DRIVING BUILDING UPGRADES WITH PRACTICAL ENERGY MANAGEMENT STRATEGIES

November 1, 2021


20 years of saving energy for Wisconsin.

20 Years focus on energy®
Partnering with Wisconsin utilities

Presenters

Tom Dragotta,
Lead Energy Advisor

Chris Seitz,
Energy Advisor

Agenda

- Introductions
- FOCUS ON ENERGY® Overview
- Impact of Energy Management
- Practical Energy Management (PEM) Model
- Review Business Case Template
- Questions

Training goal

- Recognize energy consumption can be controlled
- Create a template for more successful project buy-in
- Understand the impact of establishing an energy management team
- Create a healthier and more productive environment

FOCUS ON ENERGY®

Overview

20 Years focus on energy®
Partnering with Wisconsin utilities

Economic impact

- Since 2001, saved businesses more than $151 million in annual energy costs
- For every $1.00 invested, Focus on Energy creates more than $4.80 in benefits for the state of Wisconsin
- A study of statewide energy efficiency programs by the Berkeley Lab found Focus on Energy runs the most effective program in the nation
- Visit **focusonenergy.com/evaluation-reports** to view the full report

Services

- Technical assistance:
  - Unbiased expert advice
  - Industry expertise
  - Energy evaluations
  - Education and training sessions
  - Network of vendors and market providers
- Financial incentives

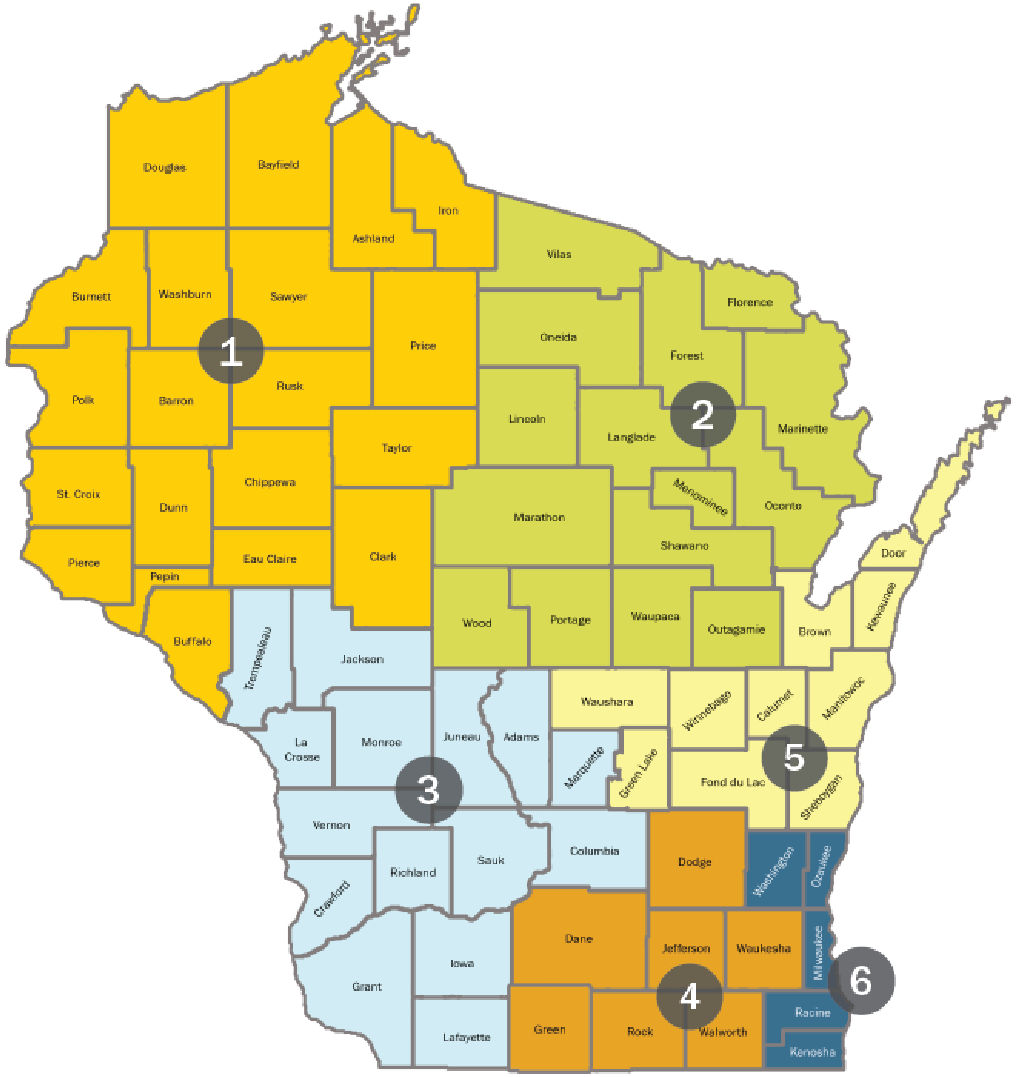
Financial incentives

- Energy efficiency:
  - Lighting
  - Compressed air
  - HVAC
  - Motors and drives
  - New construction
  - Custom projects

Financial incentives

- Renewable energy:
  - Solar electric
  - Solar hot water
  - Wind
  - Biomass
  - Biogas

2021 Energy Advisor Map



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Impact of Energy Management

20 Years focus on energy®

Partnering with Wisconsin utilities

Why is energy management important?

- Energy is a business issue
- Energy improvements are an investment, not a cost
- Energy saving low-cost/no-cost initiatives
- Building tune-ups via Retro-Commissioning

Why is energy management important?

- Can result in 6% reduction in building energy use intensity[1]
- **Demand may account for as much as 25% of the cost of your monthly electric bill**
- Operational changes alone can save significant energy
- Increases occupant comfort
- Increases safety and reliability (light levels, etc.)
- Electrical utility rates have consistently risen and the natural gas market can be volatile

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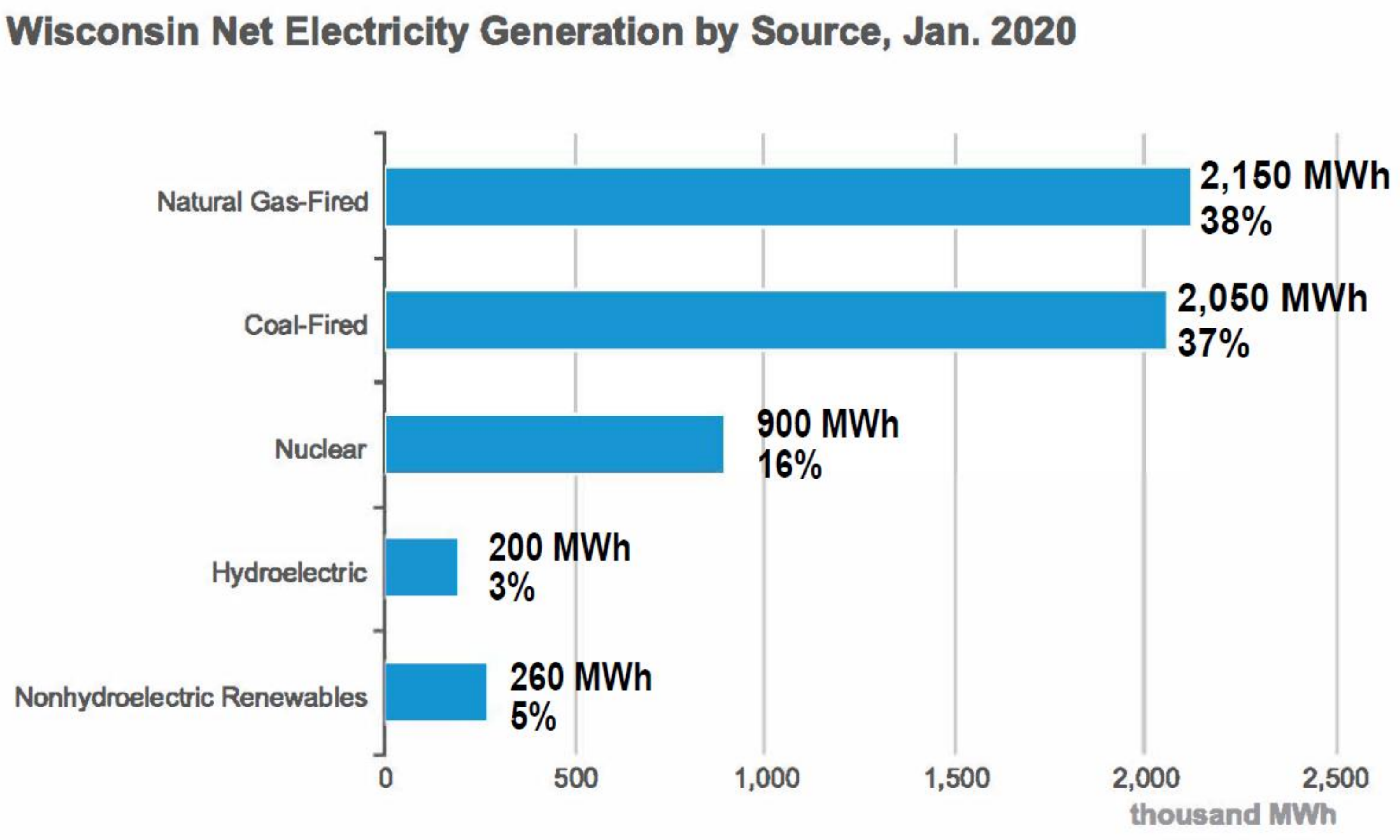
[1] Meng, T., Hsu, D. and Han, A., 2020. Measuring Energy Savings From Benchmarking Policies In New York City. [online] Aceee.org. Available at: https://www.aceee.org/files/proceedings/2016/data/papers/9_988.pdf.

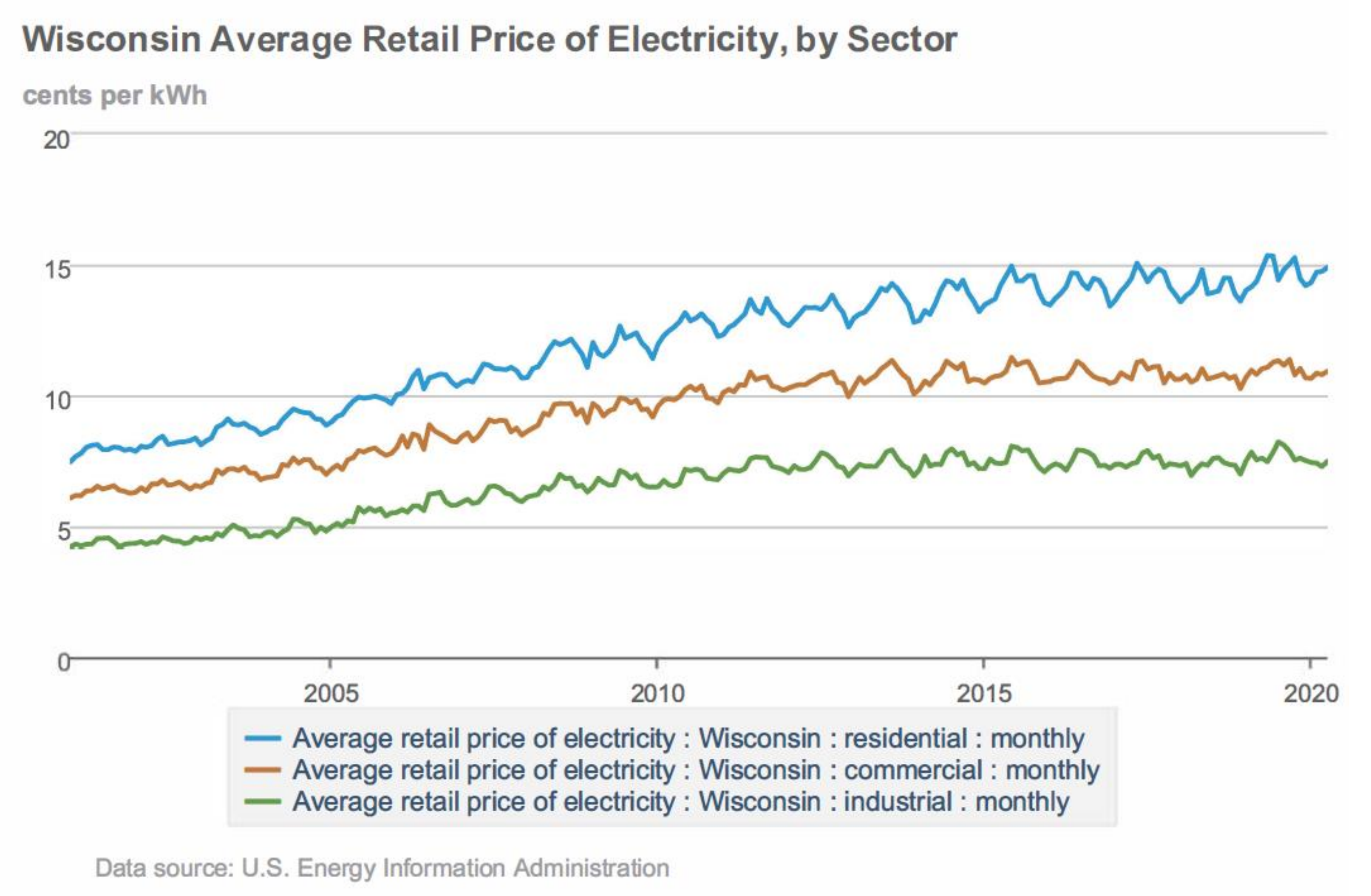
Why is energy management important?



