ADVANCED EXCEL FOR ENERGY EFFICIENCY PROFESSIONALS

AEE NORTHERN OHIO CHAPTER

11/14/2014

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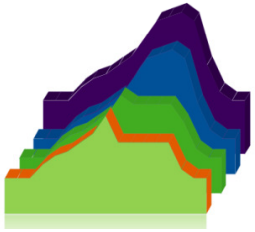
ENERGY EFFICIENCY & DEMAND MANAGEMENT, INC.
TRAINING | CONSULTING | IMPLEMENTATION

AGENDA

- About EEDM, Inc.
- Excel's use in Energy Engineering
- Excel Formulas and Functions
- Interval Data Analysis (IDA) Basics
- IDA Analysis using Microsoft Excel ®



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EEDM, Inc.

- Energy Efficiency & Demand Management
  - Training
  - Consulting
  - Implementation Assistance
- Training in Advanced Microsoft Excel® (on-line and classroom)
- Energy Efficiency and Demand Side Management (classroom)
  - Relevant or minimal theory; “cut to the chase”
  - Flexible tools
- Trained people from diverse organizations
  - Austin Energy, London Hydro, FP&L
  - Michaels Energy, Research into Action, Energy Control, Inc.
  - Burns and McDonnell, CB Richard Ellis, EnerNOC

WHY EXCEL?

- CALCULATIONS/WHAT-IF ANALYSIS
  - Complex calculations and “What–If” analysis
  - Many built-in functions + custom functions
- CHARTING
  - Variety of charts – Bar, line, pie, etc.
  - Custom formatting and dashboards
- DATA ANALYSIS/DATABASE
  - Sorting, filtering and connecting to external data
- OTHER
  - Seamless integration with other office applications
  - Collaborative environment – leave comments, call boxes, etc.

FUNCTIONS IN EXCEL

- Required to take advantage of Excel's power
- Opens door for creative data analysis and manipulation
- Excel 2013 has over 450 functions
- Relevancy to Energy Engineering
  - Proficient in ~ 100 functions
- Combine functions for greater potential
- User defined functions (UDF)
  - Steam properties
  - Psychrometric properties
  - Requires knowledge of VB

ENERGY ANALYTICS

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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AEP Energy
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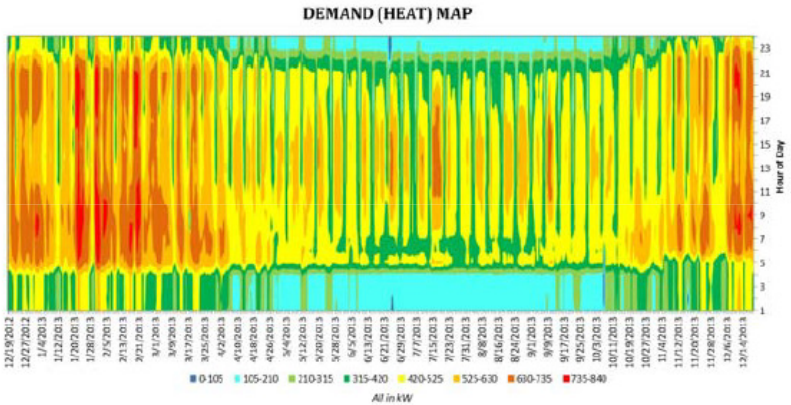


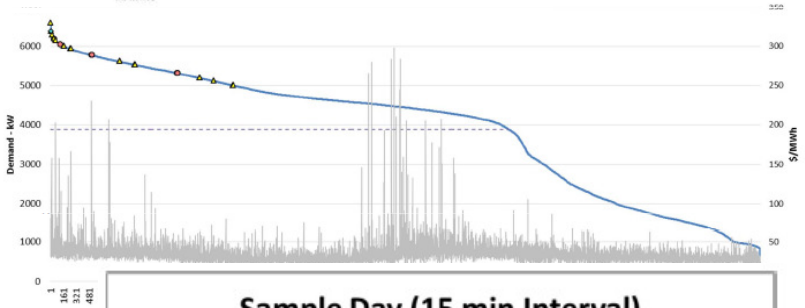
Income Statement Detail

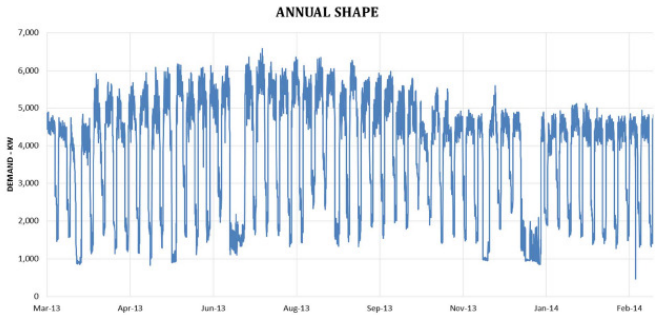
Understanding Interval Data

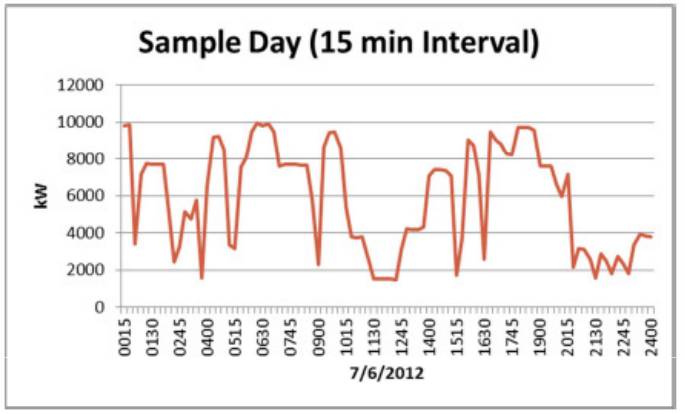
- **Interval data – Forest or Trees?**
- **Heat maps**
  - Show overall operating pattern and performance
- **Duration curves**
  - Show peak demands, operating levels, operating con
  - Allow for review of distribution demand management, transmission cost reductions, demand response and

