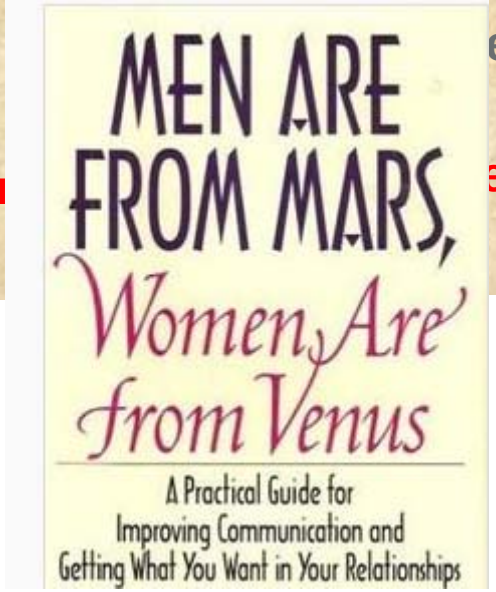
Are we THAT different?

Engineering

- Analytical
- Detail Oriented
- Educated
- Practical
- Operate by laws
  - Physics
- **Speak our own langu**

Finance

- Analytical
- Detail Oriented
- Educated
- Practical – *(ok, maybe not as much)*
- **erate by laws**
  - **FASB**
- **eak their own language**



Engineers and Finance

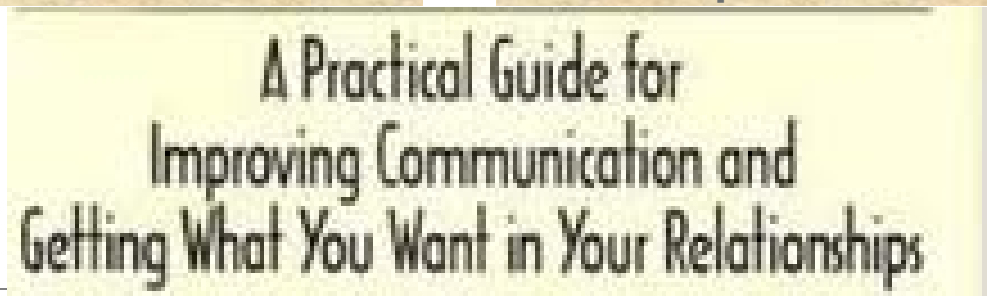
Are we THAT different?

Engineering Language

- Energy Balance
  - Thermodynamics
  - Enthalpy
  - Entropy
- Energy
  - PJM
    - PLC
    - 5CP
    - NSPL

Financial Language

- Accounting Standards
  - Balance Sheet
  - Income Statement
- Finance
  - WACC
  - FASB
  - Basis Points
  - COGS
  - Capital



Income Statements and Balance Sheets

How do cost reductions flow through the business?

The Income Statement

- **Business Revenues**
  - Load Management
  - Incentives
- **Expenses**
  - Energy
    - Distribution
    - Capacity
    - Transmission
    - Energy
    - Gas
  - Maintenance
  - Reliability Costs
- **Net Income**

The Balance Sheet

- **Assets**
  - Projects
  - Contracts
  - Flexibility
- **Liabilities**
  - Future Usage
  - Expansion
  - Capital for projects
  - Debt
- **Equity**
  - **Retained Earnings/Savings**

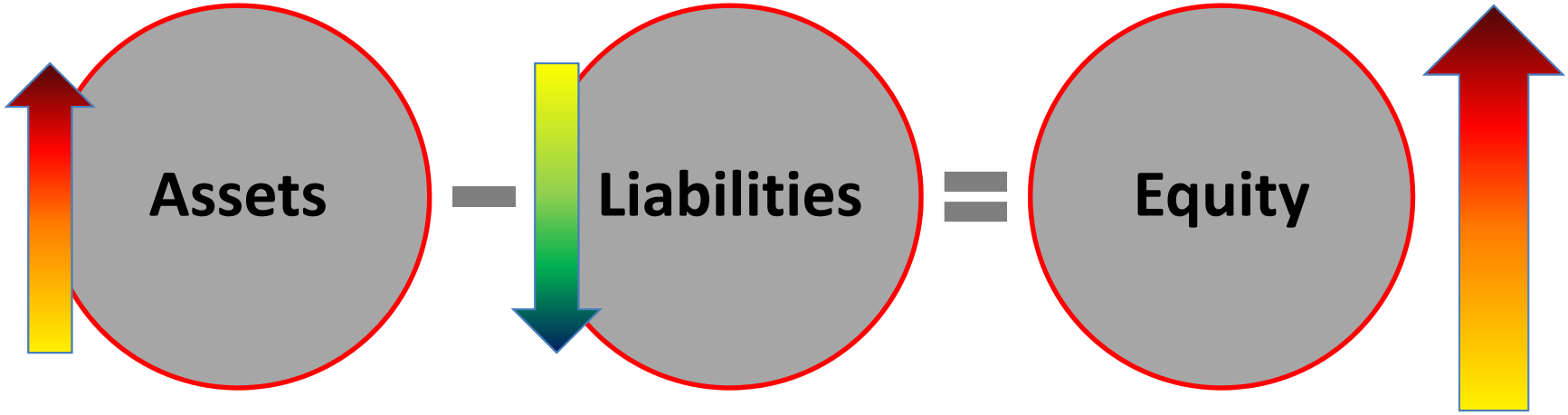
Energy Costs as a Liability

- **Liability = Long Term Payment Obligation**
  - What is your stream of energy requirements (capital and expense) over the next 5 years? 10 years?
  - Now consider if you reduce those energy requirements, and thereby reduce your liability? What is the impact on your wealth?
- **Reduce your liability through smart purchasing**
  - Good short term tool, but represents a one time gain
- **Reduce your liability through reduced requirements**
  - Creates a **permanent** reduction in cost, creating a powerful compounding effect on wealth.
- **What is your competition's cost structure? What moves are they making to reduce costs?**

Energy Resources as an Asset

- **Asset = Long Term Revenue Opportunity or Enhancement of Value**
  - What opportunity do you have to optimize your energy consuming or producing resources?
    - Load Flexibility
      - Payments for Capacity and Economic Dispatch, Ancillary Services, PLC Management, Distribution Demand Control
    - On-site Generation Resources
      - Net metering savings
      - Optimization/re-dispatch
    - Supply Contracts
      - Manage long and short positions based on market conditions
- **What competitive advantage can you gain?**

Create Wealth through Energy Management



Convert Energy Liabilities into Assets

Liabilities	Assets
Energy Requirements Energy Demand Requirements Capital for energy systems	Energy Conservation Opportunities Demand Management Opportunities Distributed Generation Opportunities

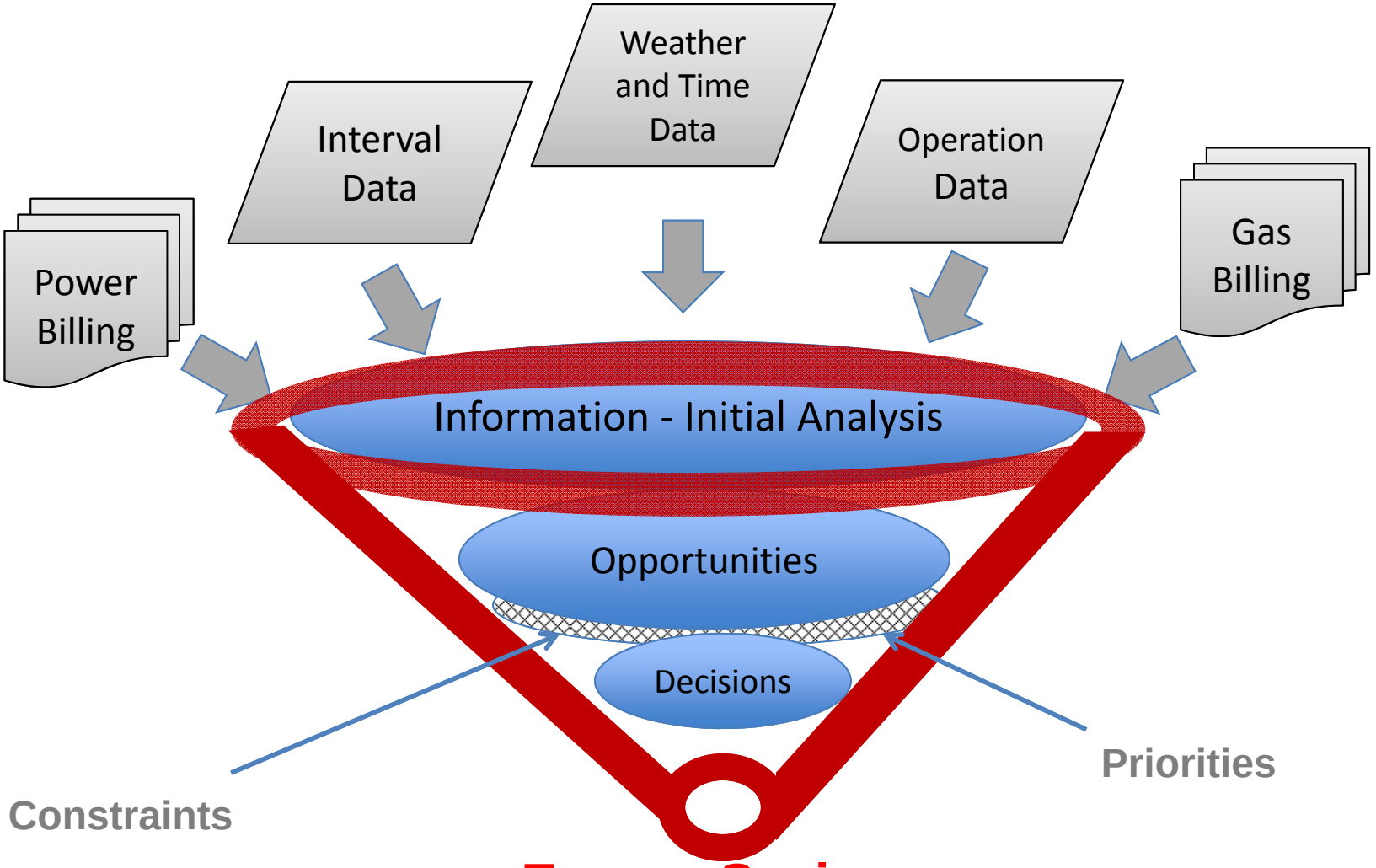
Energy Information, Knowledge and Intelligence

Opportunity and Decision Framework

- We gather **Data** to create **Information**. **Information** is a signal that tells us something about what's going on in the world.
- **Knowledge** about energy resources and markets allows us to interpret the **Information** and to identify **Opportunities**.
- **Intelligent Decisions** on **Opportunities** require **Knowledge** and known **Constraints** and **Priorities**.
- **Intelligent Decisions** enable prudent **Action**.
  - Immediate, zero or low cost value changes
  - Execution of cost effective improvements and projects
  - Holistic view of Energy Supply & Energy Management **Opportunities**

"You can have data without information, but you cannot have information without data."
- Daniel Keys Moran

Processing the Income Statement



Income Statement - Expenses

Rate & Bill Analysis

Key Metrics - Sample First Energy Customer			
Customer Name:	Sample FE Customer	Marginal $/kW:	$9.32
Account Number:	xxxx	Marginal $/kWh:	$0.0612
Location:	Cleveland, OH	Marginal $/kVAR:	$0.36
Tariff:	FE Ill. Co. GS Sec.	Gen Supplier:	XYZ Company
Total kWh:	2,400,000	Supply Rate:	$0.0458
Metered Demand:	900	Load Factor:	30%
Metered kVAR:	325	Tariff Threshold:	Voltage Class
Annual Energy Spend:	$245,000	Delivery Voltage:	Secondary

Savings Opportunities		
	Opportunity	**$ Savings**
Rate Switch	Possibly - Tariff price structure dependent on delivery voltage	Primary lower demand price by $5.15/kW
Account Consolidation	No	X
Fees	No	X
Taxes	No	X
Power Factor	Yes	$0.36 per kVAR
Comments: Explore availability and feasibility of switching to primary voltage service.		