Wisconsin Net Electricity Generation by Source, Jan. 2020

Source: U.S. Energy Information Administration

Why is energy management important?



Data source: U.S. Energy Information Administration

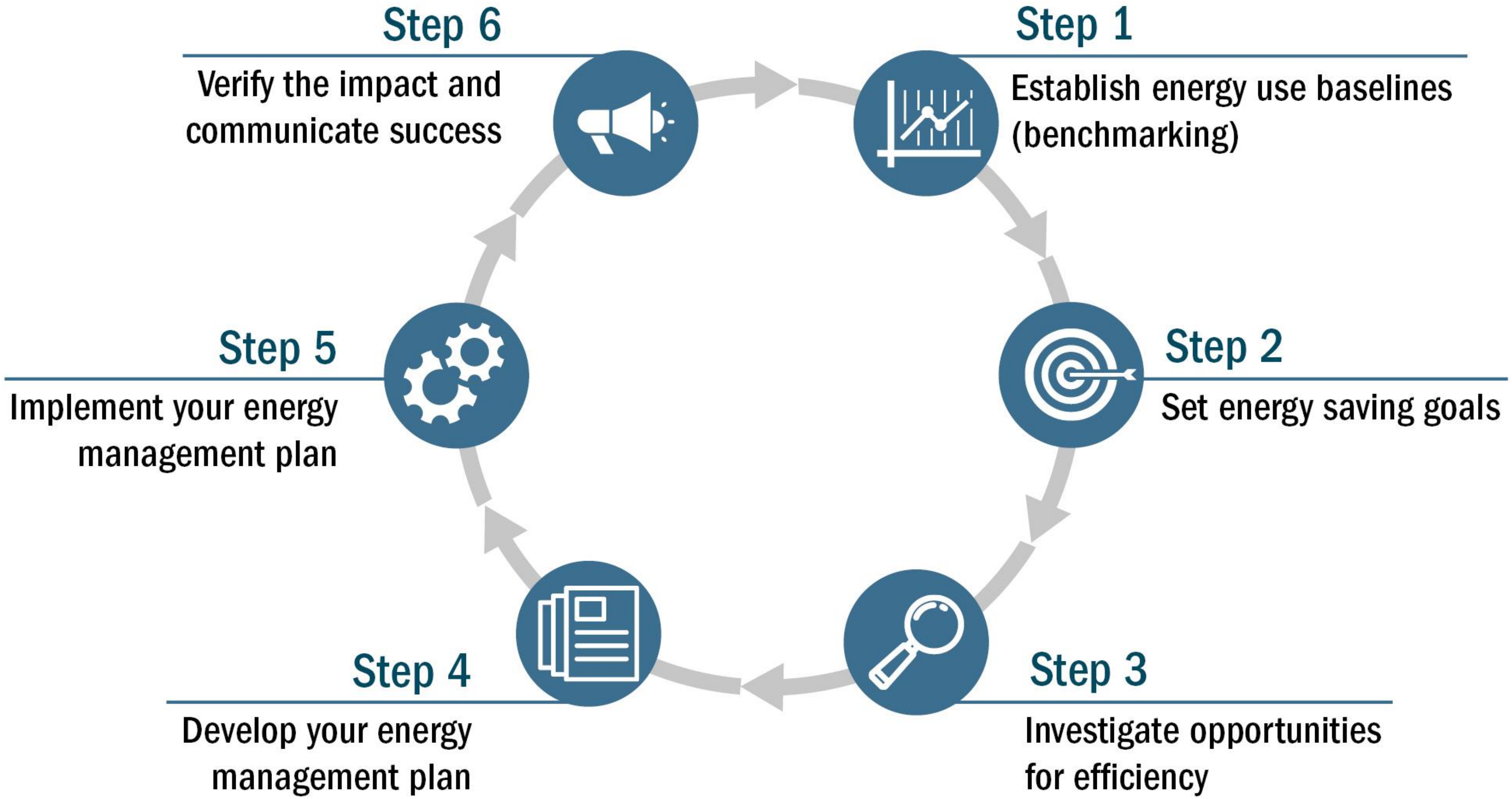
Practical Energy Management (PEM) Model

20 Years focus on energy®
Partnering with Wisconsin utilities

Goal of PEM

- Create an energy management program and team that is:
  - Strategic
  - Measurably effective
  - Attainable goals
  - Sustainable for years

PEM process model



Step 1

Establish energy use baselines (benchmarking)

Step 2

Set energy saving goals

Step 3

Investigate opportunities for efficiency

Step 4

Develop your energy management plan

Step 5

Implement your energy management plan

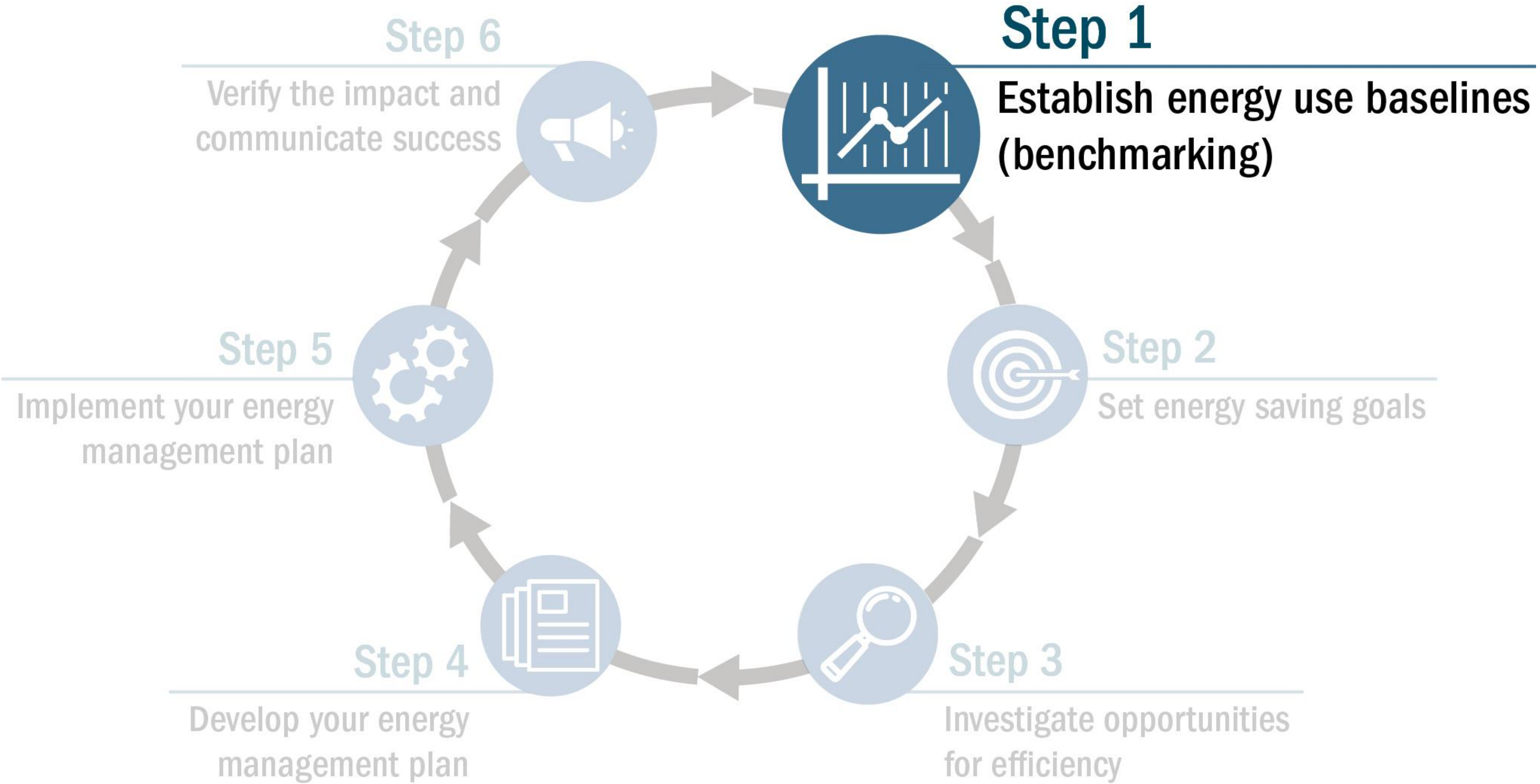
Step 6

Verify the impact and communicate success

PEM team

- Cross-functional team consists of:
    - Budget manager
    - Facility manager
    - Maintenance staff
    - Upper management
    - Building occupants
- Equipped with an Energy Team Toolkit