loads and operating sche

e analysis







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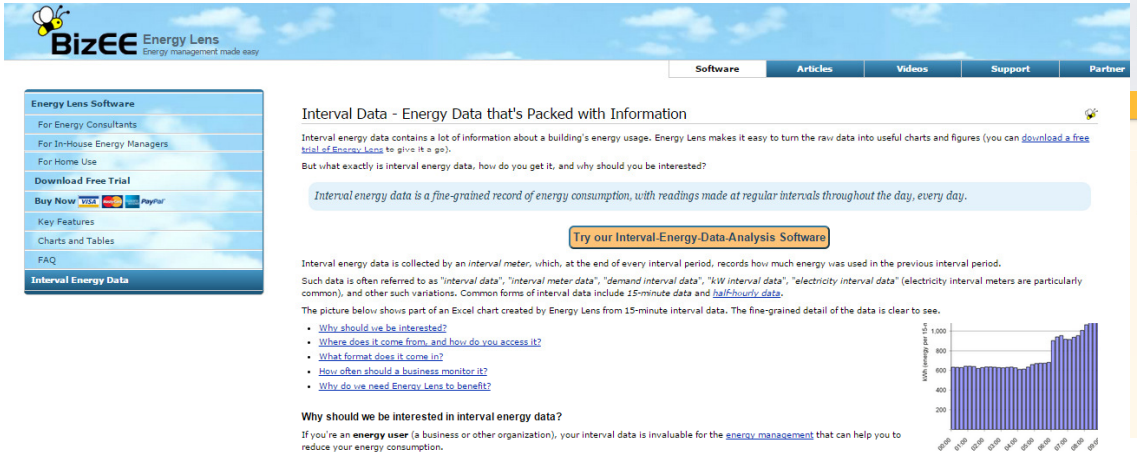
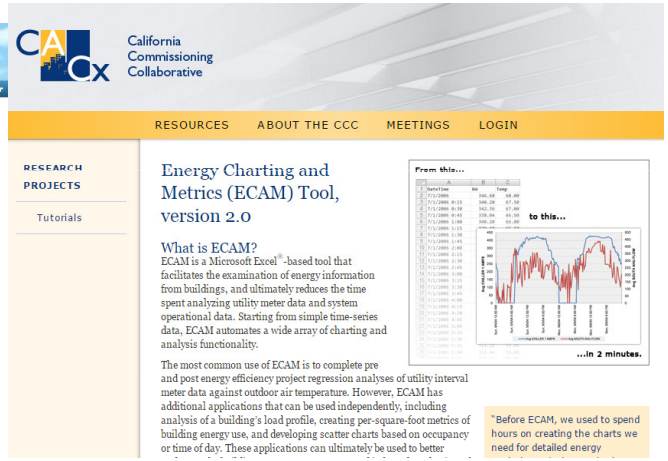
INTERVAL DATA ANALYSIS (IDA)

- Load profiling
  - Analysis carried on yearly, monthly, weekly, and daily basis
  - Identify problems that impact energy consumption
- Peak and base load analysis
  - Size, timing, and duration of peak
  - Relationship between max and min load
  - Identify demand reduction potential
- Load duration curves and heat maps
  - Magnitude of peak loads
  - Clustering of peak timings

IDA TOOLS

- Energy Charting and Metrics Tool (ECAM)
- Smart Metering, Load Profiling & Demand Response – by Lindsay Audin through AEE
- Energy Lens by BizEE Software Limited
- Interval Data Analysis Tool (IDAT)





Realtime Distance Learning For Energy-Involved Professionals

presented by aee The Association of Energy Engineers

GETTING STARTED WITH IDA

- Input Data
  - kW or kWh
    - 1 kWh over 30 minutes = 1kWh
    - 1 kW over 30 minutes = 1 x 0.5 = 0.5 kWh
  - Data for one year
- Understand facility operation to understand energy profiles
  - Occupancy and operating schedules
  - HVAC and lighting systems
  - Energy consuming equipment/process

ANALYZING IDA OUTPUT

- Derive key characteristics and answer key questions
  - Magnitude of energy use and load demand
  - Energy use profile
  - Weather impact
  - Building operating characteristics
  - Base load and variable load
  - Load spikes

