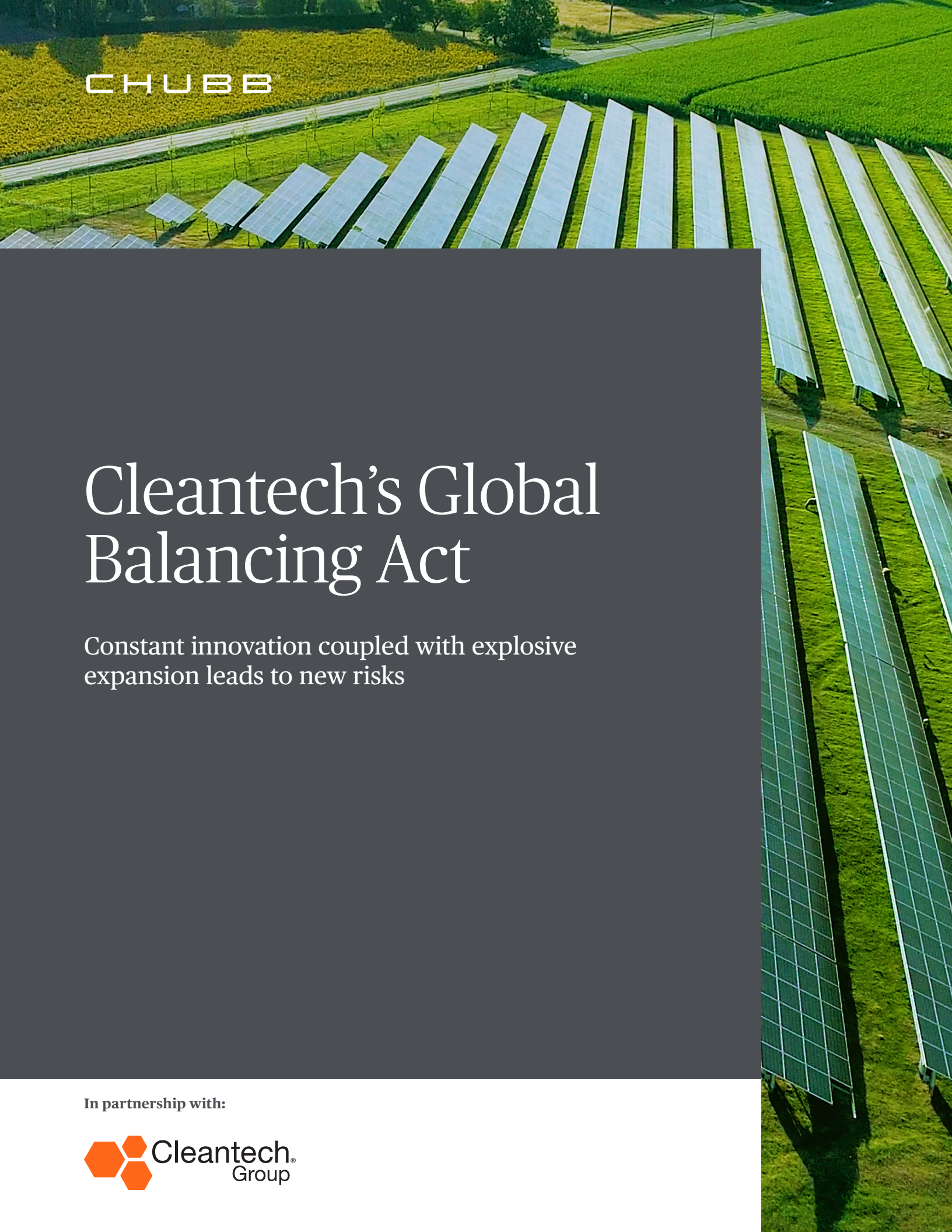


CHUBB®

Cleantech's Global Balancing Act

Constant innovation coupled with explosive expansion leads to new risks

In partnership with:

Cleantech Group®

Maria Guercio
Clean Tech Industry Practice Leader, North America

Martin Kunz
V.P.
Clean Tech US

"It's endlessly rewarding to work with companies revolutionizing sustainability. Cleantech companies face continued risk as they innovate, and Chubb remains committed to mitigating risks emanating from cyber vulnerabilities, supply chain dependencies, and globalization."

Richard Youngman
CEO, Cleantech Group

"Data, connectivity, and the use of other digital technologies are a feature of most innovative solutions these days for next-generation industry, be they in ag, energy, or transportation. It is striking both from conversations during the year and the results of this survey how CEOs of small emerging companies remain reluctant to allocate scarce resources to mitigate the significant increase in risk such technologies bring."

The details provided in this report do not form part of any contract and while every effort has been made to ensure accuracy, this cannot be guaranteed. All information used in the publication of this report has been compiled from sources that are believed to be reliable. All reasonable steps have been taken to avoid an error or misdescription arising. The material in this report is for private information only, and we are not soliciting any action based upon it. For the avoidance of doubt, CTG:I LLC ("Cleantech Group") does not warrant the accuracy, completeness, timeliness, or fitness for a particular purpose the information contained in this report. In no event shall Cleantech Group be liable to anyone for any decision made or action taken by anyone in reliance on such information.

COPYRIGHT
Cleantech Group retains all rights, including copyright, to this report, including text, pictures, graphics, or other information presented. No part of this publication may be reproduced, stored in a retrieval system in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of Cleantech Group.

Table of Contents

4 About This Report

4 Risk and Reward:
Is there a new balance?

5 Executive Summary

---

6 Insight 1

Emerging technologies are transforming cleantech.

12 Insight 2

Cleantech companies are ill-prepared for significant cyber security vulnerabilities.

16 Insight 3

Critical supply chain risks emerge in light of increased globalization.

20 Insight 4

Converging priorities and risks lead to new challenges requiring creative strategies to manage exposures.

26 Insight 5

Corporate investment, talent management, and globalization compound every other challenge cleantech companies face.

About This Report

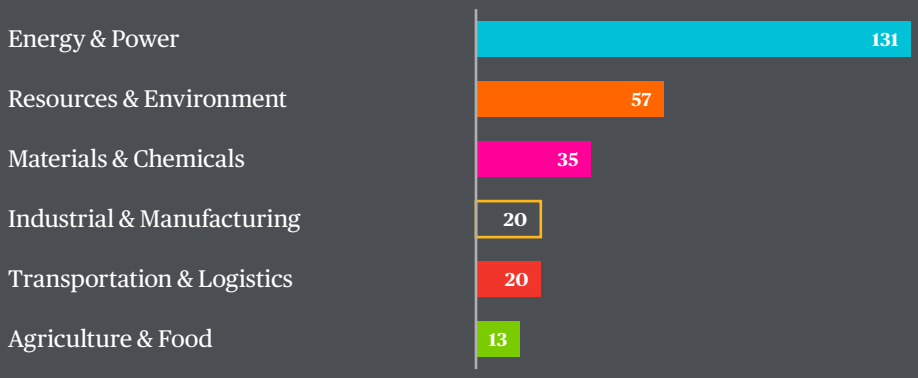
Cleantech companies are expanding their products and services to broader industry segments than ever before. They are becoming players in the most important industries in the world, including energy, food, manufacturing, and transportation. As population increases, cleantech companies are working toward addressing increasing power demands by deriving power from renewable sources, creating energy efficiencies, and addressing the scarcity of natural resources. With the growing demand for sustainability, how do cleantech companies balance innovation and growth with sound risk management to address the associated risks?

For the second time, Chubb has partnered with Cleantech Group and conducted a survey focused on cleantech CEOs from around the globe. The companies surveyed were from numerous industry segments and life cycle stages.