Step 1: Establish energy use baselines



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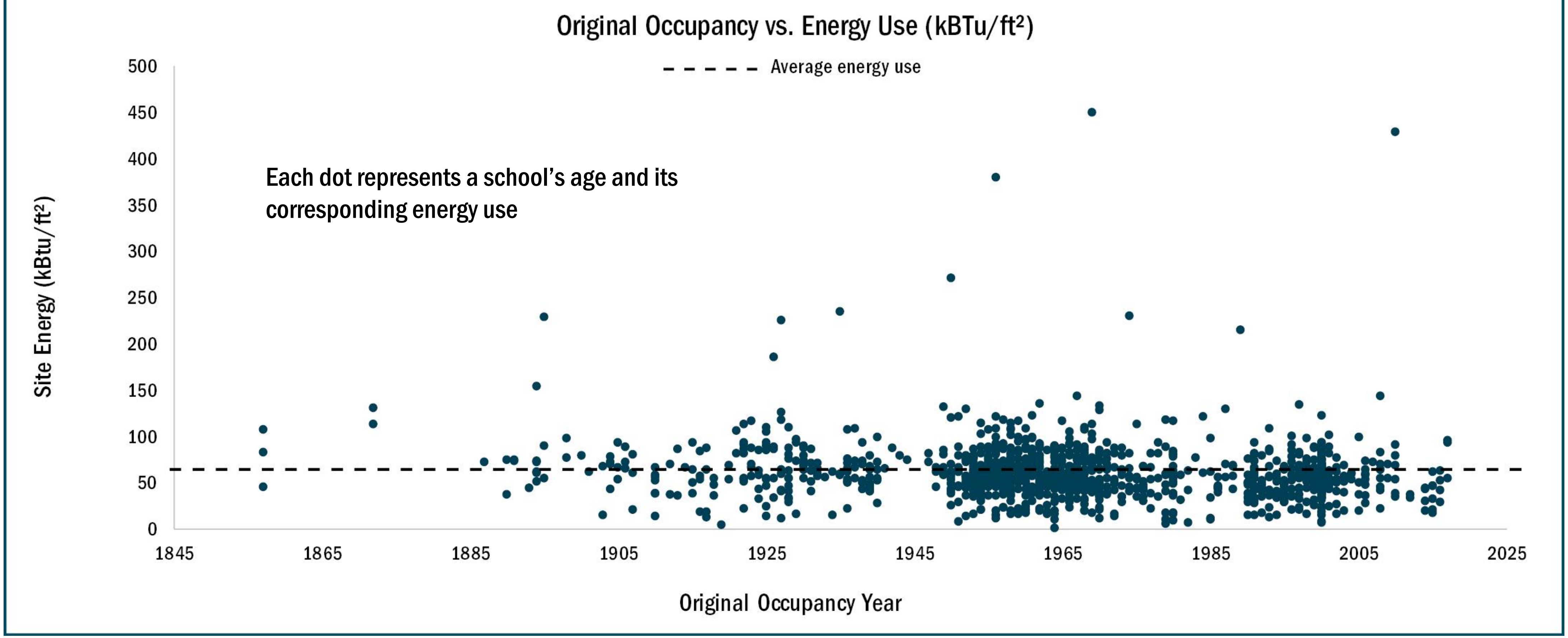
Benchmarking

- Measuring a building's weather normalized energy use and compares it to the average for similar buildings
- Allows owners and occupants to understand their building's relative energy performance
- Helps identify opportunities to cut energy waste
- *You can’t manage what you don’t measure*

Step 1

Establish energy use baselines (benchmarking)

Occupancy vs. energy use

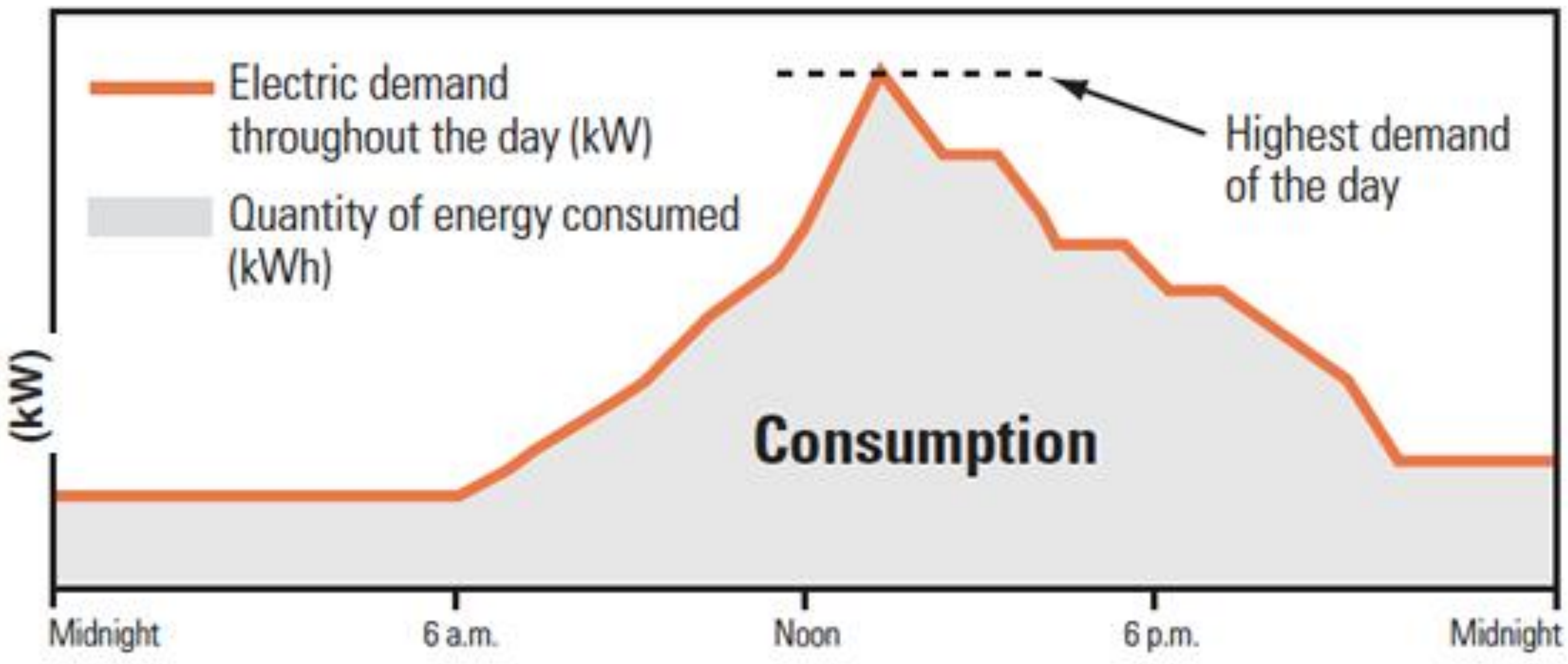


Each dot represents a school's age and its corresponding energy use

Step 1

Establish energy use baselines (benchmarking)

Electrical demand (kW) and energy (kWh)



<u>Calculating Demand Costs</u>

kWh Off Peak

500 kW x $13.80 = $6,900

kWh On Peak

500 kW x $1.85 = $925

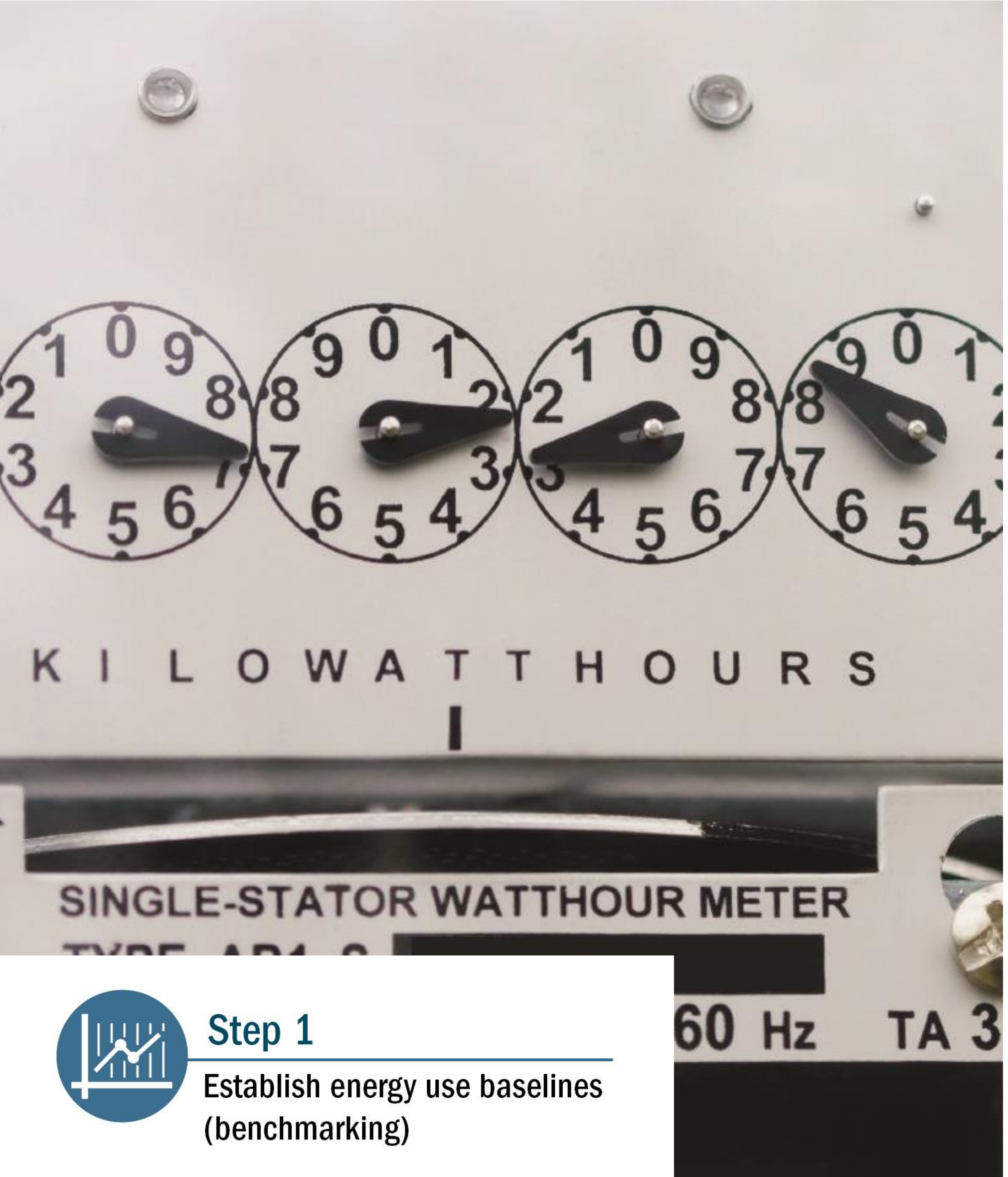
We Energies
Energy You Can Depend On

Step 1

Establish energy use baselines (benchmarking)

Years

Understanding your utility bill - electric



- Know your electric rate:
  - When is your demand window?
  - 8 am to 8 pm?
- Review history:
  - What is your baseline?
  - When are your peaks?
  - Can equipment be set to run off-peak?

Step 1

Establish energy use baselines (benchmarking)

Benchmarking with ENERGY STAR Portfolio Manager®

- **FREE** online tool provided by ENERGY STAR to measure and track energy
- Benchmark the performance of one building or a portfolio of buildings in a secure online environment
- Starting point for Practical Energy Management

Step 1

Establish energy use baselines (benchmarking)

Portfolio Manager

To get started benchmarking in Portfolio Manager you will need…

1. Property information:
    - Primary function
    - Name, address, zip/postal code
    - Year built
    - Gross floor area
2. Property use details, e.g.:
    - Operating hours
    - Number of computers
    - Number of workers, etc.
3. Consumption data for all resources you need to report for the duration of the compliance period

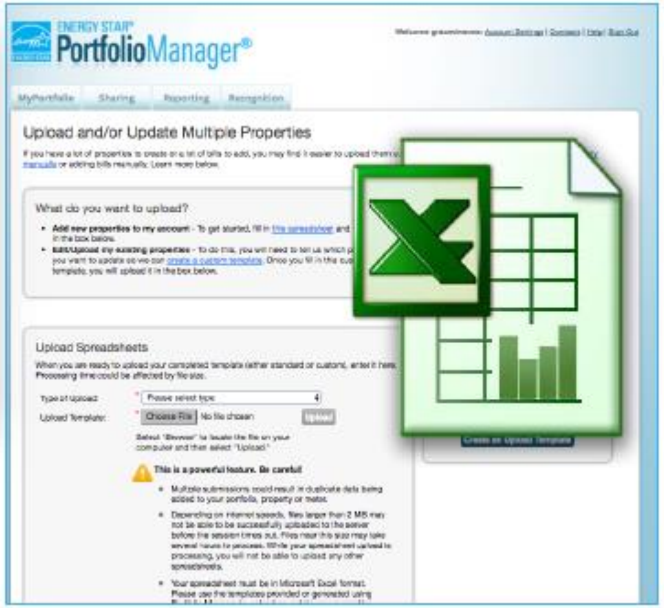
Step 1

Establish energy use baselines (benchmarking)

Entering data into Portfolio Manager

Manual entry

Spreadsheet upload



ENERGY STAR® PortfolioManager®

Upload and/or Update Multiple Properties

What do you want to upload?