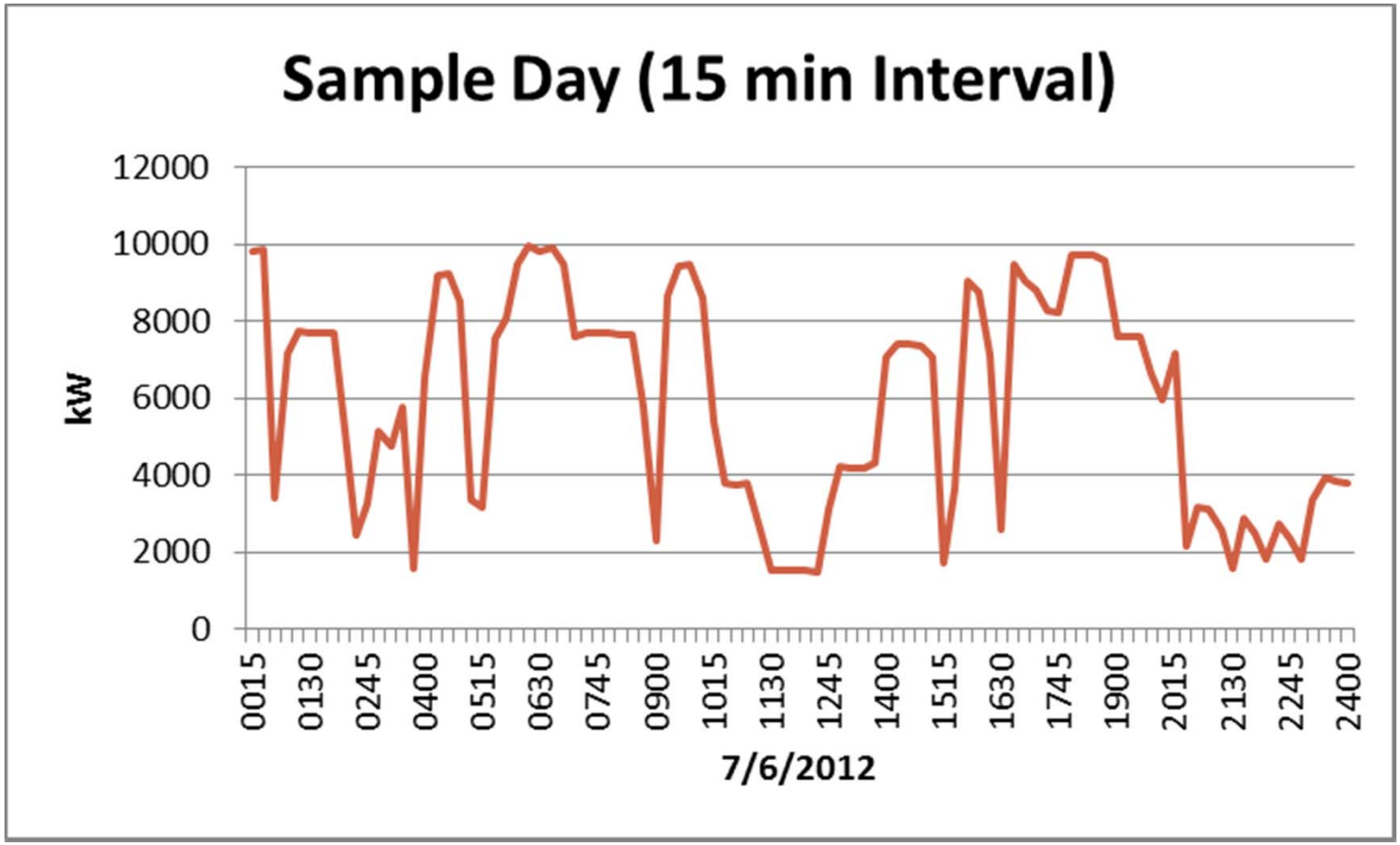
EZ Energy Assessment

- Understand high-level opportunity
- Identify immediate savings
- Determine marginal costs

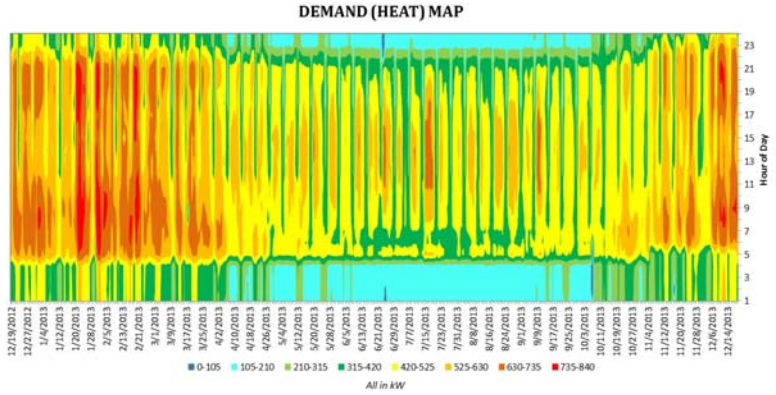
Income Statement Detail

Understanding Interval Data

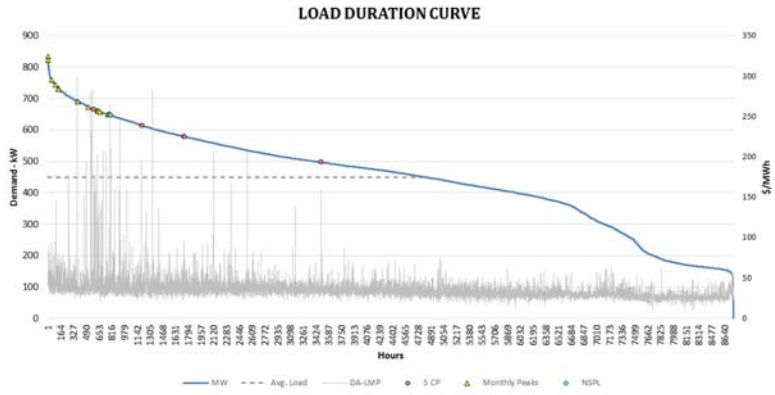
- **Interval data – Forest or Trees?**
- **Heat maps**
  - Show overall operating pattern and performance
- **Duration curves**
  - Show peak demands, operating levels, operating configurations
  - Allow for review of distribution demand management, capacity and transmission cost reductions, demand response and energy efficiency targets
- **Typical periods**
  - Provide views of connected loads and operating schedules
- **Predictive Analysis**
  - Interval independent variable analysis



