Tackling energy challenges through Energy Efficiency Solutions

Cihan KARAMIK
Energy Efficiency Manager

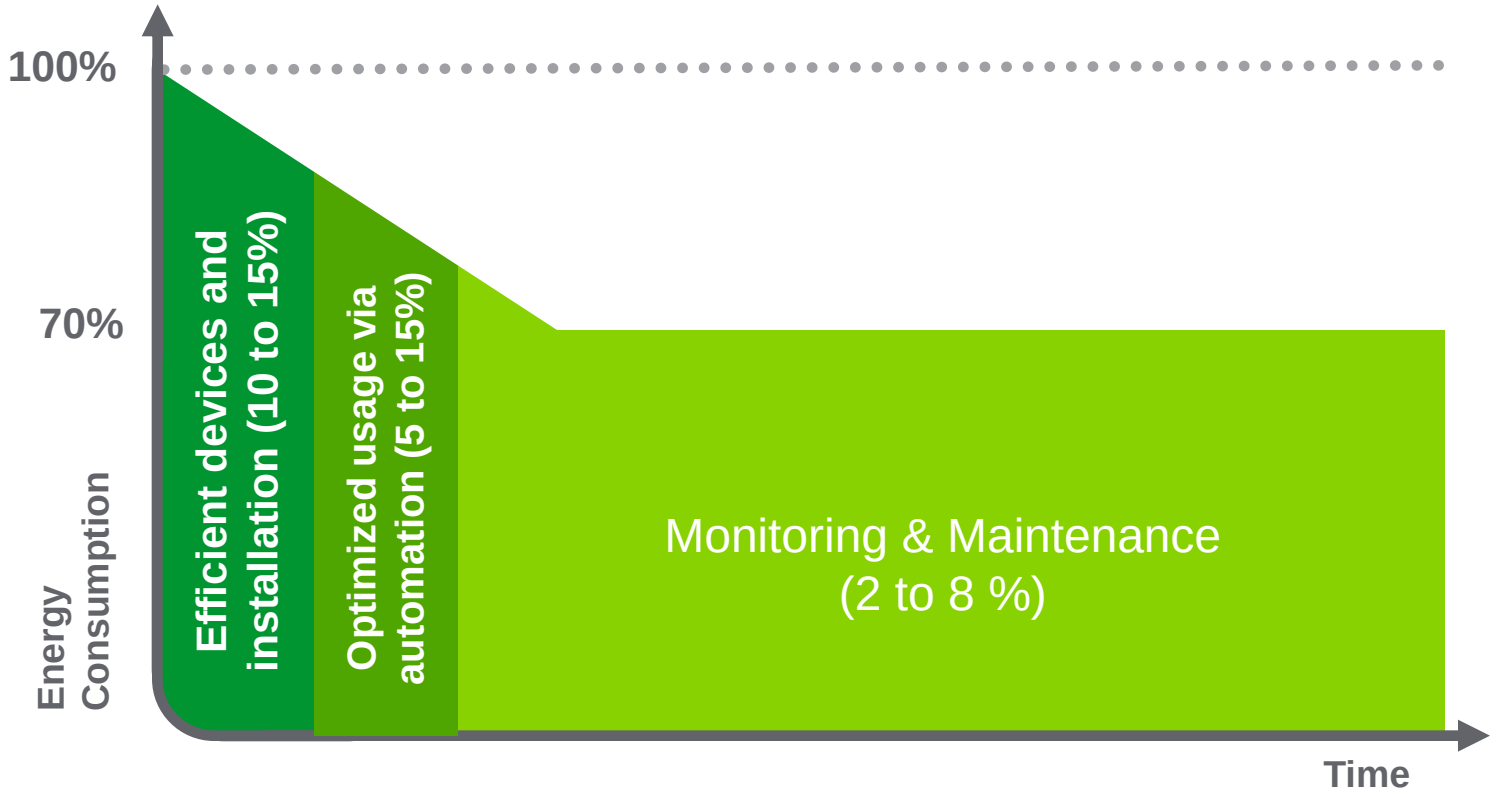
Jan 2013

Schneider Electric

30% Savings are available today…

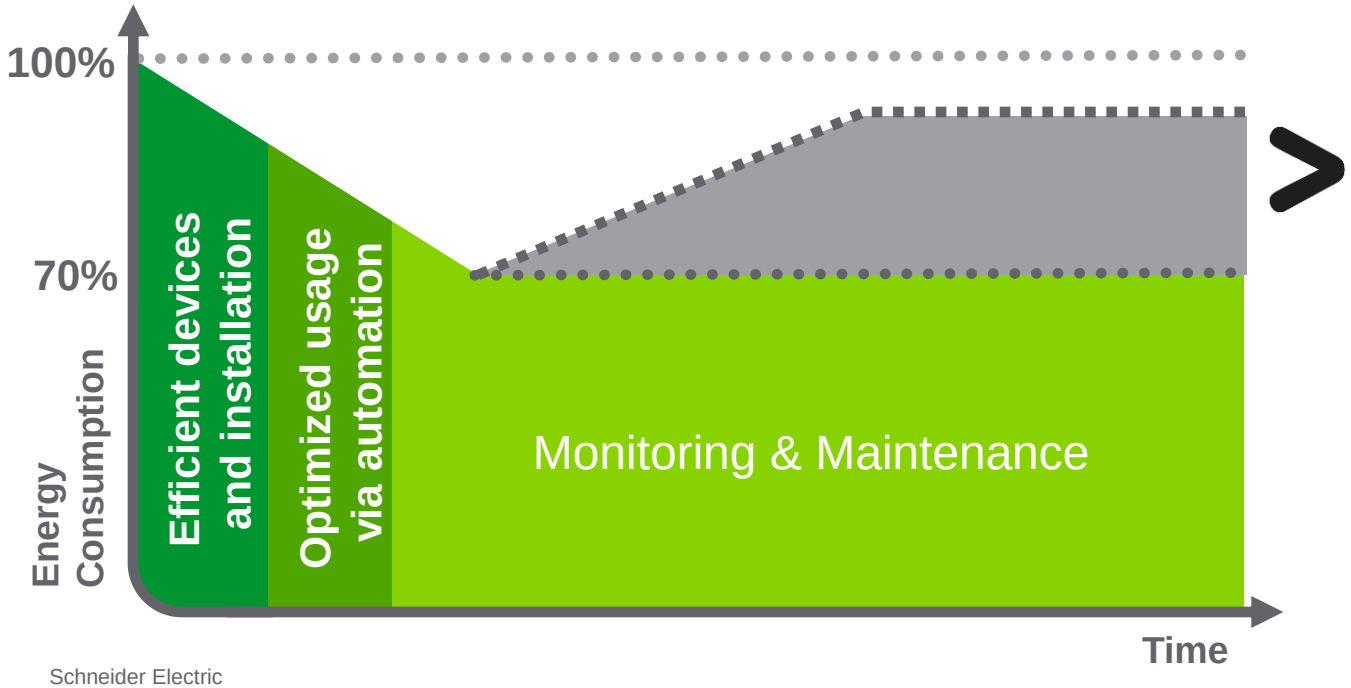
30% savings are available today…

… thanks to a combination of



… but savings can be lost quickly…

- Unplanned, unmanaged shutdowns of equipment and processes
- Lack of automation and regulation (motors, heating)
- No continuity of behaviours



Up to 8% per year is lost without monitoring and maintenance program

Up to 12% per year is lost without regulation and control systems

Sustaining Energy savings is easy, just follow the 4 Energy Efficiency steps

1 Measure

2 Fix the basics

3 Automate

4 Monitor and Improve

Sustaining Energy savings is easy, just follow the 4 Energy Efficiency steps