- Add new properties to my account
- Edit/Upload my existing properties

Upload Spreadsheets

Type of Upload: Please select type

Upload Template: Choose File No file chosen Upload

This is a powerful feature. Be careful!

Automated data uploads

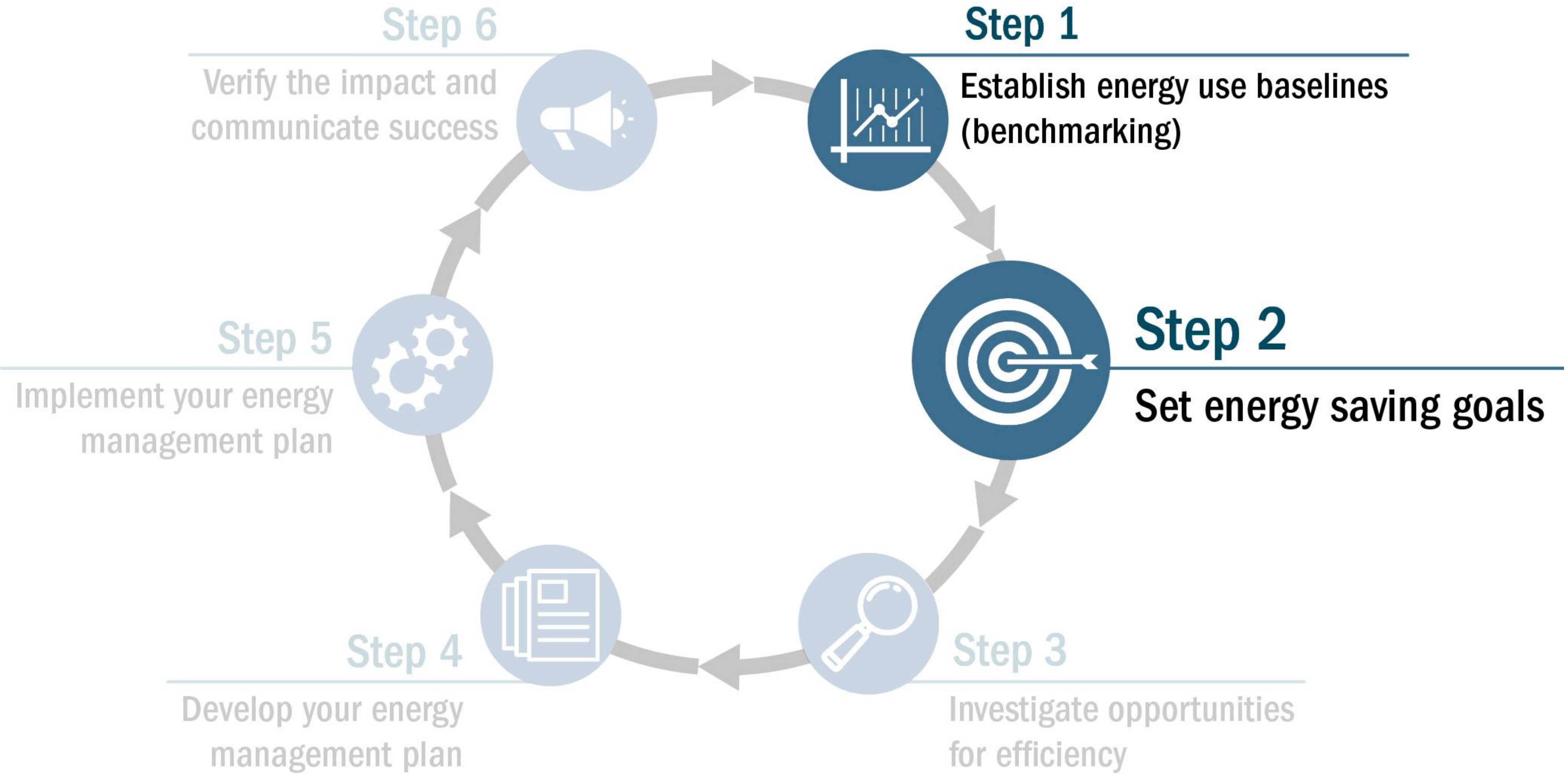
Choose the best data management method.

Step 1

Establish energy use baselines (benchmarking)

Source: ENERGY STAR®

Step 2: Set energy saving goals



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Verify the impact and communicate success

SMART goals

Specific	Clear, well defined
Measureable	Metrics determine goal achievement
Achievable	Attainable at the right level of difficulty
Results oriented	Describes the expected outcome
Time bound	Accomplished within a given time frame

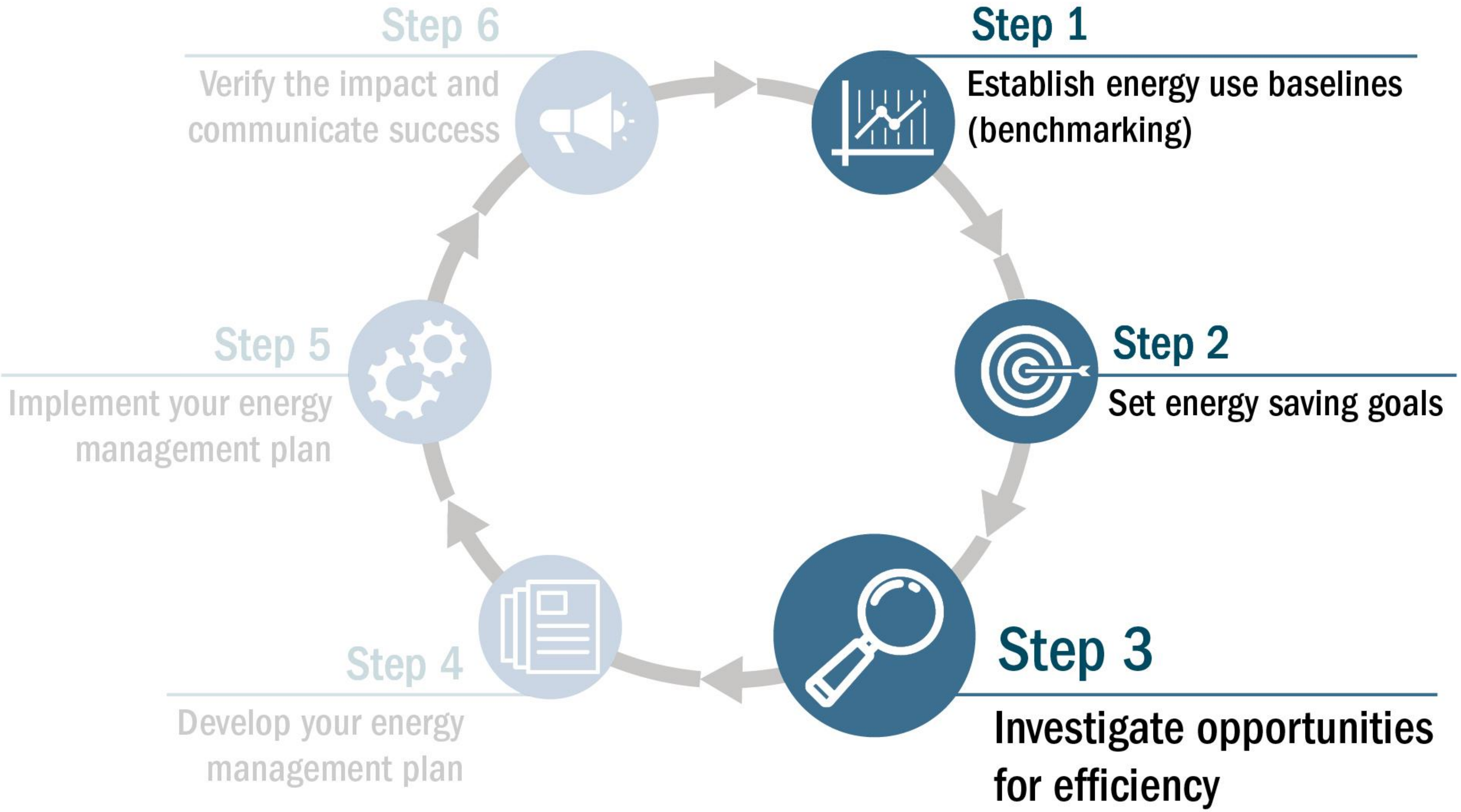
SMART goal activity

- What do you measure?
- What's important to your organization?
- What are your performance indicators?
- How are SMART goals communicated to the organization?

Step 2

Set energy saving goals

Step 3: Investigate opportunities for efficiency



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Opportunities for efficiency

- Monthly walk-through
- System inventories:
  - Equipment list
  - Model numbers
- Electrical and natural gas diagrams
- HVAC prints:
  - Piping
  - Ventilation

Step 3

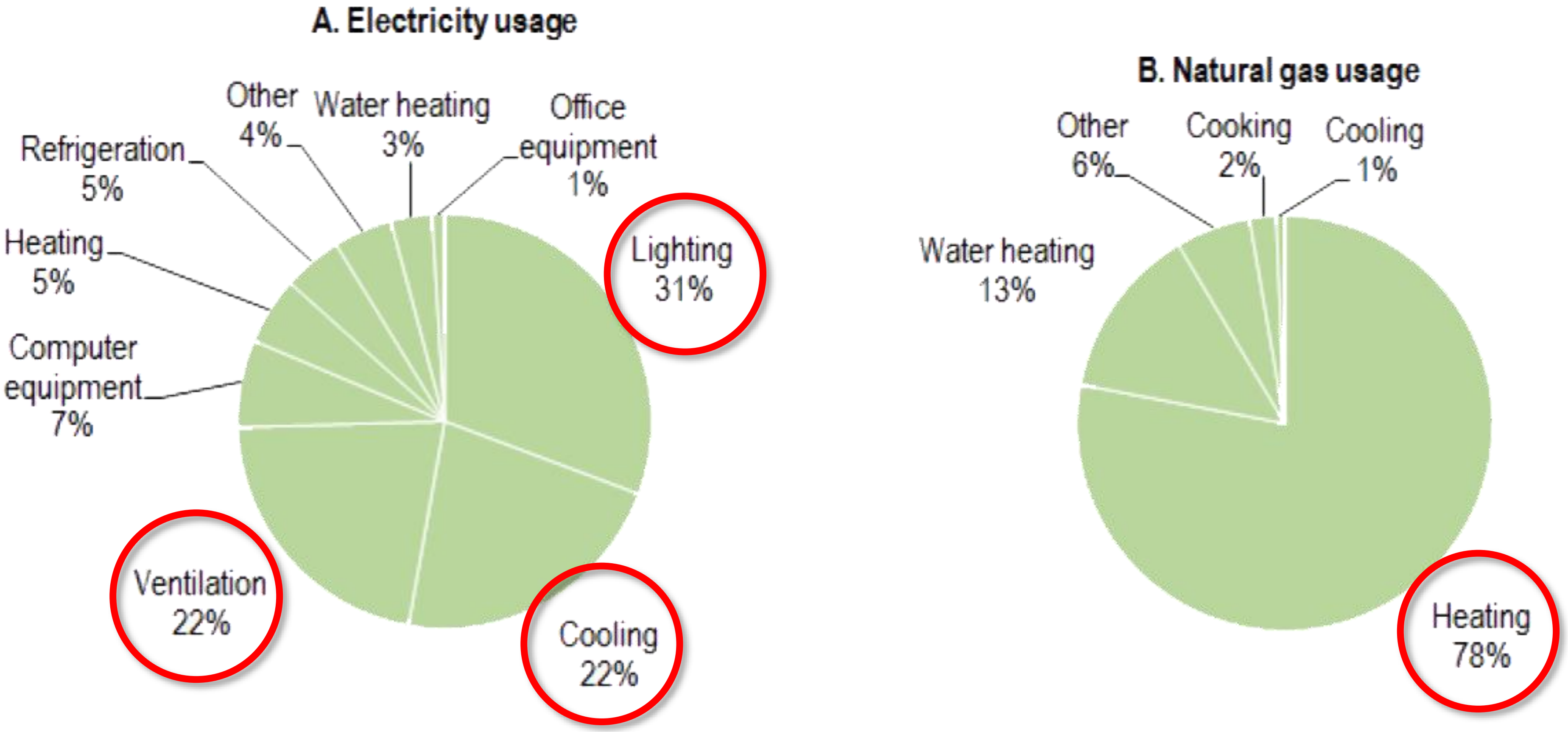
Investigate opportunities for efficiency

