

HELP US MAKE UPSTATE NEW YORK THE **BATTERY TECH CAPITAL** **OF AMERICA**



WHY SHOULD I CARE ABOUT BATTERIES?

WHY UPSTATE NEW YORK?

Batteries are fueling startups, creating jobs, and attracting investment in our region. Read more to learn how to get informed and involved!

Brought to you by the National Science
Foundation and Binghamton University



Regional Engagement

Led by Binghamton University, the National Science Foundation Energy Storage Engine of Upstate New York is a coalition of over 40 academic, industry, non-profit, state, and community organizations in Upstate New York.

Our core partners include:

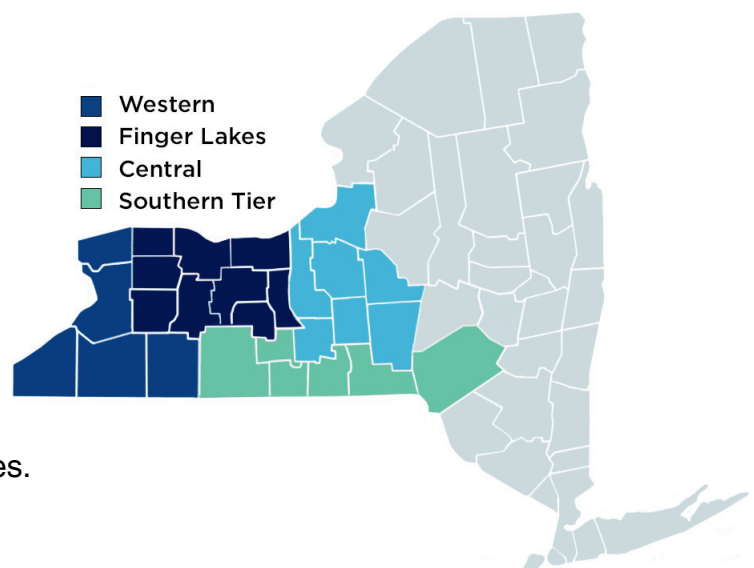


The State of New York supports the Engine with complementary funding and in-kind resources.



REGION OF SERVICE

The Engine's Region of Service comprises of 27 counties in Upstate New York – Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Cortland, Delaware, Erie, Genesee, Livingston, Madison, Monroe, Niagara, Ontario, Onondaga, Orleans, Oswego, Schuyler, Seneca, Steuben, Tioga, Tompkins, Wayne, Wyoming, and Yates.



Why should I care about Batteries?

Batteries are more than just phone power — they're powering a cleaner, safer, and more connected future for you and your community.



They Power Your Everyday Life

From the moment your phone alarm wakes you up to the cordless vacuum that cleans your home — batteries are behind the scenes, making life easier and more connected.



They're Key to a Cleaner, Safer Future

Batteries help store solar and wind power, reduce pollution, and keep our homes and businesses running — even when the grid goes down.



They Bring Jobs and Innovation to Our Region

Right here in Upstate New York, batteries are fueling a whole new economy. The NSF Energy Storage Engine is helping launch startups, train workers, and attract major companies to our communities.

- New careers in clean tech and advanced manufacturing
- Workforce training from high school to adult education
- Local investment and revitalized towns



They're Too Valuable to Waste

Batteries are full of precious materials like lithium, cobalt, and nickel. When we recycle them instead of tossing them, we protect the environment and reduce the need for mining.



New Careers Opportunities

The clean energy future is creating new kinds of jobs — and Upstate New York is helping lead the way. From the lab to the loading dock, the classroom to the construction site, battery innovation is opening up career pathways for every interest and skill set. Whether you're into science, building things with your hands, teaching others, or solving big challenges — there's a place for you in the clean tech workforce.



Explore Career Pathways

Research & Development
Help invent the next generation of batteries and energy systems.

Careers: Chemist, Materials Scientist, Battery Engineer, Data Analyst, Science Communications



Manufacturing & Assembly

Build the batteries and components that power electric vehicles, tools, and homes.