Cleantech Group reached out to more than 4,000 global cleantech company leaders through email, direct outreach, and Cleantech Forums. The data was collected in the first two quarters of 2018, where nearly 300 executives participated in the survey, nearly 20 joined in a CEO round table discussion, and 15 partook in one-on-one interviews to obtain additional color on their perception of risk.

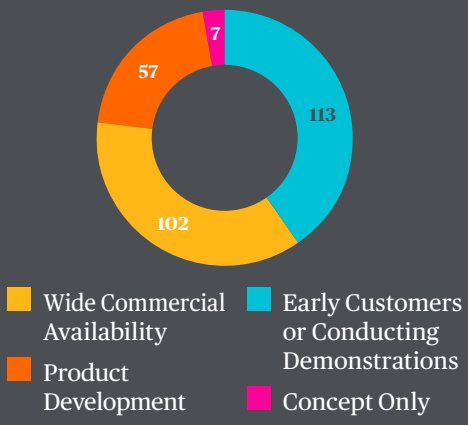
In the previous 2015 survey, cleantech executives shared their priorities for the future of their businesses and the challenges they needed to overcome to succeed. In 2018, we updated those results and compared those key findings. To enhance our survey, we dove deep into new trends and potential threats.

Industry Segment of Companies Surveyed



The majority of the companies surveyed are headquartered in North America and Europe. Survey also represents companies headquartered in Asia, Australia, Africa, and South America. Three respondents did not categorize their business.

Stages of Commercial Development



Risk and Reward: Is there a new balance?

Cleantech companies face a myriad of challenges, opportunities, and related potential risks along their growth trajectory. Advancements in technology enhance products and streamline manufacturing operations, but added interconnectivity presents wider cyber vulnerabilities. Supply chains are more efficient and span the globe, but they can be subject to a range of disruptions. Partnerships are wide ranging, but they can cause delays or put intellectual property at risk.

Findings from the research suggest that many companies need to improve their risk management strategies to make it easier to seize opportunities. Throughout this report, you'll find recommendations on how to make those improvements. These recommendations come from the combined experience of Chubb and Cleantech Group. We believe the insights shared here will help executives better prepare for their growing risks and opportunities.

Executive Summary

Cleantech companies are in a transformational phase as emerging technologies become integral to a product offering or to increase manufacturing productivity.

The growing use of sensors, Internet of Things (IoT) devices, predictive analytics, and manufacturers deploying smart factories create value, but these advancements also present risk requiring new mitigation activities.

The connected environment is expanding rapidly, yet there remains a lack of cyber security strategy.

Cyber security is clearly important to cleantech companies, with a majority aware of its potential impact on customers' purchasing decisions. Yet, approximately one in five of responding executives said they do not have a strategy to adequately protect themselves. There are many unique risk-mitigation steps that companies can undertake.

Connectivity provides a worldwide reach, and, similarly, supply chains are increasing global. The top locations for sourcing today and anticipated three years from now are the United States and Europe. However, U.S. and European share will decrease amid increased sourcing in China, Southeast Asia, Canada, and India. Such expanded global involvement offers new growth and exposure. Since half of cleantech CEOs have experienced a disruption, it is increasingly necessary to develop a formal supply chain strategy.

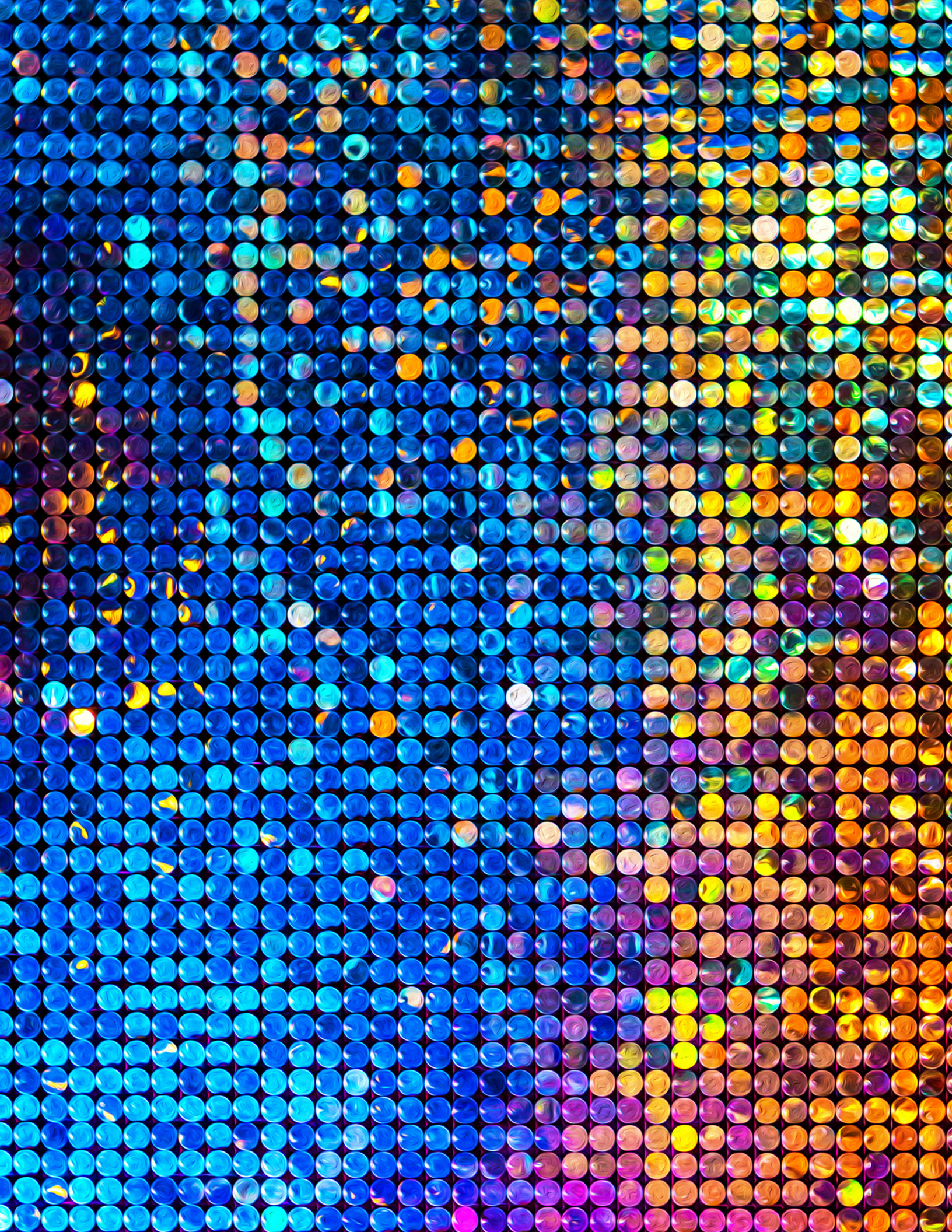
Partnerships, global expansion, and research and development (R&D) present the highest priorities both near term and long term. While partnerships are a high priority, so is careful technology sharing and protecting intellectual property. Executives also view raising financial capital, talent acquisition, and new competitors, in that order, as priority short term risks. New competitors and disruptive technologies are their top long-term risks.

As companies in cleantech chart the future, three key challenges also present opportunities: corporate capital, talent acquisition, and going global. Globalization, in particular, impacts many aspects of a cleantech company. As executives look to new markets, channels, and relationships around the world, they're finding that cultural or business practices, risk of intellectual property loss, and local regulations are important obstacles to overcome.

Read on to learn more about how cleantech executives feel about what lies ahead, steps to mitigate key risks as they grow, and how to leverage technologies and relationships.