>1 Measure

- Energy meters
- Power quality meters

2 Fix the basics

3 Automate

4 Monitor and Improve

Sustaining Energy savings is easy, just follow the 4 Energy Efficiency steps

1 Measure

> 2 Fix the basics

- Low consumption devices
- Insulation material
- Power quality
- Power reliability

3 Automate

4 Monitor and Improve

Sustaining Energy savings is easy, just follow the 4 Energy Efficiency steps

1 Measure

2 Fix the basics

>3 Automate

- Building Management Systems
- Lighting Control Systems
- Motor control systems
- Home control systems
- Variable speed drive

4 Monitor and Improve

Sustaining Energy savings is easy, just follow the 4 Energy Efficiency steps

1 Measure

2 Fix the basics

3 Automate

>4 Monitor and Improve

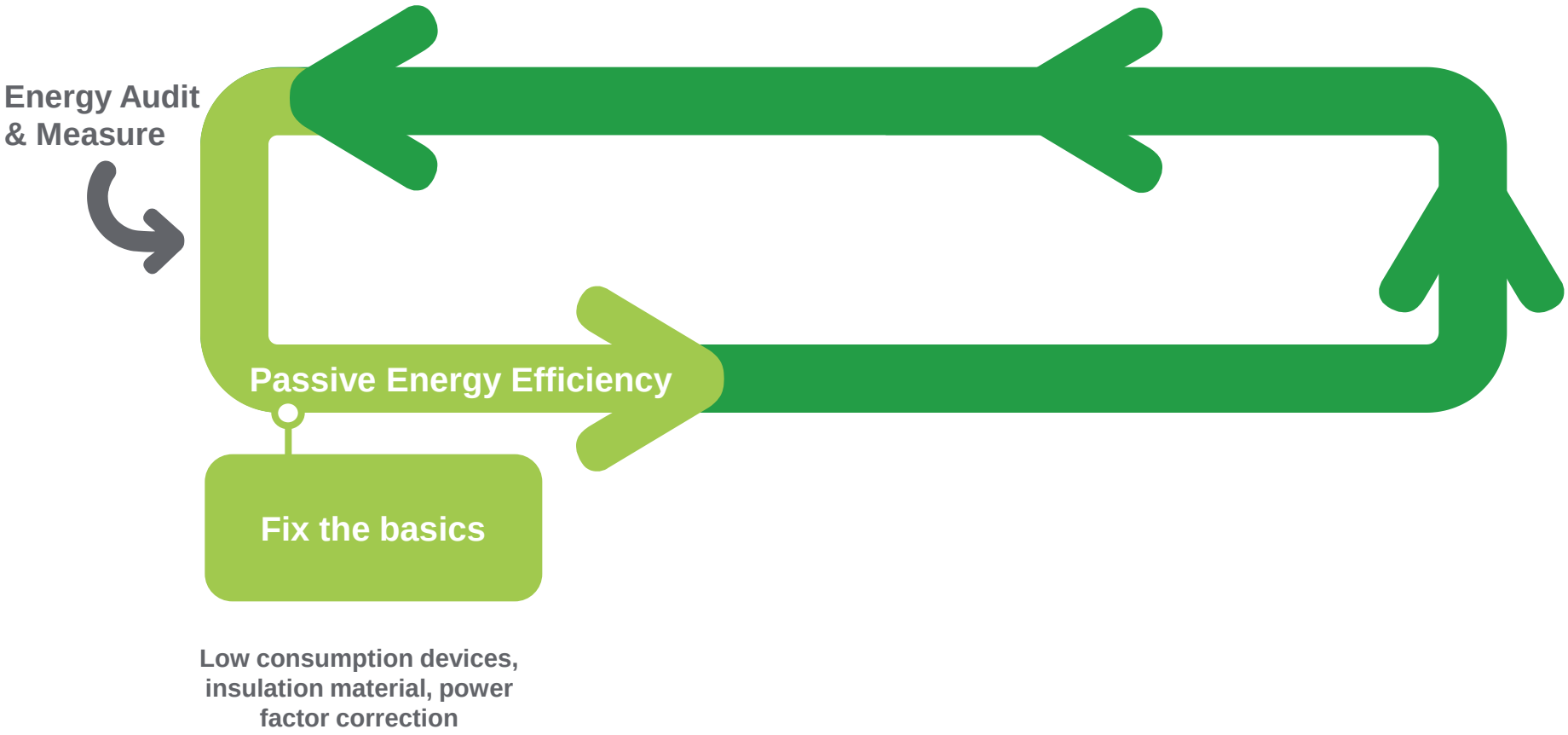
- Energy management software
- Remote monitoring systems

