COMPREHENSIVE GUIDE TO

Reporting Batteries

including sections on Lead-Acid, Lithium-Ion, EV, and Solar

ENCAMP

Table of Contents

The Lifecycle of a Lead-Acid Battery

Background

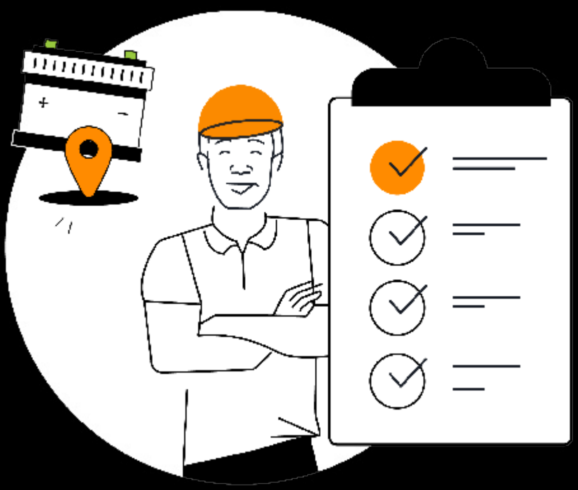
Lead-acid batteries are commonly used to power cars, industrial trucks, such as forklifts or lift trucks, and even to serve as backup power sources to cell towers. Generally, these batteries are comprised of lead-based plates that sit in a bath of sulfuric acid and water, called electrolyte. Lead-acid batteries are used to power so many different devices and vehicles because of their ability to be recharged and their low cost.

In fact, lead-acid batteries have become a sustainable choice for businesses that want to lessen their environmental impact. Particularly in the circular economy, lead-acid batteries can be recycled indefinitely. However, maintaining and discarding them is still highly-regulated because of their sulfuric acid contents.

PART 1: LEAD-ACID BATTERIES

SECTION I

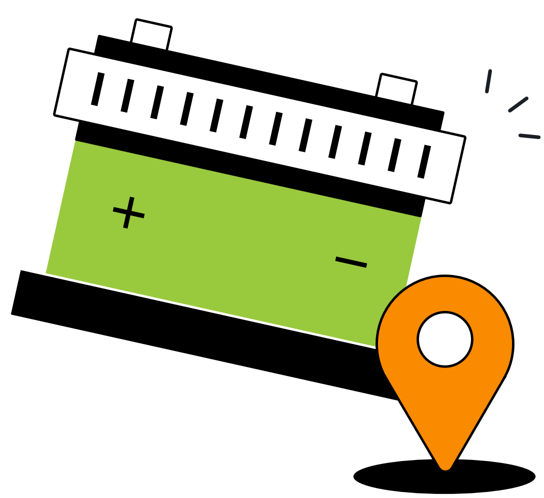
Bringing a Lead-Acid Battery On-Site



Bringing a Lead-Acid Battery On-Site

When a new chemical is brought on-site, there are several regulations to consider that can trigger additional requirements for your facility and organization.

One of those regulations is the Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA's purpose is to encourage local committees and states to plan for emergencies caused by potential chemical hazards present in their communities. In order for the **Local Emergency Planning Committee (LEPC)** and the **State Emergency Response Commission (SERC)** to become aware of these chemical hazards, facilities are required to report certain chemicals above a certain threshold to these entities. **Extremely Hazardous Substances (EHSs)** are of particular concern. These are chemicals that "could cause serious irreversible health effects from accidental releases," as defined by the EPA. EPA publishes a list of EHSs in **Appendix A** & **B**. Sulfuric acid is listed with a **Threshold Planning Quantity (TPQ)** of 1,000 pounds, the threshold at which a facility must report an EHS to their SERC and LEPC.



Because lead-acid batteries are generally considered a mixture, the amount of sulfuric acid needs to be aggregated across all batteries and other sources of sulfuric acid. Once the 1,000 pounds threshold is hit, federal EPCRA rules state that the notification to the SERC and LEPC must be made within 60 days after a shipment is received or it's produced on-site. Federal regulations also state that the following information must be submitted to the SERC and/or LEPC:

- **Emergency Planning Notification** - The notice that says your facility is subject to the emergency planning requirements of EPCRA Section 302.
- **Facility Emergency Coordinator Designation** - The designation of a facility representative who will participate in the local emergency planning process as a facility emergency response coordinator.
- **Changes Relevant to Emergency Planning (to the LEPC only)** - A notice regarding any other changes occurring at your facility that may be relevant to emergency planning. This notification must happen within 30 days after the changes have occurred. Note this would be for any changes occurring after your initial sulfuric acid Emergency Planning Notification
- **Requested Information (to the LEPC only)** - Additional information requested by the LEPC to help develop or implement their local emergency plan.

1. The format to submit the above information is not specified by the EPA.
2. The format varies based on what SERC and LEPC your facility must coordinate with.
3. Read additional Encamp guidance on EPCRA **Section 302**.

PART 1: LEAD-ACID BATTERIES

SECTION II

Chemical Inventory Reporting for Lead-Acid Batteries

Chemical Inventory Reporting for Lead-Acid Batteries

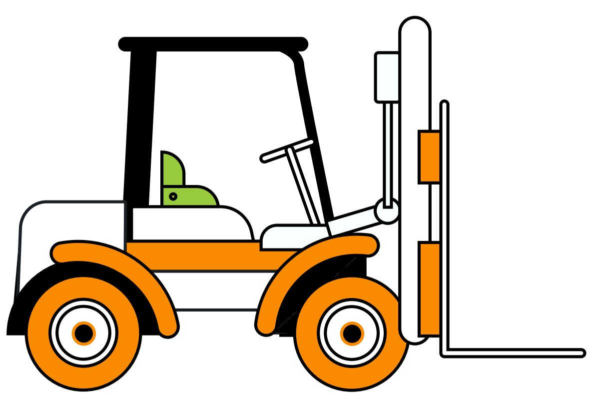
Once lead-acid batteries are on-site and you've made the appropriate notification to the SERC and LEPC to satisfy EPCRA Section 302 requirements, the next step is to confirm your Section 311-312 reporting requirements.

If you do report under Section 302 (threshold 1,000 pounds), then you must also report under EPCRA Sections 311-312 (threshold 500 lbs) to satisfy hazardous chemical inventory reporting requirements.

If you did not report under Section 302, note that Sections 311 and 312 require any facility with chemicals in quantities that equal or exceed the following thresholds to report:

- For EHSs, the TPQ listed in Appendix A and B or 500 pounds, whichever is lower.
- For other hazardous chemicals (that require a Safety Data Sheet (SDS), the threshold is 10,000 pounds).

Keep in mind that these are federal thresholds, and states may have lower thresholds. If you're curious about a specific state's approach to thresholds, check out **Encamp's State-by-State Guide to EPCRA Reporting**.



Threshold Calculation

Before we dive into how to report the batteries, let's take a look at a typical SDS for a lead-acid battery. Most SDSs will break out the components as they are designated below:

SECTION 3 - COMPOSITION

Chemical Name	CAS No.	Percentage %
Lead and/or Lead Oxide	7439-92-1	43-70
Electrolyte (Sulfuric Acid and water)	7664-93-9	20-44
Antimony	7440-36-0	0-4
Polypropylene	9003-07-0	5-10

The main components are lead and/or lead oxide and the electrolyte (sulfuric acid and water). The other components should be reviewed as well, however, neither antimony nor polypropylene are listed in Appendix A and B, so the general threshold of 10,000 pounds would apply to them if you're reporting by component (unless your state has specific thresholds). Lead and/or lead oxide is not listed as an EHS in Appendix A or B either, and therefore does not need to be aggregated across different sources of lead per **EPA's guidance document**. Primarily, sulfuric acid will be the chemical used to determine if you must report because of the TPQ. For sulfuric acid, the TPQ is 1,000 pounds. Because the reporting threshold for EHSs is the TPQ or 500 pounds (whichever is lower), the lower threshold of 500 pounds should be used.

