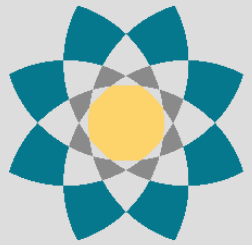


SIERRA CLUB: EFFICIENCY FIRST

PAUL SPIEGEL, PE, LEED AP

OCTOBER 6, 2020



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PRACTICAL ENERGY SOLUTIONS

A Division of Spotts, Stevens and McCoy

practicalenergy.net | ssmgroup.com

WHO WE ARE



What we do best is what you don't.



Who We Are

We are a family-owned, full-service **engineering**, **environmental**, and **surveying** firm.

We're based in Reading, Pa with satellite offices in Lehigh Valley, Lancaster and West Chester.

We use **innovative** and **integrated** approaches to solving problems that **leave the world a better place.**



Our Expertise

Energy and Sustainability Services

Facility Engineering: Structural; Mechanical; Electrical

Civil Engineering: Survey and Data Capture; Land Development; Municipal

Environmental Engineering: Water Resources; Water and Wastewater



Markets We Serve

Commercial Industry
Government
Healthcare
Education

We provide expertise to regional and national companies in the manufacturing, processing, and technology sectors as well as municipalities and utilities.



EXPERIENCE

Energy and Sustainability Services

- Energy audits/assessments/benchmarking
- Energy modeling/building energy simulations
- Energy strategic and master planning
- Financial and technical evaluation of capital projects
- Building operational review and conservation strategies
- Stakeholder Engagement Programs
- Incentive and grant project support & implementation
- Added full mechanical, electrical, civil, structural, wastewater engineering, along with surveying and GIS, from SSM
- Energy Procurement Support
- Feasibility and Design Services for Renewable Energy

ENERGY CONSULTING CLIENTS

Municipal

- City of Philadelphia
- Chester County
- Borough of West Chester
- Media Borough
- Delaware County
- Tredyffrin Township
- City of Coatesville
- Newtown Township
- Plymouth Township
- Radnor Township
- Whitemarsh Township
- Springfield Township
- West Whiteland Township
- City of Lewes

STRATEGIC FOCUS AREAS

INFRASTRUCTURE
To support and sustain the mission of the Lewes BPW, support economic development, increase customer satisfaction, and withstand potential impacts of extreme weather events and sea level rise, Lewes BPW will build and maintain reliable infrastructure.

ENGAGEMENT
We will foster customer, partner and community relationships.

ADMINISTRATIVE OPERATIONS
To support the mission of the BPW, we must maintain operational excellence.

GROWTH
Lewes BPW will support the economic growth of the community.

ENVIRONMENTAL STEWARDSHIP
Recognizing the City of Lewes as a green community, Lewes BPW will proactively take measures to reduce pollutants and to increase use of renewable energy sources.

STRATEGIC PLAN
Ten-Year Outlook | 2019

Lewes BPW
Electric, Water, and Sewer Utility

Lewes Board of Public Works
107 Franklin Avenue
Lewes, Delaware 19966

ENERGY CONSULTING CLIENTS

Institutional

- West Chester Area School District
- Garnet Valley School District
- Westtown School
- Downingtown Area School District
- The Hill School
- Lower Merion School District
- Upper Merion Area School District
- School District of Philadelphia
- William Penn Charter School
- Norristown Area School District
- DE Pathways to Green Schools
- Pottsgrove School District
- Delaware Valley Christian School
- Masonic Village of Elizabethtown

ENERGY CONSULTING CLIENTS

Commercial and Industrial

- PJM Interconnection
- Vertex, Inc.
- Liberty Property Trust
- Bentley Systems
- Sikorsky Helicopter
- Brandywine Realty Trust
- United Technologies Corporation
- QVC
- CTDI
- Goldenberg Group
- Elliott Lewis Corp
- CM3, Inc.
- Aztec Materials
- Delaware Valley Concrete

AGENDA

WHAT WE'LL LEARN TODAY

Agenda

➤ 1

Energy focus
and why it's
important.

➤ 2

Where to
start?

- Energy benchmarking

➤ 3

• Detailed
energy audits

“how do buildings work?”

Operational/performance
evaluations

➤ 4

Energy
Management
Policies

➤ 5

Strategic
planning for
capital upgrades
to meet energy
goals

➤ 6

Non-building
opportunities

➤ 7

Measuring and
evaluating your
progress

➤ 8

What we
learned today



WHAT WE'LL LEARN TODAY

Getting the most of out of this presentation



ENERGY FOCUS AND WHY IT'S IMPORTANT



ENERGY FOCUS AND WHY IT'S IMPORTANT

Why Focus on Energy Efficiency?