System inventories

- Equipment list:
  - Manufacturer
  - Location including image
  - Date installed
  - Model numbers (wear items)
  - Efficiency
  - Service schedule

Step 3
Investigate opportunities for efficiency

Energy sources



Data from US Energy Information Administration (2020)

Keep up with your building

Step 3

Investigate opportunities for efficiency

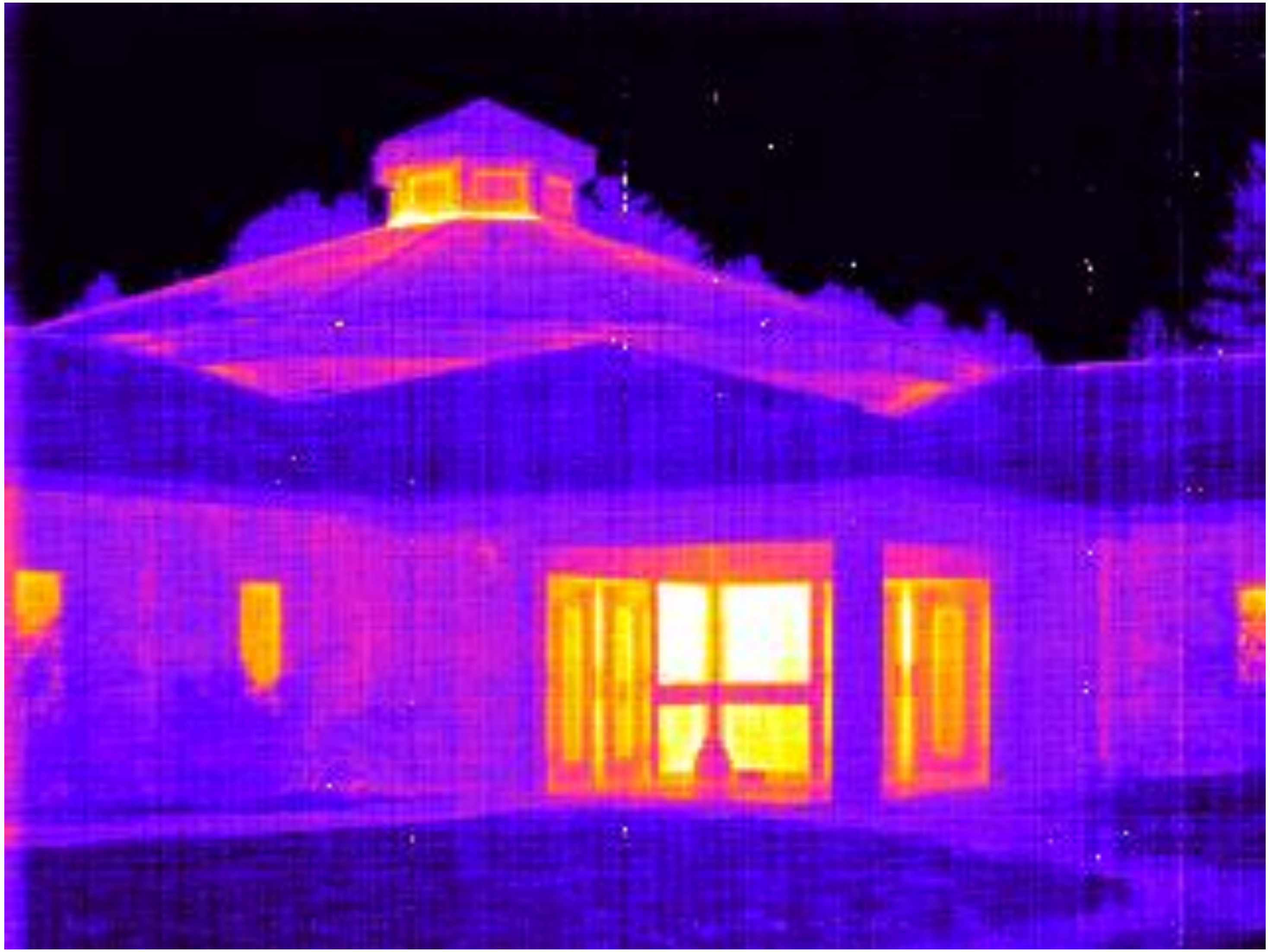
- Make a note of any changes
- Inventory when you upgrade
- Perform a small amount of building analysis and review every week

Common building issues

Step 3

Investigate opportunities for efficiency

Heat loss



Step 3

Investigate opportunities for efficiency

Positive air pressure

Insufficient lighting

Step 3

Investigate opportunities for efficiency

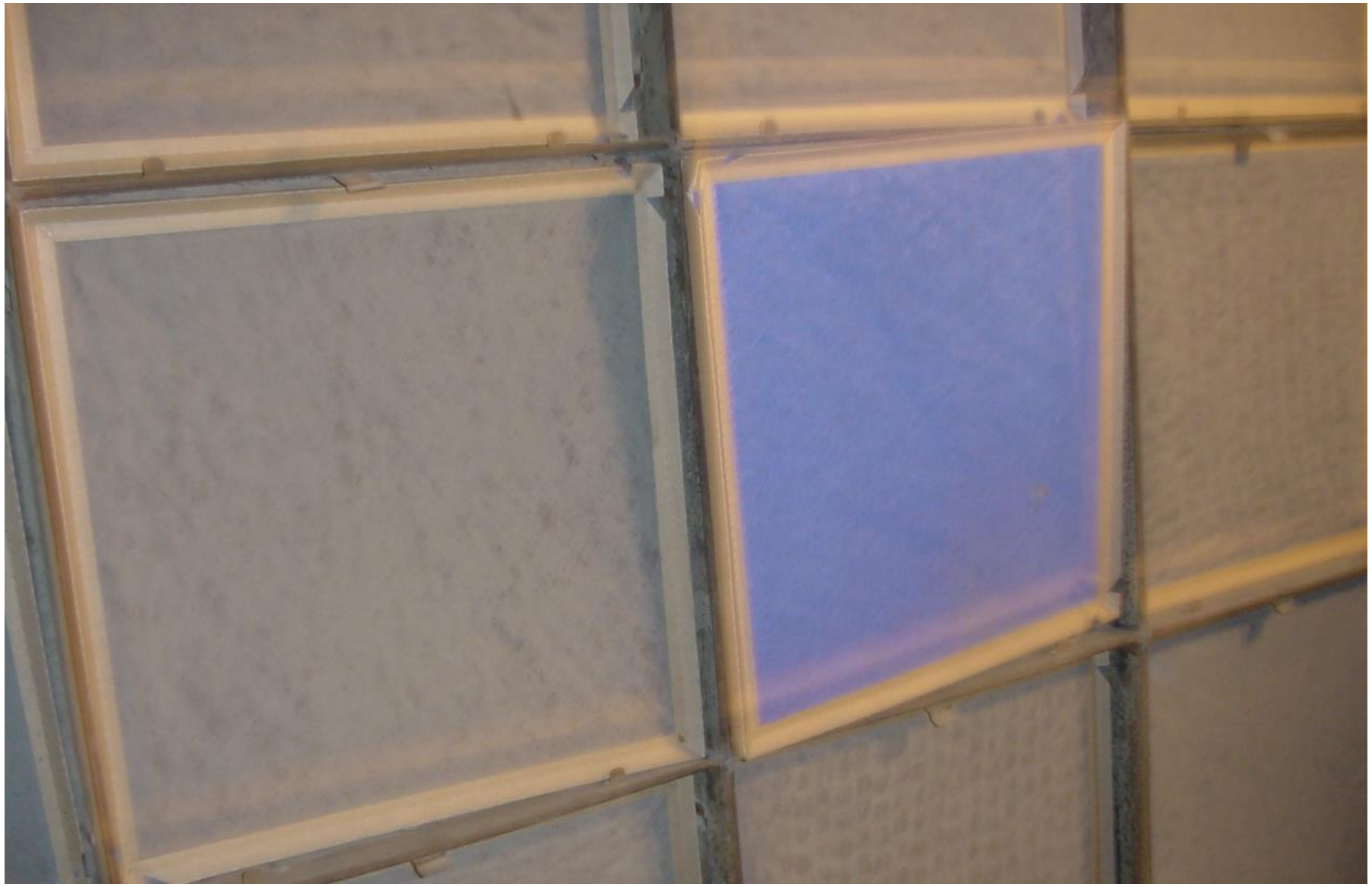
Steam system malfunction

Step 3

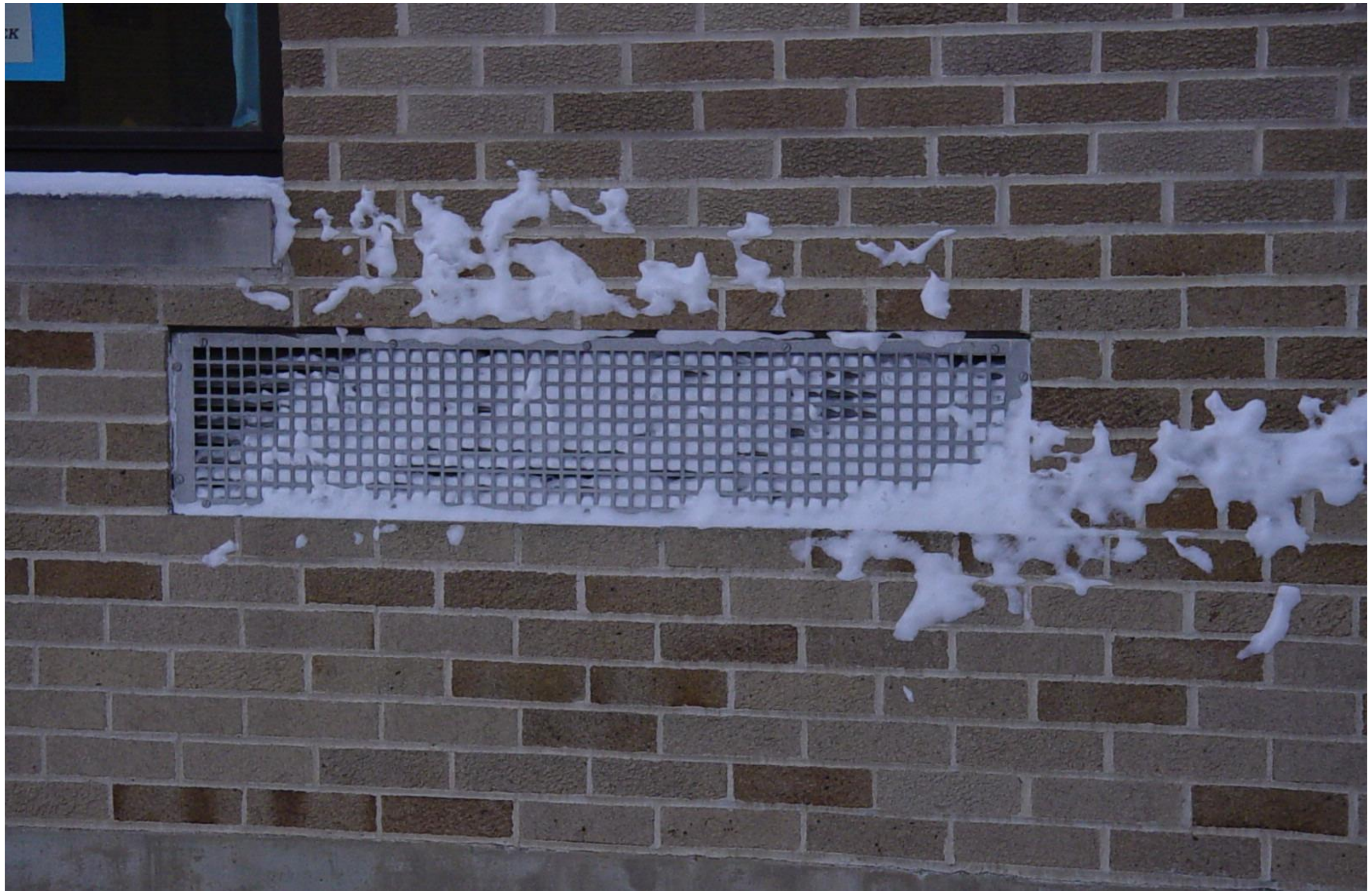
Investigate opportunities for efficiency