Lifecycle solutions for Energy Efficiency

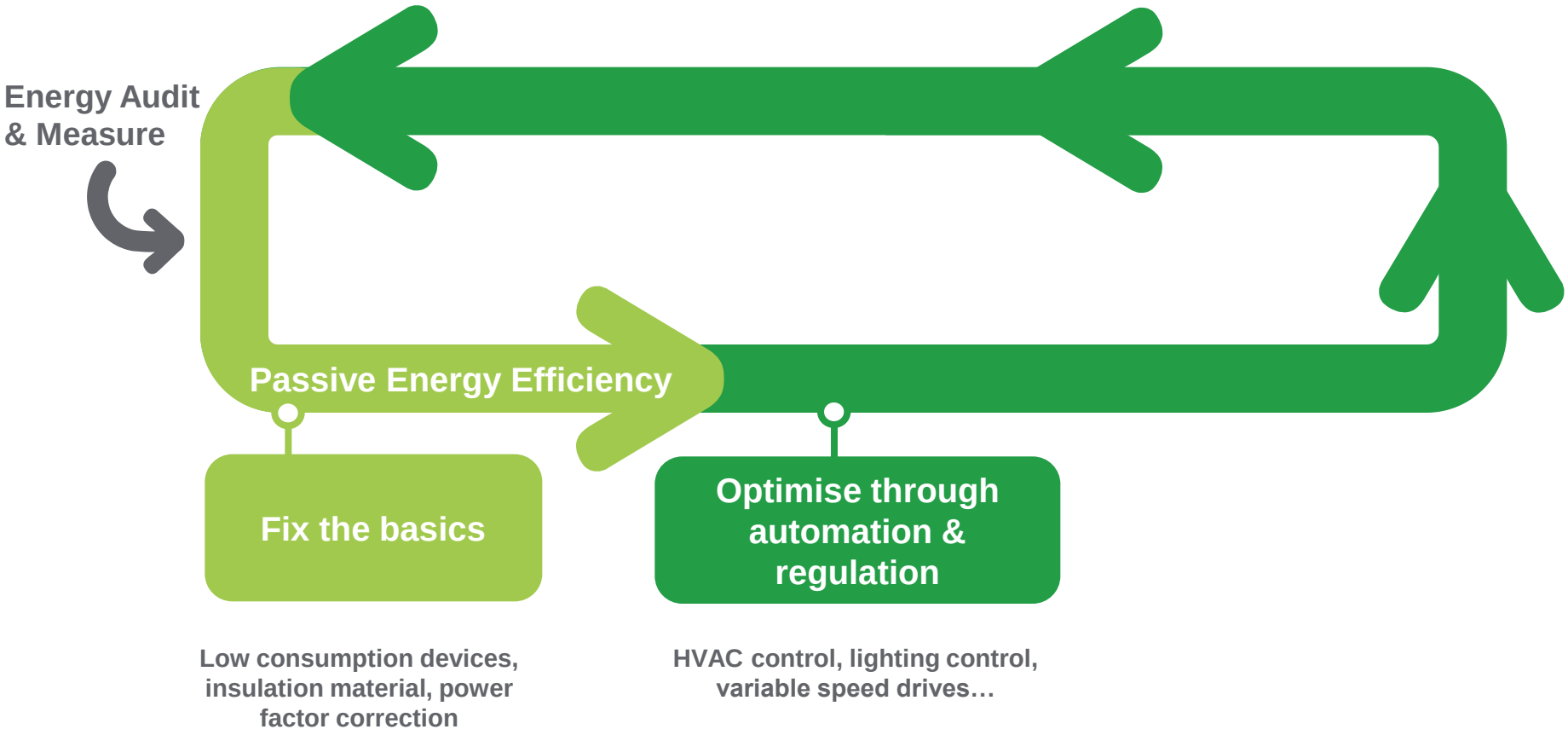
Lifecycle solutions for Energy Efficiency