Emerging technologies are transforming cleantech.

Digital and physical worlds converge and present new opportunities and risks.



1

Technologies that gather, relay, store, and manipulate data are being integrated widely.

Roughly two-thirds of cleantech companies are using enabling technologies that collect and process widespread data points, with nearly half using sensors and IoT devices (47%) and a third employing predictive analytics. IoT has become critical to doing business in technology-oriented sectors (energy, smart city, etc.) and at the same time has facilitated the digital transformation of traditionally low-tech industries.

Agriculture and food is one clear example of an industry being changed by the availability of inexpensive sensors in soil, on land, and in the air, producing data, insight, and more precise control to aid growers in improving crop yield while reducing inputs such as fertilizer and water.

2

Enabling technologies are both embedded into products and onto manufacturing floors.

Manufacturing is another example. According to Capgemini, 76% of manufacturers have a smart initiative, and more than half have aligned $100M or more toward smart factories.[1]

Cleantech leaders are exploring the benefits that artificial intelligence (AI), blockchain, conversational interfaces, and augmented reality (AR) enable. Recent investment activity indicates a change in the landscape. Investment into companies using AI has increased from $115M to $2.5B (2015-2018).[2]

3

Artificial intelligence and blockchain are on the rise and are attracting a significant investment.

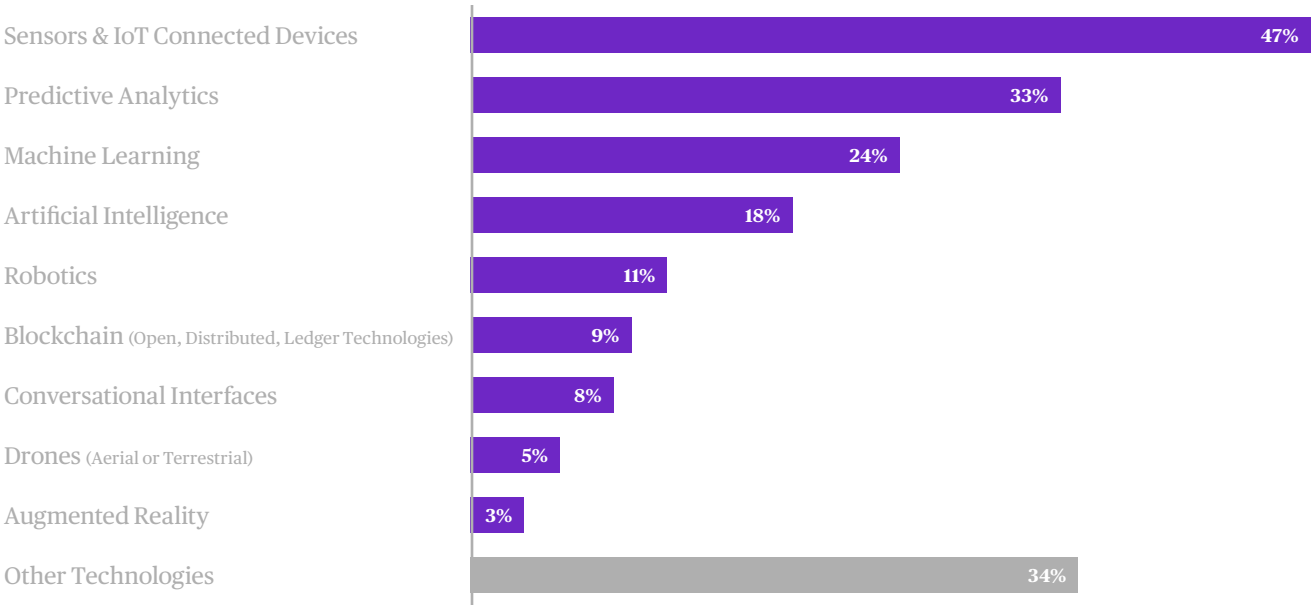
Some AI use cases include predictive maintenance of assets to prevent unplanned downtime, computer vision technologies applied to cameras (e.g., enabling autonomous cars and in agriculture for crop condition monitoring), and satellite and sensor data processing. Some blockchain use cases include shared ledgers for reducing reconciliation costs in wholesale electricity trading, enabling crop safety and traceability in agriculture and food, and water trading monitoring.

"We are an AI company applying powerful mathematical proprietary models to agriculture. With the data coming from over 100K hectares of outdoor and indoor farming environments provided by R&D centers and companies, alongside weather and satellite data, we are able to make highly accurate predictions to improve productivity and save costs."

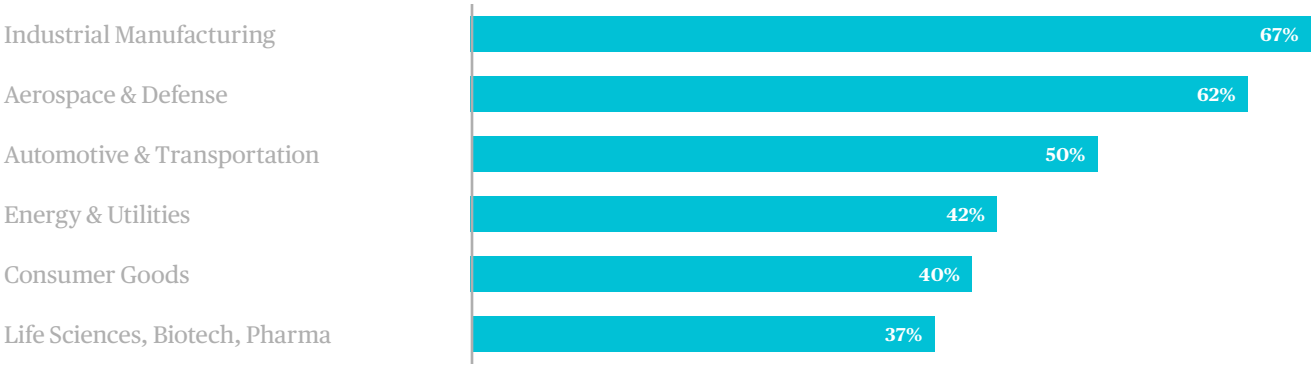
– Ricardo Antolin, Founder at ec2ce (Ag and Food, EU)

[1]Source: "Smart Factories. How can manufacturers realize the potential of digital industrial revolution," by Capgemini Digital Transformation Institute
[2]Source: Cleantech Group