Unclean air intake

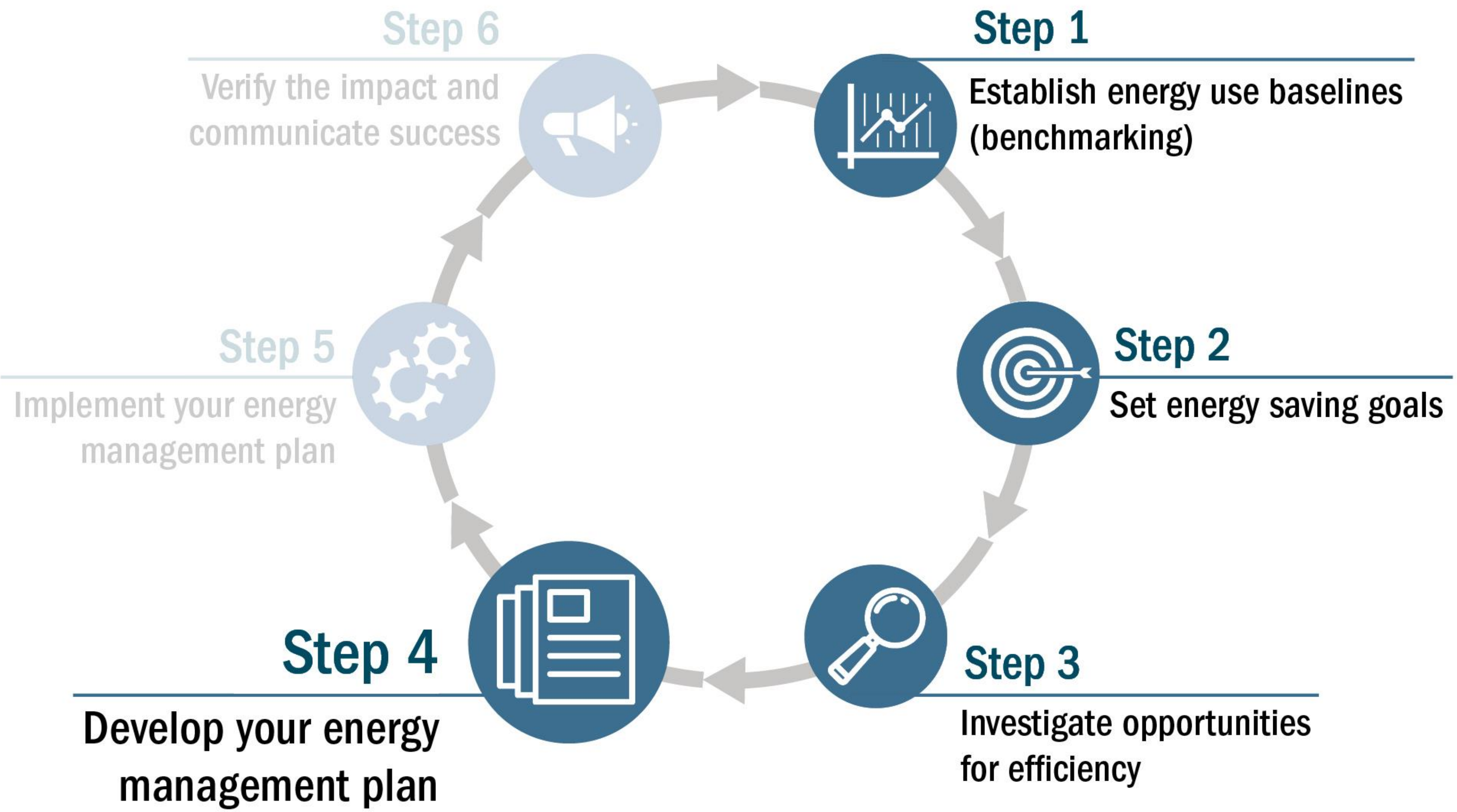
Dust-covered air filters



Fouled air intake from snow removal



Step 4: Develop your energy management plan



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Verify the impact and communicate success

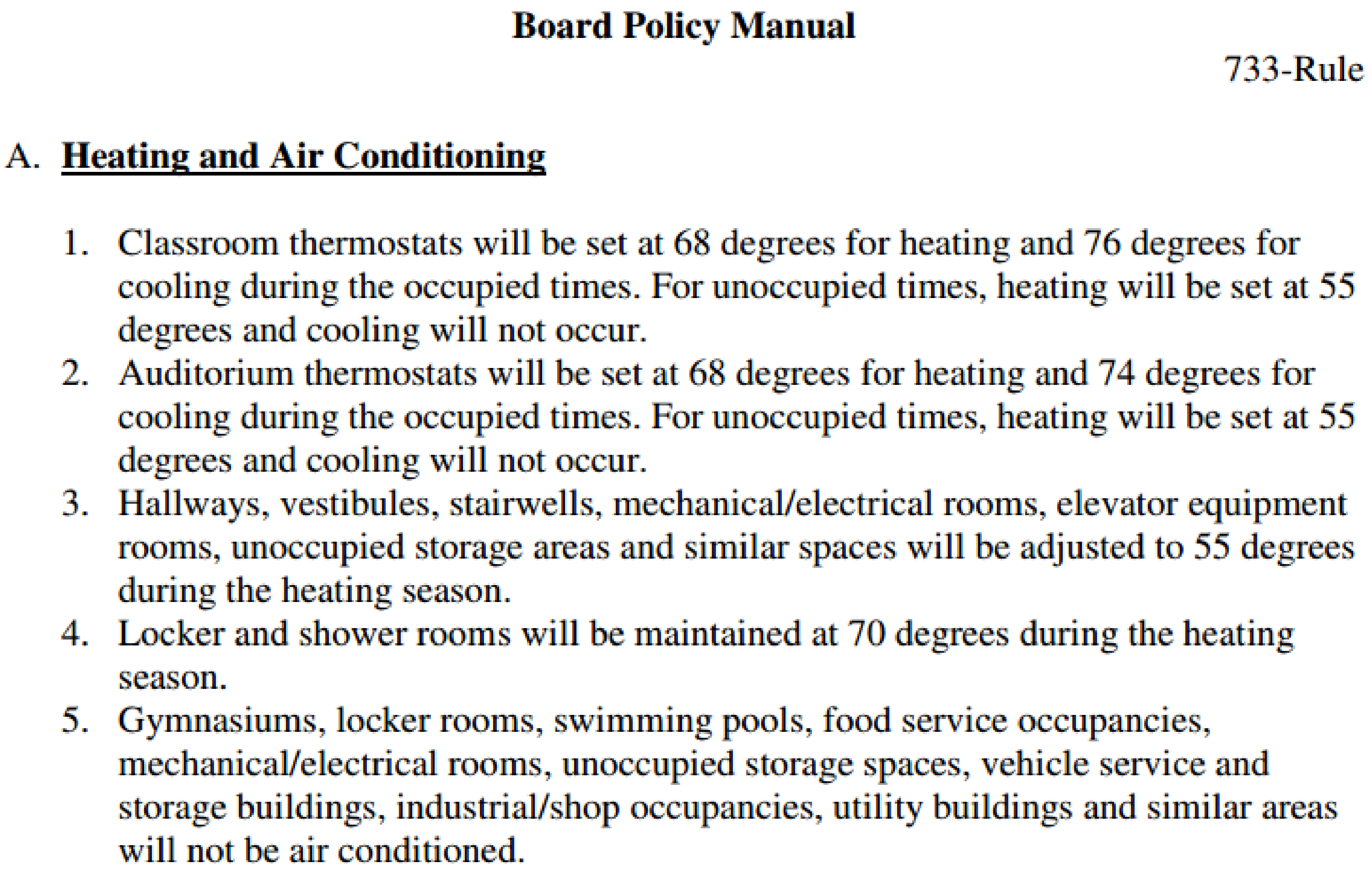
Energy management plan best practices

- Board mandated energy policies
- Operations and maintenance
- Preventive maintenance (PM) strategies
- Document best practices for operational consistency

Step 4

Develop your energy management plan

Board mandated energy policies



Board Policy Manual

733-Rule

A. **Heading and Air Conditioning**

1. Classroom thermostats will be set at 68 degrees for heating and 76 degrees for cooling during the occupied times. For unoccupied times, heating will be set at 55 degrees and cooling will not occur.
2. Auditorium thermostats will be set at 68 degrees for heating and 74 degrees for cooling during the occupied times. For unoccupied times, heating will be set at 55 degrees and cooling will not occur.
3. Hallways, vestibules, stairwells, mechanical/electrical rooms, elevator equipment rooms, unoccupied storage areas and similar spaces will be adjusted to 55 degrees during the heating season.
4. Locker and shower rooms will be maintained at 70 degrees during the heating season.
5. Gymnasiums, locker rooms, swimming pools, food service occupancies, mechanical/electrical rooms, unoccupied storage spaces, vehicle service and storage buildings, industrial/shop occupancies, utility buildings and similar areas will not be air conditioned.

Step 4

Develop your energy management plan

Operations and Maintenance (O&M)

- Routine O&M actions will:
  - Improve equipment operating efficiency
  - Prolong equipment life
  - Reduce the need for costly “emergency” repairs
  - Help manage ever increasing energy costs

Step 4

Develop your energy management plan

Impact of O&M actions

- Reduce lighting related electricity use by as much as 30%
- Reduce winter space heating costs up to 30%:
  - Scheduling
  - Established energy policy
  - BAS setpoints
- Cut HVAC energy use by 15% - 30%