- Reduced operating costs
- Environmental & health benefits
- Conserve finite resources
- Reduce risks of price spikes
- Meet long-term commitment to improve – Ready for 100?
- The path to 100% clean energy:
 - Conservation
 - Efficiency
 - Renewables

Crude Oil Price

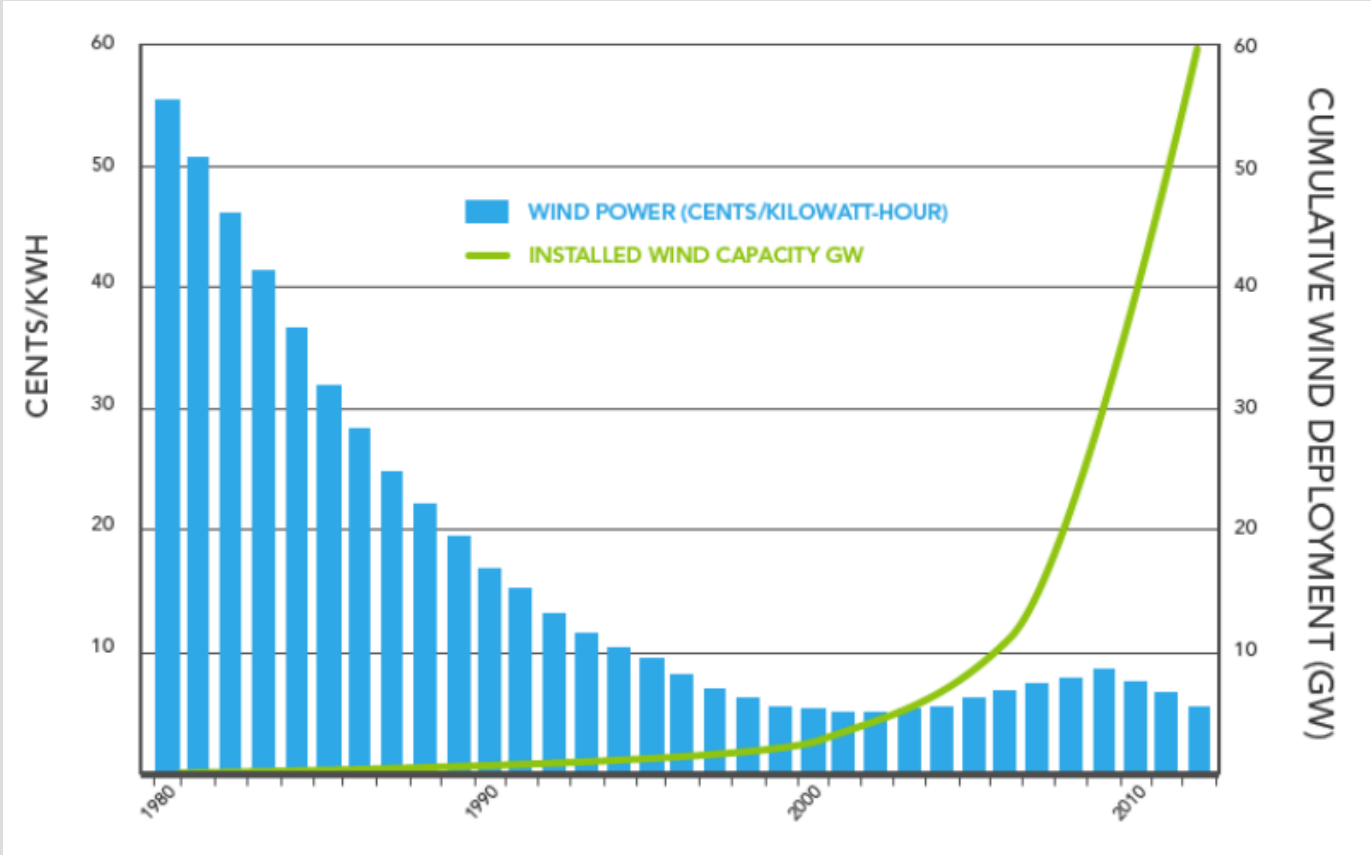


Natural Gas Price

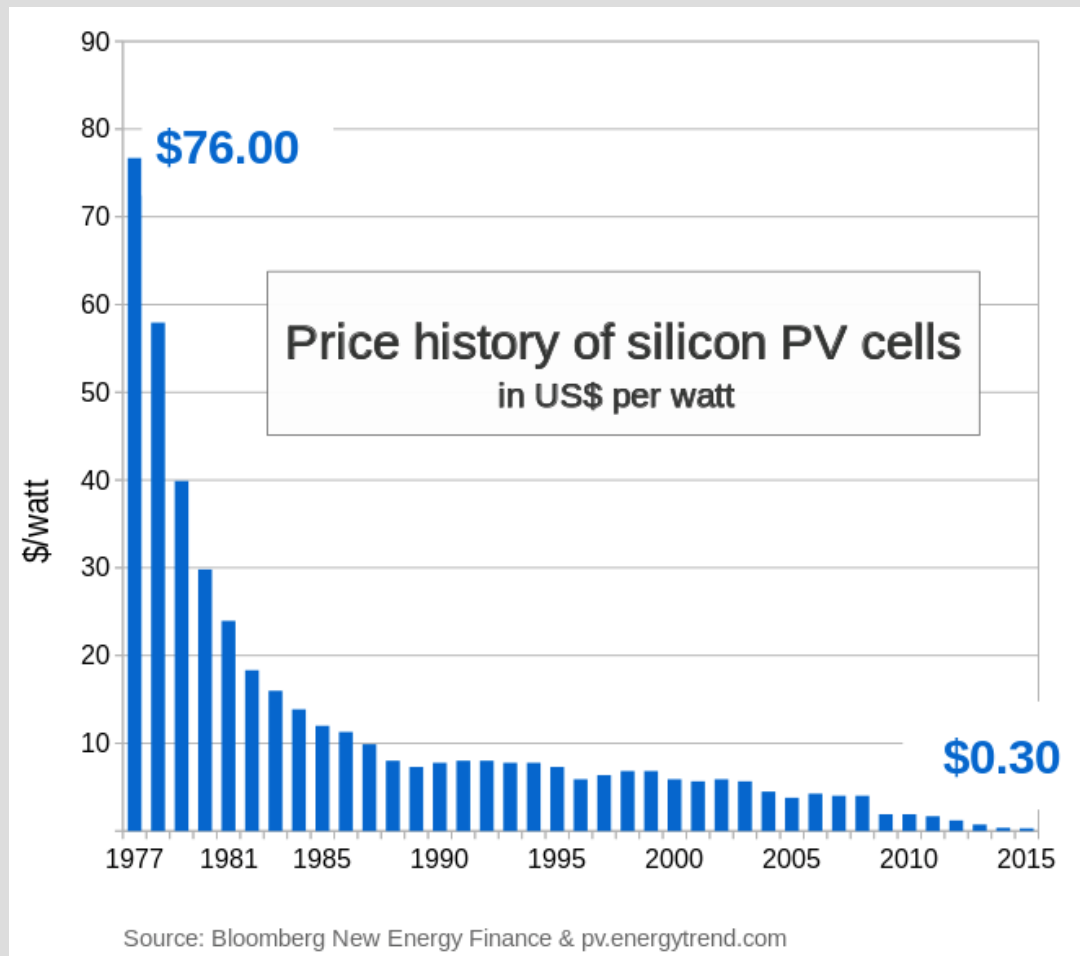


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Wind Power Price



Solar Cell Price



ENERGY FOCUS AND WHY IT'S IMPORTANT

Why Focus on Energy Efficiency?

Receive utility rebates and incentives

- PECO Act 129 rebates
- PJM Energy Efficiency incentives
- Grants for building upgrades



Alternative and Clean Energy Program (ACE)

Provides financial assistance in the form of grant and loan funds that will be used by eligible applicants for the utilization, development and construction of alternative and clean energy project in the state. The program is administered jointly by the Department of Community and Economic Development (DCED) and the Department of Environmental Protection (DEP)



Energy-Efficient PECO Customers Save Half-A-Billion Dollars

Customers take advantage of innovative, award-winning PECO Smart Ideas energy efficiency programs



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ENERGY FOCUS AND WHY IT'S IMPORTANT

Recognition through Energy Star and other programs



WHERE TO START

WHERE TO START

Now what?

You signed a
Ready for 100
commitment (or are
thinking about it) and
you're wondering
