



Energy
Storage
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ESA Corporate Responsibility Initiative

Building a Responsible Supply Chain Policy for Battery Energy Storage: A Guidebook for Companies

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This guide is a product of the [U.S. Energy Storage Association \(ESA\) Corporate Responsibility Initiative](#) (CRI). ESA organized and coordinated the CRI, which launched in March 2019. As of publication, over 60 companies and industry leaders had signed a pledge “to engage in a good-faith effort to optimize performance, minimize risk and serve as an exemplary corporate citizen in the manufacturing, deployment, implementation, and operation of energy storage projects across the United States.” The companies also pledged to contribute experts to a CRI Task Force to establish best practices in several areas, including operational safety, end-of-life/recycling and responsible supply chains.

The purposes of this Guidebook are to:

- Explain how responsible supply chain policy fits into broader concepts of environmental, social and governance (ESG) considerations;
- Describe the key ESG issues that arise in the lithium ion (Li-ion) battery storage supply chain, identify some of the organizations and resources that have emerged to help firms address those issues, and report the results of a survey of energy storage companies on their responsible supply chain policies; and
- Illustrate a process a company can undertake to develop and implement a responsible supply chain policy, along with some of the key considerations and tradeoffs to evaluate and compose an appropriate set of objectives and provisions.

Disclaimer

This Guidebook is provided for information and awareness purposes only and offers an approach for firms in the energy storage industry to develop a responsible supply chain strategy that supports fair and ethical workplace conditions and environmentally responsible stewardship. ESA assumes no responsibility or liability for the use of this document. Firms are advised to consult with legal, accounting, and insurance advisors concerning compliance and disclosure obligations, liability, accounting, and other issues associated with responsible supply chain practices.

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Marc Chupka, Vice President for Research & Programs at ESA, serves as the CRI Task Force Director. ESA would like to thank the numerous Task Force participants from signatory companies who contributed to the crafting and review of these Guidelines, as well as several external reviewers.

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Acronyms & Abbreviations

CBP	U.S. Customs and Border Protection
CRI	Corporate Responsibility Initiative
DRC	Democratic Republic of the Congo
EPRI	Electric Power Research Institute
ESA	Energy Storage Association
ESG	Environmental, Social, and Governance
ESGC	Energy Storage Grand Challenge
ESS	Energy storage system
EVs	Electric vehicles
FLA	Fair Labor Association
GBA	Global Battery Alliance
GHG	Greenhouse gases
IIJA	Infrastructure Investment and Jobs Act
IRMA	Initiative for Responsible Mining Assurance
Li-ion	Lithium ion
RBA	Responsible Business Alliance
RMAP	Responsible Minerals Assurance Process
SEC	Securities and Exchange Commission
SEIA	Solar Energy Industries Association
UNGC	United Nations Global Compact
WRO	Withholding Release Order

1. Introduction and Summary

Corporate responsibility extends beyond shareholders to include other stakeholders such as workers, society, and the environment, and efforts to address these issues forms the basis for environmental, social and governance (ESG) policy. One issue in ESG policy concerns the harmful impact that a company's suppliers may inflict on society or the environment, for which the procuring company may share some responsibility.

The dominant energy storage technology being deployed today in vehicle and stationary applications—lithium ion (Li-ion) batteries—has attracted scrutiny for potential ESG risks associated with labor conditions and environmental impacts in its supply chain. These concerns have given rise to several organizations, initiatives, and resources that provide tools to firms interested in developing and implementing a responsible supply chain policy. A survey undertaken by the Energy Storage Association (ESA) in mid-2021 shows that firms in the Li-ion battery segment have implemented a range of measures to improve the ESG performance of their supply chains or are actively considering doing so.

This report provides guidance for firms in the Li-ion battery industry who are considering developing and implementing a responsible supply chain policy. In addition to identifying a range of organizations and resources that can assist a company, the report outlines a process for developing a responsible supply chain policy and suggests a variety of options and tradeoffs that a firm should consider in the process of policy development. Policies in this area show a wide range of variation that reflects the different objectives and circumstances that firms in the industry face. While one size will not fit all, all firms in the industry can benefit from articulating a responsible supply chain policy that suits their individual company needs.

2. The Growing Importance of Responsible Supply Chain Policy

One of the hallmarks of the sustainability movement that emerged decades ago was the concept that corporate responsibility extended beyond shareholders to include other stakeholders, such as workers, society, and the environment. This concept of responsibility also expanded the expected scope of influence of corporations throughout the value chain to include encouraging upstream suppliers to adopt sustainable practices and encouraging sustainable downstream product disposition, e.g., reuse or recycling.

It is now widely understood that there is potential for upstream suppliers to inflict environmental harm or engage in socially damaging activity in their operations, and that downstream buyers have some leverage over suppliers to reduce these impacts. In fact, in many industries/contexts the external costs of suppliers vastly exceed the direct impacts of operations. For example, the global corporate disclosure organization CDP estimated that the average 2020 greenhouse gas

emissions reported from a company's supply chains were 11.4 times greater than emissions from a company's direct operations.¹

A company that procures goods and services from a supplier that engages in harmful activity can indirectly benefit from that harmful activity, and thus may bear some responsibility for taking corrective action to mitigate the damage. Corporate policies that either shun suppliers that engage in harmful activity or attempt to alter or influence their suppliers' conduct and mitigate harmful impacts are sometimes called "Ethical Sourcing" or "Responsible Sourcing" policies. Increasingly, companies are undertaking responsible supply chain policies to mitigate adverse upstream supply chain impacts, either unilaterally or in concert with other firms in an industry.

Environmental, Social, and Governance Issues

These responsible supply chain policies are part of a much broader movement in the corporate sector that looks beyond the accounting bottom line to focus attention on environmental, social and governance (ESG) issues that form the core of sustainability. Addressing ESG concerns has become a commonplace feature of corporate business plans, for example, promoting diversity, equity, and inclusion in company hiring and promotion, or reducing the carbon footprint of the firm's operations.

Common motivations for addressing ESG concerns arise from the enhanced expectations of stakeholders, including investors, employees, and customers:

- Many investors are sensitive to ESG issues, including some who elevate ESG performance to a primary consideration in investment analysis. Such "ESG investors" may, for example, invest only in clean energy companies and forego fossil fuel companies, and some ESG funds adhere to explicit ESG criteria in selecting assets;
- Firms increasingly find that their ESG performance can provide a recruiting edge in hiring employees who prefer to work at companies that reflect their social values; and
- Customers expect that the goods that they purchase are made in an ethical and environmentally sustainable way.