To calculate whether or not the battery(s) you have on-site exceed the reporting threshold, you will need the total weight of the battery. For this calculation, let's assume the battery weighs 60 pounds. To calculate the total amount of sulfuric acid in the battery, multiply the weight (60 pounds) by the percentage of sulfuric acid (44%). Note that although the percentage of sulfuric acid in our example is listed as a range (20-44%), best practice is to use the maximum amount of the range. The result is 26.4 pounds of sulfuric acid.

60 lbs x .44 = 26.4 pounds

Generally, one battery will not push you over the threshold unless it's very large. Let's say you have 20 of these batteries because you're using them to power forklifts on-site and you always have batteries on the charging station. In this situation, you would take the 26.4 pounds of sulfuric acid and multiply it by the number of batteries you have on-site (which is 20).

26.4 pounds of sulfuric acid x 20 batteries = 528 pounds of sulfuric acid

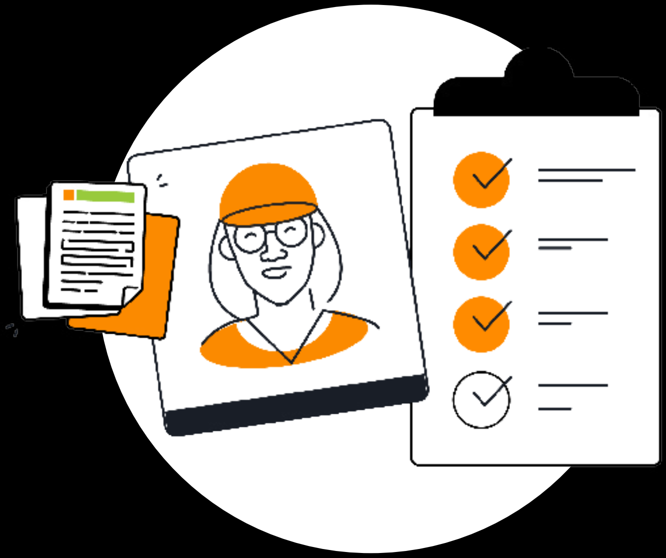
The result is that the amount of batteries you have on-site have exceeded the threshold and you are required to report the sulfuric acid.

PART 1: LEAD-ACID BATTERIES

SECTION III

Mixture Reporting vs. Component Reporting

For Lead-Acid Batteries



Mixture Reporting vs. Component Reporting

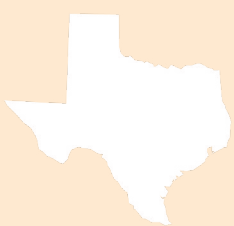
There are two ways of reporting lead-acid batteries for Tier II reporting according to the EPA. Some states* have published guidance on how they expect lead-acid batteries to be reported.

EPA's recommended approach states that a facility should be consistent in reporting between 311 (SDS Reporting) and 312 (Chemical Inventory Reporting). EPA also **states** that the submission of the Tier II form can be used for 311 purposes for hazardous chemicals brought on-site between October 1 and December 31, but confirm with your SERC and LEPC.

For 311, when a new chemical is brought or produced on-site and it exceeds its threshold:

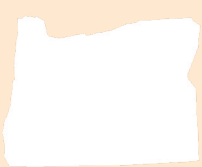
- Facilities must submit the Safety Data Sheet (SDS) of the chemical to their SERC, LEPC, and local fire department within 3 months.
- For lead-acid batteries, all components of the battery are generally combined into one SDS. This can differ if you manufacture, refill, recycle, or provide maintenance on lead-acid batteries at your facility, in which case you might have bulk ingredients on-site, with individual SDSs per ingredient.
- For the general use case, facilities must submit SDSs for the entire lead-acid battery to comply with 311.

*Here are some **state sources** that have published guidance on how they expect lead-acid batteries to be reported:



Texas Source

California Source



Oregon Source

Based on EPA's guidance (mentioned previously), reporting between 311 and 312 should be consistent:

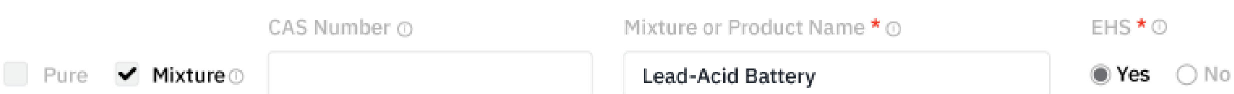
- You submitted an SDS for the entire battery to comply with 311, so you must report the entire battery (i.e., as a mixture) on your 312 report, not the components.
- However, if you brought other sulfuric acid sources on-site later, how those sources are reported (individual vs. mixture) would be determined independent of batteries, which are "locked in" as being reported as a mixture.

Mixture Reporting

When reporting lead-acid batteries as a mixture, be sure to include physical and health hazards associated with every mixture component listed on the SDS. Depending on what state your facility is in and what reporting system they have chosen to use, you may have to report the overall mixture as an EHS or only the mixture component (sulfuric acid, in this case) as an EHS.

Tier2 Submit

If you're required to use EPA's Tier2 Submit software to file your Tier II report, here is what your lead-acid battery will look like reported as a mixture.



EHS is marked as Yes because they require the overall chemical to be marked as an EHS if one of the mixture components is an EHS.

E-plan

If your SERC uses E-plan for submissions, the system will require the overall chemical to be marked as an EHS, just like Tier2 Submit. Below is an excerpt from their instructions. **Source**

- Mixture:
  1. Provide the name of the mixture, product name or trade name as provided on the MSDS sheet.
  2. Enter the CAS number of the mixture or product, if available. If not, leave it BLANK.
  3. Check box for the appropriate descriptor: solid, liquid, or gas.
  4. If the mixture contains any EHS, check the box "yes", and then enter the name and CAS number of each EHS in the mixture.
  5. You are not required to list non-EHSs in the mixture, but may report if you wish to do so.

Tier II Manager

If your SERC uses Tier II Manager for submissions, the system will require the overall chemical to be marked as an EHS, just like Tier2 Submit. Below is a screenshot from a Tier II Manager report.

CAS #: **N/A**
Trade Secret: ☐
Chemical Name: **LEAD-ACID BATTERIES**
EHS: ☐ Contains EHS: ☑ Exceeds TPQ: ☑
EHS Name:
☐ Pure ☑ Mix ☑ Solid ☑ Liquid ☐ Gas SDS

Component Reporting

If you decide to report the sulfuric acid separately, the reporting is a little more straightforward. Since sulfuric acid is an EHS, you will simply check the EHS box on whichever system your SERC uses.

PART 1: LEAD-ACID BATTERIES

SECTION IV

Damaged Lead-Acid Batteries

Damaged Lead-Acid Batteries

Lead-acid batteries are known to break from time to time. When they do, and the electrolyte begins to leak from its casing, you'll need to know how to react immediately and the necessary next steps.

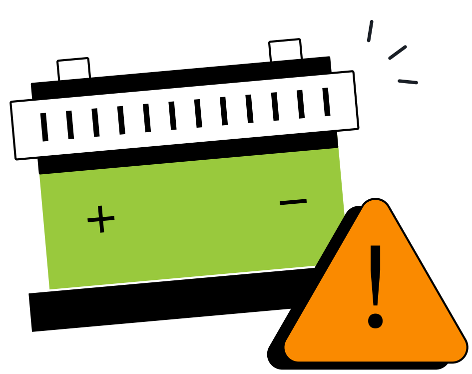
Do I need to do a 304 Notification?