Careers: Process Technician, Quality Control Specialist, Production Engineer, Robotics Operator

Installation & Integration

Make clean energy work in the real world — in buildings, vehicles, and the electric grid.

Careers: Energy Storage Installer, Field Technician, Systems Integrator, Electrician



Recycling & Recovery

Give batteries a second life by safely recovering valuable materials like lithium and cobalt.

Careers: Environmental Technician, Battery Dismantler, Circular Economy Specialist



Why It Matters

Clean tech careers are growing fast — and they're good for people, communities, and the planet. These jobs pay well, will help prevent outsourcing, and support a more sustainable future.



How to Get Started

- Talk to local schools and workforce centers
- Explore STEM clubs or internships
- Connect with clean tech companies and training programs in your region

Visit upstatenyengine.org to learn more

Our Battery Powered World

Batteries are essential to modern life, found in countless devices:

1



Household items

(remotes, toys)

2



Electronics

(phones, laptops)

3



Vehicles

(EVs, E-bikes, E-ATVs)

4



Industrial applications

(Battery energy storage systems store power from windmills and solar to dispatch later when it's needed)

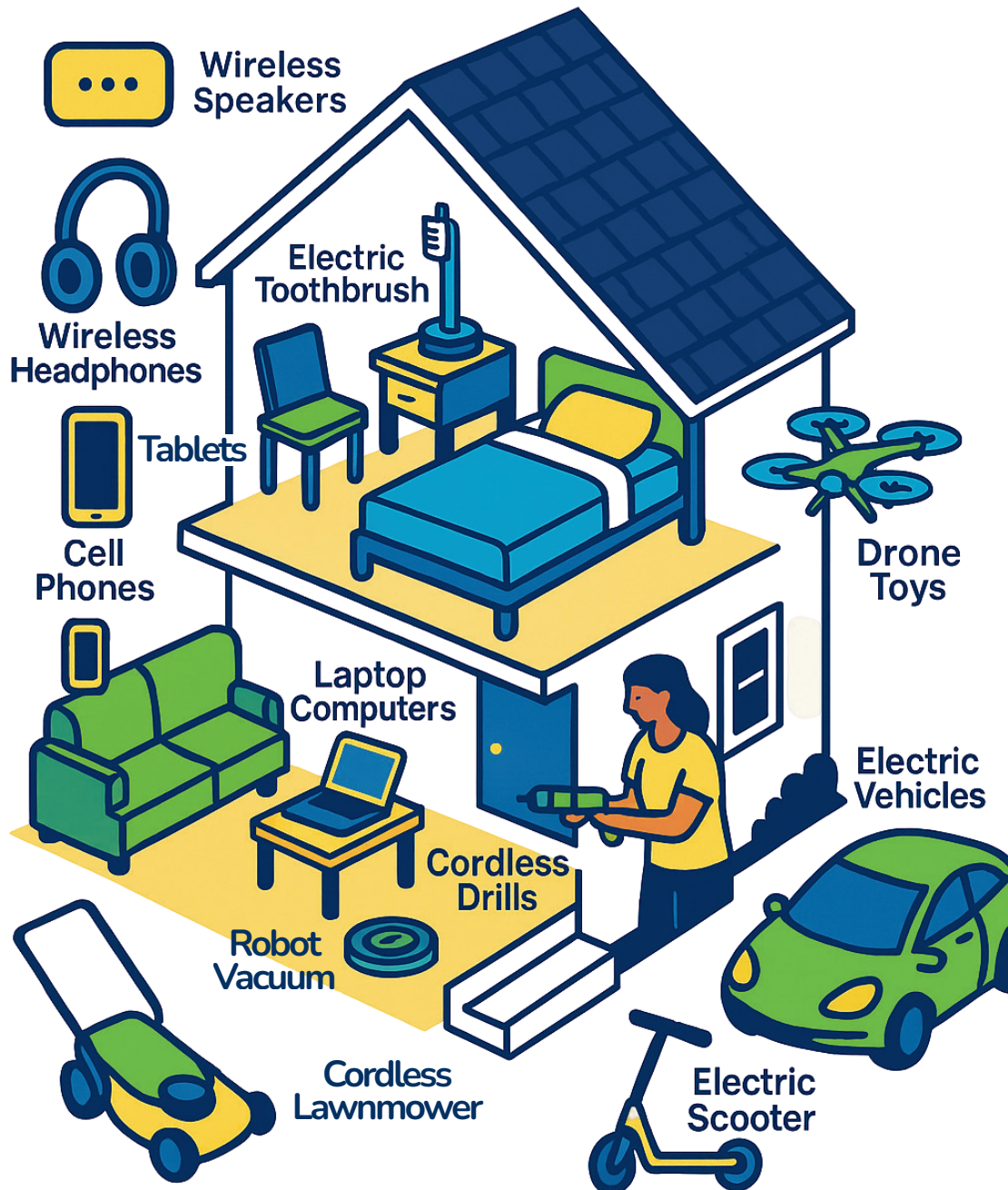
This is just a glimpse of where batteries live, but batteries aren't just for convenience. They're also helping communities:

- Store solar and wind energy for when the sun isn't shining or the wind isn't blowing
- Power critical medical devices in hospitals
- Make factories more efficient and resilient
- Reduce pollution by replacing gas-powered machines with electric alternatives

As battery tech gets better, your home, school, and neighborhood will run **smarter, cleaner, and cheaper.**

Batteries in Our Homes

The Quiet Power Behind Everyday Life



Did You Know?

The average U.S. household has more than 20 battery-powered devices. How many can you think of in your home?

How Batteries Work

Think of a battery like a reusable fuel tank for electricity.

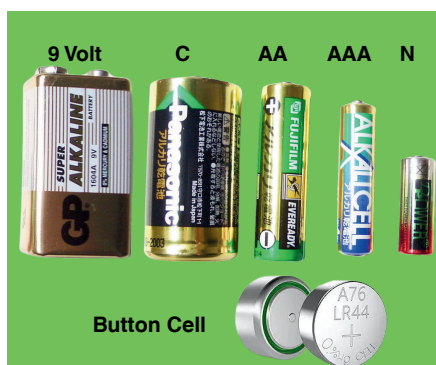
Inside every battery are two sides — a positive side and a negative side — with stuff in the middle (called “electrolyte”) that lets energy flow between them. When you turn something like a toy or flashlight on, electrons flow from the negative side through wires (called a circuit) to the positive side. That flow of electrons is what we call electricity, and it’s what powers your device!

Rechargeable batteries, like those in your phone or car, work by reversing that flow when you plug them in. Pretty neat, right?

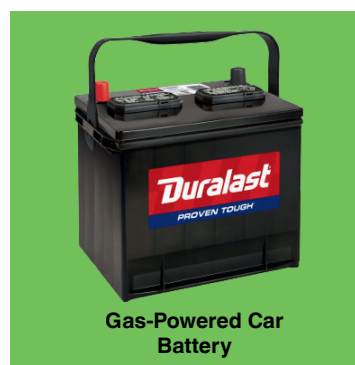
Batteries come in lots of shapes and sizes — from coin-size ones in your watch to big ones that can power an entire building. Batteries come in various types, each with different chemical compositions and properties:

Types of Batteries

Alkaline



Lead-acid



Lithium-Ion



Which battery lasts the longest?

Lithium-ion batteries usually last the longest. They store a lot of energy for their size and weight, which means they can power devices for a longer time. They also don’t lose much power when not being used. Because of this, lithium-ion batteries are commonly used in things like smartphones, laptops, and electric cars.

What is the difference between the different types of batteries?

Each type has different chemical compositions, properties, and therefore uses!