Step 4

Develop your energy management plan

Preventative maintenance

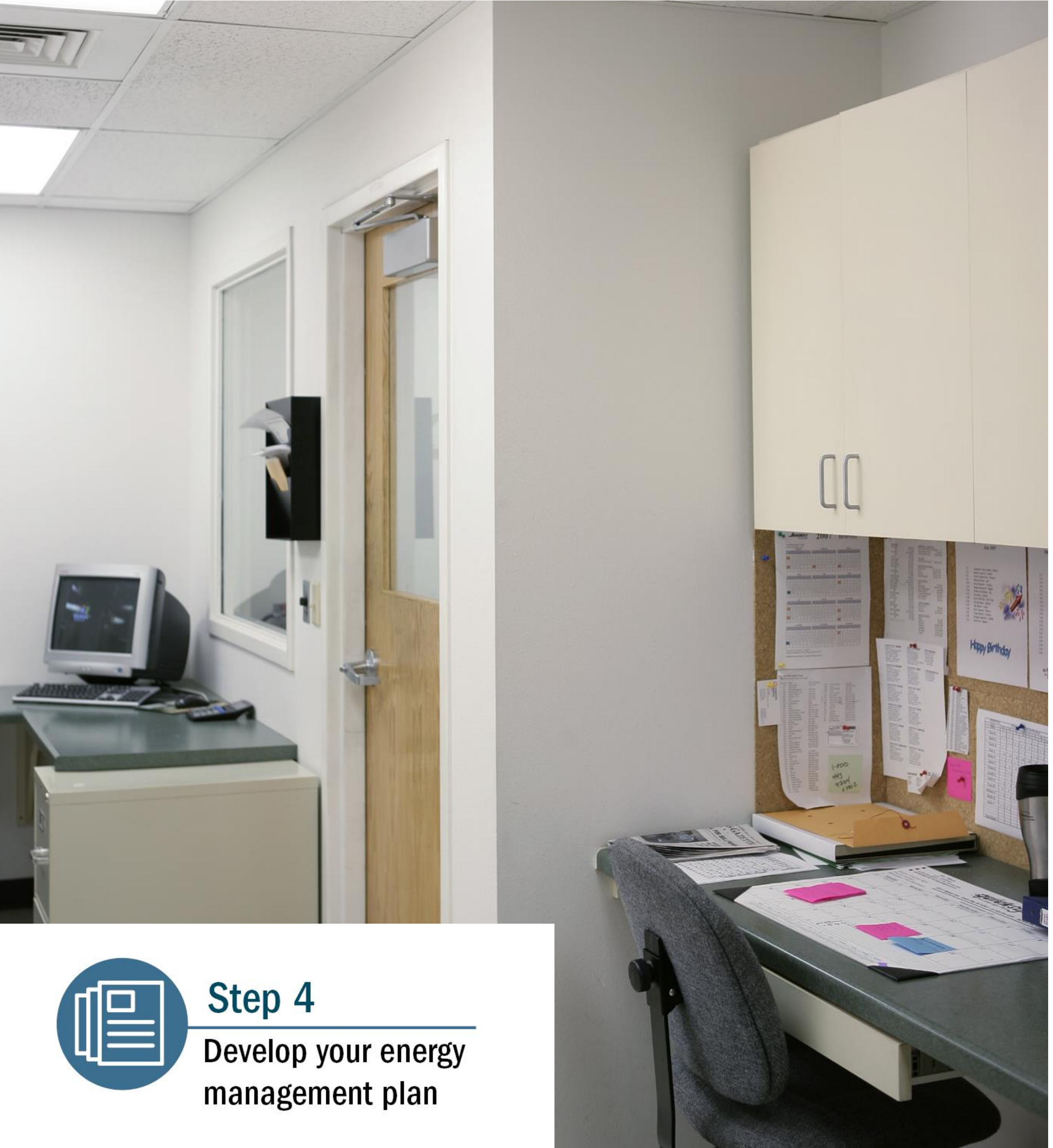
- $1.00 spent on preventative maintenance results in a savings of $5.00 on future maintenance for higher education

Source: State of Wisconsin, Department of Administration and the University of Wisconsin

Step 4

Develop your energy management plan

Low-cost/no-cost opportunities



Step 4

Develop your energy management plan

- Lighting:
  - Delamping
  - Occupancy sensors – restrooms
- HVAC:
  - Adjust set-points/schedules
  - Demand management
- Building envelope:
  - Caulking and sealing
- Retro-commission buildings

Low-cost/no-cost opportunities

- Occupant education
- Turn off/turn down:
  - Computer monitors
  - Overhead/desk lights
  - Smart boards
  - Charging stations
- Make energy a standard meeting agenda item AND create an energy team
- Focus on Energy's Energy Team Toolkit!

Step 4

Develop your energy management plan

Operation cost savings

- Calculated outside air reduction
- MERV 13 filters
- Hot water and boiler temperature setpoint
- Hours of operation:
  - Building automation system
  - Timers
  - Occupancy sensors

Step 4

Develop your energy management plan

Building Automation System (BAS)

- Goal:
  - Increased occupant comfort and energy savings
- BAS allows building operators to easily:
  - **Set-up** – Allow space temperature to increase during cooling months
  - **Setback** – Reduce space temperature during unoccupied heating months
  - **OA reduction** – Reduce outside air during unoccupied times
  - **Hot water reset** – Reduce hot water temperature during milder winter months
  - **Scheduling** – Review ventilation rates due to CDC or other recommendations
  - Consider retro-commissioning to refine these setpoints

Equipment improvement best practices

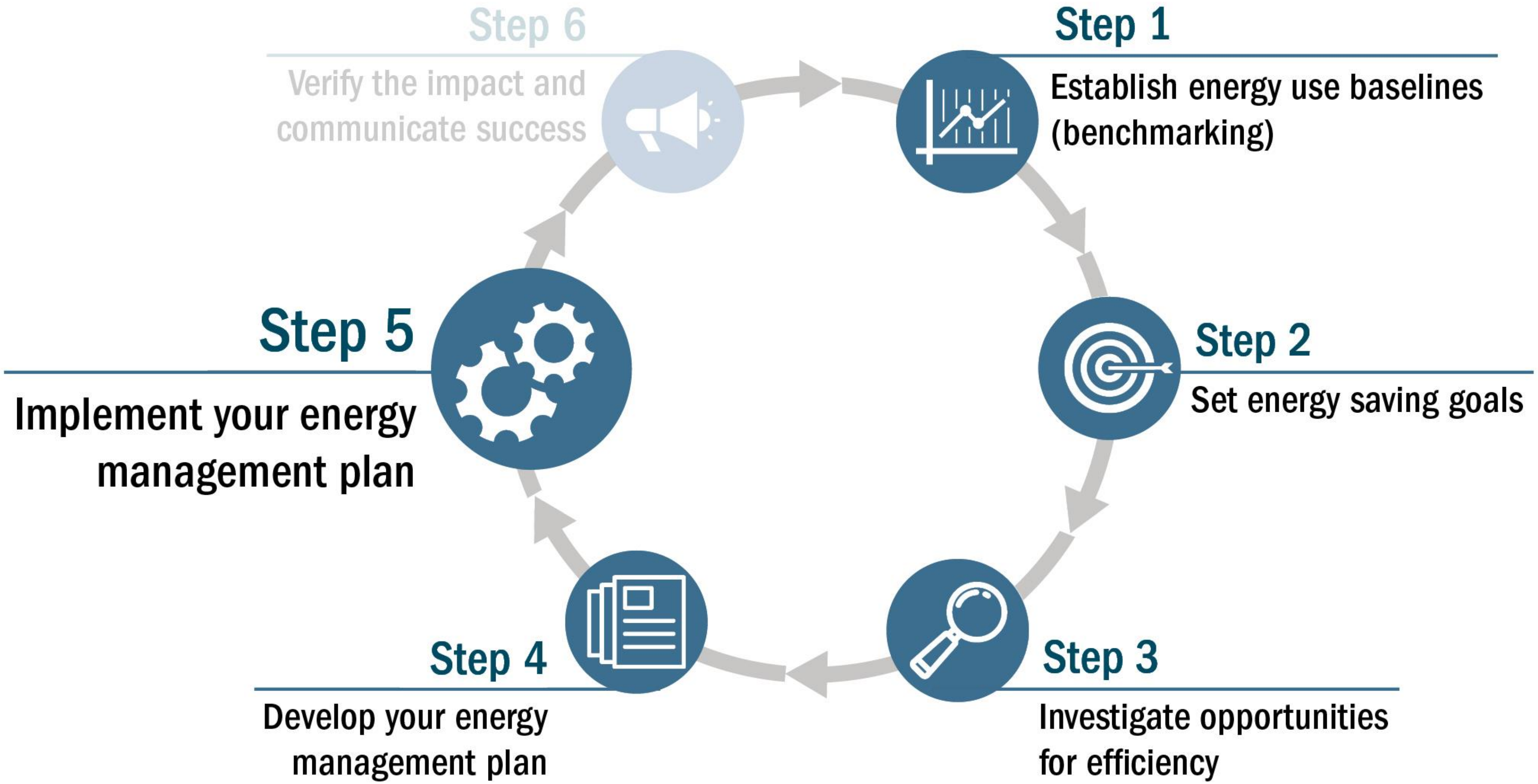
- LED lighting
- HVAC
- Office equipment
- Refrigeration
- Cooking
- Domestic hot water
- Miscellaneous loads

Step 4

Develop your energy management plan

20 Years

Step 5: Implement your energy management plan



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Verify the impact and communicate success

Gather and prioritize project opportunities

- Develop potential project list
- Estimate project costs
- Identify energy and non-energy benefits
- Prioritize project list
- Select project to present to management team

Project opportunities list

	PROJECT UPGRADE LIST	PROJECT MANAGER	PROJECT RECOMMENDED	PROJECT COMPLETED	IN-HOUSE (I) - BID (B)	ESTIMATED ANNUAL SAVINGS	ESTIMATED MEASURE TOTAL COST	ESTIMATED YEARS SIMPLE PAYBACK	ESTIMATED MEASURE LIFE	OPERATIONAL BUDGET	5 YEAR PLAN	FOCUS ON ENERGY INCENTIVE AVAILABLE	ESTIMATED INCENTIVE AMOUNT
1	Install DCV on gym AHU	JK	Y		B	$552	$1,500	2.0	10	Y	N	Y	$400
2	Convert classrooms to LED	JK	Y		I	$5,200	$26,800	3.9	18	Y	N	Y	$6,242
3	Install VFD on chilled H_20 pump	JK	Y		B	$634	$4,500	4.6	15	Y	N	Y	$1,600
4	Classroom AHU's to DDC	JK	Y		B	?	$63,000	?	15	N	Y	N	?
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													

Creating a business case

- Detailed project description
- Simple payback/financial analysis
- Implementation timeline
- Positive benefits and impact of project

Step 5

Implement your energy management plan

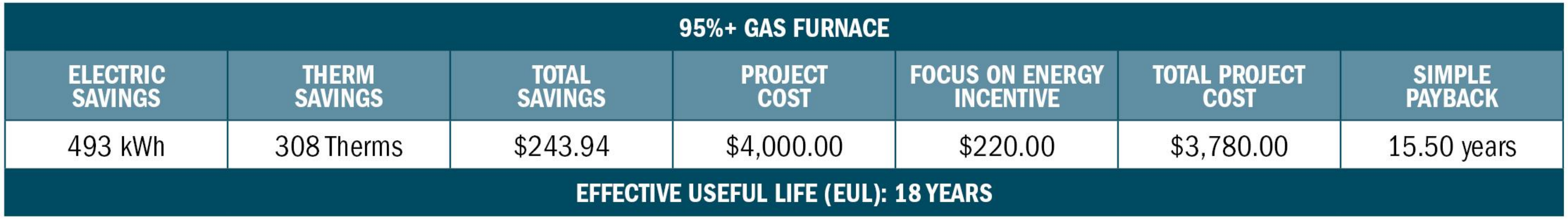
Simple payback

$$\frac{\text{Project cost} - \text{Focus on Energy incentive}}{\text{Annual energy cost savings}} = \text{Simple payback}$$

- Could include other factors for a more complete picture:
  - Maintenance savings
  - Annual increase in utility rates
  - Cost of deferring a different project

Financial analysis

- Annual savings ($)
- Simple payback calculation:
  - $\frac{\text{Net investment}}{\text{Annual savings}} = \text{Payback period}$
  - Use Focus on Energy as a resource



95%+ GAS FURNACE						
ELECTRIC SAVINGS	THERM SAVINGS	TOTAL SAVINGS	PROJECT COST	FOCUS ON ENERGY INCENTIVE	TOTAL PROJECT COST	SIMPLE PAYBACK
493 kWh	308 Therms	$243.94	$4,000.00	$220.00	$3,780.00	15.50 years
EFFECTIVE USEFUL LIFE (EUL): 18 YEARS						

Detailed project description

- Get to the point:
  - What do we need to do?
  - Why are we doing it?
  - How much will it cost?
  - What impact will it have?
- Timeline to complete
- Vendor proposal and references
- Equipment pictures
- Focus on Energy incentive or project buydown
- Positive contributions from project

