

Energy & Water Efficiency Toolkit

Partnering for Progress on
Energy & Water Efficiency

Check out our other sustainability toolkits at:
sigmaaldrich.com/sustainabilitytoolkits



DISCLAIMER

The materials in this toolkit are intended to serve as general guidance and background information only.

We have compiled the content of this toolkit carefully and in accordance with our current state of knowledge.

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What You'll Find

The Energy & Water Efficiency toolkit helps you create an action plan to implement targeted energy and water reduction activities at your company.

Leveraging insights from over 550 improvement projects and our own energy & water efficiency program called EDISON, we've outlined a framework for developing a strategy, collaborating with key stakeholders, executing projects, and measuring progress.

See how strategic improvements can directly reduce your environmental footprint by exploring our case studies throughout this toolkit.

SUPPLIER EXPECTATIONS

- Collect site data to understand your energy, water, and Scope 1 & 2 baseline – and set targets
- Conduct an energy audit of your largest facilities to quantify project impacts
- Prioritize and implement projects based on impact
- Integrate sustainability into your CapEx process

We set supplier expectations across a variety of impact areas. [Click here](#) to view them all.

WHY DOES ENERGY AND WATER EFFICIENCY MATTER?

It doesn't only benefit the planet, it benefits your business

These changes can increase efficiency, reduce Scope 1&2 emissions, conserve resources and reduce operating costs.

Improve Efficiency & Reduce Costs

Efficient buildings lower operational costs by reducing energy and water consumption. Integrating renewable energy, upgrading HVAC systems, and addressing process water use can also lead to significant savings on utility bills and enhance facility performance.



Customer Expectations & Compliance

Government agencies worldwide are tightening regulations on greenhouse gas emissions and water use, while businesses are increasingly prioritizing sustainability in their supply chains. Proactively adopting efficiency measures ensures compliance with evolving policies, while strengthening partnerships with customers who prioritize supplier sustainability.

Enhance Competitiveness & Future-Proof Operations

Sustainability is a key differentiator in the marketplace. Companies who take early action may gain a competitive edge, attract new business opportunities, and position themselves as industry leaders – ensuring long-term resilience in a rapidly evolving global economy.

Scope 1 Emissions

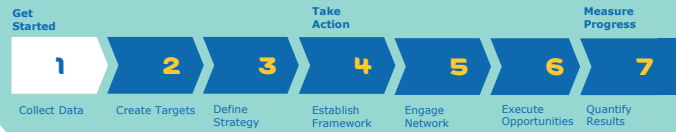
Direct emissions released by a company's facilities and vehicles.

Scope 2 Emissions

Indirect emissions from the generation of purchased energy.

To learn more about emissions accounting, check out our [**Environmental Accounting & Goal Setting toolkit.**](#)

GET STARTED



1. Collect site and utility data

Collect the data below to establish a baseline and inform your efficiency strategy. Maintain plant- or address-level granularity on a monthly basis, pulling data from your utility bills. Some utility companies offer 15-minute interval data which can be very useful for deep-dive analytics and understanding when your peak loads occur.

Collect this data:

Energy by source (e.g., purchased and self-produced electricity incl. renewables, gas, propane, oil, steam, cold)

Water by source (e.g., tap, ground, surface, rainwater)

Primary space type (office, lab, manufacturing, warehouse, etc.)

Gross floor area (square feet or meters by space type)

In order to:

Calculate Scope 1&2 emissions from energy and understand seasonal or production driven trends by location.

Understand your water withdrawals, seasonal trends, and risk profile when paired with water scarcity data.

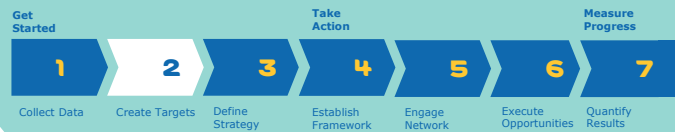
Calculate a site's Energy Use Intensity (EUI), in kBU/ft² or MWh/m². EUI is a way to benchmark site performance against similar operations.

Environmental accounting

Our organization uses an environmental accounting software for collecting and processing environmental data. For more information about converting energy data to carbon emissions, view our [Environmental Accounting & Goal Setting toolkit](#).