Alkaline



Power your:

- Remote controls
- Flashlights
- Toys

Pros:

- Inexpensive & widely available
- Long shelf life
- No maintenance needed

Cons:

- Not rechargeable (most types)
- Creates more waste
- Limited power output

Lead-acid



Power your:

- Car
- Golf Carts
- Back-up Systems

Pros:

- Low cost for high power
- Reliable for heavy-duty use
- Recyclable

Cons:

- Heavy & bulky
- Contains toxic lead
- Shorter lifespan

Lithium-Ion



Cylindrical

Prismatic



Pouch

Power your:

- Phone
- Laptop
- EVs
- Power Tools

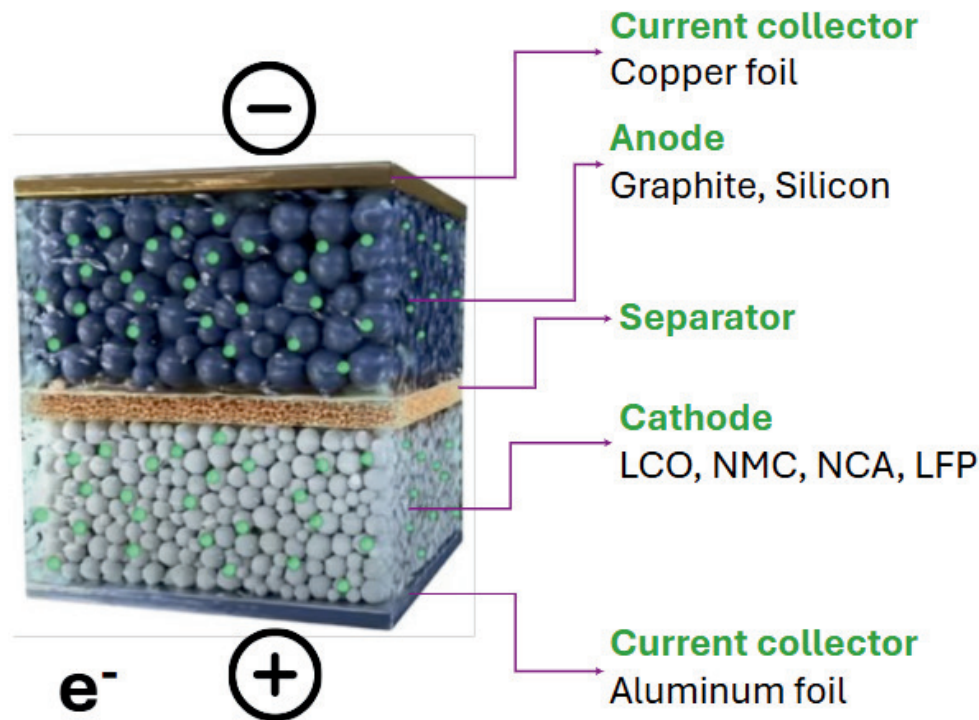
Pros:

- Lightweight & compact
- Rechargeable with long life
- High energy density
- Recyclable

Cons:

- More expensive
- Can overheat or catch fire if damaged

What's in a Lithium-ion Battery?



How are lithium-ion batteries different from other batteries?

- Lithium-ion batteries have a much higher energy density than lead-acid, making them ideal for portable electronics and electric vehicles.
- Unlike single-use batteries, they are rechargeable.



Did You Know?

Battery recycling helps prevent toxic waste and recover valuable materials like lithium, cobalt, and nickel.