These motives also overlap with sound business practice and long-run value considerations. A firm's value can be affected by perceptions and reputation. ESG lapses or serious ethical infractions can expose a firm to reputational effects that can last for years, along with direct expenses, such as environmental clean-up and fines after an oil spill. Conversely, some firms enhance their market value through promotion of successful ESG efforts as part of a brand identity strategy. Finally, a growing number of ESG investment firms, and large investment firms offering ESG-oriented funds, are pursuing investments in the clean energy space that includes battery energy storage.² These investors have a keen interest in verifying that entire ESG profile

¹ See [Transparency to Transformation: A Chain Reaction, CDP Global Supply Chain Report 2020](#), February 2021, p.14. This represents the ratio of "scope 3" emissions (from upstream and downstream value chain) to the sum of "scope 1" (direct operations) and "scope 2" (indirect emissions from purchased energy).

² BlackRock, Inc., the world's largest asset management firm, has been publicly active in ESG investing for several years and currently offers about 60 ESG-focused funds.

of a firm involved in clean energy technology—including its supply chain—in fact comports with the sustainability goals of the portfolio.

In addition to considering supply chain issues from a business reputation perspective, firms also face several legal requirements. Because the Li-ion battery supply chain involves minerals mined and processed in foreign countries with documented and/or alleged human rights and forced labor issues, U.S. firms also have legal obligations to ensure compliance in their supply chain for any imported inputs or final products. The Tariff Act of 1930 and the Fair Labor Standards Act prohibit U.S. companies from importing goods produced in whole or in part with child or forced labor. Imports are subject to review if there is reason to believe that they are produced with forced labor. The mechanism used by U.S. Customs and Border Protection (CBP) to enforce these provisions is via Withholding Release Orders (WROs) which allow CBP to detain suspect goods pending a demonstration by the importer that they were not produced using child or forced labor. Another set of requirements arise from the conflict minerals provisions in Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act. Section 1502 requires public companies registered with the Securities and Exchange Commission (SEC) to perform supply chain due diligence and disclose any use of specified conflict minerals. New laws and evolving regulations under existing law may require firms to understand, measure, and report more ESG information in the future. For example, the SEC is exploring rules to improve ESG risk reporting for publicly traded corporations, such as disclosing climate change-related risks.³ As the legal basis for addressing ESG issues will likely strengthen over time, forward-looking firms continue to assess current and potential legal requirements.

Examples of ESG Supply Chain Policy

While the firm's direct impact generally dominates ESG discussions, there are many notable examples of firms addressing ESG concerns through changes in suppliers or suppliers' conduct. Consumers increasingly care about the conditions under which the goods they purchase are produced, as well as any potential environmental harm from production. As the supply chains of various consumer goods attracted scrutiny, this led to the formation of organizations that sponsor labeling and certification programs to identify firms that conform to ESG standards. Examples include:

- “Fairtrade Coffee,” which represents a program of labor, social, and environmental sustainability in developing countries. Other agricultural products can obtain Fairtrade certification.⁴
- “Dolphin-Safe Tuna,” a labeling program that initially arose from concerns about dolphin bycatch in Eastern Pacific fisheries that over time became legally enforceable under U.S. law.⁵

³ See “[2021 Marked by SEC Focus on Climate-related Disclosures](#),” by Daniel S. Clevenger, Foley Hoag ESG Alert, November 3, 2021. See also “[Corporate ESG Disclosure: Recent Trends and Developments](#),” by Sara K. Orr and Sofia Martos, Kirkland & Ellis Practical Guidance Note, October 8, 2021.

⁴ See Fairtrade International at <https://www.fairtrade.net/about>.

⁵ See <https://www.fisheries.noaa.gov/national/marine-mammal-protection/dolphin-safe>.

- Several scandals during the 1990s involving labor conditions at apparel and footwear factories in developing countries led to the formation of the Fair Labor Association (FLA). The FLA accredits those clothing brands and companies as their suppliers adhere to the FLA Workplace Code of Conduct.⁶

Increasingly, companies that do not sell consumer goods also look to their supply chains to reduce the environmental impact of their products, and thereby enhance their brand reputation and appeal to customers, employees, and investors. Examples include the many companies that have reduced their carbon footprint by purchasing electricity generated by renewable sources such as solar and wind. By favoring renewable generation as a source of electricity supply, the purchasing companies reduce the environmental impact of their own energy supply chain and as more companies adopt clean electricity purchasing strategies, their combined influence can help accelerate the transformation of the electricity sector toward cleaner generation.⁷

As firms began to adopt responsible supply chain policies, organizations and institutions emerged to provide the tools of responsible supply chain policy, such as disclosure and reporting templates, standards and verification protocols, and certification of compliance with ESG standards. This report examines some of those organizations and the tools available to develop and implement responsible supply chain policies, focusing on the Li-ion battery segment of the stationary energy storage market.

3. Opportunities for Responsible Supply Chain Policy in the Lithium Ion Battery Energy Storage Sector

The dominant technology being deployed today for energy storage—whether in consumer electronics, electric vehicles, or stationary grid-connected storage—are batteries based on Li-ion chemistry. The supply chains for Li-ion batteries are extensive and complex, with raw materials extraction and production facilities across the globe.

Lithium Ion Battery Supply Chain

The Li-ion battery supply chain can be broken down into six main components as shown below in Table 1:

⁶ See <https://www.fairlabor.org/accreditation>.

⁷ Some companies, such as Google, have begun to pursue clean electricity procurement that matches their hourly electricity consumption with hourly renewable generation, rather than simply covering annual average consumption with annual renewable purchases. This “27/7 carbon-free electricity” (24/7 CFE) represents an effort to push electricity markets toward cleaner generation and creates demand for energy storage. Google partnered with the [AES](#) Corporation to develop the 24/7 CFE products.

