BUILDING OPERATING MANAGEMENT'S
NFMT™2015
National Facilities Management & Technology March 10-12, 2015 • Baltimore

"Big Data" for Energy Efficiency – Visualize the Invisible

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Learning Objectives

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- How/why to access interval utility data for analysis, including smart metering
- What can be learned from interval utility data, including using the information to make better building services decisions
- How these tools and techniques were used in three buildings across very different climate conditions
- Steps attendees can follow to undertake similar efforts at their own facilities

Agenda

- Today's Operating Realities
- Whole Building, Whole Lifecycle
- Enhance Operating Effectiveness
- Why Energy Management
- Energy Efficiency Challenges
- Big Data in Energy Services
- Where is Interval Data?
- The Difference Data Makes
- What the Data Can Reveal
- Examples
- Questions

Today's Operating Realities

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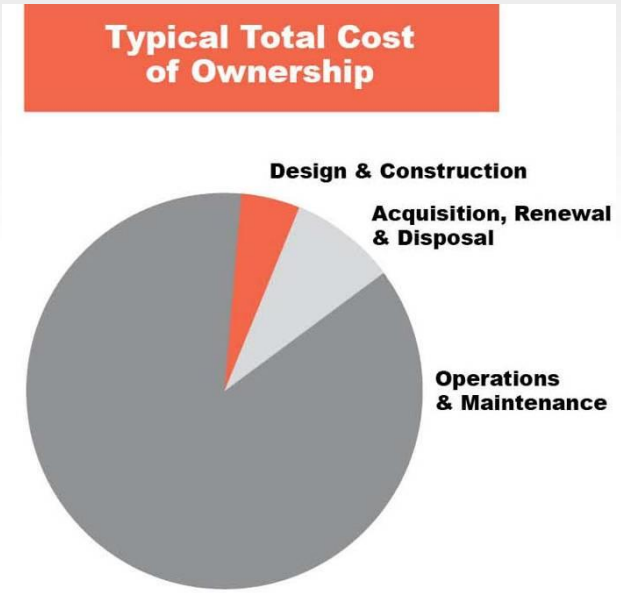
- Organizations (and individuals) are under pressure to do more, more, more with less, less, less
  - improve productivity, reduce costs, manage headcount
- Technology, data availability becoming more common and more sophisticated

- Capital investments are under great scrutiny and must provide a clear return
- Organizations are focusing more on total cost of ownership

Organizations expect real, measurable return – tougher environment

Whole Building, Whole Lifecycle

- Typical buildings have occupied lives of 50-75 years
- Operating costs typically account for 60-85% of building lifecycle costs – compared to 5-10% for design and construction costs
- High performance buildings reduce lifecycle costs so organizations can invest in other priorities and make buildings "assets" instead of "expenses"
- Areas of focus:
  - Energy and water consumption
  - System reliability
  - Environmental compliance
  - Occupant health, safety and comfort
- Energy has ties to or interface with all of these



Source: National Institute of Building Sciences

Enhance Operating Effectiveness

- Providing a safer, healthier, more comfortable (productive) environment
- Operating reliably with minimum unscheduled downtime and fast recovery
- Maintaining performance within acceptable tolerances throughout their lifespan

- Enhancing performance, retaining/increasing value and adding luster to the organization's brand and reputation
- Cost management AND operating excellence

Why Energy Management

- Knew about energy efficiency
- Knew about projects and energy reduction "things"
- Had way too much on my plate

Needed ways to efficiently

- Make energy/operations visible
- Identify and prioritize (by my metrics) what projects to do next
- An effective way to get things done and demonstrate the results

Energy Efficiency Challenges

- Where to start?
- Historically energy solutions have been
  - Costly
  - Time consuming
  - Confusing
  - Required large energy spends to justify the investment
  - Secondary effects and benefits

Cost-effective scalable solutions using real data converted to information that can actually be used – on the user's terms

Big Data in Energy Services

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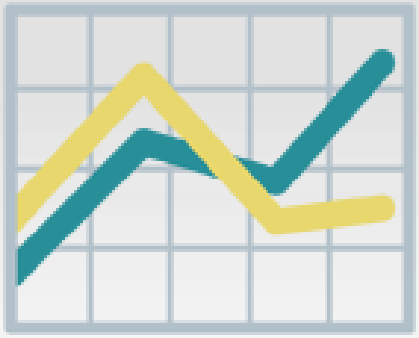
- Fast, easy and inexpensive ways to utilize utility data to understand:
  - Current usage
  - Opportunities for improvement
  - ROI analysis of energy efficiency options
- Standards and certifications can guide
  - BOMA, LEED, GBI

- Best backed by buildings and equipment expertise to interpret data and collaborate to explore, prioritize and execute options to increase efficiency

Routinely discover efficiency opportunities of 15 – 25 percent

Where is Interval Data?