GET STARTED



2. Create KPIs and targets

Define specific, measurable, achievable, relevant, and time-bound (SMART) goals for your energy and water efficiency program.

a. Forecast business-as-usual (BAU) growth

Start by modeling where your energy, water, and emissions will land year-by-year. Do this by extrapolating your historic energy growth rate out to future years. Be sure to consider any new construction or expansions planned.



b. Define the Annual Target

Considering your long-term company goals and current performance, set a glidepath to achieve your goals.

c. Calculate the Gap to Target

Calculate the gap between your business-as-usual scenario and your target each year.

d. Define the Program Target

Calculate the difference between the gap year over year. This program target is the impact your program will need to realize each year to achieve your goals.

(MWh)	Historic				Future			
	Yr.-3	Yr.-2	Yr.-1	Yr. 0	Yr.+1	Yr.+2	Yr.+3	Yr.+4
a. BAU	102k	104k	108k	110k	112k	114k	116k	118k
b. Target					110k	108k	106k	104k
c. Gap to Target (=BAU - Target)					2k	6k	10k	14k
d. Program Target (Δ in Gap to Target)					2k	4k	4k	4k

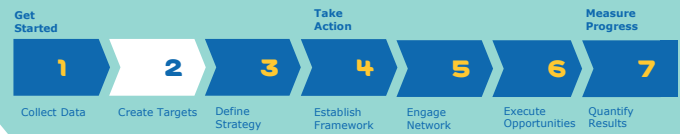
Repeat the steps above for additional impact areas such as water and emissions.

Program targets to consider

- Scope 1&2 emissions avoided
- MWh of Purchased Energy avoided
- m³ of Water Intake avoided

Don't forget to make note of the cost savings the program will generate and include this as a program KPI.

GET STARTED



2. Create KPIs and targets

To continuously measure progress and hold sites accountable, set site-specific targets on an annual basis. See how each site has been trending, whether there have been any changes that could explain the trend, and how the site's EUI compares to similar sites or external benchmarks.



a. Historic Consumption = 150MWh

Determine the site's consumption last year.

b. Change to production output +1MWh

Is the site planning on increasing or decreasing production within the existing four walls, and how does that correlate to utility increase (Hint it's usually not 1:1).

c. Efficiency Projects Planned -3 MWh

Is the site planning on implementing any efficiency projects, and what impact will these have.

d. Large CapEx Investments +0 MWh

If the site is expanding (building an addition or new building) add in the estimated impact.

$$a + b + c + d = 148\text{MWh}$$

Repeat this process each year and for each site. Set both short, and long-term site targets. If the sum of your site targets is greater than the program's targets, you may need to make a top-down adjustment to all site targets.

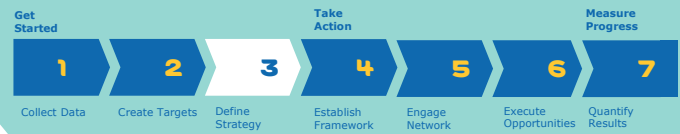
To measure site performance monthly, consider using a 12-month rolling total KPI. For example:

- 12-month rolling Purchased Energy
- 12-month rolling Water Intake

Leverage Energy Use Intensity (EUI)

Compare EUIs (e.g. in kBtu/ft² or MWh/m²) of similar sites to determine if there are outliers, and if any should have more ambitious targets than others. EUI can be measured in kBtu/ft² or MWh/m².

GET STARTED



3. Define your strategy

When engaging stakeholders and leaders to support your program, it's imperative to draw a correlation between your program's activities and goals, and your company's goals or sustainability strategy.

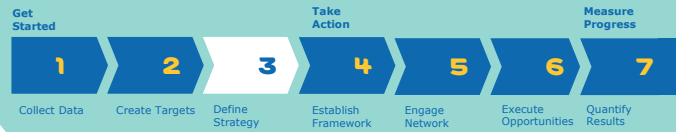
The third pillar of our sustainability strategy is to reduce our ecological footprint. Under this pillar, by 2030, we aim to reduce our Scope 1 & 2 emissions 50%, and reduce our water intensity 50% per Euro revenue, compared to our 2020 baselines. By 2040, we aim to achieve climate neutrality.