EPCRA Section 304 is the **Emergency Release Notification** section of EPCRA. You are subject to this rule if your facility "produces, uses, or stores a hazardous chemical" and you "release a reportable quantity (RQ) of any EHS or of a hazardous substance as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at your facility."

Note: The quantity of sulfuric acid to consider is the total quantity of chemical that leaves the facility, not just the quantity spilled and contained within the facility. Sulfuric acid is the main chemical of concern in regards to 304 notifications. The RQs for 304 notifications are listed in **Appendix A** and **B** ("Reportable Quantity" column) and also on the **List of Lists** ("Section 304 EHS RQ" column). For sulfuric acid, the RQ is 1,000 pounds. It may be hard to quantify the total gallons or pounds of the spill, but if the battery shell is left with only the plates inside, you can work backwards to determine if the spill has exceeded the RQ based on similar calculations that you performed for your threshold determination in Section 2.

Who do I notify?

Once you've determined that the spill has exceeded the RQ and you are subject to 304, you'll need to determine your next steps.



Do I need to do a 304 Notification?

The federal regulations state that you must notify the "SERC and LEPC of any area(s) that are likely to be affected by the **release**." If the substance is also listed on the CERLCA list (i.e., if it has a value in the "CERCLA RQ" column on the List of Lists), the National Response Center (NRC) must be notified as well. The NRC's report hotline number is (800)424-8802. EPA has also published a list of State Contact Information for 304 Notifications, which you can find **here**.

What should I include in the Notification?

EPA's website states you must include the following information. Check with your state as well, in case they require additional information.

1. The chemical name
2. An indication of whether the substance is extremely hazardous
3. An estimate of the quantity released into the environment
4. The time and duration of the release
5. Whether the release occurred into air, water, and/or land
6. Any known or anticipated acute or chronic health risks associated with the emergency, and where necessary, advice regarding medical attention for exposed individuals
7. Proper precautions, such as evacuation or sheltering in place
8. Name and telephone number of contact person

The regulations also say that gathering this information should not impede the notification on emergency response. If you have hazardous chemicals at your facility, it's best to prepare for this type of notification well ahead of a spill. Many facilities choose to post this information by a facility phone or in an accessible area so the information can be gathered quickly. The immediate notification must be conducted orally, over the phone.

Follow up

After the initial notification is made and the release has been contained, a follow-up written report must be submitted to the SERC and LEPC. Unless the event occurred during transportation or from storage incident to transportation, the written follow-up must be submitted as soon as practicable, typically within 30 days. In the written notice, you must provide and update the information that was reported in the immediate notification and include the following additional information:

1. Actions taken to respond and contain the release
2. Any known or anticipated acute or chronic health risks associated with the release
3. Where appropriate, advice regarding medical attention necessary for exposed individuals

EPA does not have a prescribed format for this notification, and only states that it should be written. Check with your SERC to see if they have a required or preferred format. For example, Indiana requires the 304 follow-up notification to be submitted via their Tier II Manager portal. Some states, like Kansas, have specified a shorter timeframe (7 days, instead of 30 days) for the follow-up notification.

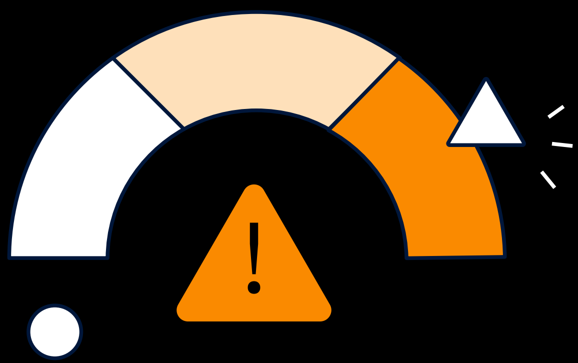
Read additional Encamp guidance on **EPCRA Section 304** **Read the article >**

Cleanup

In the midst of notifying the appropriate parties and keeping everyone safe, cleaning up the spill is another task you'll need to complete to mitigate the situation. Most SDSs provide cleanup information in case of a spill or release, so be sure to check those well in advance. It's recommended to have the proper PPE and spill kit items handy in case of an emergency, so you can clean up the spill quickly.

Some items you may need to clean up the spill:

- Proper PPE (safety glasses, gloves, Tyvek suit, etc.)
- First aid kit nearby
- Eye wash station and/or safety shower
- Empty drums or buckets for spill cleanup material (make sure they are rated for the waste that you are adding to it; i.e, corrosive waste in plastic vs. metal)
- Neutralizing absorbent
- Absorbent mats, socks, or barriers
- Waste labels



When the absorbed acid and cleanup material are packaged up into a bucket or drum, be sure to label it appropriately. If the acid was neutralized, it's possible the waste can be considered non-hazardous, but be sure to do your due diligence with analysis, if necessary. If the acid wasn't neutralized and just absorbed, the waste can be considered hazardous depending on your state's regulations, such as in **California**, which has stricter waste regulations than the Federal RCRA program.

Once packaged and properly labeled, work with your hazardous waste contractor to pick up the containers for disposal. The broken lead-acid battery casing might be salvaged. Most hazardous waste treatment companies have contracts with lead-acid battery recyclers, so they can potentially arrange for recycling.

PART 2: LITHIUM-ION BATTERIES

SECTION I

The Lifecycle of a Lithium-Ion Battery

The Lifecycle of a Lithium-ion Battery

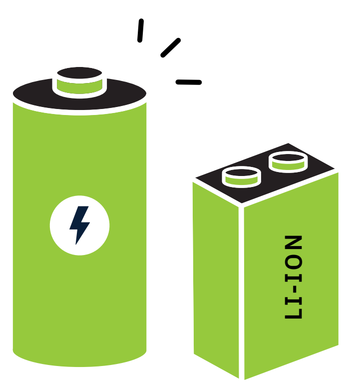
The life of lithium-ion batteries begins with them being manufactured from various metal compounds like lithium, cobalt, manganese, and nickel. Facilities must evaluate EPCRA reporting requirements for the chemicals involved at this stage.

Once in use, batteries powering consumer devices are likely exempt from EPCRA hazardous chemical inventory reporting under the Consumer Product Exemption. Industrial batteries may also be exempt if they are in the same form and concentration as consumer batteries.

At end-of-life, reporting exemptions may apply to lithium-ion batteries destined for disposal, but these must be carefully assessed. According to EPA's 2023 guidance on **Lithium-Ion Batteries and EPCRA 311-312 Reporting Requirements**, end-of-life lithium-ion batteries may qualify for exemption from EPCRA Sections 311-312 inventory reporting if they meet the definition of a Resource Conservation and Recovery Act (RCRA) hazardous waste and are subject to RCRA regulations as universal waste. Universal waste handlers must comply with storage, labeling, accumulation limits, training, and release response standards, but not the more stringent small or large quantity generator rules.

Importantly, the term "end-of-life" does not include batteries destined for reuse or refurbishment. These reuse case batteries are not considered solid wastes under RCRA and do not qualify for the hazardous waste exemption.

In summary, it is important to determine if your lithium-ion batteries need to be reported on a Tier II Inventory form from manufacture through end-of-life disposal, with exemptions applying in certain stages if specific conditions are met.



