Course Name, Description, and Learning Objectives

Wastewater (1.5 Contact Hours)

- 7 Quick Wins (30 minutes)

  Energy is typically one of the largest operating expenses at municipal wastewater treatment facilities, accounting for up to 30% of the total operation and maintenance costs. This short online course introduces the 7 Quick Wins: a framework of operational improvements that can cut energy without requiring capital investment.

- Low and No-Cost Energy Saving Strategies for Wastewater Facilities (30 minutes)

  Energy is one of the largest operating costs at wastewater treatment facilities. The good news: significant savings are often hiding in plain sight — no capital investment required. This course walks through the highest-impact operational strategies that facilities across the country are using to cut energy use right now.

- Wastewater Facts and Figures Quiz (30 minutes)

  You don't need to memorize every number in the Wastewater Treatment Efficiency Facts & Figures sheet — you need to know how to use it. This quiz gives you practice doing exactly that. Each question references a table or formula, so keep your Facts & Figures sheet handy and work through the numbers. The goal is speed and confidence, not recall from memory.

Strategic Energy Management (SEM) (2.25 Contact Hours)

- Commitment (30 minutes)

  This module establishes what commitment to Strategic Energy Management (S.E.M.) looks like, so you can build the foundational structures needed to manage energy. These commitment structures are foundational because they are what you build the rest of your energy management program on.

- Performance (45 minutes)

  Strategic Energy Management (SEM) is more than a set of tools—it's a framework for turning energy goals into measurable results. This module focuses on the "Performance" element of SEM, where data becomes the driver of action and improvement.

- Engagement (30 minutes)

  Creating a culture of energy awareness and action requires more than equipment upgrades. This module walks through how to engage the people in your organization — and beyond — to build lasting momentum for your energy management program.

- Persistence (30 minutes)

  This module focuses on the Persistence element of SEM, which ensures that energy savings and SEM practices continue long after initial projects and support end. Without persistence strategies, even successful projects can lose impact over time.

- Target audience (wastewater operator level/grade) – Wastewater Operators / Plant Personnel
- Detailed curriculum outline – Attached PDF files
- Instructor qualifications and credentials – Page 3
- Delivery method and estimated contact hours – Online (.5 to.75 contact hours per course)
- Cost and registration information – Cost and registration will be included in participation of site training and course completion details will be sent at the end of the cohort.

Instructor Qualifications

Wendy Waudby, PE

Water and Wastewater Senior Engineer

Wendy Waudby is a resourceful and results-oriented engineer with experience in water and wastewater energy efficiency, treatment plant design, wastewater reuse, and wastewater financial management. She is an innovative engineer highly valued for her ability to convey technical requirements and solve complex problems with a positive approach, integrity, and professionalism.

Matthew Smeraglio, PE

Senior Engineer

Matt is an outstanding technical communicator and experienced energy efficiency engineer with in-depth knowledge of water and wastewater. He has delivered strategic energy management cohorts, capital studies, and recommissioning's. He strives to deliver excellent customer service and high quality technical work that helps Cascade Energy's industrial and municipal customers make sound business decisions based on accurate analysis and thorough review of all energy-saving opportunities. Having been with Cascade since 2009, he has worked as a project engineer and tune-up engineer serving additional industries including refrigeration, pulp and paper, food processing, and farming.

7 Quick Wins: Operational Energy Efficiency for Wastewater Facilities

Energy is typically one of the largest operating expenses at municipal wastewater treatment facilities, accounting for up to 30% of the total operation and maintenance costs. This short online course introduces the **7 Quick Wins**: a framework of operational improvements that can cut energy without requiring capital investment.

Upon completion, you will be able to:

- Identify opportunities in each of the 7 Quick Win categories
- Apply the 7 Quick Wins framework to achieve immediate results
- Document improvements to ensure they become standard practice

At the end of this training, you will be able to download a PDF that includes both ready-to-use implementation strategies for the 7 Quick Wins and a personalized action plan you've developed throughout the course for your specific facility.

1: Turn it off

Equipment doesn't always need to run 24/7. Sometimes things run continuously just because they always have—not because they need to. Turning equipment off when it's not needed is often the simplest Quick Win to act on, and the savings can add up quickly.

[Interactive Activity] Learners complete a custom interaction related to turning equipment off.

Where to look at your facility

Aeration systems Can you cycle aeration based on dissolved oxygen levels rather than running continuously? Some plants reduce aeration during lower flow and/or lower loading times. This directly reduces aeration equipment runtime and energy use.

Mixers Anoxic zone mixers often don't need continuous operation. You might be able to cycle them—15 minutes on, 15 minutes off—or turn them down during high-flow periods.

Lighting This is a common opportunity. Lights in pump rooms, offices, or seldom-used areas often stay on 24/7 out of convenience. Occupancy sensors or timers provide simple solutions.

Pumping equipment Sometimes pumps run more frequently than needed. They're turned on "just in case," but scheduled operation based on actual need saves energy. Grit pumps can often be cycled.

> The bonus? Running equipment less often typically extends its life and reduces maintenance costs—a double benefit.

[Reflection Prompt] Learners record a personal action item or observation about turning equipment off at their facility.

2: Tune it up

Maintenance is a good investment. When equipment drifts out of spec, filters get clogged, or sensors lose calibration, energy is wasted. Clean it, calibrate it, fix what's broken, and do it on a schedule — not when something finally fails.

[Interactive Activity] Learners complete a custom interaction related to tuning up equipment.

Are your pressure gauges accurate?

Every 2 PSI of unnecessary pressure costs about 1% in compressor power. Inaccurate gauges can lead to running systems at higher pressure than needed.

Are your DO probes accurate?

If your DO probe reads 0.5 mg/L lower than it should, your aeration system uses about 6% more energy than necessary. That's because your aeration equipment is working harder to achieve a setpoint based on a DO probe that is incorrectly showing a lower DO level than the actual DO level.

How do you know if your DO probes need more frequent cleaning? Clean your probe and check the reading. If it changes significantly—say from 2.0 to 2.1 mg/L—you need to clean more often. That 0.1 mg/L error is costing you money every single day.

What you can do to be proactive

Calibrate measurement points Uncalibrated sensors can indicate a setpoint is not being met, causing equipment to run harder, wasting energy without you knowing it.

Change filters regularly Dirty filters create friction loss. As debris builds up, pumps and blowers must work harder to maintain the same output, driving up energy consumption.

Optimize setpoints Review and adjust setpoints based on current operational needs. What made sense under different conditions may be wasting energy now.

Replace temporary fixes Band-aid fixes have a way of becoming permanent energy waste. Address the root cause to restore equipment to its designed efficiency.

> The key is having a preventative maintenance schedule, not just reactive maintenance. Clean and calibrate on a schedule, not when something obviously fails.

[Reflection Prompt] Learners record a personal action item or observation about equipment calibration and maintenance at their facility.

3: Fix the leaks

Every leak is money going to waste. Whether it's low-pressure compressed air hissing from a fitting in the blower building, water bypassing a worn seal on a pump, or treated effluent leaking from a failing valve — leaks represent pure waste.

High-pressure compressed air leaks

Compressed air is extremely inefficient to produce, so it's especially important to ensure every cubic foot serves a purpose. Any leakage represents energy you've purchased but can't use. A leak assessment identifies where your compressed air system is losing pressure and creates a roadmap for cost-effective repairs. Here are the two key steps:

Step 2: Detection Walk through your facility systematically to identify every point where compressed air escapes your system. There are specialized tools available to help with this process—Cascade can assist you with leak detection resources.

Step 3: Documentation Tag each detected leak with information about its size and location. This creates a complete inventory of your system's leak points and allows you to track which ones have been addressed.

> Not every leak needs immediate attention. Focus on quantifying the larger leaks and identifying which ones are easy to fix versus those that might be more complex or costly to repair. **Start with the small leaks that can be taken care of quickly for immediate savings.**

Aeration system leaks

For wastewater treatment facilities, aeration system leaks fall into two categories: visible leaks you can spot and fix easily, and hidden leaks in buried lines that silently drain your energy budget.

One wastewater plant discovered just how costly these hidden leaks can be. They were running two blowers—one over 200 HP plus a second unit—to meet their aeration needs, but massive leaks in their buried aeration lines were sending compressed air directly into the ground.

[Interactive Activity] Learners complete a custom interaction related to identifying and assessing aeration system leaks.

Intentional leaks

Many facilities have "intentional leaks"—water flows that serve no current purpose but continue running out of habit or oversight. Non-potable water systems could typically be controlled better. Extra, unnecessary non-potable water usage can increase flows through the treatment processes.

> Regular walking inspections can reveal obvious waste: water flowing where no process is occurring, systems left on after temporary use, or equipment forgotten after maintenance. **Ask yourself: "Why is this water running? What would happen if we turned it off?"**

[Reflection Prompt] Learners record a personal action item or observation about leaks at their facility.

4: Meet the load efficiently

Wastewater treatment facilities are designed to meet permit at average flow and loading conditions as well as peak conditions years in the future. Many types of equipment at wastewater treatment facilities are often operating at part-load operation, where the flows and loading are lower than the peak design capacity. It is often very inefficient.

[Interactive Activity] Learners complete a custom interaction related to part-load efficiency.

Strategies for meeting the load efficiently

Run your most efficient equipment more often Not all equipment performs the same, even if it looks identical. One wastewater plant had two blowers—they assumed the newer one was more efficient. After measuring with data loggers, they discovered the OLDER blower was actually 17% more efficient. By running the older blower more often, they saved $4,200 per year.

Right-sizing equipment Sometimes equipment gets oversized by accident. One lift station had a 60-horsepower pump—not because they needed it, but because that's what was in the storeroom when something broke. After installing a properly sized pump, they found a 10-horsepower unit met their needs completely—using far less energy in the process.