Our energy and water efficiency program (EDISON) and program KPIs directly contribute towards our company targets as follows:

How EDISON Helps Achieve Our Sustainability Goals

PROGRAM LEVER	PROGRAM KPI	COMPANY TARGET
Onsite Renewable Energy	35,000 MWh of purchased energy reduction projects implemented annually	50% reduction in Scope 1 & 2 by 2030 vs 2020 Climate neutral in Scope 1 & 2 by 2040
Process Efficiency		
Facility Efficiency		
Water Efficiency	70,000 m ³ of water reduction projects implemented annually	50% reduction in water intake per Euro of revenue by 2030 vs 2020
Water Reuse		

GET STARTED



3. Define your strategy

To identify where your energy and water efficiency strategy should focus, consider the following example key levers from our EDISON program to maximize impact:



Onsite Renewables

Biomass
Solar
Wind



Process Efficiency

Heat Pumps
Energy Recovery
Compressed Air
Controls



Facility Efficiency

Heat Pumps
HVAC
Lighting
Motors
VFDs
Controls



Water Efficiency

Process Water
Reverse Osmosis Reject



Water Reuse

Cleaning Processes
Irrigation
Cooling Towers



TAKE ACTION

4. Establish an operational framework

Clearly outline your **operational framework** and **governance elements** to help ensure the program's success. Smaller organizations may find direct engagement with site teams to be more effective, while larger organizations may find it more effective to establish a network of regional and site contacts. Our program is structured as follows:

EXAMPLE OPERATING STRUCTURE



Program Manager

- Responsible for the direction and content of the program, including allocation of program budget to site projects.
- Develops program elements such as training, best practices, and timeline (e.g., target setting and project funding proposals).
- Reviews all investments for alignment with corporate goals.
- KPI performance review and report out with key stakeholders.



Regional Lead

- Liaison between the site and Program Manager.
- Reviews all investments within their respective region.
- Delegates tasks and makes requests to the Site Lead.
- Regional KPI performance and review with Regional Director.



Site Lead

- Development of site decarbonization plan.
- Development, proposal, and execution of site efficiency projects supported by program budget.
- Responsible for achieving site goals and aligning on priorities with the Site Director.



TAKE ACTION

4. Establish an operational framework

While efforts to improve energy and water efficiency in existing facilities are important, embed these measures into your Capital Expenditure (CapEx) projects and processes as well. Ensure alignment with company policies, goals, and sites’ energy and water master plans by leveraging your network of program experts to support CapEx project teams.

CapEx Process

- Examine your capital investment process and integrate sustainability review and approval steps.
- Consider which investments require a review, at what stages of the project’s lifecycle, and who is responsible for approval. Review requirement could be based on project type, or a financial threshold.

CapEx Policy

- Institute a CapEx sustainability policy that aligns with your company’s goals (e.g., Net Zero, fossil fuel-free, etc.). Refer to other company policies, such as sites in water stressed areas.
- Define within the policy when it is mandatory for projects to align with company goals, and how exceptions may be handled.

CapEx Deliverables

- Develop templates for project deliverables, and tools to help with quantification of impact to energy, emissions, water, etc.
- Clearly outline required deliverables for different size projects, at different stages of the project lifecycle. Deliverables for smaller projects may be simpler than deliverables for larger projects.

EXAMPLE PROJECT REQUIREMENTS

- Sustainability review and approval on projects >€500k focusing on energy, emissions, water, waste and human rights.
- Mandatory Net-Zero Scope 1&2 alignment for new construction and site expansions.
- All other projects expected to align with Net-Zero Scope 1&2 where feasible.

CASE STUDIES

PROGRAM LEVER: Facility Efficiency

Heat Pump Installation

Irvine, United Kingdom

To reduce our reliance on natural gas, the EDISON Program funded a heat pump project at our Irvine, United Kingdom manufacturing site.

We expect to reduce natural gas consumption by **1,900 MWh** annually, increase electricity consumption by **495 MWh**, and avoid **360 tons** of CO₂ emissions.

Simple Payback: 3.3 Years



Lab Retrofit

St. Louis, Missouri, USA

We added in sash controls, Variable Air Volume (VAV), and optimized HVAC settings for humidity and temperature to minimize air change rates and reduce energy.

2,600 MWh of gas saved annually
700 MWh of Electricity saved annually

Simple Payback: 5 Years



VFD Added to HVAC

Wuxi, China

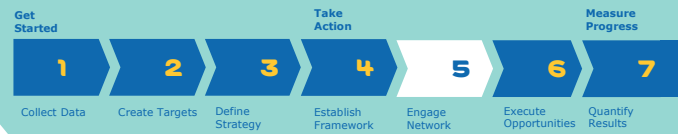
To improve energy efficiency at the Wuxi, China site, we installed a variable frequency drive (VFD) to the HVAC system that services our down-filling operations.