PART 2: LITHIUM-ION BATTERIES

SECTION II

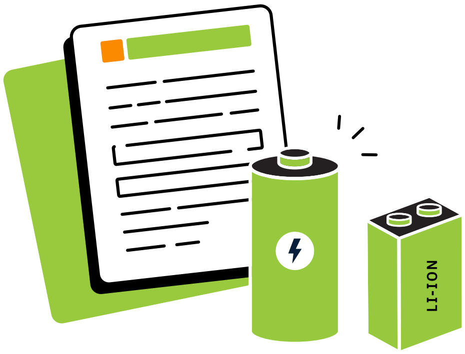
Reporting Lithium-Ion Batteries

How to Report Lithium-Ion Batteries

Compared to its lead-acid battery counterpart, a lithium-ion battery is 95% more efficient - yet equally as hazardous to the environment. One misstep could lead to catastrophic events that bring harm to the community and environment. However, lithium-ion batteries tend to be included on EPCRA Tier II reports far less frequently, due to the fact that many EHS professionals are still left with questions on how best to comply with SDS and Tier II reporting requirements.

Many facilities are beginning to transition their energy storage from lead-acid batteries to lithium-ion batteries due to their reliability and efficiency.

However, lithium-ion batties also contain flammable electrolytes which when damaged, can cause a fire hazard risk. With that, many EHS professionals have been left with questions on how best to handle lithium-ion batteries on site and report for SDS and Tier II.

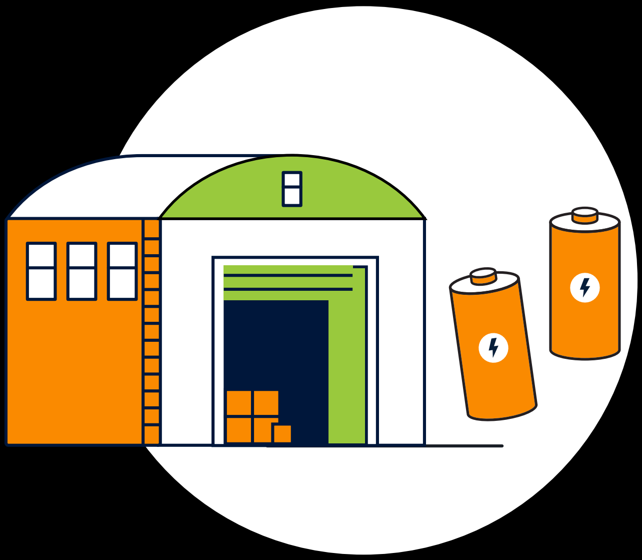


Follow this step-by-step guide to master compliance reporting for lithium-ion batteries like a pro.

PART 2: LITHIUM-ION BATTERIES

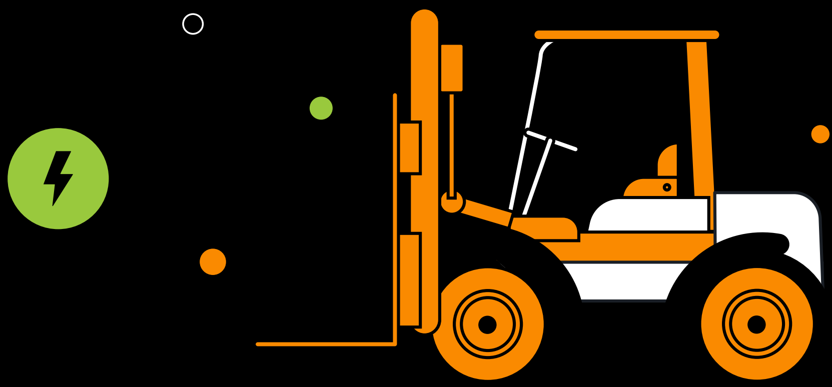
SECTION III

Chemical Inventory Reporting for Lithium-Ion Batteries



Do you need to prepare a Tier II report?

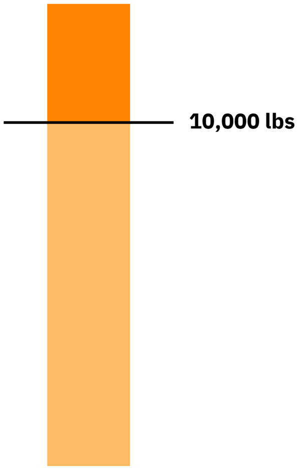
DON'T NEED TO REPORT	NEED TO REPORT
Batteries that the maintenance department uses to power their cordless drills, because these are sold for use by the general public (i.e., the same batteries available for purchase at a hardware store.)	Batteries used to power forklifts, because these are not sold for use by the general public.



Determine reporting thresholds

Because lithium-ion batteries are flammable and present potential safety issues, they're subject to EPCRA regulations and the reporting thresholds determined for Tier II filing. But unlike lead-acid batteries, **lithium-ion batteries do NOT contain any Extremely Hazardous Substances (EHS)**. Therefore, the reporting threshold for lithium-ion batteries (at the federal level) is **10,000 pounds**.

At a state and local level, reporting thresholds are more complex in that they vary among states and even counties and local jurisdictions. While many states have adopted the 10,000-pound reporting threshold for hazardous chemicals, a handful of states have lower Tier II reporting thresholds.



PART 2: LITHIUM-ION BATTERIES

SECTION IV

Mixture Reporting vs. Component Reporting

For Lithium-Ion Batteries

What is Mixture Reporting and Component Reporting?

MIXTURE REPORTING

If individual chemical ingredients are not known, calculate the total quantity of lithium-ion batteries present throughout the facility at any one time.

COMPONENT REPORTING

If each individual chemical component in the lithium-ion battery can be identified, calculate the total quantity of each component present in all mixtures.

Formula for Quantifying as a Mixture

Weight of Batteries in a Facility X Quantity of Batteries in a Facility

Battery Type	Quantity at Facility	
Forklift (Small): 375 lb. batteries	10 batteries	10 x 375 = 3750 lb.
Forklift (Large): 750 lb. batteries	6 batteries	6 x 750 = 4,500 lb.
Process Equipment: 2,500 lb. batteries	2 batteries	2 x 2,500 lb = 5,000 lb.
TOTAL		**13,250 lb.**
Indiana Hazardous Chemical Threshold		**10,000 lb.**

13,250 lb. > 10,00 lb. Lithium-ion batteries need to be reported at this facility.

Formula for Quantifying as a Component

Total Weight of Batteries in a Facility X Percentage of Chemical Component in each Battery