Step 1: Example Annual Load Visualization



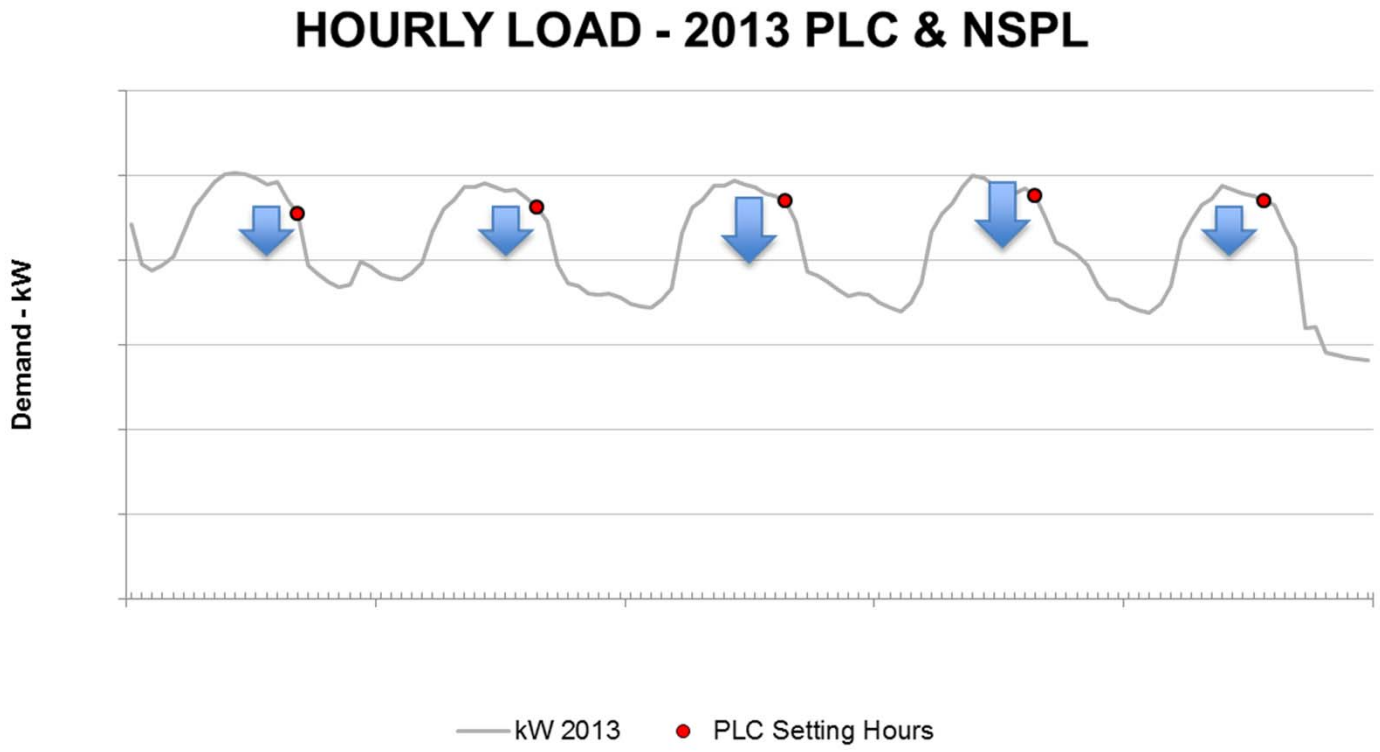
Visualization of Yearly Usage



Visualization yearly demand

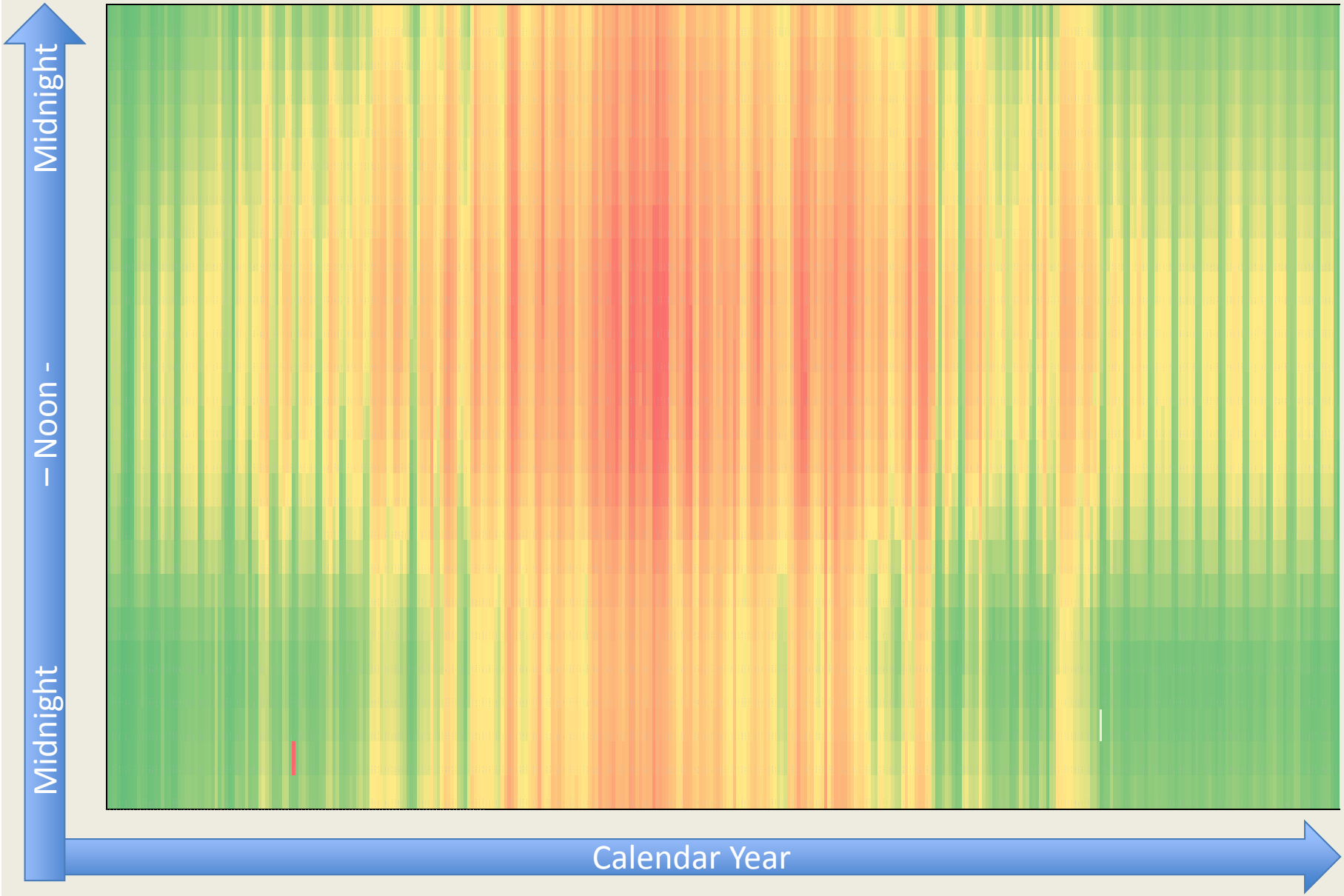
- Understand how your building operates
- Identify special conditions and challenges

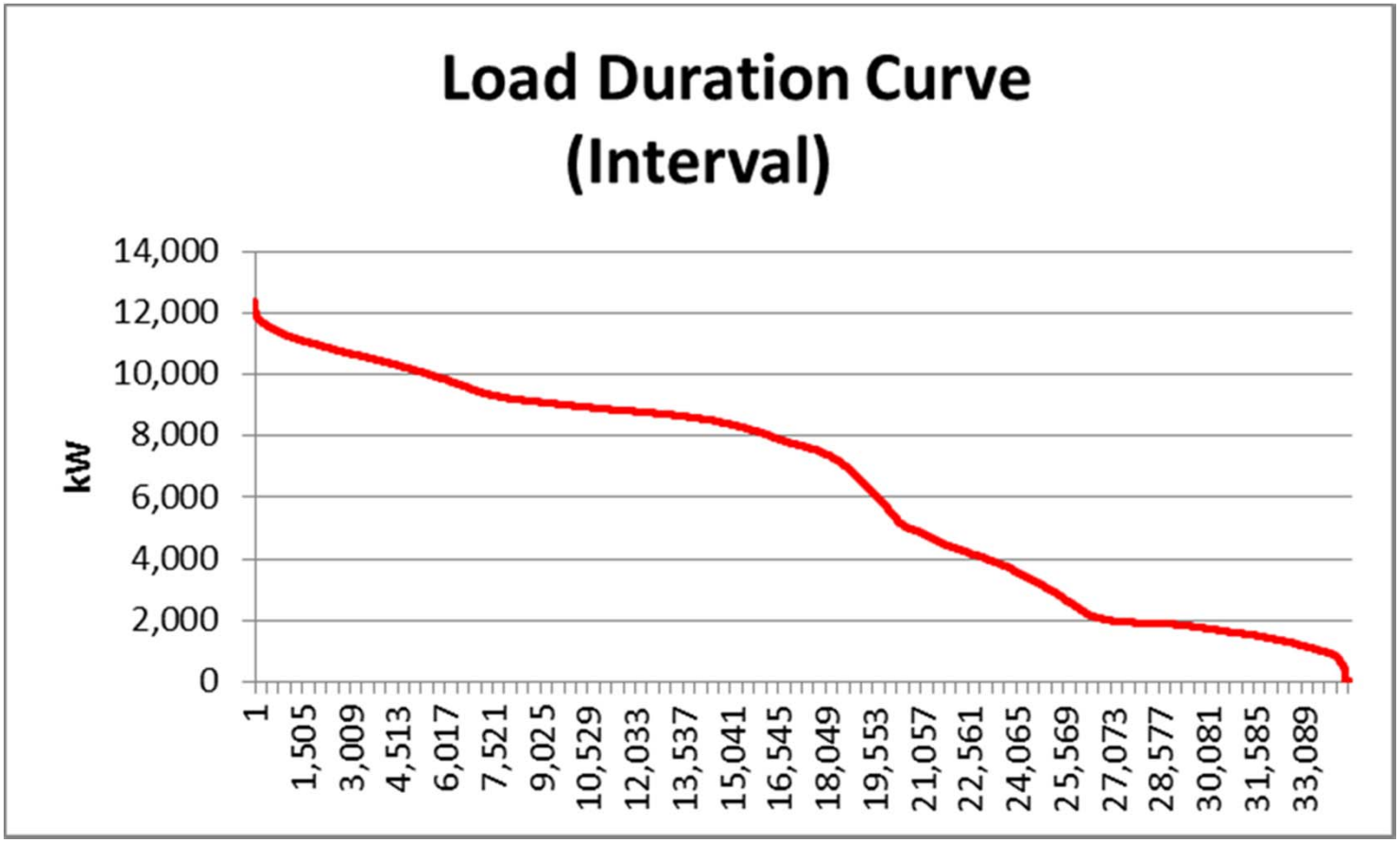
Step 2: Example Grid Peak Load Visualization