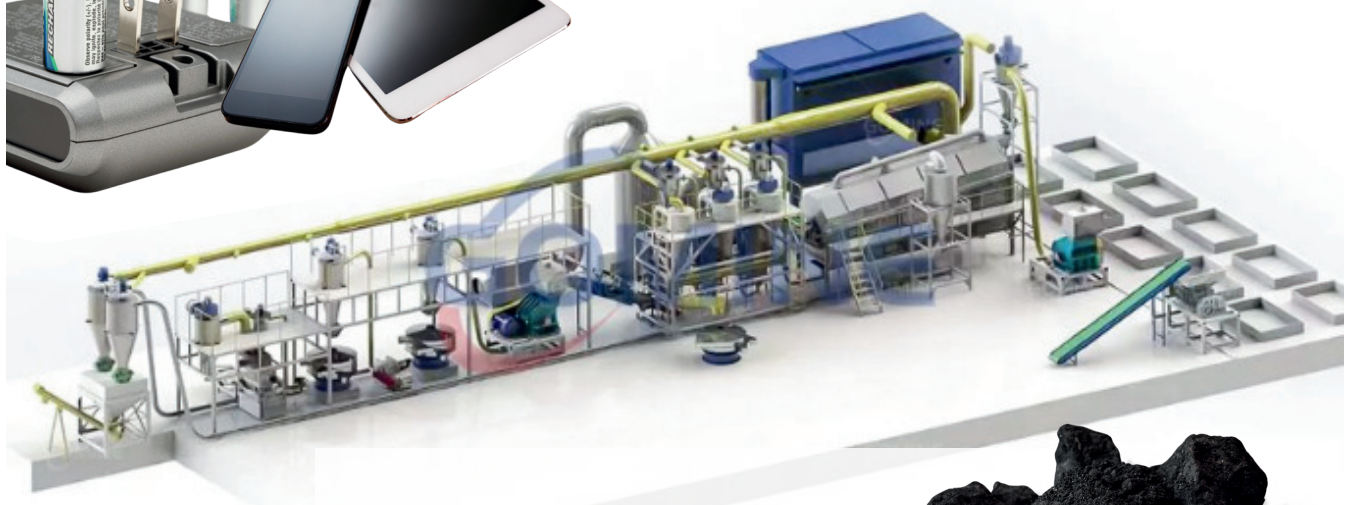
Critical Minerals!

Mn Manganese	Li Lithium
Co Cobalt	Ni Nickel

What happens when we recycle Lithium-ion batteries?



Battery Recycling Center



Black Mass is the mixture of battery components, recovered after shredding. It's used to extract valuable minerals during recycling.



End of Life Battery

When you're done with a battery, recycle it!



Black Mass

The recycle process starts by turning the batteries into Black Mass.



Metal Sulfates & Powders

Then the metal sulfates and powders are removed to be repurposed.



New Battery (or other industries)

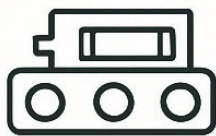
Then the metal sulfates and powders are repurposed into new batteries!

The Recycling Process: 7 Steps



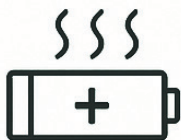
Collection

Old or used batteries are dropped off at collection points — like stores, recycling centers, or events — instead of being thrown in the trash.



Sorting

The batteries are sorted by type and chemistry (like lithium-ion, alkaline, etc.), so each one can be handled the right way.



Discharge

Any leftover energy in the batteries is safely removed, so they don't spark, overheat, or catch fire during recycling.



Shredding

The batteries are crushed or shredded into small pieces, breaking them apart to separate materials like metal, plastic, and chemicals.



Black Mass

This shredded mix contains valuable materials — like lithium, cobalt, and nickel — and is called “black mass.” It looks like fine, dark powder.



Extraction

The black mass then undergoes various processes to extract critical minerals. The metals are cleaned and refined into a pure form, ready to be used again in making new products/batteries.



We turn waste into value!

What if we DON'T recycle batteries?

Environmental contamination:

Leaking chemicals pollute soil and water



Health hazards:

Exposure to toxic substances can harm human health



Safety risks:

Some batteries can cause fires or explosions if damaged



Resource depletion:

Critical minerals are lost when not recycled



There are critical minerals in all Lithium-Ion batteries!

- **Manganese**- Commonly used in lithium manganese oxide (LiMn_2O_4) batteries, found in power tools and electric vehicles.
- **Lithium**- The foundation of lithium-ion batteries, which power most phones, laptops, Electric Vehicles, and grid storage systems.
- **Cobalt**-Found in lithium cobalt oxide (LiCoO_2) and NMC. (nickel-manganese-cobalt) batteries.
- **Nickel**-Used in NMC and NCA (nickel-cobalt-aluminum) battery chemistries, often in Electric Vehicles.