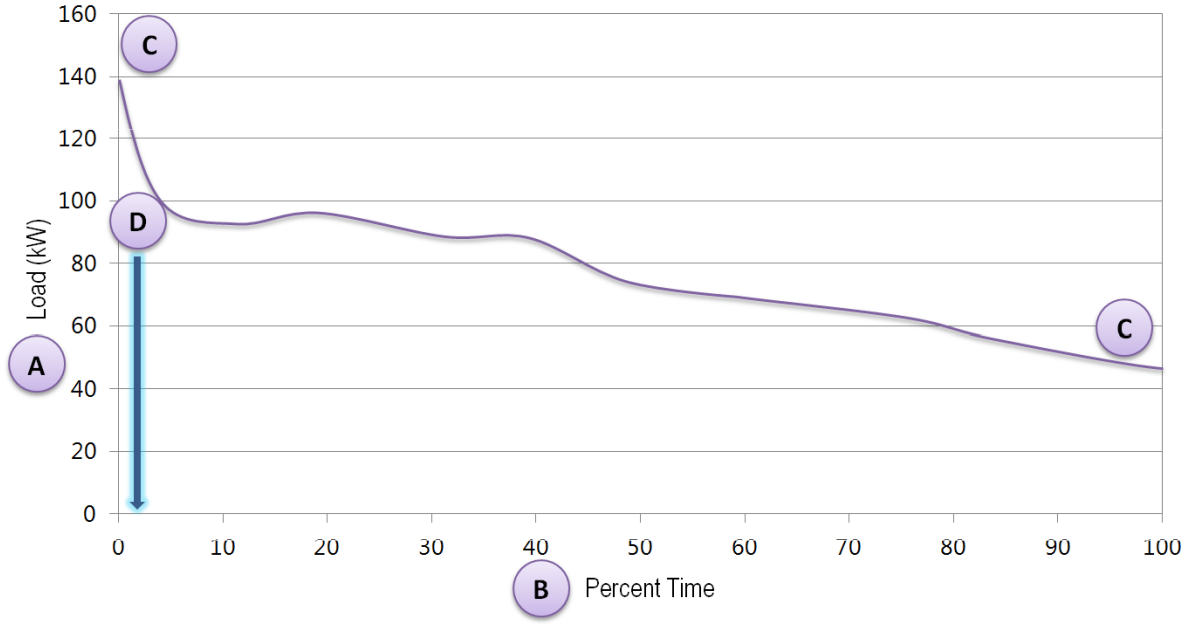
LOAD DURATION CURVE

(A) A one year load duration curve is plotted, with load on the y-axis

(B) The x-axis indicates the percent time that the load was at or greater than the y-value

(C) The base load is never less than ~ 48 kW and the maximum load is about 140 kW

(D) The peak demand above 120 kW is only 2-3% of the time throughout the year



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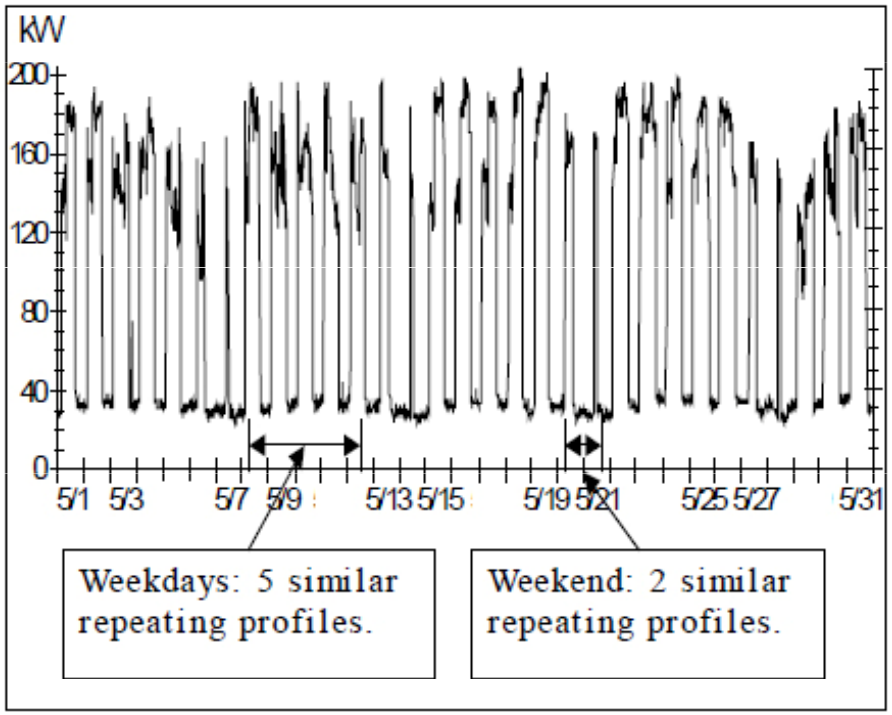
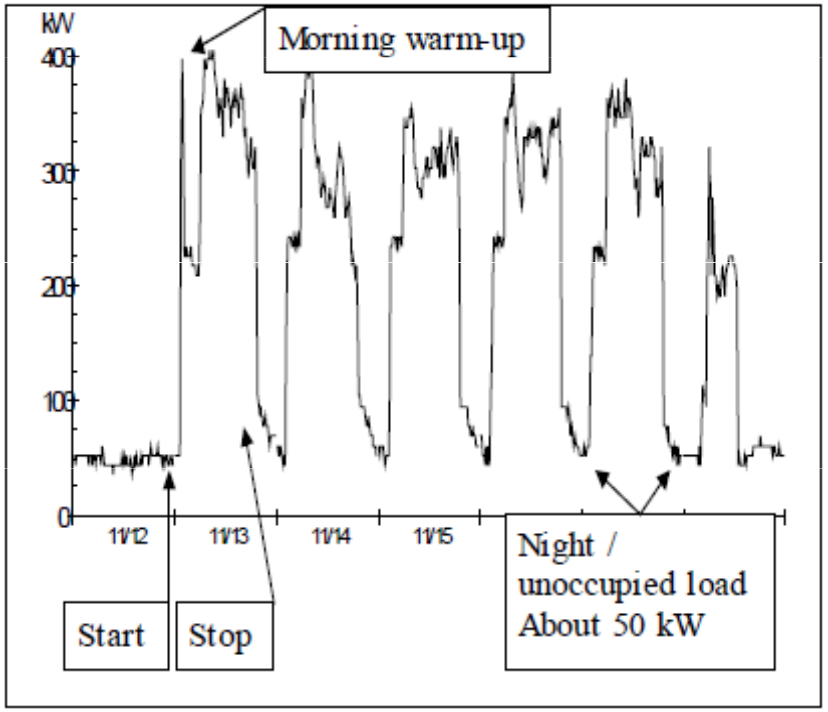
WHAT TO LOOK FOR IN INTERVAL DATA?