650 MWh of electricity saved annually

Simple Payback: 3.6 Years



TAKE ACTION



5. Engage your network

It is important to continuously engage your organization and offer structured development opportunities for high performers who are interested in participating in your program. **This may include:**

Upskilling your team

Organize professional trainings with organizations such as the Association of Energy Engineers ([Certified Energy Auditor](#) and [Certified Energy Manager](#)) and The Energy Institute ([Energy Manager Level 2](#)) to upskill your team.

Sharing best practices

Create repositories of project successes such as financial and energy savings. Plan for annual or semi-annual summits to bring program stakeholders together. Share best practices across regions, recognize achievements, and bring vendors in to speak about the latest advancements in technologies.

keys to success

A strong foundation is built upon collaboration across the organization and equipping stakeholders with tools and resources to drive change toward your common goals.

Organize a cross-functional team

Include members from:

- Engineering
- Procurement
- Operations
- Quality
- Controlling

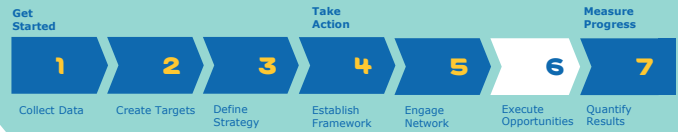
Provide training resources

These could be:

- Workshops
- Webinars
- Detailed guidelines and checklists
- Industry regulations and best practices



TAKE ACTION



6. Prioritize and execute opportunities

A wide variety of opportunities exist, whether it be no-cost/low-cost actions, or those which require capital investment. There are opportunities to fit all size organizations with different size budgets.



No-Cost

- **Behavioral Changes:** Foster a culture of conservation; encourage staff to turn off equipment when not in use.
- **Maintenance Practices:** Regularly inspect and maintain HVAC and irrigation systems to ensure optimal performance, conduct routine checks for leaks or equipment operating off-hours.
- **Operational Adjustments:** Adjust HVAC setpoints to minimize energy use during off-peak hours, adjust lighting timers based on occupancy & need.



Low-Cost

- **Address the basics:** Install low-flow water fixtures and replace traditional lighting with energy-efficient LED fixtures.
- **Measurement & Control:** Install clamp-on meters to measure usage and identify inefficiencies, VFDs on motors, sash closers on fume hoods, occupancy sensors on lighting, and optimize building management systems.



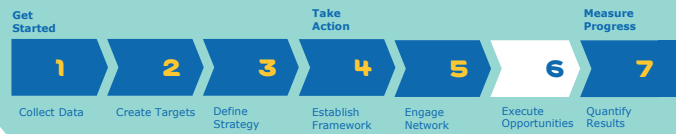
Capital Expense

- **Master Planning:** Develop a comprehensive decarbonization and water efficiency master plan, outlining short and long-term investments required to achieve your goals. Use this master plan to guide the design of any new construction planned. Integrate Net Zero design into your facility expansions.
- **Equipment and Controls:** Upgrade to high-efficiency heat recovery chillers, fuel switch from natural gas to heat pumps, invest in advanced process control systems to optimize production.

Financial Incentives

See our resources page to learn more about incentives and tax credits for energy efficiency projects

TAKE ACTION



6. Prioritize and execute opportunities

When deciding where to allocate capital to support projects, you'll want to develop a way to compare project results across multiple dimensions.

FOR EXAMPLE: how can you compare a project that saves water to one that saves energy? Or how can you compare a project that saves gas, but uses more electricity and water? The answer is to create a common denominator. We call it our "EDISON Score", in which we base on a **project's impact** (positive or negative) against the **Program Targets**.

Example Program Targets	
Energy	35,000 MWh/year
Water	70,000 m ³ /year
Emissions	4,000 tons of CO ₂

Each project receives an EDISON Score:

$$\text{EDISON Score} = (\text{Energy Score}) + (\text{Water Score}) + (\text{Emissions Score})$$

Where:

$$\text{Energy Score} = (\text{Project MWh of Energy Saved} / 35,000) \times 100$$

$$\text{Water Score} = (\text{Project m}^3 \text{ of Water Saved} / 70,000) \times 100$$

$$\text{Emissions Score} = (\text{Project CO}_2\text{e Saved} / 4,000) \times 100$$

While evaluating projects based on impact towards program goals is important, you'll likely want to incorporate financial considerations as well.