Energy Audit
& Measure

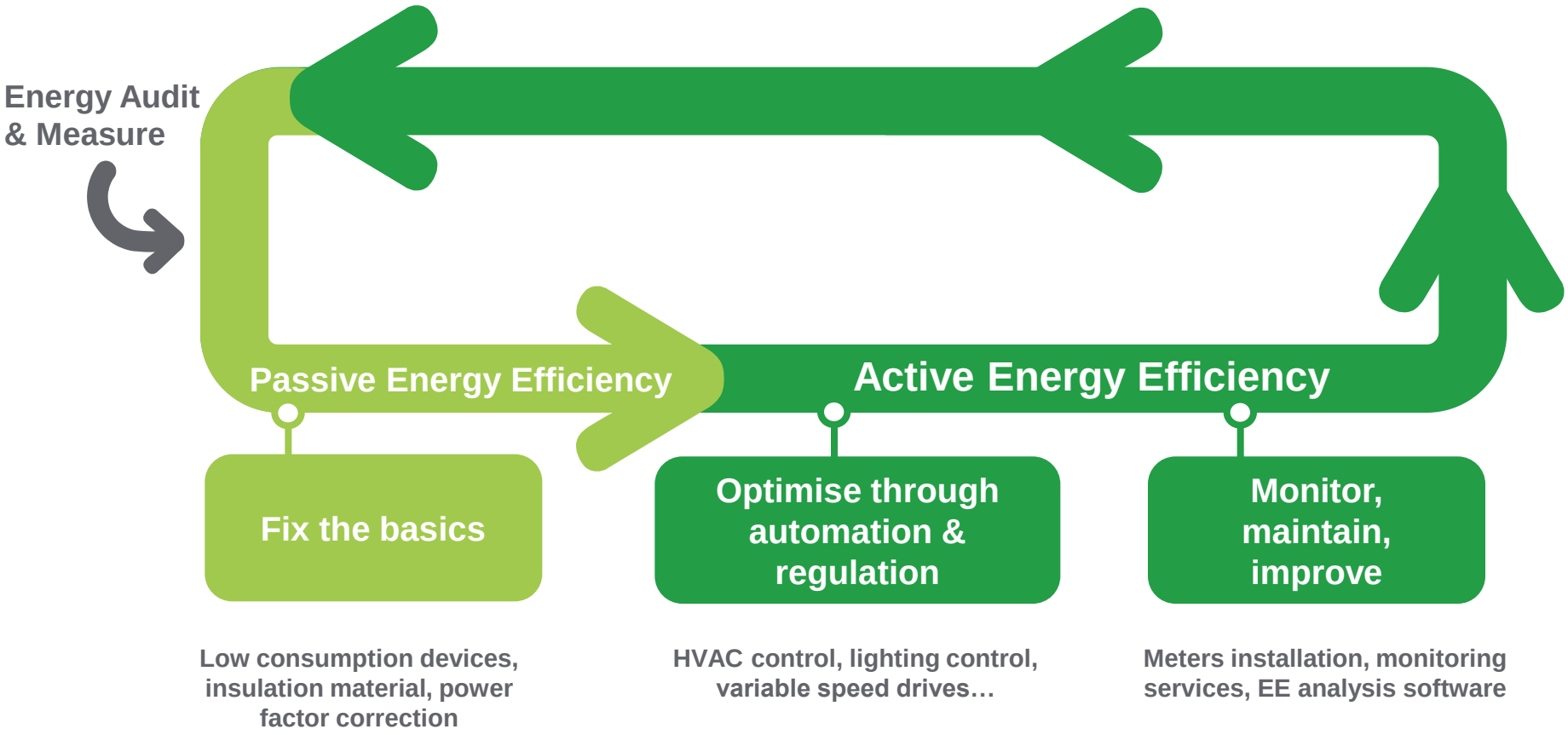
Lifecycle solutions for Energy Efficiency



Lifecycle solutions for Energy Efficiency



Lifecycle solutions for Energy Efficiency



Schneider Electric is involved in

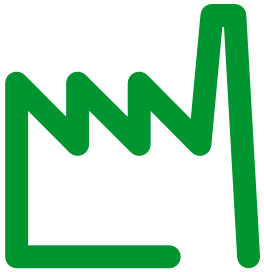
72% of end user energy consumption

We can help you make savings!

Where are the savings ?

Industry & infrastructure

Average facility can reduce consumption by 10 to 20%



- 25% savings would save 7% of the world's electricity
- Motors, account for over 60% of electricity usage

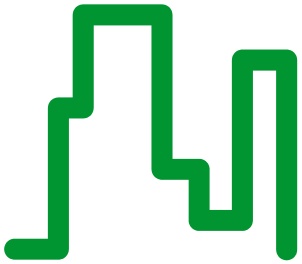
Data centres & networks

Power & cooling can reduce power consumption by 20 to 30%

- Power & cooling systems is 50% of electricity usage
- Saving energy improves DC infrastructure efficiency

Buildings

Renovation can yield up to 30% of energy savings



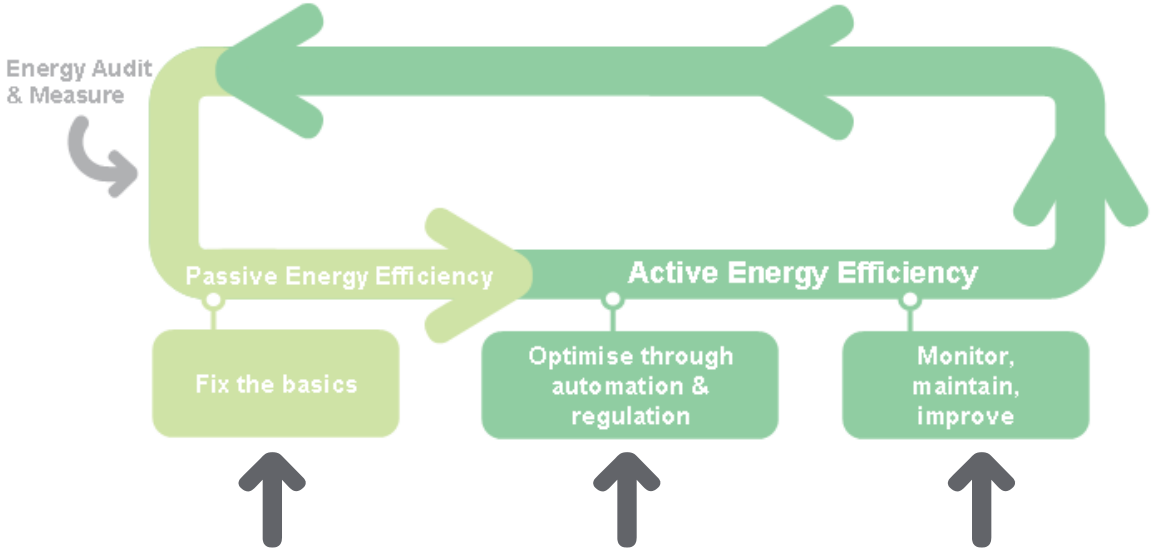
- Consume 20% of total energy
- 3 key areas: HVAC, lighting & integrated building solutions

Residential

EE products may save 10% to 40% in electricity

- 20% to 25 % of consumed energy (EU & US)
- Lighting & appliances over 40%

We contribute through our solutions !



- Energy Audits
- Consulting services

- Building Management Solutions
- Power management solutions
- Motor control solutions
- Lighting control solutions
- Home control solutions
- Monitoring services

A Day in the Life of an Energy Manager

A Walkthrough of a Typical EEM User Experience in managing abnormal energy use.