Staging strategy Running more equipment isn't always more efficient. Running two blowers at 40% capacity each might use MORE energy than running just one at 80%—yet many facilities do exactly that. One unit at higher capacity often outperforms two at partial load. Add a VFD for trim duty when loads fluctuate, and you have a system that actually matches what the process needs.

> Run your most efficient blower first, and let it operate at a higher, more efficient capacity before bringing a second unit online. Multiplying units doesn't multiply efficiency — it often does the opposite.

[Reflection Prompt] Learners record a personal action item or observation about load matching at their facility.

5: Question assumptions

"We've always done it that way" is not a good reason to keep doing it that way—especially when it comes to energy. Do you know the history behind every setpoint in your facility? Many facilities operate under assumptions that made sense at one time but may not anymore. The trick is to ask: "Why?"

[Interactive Activity] Learners complete a custom interaction related to questioning operational assumptions.

Questions to ask at your facility

- What are your critical process parameters? Why do you use specific pressure, flow, or VFD speed setpoints?
- How were these setpoints determined? Should they be changed?
- How closely can you meet the setpoints?
- Are competing setpoints optimized for the best overall outcome?
- Are your critical control gauges and transducers accurate?
- What is their calibration schedule?
- What is the impact on process control if they're not accurate?

[Reflection Prompt] Learners record a personal action item or observation about assumptions and setpoints at their facility.

6: Do it right the first time

The best time to get the controls and equipment features you need is before operations begin — changes become much more costly once a system is running. The key is thinking about what operational flexibility you might need. If it's a situation where flow could vary, then consider a VFD.

Mixers & VFDs

Mixers are typically designed to take settled solids and resuspend them. But once this happens, mixers are just keeping everything in suspension, which requires much less power. That's why it's great to have VFDs on your mixers to give you that flexibility.

This is especially true if you're using a mixer in a tank where the level fluctuates. When the tank has less water, you could have that mixer turned down. When the tank is fuller, you can run it faster.

> VFDs aren't always necessary. If a pump operates at constant flow, you don't need variable speed—just specify the right fixed-speed pump for that duty. VFDs make sense when loads vary significantly.

Tactics to avoid rework in wastewater treatment

- Equipment for a process should have enough turndown to operate efficiently at almost all flows and loads.
- Controls should allow operators to make adjustments — like adding cycling to equipment operation or adjusting pressure setpoints as needed.

[Reflection Prompt] Learners record a personal action item or observation about design and specification decisions at their facility.

7: Make it a habit

You've identified opportunities. You've made improvements. Now how do you make sure they stick? Many energy improvements fail over time — not because of equipment problems, but because changes aren't properly documented. When staff rotates or priorities shift, good practices get forgotten and energy waste creeps back in.

Proven strategies for creating lasting change

Document Standard Operating Procedures (SOPs) Once you implement an energy improvement, update your standard operating procedures to reflect the new approach. Your SOPs should answer:

- What changed (specific equipment, setpoints, schedules)
- Why it changed (energy savings, process benefits)
- How to maintain the change (step-by-step instructions)
- When to check or verify the change is still in place

Track and tag For ongoing issues like high-pressure compressed air leaks, create a tagging system:

- Tag the leak with severity, date found, and responsible party
- Track repairs systematically
- Monitor for new leaks regularly

Build awareness Train all staff on energy efficiency, and make it visible:

- Post energy use trends where everyone can see them
- Celebrate when targets are met
- Recognize team members who identify opportunities
- Include energy in shift handover discussions

Regular reviews Schedule monthly or quarterly energy reviews to:

- Review energy data and trends
- Identify new opportunities
- Update your opportunity list
- Report progress to management
- Adjust strategies as needed

[Interactive Activity] Learners complete a custom interaction related to making energy efficiency a habit.

[Reflection Prompt] Learners record a personal action item or observation about sustaining efficiency improvements at their facility.

Conclusion

Energy waste at wastewater facilities rarely comes from one big problem — it comes from dozens of small ones that nobody has stopped to question. The 7 Quick Wins give you a systematic way to find them, fix them, and make sure they stay fixed.

The 7 Quick Wins — Review

Turn it off Equipment that runs when it doesn't need to is pure waste. Turning equipment off when it's not needed is often the simplest Quick Win to act on, and the savings can add up quickly.

Tune it up When sensors drift and filters clog, your equipment compensates by working harder. Clean your DO probes, calibrate your instruments, and maintain on a schedule — not when something fails.

Fix the leaks Compressed air and water leaks are costing you money right now. Tag what you find, prioritize the biggest losses, and start with what's easy to fix.

Meet the load efficiently Most equipment is sized for peak demand, but rarely operates there. Measure what you actually need, run your most efficient equipment first, and match capacity to real load.

Question assumptions Setpoints that made sense years ago may not make sense today. Ask why every critical parameter is set where it is, and verify that the answer still holds.

Do it right the first time The key is thinking about what operational flexibility you might need. Specify VFDs where loads vary, right-size equipment, and avoid the cost of retrofitting later.

Make it a habit Savings don't persist on their own. Update your SOPs, track your energy data, and make efficiency part of your team's conversations.

Congratulations!

Well done. You now have a practical framework for finding and acting on energy waste. Pick one Quick Win, act on it, and document what you did. Each improvement makes the next one easier.

[Reflection Download] Learners download a personalized action plan PDF compiling their reflection responses from throughout the course.

Note: Blocks marked Interactive Activity, ➡ Transition, ✏ Reflection Prompt, and Reflection Download are delivered via Mighty and are not captured in this transcript. Contact the course author for Mighty block content details.

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Strategic Energy Management: Building Engagement for Success

Creating a culture of energy awareness and action requires more than equipment upgrades. This module walks through how to engage the people in your organization — and beyond — to build lasting momentum for your energy management program.

Upon completion, you will be able to:

- Explain why people engagement is essential to a successful SEM program
- Identify key energy influencers in your organization and describe how to engage them
- Select audience-appropriate engagement tactics for leadership, staff, and external stakeholders
- Describe tools such as energy boards, posters, stickers, tags, and campaigns that support ongoing engagement
- Build an engagement strategy using Gazebo to track tactics as projects in your opportunity register

Welcome to Strategic Energy Management: Building Engagement for Success. In this module, you'll discover how to create a culture of energy awareness and action throughout your organization.

Before we begin, take a moment to review the "Lasting Change Process" and consider how all the elements of your strategic energy management efforts connect. Engagement is a critical element in this process and is key to achieving your strategic outcomes.

Lesson 1: People or Equipment?

So what helps you reach your goals — people or equipment? A well-tuned building management system can optimize energy and operations. But without tracking and people acting on the data, it's just noise. Equipment alone doesn't manage energy. Engagement does.

Because many energy-saving improvements require staff behavioral changes, engaging organizational support and participation is key to changing your facility's culture on energy use. But the benefits go beyond energy savings. Engaged employees are more satisfied, more likely to stay, and help make your organization more competitive.

Lesson 2: Building Support for Your Energy Management Program

The goal of engagement is to build support for your energy management program. You do this by interacting with people in a way that connects their "Why?" with guidance on the "How?". The steps to achieve this goal are:

- **Engage** — Connect with individuals and explain why energy management matters
- **Educate** — Help people understand their role and how they impact energy performance
- **Empower** — Give people the tools, information, and authority to act
- **Re-Energize** — Reinforce ongoing participation through recognition and fresh initiatives

You Can't Do This Alone

As you begin your SEM journey, you don't need to reinvent the wheel. Chances are, your facility has already built engagement around areas like safety, production, or quality. Think back to those efforts. What worked well to get people involved? What didn't gain traction? Those lessons can help guide what you do next.

What Does an Engaged Individual Look Like?

Typically, an engaged individual shares these common traits:

- **Aware** — They know about the energy management program and its goals (the "Why?")
- **Knowing** — They understand they have a role to play because they impact energy performance
- **Empowered** — They are equipped to take steps to support the program
- **Recognized** — Their contributions are acknowledged and celebrated

Remembering Your 'Why?'

Leading with why you're doing something instead of what you're doing makes it easier to inspire and move people to act. Now think about what really motivates your team. Financial investment, job security, year-end bonuses — those matter. But what about deeper drivers? Personal commitment. A passion for sustainability. Pride in their brand. When you understand what fuels your team, you unlock powerful ways to engage them and drive meaningful energy outcomes.

What Level of Engagement Are You Looking For?

Not everyone needs the same level of engagement. Your energy team needs deep involvement, while general staff may only need basic awareness. Consider how much detail you need to share and what role each audience will play. Are they hands-on in your efforts? Will they need training? Are you asking for their feedback? Knowing the answers to these questions will help you craft an engagement message more effectively.

Lasting Change Requires Supportive Policies

Voluntary action is a great start. But lasting engagement takes policy. Some examples might be updated job roles, improved signage, or edits to employee manuals. Some organizations go further and connect energy use, ESG reporting, and ISO 50001 to their brand identity as a way to attract talent, invest smart, and stay competitive.

Lesson 3: Who Are You Hoping to Engage?

Who are you hoping to engage in a strategic energy management program? Different roles require different approaches, messages, and levels of involvement.

Audience: Leadership

Leadership buy-in is key. When leadership understands the "why" behind SEM and supports your elevator pitch, it signals that energy management is a priority. Their role is to support the team, allocate time and budget, and help communicate energy goals. Recognition from leadership also boosts motivation.

Once leadership is on board, ask them to make an announcement. They can share the elevator pitch, the "why," and the energy policy and goals. Encourage them to end with a clear ask: invite feedback, encourage action, and let people know their involvement is expected.

Audience: Energy Influencers

Certain roles in your organization have outsized influence on energy performance:

- **Operations, maintenance, and facilities staff** impact day-to-day efficiency. Their decisions shape how equipment runs and where low- and no-cost improvements can be made.
- **Design and procurement teams** lock in future energy use. Their decisions impact the efficiency of new equipment and buildings, inform suppliers and contractors, and evaluate projects on lifecycle costs.
- **Culture drivers** have a significant impact on organizational culture, giving them the ability to engage and influence others.