Technologies Being Employed

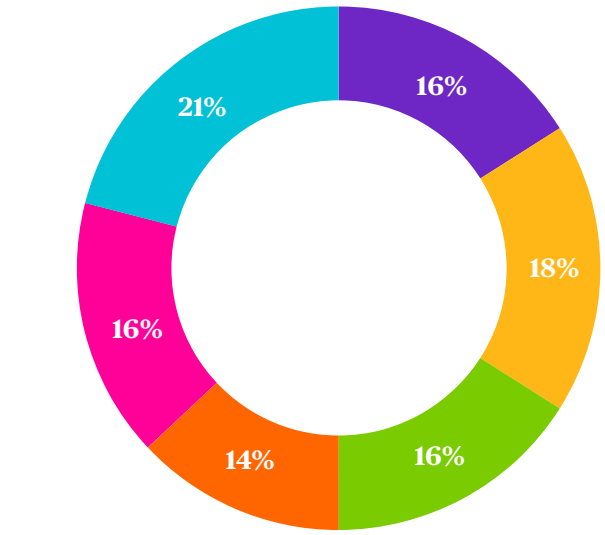


Share of Manufacturers with Smart Factory Initiatives



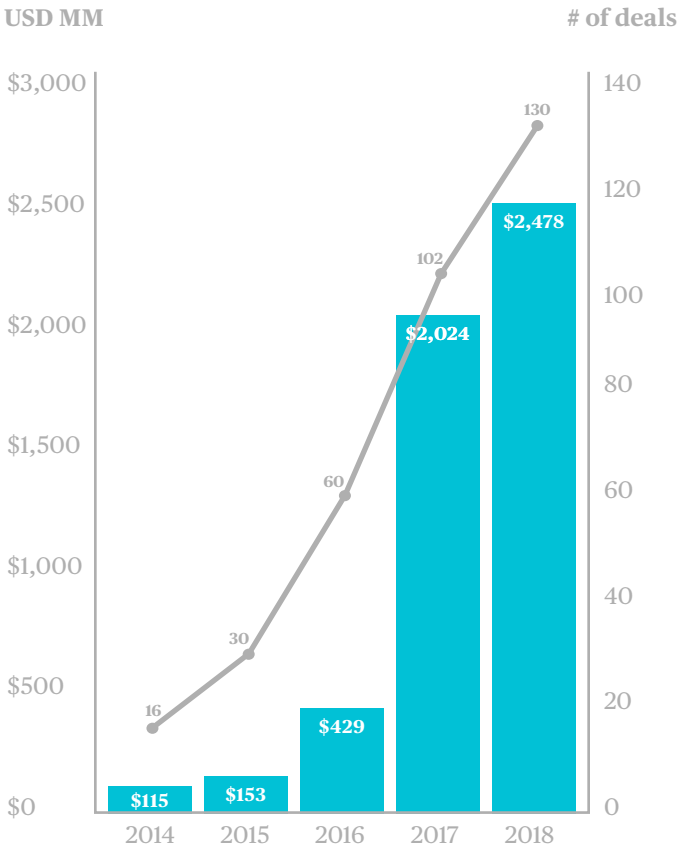
Source: "Smart Factories. How can manufacturers realize the potential of digital industrial revolution," by Capgemini Digital Transformation Institute

Technologies Used by Indoor Agriculture



Source: "State of Indoor Farming 2017," Agrilyst

Investment into Companies Using AI



Source: Cleantech Group i3

Risk Spotlight

A disturbance to deployed emerging technology may result in product or process downtime, damage to assets, financial injury to customers, physical injury, or unintended access to private information. Consider these risk mitigation steps:

- Systematically assess the vulnerabilities of the digital technologies embedded into your products.
- Review security protocols to reduce the risk of a network/system failure that could result in a third party or employee injury.
- Evaluate how a network or system disruption could impact customers.
- Consider and protect the sensitive or proprietary data that could be accessed in the event of a data breach.
- Perform an annual, enterprise-wide review of your risk management and contractual controls to mitigate the escalating cyber and operational risks associated with the use of digital technologies.

Cleantech companies are ill-prepared for significant cyber risk vulnerabilities.

1

Industries are digitizing at a rapid rate with connected sensors and data-driven analytics.

2

77% of executives are aware of cyber security's potential impact on customers' purchasing decisions.

3

Roughly one in five respondents indicated they lack a strategy for protecting themselves against cyber breach.

The lack of strategy around cyber security is not unique to cleantech, as similar results exist across small and mid-size enterprises (SMEs). A recent Chubb report with Symantec indicated that SMEs give inadequate resources, time, and funds to cyber security, with 67% having no data security policies and of those that do, 87% have no formal written policy in place.[1]

Two key factors lead to a lack of protection among SME's:

Low risk perception—Companies correlate smaller size to reduced cyber risk. This perception held up in our survey results that indicated only 5% of cleantech CEOs ranked cyber security as a short-term risk and only 8% ranked cyber security as a long-term risk. In fact, small companies are likely to be targeted because they are less prepared to defend themselves compared to a larger corporation.

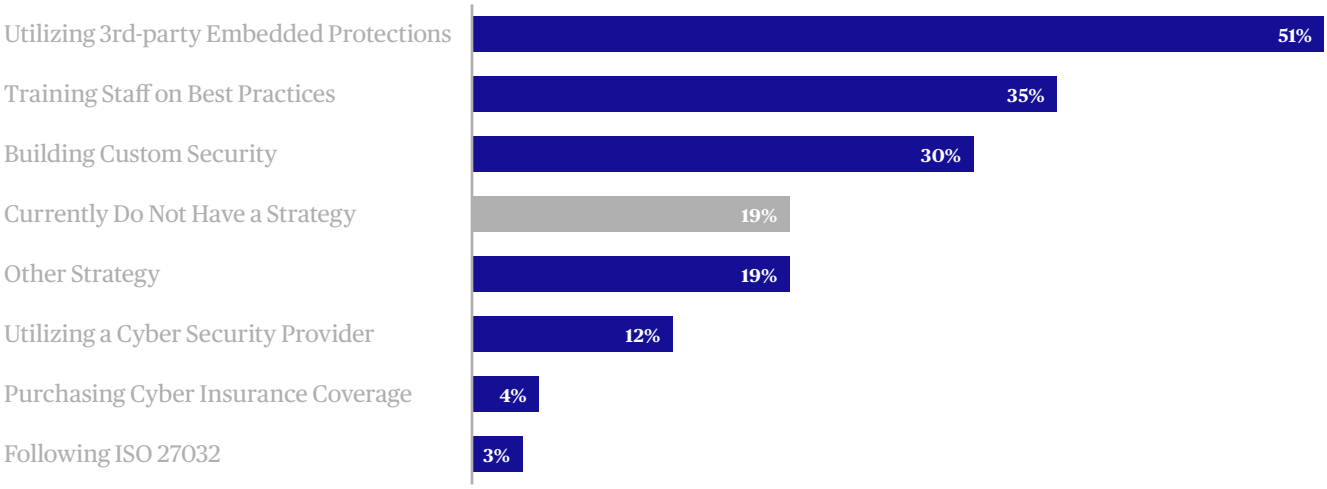
Limited resources—Every dollar spent on cyber security is a dollar that didn't go into R&D, business development, or other mission-critical tasks. The return on investment for cyber security may not be clear enough to motivate action. However, of the SMEs that suffered a cyber breach, 93% experienced a severe business impact, indicating that there are financial ramifications and reputational risk for lack of preparation.

"Cyber security is a concern for the system, regulators, and our customers, so we are building it as one of our core competencies using encrypted protocols. We are also partnering with Lancaster University, a leading university in cyber security."

—Dr. Graham Oakes, Founder, Chair, Chief Scientist at Upside Energy (Energy & Power, EU)

[1]Source: "Internet Security Threat Report (ISTR) 2018" by Symantec

Current Methods of Protecting Company from Cyber Threats



Risk Spotlight

A cyber risk-management program should be unique for each company based on the exposures associated with their operations. These risk mitigation steps should be common among all cleantech companies:

- Develop and enforce a formal, written password policy.
- Educate all employees regularly on cyber security vigilance.
- Update IT equipment and deploy security software.
- Create a cyber incident response plan.
- Purchase cyber insurance.

What happens when I have a cyber incident? When insurance is purchased with Chubb, a Cyber Incident Response Service is ready to assist with legal, computer forensic, notification, public relations, crisis communications, fraud consultation, credit monitoring and identity restoration advice and services.

Ransomware is a common cyber attack that disables a company's computers and phones. With the Chubb Cyber Alert mobile application, a policy holder can have 24/7 access to incident response services. This tool can be part of a formal company-wide response plan.

Critical supply chain risks emerge in light of increased globalization.

1

North America and Europe remain a top choice for sourcing, but China's presence is growing at an increasing rate.