Table 1: Lithium Ion Battery Supply Chain

Components of the Lithium Ion Battery Supply Chain	
Component of Supply Chain	Description
1. Raw material production	Ore mining or other mineral extraction activities, particularly lithium, cobalt, nickel, manganese and graphite
2. Material processing	Refining and concentrating raw ores into specific materials used for cathodes, anodes and electrolytes
3. Battery cell manufacturing	Manufacturing components from processed materials and fabricating the fundamental unit (cell) of battery storage devices
4. Battery pack manufacturing	Creating assemblies of cells suitable for integration into end-use devices
5. Manufacturing or construction of end-use devices	Integrating battery packs into the assembly of electric vehicles (EVs) or construction of stationary energy storage systems (ESS)
6. Battery end-of-life and recycling	Recycling spent batteries to recover raw or intermediate materials to re-introduce into the supply chain

The focus of this report is on the U.S. stationary energy storage industry consisting of battery cell/pack manufacturers, along with firms who integrate components, construct, and operate stationary energy storage facilities (numbered 3, 4 and 5 on the table). These are the firms whose responsible supply chain policies could affect upstream entities who mine, process, and manufacture battery components. One key activity not represented in this framework is transportation services between these steps in the value chain, which, owing to the global pattern of resources and production capacity, are quite extensive. In this paper, we also do not address “downstream” battery end-of-life and recycling step in the supply chain, as the ESA Corporate Responsibility Initiative has addressed those issues in previous publications.⁸

Additionally, this report does not address the important considerations associated with on-shoring a battery supply chain. Most global processing and manufacturing capacity resides in other countries and particularly in China, which dominates the strategic, economic, national security and trade issues that emerge with projections of massive growth in the demand for battery energy storage (primarily from EVs). These important issues occupy the attention of national policymakers, which is reflected in current U.S. policy that favors and incentivizes domestic mining and manufacturing of Li-ion battery systems.⁹ Nonetheless, while the on-

⁸ See the [CRI reports](#) posted on the ESA website for additional information.

⁹ The Department of Energy (DOE) Energy Storage Grand Challenge (ESGC) was launched in January 2020 and focuses heavily on domestic production of energy storage, as explained in the [ESGC Roadmap](#) (December 2020). More recently, the Biden Administration featured battery supply chains as one of [100-Day Reviews under Executive Order 14017](#), and the [Infrastructure Investment and Jobs Act](#) (IIJA) signed

shoring of supply chains can provide a range of benefits—including improving ESG performance—the focus of this report is the ESG implications of current supply chains and how individual firms' policies might address those concerns.

ESG Issues in the Lithium Ion Battery Supply Chain

A recent study from the Electric Power Research Institute (EPRI) provides an excellent synopsis of the ESG issues that arise in the Li-ion supply chain.¹⁰ Some of the issues covered in the EPRI report reflect strategic economic and national security concerns, e.g., reliance on foreign sources for critical minerals used in defense or global scarcity of critical materials to accommodate projected demand growth. Here we focus on the ESG issues that can be addressed via responsible supply chain policies.

There are currently three primary ESG issues arising in the Li-ion battery supply chain:

- Exploitative labor practices, such as forced and child labor, in the cobalt mining sector in the Democratic Republic of the Congo (DRC). About half of the global supply of cobalt originates in the DRC, of which 15% to 30% comes from small scale artisanal mines prone to labor abuses and unsafe conditions.
- Environmental impacts of mining and processing, particularly water pollution and scarcity in arid regions that produce a large proportion of lithium salts.
- Greenhouse gas emissions in the extraction, processing, transportation and manufacturing phases of battery production.

This report focuses on policies that primarily address the first two issues. Life-cycle greenhouse gas (GHG) emissions are a key performance indicator for the environmental impacts of most industrial products, since mining, transportation, and manufacturing typically emits GHG through fossil fuel use. Much of ESG policy focuses on life-cycle GHG emissions, i.e., measuring emissions from upstream material supply, product manufacture and use, and downstream disposition. These analyses are especially useful to compare the GHG performance of alternative technologies or production or consumption choices, for example, whether the life cycle GHG emissions from an EV are lower than those from a comparable internal combustion engine vehicle (typically yes, assuming a modern clean electric grid). Analyses of life-cycle GHG emissions from Li-ion battery production are difficult to compare but generally show modest variation based on the chemical makeup of the batteries and the assumed location of production. Emissions from balance-of-plant materials (steel, copper, cement) commonly used in stationary energy storage systems have limited substitution possibilities and/or do not contribute heavily to the total life-cycle GHG emissions. While life-cycle GHG emissions are common metrics used to assess the effect of responsible sourcing policy, analysis of life-cycle emissions raise complex issues, many of which are not specific to the Li-ion battery supply chain.

by President Biden on November 15, 2021 contained \$6 billion in program spending (Section 40207) to bolster domestic battery supply chains.

¹⁰ See EPRI, [Sustainability Aspects of the Lithium Ion Battery Supply Chain](#) (February 2021).

Existing Standards for Responsible Supply Chain Practices

The EPRI report outlines initiatives and resources that provide support for supply chain policies in the Li-ion battery industry, focusing on the upstream mining and raw material processing steps. These initiatives:

...provide some previously missing key elements to address environmental and social responsibility challenges: clearly defined standards of good practice; determining the compliance of individual suppliers; and communicating this information to manufacturers and, potentially, the end consumers.

Taken together, these initiatives open the possibility that markets and consumers, when provided with transparent and trusted compliance data, can exert influence through their purchasing decisions to select more environmentally and ethically sound supply chains.¹¹

The standards/guidelines described in the EPRI report are summarized in Table 2 (reproduced from EPRI report Table 6):

Table 2: Selected Published Guidelines for Responsible Mining that Apply to Key Battery Materials

Name	Published by	Referenced by	Materials Covered	Scope			
				Labor Standards	Environmental	Disposal/ Recycling	Raw Materials Provenance
The OECD Due Diligence Guidance for Responsible Mineral Supply Chains	OECD	Responsible Minerals Assurance Process; Cobalt Industry Responsible Assessment Framework [49]; U.S. Securities and Exchange Commission; Chinese Due Diligence Guidelines; others	All mineral supply chains	Y	N	N	Y
Standard for Responsible Mining	Initiative for Responsible Mining Assurance (IRMA)	Anglo-American (multinational mining company); civil society groups	All mined materials	Y	Y	N	N
Chinese Due Diligence Guidelines for Responsible Minerals Supply Chains	China Chamber of Commerce of Metals, Minerals & Chemicals Importers & Exporters		All mineral resources; Initial focus on non-battery materials (Sn, Ta, W, Au)	Y	Y	N	N

Source: EPRI, *Sustainability Aspects of the Lithium Ion Battery Supply Chain*, Table 6 on p. 10