Implementation timeline

Step 5

Implement your energy management plan

- Project milestones:
  - RFP preparation and release
  - Engineer/design contractor selection
  - Design and product selection
- Project timeline:
  - Equipment order dates
  - Installation timeframes
  - Project close out
  - Start-up/commissioning (if applicable)
  - Parties involved (or owner)

Positive benefits

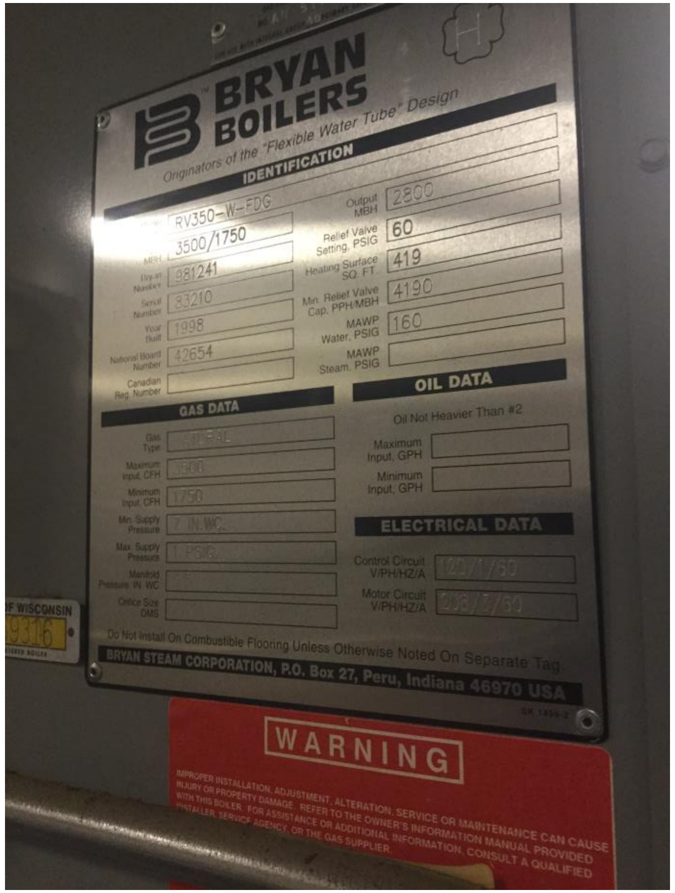
- Align with the organization's strategic priorities:
  - Building comfort
  - Safety and health
  - Reduce maintenance levels and duties
  - Overall building operations
  - Budget preservation

Step 5

Implement your energy management plan

Supporting materials

- Product literature
- Savings calculations
- Success stories from former projects




AHRI CERTIFIED®
www.ahridirectory.org

Certificate of Product Ratings

AHRI Certified Reference Number : 7492484 Date : 04-06-2020 Model Status: Active

Brand Name : LAARS

Series Name : MagnaTherm

Model Number : MGH3500I

Material : Stainless Steel

Location : Indoor

Fuel Type : Natural Gas; Propane Gas

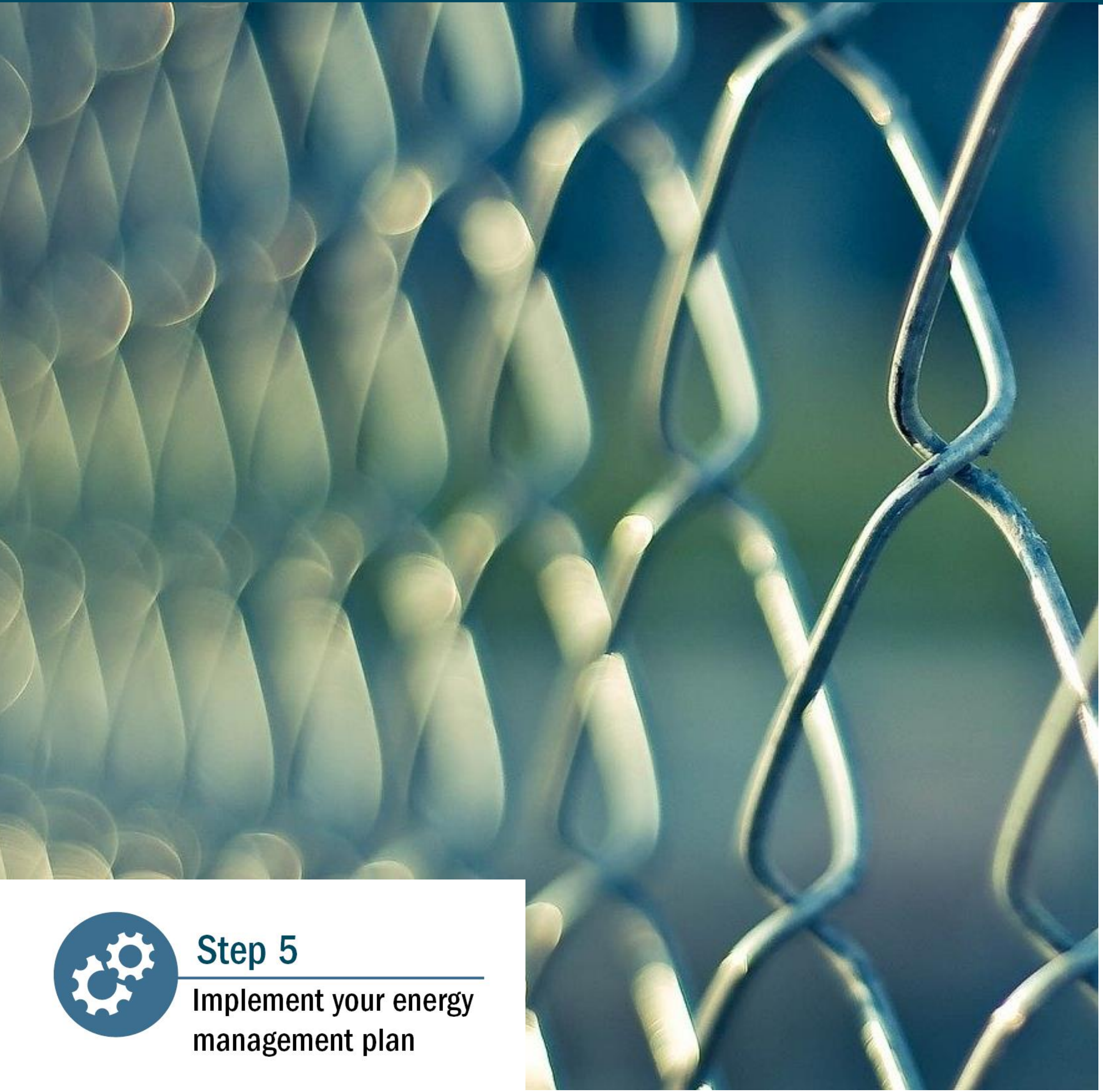
Input Rating, MBH : 3500

Input Rating, gph :

Gross Output (MBH) : 3276

Ignition Type : Intermittent/Electronic Ignition

Types of project resistance



- Misperception:
  - Lack of technology understanding – inform and educate
- Skepticism:
  - Not confident of facts – offer assurance through successful case studies

Step 5

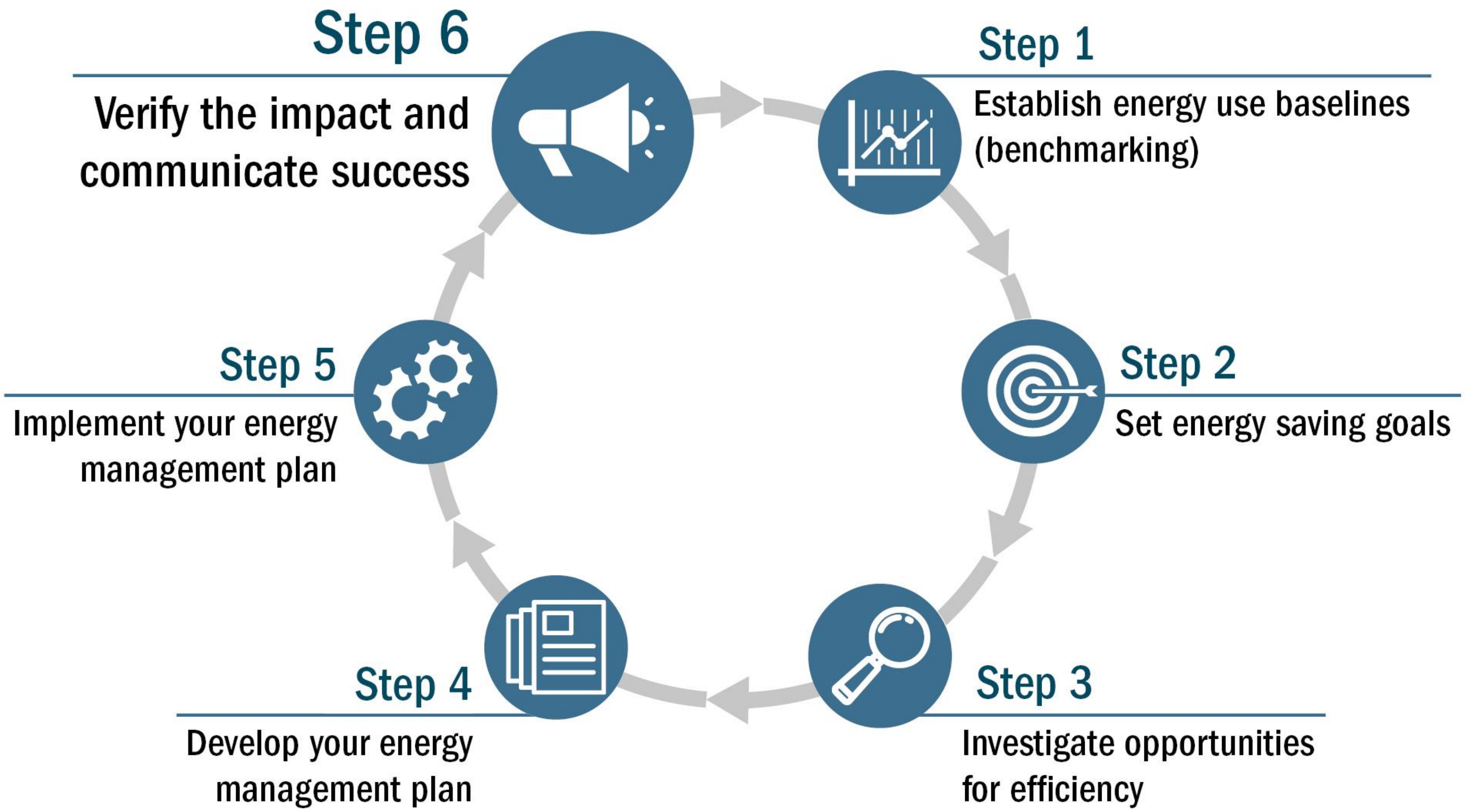
Implement your energy management plan

Resources for help

- Your energy team
- Focus on Energy
- Utility representative
- Vendors
- Peers
- Other resources:
  - www.epa.gov
  - www.energystar.gov

Step 5
Implement your energy management plan

Step 6: Verify the impact and communicate success



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Verify the impact and communicate success

Energy team background

Step 6

Verify the impact and communicate success

- Northeast Wisconsin Technical College (NWTC) serves 20,000+ students every year
- Formed its Energy Management Team in 2007
  - Comprises staff members and representatives from its local utility and Focus on Energy
  - Meets once a month both virtually and in-person

Energy savings

- Annual kWh savings
  - **900,000 kWh**
- Annual therm savings
  - **9,000 therms**
- Annual utility bill savings
  - **$80,000 per year**
- Able to power 100 Wisconsin homes for an entire year

Step 6

Verify the impact and communicate success

20 Years

Thank You.

888.623.2146

focusonenergy.com

20 years of saving energy for **Wisconsin.**

20 Years focus on energy®

Partnering with Wisconsin utilities