Schneider Electric

The Facility

- Schneider Electric has a site in Victoria, BC Canada:
  - Keating Cross Road Building
    - Includes a production floor for meters
  - Rajpur Building – software development
  - Bertram Building – front and back office functions

- Schneider Electric has a corporate wide initiative to reduce energy usage
  - Site energy champion appointed at the Victoria site
  - Monitoring & auditing tools implemented (i.e. meters & software)
  - Technical resource assigned to assist the energy champion

Step 1

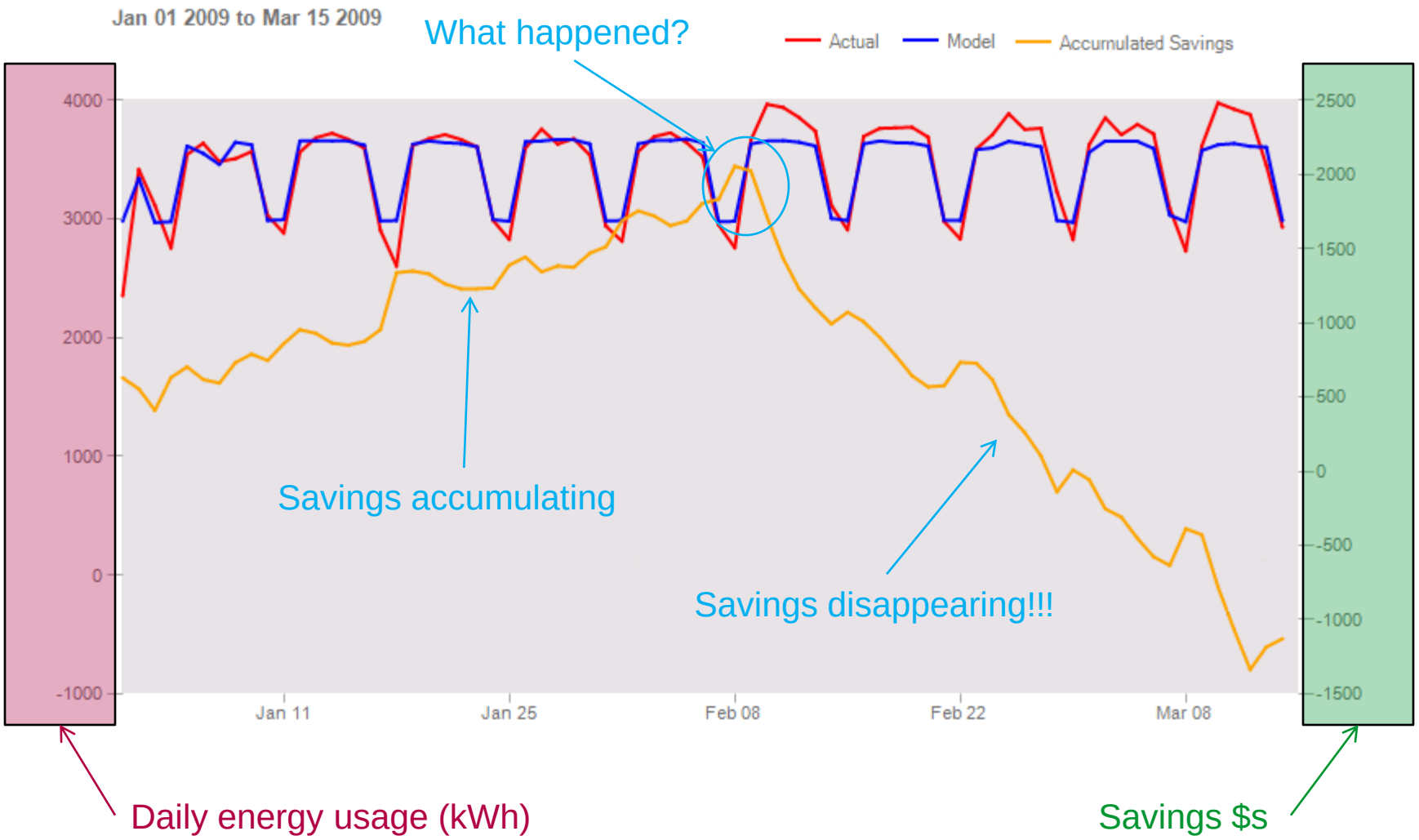
Sitting in your chair, squinting at your computer monitor…..

Congratulations!

You’re responsible for an energy savings program!

- The Keating building, which houses meter production, has been slowly increasing its energy efficiency and is currently saving money on electricity when compared against last year’s baseline consumption.
- Although it’s recognized that the HVAC system as a whole is poorly designed and inefficient, we’re charged with finding ways to save money without requiring major CAPEX projects.
- We’ll go look for smaller savings opportunities that will add up over time.