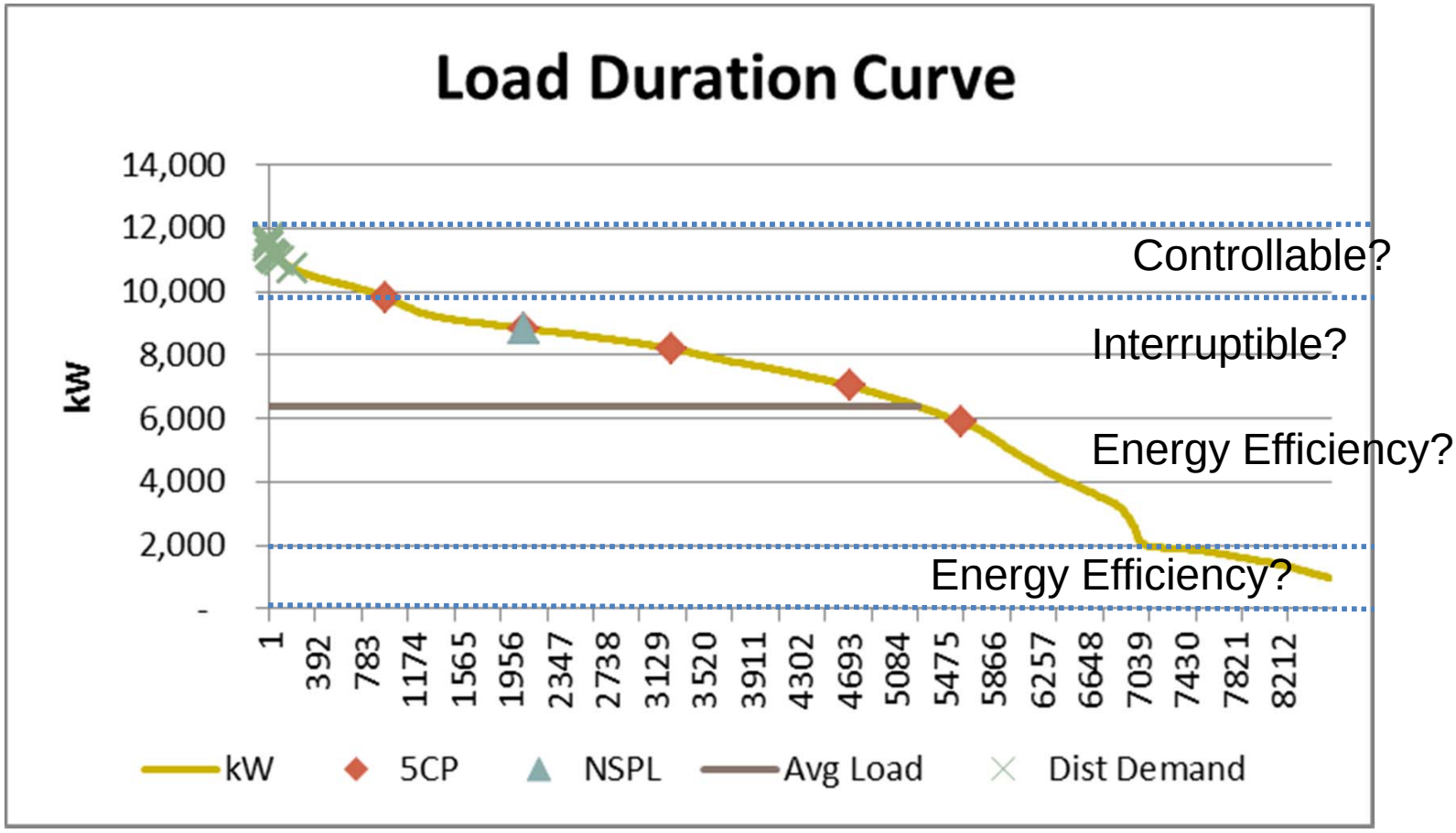


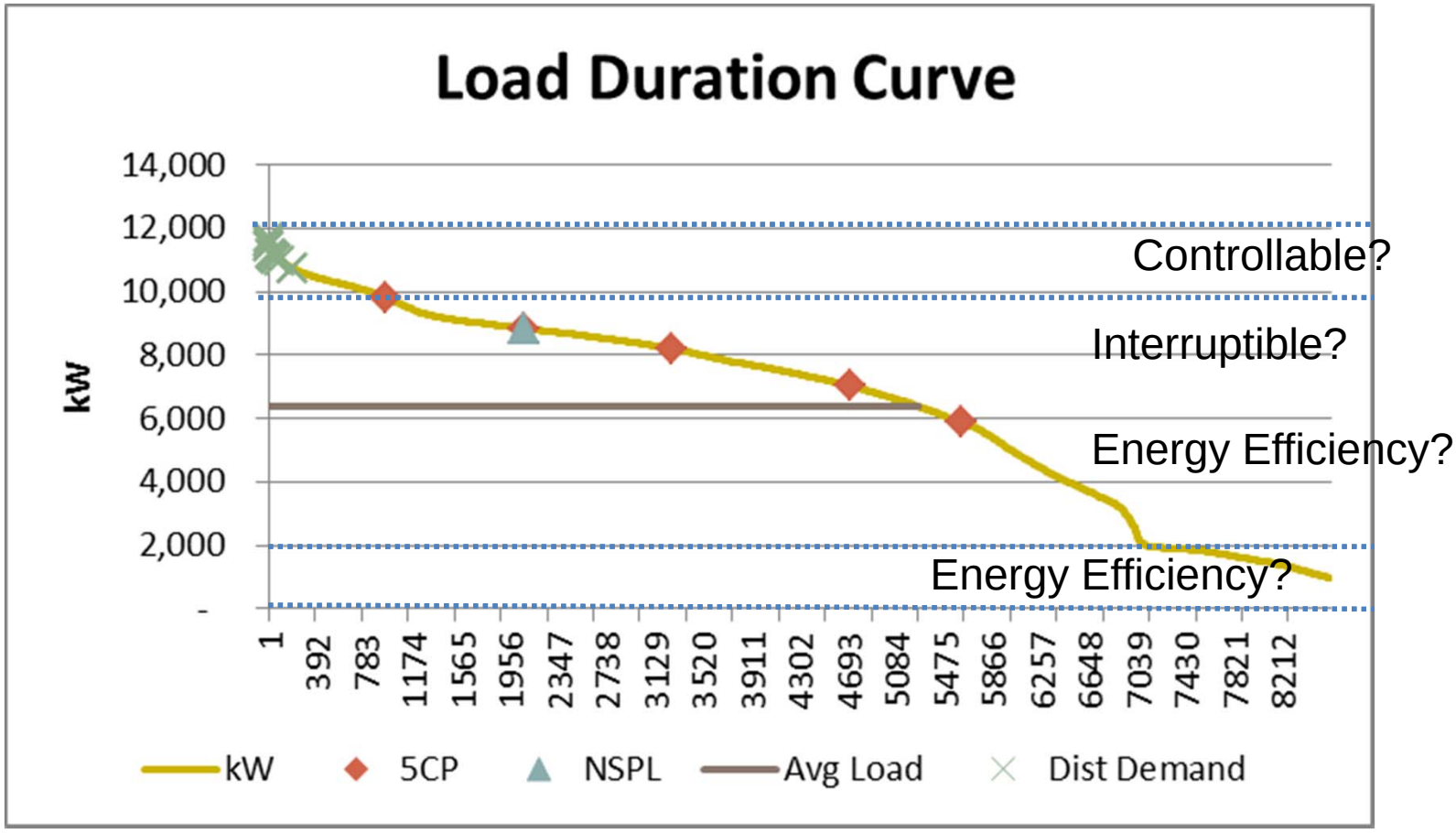
- Work with operational teams to identify load reduction sequence
- Suggest strategies based on best practices