Source: "Using Interval Data as a Diagnostic Tool", Will Price and Reid Hart, Eugene Water & Electric Board

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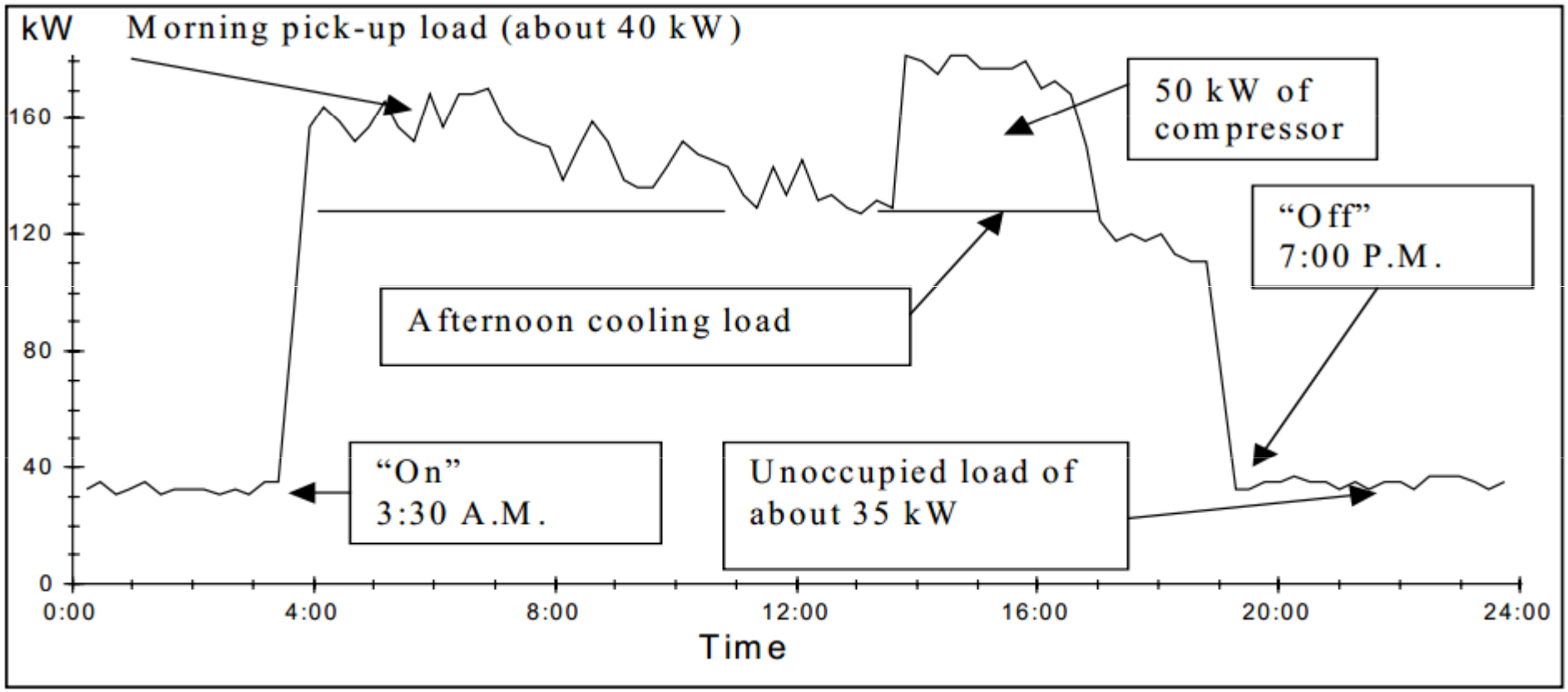