Keating Building Energy Performance



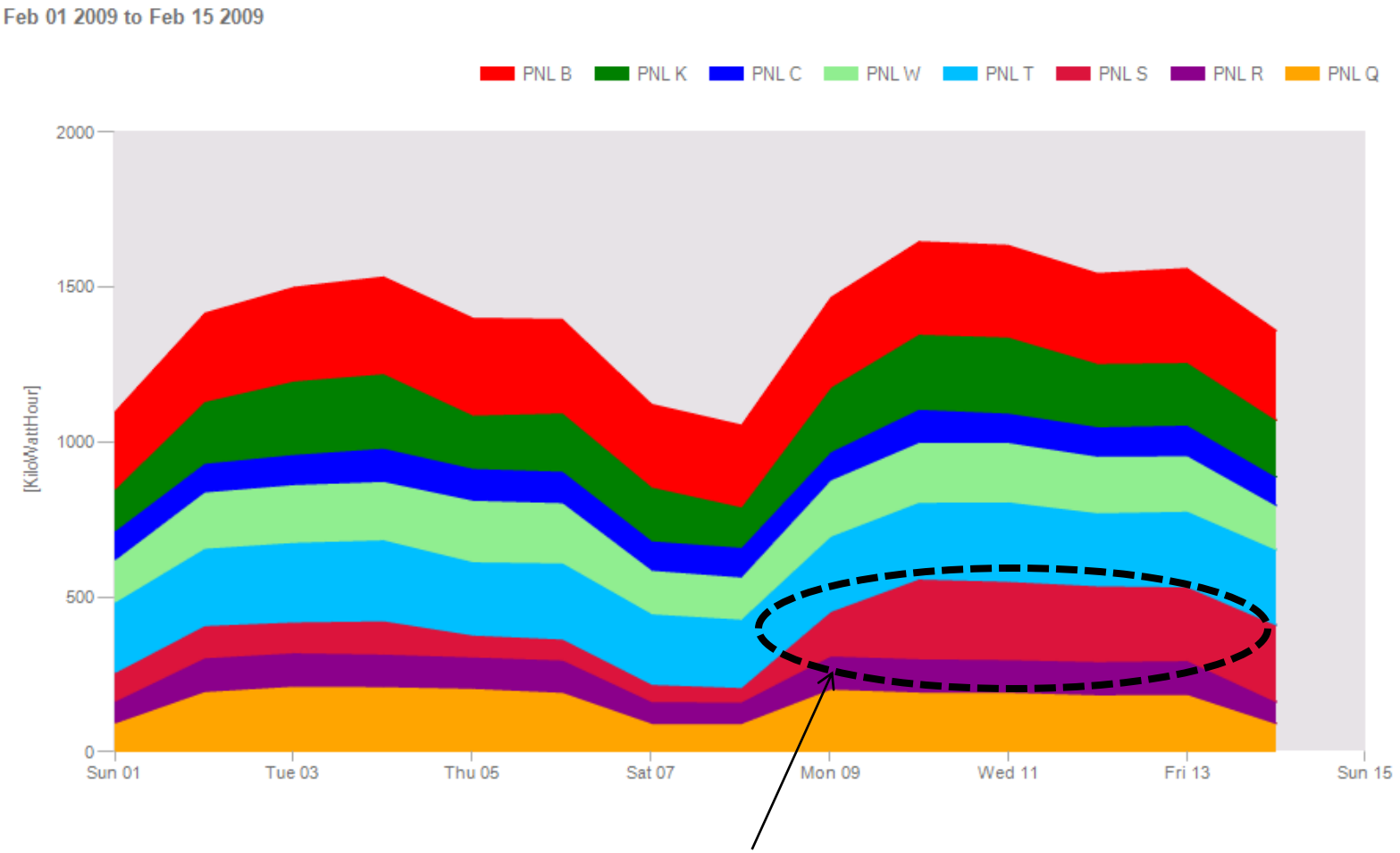
Starting the investigation…

1. When did our energy usage pattern change?
2. Where did the change occur?
3. How much was the change?
4. Why did our savings disappear?

Analyzing the data…

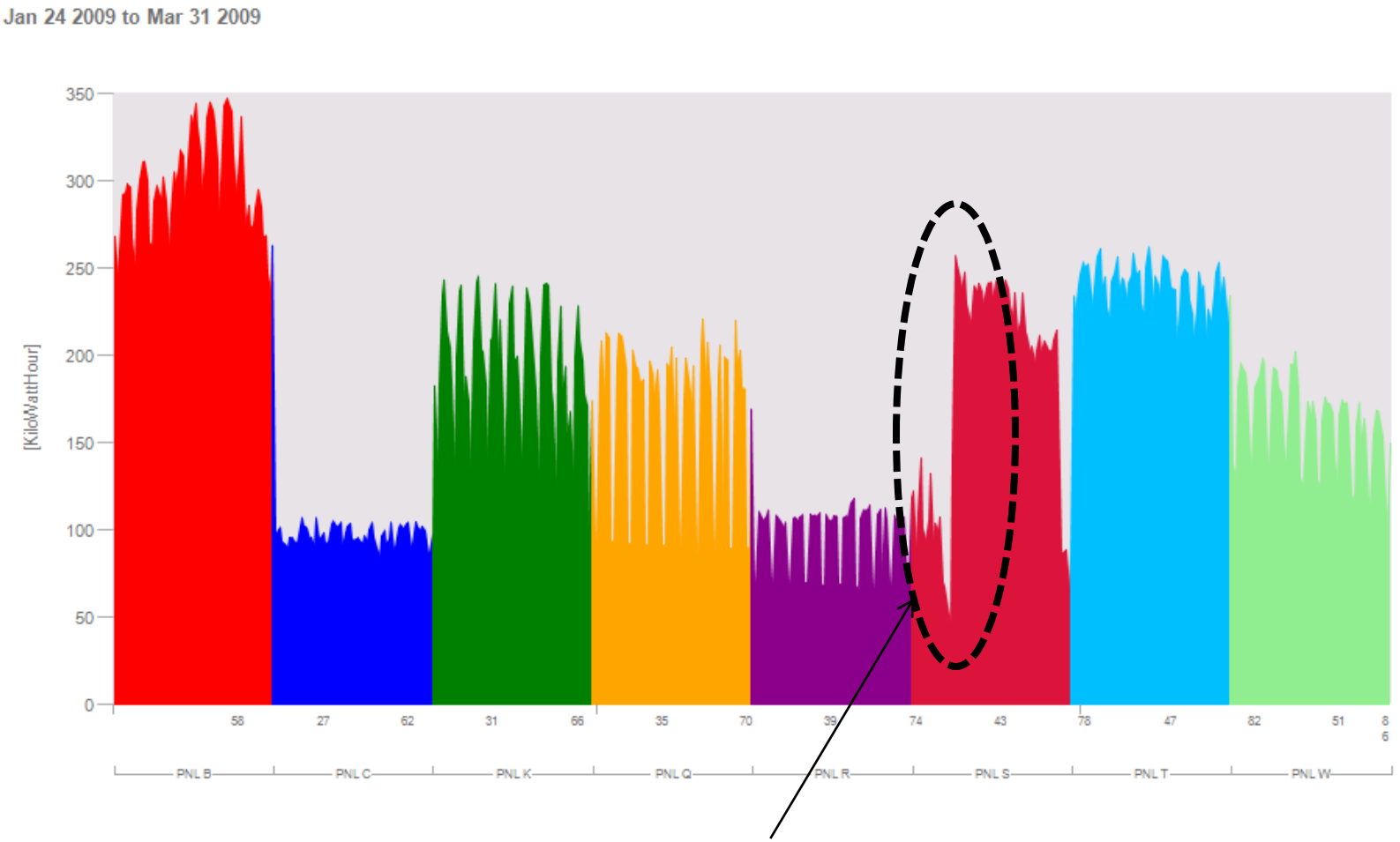
1. There are dozens of loads in the overall total
2. In an ideal world, you'd be able to model consumption at the sub meter level, but…
   - we have a model for the total Keating Building
   - we have a model for Production
3. Production showed a sharp increase in energy usage on Feb 9, 2009:
   - Production is a big department, can we narrow it down?
   - There are eight panels feeding the production floor, each with a meter, let's take a look…