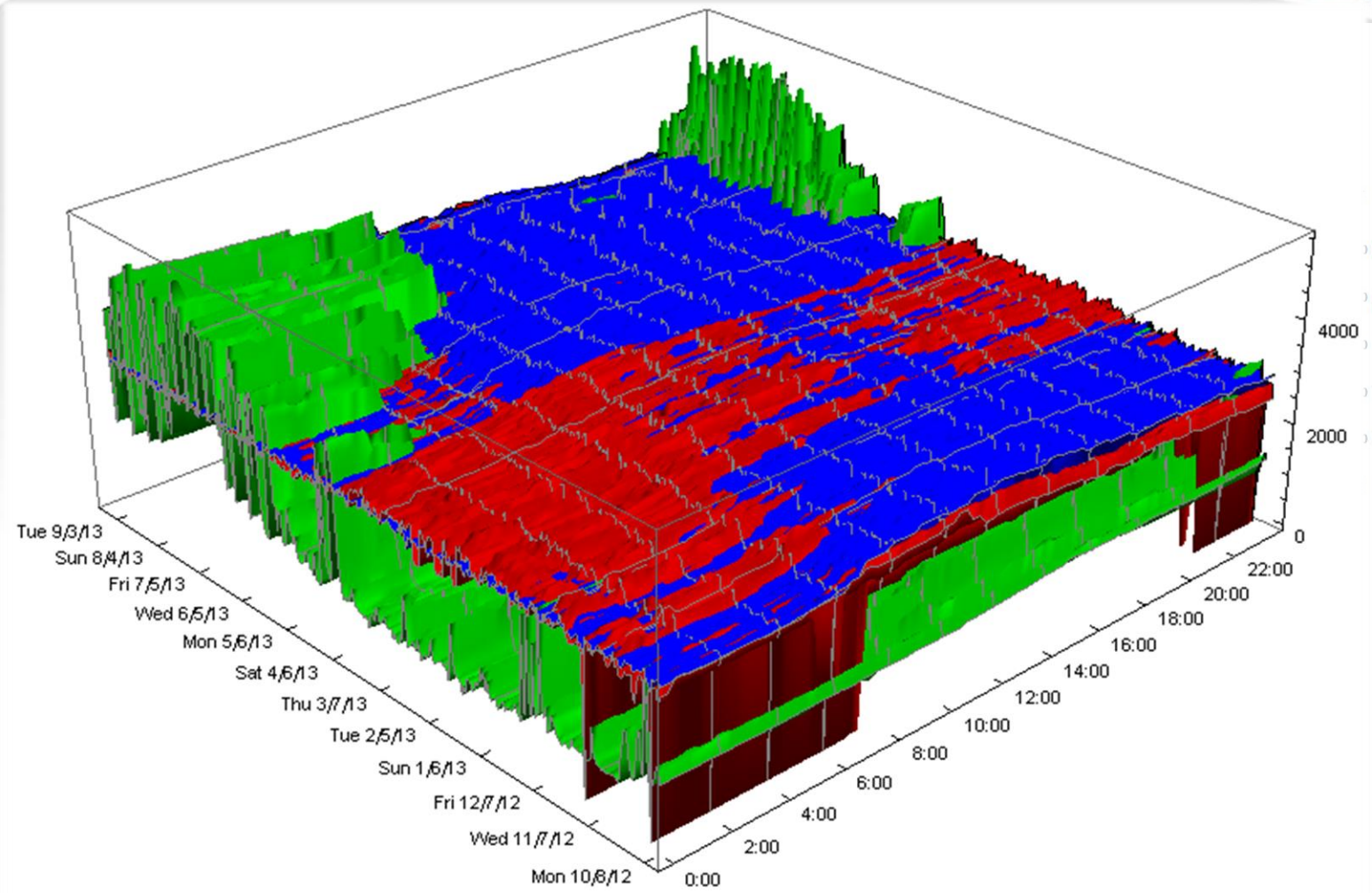
Use what is there… Obtain additional…



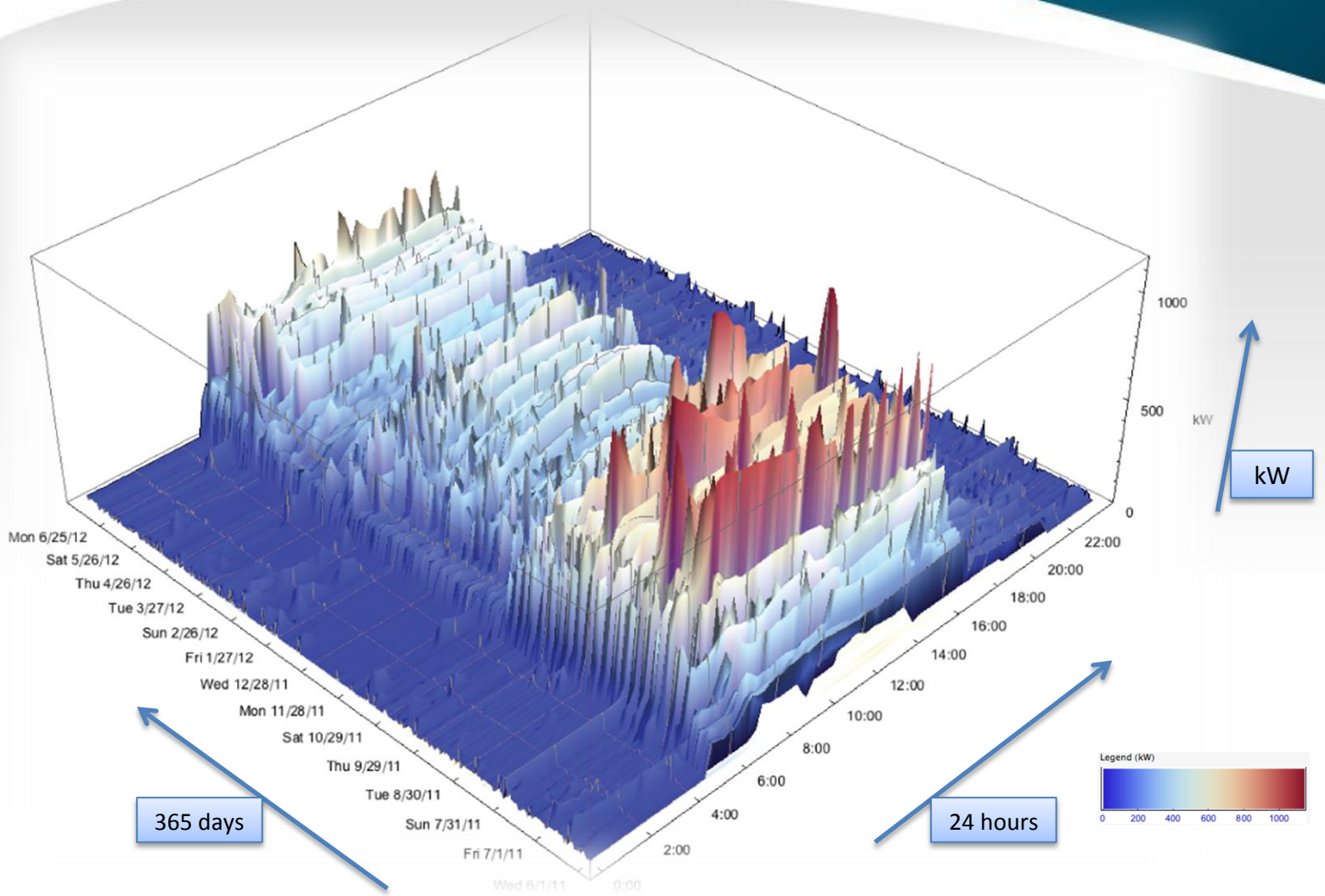
Need Date, Time, (value), (units)

High interval data exists for many commercial and industrial customers, and costs little or nothing to obtain