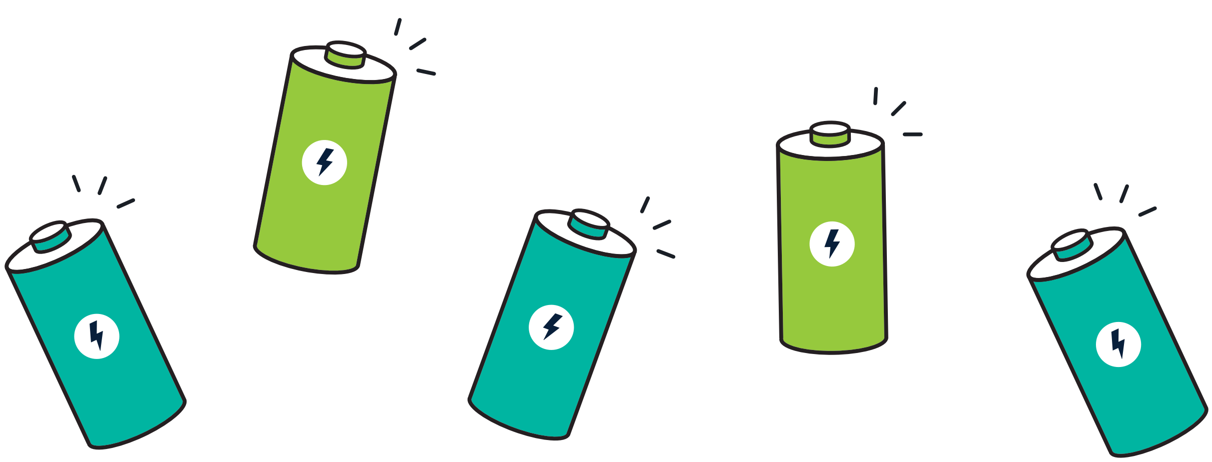
Battery Type	Total Weight	% Copper	Copper Total
Forklift (Small): 10 @ 375 lb. batteries	3,750 lb.	15%	3,750 lb. x 15% = 563 lb.
Forklift (Large): 6 @ 750 lb. batteries	4,500 lb.	15%	4,500 lb. x 15% = 675 lb.
Process Equipment: 2 @ 2,500 lb. batteries	5,000 lb.	15%	5,000 lb. x 15% = 750 lb.
Copper Shot, Raw Material Storage Area: 25 bags @ 200 lb. per bag	5,000 lb.	100%	5,000 lb. x 100% = 5,000 lb.
Carbon Steel Blanks, Raw Material Storage Area: 1 pallet @ 1,500 lb. per pallet	1,500 lb.	1%	1,500 lb. x 1% = 15 lb.
6” diameter 5’ copper Tube, East Yard: 60 tubes @ 70 lb. per tube	4,200 lb.	100%	4,200 x 100% = 4,200 lb.
TOTAL			**11,203 lb.**
Indiana Hazardous Chemical Threshold			**10,000 lb.**

11,203 lb. > 10,00 lb. Copper would need to be reported at this facility.

Chemical details in a Tier II submission

Although the Tier II reporting portal interface will vary depending on the state, the following will be true when reporting lithium-ion batteries:

- If quantifying as a mixture, "Mixture" should be checked; the CAS Number should be blank or "N/A", as it is not required for mixtures
- "EHS" should be marked as "No"
- Physical State will be "Solid"
- Because the mixture does not contain any EHSs, the "Mixture Components" section is not required to be filled in. However, it's recommended to complete this section as a best practice.
- Components can be found in Section 3 of an SDS. When given a range for a component, such as 5-10%, we recommend reporting the higher end of the range (e.g., 10%).



Properly communicate chemical and hazardous details in a Tier II report

Although Tier II reporting requirements will vary by state or county, filling in chemical and hazard details remain the same for Tier II reports. It's most important to remember that **providing the most updated and accurate information will help first responders and emergency planners the most.**

What to do: Now that the quantity of reportable lithium-ion batteries and applicable thresholds have been determined, the last and most important step is adding it to a Tier II report.

Chemical Details Checklist

- Check as Mixture
- EHS marked as No
- CAS Number should be marked as N/A
- Physical State is marked as Solid

Chemical physical and health hazards can be found in your safety data sheet (SDS). For any given facility, it's important to regularly update site maps and SDSs that contain vital information about hazardous chemical substances and how to safely handle them, to protect the community and the environment from any catastrophic events.

Typical hazards of lithium-ion batteries as marked on a Tier II Report

PHYSICAL HAZARDS

- Explosive
- Flammable
- Self-heating

HEALTH HAZARDS

- Acute toxicity
- Skin corrosion or irritation
- Serious eye damage or eye irritation
- Respiratory or skin sensitization
- Carcinogenicity
- Specific target organ toxicity

Reporting Exemptions for Lithium-Ion Batteries

Many lithium-ion batteries will qualify for reporting exemptions under EPCRA Sections 311-312. If lithium-ion batteries are exempt from the definition of a hazardous chemical, they do not need to be reported as one.

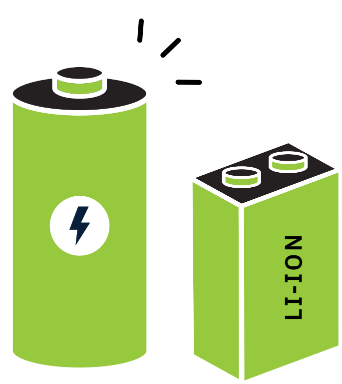
Here are two key reporting exemptions that may apply to lithium-ion batteries:

- Consumer Product Exemption **[40 CFR 370.13(c)(1)]**. Applies to batteries used for personal, household, or consumer purposes, or present in the same form and concentration as consumer products.

- Resource Conservation and Recovery Act (RCRA) exemption **[29 CFR 1910.1200(b)(6)(i)]**. This applies to batteries that meet the definition of RCRA hazardous waste or universal waste and are managed under RCRA regulations.

Exemptions like the Articles Exemption only apply to lithium-ion batteries in specific situations. In many cases, it has been determined that they should not be considered articles, due to their potential to leak, spill, or break under normal use.

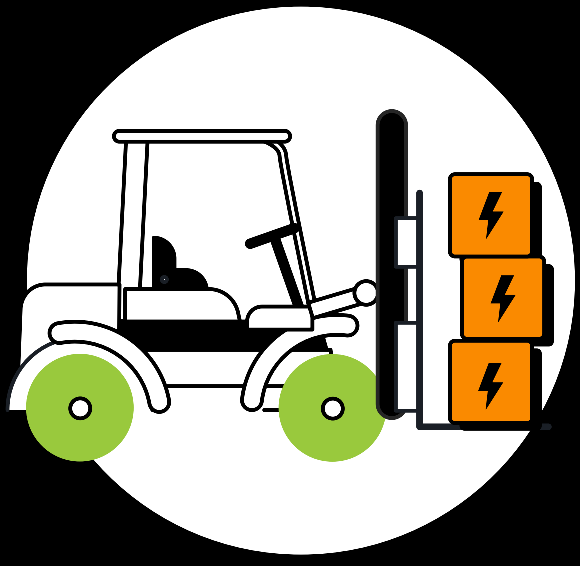
It is important to carefully read the regulations to determine if your specific lithium-ion batteries qualify for an exemption or are subject to normal EPCRA 311/312 hazardous chemical reporting requirements.



PART 3: EV BATTERIES

SECTION I

Introduction to Electric Vehicle (EV) Batteries



Introduction to Electric Vehicle (EV) Batteries

While you may be accustomed to traditional lithium-ion batteries used to power consumer electronics such as laptops and cell phones, another industry that relies on them is the electric vehicle (EV) industry.

Background

Electric vehicles were invented and produced in the 1800s when early innovators from Hungary, the Netherlands, and the United States started to create small-scale electric vehicles. However, it wasn't until the second half of the 19th century that the first practical EVs were made by French and English inventors. As electricity became more widely available in the 1910s electric vehicles became more prevalent. However, plentiful gasoline and improved efficiency saw electric vehicles edged out. The 2000s changed consumers' minds with the success of the Toyota Prius hybrid and the launch of Tesla. This spurred automakers to develop more electric models. Now, according to the International Energy Agency, electric vehicle (EV) sales broke records in 2021, with nearly 10% of global car sales being electric.