The easiest way to connect with energy influencers is through conversation — nothing formal, no PowerPoint slides, just talk. Focus on your program's "why" and clearly ask for their support. Provide training that fits their role, share reminders and SOPs, and make it easy for them to act by identifying and removing barriers.

Audience: Organizational Staff

Everyone in your organization influences energy performance. To reach your goals, you need broad awareness and participation. Announce your energy management program and keep people informed with regular updates. Create multiple ways for staff to ask questions, provide feedback, and get involved. Make sure some messages come from leadership — that signals energy is a priority.

Audience: External Stakeholders

Who outside your organization influences energy performance? Some stakeholders just need general awareness — similar to hotel signs reminding you to reuse towels, subtle cues can nudge behavior. Others can be more actively involved. Be proactive with utility partners, suppliers, and contractors. These relationships and agreements can help you meet energy goals and compliance requirements.

Audience: Utility Providers

Most utilities offer financial support for energy projects and provide technical expertise to help identify and launch initiatives. Their efficiency program metrics often depend on customers like you delivering measurable savings. Your account representative or energy efficiency contact should be a go-to resource — ask what support they can offer and bring ideas forward.

Audience: Government Programs

State and federal programs also offer valuable support. Agencies like the Department of Energy run frequent competitions and are actively looking for demonstration projects. Programs like DOE's Better Buildings and the EPA's clean energy initiatives can provide technical expertise, project funding, and public recognition. If you're not sure where to start, ask your SEM coach how to get connected.

Lesson 4: Choose Tactics to Fit Your Audience

You've done your research. You know who you want to engage and why. Now think about how to reach them effectively. The following tactics are designed to make energy visible, actionable, and part of your everyday culture.

The Energy Board

One of the most effective tools for promoting energy management is the energy board. Whether physical or digital, it makes your achievements visible and reinforces the fundamentals of SEM:

- **Commitment** — reflected through clear goals and defined team roles
- **Improvement** — shown through project lists and campaign updates
- **Performance** — tracked using graphs, dashboards, or progress bars
- **Engagement** — built into the board itself, especially when it includes space for feedback, ideas, or celebrating success
- **Persistence** — emphasized by linking efforts back to long-term goals and reminding staff that energy management is ongoing

> The board doesn't need to be complex. Even a rotating display monitor can highlight specific initiatives with targeted messaging.

Engagement Posters

Consider how safety is handled in most industrial facilities — it's consistently prioritized, with space carved out in meetings and messaging displayed throughout the site. We can apply the same approach to energy. By making energy use and greenhouse gas emissions more visible through posters and signage, we can encourage broader participation in energy-saving actions.

There are many poster templates available online from state and federal agencies, covering both commercial and industrial settings.

Stickers

Stickers are a practical tool for encouraging energy-saving actions. When placed directly on equipment, they serve as timely reminders at the point of use. They make it easier for employees to respond in the moment and contribute to energy goals without needing additional instruction.

Shut-it-off stickers provide clear guidance on whether equipment can be powered down safely. These visual cues eliminate uncertainty and empower staff to act with confidence.

Opportunity Tags

Opportunity tags provide employees with an easy way to flag equipment that needs attention. Each tag includes a tear-off portion for submitting to the energy team. Be sure to set a clear drop-off point, like a suggestion box, and recognize every submission. Even if the idea isn't used, their effort matters.

Discussion Cards

Discussion cards are a simple way to bring energy topics into everyday conversations. They help explain the "why" behind energy-saving actions and encourage critical thinking. Use them during recurring meetings to spotlight energy and invite idea sharing.

Focused Campaigns

To keep energy engagement fresh, consider adding short-term campaigns alongside your ongoing efforts. These focused initiatives can spark new ideas, highlight specific behaviors, and re-energize your team. Each campaign is easy to launch and can be tailored to your facility.

[Interactive Activity] Learners complete a custom interaction related to choosing engagement tactics for their facility.

[Reflection Prompt] Learners record a personal action item or observation about engagement tactics they plan to use.

Conclusion: Make Energy Engagement Part of Your Culture

Energy engagement isn't a one-time event. It's a series of actions that build awareness, drive behavior, and support long-term goals. You've explored tactics like posters, stickers, tags, discussion cards, and focused campaigns — all designed to make energy visible and actionable. You've also considered your audience, their motivations, and how to tailor engagement to fit your facility's culture.

Now it's time to choose your tactics, add them to your opportunity register in Gazebo, and start tracking progress.

> Remember: small actions add up. Keep the momentum going and make energy engagement part of your everyday culture.

Congratulations!

Well done. Successful facilities have something in common: the willingness to engage their people early, communicate the "why," and steadily build a culture where energy management is everyone's responsibility.

Note: Blocks marked [Interactive Activity], [Transition], [Reflection Prompt], and [Reflection Download] are delivered via Mighty and are not captured in this transcript. Contact the course author for Mighty block content details.

Strategic Energy Management: Commitment

This module establishes what commitment to Strategic Energy Management (S.E.M.) looks like, so you can build the foundational structures needed to manage energy. These commitment structures are foundational because they are what you build the rest of your energy management program on.

Upon completion, you will be able to:

- Explain what Strategic Energy Management is and why a strategic approach is necessary
- Describe the four foundations of S.E.M. commitment: elevator pitch, energy policy, energy goal, and energy team
- Draft an elevator pitch that communicates your reason for pursuing energy efficiency
- Identify the key elements of an effective energy policy
- Write a clearly defined energy goal using the four required components
- Describe the roles and characteristics of a well-functioning energy team

Welcome! In this module, we establish what commitment to Strategic Energy Management looks like so you can build the foundational structures to manage energy. We begin with a high-level recap of S.E.M., then dive into the four foundations of commitment: your elevator pitch, energy policy, energy goal, and your energy team. After this session, you should gain an understanding of the connection between these foundational structures — structures that apply not only to managing energy, but also to managing other sustainability initiatives such as greenhouse gas emissions.

Lesson 1: What Is Strategic Energy Management?

S.E.M. is about developing and executing a strategic plan to achieve and sustain energy goals over the long term. A key point to remember: it's not a one-off project, though projects are part of it. Instead, energy management is about establishing a robust plan so that you can continue to reap energy saving benefits well into the future.

One way to think about this is to correlate S.E.M. to a safety program. Sites with safety programs are committed to keeping their employees safe and direct resources towards doing so. They have safety goals, committees, and continuously elevate the importance of a safe workplace. We want to accomplish the same with energy efficiency — creating a program where everyone understands why it is relevant, why they should be involved, and what success looks like.

Ad Hoc vs. Strategic Approach

One way to understand S.E.M. is by contrasting an ad hoc approach with a strategic one. In an ad hoc approach, energy costs rise, management reacts, cuts some waste, and costs come down — but with no strategic measures in place, costs rise again. You end up in a cyclical pattern of reactive, unmanaged energy spending.

When you take a strategic approach, energy costs look very different over time. Low- and no-cost savings measures are identified and sustained. Capital-grade projects deliver additional savings. And over the long term, S.E.M. results are baked into the culture of an organization, generating even more savings.

Benefits of S.E.M.

There are many reasons to participate in an S.E.M. program. Some common ones include:

- Reducing energy costs and greenhouse gas emissions
- Increasing customer and employee satisfaction
- Strengthening your brand and competitive position
- Contributing to global sustainability efforts
- Freeing up resources for your core mission

> Take a moment to think about your reason for participating in S.E.M. and the strategic outcome you hope to achieve. Write it down — you will revisit it when developing your elevator pitch.

Lesson 2: The Lasting Change Process and Commitment

One of the most important things early in this program is defining what success looks like as a target outcome. The "Lasting Change Process" helps you understand where you are in building an energy management program. Its phases are covered in depth throughout the program through online trainings.

Start at commitment. As with any initiative, demonstrating commitment to S.E.M. at your organization is key to its success, including the achievement of your goals.

The Four Foundations of Commitment

When committed to S.E.M., your organization forms an energy team and provides them with the resources needed to achieve your energy efficiency goal. This commitment is achieved through four aspects:

- **Elevator pitch** — Your clear, concise reason for pursuing energy efficiency
- **Energy policy** — A formal, documented directive on how to implement energy management practices
- **Energy goal** — A tangible target that defines what success looks like

- **Energy team** — The people responsible for building and sustaining the S.E.M. program

Your pitch, policy, goal, and team are all connected and flow from one another. These four aspects will likely look different at each organization, as they depend on available resources and organizational culture. Build an energy management program that works best for you.

Lesson 3: The Elevator Pitch

The first foundation of S.E.M. commitment is the elevator pitch. Imagine yourself in an elevator next to someone you want to do business with. You have 30 seconds between stops to make your case. The elevator pitch is your script for that brief moment.

In S.E.M., your elevator pitch sets the tone and reasoning for why you are building an energy efficiency program. Having your "why" clearly defined ensures the purpose is accessible whenever someone asks why you're investing time and effort in this program.

Who Is the Pitch For?

The elevator pitch is used to sell S.E.M. internally — to upper management, leadership, and colleagues at your site. Since you'll be asking for their help, it's crucial that colleagues understand how energy efficiency is relevant and beneficial.

Questions to Guide Your Pitch

When developing your elevator pitch, ask yourself:

- Why are we doing this, and why is it worth spending time on?
- What is the strategic direction we're striving for? Are there related goals?
- What challenges is our organization currently facing, and how could S.E.M. help?

For example: if your driving force is reducing operating costs, the benefit could be freeing up resources for your core mission. If your goal is reducing your environmental footprint, S.E.M. can help you contribute to global sustainability and impress current and future customers.