The Difference Data Makes



3D View – Total Building Performance



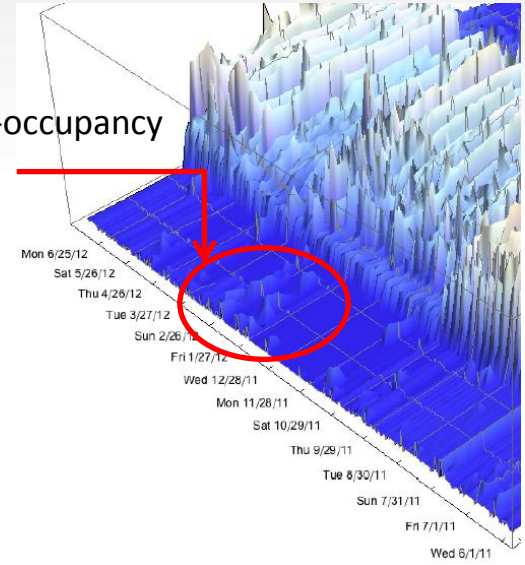
Scheduling View – Top Down

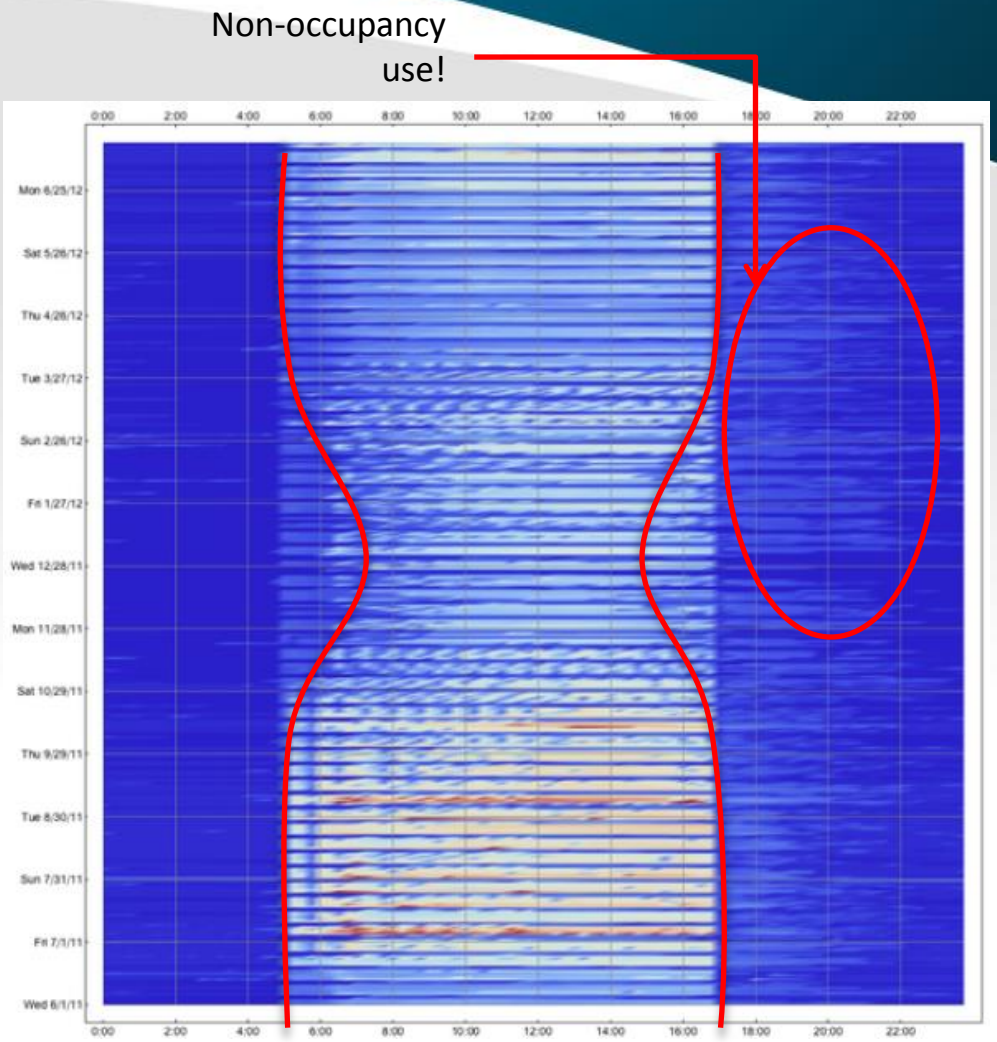
Good Performance