Did you know that it's **ILLEGAL** to throw out Rechargeable Batteries?

NYS Rechargeable Battery Law (Dec. 10, 2010):

- Throwing rechargeable batteries (Lithium-ion batteries included) into the trash is illegal
- Consumers must dispose of rechargeable batteries at drop-off locations or rechargeable battery retailers
- NYS retailers selling rechargeable batteries or products containing rechargeable batteries must accept used rechargeable batteries from consumers for recycling.

But, how do I recycle them? What do I do with them?

Both alkaline and Lithium-ion batteries can be recycled!

Find recycling locations at:

- Retail stores (e.g., electronics stores like Best Buy, Staples, Home Depot, Walmart, Lowes, etc)
- Recycling centers
- Online resources (e.g., Call2Recycle, Earth911, nyc.gov/batteries)
- Both alkaline and lithium-ion batteries can be recycled!
- Local recyclers like Bridge Green Upcycle.



ACTION



Visit nyc.gov/batteries to find the nearest
special waste drop-off sites

What should I do if my battery is swollen or damaged?

A swollen battery, typically in a phone or laptop, is a sign of internal chemical reactions going awry and potentially posing a safety risk. It can be caused by overcharging, age, or manufacturing defects, leading to the creation of gas and swelling. While it's not always immediately dangerous, a swollen battery should be addressed promptly.



Summary

- A swollen or damaged battery is a fire hazard and should not be used or thrown away in the trash.
- Avoid puncturing it and take it to a certified battery recycler or hazardous waste facility.
- Stop using it immediately and seek professional disposal. Visit nyc.gov/batteries to find the nearest special waste drop-off sites.

10 Battery Facts You Should Know

1

Batteries are everywhere: The average U.S. household uses more than 20 battery-powered devices — from phones and laptops to flashlights, toothbrushes, and power tools.

2

Lithium-ion batteries power modern life. They're in smartphones, electric vehicles, laptops, and solar storage systems — because they're lightweight, rechargeable, and energy-dense.

3

Battery technology is changing fast. New batteries are being designed to charge faster, last longer, store more energy, and be safer and more sustainable.

4

Upstate New York is becoming America's Battery Capital. Thanks to the NSF Energy Storage Engine, companies, universities, and startups are making breakthroughs in battery research, recycling, and manufacturing — right here.

5

Batteries help fight climate change. They store clean energy from solar and wind, reducing the need for fossil fuels and cutting carbon emissions.

6

Recycling batteries protects people and the planet. Batteries contain valuable materials like lithium, cobalt, and nickel. When not recycled properly, these materials can contribute to pollution and waste. Recycling keeps them out of landfills and puts them back to good use!

7

You shouldn't throw batteries in the trash. They can leak harmful chemicals, spark fires, or contaminate soil and water. Use local drop-off programs or battery recycling bins instead.

8

Battery jobs are growing. Clean energy and battery careers are expanding — from engineering and robotics to manufacturing, testing, and recycling — with new training programs across Upstate NY.