Writing Your Pitch

Start with: *"Strategic energy management will benefit our organization by…"* and fill in your reasoning. Your pitch may be adjusted depending on who you're speaking with, but the goal is always to help people understand that S.E.M. is a worthwhile effort that benefits your organization.

[Interactive Activity] Learners complete a fill-in-the-blank exercise to develop their elevator pitch.

[Reflection Prompt] Learners record their elevator pitch for future use.

Lesson 4: The Energy Policy

An energy policy is how you formalize your organization's commitment to energy management best practices. It is a structured, documented directive on how to implement energy management practices — communicating to your organization that managing energy is important and that you are fully committed to energy efficiency.

The energy policy should be vetted and approved by leadership. Upper management ultimately has the responsibility and authority to enact policies, so their buy-in is key. The policy becomes the bedrock of your S.E.M. program — a roadmap for those who will implement it day to day.

Key Elements of an Energy Policy

The following elements are grounded in ISO 50,001 standards for global energy management best practices. As you review them, think about which may already be in place at your organization:

- **Continuous improvement** — Commit to improving energy performance over time, not stagnating
- **Efficiency practices** — Commit to regularly evaluating and improving how your program operates
- **Energy goals and targets** — Set objectives, establish numerical targets, and track progress
- **Legal and voluntary compliance** — Adhere to applicable climate, carbon, or emissions requirements
- **Efficient design and procurement** — Ensure people making purchasing and design decisions are part of your program
- **Adequate resources** — Ensure sufficient people, time, and budget are allocated by management

How to Write Your Policy

Start by checking whether you already have an energy policy, or any related policies on greenhouse gas emissions or sustainability — corporate may have more information. Use existing policies as a foundation to avoid reinventing the wheel.

If you don't have existing policies, use the examples and template provided in this course (available in Resources). Once drafted, share the policy with leadership for approval, then communicate it broadly — at company meetings, via email, and in newsletters.

> S.E.M. is about continuous improvement. Your first draft doesn't need to be the final draft. Keep it simple at first and revisit, revise, and improve it over time.

Structuring Your Policy Around the Lasting Change Process

A simple energy policy can be structured to align with the five foundations of the Lasting Change Process:

- **Commitment** — Outline leadership buy-in and resource commitment
- **Improvement** — Commit to finding and implementing energy saving opportunities

- **Performance** — Define and establish metrics; track and share progress
- **Engagement** — Collaborate with others throughout the organization
- **Persistence** — Ensure efforts continue through continuous improvement and reflection

[Interactive Activity] Learners review two example energy policies and identify key elements.

[Reflection Prompt] Learners note which policy elements are already in place at their organization.

Lesson 5: The Energy Goal

An energy goal is a tangible target that succinctly summarizes what success looks like for your S.E.M. program. It is a picture of your success and what you hope to achieve. Your goal stems directly from your reason for pursuing energy efficiency and from your energy policy — making your policy more actionable and giving you something concrete to aim for.

Energy goals are also great engagement tools. By announcing your goal and sharing progress, you can leverage it to engage and motivate your organization.

What Makes a Good Energy Goal?

- **Flows from your energy policy** — Your goal and policy must remain consistent with one another
- **Easy to measure** — The data used to track progress must be accessible, meaningful, and accurate
- **Developed by the right people** — Include those who heavily influence energy consumption
- **Supported by management** — Leadership sets priorities and provides resources; their buy-in is crucial
- **Has a clear owner** — Someone must be ultimately accountable for meeting the goal
- **Clearly defined** — All four components (see below) must be present

The Four Components of a Clearly Defined Goal

- **Measure of success** — What variable are you trying to impact? (e.g., total electricity consumption)
- **Target** — How do you want this measure to change? (e.g., 5% reduction)
- **Baseline** — A reference time period to compare your results against
- **Timeline** — A clearly defined end point for when you want to achieve your target

> Example goal: "Reduce electricity consumption 5% compared to a 2024 baseline, by the end of 2025." Your wording may vary, but all four components should be present.

What Variables Will You Track?

There are many variables you might consider. The key is to determine what metrics you already use and which would be most applicable to your organization. Common options include:

- Total electricity savings / percent electricity savings
- Energy cost savings
- Energy spent per production unit
- Greenhouse gas emission reduction

[Interactive Activity] Learners select which variables they would track and write their own energy goal.

[Reflection Prompt] Learners record a draft energy goal for their facility.

Lesson 6: The Energy Team

An energy team is a group of people brought together and assigned the responsibility of building an S.E.M. program to achieve an energy efficiency goal. The energy team is one of the most important resources needed to achieve your goal — responsible for monitoring progress, finding savings opportunities, engaging the wider organization, and ensuring the program continues well into the future.

To build your energy team, identify those who understand why you are pursuing S.E.M. and who have the knowledge, means, and authority to implement your energy policy.

Three Key Roles on the Energy Team

Executive Sponsor Oversees the energy team, establishes high-level goals for the energy management program, and works with top management and leadership to approve resources and funding for energy efficiency projects.

Energy Champion In charge of day-to-day activities of the S.E.M. program. Responsible for keeping the program and team on track and moving forward.

Data Lead Responsible for collecting and managing important program data such as utility bills and production metrics.

Who Should Be on Your Team?

When creating your energy team, a few questions help identify whose involvement is critical:

- Who at the higher levels of your organization is accountable for your energy goal?
- Who has the authority to allocate resources — time, people, and money — toward the energy goal?
- Who needs to be represented due to their influence on energy consumption?

For example: if HVAC accounts for 60% of your energy use, you want HVAC personnel on the team. If production is your primary energy driver, a production supervisor is essential.

Characteristics of a High-Functioning Team

- **Small and engaged** — Smaller teams often move faster and build momentum more quickly; bring in others on an as-needed basis
- **Clearly defined roles** — Each member knows their responsibilities and is accountable to the energy goal
- **Cross-functional representation** — Depending on your goal, members may come from varied parts of the organization
- **Redundancy** — Identify backups so that losing one person doesn't derail the effort
- **Active executive sponsor** — Sponsors supply resources; their engagement is key in securing what the team needs
- **Regular meetings** — A recurring team meeting with a fixed agenda drives efficiency efforts forward

[Interactive Activity] Learners identify who should fill team roles at their organization.

[Reflection Prompt] Learners record a plan for building their energy team.

Conclusion: Communicating Your Commitment

Once you have all four foundations of commitment — your pitch, policy, goal, and team — communicate this commitment across your organization. A successful S.E.M. program requires broad awareness of all four. Sharing your commitment is a fantastic start.

Today you learned the four fundamentals of S.E.M. Commitment and how they connect:

- Your **elevator pitch** defines the reason why you are pursuing S.E.M. and how energy efficiency will benefit your organization
- You expand upon your pitch to create your **energy policy**, which outlines specific actions and sets team priorities
- Your **energy goal** provides a tangible marker for success, and must remain consistent with your policy
- Your **energy goal** is achieved through the focused efforts of your **energy team**

> Throughout your trainings, you will learn more ways to engage colleagues and advance your S.E.M. program. Sharing your commitment is the foundation everything else is built on.

Congratulations!

You've completed the Commitment module. Before exiting, take a moment to reflect: what are the key lessons you've learned? What points stood out to you the most? Each of the four foundations — pitch, policy, goal, and team — now gives you something concrete to build on as you move forward in your S.E.M.

journey.

Note: Blocks marked [Interactive Activity], [Transition], [Reflection Prompt], and [Reflection Download] are delivered via Mighty and are not captured in this transcript. Contact the course author for Mighty block content details.

Low and No-Cost Energy-Saving Strategies for Wastewater Facilities

Energy is one of the largest operating costs at wastewater treatment facilities. The good news: significant savings are often hiding in plain sight — no capital investment required. This course walks through the highest-impact operational strategies that facilities across the country are using to cut energy use right now.

Upon completion, you will be able to:

- Identify low or no-cost energy-saving opportunities applicable to your facility operations
- Calculate potential energy savings using provided rules of thumb
- Develop an action plan with at least two specific operational changes to implement at your facility

At the end of this training, you will be able to download a PDF that includes your personalized action plan compiled from your reflections throughout the course.

Introduction: Hidden Savings in Plain Sight

You're probably already working hard to keep your facility running smoothly while managing tight budgets and staffing. What you may not realize: there are often thousands of dollars in annual energy savings available through adjustments to how you're already operating.

This course covers five operational focus areas where facilities consistently find savings:

- **Control & Optimize DO Levels** — Aeration is typically 50% of your energy bill. Probe accuracy and setpoint control matter more than most operators realize.
- **Control & Minimize Blower Discharge Pressures** — Are your blowers running at the minimum pressure needed? Is your control system actually doing what you think it's doing?
- **Optimize Pumps & Pumping** — Wet well level directly affects pump energy. Small changes in operating level can yield measurable savings.
- **Optimize RAS Pumping** — RAS pumps are sized for peak flow but rarely need to run that way. Switching to flow-paced RAS is a proven path to savings.
- **Non-potable Water: Flow & Pressure** — Seal water flows, over-pressurized systems, and intentional leaks are costing you money around the clock.

[Transition] Transition to Lesson 2.

Lesson 2: Control & Optimize DO Levels

At most wastewater treatment facilities, aeration is the single largest energy user — typically **50% of total electricity consumption**. Small improvements here have big impacts.

The DO probe problem

A DO probe reading just 0.5 mg/L low forces your blowers to work harder than the process actually requires. Most facilities operate with a DO setpoint around 2.0 mg/L. If your probe is reading low, your blowers are compensating for a problem that doesn't exist.

[Interactive Activity] Case study: The DO Probe Surprise — learners review how one facility's buildup-covered probes were driving unnecessary blower energy.