Institutional Heat Map

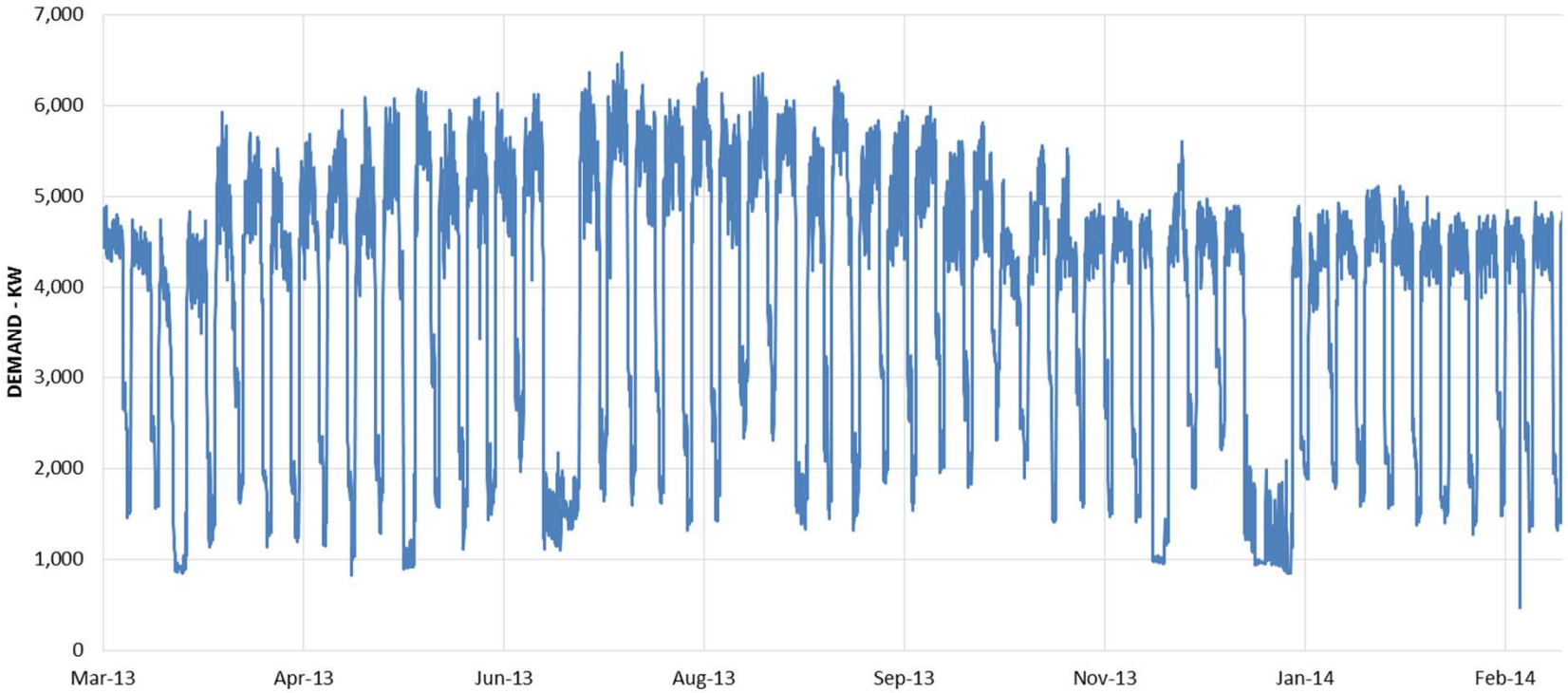




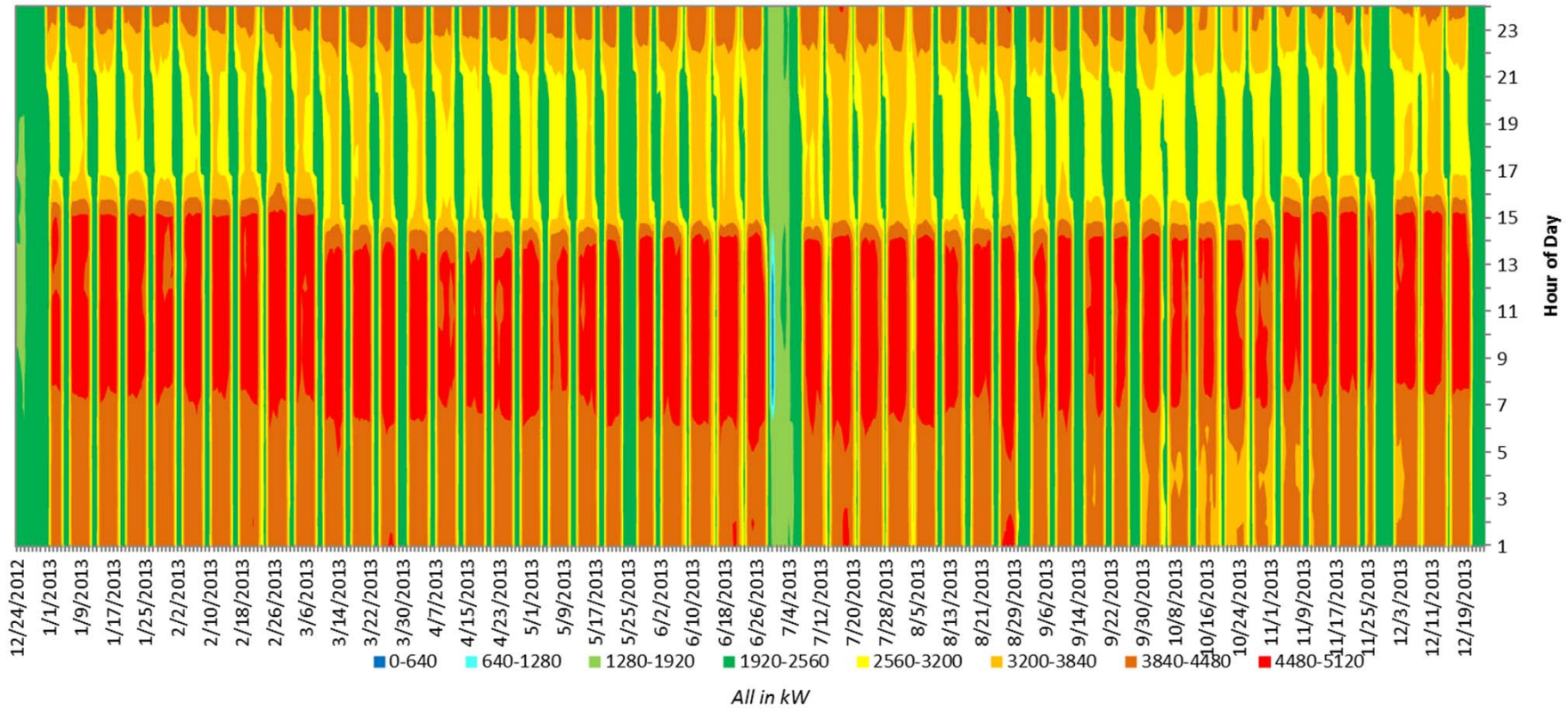


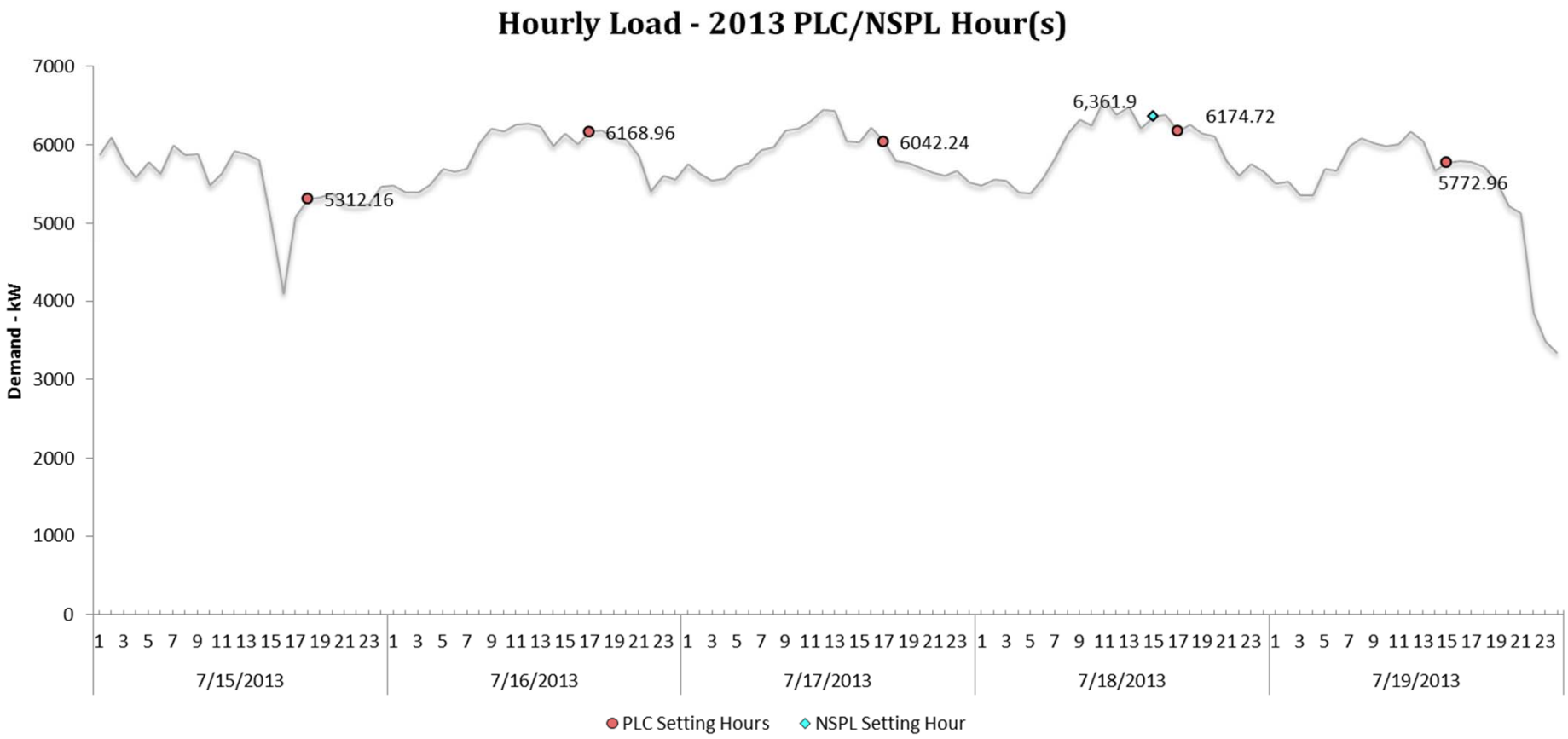


ANNUAL SHAPE

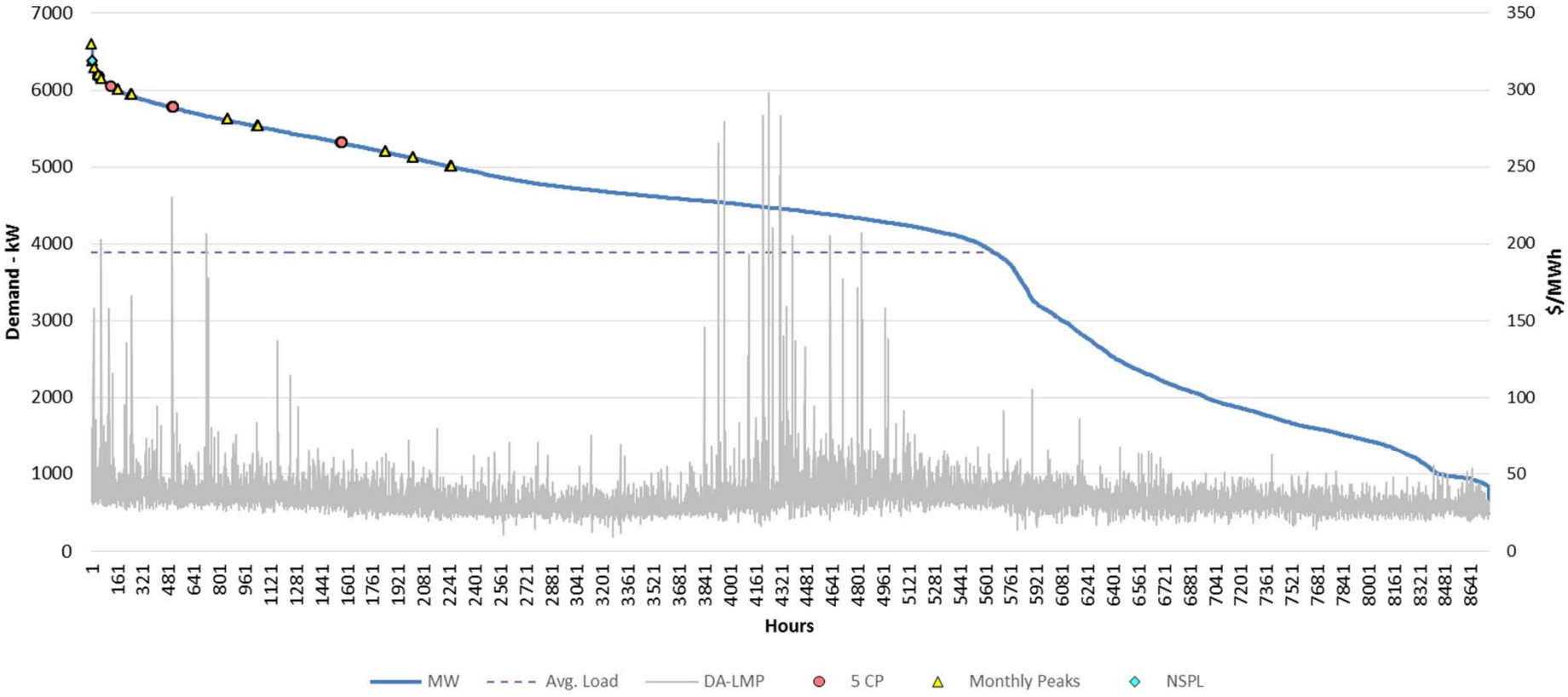


DEMAND (HEAT) MAP





LOAD DURATION CURVE