- Consistent start-stop
- Shuts down – deep blue

Not Optimized

- Expect hour glass shape
- Late hours shown on right





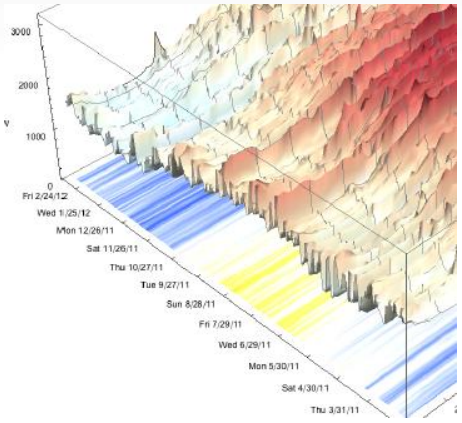
Poor Performance: Start-Stop

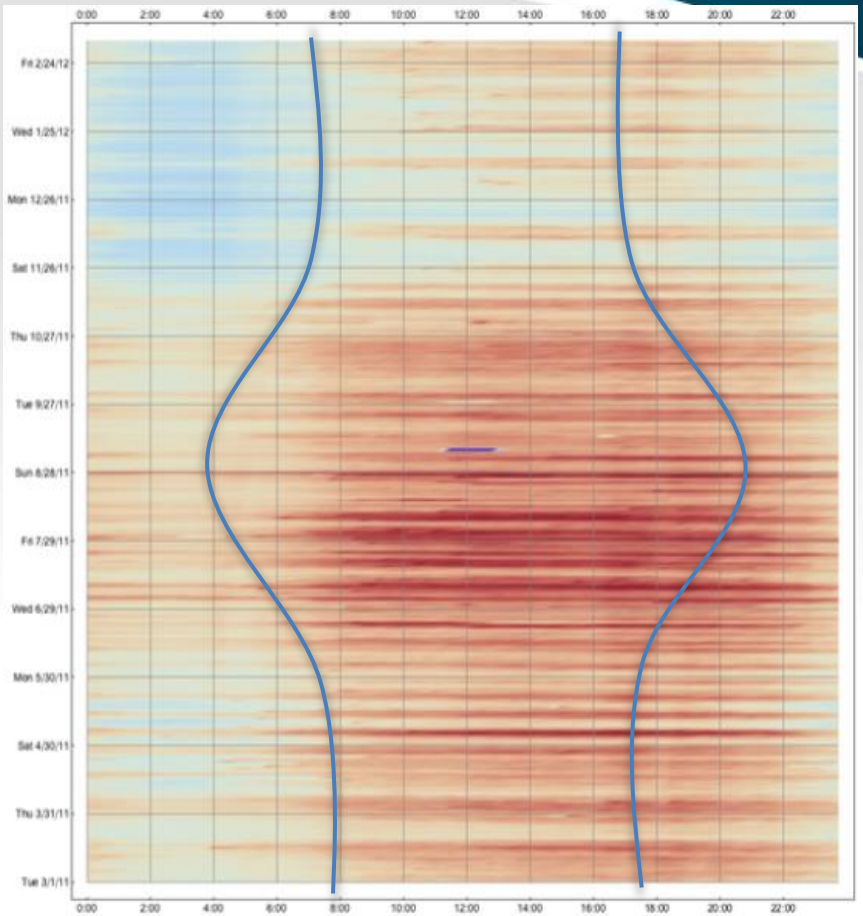
Poor Performance

- No consistent pattern
- Poor shutdown

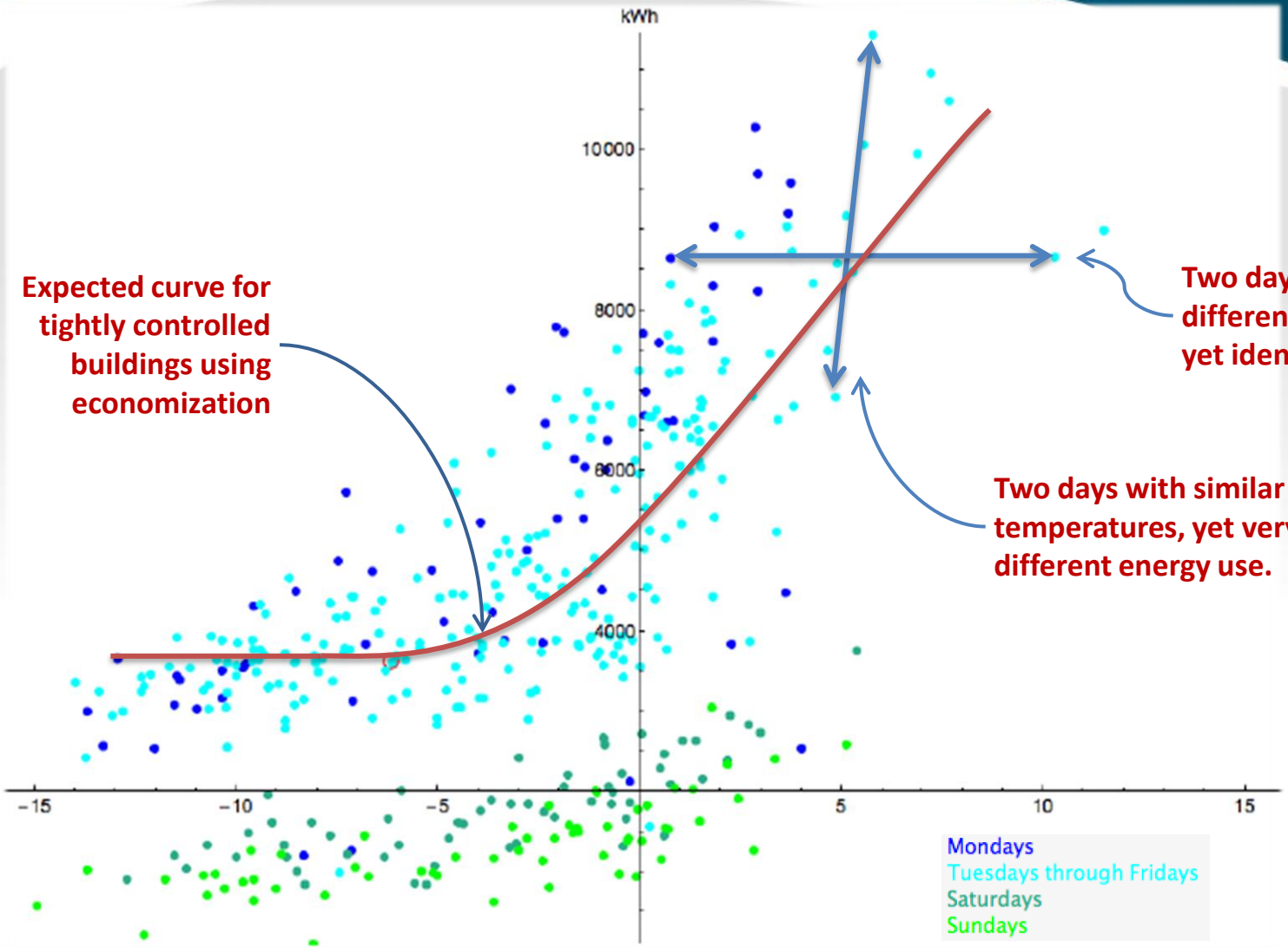
Partially Optimized

- Some hourglass shape
- Late hours shown on right