Case Study: The DO Probe Surprise

A facility discovered that a small DO probe error was quietly driving up blower energy use. Their probes were reading 0.5 mg/L lower than actual, forcing blowers to run harder than necessary. When the team cleaned the probes, readings jumped from 2.0 to 2.5 mg/L — proving that buildup was the culprit. By establishing a regular cleaning and calibration schedule, the facility eliminated unnecessary energy waste with no equipment upgrades and no capital spend.

Rules of thumb: DO levels and blower energy

Saturated DO The dissolved oxygen in your aeration basin is the driving force for oxygen transfer. Raising that driving force lowers blower energy. More saturated DO = less blower work.

DO rule of thumb A 0.5 mg/L reduction in average DO level creates approximately **6% energy savings** at the blower.

DO calibration & cleaning A probe reading 10% low (e.g., reading 2.0 when actual is 2.2) costs you **2.4% more energy** at the blower — every day.

DO and temperature As mixed liquor temperature increases, the impact of elevated DO levels increases. Facilities at higher temperatures or elevations have even more to gain from DO optimization.

[Interactive Activity] Impact of DO Levels on Energy — learners use a reference table to find energy savings potential based on their mixed liquor temperature and current DO setpoint.

Using the DO impact table

Find your average mixed liquor temperature, then your starting DO setpoint. The intersection shows your savings potential if you reduce to 2.0 mg/L. For example, at 2°C (36°F) with a starting DO of 3 mg/L, potential savings are **8.5%**.

> Savings calculations are based on typical operating conditions. Actual savings will vary depending on your system configuration, equipment capabilities (including turndown performance), DO setpoints, and loading conditions.

[Interactive Activity] Case study: Lagoon Aerators That Didn't Need Full Power — learners review how one facility left energy savings on the table after installing VFDs.

Case Study: The Lagoon Aerators That Didn't Need Full Power

A juice processing facility installed VFDs on their lagoon surface aerators during a capital project — then kept running them at 100% speed. Once they focused on energy savings, they reduced one 75 hp aerator and one 50 hp aerator from 60 Hz to 50 Hz, and shut off a third 50 hp aerator entirely. Annual savings: **340,000 kWh — $17,000 per year**.

> Turning off one 50 hp aerator avoids roughly 278,000 kWh annually — the equivalent of removing about 44 gas-powered cars from the road for a year.

[Reflection Prompt] Learners record a personal action item or observation about DO control and aeration efficiency at their facility.

Lesson 3: Control & Minimize Blower Discharge Pressures

Beyond DO probe accuracy, look at your blower operation. Are your blowers running at the minimum discharge pressure required? Are your controls actually programmed the way you think they are?

Case Study: The Blower Speed Mix-Up

At one facility, the control team was told blowers could go down to 33% speed. But when the programming was done, someone entered **33 Hz instead of 33%**. At 60 Hz = 100% speed, 33 Hz is actually over 50% speed. The facility was unknowingly operating at more than twice the intended minimum. Once discovered, they optimized the control system and captured the savings they'd designed for.

The lesson: **Check your control system.** What the programmer intended and what the system is actually doing may not match.

[Transition] Transition prompting learners to think about their own blower controls before moving on.

[Reflection Prompt] Learners record a personal action item or observation about blower discharge pressure and control system verification at their facility.

Lesson 4: Optimize Pumps & Pumping

Your influent pumps work against two forces: **static head** (the vertical distance the pump must lift water) and **friction losses** (resistance in pipes and fittings). Here's what many operators don't immediately consider: the water level in your wet well directly affects how hard your pump works.

How wet well level affects pump energy

Imagine your pump discharge is 20 feet above the pump centerline. If your wet well water level sits 5 feet above the pump centerline, your actual static head is only **15 feet** — the inlet water level gives the pump a running start.

Now imagine you raise the wet well level by just 1 foot. Static head drops from 15 to 14 feet — a **7% reduction**. Since pumping power is directly proportional to both flow and head, a 7% reduction in head produces roughly a **7% reduction in energy** — even with the same flow.

[Interactive Activity] How We Calculate This — step-by-step walkthrough of the static head and pump energy calculation.

> This strategy works best when static head is the dominant component of your total head. If friction losses are significant at your facility, the energy savings from raising your wet well level will be smaller.

Three facilities, three success stories

The Wet Well "One Foot" Fix A pulp and paper mill raised their wet well level 1 foot during warm months and ½ foot during cold months (accounting for higher stormwater risk in winter). Annual savings: **35,000 kWh — $2,100.** Zero equipment cost.

RAS Wet Well Level Raised 2 Feet Another facility raised their RAS wet well level by 2 feet. Annual savings: **11,000 kWh — $660/year.** Small savings add up.

The 8-Foot Difference A wastewater treatment facility raised their wet well level an average of 8 feet and optimized their in-house controls as part of a broader flow equalization effort. Annual energy cost savings: **$25,000/year.**

How to get started safely

Start conservative:

- Try raising wet well level by **3–6 inches**.
- Monitor for **one week** and evaluate results.
- If conditions are stable, raise by another 3–6 inches.
- Account for **seasonal differences** in flow — what works in summer may not be appropriate in winter.
- **Inform and involve affected parties** — include the team managing the upstream collection system.

[Reflection Prompt] Learners record a personal action item or observation about wet well level and pump optimization at their facility.

Lesson 5: Optimize RAS Pumping

If your facility has activated sludge treatment, you have RAS pumping — and RAS pumps are sized for peak flow conditions. They typically handle high flow at very low head, which creates an excellent opportunity for savings.

> **Rule of thumb:** If your RAS pumping rate is typically under **30% of influent flow**, your RAS system is probably operating efficiently. If it's over 30%, investigate whether you can operate differently.

[Transition] Transition to the RAS Pumping Transformation case study.

Case Study: The RAS Pumping Transformation

One facility was running constant-flow RAS with three 20 hp pumps operating at **88% of full load amps, 24 hours a day, 365 days a year**.

- Baseline amps per pump: 22.7 A

- Baseline annual energy: 400,000 kWh/yr

They switched to running RAS as a **percentage of influent flow** instead of constant flow. RAS rate now varies with actual plant conditions.

- Upgraded amps per pump: 16.1 A (average)
- Annual energy after change: 180,000 kWh/yr

Results: The pumps dropped to an average of 42% of full load amps — less than half the power draw.

- Amp reduction per pump: 6.6 A
- Annual energy savings: **220,000 kWh**
- Annual cost savings: **$13,000**

> Amps don't appear on your bill — kilowatt-hours do. Translating amp readings to kWh is how you verify and communicate the savings.

[Reflection Prompt] Learners record a personal action item or observation about RAS pumping at their facility.

Lesson 6: Non-potable Water — Flow & Pressure

Non-potable water systems are easy to overlook. They run quietly, they don't trip alarms, and they've often been set up once and never revisited. That's exactly why they represent reliable, low-effort savings opportunities.

Leaks: unintentional and intentional

Leaks come in two forms:

Unintentional leaks — Seal water is a common example. Each pump's seal water supply is often set generously and then forgotten. Auditing seal water flow and throttling back to the minimum required flow can yield immediate reductions with no capital investment and no operational risk.

Intentional leaks — Many facilities have water flows that serve no current purpose but continue running out of habit. These "always-on" flows add up to real energy cost: the pump moving that water runs 8,760 hours a year.

[Interactive Activity] How We Calculate This — calculation walkthrough for a 50 gpm reduction to a non-potable water system at 100 psi, 75% pump efficiency, 93% motor efficiency, running constantly.

Pressure: question every setpoint

Case Study: The Pressure Setpoint Change

A facility's non-potable water system had been running at 85 psi — their stated minimum setpoint — around the clock, every day.

When the team asked what actually *needed* 85 psi, the answer was: **one grit washer, running 2 hours a day.**

Their first instinct was to install a dedicated booster pump station to serve the grit washer at 85 psi while dropping the rest of the system to 60 psi. Solid plan — but it came with capital cost and a project timeline.

Then someone asked: "How low can these pumps actually run?" Turns out, significantly lower than 85 psi — without issue. So instead of a booster station, they made a **simple control adjustment**: drop to the lowest sustainable pressure for the 22 idle hours, then ramp back up to 85 psi for the 2-hour grit wash cycle.

They took a conservative "tweak and peek" approach:

- Week 1: dropped to 80 psi
- Week 2: dropped to 75 psi
- Week 3: **stayed at 75 psi**

No new equipment. No capital spend. Just a smarter schedule and a setpoint change.

> Systems are often set up for worst-case conditions — and then left there. The fix isn't always a capital project. Sometimes it's a question and a setpoint change.

[Reflection Prompt] Learners record a personal action item or observation about non-potable water flow and pressure at their facility.

Lesson 7: Additional O&M Energy-Saving Opportunities

The five primary focus areas cover the biggest energy users at most facilities. But there are several additional O&M opportunities worth walking through.

[Interactive Activity] Channel Aeration — learners explore energy-saving strategies for aeration channel systems.

[Interactive Activity] Aeration Basin — learners explore additional basin-level aeration optimization strategies.

UV Disinfection

If your facility has a UV system, verify your actual delivered dose against your design dose. Systems running at 100 mJ/cm² when the design dose is only 40 mJ/cm² are more than doubling the energy needed for effective disinfection.

How does this happen? UV transmittance analyzers can fail. Controls can be value-engineered out during construction. No one goes back to check. UV systems typically account for **10–15% of total facility energy** when running — over-disinfecting is an expensive habit.

Digester Mixing

Mixers are designed to resuspend settled solids — that's their maximum power requirement. Most of the time, they're just maintaining suspension, which requires far less energy. Facilities with anaerobic digesters have found they can **cycle mixers** or **reduce speed with VFDs** without affecting solids treatment or gas production.