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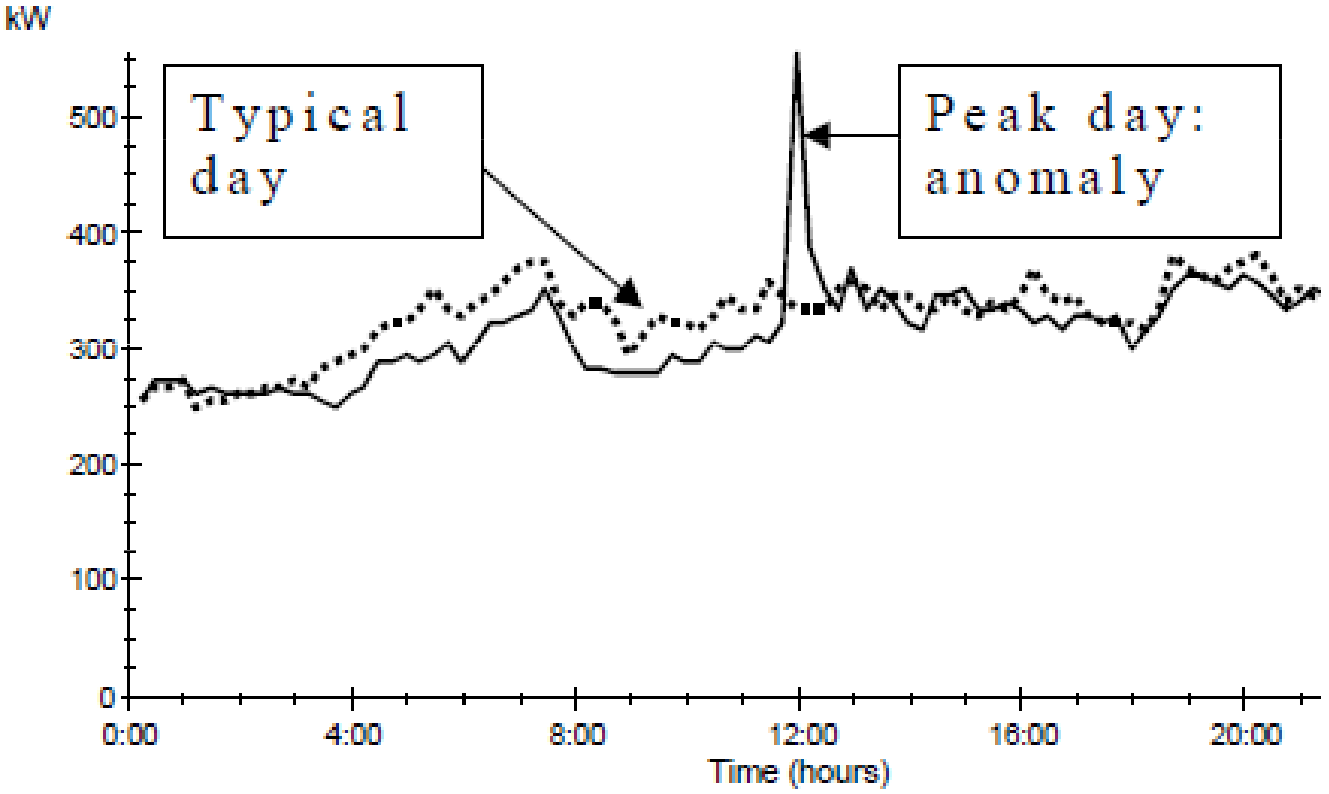
ENERGY USE PROFILES



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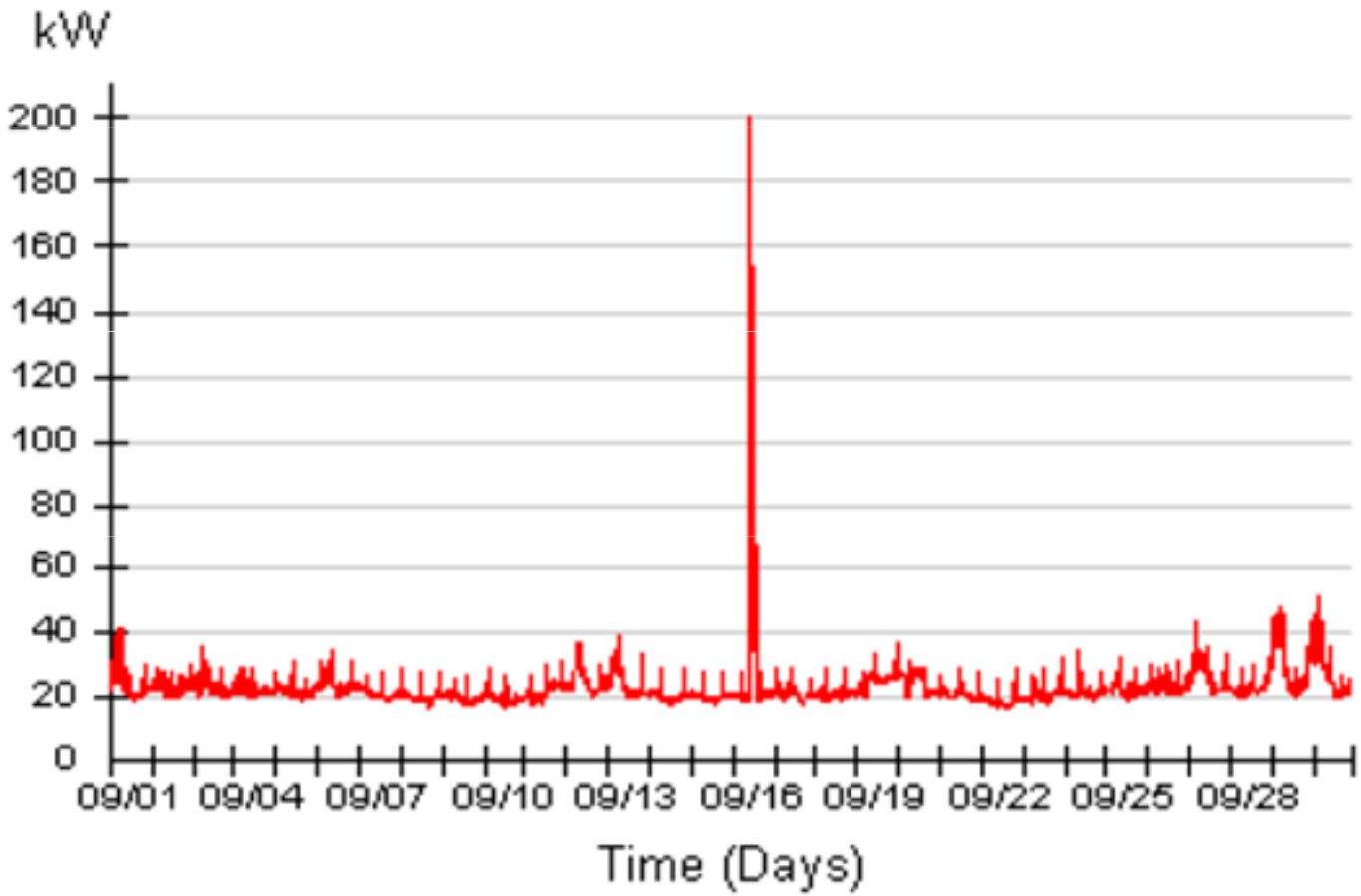