- Lack of consistency





Energy Use (kWh) vs. Temperature

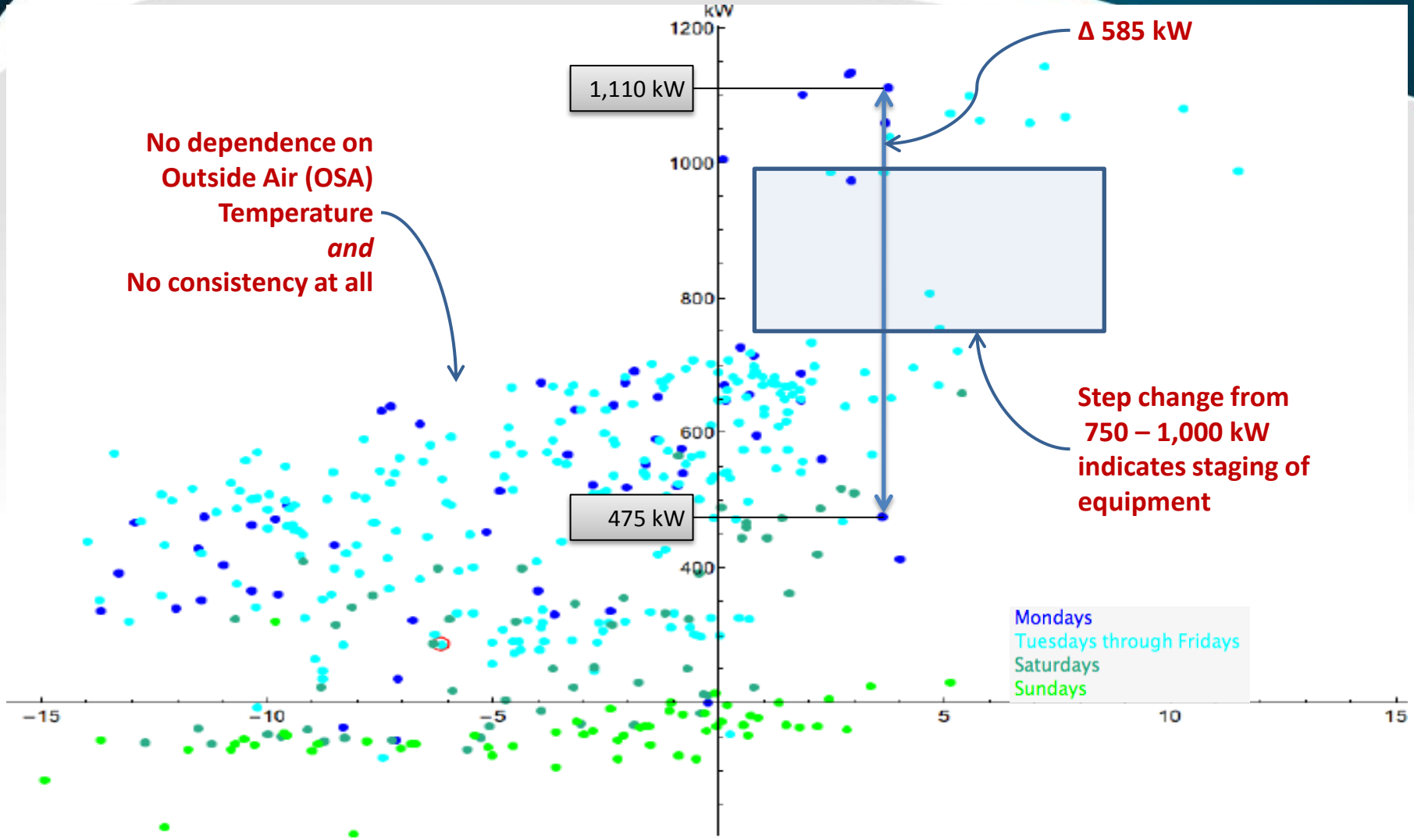


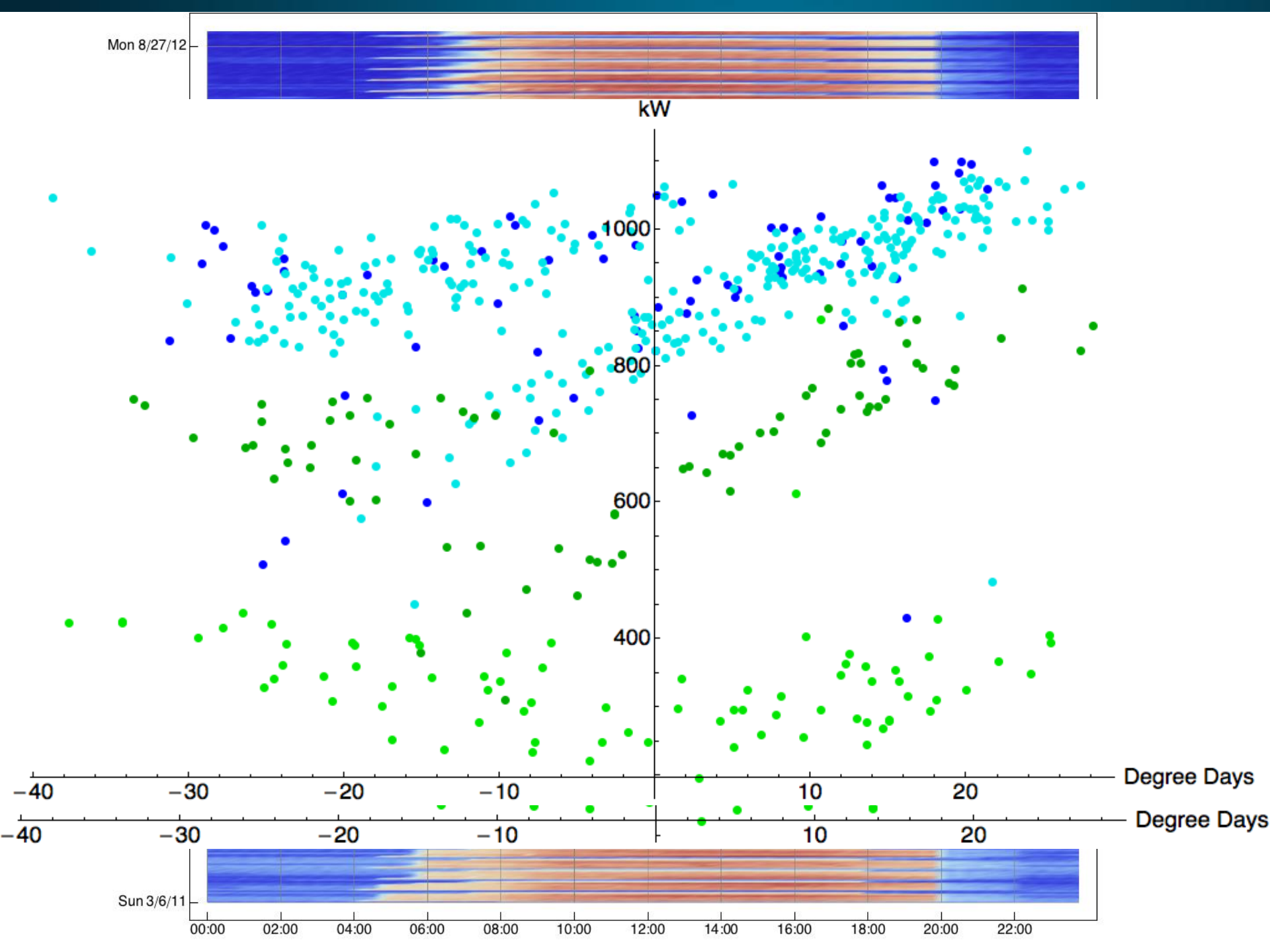
Expected curve for tightly controlled buildings using economization