The frameworks that can be used to verify and certify compliance with the relevant standards are summarized in Table 3 (reproduced from EPRI report Table 7):

¹¹ See EPRI, p. 9

Table 3: Selected Frameworks to Implement Guidelines for Responsible Mining

Name	Type of Initiative	Operated by	Participation	Mandatory or Voluntary	Materials Covered	Scope			
						Labor Standards	Environmental	Disposal/ Recycling	Raw Materials Provenance
Responsible Minerals Assurance Process (RMAP)	Third-party assessment of smelter/refiner management systems and sourcing practices to validate conformance with OECD and RMAP standards	Responsible Minerals Initiative	Cobalt smelters: • 7 conforming • 22 participating • 62 eligible	Vol.	Co, Au, Ta, Sn, W	Y	N	N	N
Battery Passport	Data sharing (digital platform) of battery composition and features	Global Battery Alliance/World Economic Forum	Seeking participation from battery original equipment manufacturers (OEMs)	Vol.	n/a	Y	Y	Y	Y
Cobalt Industry Responsible Assessment Framework (CIRAF)	Reporting framework and management tool	Cobalt Institute		Vol.	Co	Y	Y	N	N
Responsible Sourcing Requirements	Defined and consistent implementation of existing labor and environmental standards	London Metal Exchange	All traders on the London Metal Exchange	Man.	Many	Y	Y	N	N

Source: EPRI, *Sustainability Aspects of the Lithium Ion Battery Supply Chain*, Table 7 on p. 11.

As described in greater detail in the EPRI report, these standards and verification protocols can provide the building blocks for a company’s ESG policy that focuses on mining and processing sectors upstream in the Li-ion battery supply chain.

In addition to the standards and initiatives that focus on the battery supply chain, a variety of organizations provide generic tools to help estimate the greenhouse gas emissions from various supply chains, which then can be analyzed for emission reduction opportunities to help attain climate-related goals. These include non-profits such as the [CDP](#) (formerly Carbon Disclosure Project), which runs a global disclosure system for investors, companies, cities, states, and regions to manage their environmental impacts—including those from [supply chains](#)—along with their partners that provide analytic services. Other third-party safety and compliance management platforms used by utilities and system integrators contain elements of GHG reporting for ESG purposes and can generate documents such as certification statements.

Current Status of Corporate Supply Chain Policy in the Energy Storage Industry

During May and June 2021, ESA sent a survey to members of the Corporate Responsibility Initiative Task Force (which includes non-ESA member organizations) as well as all ESA members to obtain information on the status of responsible sourcing policy in the industry. The results of the survey indicated that firms in the industry exhibit a wide variety of experience with, and take different approaches to, responsible supply chain policy.¹² ESA received responses from 22 organizations, 17 of which were involved in the energy storage supply chain. The three

¹² While the survey results are instructive, they do not provide a statistically valid basis for inferring the results of the industry as a whole, owing to a likely biased sample (e.g., primarily companies engaged in the Corporate Responsibility Initiative) and relatively small number of surveys returned (only 17 firms involved in the supply chain).

primary sets of questions asked the respondent: (1) to identify company type and whether the company has a responsible supply chain policy; (2) to describe the characteristics of the supply chain policies; and (3) to gauge the interest of companies without supply chain policy in developing one.

Of the 17 organizations involved in the energy storage supply chain, five identified themselves as manufacturers of energy storage equipment and 12 identified themselves as implementers (i.e., builders or operators of energy storage systems). Asked “Does your company or organization have a policy on responsible supply chain practice?” 10 answered “Yes” (three of the manufacturers, and seven of the implementers) and seven answered “No, but presently considering a policy.” See Table 4:

Table 4: ESA Survey, “Who Has, or is Considering, a Responsible Sourcing Policy?”

Who Has, or is Considering, a Responsible Sourcing Policy?				
17 organizations involved in the energy storage supply chain responded to survey	In what segment of the energy storage supply chain is your organization?			
	Manufacturers		Implementers	
	5		12	
	“Does your organization have a policy on responsible supply chain practice?”			
	Manufacturers		Implementers	
	Yes	No	Yes	No
	3	2	7	5

In terms of the current policies themselves, of the 10 firms that have a responsible supply chain policy, eight stated that the policy addressed fair/safe labor practices while five of those eight also stated their policy addressed environmental impacts. Two others stated that their policy addressed other issues, such as corruption.

There was substantial variation in the policy mechanisms employed among the 10 organizations who have a responsible supply chain policy:

- 5 require suppliers to adhere to their company code of conduct
- 6 require suppliers to pledge to comply with third-party standards or guidelines
- 2 assure supplier compliance via third-party verification/audit or certification
- 3 assure supplier compliance via direct verification/inspection of facilities
- 1 belongs to or participates in intra-industry collaborative action

See Table 5:

Table 5: ESA Survey, “What are the Characteristics of Responsible Sourcing Policies?”

Characteristics of Responsible Sourcing Policies					
Of the 10 firms that have responsible sourcing policies:	Issues the policies address (can chose more than one)				
	Fair and Safe Labor Practices		Environment		Other (includes corruption, performance & reliability)
	8		5		2
	Policy Mechanisms (can chose more than one)				
	Company code of conduct	Third-party standards	Third-party verification	Direct verification	Intra-industry collaborative action
	5	6	2	3	1

For those seven firms that currently do not have a policy, but are considering one, four have received inquiries or recommendations from suppliers, customers, or other business partners to consider or institute a policy on responsible supply chain and all seven would consider joining an industry-wide collaborative approach/pledge, such as one that the ESA Corporate Responsibility Initiative (CRI) might facilitate. See Table 6:

Table 6: ESA Survey, “For Firms Without a Policy, How Much Interest in Having One?”

How Much Interest Exists to Develop/Adopt a Policy?		
Of the 7 firms that do not currently have a policy:	Received inquiries or recommendations from stakeholders to consider a policy	Would consider joining an industry-wide collaborative approach or pledge
	4	7

These results suggest that most firms involved in the energy storage supply chain either have, or are considering, a responsible sourcing policy; those with a responsible sourcing policy primarily address forced or child labor issues, with environmental issues secondary; those with a responsible sourcing policy utilize a variety of approaches, typically employing third-party

standards or requiring suppliers to adopt their own codes of conduct, and firms that are considering developing a responsible sourcing policy have heard from external stakeholders and would consider joining an industry-wide initiative. These results indicate that most in the industry recognize the importance of supply chain impacts on sustainability and are either taking or considering a broad range of actions to mitigate potential harm.