Globalization is the key to increased opportunities and rapid market growth. North America and Europe are the two main regions where cleantech companies are currently sourcing from, which is similar to our results in the 2015 survey. These regions benefit from high economic stability and ease of doing business, making it a relatively simple choice for leaders in cleantech to source close to home.

China holds a consistent third place as the preferred market for sourcing both today and in the future.

2

As globalization increases, supply chain risks become predictable. Yet, only 12% of cleantech companies have a supply chain response plan.

Looking ahead three years, Europe and the U.S. will remain in the top two spots while both decline significantly in dominance.

Southeast Asia seems particularly attractive to leaders in the industry with the percentage of companies sourcing from there set to more than double to 33%. Canada is also on the rise, expanding from 17% to 34% over the next three years.

A look at the list of greatest perceived supply chain risks (see graphic on page 19) may provide some insight into the importance of completing due diligence when selecting a business partner.

3

50% of respondents suffered a supply chain disruption, and, of those, 80% reported a severe impact to their business.

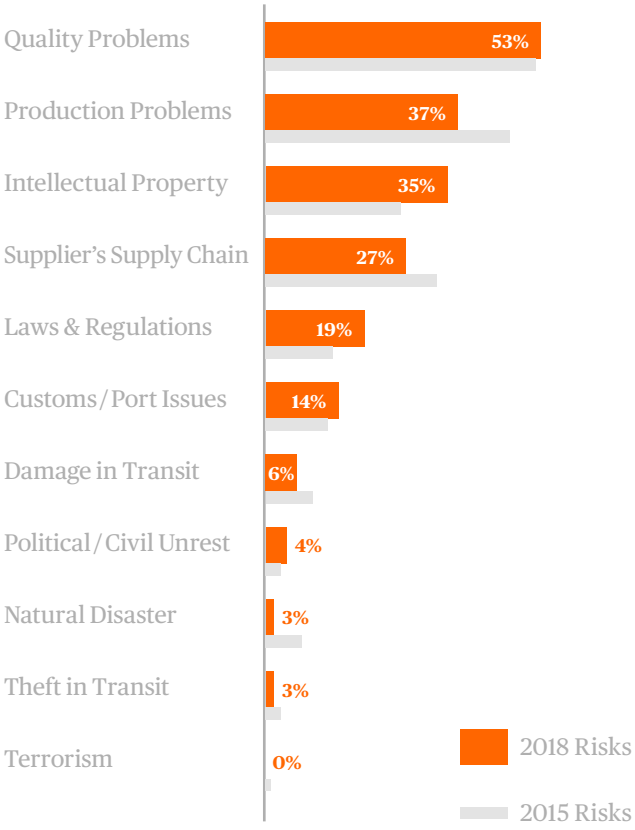
More than half of the companies surveyed indicated that they have experienced supply chain disruption within the last three years. When these interruptions occur they are significant– four out of five companies report a material impact on their business.

In spite of the disruptions, only 12% of the companies have a formal supply chain plan to help prepare the organization to react to unexpected disruptions and help avoid potentially negative consequences of inaction.

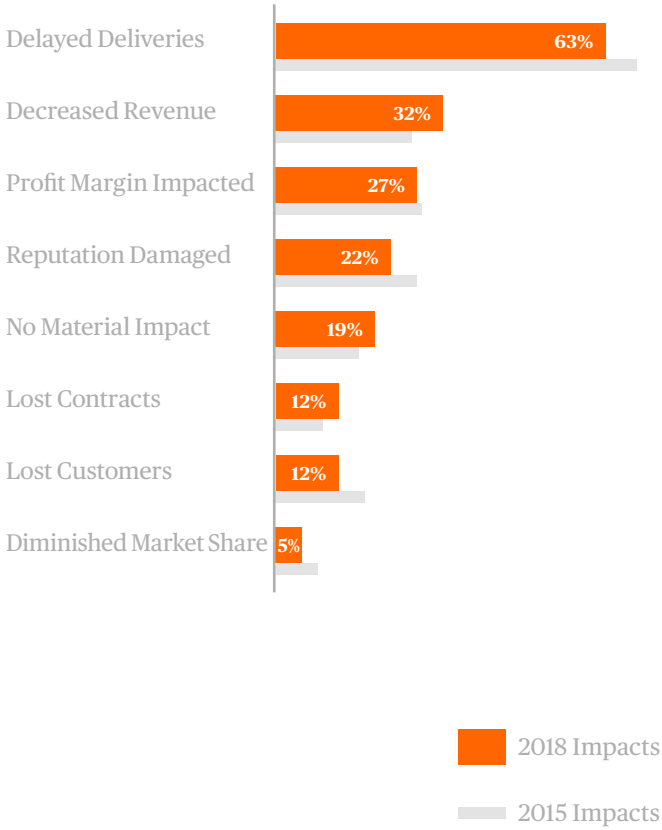
"We started sourcing globally from the beginning. It has always been an important part of our fundamental vision that we wanted to dramatically lower the cost, have diversity of supply, and maintain quality."

– Paul Mertes, President & CEO at CircuitMeter (Energy & Power NA)

Greatest Risks to Supply Chain



Impact of Supply Chain Disruptions



!

Risk Spotlight

Supply chain disruptions can lead to delayed deliveries, lost customers, decreased profit margin, and damage to your reputation. When building a resilient supply chain, consider the following:

- Understand your entire network, including all suppliers, their sub-suppliers, storage facilities, and transportation routes, and check for locations that are vulnerable.
- Work with multiple suppliers and set objectives and comparable metrics that will help you track the resiliency of your supply chain, hold suppliers accountable, and identify issues early on.
- Make sure intellectual property protections are in place. Verify if your supplier's jurisdiction will uphold your IP contractual agreements. Know how companies in your supply chain protect against breaches.

Survey respondents are currently using the following best practices: having multiple sources for critical supply components (48%), conducting sample tests (37%), and sourcing from proximate suppliers (31%).

Consider purchasing a global insurance policy to protect your balance sheet. Global Contingent Business Income, for example, may minimize the financial impact of a potential disruption. Choose a multinational insurance company that can protect your financial interest and your people, and that can provide guidance and expertise when dealing with country-specific nuances and local regulations.

Converging priorities and risks lead to new challenges requiring creative strategies to manage exposures.

1

Partnership is a top priority yet presents risks.

New partnerships, globalization, and R&D are the highest short and long term priorities for companies in cleantech. Other top long term priorities are largely the same as in our 2015 survey. However, acquisition was a larger focus previously with 48% of respondents claiming acquisition as a priority versus 33% in 2018.

Partnership formation is as essential today to cleantech companies as it has been in the past and is likely to remain the same in the future. Although a great strength, partners (development partners and/or channel partners) are also perceived as the top risk to intellectual property.

2

57% of executives see raising financial capital as the top short-term risk.

It's not surprising, in light of this, that careful screening of partners is second only to patenting innovations, as a method for protecting their intellectual property.

More than half (57%) of cleantech leaders see raising financial capital as among their top short-term risks, placing it prominently above the second most popular risk, talent acquisition (34%). In the short term, smaller companies (revenue less than $1M) are more likely to perceive raising capital as a risk, whereas larger companies are more likely to be concerned about talent acquisition.