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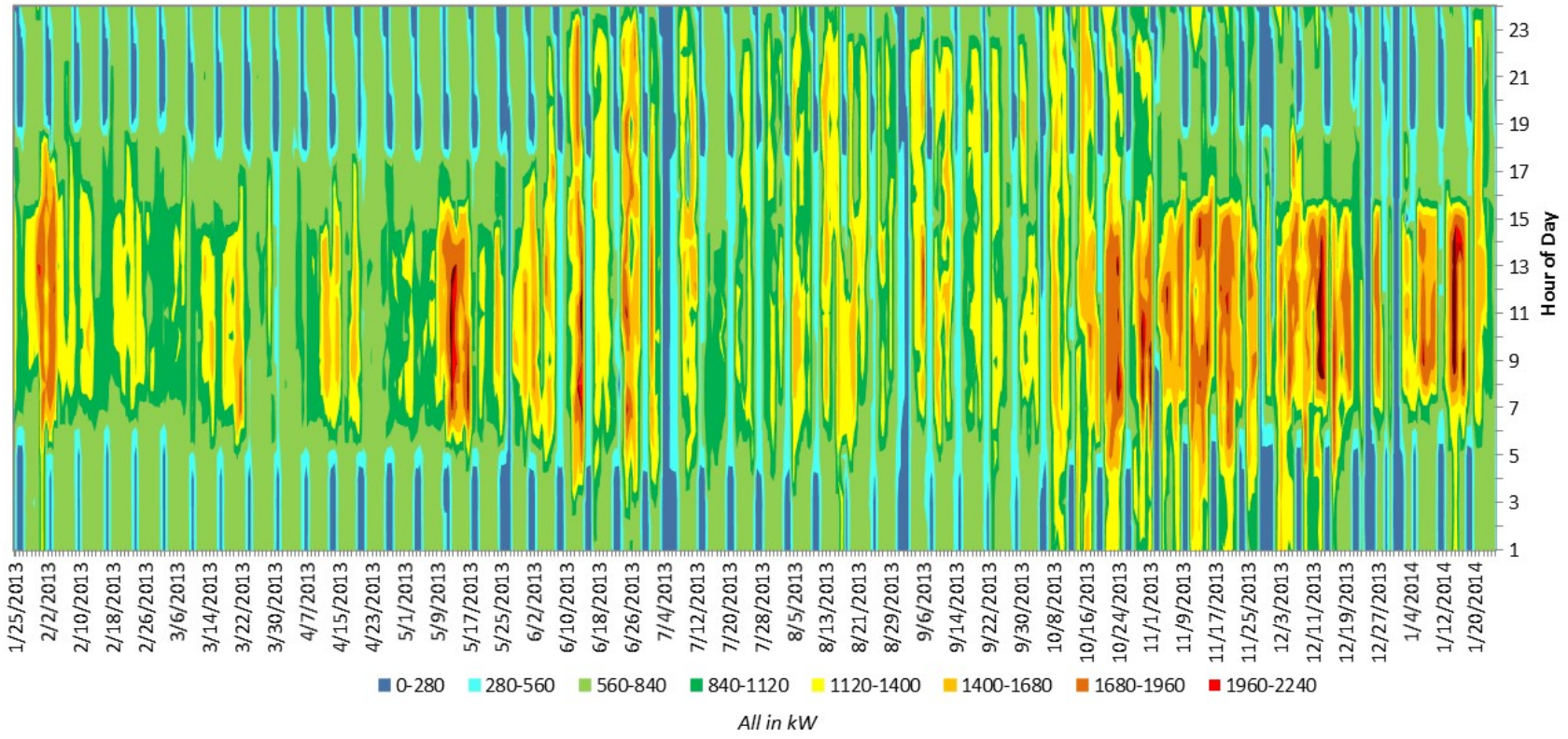
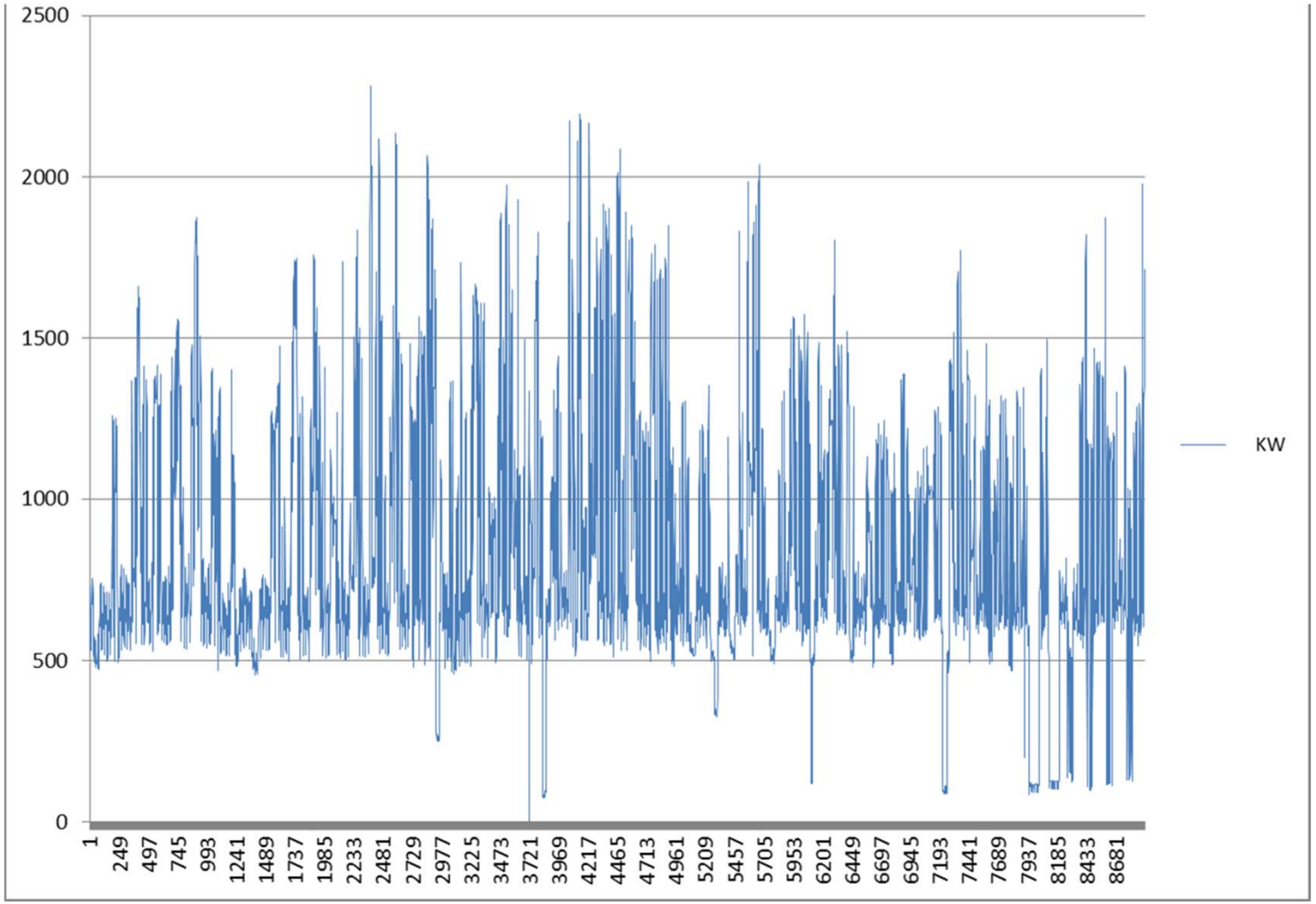


Jan 2012-Jan 2013 Usage



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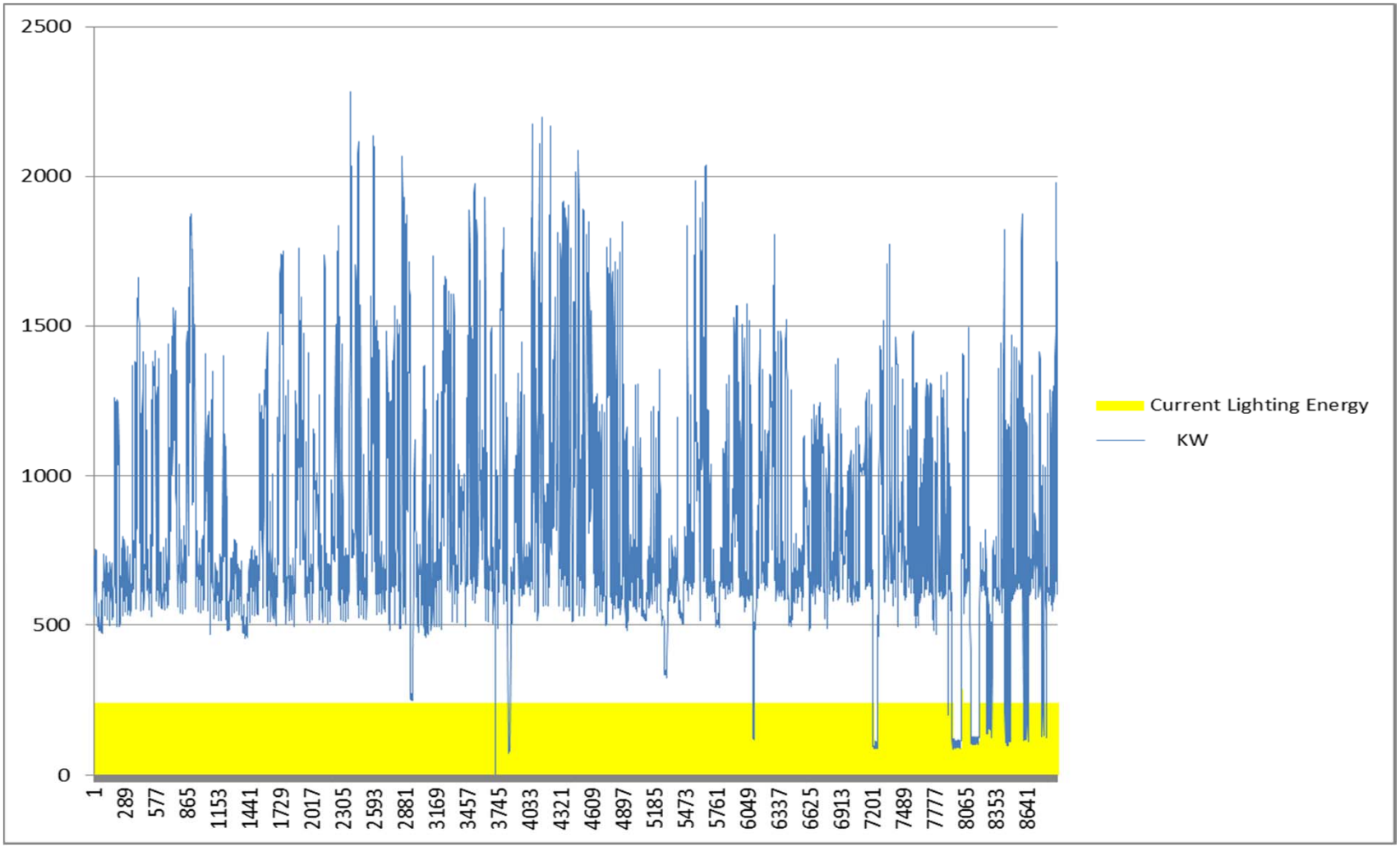

