2024 EDITION

Pillars of The Green Transition

Senior Project Director and Editor: George Clarke

Written by: Ignacio Louzan

"When energy is the underlying material basis of any civilization, the significance of changes in energy should be self-evident. Thus far in human history, economic development has been a function of using more energy,"

— Helen Thompson, Professor of Political Economy, Cambridge

The shape of our modern world was generated, and is sustained, by our access to cheap energy. The exponential development in technologies, trade, wealth and material comfort—they were all made possible by the en masse availability of energy in the form of fossil fuels. Today, they hold a central position in the world, powering vehicles, militaries, food production, and even the manufacturing of renewable energy technologies. As fossil fuels account for 82 percent of our current global energy consumption (S&P Global), the deep-rooted nature of our energy paradigm is unavoidable, and should be confronted as what it is.

In the past few years, achieving net-zero emissions by 2050 has emerged as the ultimate deadline in what is seen as the existential fight of our era. This target, informed by scientific consensus on limiting global warming to 1.5°C above pre-industrial levels, is being adopted by governments and organizations across the world. However, whether meeting such a deadline is possible, and at what cost, is a question of ever increasing urgency. McKinsey estimates that achieving net-zero emissions by 2050 would require $275 trillion in cumulative spending on physical assets, equivalent to about 7.5 percent of global GDP annually until 2050. This robust figure makes one thing very clear: it is crucial to assess how practical and effective the proposed measures are—there is little to no margin of error if net-zero is to be a reality, especially as early as 2050.

In this report, we explore how a diverse energy mix seems to be the most realistic path forward, balancing the strengths of some technologies with the limitations of others. By doing so, we'll gain insight into the transformative potential re-thinking energy holds for our world.

IN THIS REPORT...

MARKUS KREBBER | CEO, **RWE AG**

Debates about whether we will meet specific targets exactly on time, won't help. Instead, the focus should be on identifying the real hurdles and overcoming them as quickly as possible.

ZORAN BOGDANOVIC | CEO, **COCA-COLA HBC**

At the heart of our sustainability ambition is a fundamental belief that we can operate as a successful and profitable business and reduce our carbon emissions and the impact we have on the environment around us. We know these can live side by side.

ANDREW MACDONALD | SVP FOR MOBILITY, **UBER**

Drivers are adopting EVs five times faster than the general population, and a significant portion of our rides are now electric.

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I see the CO2 Battery becoming a symbol of the transition to a decarbonized world, much like wind turbines have become synonymous with renewable energy.

CLAUDIO SPADACINI | CEO & FOUNDER, **ENERGY DOME**

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What Barriers and Opportunities Shape Electrification?

As we rush toward electrification as the primary solution for our energy future, we might be overlooking some fundamental limitations. According to the International Renewable Energy Agency (IRENA), we'll need at least 40 times more energy storage capacity by 2050 to support the move away from fossil fuels. These batteries need rare earth metals, which have to be sourced through an often expensive and heavy-emission process, complicating the situation further, and raising concerns about whether our electrified future is truly sustainable. This paradox has pushed innovators to look beyond traditional battery technology. Claudio Spadacini, CEO and founder of Energy Dome, highlights its CO2 Battery—an ingenious solution that is not dependent on rare earth elements. "Our technology is based on a thermomechanical process that compresses and liquefies CO2 when storage is required. When electricity is needed, the CO2 is re-evaporated and expanded to supply power back to the grid," Spadacini says. As it scales to gigawatt-hour capacity, he expects its costs to be "40 percent lower than those of lithium-ion systems."

Safety concerns further complicate the battery equation, as recent incidents of battery fires in electric vehicles and energy storage facilities have highlighted the technology's vulnerabilities. The market is projected to reach $435 billion by 2030 (Bloomberg NEF), and if batteries are to become an ubiquitous technology, the timing of innovations related to safety is crucial. To address such concerns, Michel Cousineau, CTO of EVLO Energy Storage Inc, emphasizes their approach: "We've integrated numerous safety features, adopting a holistic approach. One notable feature is that we meet and exceed the NFPA (National Fire Protection Association) 69 design standard, which involves active and passive venting systems to manage gas concentration in the event of a thermal incident."