One facility runs rapid full-speed mixing for 2 hours per day, then drops to 75% speed (45 Hz) for the remaining 22 hours. Annual savings: **$8,800.**

Biofilter Heating

At another facility, operators investigated their biofilter — which included a humidification tower heated by electric elements. The temperature setpoints had never been reviewed after startup. The heaters were set higher than necessary.

By making small reductions to setpoints over time, the heaters nearly stopped running — without any effect on biofilter performance.

> The common thread across all these examples: **None of these facilities bought new equipment. They started questioning their assumptions and operated more efficiently.**

[Reflection Prompt] Learners record a personal action item or observation about additional O&M opportunities at their facility.

Conclusion: Make the Move

The facilities in this course didn't overhaul their equipment. They optimized what they already had.

Small changes add up. Raising a wet well level by a foot. Cleaning DO probes more frequently. Reducing non-potable flow. Adjusting a pressure setpoint. Individually, these might save a few hundred or a few thousand dollars. Together, they add up to a significant reduction in your energy bill.

Start conservative and refine. You don't need to make dramatic changes overnight. Raise the wet well level 6 inches. Monitor it for a week. Raise it another 6 inches if things look stable. Adjust your RAS rate gradually. Test, evaluate, and refine.

Document your wins. When you find something that works, put it in your SOPs. Make sure everyone on your team knows why you're operating that way. Great practices only stick when they're documented and shared with new staff.

[Transition] Transition to the commit-to-action prompt.

Commit to Action

Before you leave today, pick **two opportunities** that feel doable at your plant. Write them down. Schedule them — even tentatively. Then do them.

Other facilities with the same constraints, the same staffing, the same aging equipment are moving on this. The difference isn't budget or equipment. It's that they started asking the hard questions and moving the needle incrementally. You have the same tools.

[Reflection Prompt] Learners record their two committed action items.

[Reflection Download] Learners download a personalized action plan PDF compiling their reflection responses from throughout the course.

Congratulations!

Well done. You now recognize that successful facilities have something in common: the willingness to start small, experiment, and steadily move the needle with the budget and equipment they already have.

Note: Blocks marked Interactive Activity, ➡ Transition, ✏ Reflection Prompt, and Reflection Download are delivered via Mighty and are not captured in this transcript. Contact the course author for Mighty block content details.

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Performance (Lesson 3)

Course Transcript

Strategic Energy Management (SEM) is more than a set of tools—it's a framework for turning energy goals into measurable results. This module focuses on the “Performance” element of SEM, where data becomes the driver of action and improvement.

Upon completion, you will be able to:

- Define the concept of energy performance and its role in Strategic Energy Management (SEM).
- Explain the importance of measuring energy performance to support energy goals, operational improvements, and stakeholder engagement.
- Select appropriate key performance indicators (KPIs) based on available data and energy drivers.
- Apply the review–measure–monitor–share framework to evaluate and improve energy performance at your facility.
- Interpret energy performance data to detect deviations, verify improvements, and communicate results to stakeholders.

At the end of this training, you will download your text reflections and email them to your SEM coach. You can also save a copy to use in your SEM work.

INTRODUCTION

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SEM in Action

SEM isn’t just about saving energy—it’s about creating lasting change through five key elements: **Commitment, Improvement, Performance, Engagement, and Persistence.**

Today, we’ll focus on **Performance**, the step that turns data into decisions. You’ll see how this connects to your earlier work on **Commitment** and how both drive measurable progress toward your energy goals.

Commitment & Performance

Commitment and Performance are two essential elements of SEM.

Commitment involves setting energy goals and establishing an Energy Team empowered to meet them.

Performance outlines the methods used by the Energy Team to define, measure, track, and report progress toward those goals.

By reviewing data with your team and measuring progress toward your energy goals, you gain insight into how you’re performing. Are you on track? Do adjustments need to be made? Sharing these results with stakeholders not only demonstrates accountability but also motivates the organization and strengthens engagement.

Every performance action—**reviewing, measuring, monitoring, and sharing**—connects directly back to your original commitment to energy management goals, ensuring that they remain front and center.

> **Takeaway:**
> Performance is not separate from commitment—it’s the mechanism that validates and strengthens it.

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What is Energy Performance?

Energy performance focuses on **using data to make decisions** that improve how you interact with energy—whether that means **doing more with the same energy, reducing waste, or optimizing processes**.

Energy performance helps us set and align goals across three areas—**supply**, **demand**, and **efficiency**.

Energy Supply

Energy supply refers to the sources and quantity of energy entering your facility—such as electricity, natural gas, or renewables. Understanding your supply mix helps you identify opportunities for cleaner or more cost-effective energy.

Energy Demand

Energy demand is how you use energy in your operations. Think HVAC systems, lighting, pumps, compressors. Knowing where energy goes helps you target improvements.

Energy Efficiency

Energy efficiency means doing the same work with less energy. Examples include upgrading equipment, optimizing processes, or improving controls. Understanding how efficiency impacts your operations helps you identify where small changes can lead to big savings.

Here's a visual definition: using **data** to increase our **knowledge** of our energy management needs so we can **take action** to make informed improvements.

> **Takeaway:**
> If you remember one thing from this section, let it be this: measuring results is the foundation for improvement.

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Why Measure Energy Performance?

Now compare your answer with these three key reasons for tracking energy performance:

Step 1 – Track Progress

Goals only drive change when you measure progress against them. Without a clear goal, energy data is just numbers. Tracking performance helps you understand if you're on course—and whether you need to adjust, amplify, or rethink your efforts.

Step 2 – Improve Operations

Measuring energy performance helps you verify whether your improvement efforts are working. Are your projects delivering the expected savings? Are there unexpected spikes or drops in usage? Data can reveal inefficiencies, uncover new opportunities, and guide smarter decisions.

Step 3 – Communicate Success

Sharing performance results builds momentum. When employees and stakeholders see that their efforts are making a difference, it boosts engagement and reinforces a culture of energy management. Use data to tell your success story and inspire continued action.

> **Takeaway:**
> Measuring energy performance helps you stay on track, improve operations, and share success. It turns data into action by tracking progress, verifying savings, and motivating your team.

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Knowledge Check

What is the primary focus of the "Performance" element in SEM?

- ■ Installing energy-efficient equipment
- ■ **Turning data into decisions**

- Conducting energy audits
- Setting long-term energy goals

What does the Review–Measure–Monitor–Share framework support?

- Equipment purchases
- **Energy performance evaluation**
- Staff training
- Budget planning

What are the three key reasons for tracking energy performance?

- **Track progress, Improve operations, Communicate success**
- Monitor competitor performance, track facility efficiency, improve HR metrics
- Forecast future energy prices, Automate procurement, Reduce vendor dependency
- Increase production speed, reduce downtime, reduce training costs

MEASURE

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What Metrics Do You Use?

Before diving into energy-specific metrics, it's helpful to look at the kinds of **performance data** your organization already tracks. **These might be related to production, operations, or business outcomes**. Organizations often track metrics like: Products per Day, Monthly Revenue, GhG Emissions, kW/ton.

These are mostly **non-energy metrics**, but they reflect how the business operates. They can also help explain changes in energy use when paired with energy data.

> **Takeaway:**
> Understanding these existing metrics can help build a foundation for developing energy performance indicators later.

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Energy Key Performance Indicators (KPIs)

Once energy and energy driver data are available, the next step is to create KPIs. These help **track progress toward energy goals and guide decision-making**.

Answer these questions to help you choose strong KPIs:

Step 1 – What are my energy goals?

- Are you aiming to reduce total energy consumption?
- Are you targeting specific sources (e.g., electricity, natural gas)?
- Are you focused on GHG emissions, cost savings, or operational efficiency?

This sets the foundation for selecting relevant KPIs.

Step 2 – What energy and energy driver data should I include?

- Energy data: electricity, gas, fuel oil, etc.
- Energy drivers: production volume, weather, occupancy, operating hours

Energy drivers help normalize energy use and improve KPI accuracy.

Step 3 – Does this metric help me measure progress toward my energy goals?

- Does it reflect changes in energy use over time?

- Can it be tied to specific actions or projects?
- Is it meaningful to stakeholders?

If the metric doesn't align with your goals, it's not a strong KPI.

Step 4 – At what resolution is data available?

- Monthly utility bills?
- Daily, hourly, or 15-minute interval data?
- Submetered systems?

Higher resolution enables more precise tracking and modeling.

Step 5 – How well do energy and energy driver data align?

- Are they collected over the same time periods?
- Are they collected at the same resolution?

Misaligned data resolutions can lead to misleading KPIs. If you have energy driver data such as production on a weekly basis and only have 15-minute interval data, you'll need a tool such as Gazebo to align your data to the same time resolution before calculating reliable performance metrics.

> **Takeaway:**
> Strong KPIs help you turn data into knowledge, and knowledge into action. When chosen well, they help teams understand trends, identify opportunities, and take meaningful action.

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Single Metrics

The most basic type of energy performance indicator is a **single metric**—a straightforward measurement that tracks one thing, like total energy used or the amount spent on energy each billing cycle.

Pros

- Easy to understand and often familiar to people who aren't deeply involved in energy management.
- Financial figures are often most interesting to management.

Cons

- Usually based on monthly utility bills—only one data point per month, making it hard to spot trends.
- Don't account for energy drivers (production volume, weather, operating hours).

Energy consumed per billing cycle

- This only provides 12 data points per year.
- The number of days per billing cycle varies.
- Billing cycles don't always align with calendar weeks or months.
- It doesn't account for variation from energy drivers.

Dollars spent per billing cycle

Items above, plus:

- Energy rates frequently change.
- Rate tariffs are complicated.
- Bills include many different fees.

Ideally we would be able to see the impact of all the projects we complete. In other words, we'd expect our bills to come down over time because we've completed these projects. In reality, a lot of the opportunities we will identify over the course of this program are small, and it's easy for them to get lost due to changes in our energy drivers—in production swings, schedule changes, or seasonal temperature swings. If we just look at utility bills, we may not see the needle move at all.