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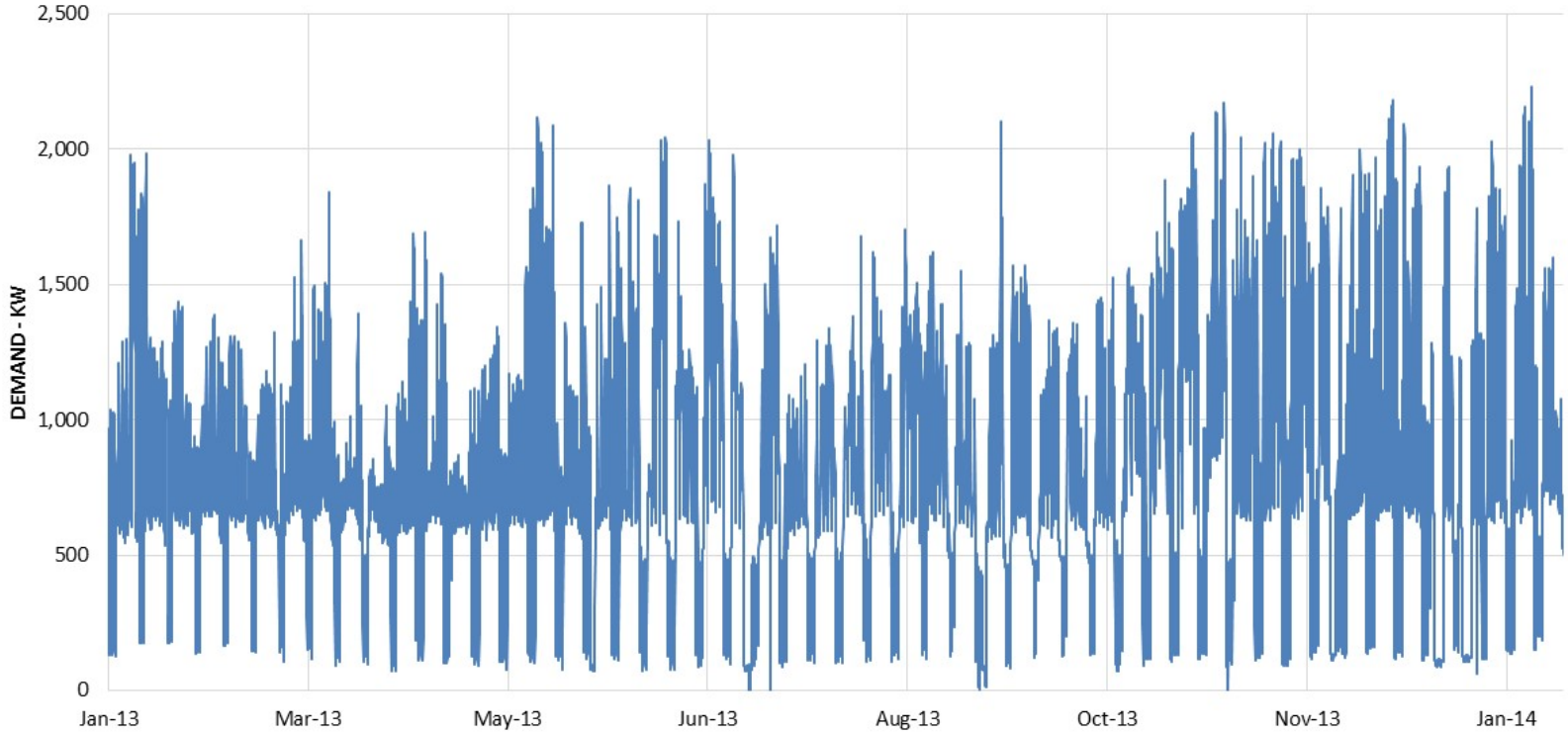
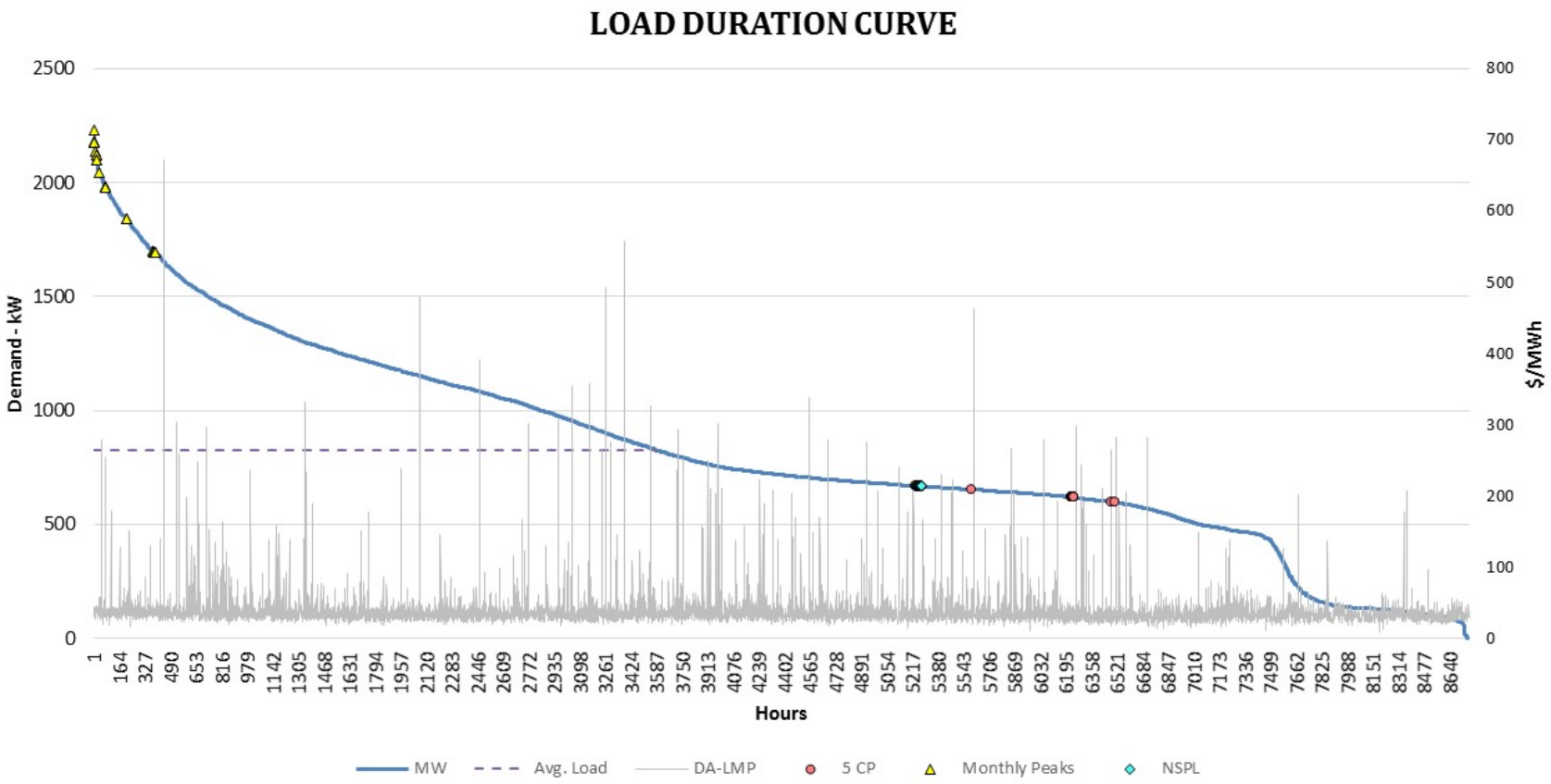
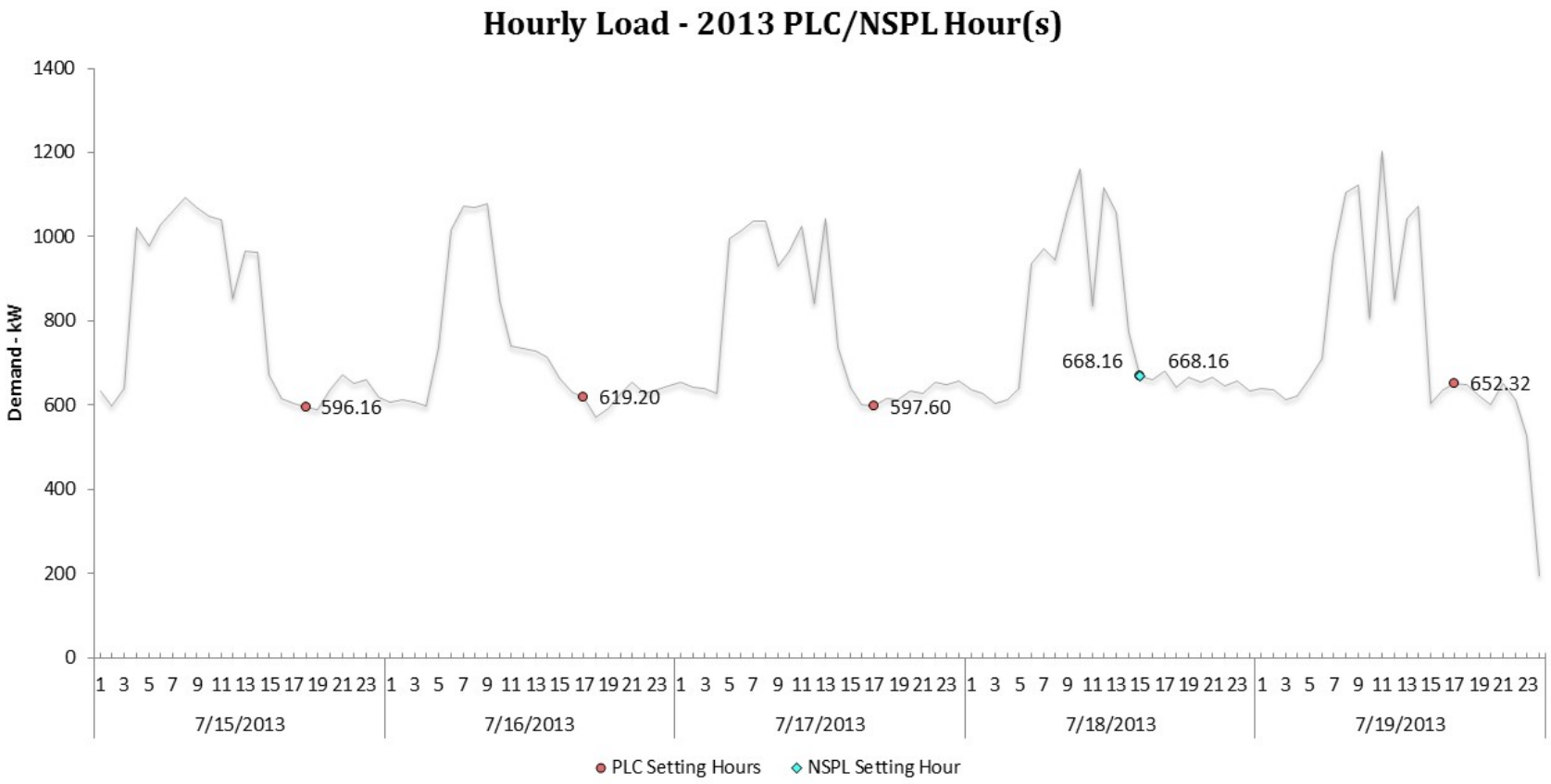
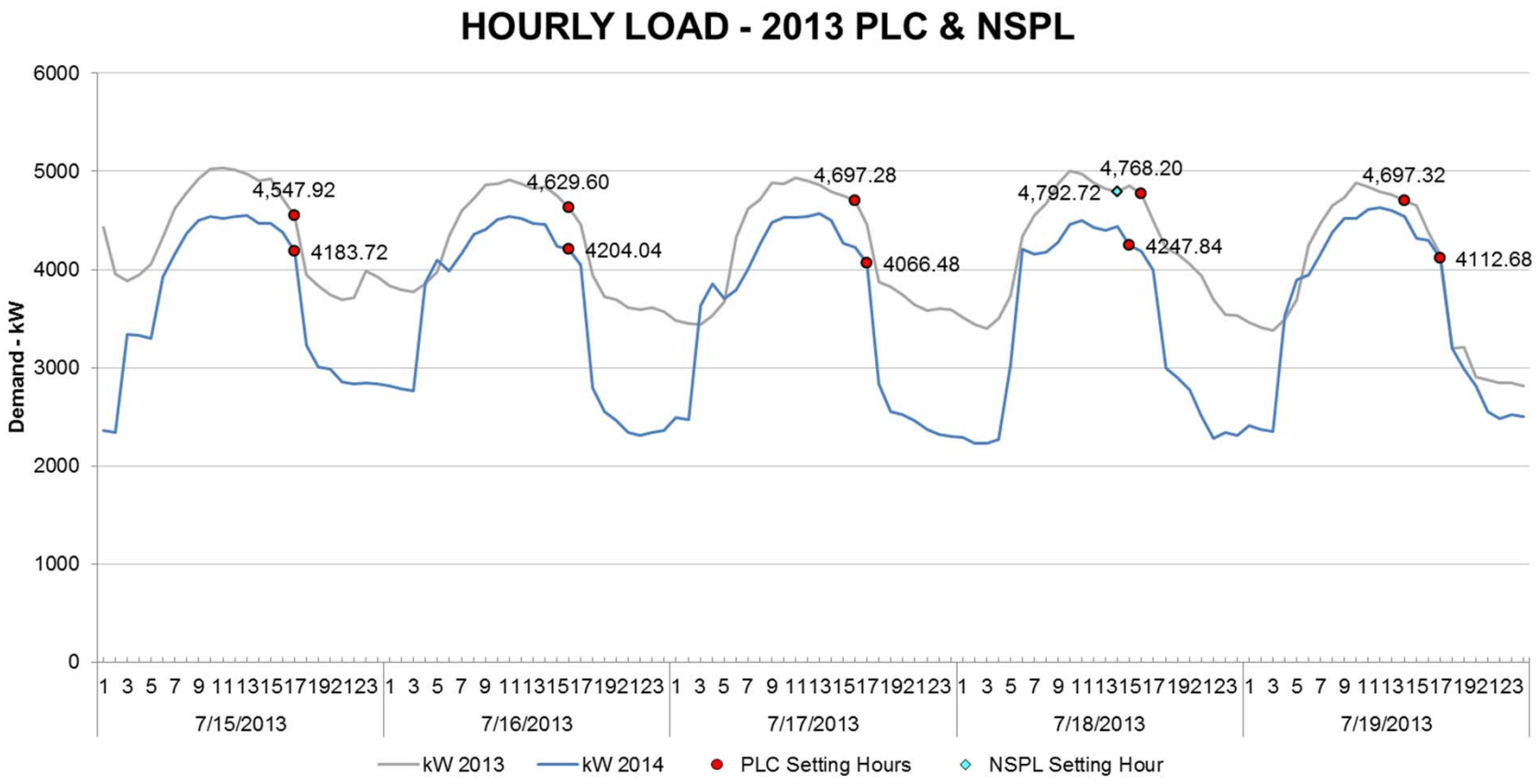