4. Guidelines for Developing Responsible Supply Chain Policy

An energy storage firm that participates in the Li-ion battery supply chain interested in developing and implementing a responsible supply chain policy need not start from scratch. As described earlier, there are organizations and resources available to assist such an effort. This section outlines how firms wishing to develop and implement a responsible supply chain policy can utilize the available resources to develop create a corporate policy, while weighing various considerations and tradeoffs that reflect the firms' ESG goals and supply chain objectives.

Organizations & Firms that Help Develop Responsible Supply Chain Policies

Several non-profit institutions and organizations can provide assistance and furnish resources to help firms develop responsible supply chain policies and protocols. These include:

- **United Nations Global Compact:** The [UNGC](#) is a voluntary membership initiative composed of almost 19,000 organizations. Those who join pledge to follow the [Ten Principles of the U.N. Global Compact](#) in their business dealings. The UNGC publishes a variety of publicly available resources covering a broad range of ESG issues, including responsible supply chain management.
- **BSR:** Originally Business for Social Responsibility, the [BSR](#) is a voluntary membership that promotes ESG objectives and programs for businesses, including working “with companies’ supply chain, sourcing, and procurement functions to develop supply chains that deliver business value and are inclusive, resilient, and transparent, creating long-term benefit for all involved stakeholders.”
- **Responsible Business Alliance:** According to its website, the “Responsible Business Alliance ([RBA](#)) is the world’s largest industry coalition dedicated to corporate social responsibility in global supply chains.” RBA members, which include leading electronics and automobile manufacturers have access to online tools to manage responsible sourcing. RBA also developed the Responsible Minerals Initiative (RMI) described later.

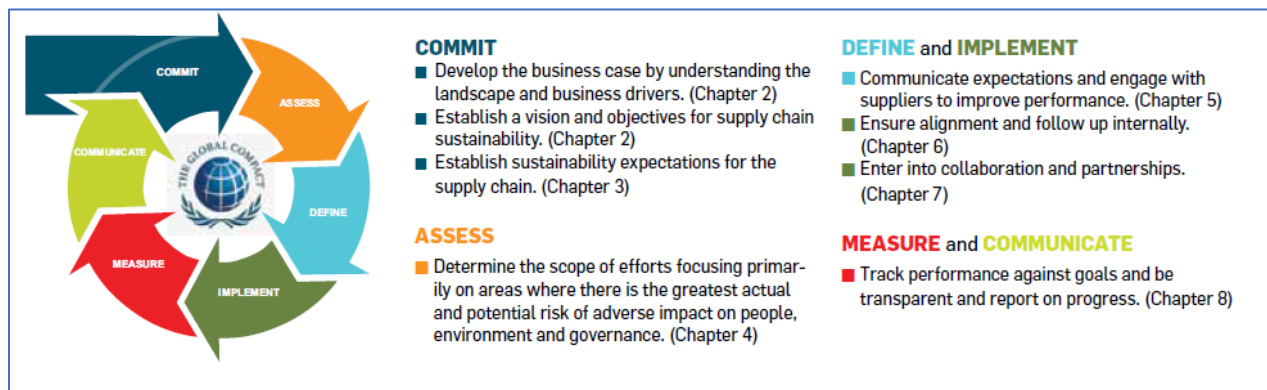
In addition to non-profit organizations and business associations, most of the major accounting and management consultancies offer ESG policy support, often focusing on corporate operations issues such as greenhouse gas/carbon footprint analysis and mitigation. Some of these same firms offer responsible supply chain policy development and implementation services. In addition to the major international accounting/consulting firms, smaller more specialized firms offer policy development support and implementation services such as tracing provenance, facility inspection, and certification.

Finally, many companies with ESG policies that incorporate responsible supply chain considerations post their policies on their websites. These examples provide a wide range of templates for other firms considering responsible supply chain policies, from very comprehensive supply chain requirements to a simple paragraph outlining supplier expectations.

Process for Developing Supply Chain Policy

Like any corporate policy development effort, the process of developing responsible supply chain policy involves defining objectives, analyzing the problem, designing then implementing the policy and monitoring the outcomes. Figure 1 below shows a best practice process for developing a responsible supply chain policy as outlined in a guidebook issued by the UN Global Compact.¹³

Figure 1: Supply Chain Policy Development Process from UN Global Compact Practical Guide



We will focus our discussion on four primary steps, adapted from the above process description:

1. Establish supply chain policy objectives
2. Develop assessment methods and evaluate policy options
3. Codify and implement supply chain policy
4. Measure and communicate progress toward goals

Before commencing the actual process of policy development and implementation, a firm needs to locate the process within its organization structure and decide who will be responsible for policy development and implementation. In a recent survey of public and private companies conducted by law firm Thompson Hine, most of the oversight responsibility for ESG development and execution resides in the CEO/Chairperson and/or legal department.¹⁴ This elevated status highlights the growing importance given to ESG policies in corporate governance and awareness that supply chain policy development is most likely to achieve

¹³ See [Supply Chain Sustainability: A Practical Guide for Continuous Improvement, Second Edition](#) p. 5.

¹⁴ See [“An ESG Snapshot: Survey Confirms Companies Are Responding to Increasing Expectations,”](#) Thompson Hine, September 28, 2021.

internal consensus and management buy-in when led by a member of a company's executive team.

Another related decision is determining the mix of internal resources vs. external assistance to devote to the policy development process. External organizations are critical resources best used in service to an internal executive lead, and effective policy development processes cannot completely be outsourced. Supply chain policy development led by a senior executive is more likely to succeed in achieving internal consensus and management buy-in. Finally, a company opting to utilize partner organizations or consultants to assist in policy design and implementation needs to select and retain appropriate partners. Because most of the major business consultancies offer ESG and/or supply chain advisory services, firms that already retain these consultants may be able to expand existing relationships rather than having to forge new ones. Once internal and external resources are identified and committed to developing a responsible supply chain policy, the process will address multiple decisions in several key areas, as outlined below.

Step One: Establish Supply Chain Policy Objectives

There are many potential objectives for responsible supply chain policy, which vary along several dimensions. For example:

- Does the objective cover a single ESG topic, or a range of ESG topics?
- Does the objective cover a single input, or a wider set of inputs?
- Does the objective have an accepted compliance standard, or not?