3

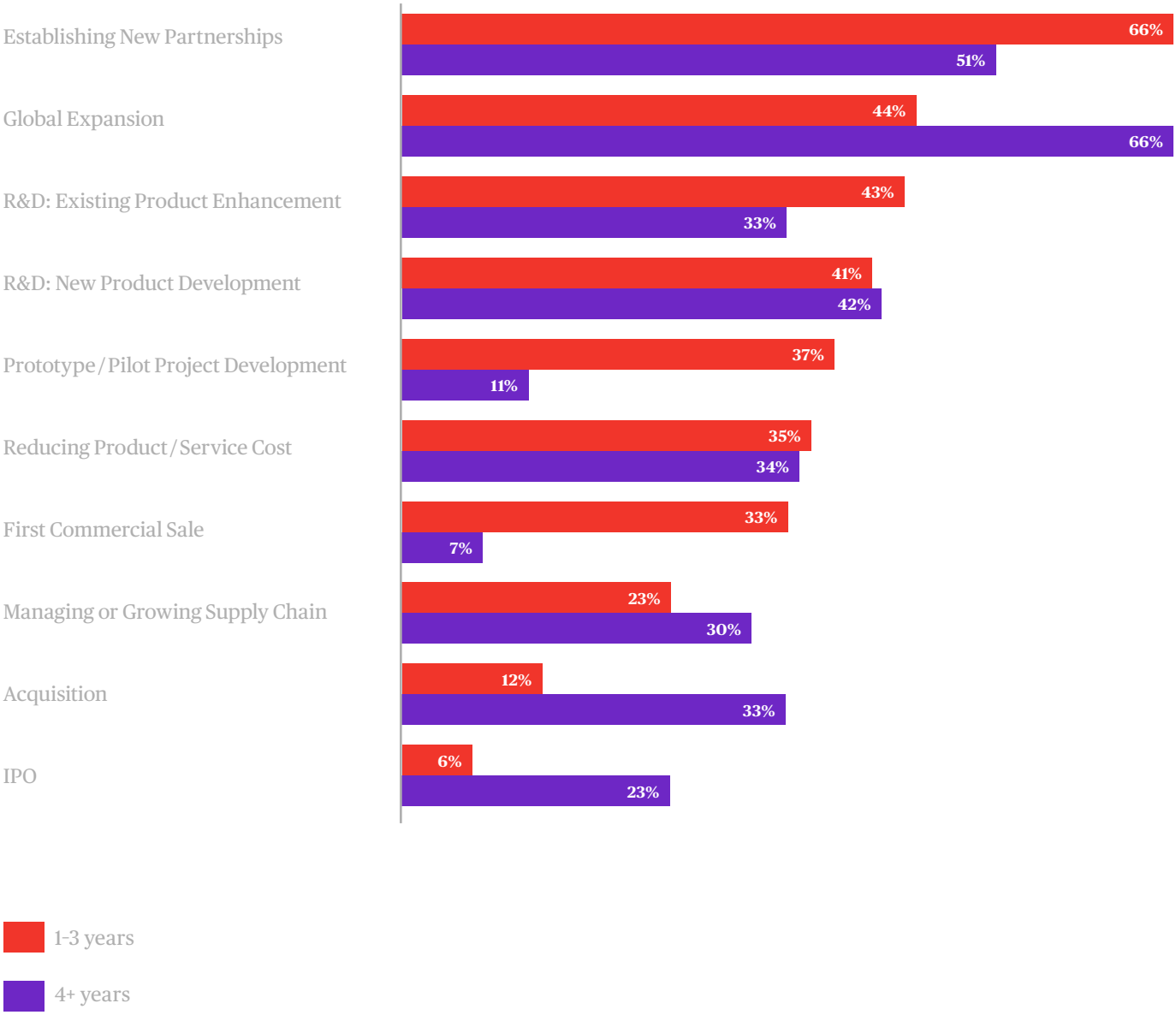
Competition becomes the biggest risk long-term.

In the long term, the story changes. The threat of new competition taking market share becomes the largest risk followed by the risk of being disrupted by new technologies. While new competitors was the third most popular risk in the short term, moving two spots from 2015 to number one, disruptive technologies moved up four spots from 2015 to number two, indicating the awareness of the heightened probability for disruption by new technologies with time.

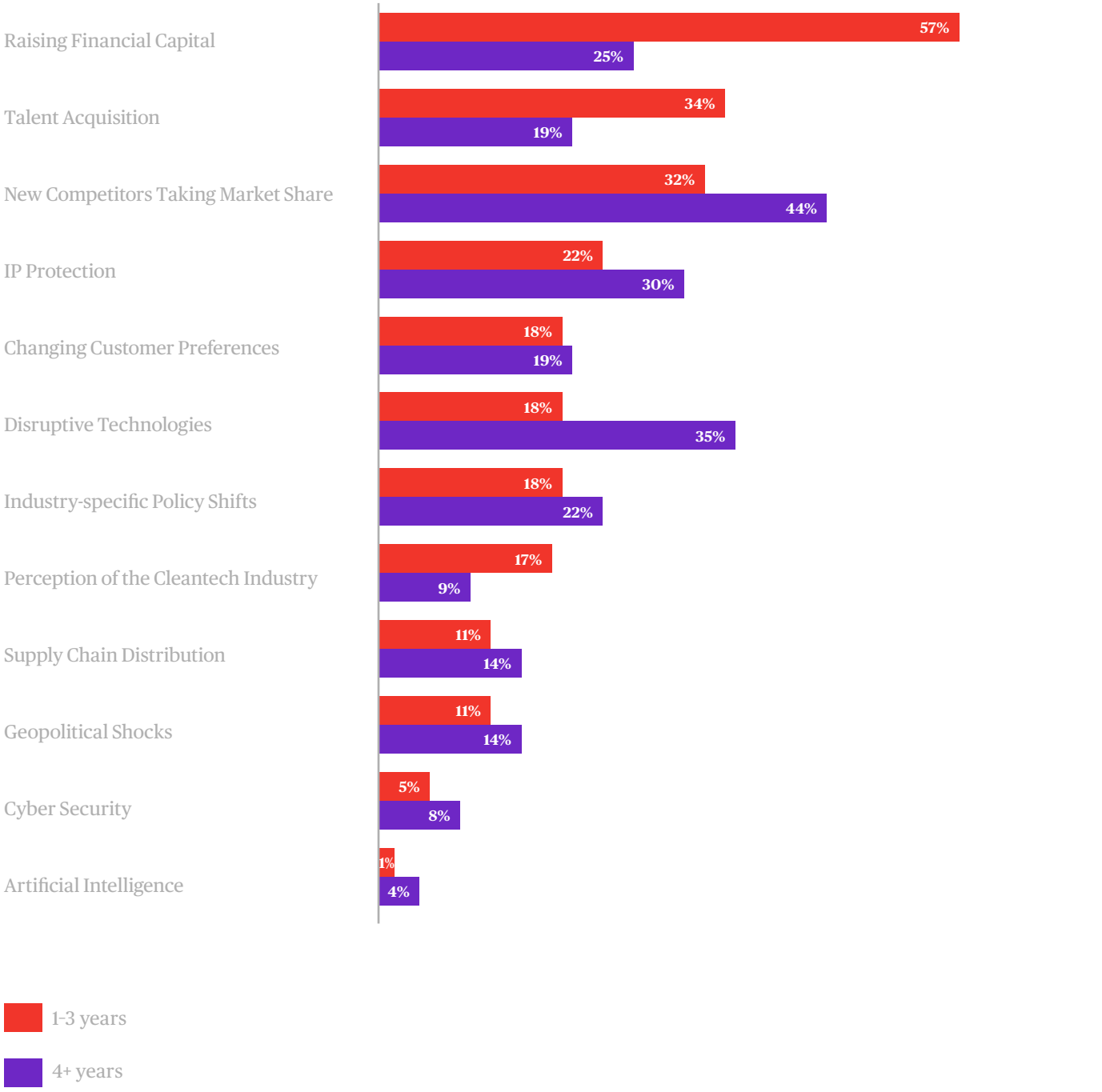
"The strength of our relationships is important to protect our intellectual property. We have patents and contracts, but a lot of it is around the relationship that we have with the customer. Good relationships that deliver what they promise minimize incentive to steal."