Source: NGrid

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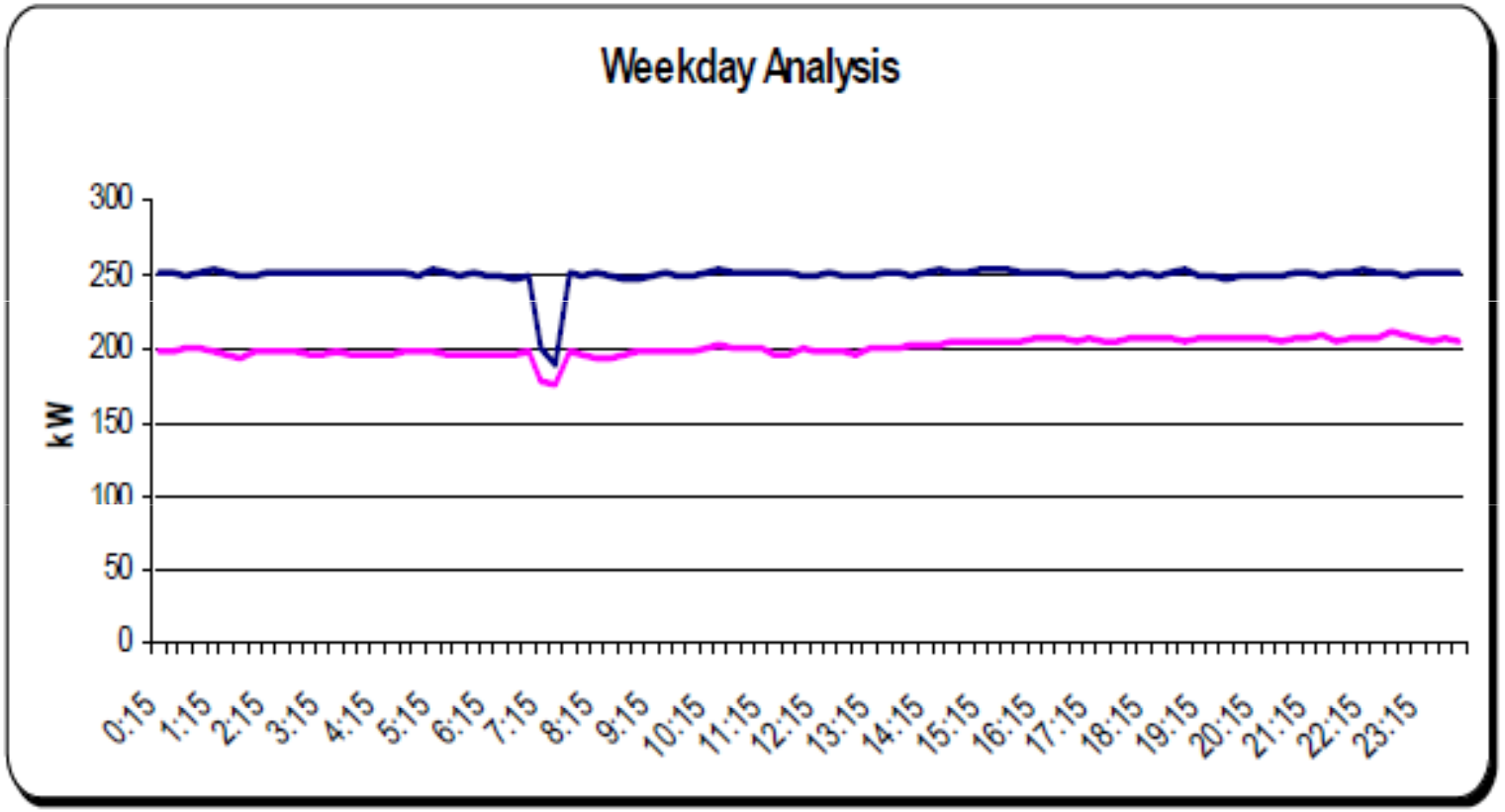