Types of EV Batteries

There are four different types of electric vehicles:

- Hybrid-electric vehicles (HEV)
- Plug-in hybrid electric vehicles (PHEV)
- Battery electric vehicles (BEV)
- Fuel cell electric vehicles (FCEV)

Different battery types vary by ion types, electrode materials, and associated electrolytes. There are currently three EV batteries that are most commonly used:

Lithium-ion batteries
- The most common type used in EVs today
- High energy density, fast charging, low self-discharge
- Over 6.5 million in use in EVs in the US as of early 2022

Nickel-metal hydride batteries
- Most often used in plug-in hybrid electric vehicles (PHEVs)

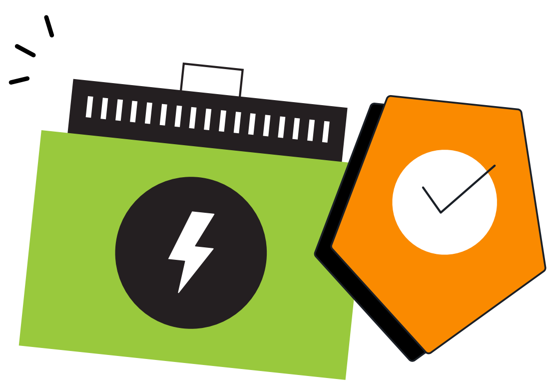
Lead-acid batteries
- Can be used in EVs but only for auxiliary features, not the main power

Highest EV Usage by State

California has the highest adoption of electric vehicles in the United States by a significant margin. As of 2021, over 1.13 million electric vehicles are registered in California, representing 39% of the total US EV fleet. California accounts for nearly half of all electric vehicles sold in the US each year. The state has set aggressive goals to phase out gasoline-powered automobile sales by 2035 and industry has responded. California has over 73,000 public charging stations, far more than any other state. Other leading states for EV adoption include Florida, Texas, Washington, New York, and New Jersey, but each has just a fraction of California's EV numbers. California's policies including vehicle emissions standards, purchase incentives, charging infrastructure investments, HOV lane access, and awareness campaigns have accelerated EV uptake. The Californian consumers' environmental focus and the mild climate also promote EV popularity.

The Future of EVs

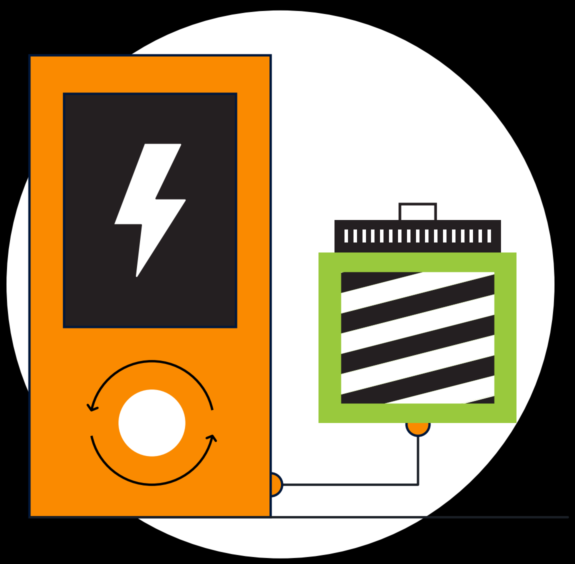
There are three additional batteries that are still in the research stage but will eventually be used in EVs shortly: lithium, sulfur batteries, and solid-state batteries.



PART 3: EV BATTERIES

SECTION II

The Lifecycle of an EV Battery



Production

According to a 2022 report by the International Energy Agency, as of 2022 China is by far the largest manufacturer of Li-ion EV batteries themselves, though governments in the US and Europe have initiatives to develop domestic supply chains. Critical mineral demand is surging faster than new supply capacity. Lithium demand could rise 6-fold by 2030, requiring 50 new average-sized mines. However, lead times for new mines can take over a decade. High commodity prices may shift battery chemistries to less mineral-intensive options like lithium iron phosphate batteries (LFP). The manufacturing process of EV batteries is more energy-intensive and has a higher environmental impact than of an internal combustion engine (ICE) vehicle mainly because of the toxic fumes released and the water-intensive nature of the activity. To ensure mining is sustainably scaled up to avoid bottlenecks, international cooperation is needed on investment and standards to meet these goals. Recycling and reusing batteries can aid in some relief to the mining process but the technology surrounding it is still inefficient. Governments must promote traceability and progress monitoring to meet environmental and social goals across EV supply chains.

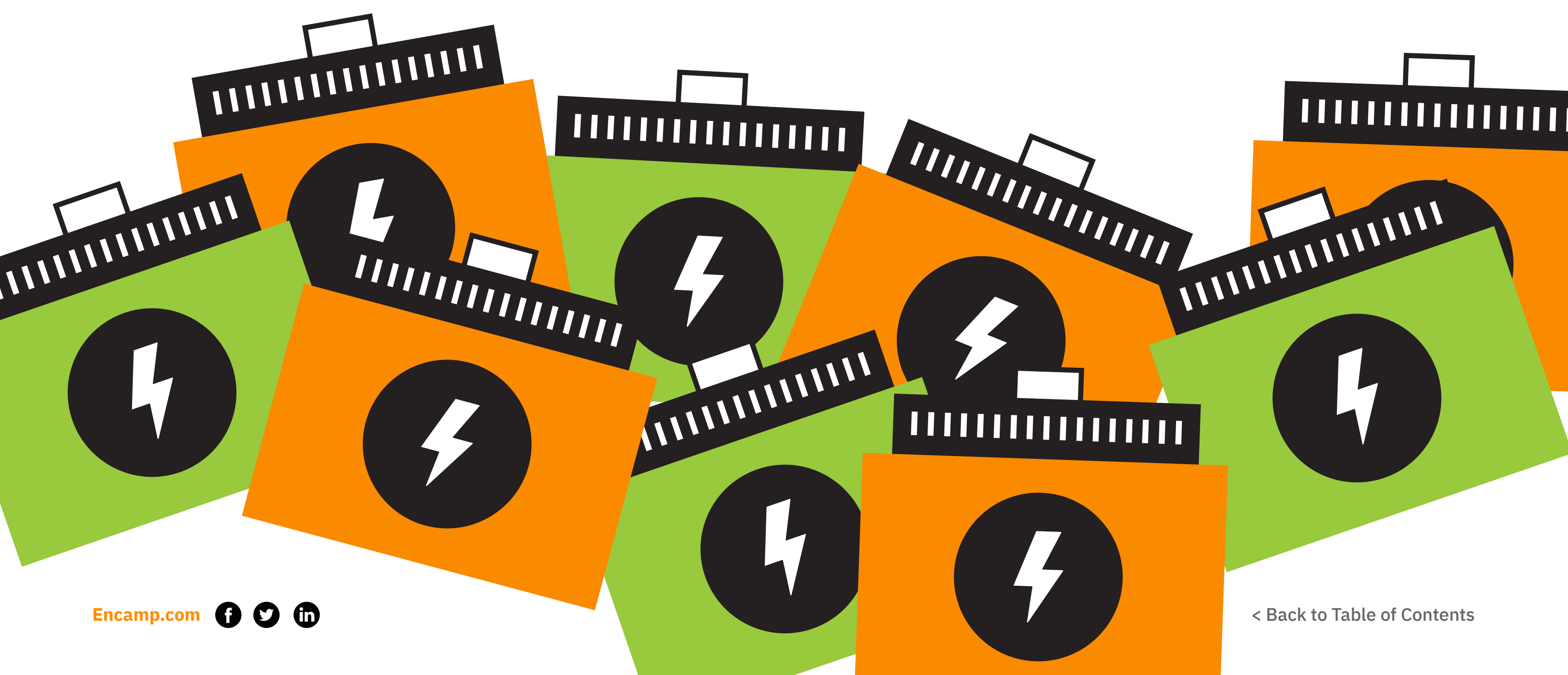
In-Use

Electric vehicle battery life expectancy depends on the EV and the conditions in which the user is driving. Federal regulation in the U.S. mandates that EV batteries be covered for a minimum of eight years. Because of this mandate, most automakers have an 8-10-year or 100,000-mile warranty on EVs. Real-world data shows Tesla batteries losing 5-6% capacity in the first 20,000-50,000 miles. Hyundai offers a 10-year/100,000-mile battery warranty, expecting no more than 30% degradation. Tesla's Model Y has an 8-year or 120,000-mile warranty with a minimum 70% retention of battery capacity over the warranty period. EV batteries lose a small amount of capacity with each charge cycle, although degradation slows over time. Proper maintenance and avoiding frequent fast charging help to maximize battery life. Charging to 85-90% capacity is ideal for daily use. Active cooling/heating systems keep batteries in an optimal 50-86F temperature range to maintain performance and reduce degradation. While batteries will need replacement down the road, costs are likely to be much lower in the future compared to today.