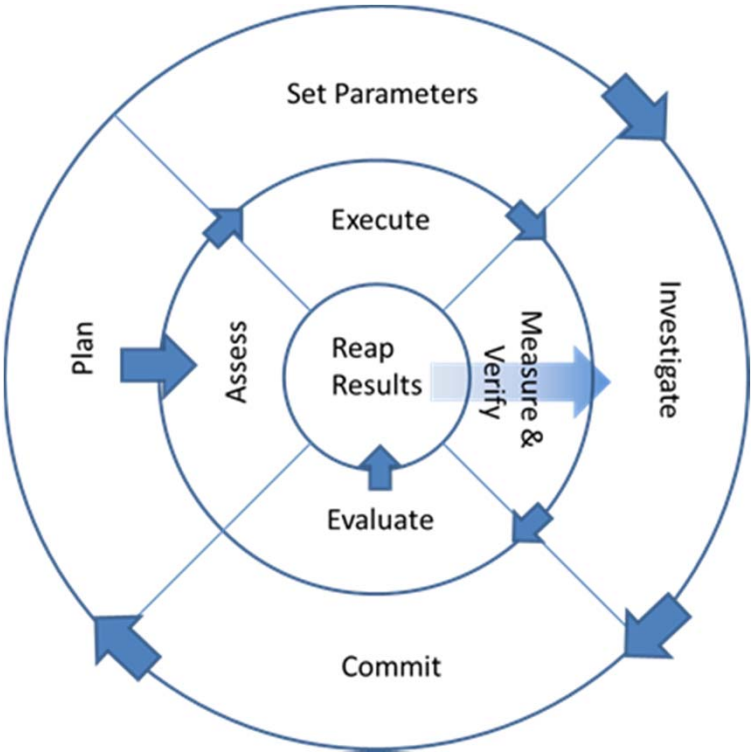
Deep Diving with Interval Data

- **Interval data can be used in great detail for weather sensitive loads**
  - Hourly weather data – dry bulb temperature, humidity, wind speed, wind direction, solar gain, precipitation
  - Hourly (or less) load response
- **Hourly service or production data can be leveraged too**
- **Hourly sensitivities and drivers**
  - Production and weather
  - Correlations and coefficients can be used to flag system issues and performance
  - Performance can be linked back to specific Energy Conservation Measures
  - Data can be used for measurement and verification

Determining the Opportunity

A Combinatorial, Systemic, Holistic Review

- **View your Energy Resources and Requirements, and associated Assets and Liabilities, as a complete interconnected system**
- **Combine Knowledge and Information across the spectra to develop emergent solutions**
  - The whole is more than the some of its parts
  - Identify measures that work only in, or work better in combination than either separately

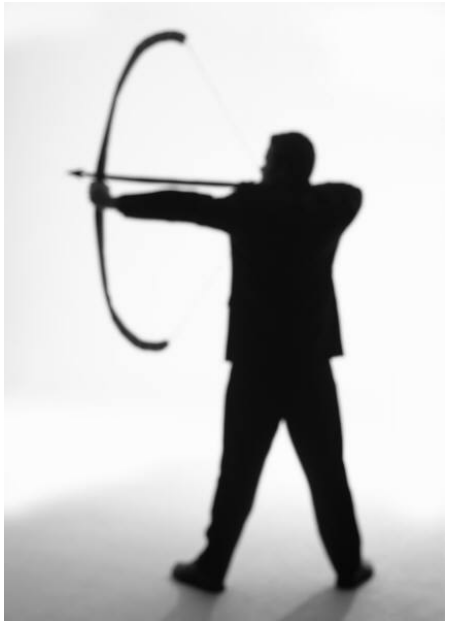


Opportunity Screening – Setting Parameters

- **What constraints do you have?**
  - Financial
    - Minimum payback – what is the requirement?
    - Tax appetite - incentives and rebate treatment
    - Capital limitations/Credit – how do projects compete?
  - Resources
    - Program and project managers, engineering, outage time
  - Timing
    - Budget cycles, approval processes, incentive program deadlines

“A man’s got to know his limitations” – Dirty Harry

Decision Framework – Setting Parameters



- **What are your Priorities & Objectives?**
  - Financial/Profitability
    - What is the total spend on energy?
    - What is the cost per product/service produced?
    - How does a dollar saved enhance profits?
  - Risk
    - How do price or consumption moves affect you?
  - Green House Gas
    - Are there specific targets or objectives?
- **What reduction in energy cost OR volume is required to meet your objectives?**

"If you don't know where you are going, any road will get you there." – Lewis Carroll

Energy Management Financing

Improving the Balance Sheet on the Income Statement

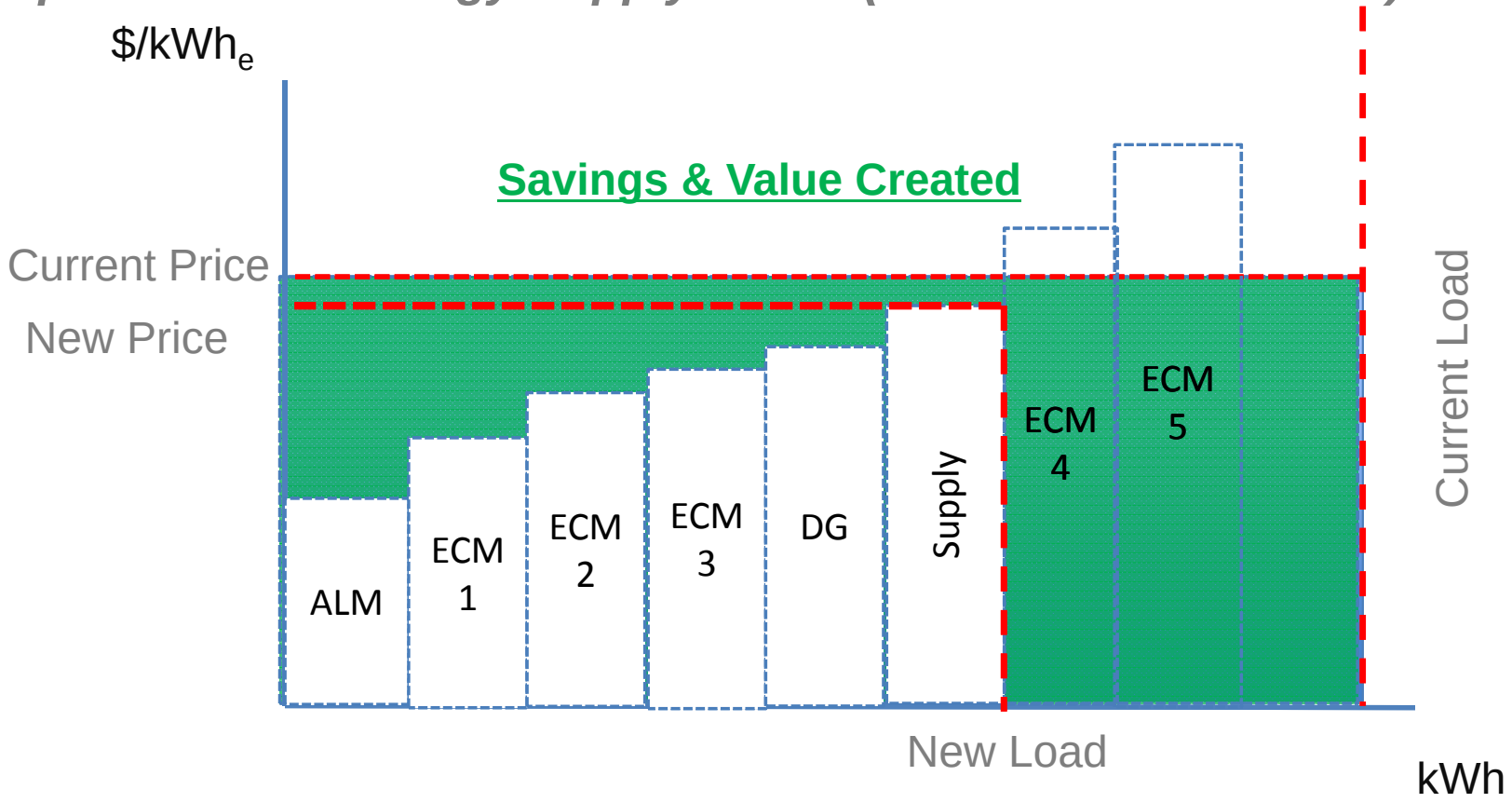
- **Allows you to move forward with economic projects despite cash and capital constraints**
  - Immediate positive cash flow for conservation projects through financing

- **Market is developing rapidly with new structures and participants**

- **Considerations**
  - Provider risk
  - Balance sheet
  - Tax attributes

Take It to the Balance Sheet

Optimize Your Energy Supply Curve (Assets and Liabilities)



Protecting Your Wealth

Measurement and Verification

- **Energy information can be used to verify project performance**
  - Sub-metering can be added as needed
- **Ongoing reporting and review is critical**
  - Stay on top of performance metrics
  - Flag areas that are slipping
  - Continued M&V
  - Predictive indicators
  - Baselines for future projects
- **Energy markets change all the time.**
  - Knowing the next best project is valuable insurance.

Questions and Follow Up

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"The secret of getting ahead is getting started. The secret of getting started is breaking your complex overwhelming tasks into small manageable tasks, and then starting on the first one." – Mark Twain