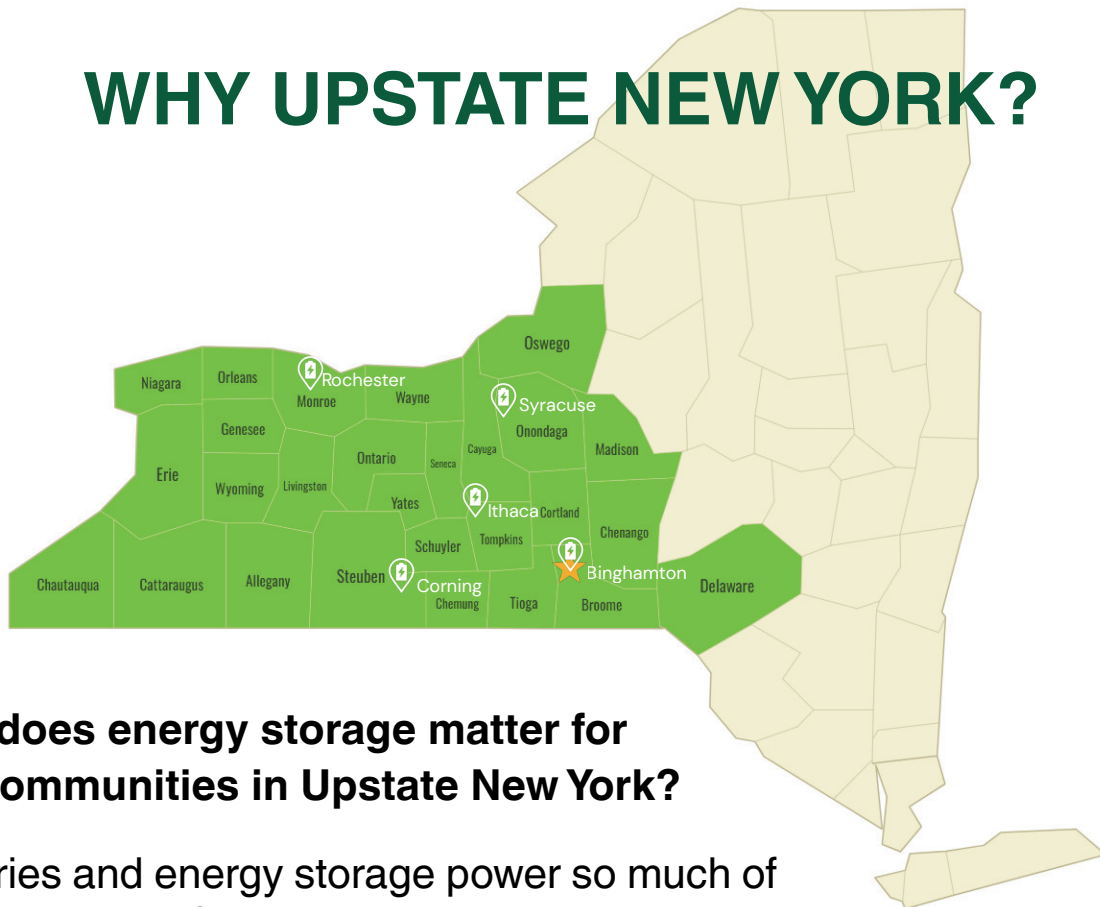
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Electric vehicles run on batteries. EVs use large rechargeable battery packs that can last hundreds of miles per charge — and many EV batteries are being reused or recycled at the end of their life.

10

Everyone can make a difference. Whether you recycle your old batteries, choose rechargeable ones, or learn more about clean energy, small actions support a smarter, more sustainable future.

WHY UPSTATE NEW YORK?



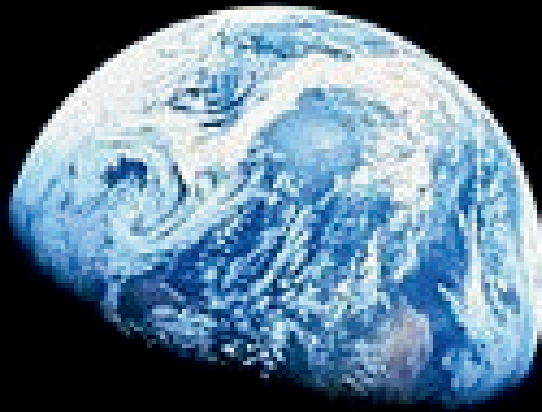
Why does energy storage matter for our communities in Upstate New York?

Batteries and energy storage power so much of our daily lives—from phones and laptops to cars and even homes. But right now, most of this technology is made overseas, especially in China. That means we're depending on other countries for something we use every day.

Here in Upstate New York, **we have the talent, the tools, and the industries to bring this work home. Our region is full of smart scientists, skilled workers, and growing companies that are ready to lead the way.**

By building a strong energy storage industry here, we're not just creating new technologies—**we're creating good jobs, training opportunities, and a stronger local economy for the future.**

It's about keeping innovation local and making sure our communities benefit from the clean energy movement.