what to expect?
What to do first?

You need a plan!



ENERGY BENCHMARKING

ENERGY BENCHMARKING

Reasons for benchmarking

- Your best first step! You can't find the path to your intended goal or destination unless you know where you are!
- Allow building owners to grade their energy performance
- The benchmark "score" identifies whether opportunities exist
- Once you identify projects and implement them, you can track your savings and your updated benchmarked score

ENERGY BENCHMARKING

What is benchmarking?

- Establishes a metric for measuring performance
 - What does 185 kbtu/sf mean to a building owner?
- Compares the performance to a standard or to comparable buildings
- Primary building energy benchmarking tool is ENERGY STAR Portfolio Manager – ratings based on CBECS 2012
 - [Commercial Buildings Energy Consumption Survey](#)

ENERGY BENCHMARKING

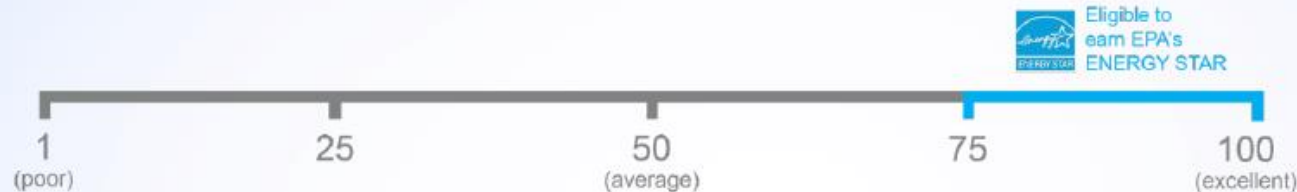
ENERGY STAR Portfolio Manager

- A free tool that benchmarks your building against a database of similar buildings
 - Required by law in Philadelphia, and many other cities
 - Some have voluntary programs
- Corrects for occupancy (hours and number of people) weather, computers, square footage and type of use, among other elements
- Provides a score of 1 – 100 and a “Statement of Energy Performance” (SEP) as a benchmark report
 - [Energystar.gov](http://energystar.gov)

ENERGY BENCHMARKING

1- 100 ENERGY STAR Score

1-100 ENERGY STAR score



Primary objectives of the 1-100 ENERGY STAR score remain:

- Compare buildings to the national population of peer buildings
- Evaluate energy performance for a whole property using actual metered energy consumption
- Normalize for building activity, weather and climate
- Offer a simple way to evaluate measured energy use, prioritize investments, and communicate relative performance across a portfolio of buildings

Image from Energystar.gov



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ENERGY BENCHMARKING

CBECS 2012 Summary

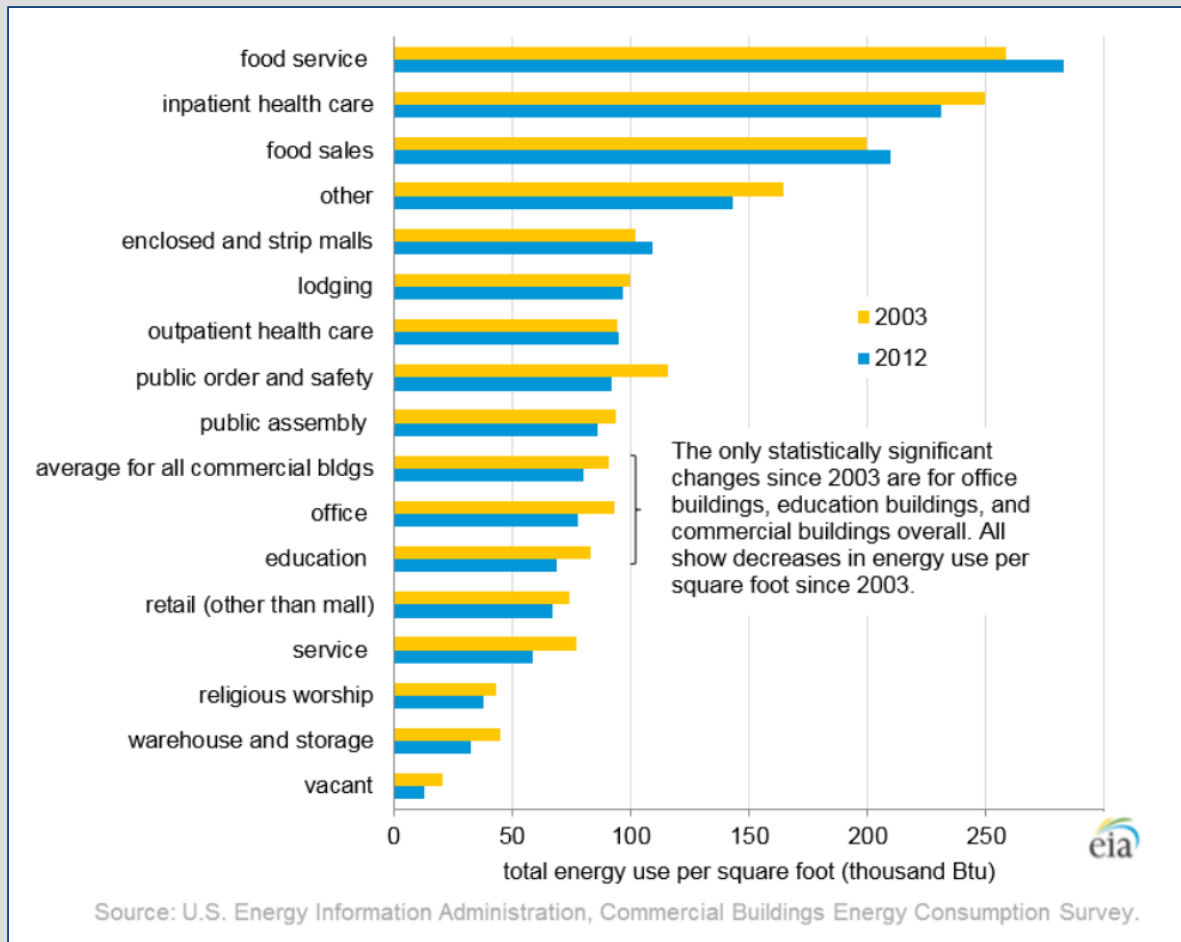


Image from Energystar.gov



ENERGY BENCHMARKING

Benchmarking Ordinances



Image from Energystar.gov

DETAILED ENERGY AUDITS



How do buildings work?

- Multiple systems use energy
- There are interactive effects and weather impacts
- Identify the primary energy-using systems, breakdown by percent
 - HVAC
 - Lighting
 - Domestic hot water
 - Plug loads: appliances, computers, printers, copier, space heaters (!!)
 - Building envelope (impact on HVAC and lighting)
 - Roof, walls, doors, windows
 - Server rooms