Two days with very different temperatures, yet identical energy use.

Two days with similar temperatures, yet very different energy use.

Daily Demand (kW) vs Temperature




Mon 8/27/12
kW
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−30
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10
20
Degree Days
Degree Days
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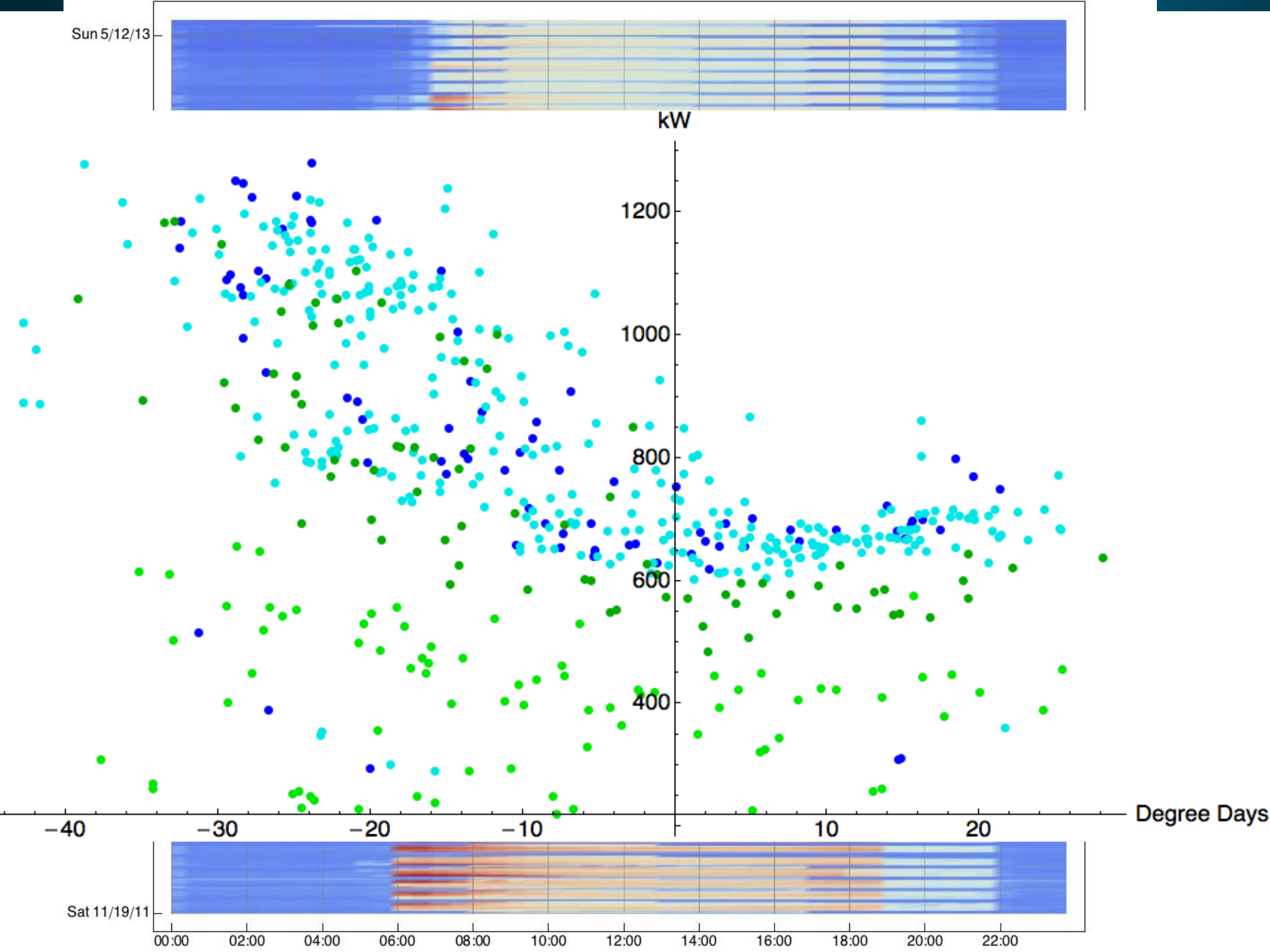