But, **these small improvements do add up!**

> **Takeaway:**
> When we track energy using an appropriate method (that takes into account all the “energy drivers”) we can isolate the savings from these projects from the normal variations at your facility.

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Energy Ratios

The next level of energy performance indicators is the **energy ratio**. These metrics compare energy use over time to something meaningful like production volume, which makes it easier to track efficiency over time.

Examples of energy ratios: **kWh / 100 Widgets** and **Therms / Heating Degree-Day**.

Because energy ratios are adjusting energy data to account for something that influences energy use—like production volume or operating hours, they allow for **more accurate comparisons** such as:

- Across different time periods
- Between different locations
- Even between similar processes with different outputs

This gives teams a more “apples-to-apples” view than simple metrics like total energy use and helps answer questions like: “Are we using energy more efficiently this month than last?” and “Is one facility performing better than another?”

Energy Ratios in Practice

The blue line in a graph plots total energy use over time — you notice a clear spike. The orange line plots production and shows a spike in energy use that lines up with a spike in production. That suggests the increase in energy use was likely caused by increased output.

A second graph uses the same data but plots an energy ratio: energy consumption per unit of production (kWh/unit) over time. Notice the spike in the green line, which highlights a period where production drops, but energy use remains relatively flat. This causes the energy ratio to spike. **Because the same amount of energy is being used to produce fewer units, the consumption per product increases.**

Advantages of Energy Ratios

- They are easy to calculate.
- They are easy to understand.
- They account for a single energy driver.

Disadvantages of Energy Ratios

- Your energy data and energy driver data must match up in time.
- Many facilities have more than one energy driver, and ratios typically only account for one. That can lead to misleading results.
- Ratios can also get distorted during low-production periods, especially when baseload energy stays constant.
- They can be misleading. The ratio can “improve” without any change in energy management.

> **Takeaway:**
> Energy ratios can reveal changes in performance that total energy use alone might miss. Comparing energy data with drivers like production helps teams understand performance in context and avoid misinterpreting normal operational changes. However, energy ratios typically account for only one driver and can be less reliable in complex or variable environments.

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Energy Intensity Models

Energy KPIs are a simple method of tracking performance. However, the results often don't provide information that an **energy team can act on**. The KPI is less than effective on low production days because it **doesn't effectively account for the "baseload" energy**—that is, the energy used whether or not a product is being produced.

Energy Intensity Models

Energy intensity models, our **ideal way of tracking energy performance on an ongoing basis**, are typically more complicated, but also provide results that an energy team can more easily understand and translate into action.

An energy intensity model is a formula that establishes **mathematical relationships between your energy drivers—like weather, production, and scheduling—to the energy you use, such as electricity.** By plugging in these variables and adding a constant, you can predict daily energy use and compare it to actual performance. These are commonly referred to as **energy models or multi-variable regression models**.

Formula example: **Daily Predicted kWh = A (Constant / "Baseload") + B (Weather Factor °F) + C (Weekend Influence) + D (Raw product lbs)**

Energy Intensity Model Advantages

- They can produce highly accurate predictions of energy consumption.
- They account for baseload energy use.
- They incorporate multiple energy drivers at once.

Energy Intensity Model Disadvantages

- It may not be possible to build a model if sufficient data is unavailable.
- They are not intuitive and require specialized tools and expertise.
- They require more time and effort to update and track regularly.
- They may "break" if operating conditions change significantly.

A **changepoint model** helps us predict energy use more accurately across temperature ranges—above a threshold temperature, energy use rises with cooling load; below it, a relatively consistent baseload is maintained.

> **Takeaway:**
> Energy models help teams move beyond surface-level tracking by offering predictive insights into how energy should behave under normal conditions. This enables better decision-making and more credible savings claims. However, they demand more effort and may not be practical for all facilities.

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Bottom-up Approach

There are cases where using an energy intensity model isn't realistic, either because production data can't be accessed or the site has changed too much since the baseline period. Bottom-up calculations offer a practical alternative for estimating energy savings. These are estimates of energy savings made at the project level—for example, calculating how much energy a setpoint change might save over a year.

Example: 40 HP Motor Bottom-up Calculation

Step 1 – Calculate Power (kW)

Power (kW) = 0.75 × HP = 0.75 × 40 = **30 kW**
Note: This doesn't take into account load or motor efficiency but is a rough estimate.

Step 2 – Calculate Energy (kWh)

Energy (kWh) = kW × Annual Operating Hours = 30 kW × 8,760 = **262,800 kWh**
We use 8,760 to represent 24/7 operation.

Step 3 – Calculate Annual Energy Cost ($)

Annual Energy Cost ($) = kWh × $/kWh = 262,800 × $0.25 = **$65,700**

Takeaway:
In some cases, KPIs or energy intensity models are not realistic. A bottom-up approach offers a practical alternative—estimating savings at the project level using equipment data and operating assumptions.

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Recap

We've now covered four options to track your energy performance—from simple to complex:

1 – Simple metrics such as tracking consumption via monthly bills.

2 – Energy ratios, which normalize energy use to one energy driver.

3 – Energy models, which convert performance data into decisions you can act on.

4 – Bottom-up calculations for specific project-level savings estimation.

The methods and tools we use are designed to turn data into actionable knowledge. This often requires finding a balance between the accuracy of the tracking method and ease of use in order to achieve two goals:

- **Feedback on Energy Performance** – provide feedback on how specific actions affect energy performance.
- **Credible Energy Savings Numbers** – provide credible energy savings numbers that can be used to calculate financial incentives.

Takeaway:
Now that you're equipped with a basic understanding of energy performance tracking, your coach will help you identify a method that's accurate enough to be useful and simple enough to maintain and share.

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Knowledge Check

What type of data should be included when measuring energy performance?

- ■ Annual revenue projections and vendor payment schedules
- ■ Staff training hours and HR policy compliance rates
- ■ Customer satisfaction scores and IT system uptime
- ■ **Energy consumption and energy drivers**

Why is it important to include energy driver data?

- ■ **To normalize energy use and improve accuracy**
- ■ To reduce the number of KPIs
- ■ To simplify reporting formats
- ■ To comply with safety regulations

What is the risk of using only monthly utility bills?

- ■ **Limited ability to detect short-term changes**
- ■ Too much data to analyze
- ■ Increased stakeholder confusion
- ■ Reduced equipment lifespan

MONITOR

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Monitoring Energy Performance

Monitoring is a critical part of Strategic Energy Management (SEM). It's not enough to collect data—you need to review it regularly and **determine if you need to act**.

Monitoring helps teams:

- **Track progress** toward energy goals
- **Review the status** of completed and priority projects
- **Spot deviations** from expected performance
- **Share updates** with stakeholders

Energy Performance Reports

The goal is to turn your energy metrics into **actionable insights**. One of the best ways to do this is by creating an **Energy Performance Report**. It doesn't need to be complex. What matters is that it's easy to update, easy to share, and reviewed regularly. A good report includes:

- **Trends** in your energy performance
- **Updates** on completed and priority energy projects
- **Progress** toward your energy goals

When used consistently, this kind of report helps your team stay focused, **spot issues early, and communicate results clearly to stakeholders.**

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Energy Report Example 1

Here's an example of how tracking KPIs can help you spot when something's off. Let's say your expected daily KPI range is 50 ± 20. On day 11, there is significant deviation from your expected range. That's your cue to consider **what changed** and **why.**

- If it's a **bad deviation**, maybe someone did maintenance and accidentally reset your optimized settings.
- If it's a **good deviation**, maybe a new project kicked in and delivered better-than-expected results.

> **Takeaway:**
> Either way, your Energy Performance Report lets you know that this is your opportunity to act—either fix what's broken or scale what's working.

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Energy Report Example 2

In this example, the site set a goal to reduce natural gas consumption by 20% over two years. After implementing a project halfway through, they saw immediate savings—actual consumption dropped below predicted levels, and cumulative savings began to grow.

However, savings soon plateaued. Something had changed. It turns out a maintenance event had reset the heating system setbacks, undoing the energy-saving settings. Because no one noticed, the site missed out on eight months of savings.

Once the issue was identified and corrected, savings resumed, and the site ultimately met its goal.

> **Key takeaway:**
> Monitoring performance helps you catch issues early—whether it's a setback or a success—and take timely action to stay on track.

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Energy Report Example 3

This example shows a compressed air system over a six-day period, including a three-day holiday shutdown. The KPI being tracked is **kW per 100 CFM**, with a target of **20 ± 1**.

A few key observations:

- **Compressed air was still being supplied during the shutdown—153 CFM.** Why was energy being consumed when the facility wasn't operating?
- The **KPI value exceeded the expected range** during this period, indicating poor efficiency.

> **Key takeaway:**
> System-level KPIs are especially useful for managing significant energy uses. They help staff optimize operations and contribute directly to SEM goals.

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Monitoring Best Practices

The list below summarizes the key steps for **reviewing**, **measuring**, and **monitoring** energy data to support your SEM actions.

Define Your SEM Boundary

What part of your facility are you focusing on? Select the area of focus (site, system, process).

Know Your Data

What energy and driver data do you need? Include both energy consumption and energy drivers.

Choose Your Timing

Will you measure monthly, weekly, daily? Determine how often data will be collected.

Define Your KPIs

What metrics will you track, and how will you calculate them? Document which KPIs you'll use and how they'll be calculated.

Set Performance Targets

How will you know if you're improving? Define goals and how improvement will be measured (e.g., actual vs. expected).

Flag Deviations

What counts as "off track"? What's your acceptable range? Specify expected values and acceptable ranges.

Plan Your Response

When will you check the data, and what will you do if something's wrong? Decide when to review data and what actions to take.

Document Everything

Document the activities above and note major site changes, such as production schedules, staffing adjustments, or equipment updates.