Global supply chains of EV batteries - iea.blob.core.windows.net. Accessed September 8, 2023. https://iea.blob.core.windows.net/assets/4eb8c252-76b1-4710-8f5e-867e751c8dda/GlobalSupplyChainsofEVBatteries.pdf?ref=climate.benjames.io.

Disposal of EV Batteries

Businesses generating lithium-ion or NiMH battery waste are subject to federal, state, and local hazardous waste regulations. Batteries must be managed as Universal Waste in most states and cannot be disposed of as normal trash. Universal Waste rules require proper storage, labeling, containment, training, shipping records, and recycling. Most areas prohibit the disposal of lithium-ion and NiMH batteries in landfills. Recycling or recovery is required. Battery manufacturers must comply with regulatory battery collection and recycling programs in their jurisdiction.



SECTION III

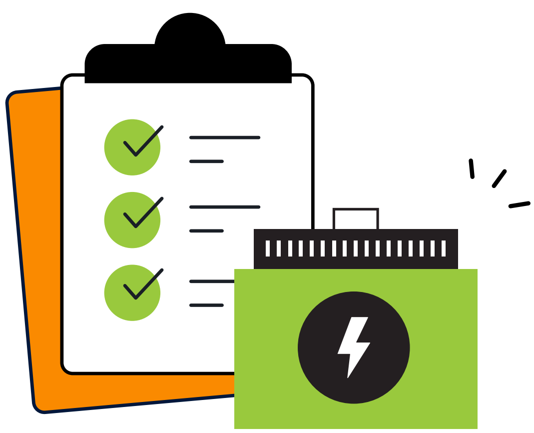
Reporting Exemptions for EV Batteries

Reporting Exemptions for EV Batteries

Most EV batteries will qualify for an EPCRA reporting exemption known as the "consumer product exemption", found in 40 CFR 370.13(c)(1). Under this exemption, consumer and consumer-style products, including batteries, do not need to be included on EPCRA Tier II reports.

Because the public is generally familiar with the hazards posed by such materials, the disclosure of such substances is unnecessary for right-to-know purposes. The exemption extends to any substance packaged in the same form or concentration as a consumer product whether or not it is used for the same purpose as the consumer product - for example, EV batteries that are used for industrial purposes, but that are the same size as those found in consumer cars, are exempt.

Any EV batteries that are larger or more concentrated than an EV battery used by the general public, would not be eligible for this exemption and standard reporting rules apply.

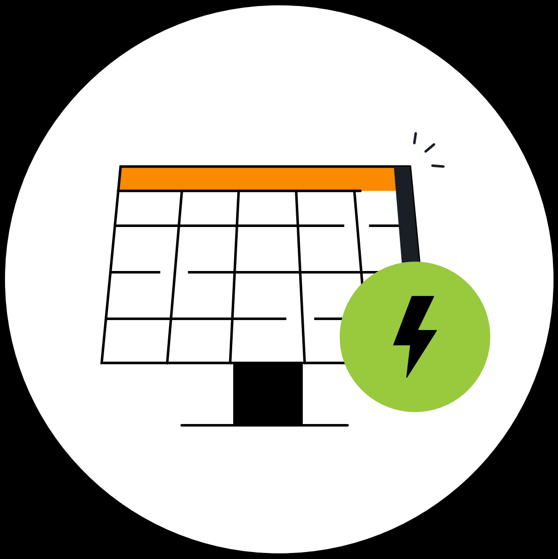


Global supply chains of EV batteries - iea.blob.core.windows.net. Accessed September 8, 2023. https://iea.blob.core.windows.net/assets/4eb8c252-76b1-4710-8f5e-867e751c8dda/GlobalSupplyChainsofEVBatteries.pdf?ref=climate.benjames.io.

PART 4: SOLAR BATTERIES

SECTION I

Introduction to Solar Batteries



Introduction to Solar Batteries

Though perhaps the most familiar solar batteries are embedded in rooftops, solar energy can also be stored in large-scale facilities using advanced batteries. Unlike residential usage, these could trigger a requirement for Tier II chemical inventory reporting.

Background

There are different battery technologies used for solar energy storage, each with its own advantages and disadvantages. Lead-acid batteries are the most mature and inexpensive option but suffer from lower energy density. Lithium-ion batteries are the most popular for residential use and provide higher efficiency in a lighter-weight package but currently have a higher upfront cost. For large-scale solar storage, flow batteries like vanadium redox are an emerging solution with the ability to store large energy capacities. New innovations like lead-carbon and saltwater batteries may provide more options down the road.

Types of Solar Batteries

Currently, there are four main types of solar batteries that are in use:

- **Lead-acid batteries** - The oldest type of solar battery with three subtypes: sealed lead-acid, flooded lead-acid, and gel lead-acid
- **Lithium-ion batteries** - A newer type that lasts longer, is lightweight, smaller, and requires less maintenance but costs more
- **Flow batteries** - Very new with a 100% discharge rate but low energy density requiring large storage tanks
- **Nickel-cadmium batteries** - Can operate in extreme temperatures but are highly toxic and rarely used residentially

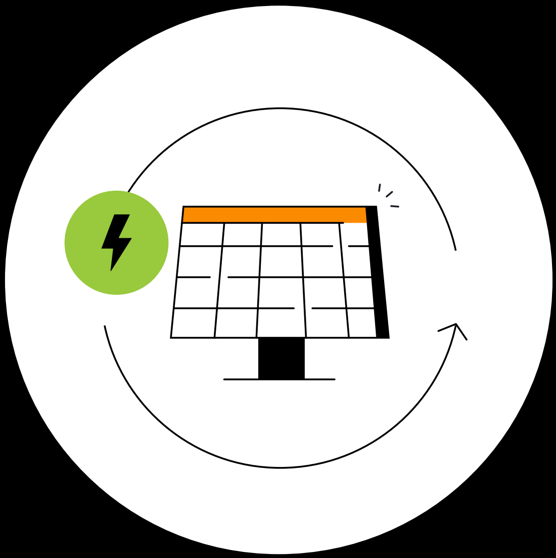
The Future of Solar Batteries

As costs keep falling, performance improves, and new innovations emerge, storage will become an increasingly integral part of both rooftop and utility-scale solar power systems.