"The greatest threat to our planet
is the belief that someone else
will save it."

- Robert Swan

HOW TO STAY INVOLVED

Upstate New York is becoming the Battery Capital of America, and that means more innovation, education, and job opportunities are coming to our communities. Whether you're a parent, student, job seeker, or just curious, here are easy ways to stay in the loop:



Check out our website

<https://upstatenyengine.org/news/>

Learn about upcoming events, programs in schools, job training, and more!



Learn What's Happening in Local Schools

We're working with schools across the region to teach students about clean energy, science, and future careers. STEM days, battery science demos, career fairs... etc. Is your school engaged?



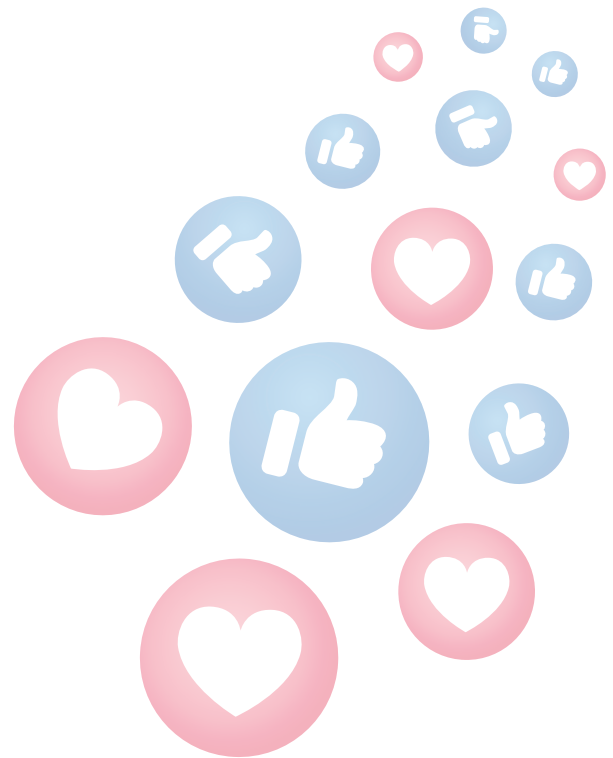
Discover Career and Training Opportunities

New companies are setting up shop here, and they need workers. No experience? No problem. Programs are designed to support learners at all stages.



Attend a Local Event or Info Session

We host events around the region, open to everyone. Community listening sessions, Workforce development workshops, School showcases, and science expos. Come meet people, ask questions, and see the work firsthand.



STAY CONNECTED



Follow us on LinkedIn

[linkedin.com/company/
upstate-ny-energy-
storage-engine](https://linkedin.com/company/upstate-ny-energy-storage-engine)

WE NEED YOUR HELP!



Spread the Word– It's Easy

If you hear something exciting,
share it with your neighbors,
coworkers, or community groups.

Tag us on social media, invite
others to events, and help us
grow a more connected and
informed region



Powering the Future—Together!

The battery ecosystem in Upstate New York is growing fast. Right here in our own backyard, Upstate New York is becoming America's Battery Capital.

Through the National Science Foundation (NSF) Energy Storage Engine, we're bringing together top scientists, local startups, skilled workers, educators, and community leaders to create the next generation of energy storage — cleaner, safer, and made in the USA.

This Engagement Toolkit was created to help learners, families, and communities explore how batteries work, why they matter, and how they power our everyday lives. It's a starting point to learn what this work means, why it matters, and how you can be part of the energy revolution already underway.

 **Learn more:** upstatenyengine.org

Special Thanks To:



Dr. Meera Sampath, CEO, Upstate NY Energy Storage Engine
Dr. Myra Henry, Director of Regional Engagement
Dr. Maggie Cousin, Program Administrator

Regional Community Feedback Pilot Groups

- YWCA of Rochester and Monroe County
- YWCA of Syracuse
- Boys & Girls Club of Broome County
- Action for Older Persons