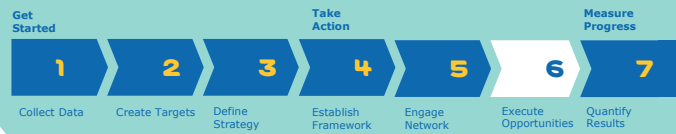
Project data to collect:

- Project cost, cost savings & incentives
- Energy (MWh), and Water (m³) savings

In order to calculate:

- EDISON Score
- Emissions Savings
- Internal Rate of Return
- Net Present Value & Payback

TAKE ACTION



6. Prioritize and execute opportunities

Depending on your organization's financial requirements, you may need to consider financial viability at the project level. Many companies will evaluate investments based on Internal Rate of Return (IRR), Payback, and/or Net Present Value (NPV), and will set limits for what is generally acceptable. For example, your organization may require all projects to have an IRR >5% and a positive NPV. Be sure to calculate these financial metrics at project level to ensure alignment with financial expectations.

Example prioritization calculations:

Project	Energy Saved	Water Saved	Emissions Saved	IRR	NPV	Energy Score	Water Score	Emissions Score	EDISON Score
Chiller Upgrade	7K MWh	0 m ³	800 t CO ₂	6%	120K	20	0	20	40
Cooling Tower Efficiency	0 MWh	14K m ³	0 t CO ₂	10%	50K	0	20	0	20
Steam Trap Repairs	3K MWh	7K m ³	600 t CO ₂	2%	-20K	9	10	15	34

Once the financial check is complete, prioritize the remaining projects based on their EDISON Scores. In the theoretical example above, the Steam Trap Repair project would be disqualified due to an IRR and NPV below the company's financial hurdles, leaving the Chiller upgrade as priority #1, and Cooling Tower Optimization as priority #2.

Applying this methodology is just one way you may want to prioritize top performing projects that fit within your budget.

IRR

Used to assess an investment's profitability, representing the annualized, compound rate of return that makes the net present value of all cash flows equal to zero.

NPV

Determines the current value of an investment by subtracting the initial cost from the present value of future cash flows, accounting for the time value of money, ensuring future cash flows are discounted to today's dollars.

CASE STUDIES

PROGRAM LEVER: Onsite Renewable Energy



Solar Panel Installation

Darmstadt, Germany

We added **560 KW** of solar panels to the roof of our Distribution Center building, producing **400 MWh** of electricity annually.

Simple Payback: 5.3 Years

Solar Panel Installation

Milwaukee, Wisconsin

We installed a **550 KW** of solar panels at our Milwaukee site, producing **927 MWh** of energy annually.

Simple Payback: 6.7 Years



Biomass Central Heat Plant

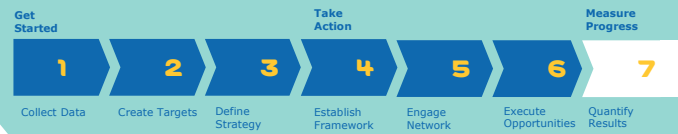
Jaffrey, New Hampshire

We built a central heat plant that uses locally sourced wood chips as renewable biomass to generate steam and hot water, meeting 100% of the site's heating needs. This project eliminates over **1.5 Million** liters of oil annually and reduces CO₂ emissions by **3,480** metric tons.

Simple Payback: 7 Years



MEASURE PROGRESS



7. Quantify and share results

- Establish a reporting framework that works for your organization. Determine who needs to be informed, on what frequency, and how the information will be delivered.
- Measure progress against your program’s goals. For example, did you implement enough projects to reach your savings goals? Track your investments, savings, and impact.
- Measure site performance against their targets. This could be as simple as an Excel scorecard – or a fully integrated dashboard that pulls data directly from your environmental accounting system.

Monthly Scorecard (Purchased Energy, Water Intake, etc.)				
Site	Baseline	Target*	Current Value	Value v. Target
Total	15,350	15,052	14,920	- 132
Site 1	4,200	4,250	4,325	75
Site 2	6,500	6,255	6,145	- 110
Site 3	3,400	3,385	3,350	- 35
Site 4	1,250	1,162	1,100	- 62

*Some sites may plan for an increase due to site expansions or production changes.

When reviewing site performance, focus on sites that are both overperforming, and underperforming to determine the root cause of deviations.

Ask Underperformers:

- What has changed at your site? Has production demand increased unexpectedly on energy or water intensive processes?
- Have you checked equipment schedules? Have you walked the facility off-hours to look for equipment that has been left on? What corrective actions will the site take? How can I help?

Ask Overperformers:

- Have energy intensive processes experienced a decrease in demand?
- Has a capital investment project been delayed?

SHARE YOUR PROGRESS

We want to work with partners engaged in initiatives that reduce the carbon footprint of materials we source from them. Share your strategies, plans and successes with your procurement contact.