> **Note:**
> It may take months of data collection, analysis, and trial-and-error to get here. Don't be discouraged. Start with what you have, build from there, and let the data guide your next steps.

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Knowledge Check

How often should energy performance data ideally be reviewed?

- Once a year
- After a project is completed
- **Regularly – daily, weekly, or monthly**
- Never

What does combining top-down and bottom-up approaches help you do?

- Reduce reporting frequency
- **Validate savings from projects**
- Increase production
- Simplify HR processes

What is a key takeaway from monitoring examples in the course?

- **Timely action is critical to maintaining savings**
- Reports should be shared annually
- Monitoring is optional
- Deviations are always negative

SHARE

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Sharing Results to Drive Engagement

Sharing performance results is more than a communication task—it's a strategic move. Regular updates to **stakeholders, including leadership, energy team members, staff, and external partners**, reinforce your commitment and energize your SEM efforts. When people see the progress, they're more likely to support it.

Broad engagement is key: when more people are aware of your goals and progress, they're more likely to contribute to success. **Frequent communication helps shift SEM from a project to a shared organizational priority.**

Use a variety of methods to share your messaging:

- **Printed Materials** – Posters, newsletters, bulletin boards
- **Announcements or Presentations** – Crew meetings, quarterlies, all staff events
- **Electronic Communication** – Bulk emails, intranet posts, electronic message boards
- **Direct Outreach** – Personalized emails, phone calls

Takeaway:
Giving your people regular updates makes your SEM work more real to them and holds everyone accountable.

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Example Dashboard

This graphic, created with Gazebo, shows how data can tell a powerful story when presented clearly. By **combining numbers with a clear visual**, it shows progress in a way that sparks interest and drives continued participation.

Note the red line that tracks total energy savings over time, giving a clear picture of progress.

What else could you share to keep your energy team informed?

- Completed projects
- Upcoming projects
- Annual utility costs
- Progress toward energy goals

- KPI trends
- Project-specific metrics

Takeaway:
Visual storytelling matters. Summarizing your data in a simple, engaging format—like this example—makes progress easy to understand and helps build support for future energy initiatives.

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Example Reporting

This example includes both graphs and a narrative section explaining the key points shown in the data. Use the arrows to explore both pages.

Example report elements include weather-normalized energy use intensity (EUI) trends, average Energy Star scores across facility types, facility-level data tables with electricity use, natural gas use, total energy use, GHG emissions, and normalized EUI comparisons.

Takeaway:
Make your progress visible. When people see real numbers, they stay motivated to keep improving.

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Knowledge Check

What does sharing performance data help reinforce?

- Marketing goals
- **Your commitment to energy management**
- Budget allocations
- Staff scheduling

What is the role of dashboards in sharing performance?

- To track employee attendance
- **To visually communicate progress and key actions**
- To manage vendor contracts
- To simplify tax reporting

What is the main purpose of sharing energy performance results?

- To reduce utility bills
- To simplify budgeting
- To comply with HR policies
- **To drive engagement and accountability**

CONCLUSION

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Wrapping Up

Strategic Energy Management isn't just about saving energy—it's about turning data into decisions that drive lasting change. Let's wrap up by reviewing how measuring, monitoring, and sharing performance keeps your organization moving forward.

1 – Introduction – SEM in Action

Strategic Energy Management (SEM) is about more than reducing energy use—it's about creating a culture of continuous improvement. **Performance is the critical link between planning and results.** It validates your commitment by turning data into actionable insights. SEM connects five key elements—Commitment, Improvement, Performance, Engagement, and Persistence—and today's focus on Performance shows how data drives decisions and lasting change.

2 – Measure – Turning Numbers into Knowledge

Measuring energy performance is the foundation for improvement. Without measurement, energy data is just numbers. By tracking performance, you can confirm whether projects deliver expected savings, identify inefficiencies, and uncover new opportunities.

- **Single Metrics** – Track one thing; easy to understand; limited detail; no driver normalization.
- **Energy Ratios** – Compare energy to a single driver; easy to calculate; can be misleading at low production.
- **Energy Intensity Models** – Multi-variable; highly accurate; account for baseload; require data and expertise.
- **Bottom-Up Approach** – Project-level savings estimates using equipment data; useful when modeling isn't feasible.

3 – Monitor – Build Insight Through Reports

Monitoring is a critical part of SEM. Collecting data isn't enough—you need to **review it regularly and act on what you find**. Energy performance reports turn raw data into actionable insights, helping teams track progress, spot deviations, and maintain accountability.

Monitoring Best Practices:

- Define Your SEM Boundary: Decide which site, system, or process to monitor.
- Know Your Data: Include both energy consumption and drivers like production or weather.
- Choose Your Timing: Set review frequency—monthly, weekly, or daily.
- Define KPIs: Document which metrics you'll track and how they're calculated.
- Set Performance Targets: Establish expected ranges and improvement goals.
- Flag Deviations: Identify what counts as "off track" and plan responses.
- Document Everything: Keep records to support your SEM journey.

4 – Share – Drive Engagement

Sharing results is more than a communication task—it's a strategic move that builds trust and momentum. Regular updates reinforce your commitment and **make Strategic Energy Management (SEM) a shared organizational priority**. When people see measurable progress, they stay motivated and contribute to future success.

Methods to share results: dashboards, printed materials, announcements, electronic communication, and direct outreach.

Congratulations! You've explored how Strategic Energy Management turns data into action through four key steps: Introduction, Measure, Monitor, and Share. Your journey doesn't end here—every insight you apply strengthens your commitment and drives lasting change.

Note: Blocks marked Interactive Activity, Transition, Reflection, and Reflection Download are delivered via Mighty and are not captured in this transcript.

Wastewater Facts and Figures Quiz

You don't need to memorize every number in the Wastewater Treatment Efficiency Facts & Figures sheet — you need to know how to use it. This quiz gives you practice doing exactly that.

Each question references a table or formula, so keep your Facts & Figures sheet handy and work through the numbers. The goal is speed and confidence, not recall from memory.

> Download the Facts & Figures sheet and keep it open as you work through this quiz.

Multiple Choice

Q1 of 15

Which of the following is NOT a top 10 category of wastewater O&M savings?

- ○ Control Your UV System
- ○ Optimize Your Secondary Clarifier Rake Speed
- ○ Control Your Odor Control
- ○ Control & Optimize DO Levels

Q2 of 15

A DO probe that reads 10% low…

- ○ Needs a calibration check
- ○ Could be costing you 2.4% at the blower
- ○ Needs to be cleaned frequently
- ○ All of the above

Q3 of 15

At a mixed liquor temp of 50°F, what % energy could you save from going from a DO setpoint of 2.5 to 2 mg/L?

- ○ 5.4%
- ○ 4.6%
- ○ 10.8%
- ○ 6.2%

Q4 of 15

At a mixed liquor temp of 59°F, what % energy could you save going from a DO setpoint of 3 to 2 mg/L?

- ○ 14.1%
- ○ 12.3%
- ○ 10.8%
- ○ 6.2%

Q5 of 15

What % energy could you potentially save from going from 10 psig to 9.4 psig?

- ○ 3.3%
- ○ 3.7%
- ○ 4.9%
- ○ 5.5%

Q6 of 15

When estimating the true electrical power (kW) required to operate a pump, which of the following must be included to correctly estimate energy use?

- ○ Only the water horsepower (GPM × feet)
- ○ Flow (GPM), Head (ft), Pump efficiency, motor efficiency, transmission losses if not direct-coupled, and VFD efficiency
- ○ Motor nameplate horsepower only
- ○ Pump efficiency only, since motors are nearly 100% efficient

Q7 of 15

A 100 hp pump runs 24/7 at full load power. What is the rough annual energy use?

- ○ 10,080 kWh
- ○ 525,000 kWh
- ○ 657,000 kWh
- ○ 876,000 kWh

Q8 of 15

When estimating energy use (kWh) for a three-phase pump motor using measured electrical current, which factors must be included to calculate kWh correctly and identify pumping energy savings opportunities?

- ○ Amps and volts only, since power factor is negligible
- ○ Amps × volts × hours only
- ○ Amps, volts, power factor, the three-phase constant (1.73), and runtime
- ○ Motor horsepower and nameplate efficiency only

Q9 of 15

An influent pump station operates at a total dynamic head (TDH) of 20 feet. Operators raise the wet well level, reducing the required TDH by 2 feet without changing flow or pump efficiency. Based on this operational change, what is the approximate reduction in pumping energy?

- ○ 2%
- ○ 5%
- ○ 10%
- ○ 20%

True / False

Q10 of 15

Equipment that runs continuously (24 hours per day, 7 days per week) operates 8,760 hours per year.

- ○ True
- ○ False

Q11 of 15

Reducing equipment runtime by one day per week lowers annual energy use by approximately 14%.

- ○ True
- ○ False

Q12 of 15

Reducing runtime by 1 hour per day has little impact on annual energy use.

- ○ True
- ○ False

Q13 of 15

A 10 HP motor running 24/7 uses roughly 65,000 kWh per year.

- ○ True
- ○ False

Q14 of 15

Reducing runtime often produces faster and more reliable energy savings than upgrading equipment efficiency alone.

- ○ True
- ○ False

Q15 of 15

Smaller horsepower motors are typically more efficient than larger horsepower motors.

- ○ True
- ○ False
- ○ Determine potential energy savings from reduced DO setpoints
- ○ Quantify energy savings potential from reducing blower discharge pressure

Congratulations

You've now passed the Wastewater Facts and Figures Quiz!

Be sure to save the Facts & Figures Sheet as a resource. The figures in this reference sheet are most useful when you can reach for them quickly in the field or in a planning conversation to:

- Determine potential energy savings from reduced DO setpoints
- Quantify energy savings potential from reducing blower discharge pressure

The more you use it, the faster it becomes second nature.

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