Analyzing the data…



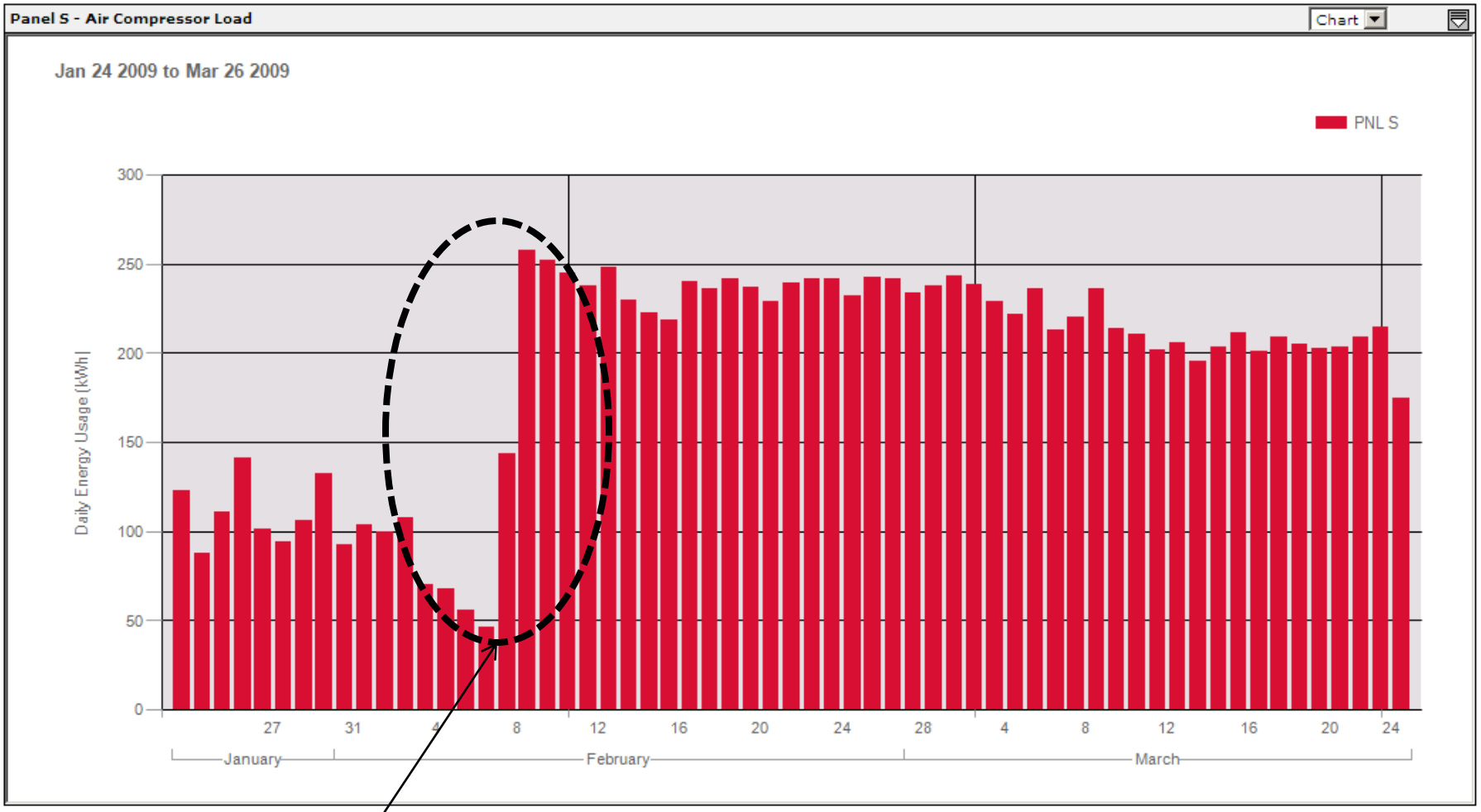
Consumption increased on PNL S starting Feb 9…

Analyzing the data…



An alternative view showing the same change in PNL S

Analyzing the data…



PNL S energy usage

The end of Step 1…

What we know so far:

1. There was a change in our historic energy usage patterns
2. When the change occurred (Feb 9, 2009)
3. Where the change occurred (Panel S in Production)
4. How large the change was (~ double)

What we don't know:

1. What specific load(s) are causing the new energy usage pattern
2. Why this change occurred

This is as far as you can get sitting squinting at your computer screen…

Step 2

Stop squinting at your monitor and do some field work…

Schneider Electric

On the trail…

1. Talk to the right person/people (ex: Facilities Manager) and find Panel S:
   - What loads are on that panel?
   - What equipment changes might have occurred?
   - Is the Production Floor running differently?
   - What is the maintenance history of the equipment on Panel S?
2. Dave Clark is the Facilities Manager for the Schneider Victoria Buildings

   "Of course the power consumption went up on Feb 9. Let me tell you the story…"

Getting the details…

1. We purchased a large screw-type Kaeser compressor to take over from our aging reciprocating Ingersoll Rand compressors.
   - More efficient because of a Variable Speed Drive (VSD)

2. Around the same time…
   - Compliance with the new Restriction of Hazardous Substances Directive (RoHS) from the EU.
   - Some air powered, lead fume handling equipment was no longer needed.
   - Overall Production demand for compressed air was reduced and this left the new Kaeser compressor lightly loaded.