DETAILED ENERGY AUDITS

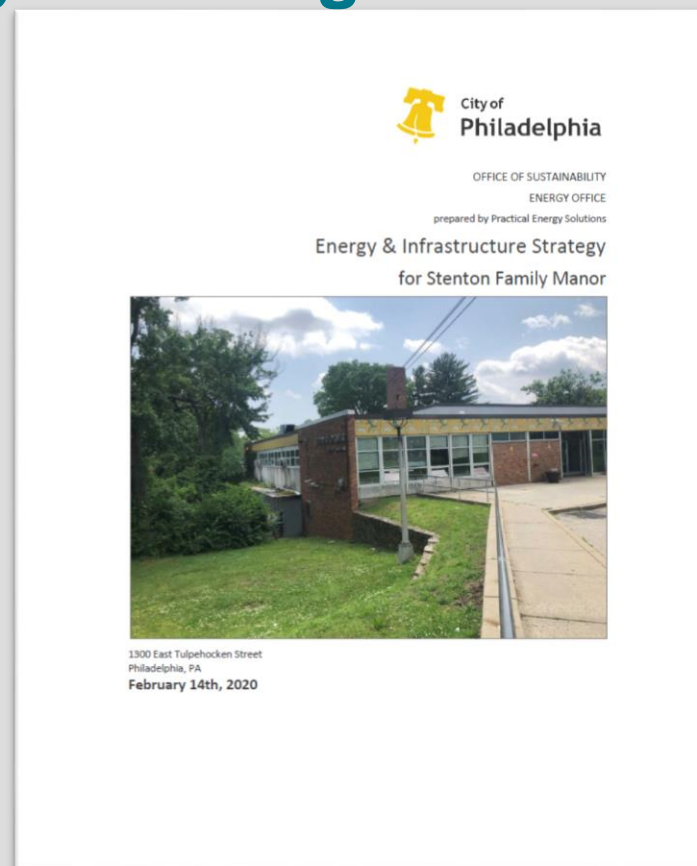
Energy Audits

- **Where, when and how are you using energy?**
- **Have an expert evaluate your building to identify projects that will improve building energy performance**
 - Perform operational studies to identify ways to save energy quickly, with little or no investment
 - Inventory of primary energy using equipment
 - Evaluate existing equipment based on age, condition, efficiency, size
 - Energy modeling (investment grade audit) for major capital investments
 - Assess energy savings and financial returns

DETAILED ENERGY AUDITS

Energy Audits and Energy Planning

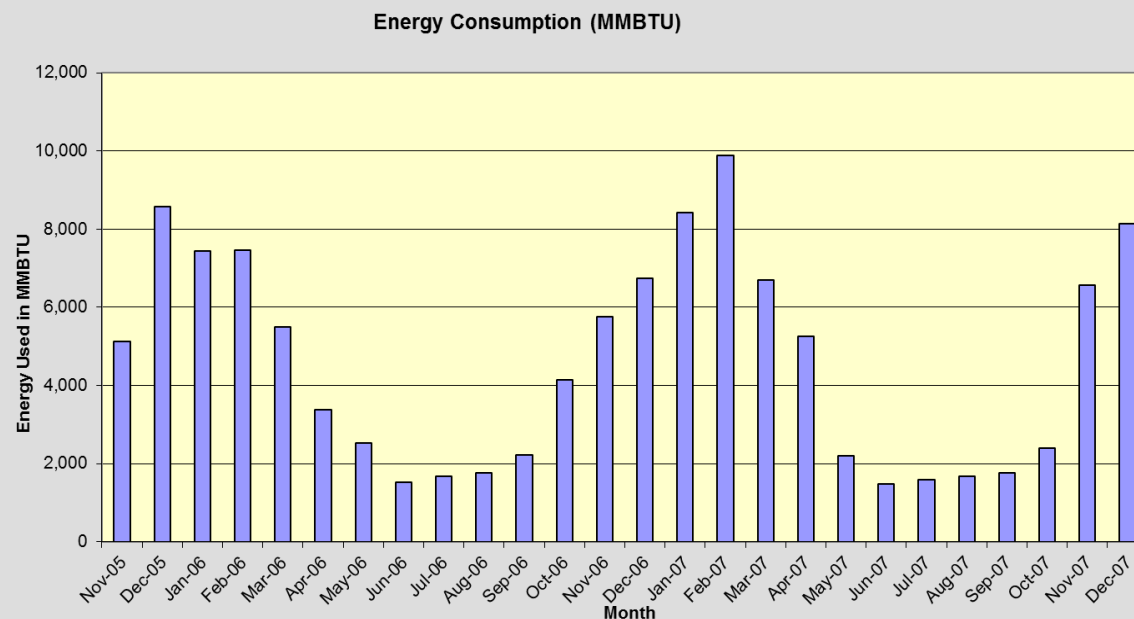
- Energy Audits can be the foundation of an Energy Master Plan for future facility improvements
 - Identify your goals, ie. 25% reduction in energy use, 100% renewable
 - Implement capital upgrades to buildings to reach goals
 - Plan for equipment replacement at end of life
- Can establish a baseline for tracking your future energy performance and metrics to measure your success