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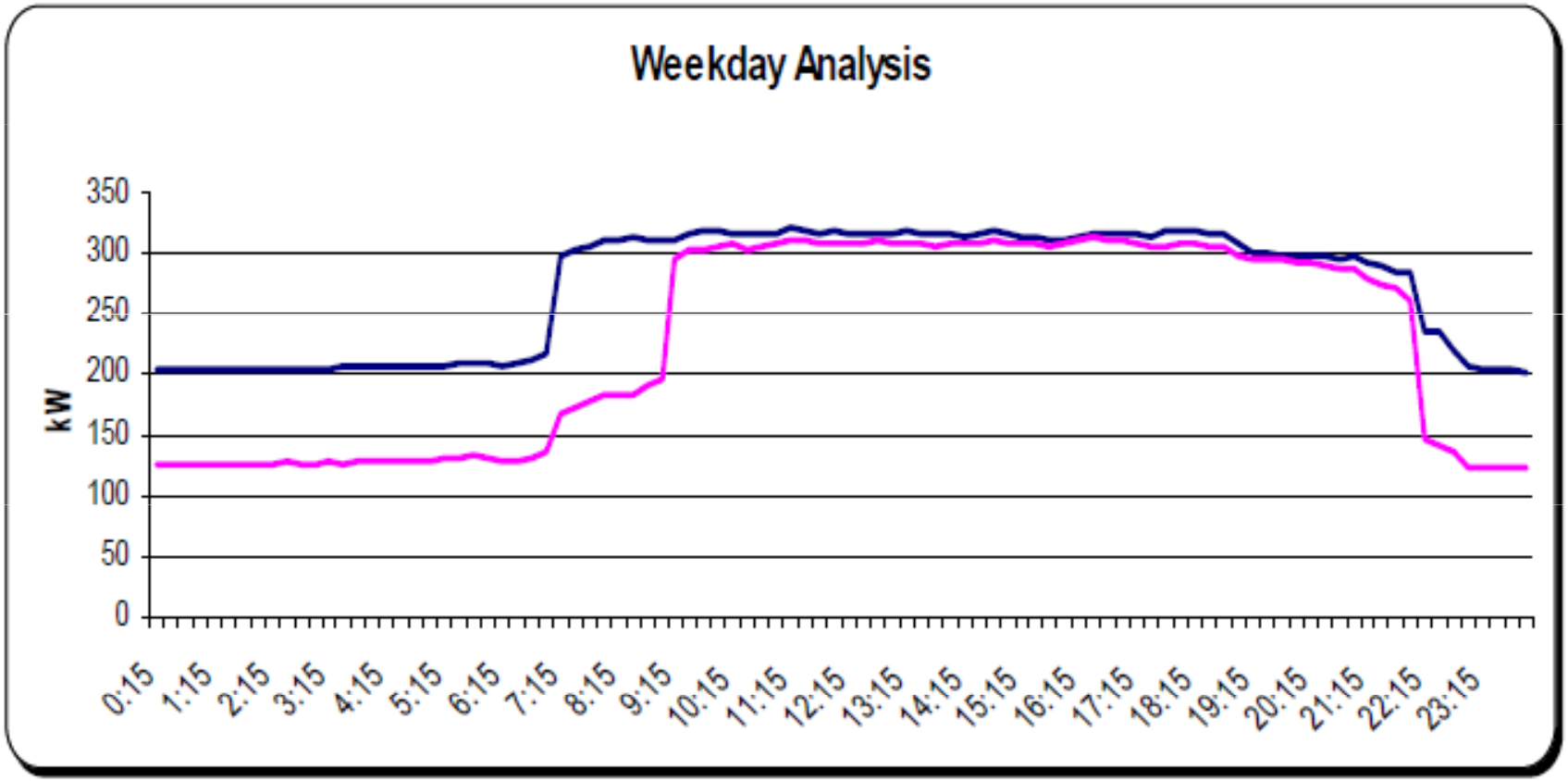