Some of these criteria will affect the feasibility and cost of implementing an objective; and selecting an objective or set of objectives for responsible supply chain policies will entail evaluating some implementation considerations. Thus, objectives may shift somewhat during the policy development process.

Choosing objectives for supply chain policies will occur in the context of a firm's existing policies. Firms without any ESG policies that apply to their own operations should first consider implementing a code of conduct that governs their own facilities and processes before articulating expectations for their upstream supply chain partners. Completing that first step ensures that supply chain policies developed subsequently are informed by—and in some cases can mimic—the company's internal code of conduct.

Many firms that contemplate establishing a responsible supply chain policy already have some elements of ESG policies in place—for example, a carbon footprint reduction goal that applies to their own operations' energy consumption or a company code of conduct that reflects specific labor standards. One strategy for establishing supply chain objectives is to consider applying a company's current array of existing ESG policies to its suppliers. The usefulness of this approach will depend on the scope of a company's ESG policies

Companies that already strive to attain specific, more targeted ESG goals may wish to expand those goals into their supply chains to maintain a consistency among ESG objectives. An existing ESG policy that only addresses labor standards, for example, might suggest a responsible supply chain component that focuses on supplier labor standards. In contrast, a more expansive existing ESG policy—e.g., covering labor, environmental and other sustainability elements—might argue for a correspondingly comprehensive supply chain policy. A firm may even extend their own ESG obligations onto their suppliers, i.e., insisting that their suppliers adhere to the organization’s own code(s) of conduct. This wide-angle approach ensures a measure of consistent treatment between a firm and its direct (tier 1) suppliers, but also may impose obligations and burdens on suppliers without commensurate expected benefits. Requesting that all suppliers—theoretically including office supplies, IT, leased vehicles, etc.—to conform to detailed and substantial requirements that span a range of issues is unlikely to improve sustainability in those supply chains relative to the burdens imposed.

Moreover, even a company with a broad suite of ESG policies with multiple objectives may find that more narrowly tailored objectives to specific supply chain concerns can be appropriate and achieve desired impacts. For example, a battery manufacturer could focus supply chain policy on specific minerals known to raise issues and essentially exclude other suppliers while still making substantial progress. Setting ambitious goals for a single critical input’s supply with known risks and/or sustainability issues can be appropriate and more effective than attempting to apply vague goals to every conceivable supplier. The scope and depth of a responsible supply chain policy will reflect a balance between the likely benefits and burdens, and where impacts are most resonant with the underlying ESG goals of the company.

Step Two: Develop Assessment Methods and Evaluate Policy Options

Developing an Assessment Method

With ESG objectives identified, energy storage companies should then develop their method for assessing progress toward those objectives. The scope and rigor of supply chain analysis depends on the nature of the objectives/goals and to some extent the position of the firm in the value chain. Simple objectives can reduce the need for detailed comprehensive analysis. For example, an objective to avoid purchasing material produced with forced or child labor may require only an examination of a single material input and whether the current supply chain (firms operating in specific low-risk countries) complies with the standard.¹⁵ More complicated and quantifiable objectives, such as reducing upstream GHG footprint by X percent in Y years, may require a much more detailed analysis of supplier operations.

Direct observation and assessment of a company’s supply chain can provide significant information but may require significant resources to accomplish effectively. Formal supply chain mapping, which can involve identifying and quantifying upstream transactions for a single input,

¹⁵ This does not imply that labor compliance monitoring issues are simple; even in relatively straightforward situations monitoring can pose immense challenges.

can become very complex very quickly. Supply chains for processed commodity inputs can merge, diverge, and tangle across geographies and entities as they move downstream from extraction, transportation, processing, manufacturing, etc. Difficulty in establishing provenance can complicate the application of qualitative standards to a specific production input—for example, whether forced labor was involved at some point upstream in the supply chain. In cases where quantification of physical/economic ESG impacts is desired, for example in determining life-cycle greenhouse gas emissions, it usually is not possible to compute the facility-level electricity consumption per unit production and/or carbon intensity per unit electricity consumed. For these metrics, regional or country estimated averages are typically used in lieu of more granular actual data.

Relying on the reports of intermediate suppliers can reduce resource burdens for assessing progress toward objectives but can also limit a company's visibility into its supply chain. While it is natural to assume that firms further downstream in the supply chain face a greater analysis burden, such is not always the case when intermediate firms have strong responsible supply chain policies in place. For example, an ESS integrator or developer might require certain labor and environmental standards for procured batteries. However, the same firm could rely on selected battery manufacturers' supply chain policies to ensure compliance without undertaking a rigorous or comprehensive upstream analysis. While attractive, this approach relies on the rigor and credibility of the suppliers' policies and creates risks for the purchaser who might rely on misleading, incomplete, or even fraudulent representations. When a supplier's policies prove to be strong and reliable, this approach reinforces the value of responsible supply chain policies across the entire supply chain. When potential customers begin to prefer suppliers with rigorous and credible responsible supply chain policy representations to those without such policies, the prospects for sustainable supply chains improve.

Developing Policy Options and Assessing Tradeoffs Among Approaches

Assessment of current supply chains relative to the objectives provide the foundation for developing policy options to consider. Among the many parameters to consider in constructing a responsible supply chain policy, major issues include:

How will the firm interact with upstream suppliers? There are various approaches that entail different relationships with upstream suppliers. The spectrum of approaches generally involves a tradeoff between cost and accuracy or certainty, although some established programs may be able to provide assurances without involving great cost. At one end of the spectrum, a simple objective that covers one input (e.g., a specific mineral) in one dimension (e.g., labor abuses) that can be verified as compliant with an accepted standard (e.g., IRMA standard) at the point of likely concern (e.g., a specific mine) using certifications that flow downstream in a simple supply chain could verify compliance without significant involvement with upstream suppliers. The information that flows downstream could be preserved in each transaction, meaning that a direct (tier 1) supplier would possess all the required information, obviating the need to interact directly with tier 2 (or 3, 4,.. etc.) suppliers. When these conditions are present, the degree of interaction with upstream suppliers will be modest and the costs of monitoring the supply chain potentially small.

At the other end of the spectrum, a company may have to establish a network of information acquisition obligations upstream in the supply chain, conducting physical inspections and audits of upstream entities to verify compliance and provenance throughout the supply chain. Even if third parties perform the inspections and audits, this approach entails substantial involvement with tier 2+ suppliers and incurs much higher costs. However, it may be necessary for some critical inputs where certifications or other information/indicators are less prevalent or credible.