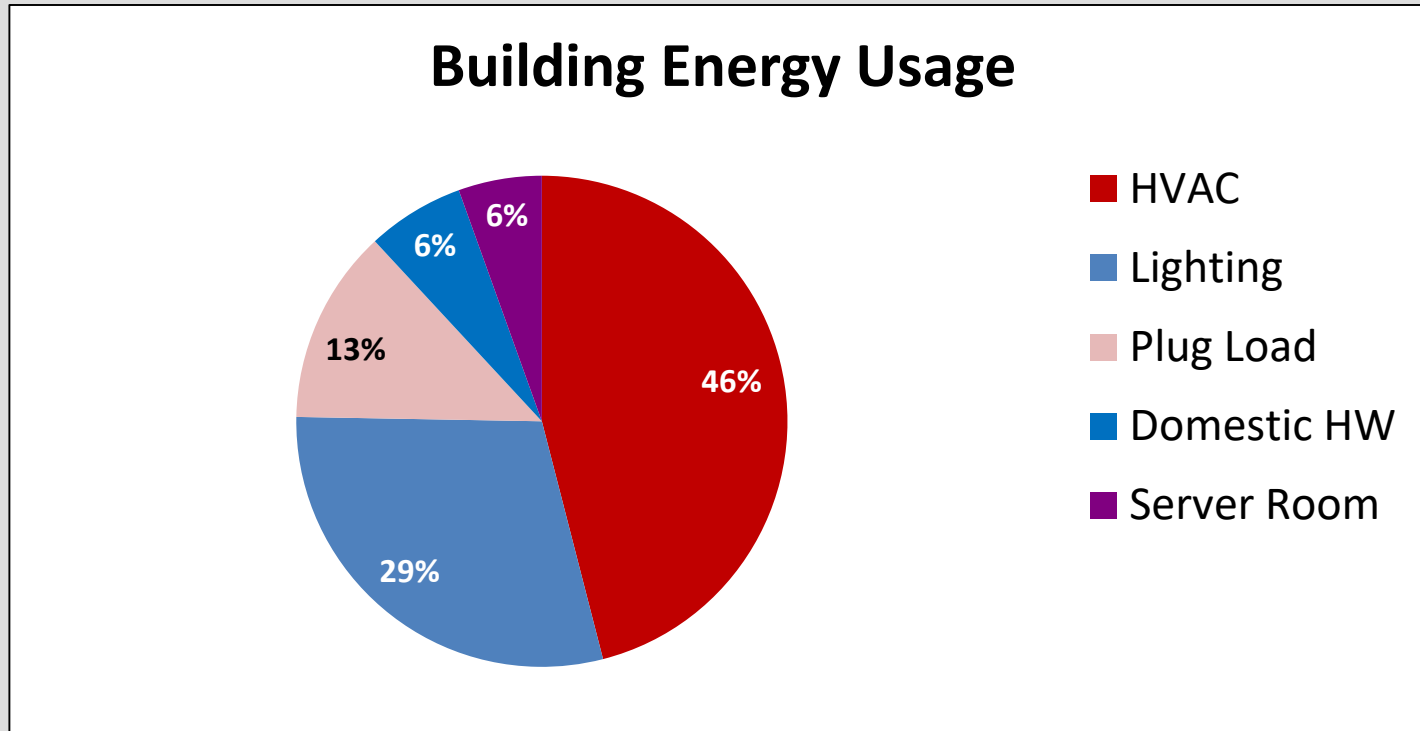
DETAILED ENERGY AUDITS

Utility Bill Analysis

- Rate structure
- Consumption quantities
- Natural gas savings versus electricity (BTUs)
- Consumption patterns
- Projection or baseline of future energy consumption