– Ari Raivetz, CEO at Organica Water (Resources and Environment, EU)

Short- and Long-Term Priorities



2018 Short- and Long-Term Risks



Source: 2015 Cleantech CEO priorities survey

Risk Spotlight

Choosing partners wisely can expand capabilities, product commercialization, channels, and revenue. However, unexpected issues with partners can cause a range of issues. The following can contribute to effective partnerships:

- Examine each partner's track record and financial strength.
- Ensure intellectual property protections are in place, and verify that your partners are based in jurisdictions that will uphold contract law.
- Perform due diligence on each potential partner, and build relationships.
- Require Product Liability and Errors and Omissions insurance for development, supplier, or installation partners.
- Protect traveling employees by purchasing business travel accident and foreign voluntary workers compensation insurance.

Corporate investment, talent management, and globalization compound every other challenge cleantech companies face.

1

One in five companies expects their next financing to come from corporate capital.

2

To acquire top talent, executives overcome a limited available workforce, and compensation and cost challenges.

3

Globalization knows no boundaries.

According to Cleantech Group's i3 platform, the amount of funding and number of deals has steadily increased across cleantech since 2015. Not including outlier deals above $350M, 2014 saw roughly $12.2B (1,476 deals) while 2018 had $29.7B (2,000 deals) of venture and growth capital investments.

Approximately one in five companies expect their next financing to come from private equity, corporate, or other venture capital. Private equity and other venture capital were expected to be high on the list. Interestingly, large corporations are increasingly more active in supporting innovation by creating multiple new structures. Corporate ventures capital is one approach, with many organizations working actively with innovators to provide access to clients and get real-world feedback. Corporates are now sponsoring accelerator programs, running their own programs, forming university partnerships, and expanding open innovation activities in general.

Competition for top-tier talent, both technical and managerial, has always been a priority of leaders in cleantech. Based on the initial CEO interviews used to craft this survey, it's becoming a greater challenge to attract and retain talent. The results from the survey indicate that available workforce, compensation, and costs are the main challenges.

The two main targets of talent acquisition strategies are: Engineers (40%) and Sales/Business Development (33%). The divide between earlier stage companies and later is clear and as expected: 54% of the companies in product development stage are focusing on hardware/software engineering while 47% of companies with widely commercially available products or services are focusing on sales and business development (compared to 12% for product development).

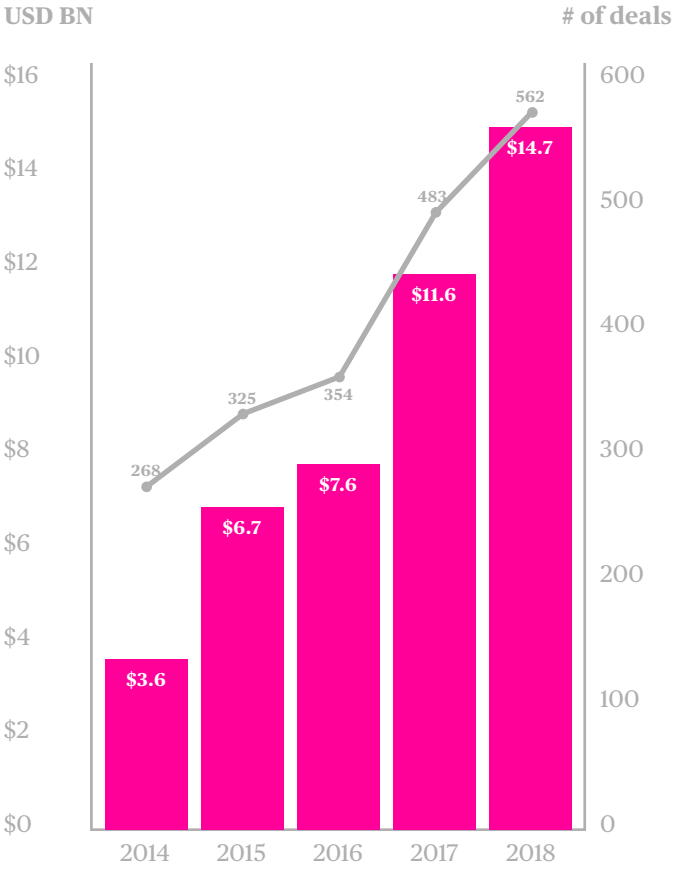
Similar to sourcing, cleantech companies are currently selling close to home with the U.S. and Europe being the top regions. However, in the next three years global expansion is on the table: the top eight regions, on five continents, are within 10% of each other for likeliness of cleantech companies selling to that region. Few companies are actively avoiding any region.

Cleantech companies perceive cultural and/or business practices and perceive increased risk to intellectual property as the largest obstacles to global expansion. The biggest change since the 2015 survey is a 6% increase in the perceptions of government regulations and/or permitting requirements as a growing challenge.

"Companies need to be aware that with international expansion, there are many factors to consider. There is a risk of getting spread too thin too quickly, intellectual property concerns, choosing the right partners, and using the right entry points."

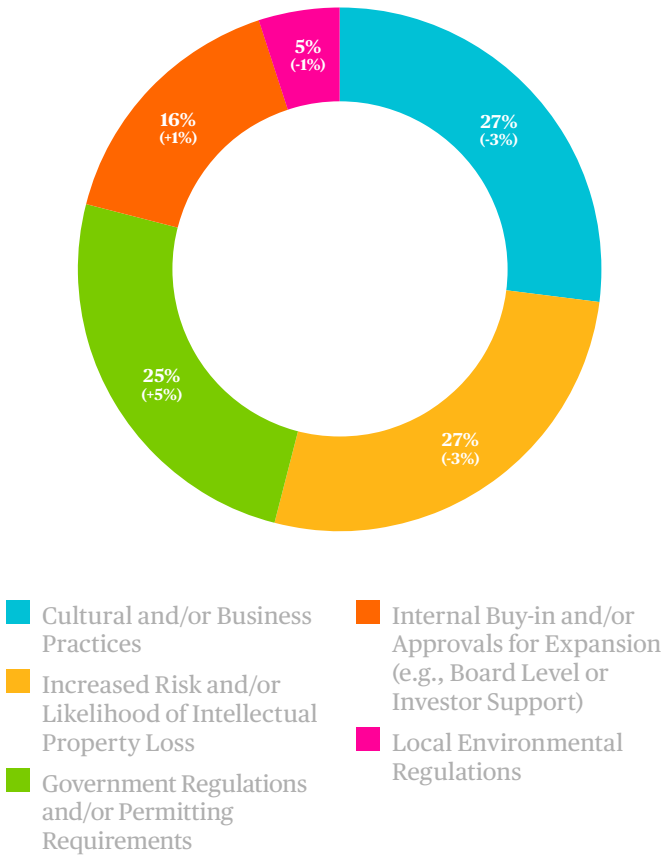
– Tom Stepien, CEO at Primus Power (Energy & Power, NA)