PART 4: SOLAR BATTERIES

SECTION II

The Lifecycle of a Solar Battery



The Life Cycle of Solar Battery

Production

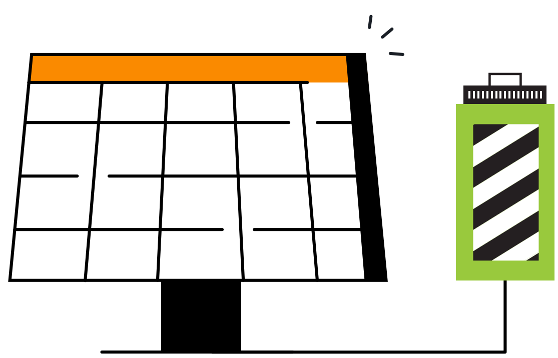
The manufacturing of solar batteries involves assembling electrode sheets, separators, electrolytes, and other components into sealed battery cells, which are then connected to modules. While several battery chemistries are used for solar energy storage, lithium-ion has become the dominant technology. This is due to lithium-ion batteries having high energy density, high efficiency, long cycle life, and continuing cost reductions. For example, lithium nickel manganese cobalt oxide (NMC) and lithium iron phosphate (LFP) cathodes are commonly paired with graphite anodes to produce safe, durable lithium-ion cells for solar storage. Automated manufacturing processes allow high-volume production of lithium-ion batteries to achieve economies of scale. Advancements in lithium-ion battery performance, lifetime, and costs are enabling their large-scale adoption for storing and discharging renewable energy from solar panels.

In-Use

The life cycle of a solar battery begins with the raw material extraction and processing required to produce battery components like electrodes, electrolytes, separators, and casing materials. The battery is then manufactured by combining these elements into individual cells, which are assembled into modules and packs. In the usage phase, the solar batteries will go through regular charge-discharge cycles for many years as they store and deliver energy from the solar panels. Proper maintenance and operation during this time are key to achieving optimal battery life and performance. Once battery capacity degrades beyond usability, the old solar batteries enter the recycling or disposal phase.

Disposal of Solar Batteries

Proper disposal and recycling of solar batteries that have degraded beyond usable capacity is critical for safety and sustainability. Batteries must be managed as Universal Waste in most states and cannot be disposed of as normal trash. Universal Waste rules require proper storage, labeling, containment, training, shipping records, and recycling. If simply thrown in landfills, toxic battery chemicals can leak into soil and groundwater. Recycling recovers valuable compounds and metals for reuse, reducing the need for new mining. Implementing organized collection systems and recycling infrastructure helps divert solar batteries from landfills. Partnerships between solar installers, manufacturers, and recyclers can maximize resource recovery, and in **July of 2023 the federal government announced that they would be investing $20M into optimizing the lifecycle of these systems.**



PART 5: ENCAMP'S SOLUTION

SECTION I

Encamp's Environmental Compliance Reporting Solution

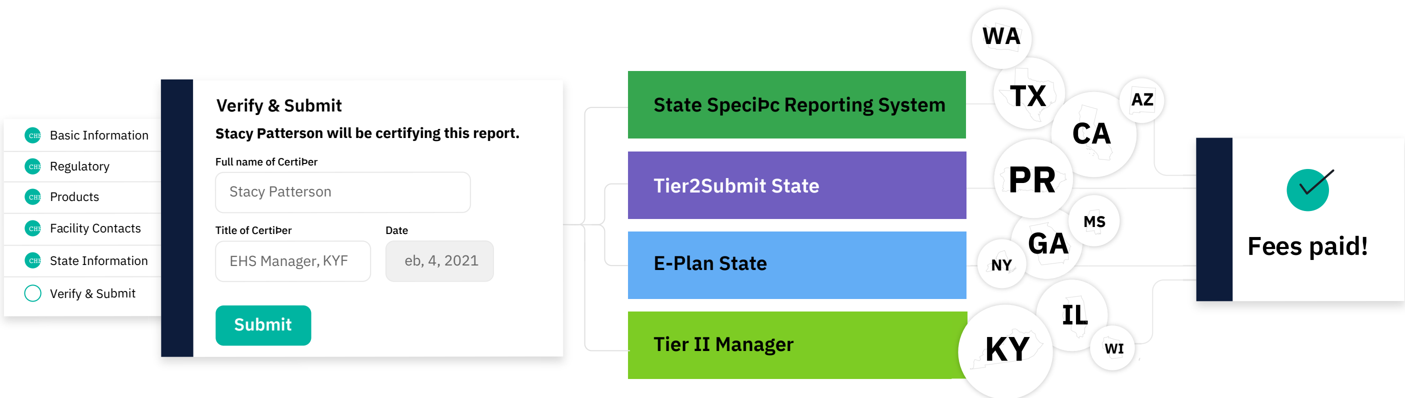
Encamp's Solution

How Encamp helps

- Increase visibility of all things Chemicals for HMBP, Tier II/SARA reporting
- Centralized Product Catalog
- Automated SDS Digitization
- Submit your reports & complete fee payments with expertise and automation
- Backed by a team of compliance professionals that are best-in-class for any kind of regulatory support
- Centralizes all of your data into one platform

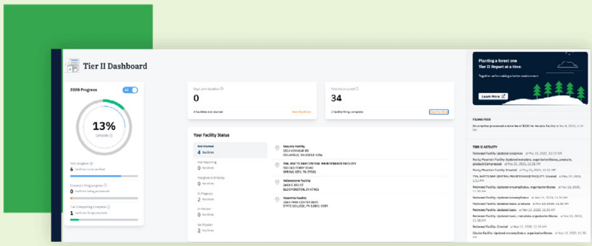
End-to-End Tier II Reporting

We've built the logic - state-by-state - that automatically submits your EPCRA Tier II reports to the correct SERC, LEPC, and Fire Department. Just hit submit, and Encamp takes care of the rest.



The Encamp platform supports automated Tier II reporting for all 50 states, territories and local agencies.

Encamp not only helps you prepare your Tier II reports, it automatically submits them with a click of a button to each state agency, regardless of which software or portal is required.

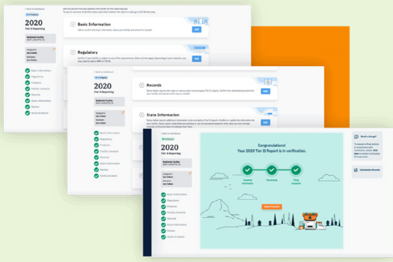


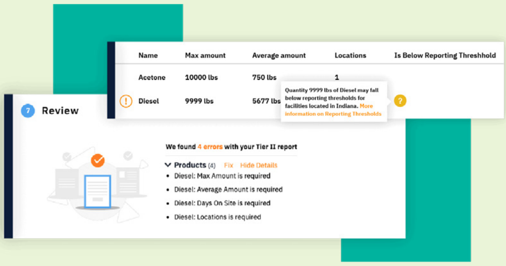
On time, every time

Track reporting progress in our Tier II Dashboard, facility by facility, to make sure all your sites meet the due date.

Streamlined Tier II reporting

Eliminate corruptible spreadsheets, logging into all the various state portals, manual data entry, and mailing reports to LEPCs and fire departments.





Automated data validation

Ensure complete and accurate compliance, right down to Tier II reporting thresholds, with our built-in data validation and review checks.

You're in Good Hands

Comprehensive coverage

54

States & Territories Filed In

Our regulatory compliance experts have deep knowledge of unique state requirements.

We've seen it all

27K+

Reports Filed Since 2019

This makes us the largest third party filer of Tier II reports.

Reclaim your time

60K+

Reporting Hours Saved

By leaving the grunt work of reporting to us, you can focus on impactful projects.

Encamp lets you easily manage your facility compliance data, tasks, reporting, submissions, fee payments and record keeping — in one place. By automatically checking reporting requirements across 33,000+ jurisdictions in the U.S., Encamp automates EPCRA Tier II compliance reporting from start to finish, saving our customers save hundreds of hours.

Request a demo