Typical Admin Office Building Energy Use



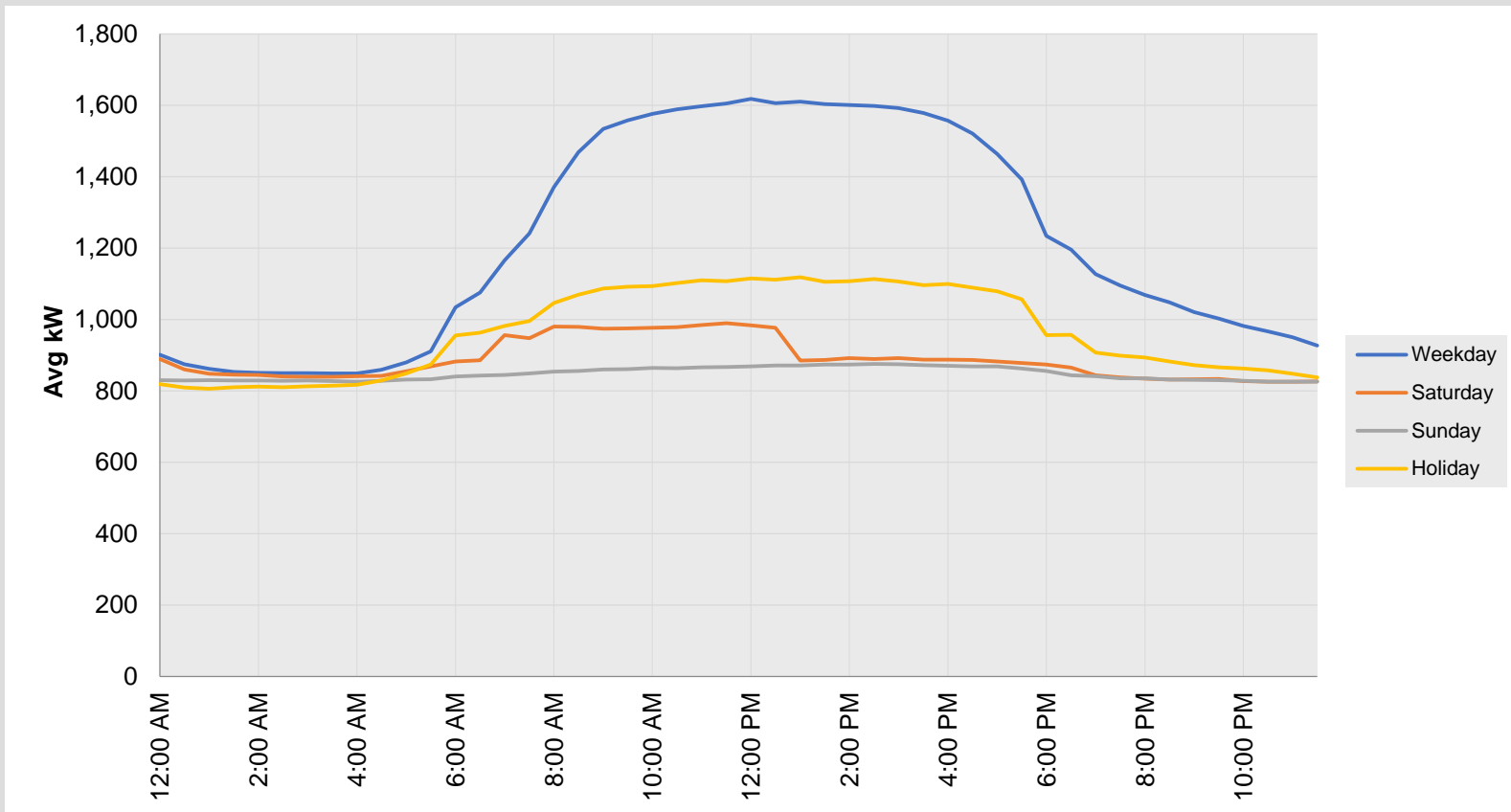
DETAILED ENERGY AUDITS

Operational Improvements

- Low cost, high return on investment options:
 - Control sequences to match building operation to occupancy
 - Setpoints and efficient management of systems
 - Occupant behavior
 - Maintenance staff involvement
 - Best suited to facilities with limited operating hours