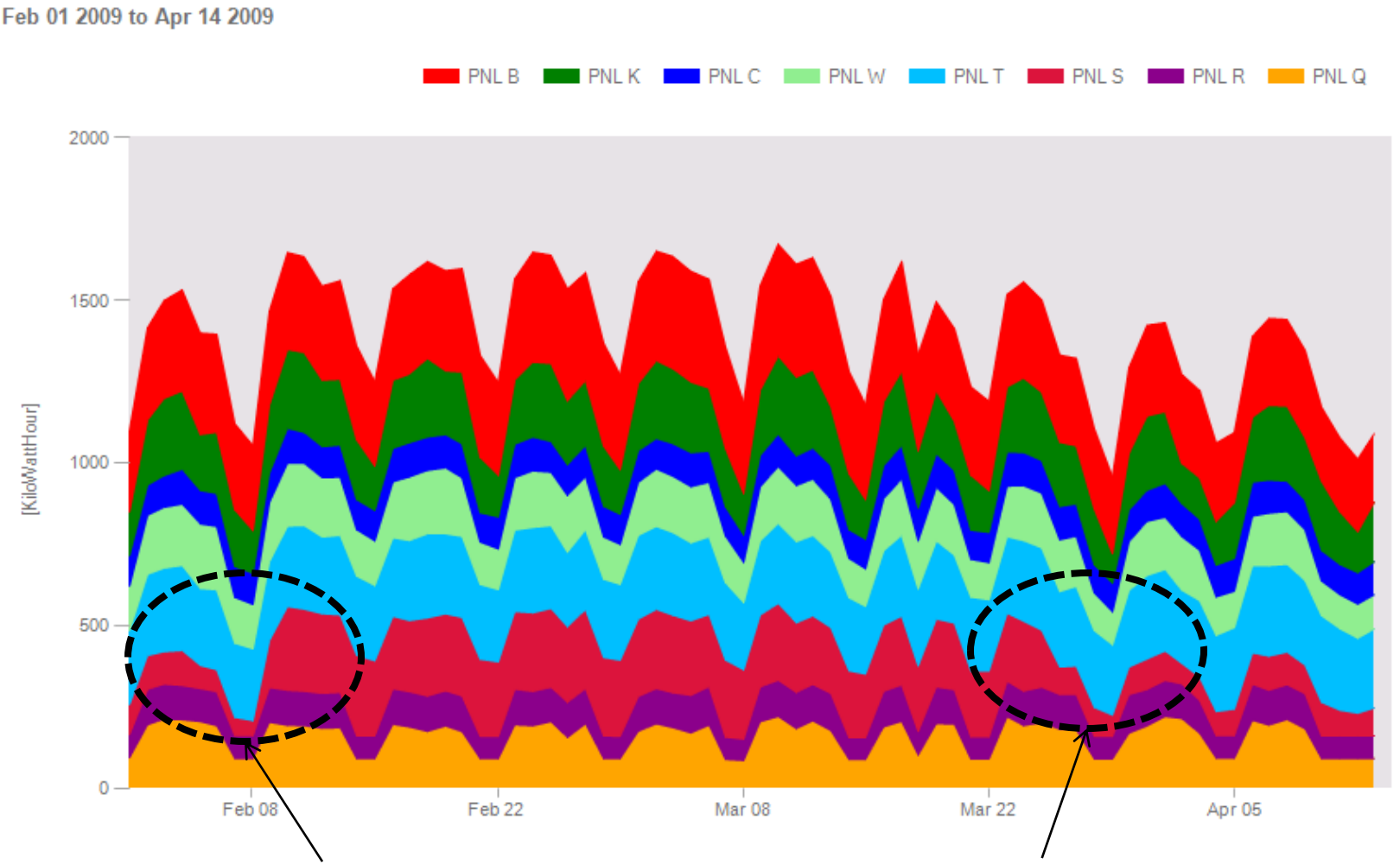
Getting the details…

1. The lightly loaded compressor revealed a firmware bug!
   - The lightly loaded compressor often reported a spurious fault and shut itself off.
   - Production was negatively impacted.
   - The Engineers at Kaeser are “working on” a fix.
2. “Temporary” workaround?
   - Increase load on the compressor, but how?
   - Open a bleed valve a tiny bit with a muffler on it to create a deliberate air leak!
3. Mystery solved? Not exactly…
   - All of this happened in 2008, and the recorded energy consumption on PNL S, prior to the spike on Feb 9 2009, was with the bleed valve partly open.

Solving the case…

1. What happened on Feb 9 2009?
    - Large compressors of this type require routine maintenance to keep them dependable.
    - Our compressor was shut off for maintenance on the weekend of Feb 7th and 8th.
    - The service technician, knowing of our problem and workaround, re-opened the bleed valve after he'd finished servicing the big compressor, but the bleed valve was opened too far!
2. After Dave had finished the story he went over to the compressor and tapped the handle on the bleed valve, problem solved.

Solving the case…



In Summary

1. The troubleshooting process:
    1. Model energy consumption,
    2. Monitor for systemic deviation (i.e. actual vs expected),
    3. Review the data,
    4. Talk to the right people,
    5. If possible, implement a fix.
2. A small, low effort fix yielded savings of thousands of dollars per year
3. Savings are maximized by the aggregation of many small savings. Don't dismiss the small improvements.

"Some things you can fix, some you can't, but without energy management,
you wouldn't even know to look"

Make the most of your energy