Investments with a Corporate Involved



Source: Cleantech Group

Obstacles to Global Expansion

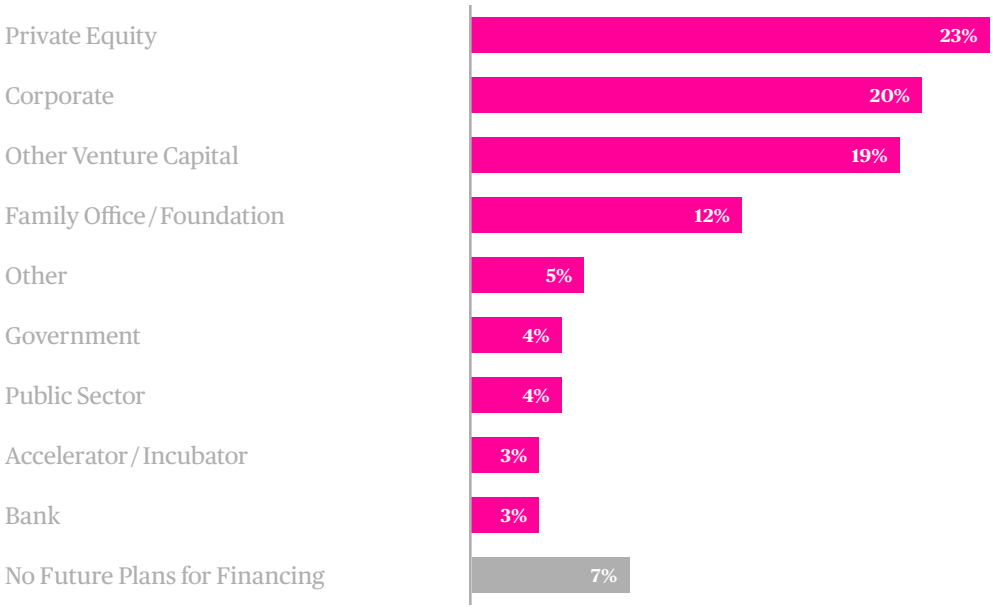


Risk Spotlight

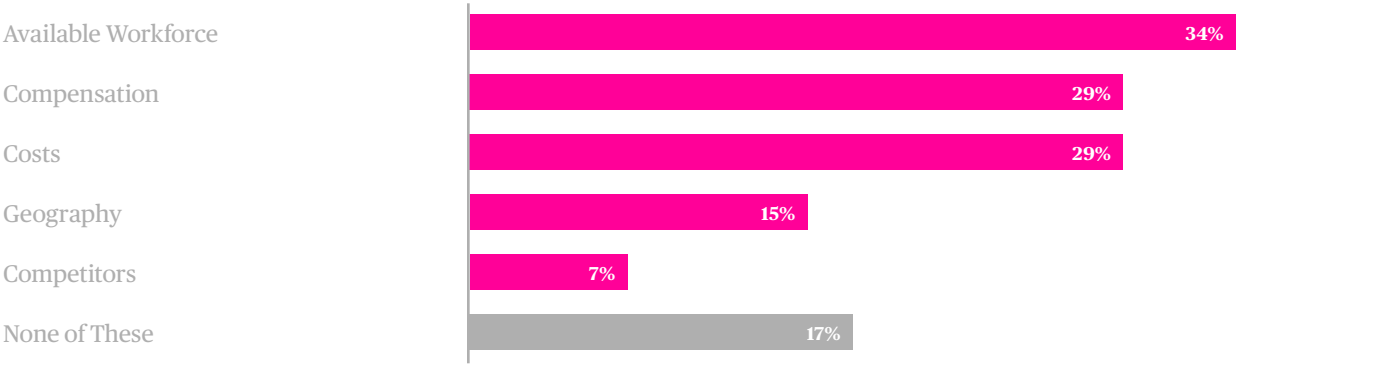
Cultural and/or business practices in certain countries plus intellectual property risk are seen as the main obstacles to global expansion. Accordingly, CEOs think the best ways to minimize the risk associated with conducting business globally are:

- To conduct stringent due diligence on prospective partners (53%)
- To leverage expert professional services (e.g., intellectual property legal services, country experts) (49%)
- To use innovative business models that protect against intellectual property loss (46%)
- Travel frequently to global business locales (39%).

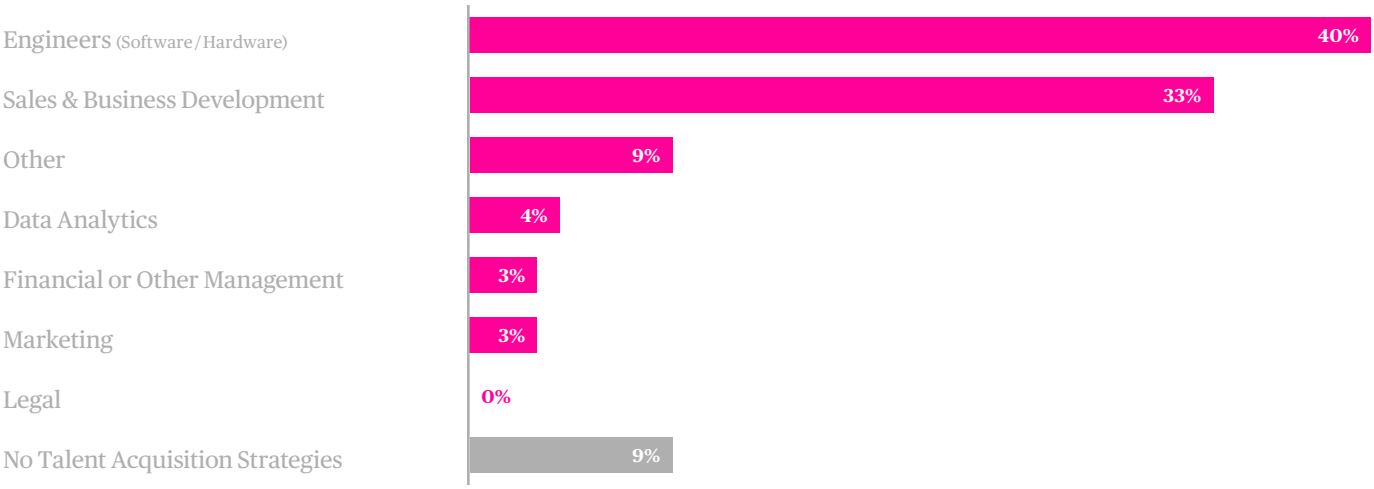
Likely Sources of Financing



Talent Acquisition Challenges



Focusing Talent Acquisition On:



About Chubb

Chubb is the world's largest publicly traded P&C insurance company and the largest commercial insurer in the U.S. With operations in 54 countries and territories, Chubb provides commercial and personal property and casualty insurance, personal accident and supplemental health insurance, reinsurance, and life insurance to a diverse group of clients. As an underwriting company, we assess, assume, and manage risk with insight and discipline. We service and pay our claims fairly and promptly. We combine the precision of craftsmanship with decades of experience to conceive, craft, and deliver the very best insurance coverage and service to individuals and families, and businesses of all sizes. Chubb maintains executive offices in Zurich, New York, London, and other locations.

About Cleantech Group

Founded in 2002, the mission of Cleantech Group is to accelerate sustainable innovation. Our subscriptions, events, and programs are all designed to help corporates, investors, and all players in the innovation ecosystem discover and connect with the key companies, trends, and people in the market. Our coverage is global, spans the entire clean technology theme, and is relevant to the future of all industries. The company is headquartered in San Francisco, with a growing international presence in London.

Contact us

For more information, please visit www.chubb.com

Chubb
202 Halls Mill Road
Whitehouse Station, NJ 08889

chubb.com

Chubb. Insured.℠

Chubb is the marketing name used to refer to subsidiaries of Chubb Limited providing insurance and related services. For a list of these subsidiaries, please visit our website at www.chubb.com. Insurance provided by U.S.-based Chubb underwriting companies. All products may not be available in all states. Surplus lines insurance sold only through licensed surplus lines producers. Chubb is the world's largest publicly traded property and casualty insurance group. With operations in 54 countries, Chubb provides commercial and personal property and casualty insurance, personal accident and supplemental health insurance, reinsurance and life insurance to a diverse group of clients.

WP-CleanTech-11-18