How much can the policy rely on established standards/certifications? Relying on existing frameworks to the extent possible will simplify implementation and reduce the cost of conducting responsible supply chain policies. There are several established, internationally accepted standards and auditing protocols that provide useful tools for mineral inputs; however, they do not cover all issues for all inputs across all markets. For instance:

- The [OECD Due Diligence Guidance for Responsible Mineral Supply Chains](#) applies to all mineral mining but only addresses labor practices. This guidance provides a framework to assess suppliers compliance with international labor standards and norms.
- The [Responsible Minerals Assurance Process \(RMAP\)](#) applies to cobalt (and selected other minerals less relevant to batteries) and addresses labor practices in a manner that meets the requirements of the OECD Due Diligence Guidance and the U.S. Dodd-Frank Wall Street Reform and Consumer Protection Act. RMAP enables 3rd party assessment to certify that a cobalt smelter's mineral sourcing practices conforms to the standards, but not all smelters participate.
- [Standard for Responsible Mining Assurance \(IRMA\)](#) issued by the [Initiative for Responsible Mining Assurance](#) (IRMA) covers both labor standards and environmental issues in a detailed fashion at the individual mine level, mines which can be thereby certified under verification/audit protocols by 3rd parties.
- [Responsible Sourcing Requirements](#) at the London Metal Exchange (LME) require that brands that trade on the exchange certify that their commodities' production adhere to various labor and environmental standards.¹⁶ While these standards only cover metals listed and traded on the LME, the certification adheres to the company selling the commodity. Since all brands listed for good delivery on the LME against physically settled contracts must meet responsible sourcing standards, a buyer may not have to secure physical procurement through the LME in order to obtain certified supplies from a listed brand.

How much flexibility will be permitted in implementation? A responsible supply chain policy will feature obligations on suppliers, which will need to be encouraged or in some cases enforced as a condition of remaining a supplier in good standing. A range of implementation approaches could be considered, from restrictive to flexible, to maximize compliance. On the restrictive side, suppliers may have to agree to audits/inspections of facilities, or maintain specific certifications (e.g., ISO 14001) otherwise face immediate suspension of transactions. More flexible approaches would give time to cure minor deficiencies, assist upstream suppliers to gain certifications or demonstrate compliance while they make good faith efforts to attain

¹⁶ The labor standards are based on OECD Due Diligence Guidance and the environmental standards reflect ISO 14001 standards.

performance targets. The standards described above vary in their tolerance for temporary or minor noncompliance: adopting a standard for supply chain monitoring and enforcing will require adopting an implementation strategy as well. In some cases, flexibility is essential to induce suppliers to undergo certification and thus improve performance, while in other cases it may limit the overall effectiveness of imposing a standard. The leverage that purchasers have, given the conditions of supply, will inform the desired level of flexibility.

How much ongoing monitoring and verification will be required? The frequency and rigor of the monitoring and verification activity is an important element of the initial policy design because the extent of monitoring can improve compliance and program effectiveness but also incur costs for both supplier and purchaser. Supplier agreements commonly have requirements to notify buyers when material conditions change, but otherwise grant limited visibility into supplier operations. For ESG issues, purchasers may elect to monitor performance and compliance more proactively. For example, periodic audits or inspections may be part of a supplier agreement, either conducted by the purchaser or through a third party. For codes of conduct that require (tier 1) suppliers themselves to audit or monitor the performance of their (tier 2) suppliers, the results of those inspections would be reported to the procuring company. While verification and compliance monitoring can be a continuous process, more common approaches employ periodic checks on status or progress, typically on an annual or biennial basis.

What are the likely costs and benefits? The implementation of a responsible supply chain policy will incur some direct costs, for example, commissioning audits or interviewing suppliers to ensure compliance. Indirect costs can be small (assuming little or no changes in procurement or suppliers, and negligible changes in procurement cost) or potentially large if existing supply chains need to be revamped to attain the policy goals.¹⁷ The longer-run benefits can be substantial but are less quantifiable or even tangible—for example, the avoidance of damaged reputation for customers or investors if unsustainable supplier practices are uncovered.¹⁸ Given the inherent uncertainty in costs and benefits, the economic analysis of responsible supply chain policy is better framed as an exercise in risk assessment and management, where firms consider regulatory, legal and reputational risks of alternative supply chains, and can more effectively manage those risks as they better understand their own supply chains. Such an analysis may also want to consider how other firms in the industry address supply chain issues. To the extent that more firms pursue effective, responsible supply chain policies, the greater the overall impact on supply chains; the more broadly and equitably the costs might be distributed; and the more concentrated the adverse impacts on laggards who take on greater reputational risk by not addressing supply chain sustainability concerns.

¹⁷ There are very few estimates of the costs of administering or complying with responsible supply chain policies. Two studies from Rwanda estimated that total due diligence costs represent approximately 2-4% of mineral export value, but this is mineral- and country-specific and doesn't capture which parties ultimately bear the costs. See [Costs and Value of Due Diligence in Mineral Supply Chains - OECD Position Paper](#) p. 23.

¹⁸ See [Quantifying the Costs, Benefits and Risks of Due Diligence for Responsible Business Conduct: Framework and Assessment Tool for Companies](#) (OECD and Columbia School of International and Public Affairs, 2016) for some examples of costs and benefits estimation.

Are there relevant industry initiatives to foster responsible supply chain policy? There are some membership organizations and ESG initiatives that are battery- or mineral-focused, such as:

- The [Global Battery Alliance](#) (GBA) is an organization founded in 2017 with a goal to establish a sustainable battery value chain by 2030, incorporating objectives such as circularity, environmental protection and sustainable development. GBA includes among its members EV and battery manufacturers (including manufacturers of stationary energy storage system batteries), and has launched two initiatives focused on supply chain management:
 - The [Battery Passport](#), which will apply blockchain technology to “provide trusted information on indicators related to responsible and sustainable practices, resulting in a ‘quality seal’ capturing authenticated records of the responsible sourcing, management, recycling and use of a battery across its full lifecycle” including tracking the upstream provenance of critical minerals.
 - The [Cobalt Action Partnership](#) which aims “to immediately and urgently eliminate child and forced labor from the cobalt value chain, contribute to the sustainable development of communities, and respect the human rights of those affected” through engagement, dialogue, and other activities that support mining communities in the DRC.
- The [Responsible Minerals Initiative](#) (RMI), a program under the Responsible Business Alliance (RBA) with over 400 member companies, helps companies from a range of industries to address responsible mineral sourcing issues in their supply chains. RMI created the Responsible Minerals Assurance Process (RMAP) and recently released a [Revised Cobalt Refiner Supply Chain Due Diligence Standard](#), which is designed to further support companies’ due diligence and responsible production and sourcing activities within the cobalt value chain and enable companies to comply with the London Metal Exchange (LME) Responsible Sourcing requirements.