Sun 5/12/13
kW
1200
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Degree Days
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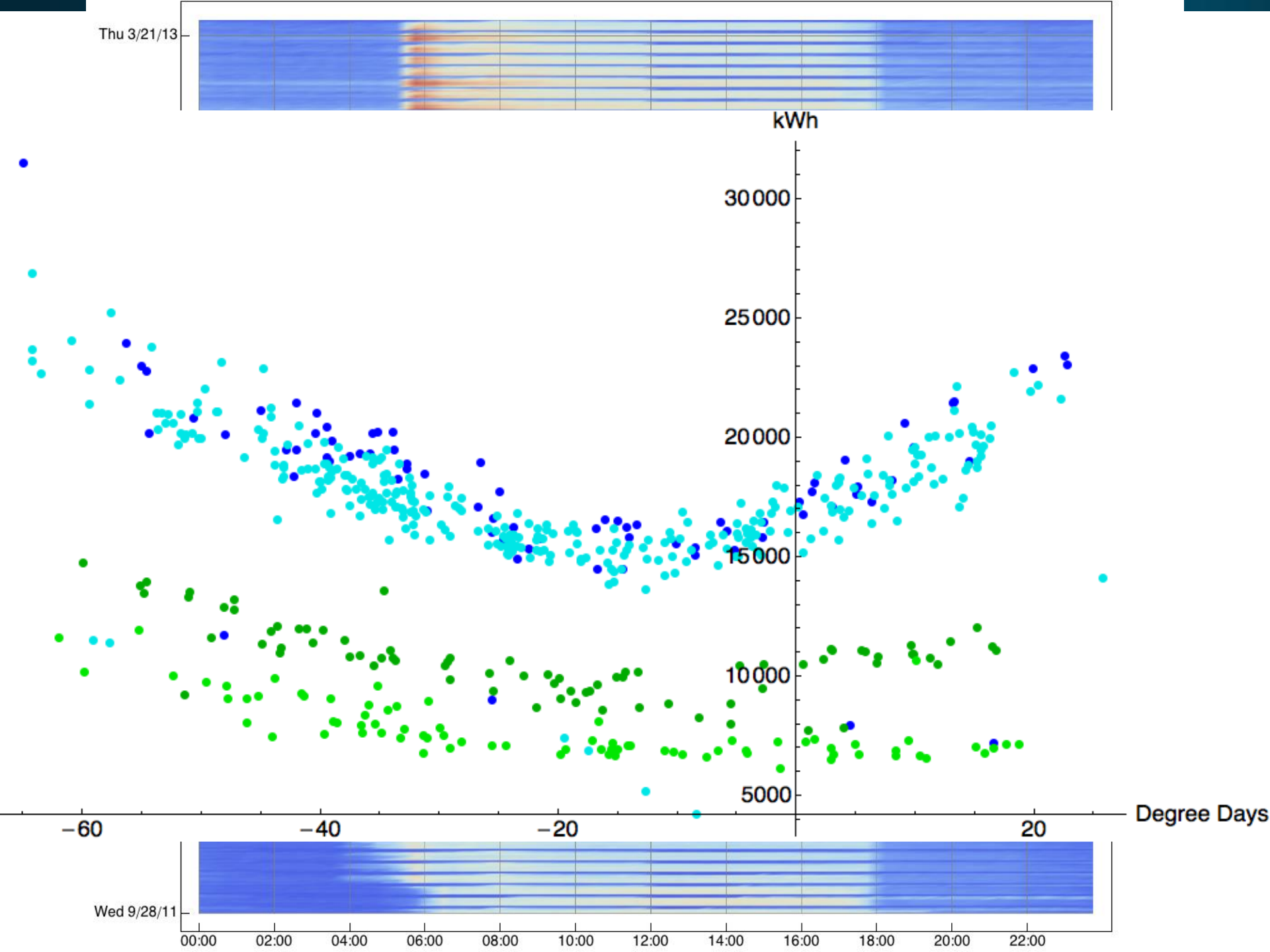
Thu 3/21/13
kWh
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Degree Days
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Wrap Up

- What is next?
  - Data
  - Information
  - Actionable recommendation

- Questions?