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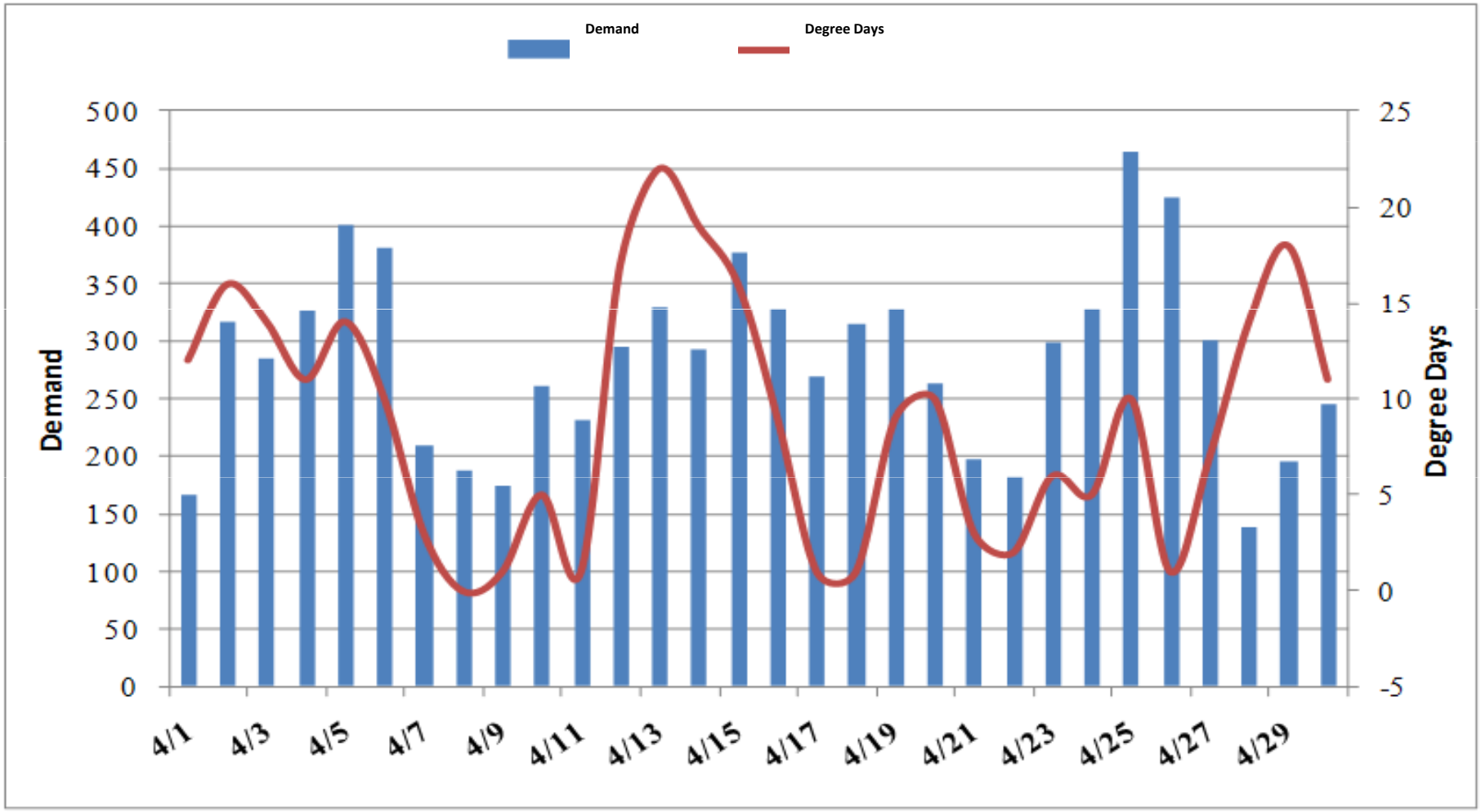
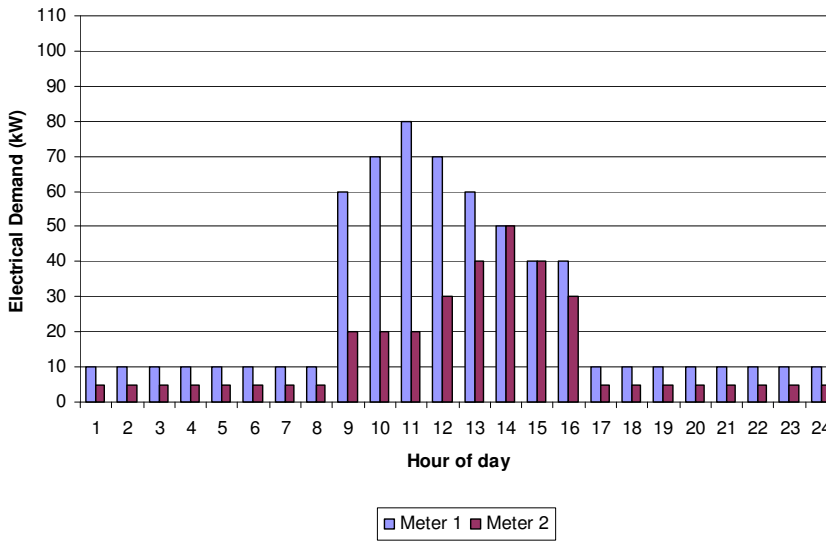
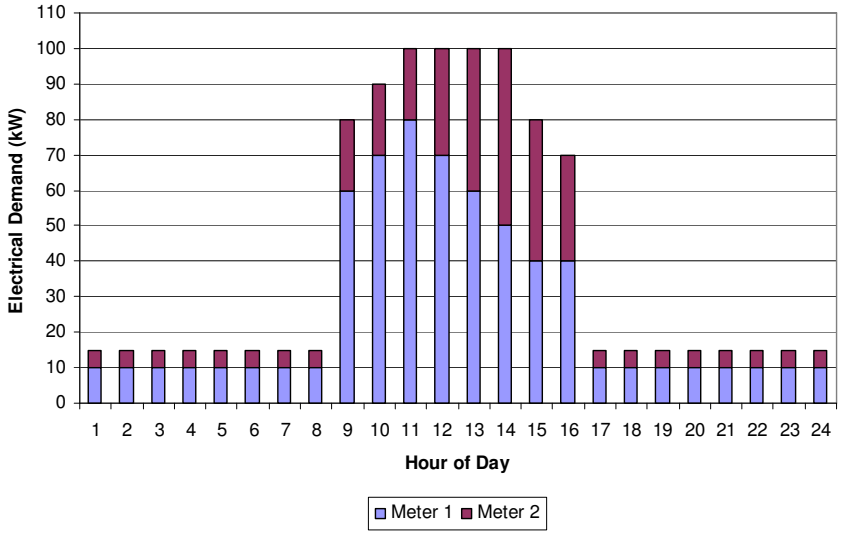


Source: KPPC

METER CONSOLIDATION





- Billed demand with two meters

  = 80 kW + 50 kW = 130 kW

- Billed demand with one meter =~ 100 kW

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