CASE STUDIES

PROGRAM LEVER: Water Efficiency



Condensate Water Recovery

Visalia, California, US

We capture water from our cooling system and reuse it for irrigation.

1,000 M³ of water reduced

Simple Payback: 7.8 Years



Reverse Osmosis Water Recovery

Kankakee, Illinois, USA

We installed a high-efficiency duplex Reverse Osmosis (RO) system designed to reduce reject water and maximize recovery. The system recovers **95%** of incoming water, producing **179.81 liters** per minute of usable water while saving **20,000 M³** annually.

Simple Payback: 4.1 Years

RESOURCES

Explore these additional resources to enhance your energy and water efficiency program.

ENERGY AND WATER EFFICIENCY RESOURCES

EU Commission: EU policies and initiatives promoting energy efficiency across member countries

EPA WaterSense: Information on water-efficient products and practices

Industrial Energy Management: A guide on energy efficiency practices in industrial settings

Energy Audit Guidebook: Energy Audit tools and guidelines

LEED Tools for Green Building Design: Scorecard for Green Building Design Standards

EUI Calculator: Energy Star EUI Database and calculator

International Institute for Sustainable Laboratories: Lab efficiency programs and benchmarking

TRAININGS AND TOOLS

Association of Energy Engineers: Certified Energy Auditor and Certified Energy Manager Training

Energy Institute: Energy Manager I, II, and III training

FINANCIAL INCENTIVES

Database of Incentives by State: Comprehensive database of incentives and policies that support renewables and energy efficiency in the U.S.

EU Energy Efficiency Funding Opportunities: Database of funding opportunities across the EU

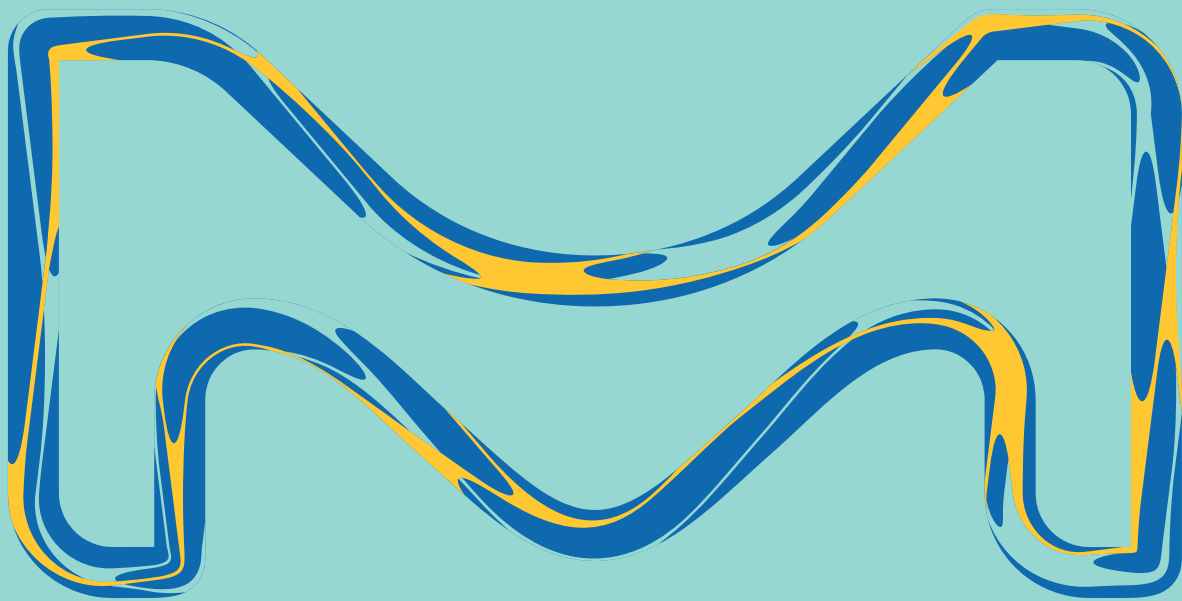
EU LIFE Program Funding Opportunities: Funding available via the EU LIFE Program

UK Energy Efficiency Grant Opportunities: Database of funding opportunities across the UK

Ireland Financing and Incentive Opportunities: Database of funding and financial opportunities in Ireland

China Energy Efficiency Incentives: China policies, incentives and initiatives promoting energy efficiency

Contact your local utility company or government agency for guidance on other incentive opportunities.



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