There are also initiatives in related industries that could form a template for stationary energy storage industry members to pursue responsible supply chain policies. For example, the [Drive Sustainability](#) initiative sponsored by a broad coalition of automakers (including battery electric vehicles) and is conducting supply chain mapping for 37 raw materials commonly used in automobiles. The Solar Energy Industries Association (SEIA) recently established a solar supply chain initiative that includes a Solar Industry [Forced Labor Prevention Pledge](#), a [Traceability Protocol](#), and an updated [Solar Industry Commitment to Environmental & Social Responsibility Participant Handbook](#), which features several items relevant to responsible supply chain management.

Will significant shifts in supply chains be considered for achieving compliance? While the policies contemplated generally apply to existing supply chains and presume that changes are incremental, more dramatic shifts in strategy could also attain goals. For example, a battery manufacturer can backward integrate into mining/processing or directly purchase ore from a

certified mine to process downstream.¹⁹ Another strategic shift could include battery manufacturing companies on-shoring major supply chain links, such as lithium mining, which would bring much of the upstream mining and processing of materials under U.S. labor and environmental standards and reduce the materials transportation costs and emissions arising from expansive global supply networks.²⁰ Finally, altering battery chemistry to reduce or eliminate cobalt or other high risk materials would also contribute to attaining ESG goals. Such significant shifts in supply chains are generally made for broad, strategic commercial reasons, although the ESG implications and benefits increasingly enter companies' strategic decision calculus.

Step Three: Codify and Implement Responsible Supply Chain Policy

After articulating the goals and objectives and deciding on policy elements, a firm will determine the form and format the policy will take to convey the policy to internal and external stakeholders. In terms of internal stakeholders, a responsible supply chain policy is most effective when embedded in day-to-day management processes compared with relegation to occasional reference or afterthought. For external stakeholders such as suppliers, firms must make their policies known and understood.

Common formats include a **pledge or commitment** to avoid or reduce adverse outcomes from supplier behavior, with the procuring firm promising to undertake various activities or actions. This format commonly provides limited detail but rather describes in general the kinds of activities that they will expect their suppliers to avoid and possibly how they might induce suppliers to change (or change suppliers) if they discover supplier impacts that are inconsistent with the procuring firm's responsible supply chain objectives or goals.

A more detailed description is sometimes formalized as a **supplier code of conduct**, which outlines obligations that suppliers assume when transacting with the procuring firm. This may or may not be identical to the code of conduct the procuring firm requires of its own operations. If identical to the own firms' code of conduct, then the supplier code of conduct can simply incorporate that by reference. In some formulations, a tier 1 supplier assumes the procuring firm's entire code of conduct, including the obligation to impose the code of conduct on its own suppliers, *ad infinitum*, until the code theoretically applies throughout the upstream supply chain. However, this recursive structure may be stated less with less specificity, for example in a statement that suppliers are expected to require that their lower tier suppliers or subcontractors also follow the spirit of the supplier code of conduct.

¹⁹ See "[LG Energy Solution to have 6-year access to nickel, cobalt from Australian Mines amid heated competition over raw materials](#)" (PR Newswire August 15, 2021) for a discussion of an ESG impacts of direct purchases from IRMA-certified mining operations.

²⁰ [American Battery Factory](#) provides an example of a firm working toward on-shoring supply chain to produce lithium iron phosphate (LFP) batteries without using cobalt or nickel.

Implementation details that may be commonly omitted in pledges or codes of conduct can be incorporated into request for proposals (RFPs) and contracts. For example, if a firm requires a supplier to adhere to a specific code of conduct, that requirement (along with the code of conduct) should appear in RFPs issued to potential suppliers. This signals the importance of the code of conduct to the firm issuing the RFP, helps the potential supplier create a responsive proposal and, if selected, will speed the contracting process. Supplier codes of conduct can also occupy different roles in completed contracts, with varying degrees of binding or enforceability.

Finally, implementation should include periodic or continuous process of reconsidering and possibly revising or updating policies, as shown in the circular process diagram (Figure 1) from the UNGC *Supply Chain Sustainability: A Practical Guide for Continuous Improvement*. Among the ten companies that reported having responsible supply chain policies in the ESA survey, three had revised their policy over time, indicating that such policies can evolve over time to reflect changes in objectives, conditions, or measured progress.

Step Four: Communicate Progress Toward Goals

Most large publicly traded firms report some progress on their ESG goals in an annual report, although such reports are primarily intended for ESG investors and may not provide details regarding compliance with goals. One exception may be quantitative goals for greenhouse gas or carbon reductions from supply, where quantitative progress can be estimated and verified by auditing firms, consultants, or engineering firms.²¹ For other external stakeholders, such as the public, many companies make their responsible supply chain policies accessible. For companies that do not, this often reflects internal counsel's assessment of perceived legal or reputational risks if external stakeholders believe that the company is not fulfilling their obligations under the policies or if infractions by suppliers are brought to light.

Responsible supply chain policies that target human rights, labor, and local environmental impacts have qualitative outcomes that are less relatable in an annual report format. In fact, outcomes under even a rigorous supply chain policy may not change from year to year, if the measurable objectives and goals are continuously met by suppliers. Of course, supply chains change through time, and an effective supply chain policy must respond to, and evolve with, market changes. That is one reason why periodic monitoring and reporting is necessary: responsible supply chain outcomes are not achieved in perpetuity without efforts to maintain and improve the outcomes.

5. Conclusion

Responsible supply chain policies are commonplace but not universal in the energy storage industry. Although developing a responsible supply chain policy can entail a substantial effort,

²¹ See "[S&P 500 and ESG Reporting](#)" by the Center for Audit Quality, August 9, 2021.

there are numerous organizations and resources available to assist firms undertaking the policy development process. By articulating objectives and assessing options and tradeoffs among alternative approaches, battery energy storage companies can institute a responsible supply chain policy that reflects their corporate goals and enhances the safety and sustainability of the industry.