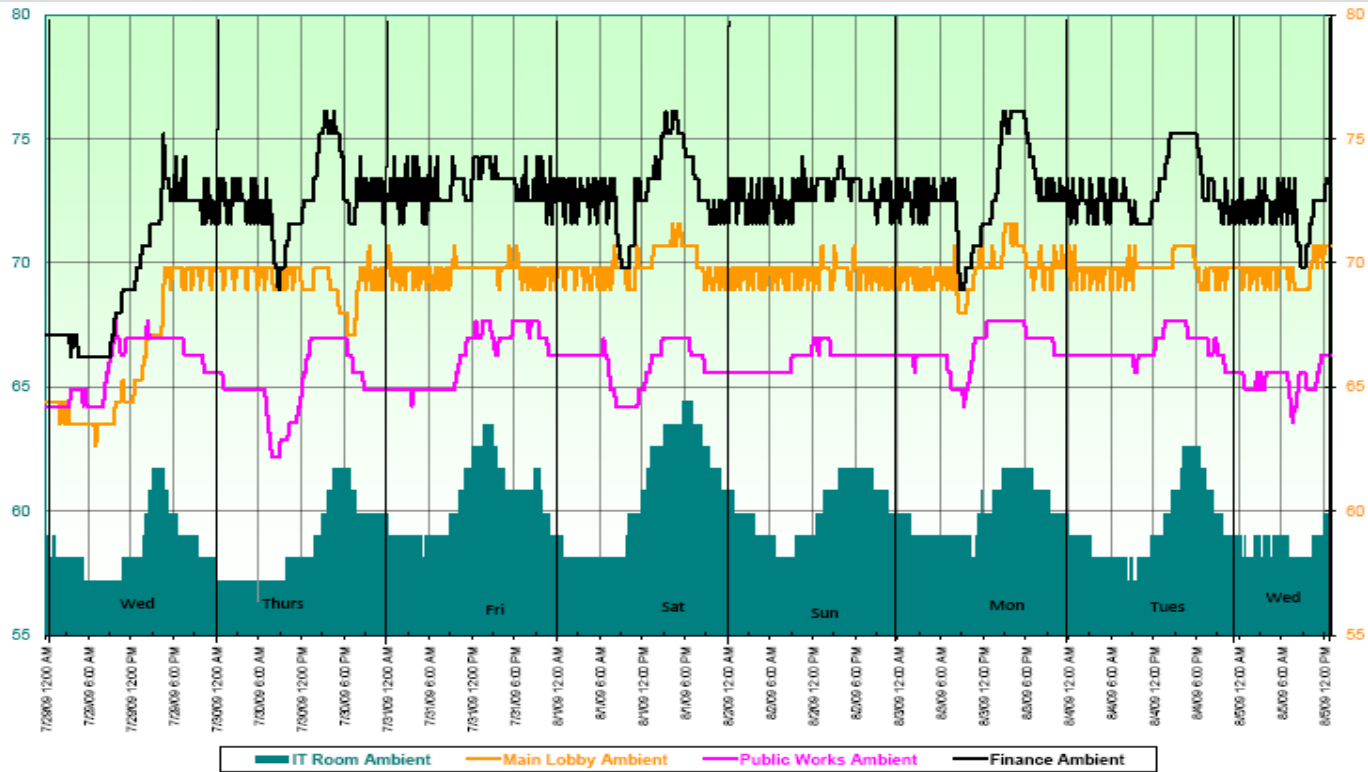
DETAILED ENERGY AUDITS

Interval Data – Scheduling and Controls



DETAILED ENERGY AUDITS

HVAC Operational Schedules



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ENERGY MANAGEMENT POLICIES

ENERGY MANAGEMENT POLICIES

What does an Energy Management Policy do?

- Provides guidance or requirements for operational and capital purchase activities, such as:
 - Assigns responsibility for energy performance of buildings
 - Outlines target settings for HVAC equipment to optimize energy performance, comfort, productivity and indoor air quality
 - Sets purchasing policies for appliances and other plug loads
 - Can also identify beyond code priorities for new buildings and major renovations such as:
 - LEED
 - Green Globes
 - ENERGY STAR
 - Provides guidance for occupant behaviors that impact energy use
 - Training requirements for maintenance staff

STRATEGIC PLANNING AND CAPITAL UPGRADES



STRATEGIC PLANNING AND CAPITAL UPGRADES

Capital Investments

- Lighting
 - LED
 - Controls
- Building Envelope
 - Insulation
 - Windows
 - Infiltration
- Heating and Air Conditioning
 - More efficient primary systems (consider electrification)
 - Better controls
 - Accessories:
 - Economizers
 - Heat Recovery
 - VFDs
 - Demand Controlled Ventilation
 - Domestic Hot Water

STRATEGIC PLANNING AND CAPITAL UPGRADES

Heating and Air Conditioning

- Heating, Ventilating and Air Conditioning (HVAC) accounts for 40 – 60% of the energy used in U.S. commercial buildings
- The older your current system is the greater the opportunity to improve efficiency
- New controls
- Proper sizing and set up (lighting and building envelope affect this)
- Electrification

Best HVAC Opportunities

- **The Case for Investing in Electrification**
 - Our primary options for renewable energy all involve electricity
 - Investing in natural gas or oil fired heating prevents getting to zero carbon emissions for the life of the equipment purchased.
 - Our **ONLY** option for getting to net zero carbon emissions is to use electricity for all heating and cooling

Best HVAC Opportunities

- Heating Efficiency examples
 - Oil fired heat – 80% (0.80 COP)
 - Standard natural gas boiler - 85%
 - Modular natural gas condensing boiler – 95% - 98%
 - Air source heat pump – COP > 2.0 (200%!)
 - Geothermal/Ground Source heat pump - COP 3 - 4
- Cooling Efficiency
 - Air-cooled DX – COP of 2.8
 - Air source heat pump – COP of 3 - 5
 - Water cooled centrifugal chiller – COP > 5.5
 - Geothermal – COP up to 18! (vs. 2.8 for DX)



NON-BUILDING OPPORTUNITIES

NON-BUILDING OPPORTUNITIES

Beyond Buildings

- Other efficiency opportunities and goals:
 - Street lights
 - Fleets – electric vehicles
 - Traffic lights
 - Athletic field lighting
 - Parking lots
 - Wastewater Treatment Facilities
 - Lighting
 - Pumps
 - Blowers
 - Conveyance equipment
- Peak Demand Management



MEASURING AND EVALUATING YOUR PROGRESS

MEASURING YOUR SUCCESS

Tracking and Reporting Energy Use

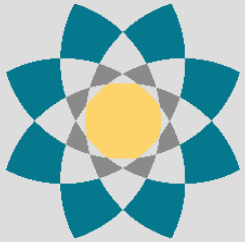
- Set a baseline during the Strategic Planning stage
- Measure your performance and compare to the baseline, and to your goals
 - Energy Star Portfolio Manager
- Share your results with your stakeholders
- Use the results to encourage others

WHAT WE LEARNED TODAY

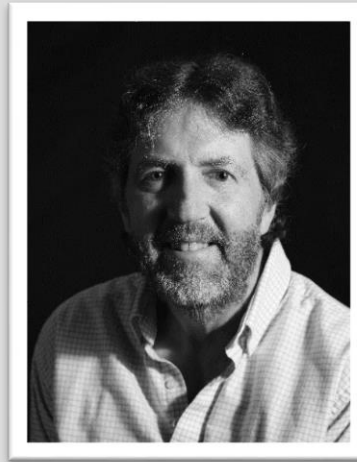
WHAT WE LEARNED TODAY

Recap

- Benchmark your building performance
 - Set goals for improvement
 - Look for conservation and building management opportunities
 - Implement Energy Management policies
 - Perform a detailed Energy Audit
 - Develop a Long-Range Capital Plan, including financing options
 - Implement projects
 - Continue benchmarking monthly or annually to track your progress
-
- READY FOR 100



Thanks for joining us!



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