"However, batteries alone cannot solve the issue of long-term energy storage," claims Gavin Towler, CTO of industrial giant Honeywell. As an alternative to batteries, a promising solution is hydrogen. By using electricity to split water into hydrogen and oxygen through electrolysis, excess renewable energy can be stored as hydrogen.

The world urgently needs new sources of uranium to power the clean energy transition and support a buoyant nuclear industry. Once operational, our Rook I Project will produce approximately 25 percent of the world's mine supply, providing the fuel source essential for tackling one of the world's most pressing challenges.

LEIGH CURYER | CEO, **NEXGEN ENERGY**

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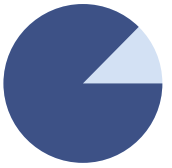

Fossil fuels account for **82%** of our current energy consumption

Source: S&P Global

This stored hydrogen can thereafter be converted back to electricity through fuel cells or used directly as a clean fuel source. Bloom Energy is an example of those looking to make hydrogen a viable reality. "Our solid oxide electrolyzer operates at temperatures over 750 degrees Celsius, providing a significant efficiency advantage," says Ravi Prasher, CTO of Bloom Energy. Their high-temperature approach makes their electrolyzers "20-25 percent more energy-efficient" than conventional alternatives.

With Goldman Sachs projecting the hydrogen economy to reach $2.5 trillion by 2050, such improvements could accelerate hydrogen's dominance in the energy storage field. Markus Krebber, CEO of RWE, emphasizes the importance of integrated systems in this transition: "Hydrogen is in its early stages, but it holds great potential as part of the clean energy mix. One of our flagship projects in Germany is focused on producing green hydrogen through a 300-megawatt integrated system that includes storage capacity. Storage is critical because it allows us to balance hydrogen production with demand, ensuring that energy can be used effectively. This project is not just about hydrogen production, but about creating a complete system that integrates storage and infrastructure." This holistic approach aligns with the views of other industry leaders. As Doron Blachar, CEO of Ormat Technologies, points out, "The transition will require a combination of improved storage technologies and enhanced grid

At Eversource, our approach involves integrating solar, wind, and other renewable sources ... energy efficiency and demand response ... to build a resilient and sustain- able energy infrastructure that meets our customers' needs ... toward a greener future...

DIGAUNTO CHATTERJEE | SENIOR VICE PRESIDENT, ENGINEERING, **EVERSOURCE**

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capabilities to support the increasing share of renewable energy in the overall energy mix." Ishan Palit, COO of TÜV SÜD, gave us some insights in this regard: "We are involved in certifying green hydrogen and green ammonia, and ensuring their traceability within supply chains. However, despite these efforts, the sheer demand for energy far outstrips the supply of clean energy. This challenge is further complicated by the high costs associated with producing clean energy, which necessitates substantial investment and innovation to bridge the gap."

Sustainable Mobility

Transportation accounts for nearly a quarter of global CO_2 emissions, according to the International Energy Agency (IEA). Just as we are experiencing a constant increase in energy demand across industries, the World Energy Council highlights that the global car fleet is expected to triple by 2050. This entails a double challenge; how do we keep up producing and delivering more energy for mobility while decreasing emissions?

CYRIL ABITEBOUL | TEAM PRINCIPAL & PRESIDENT, **HYUNDAI MOTORSPORT**

We've been working with sustainable fuels for a few years now, and it's a promising area for motorsport. In fact, World Rally Championship was the first motorsport to adopt sustainable fuel, even ahead of Formula One, which will follow suit in the future.

WESAM ALGHAMDI | CEO, **NEOM GREEN HYDROGEN COMPANY**

We'll be converting green hydrogen into 1.2 million tonnes of ammonia, which translates into saving 5 million tonnes of carbon emissions annually.

WILL GARDINER | CEO, **DRAX**

Biomass is unique because it's a renewable, dispatchable energy source, meaning it can be turned up or down based on demand. This flexibility is crucial for maintaining a balanced energy system, especially when wind and solar aren't generating power.

MICHEL COUSINEAU | CHIEF TECHNOLOGY OFFICER, **EVLO ENERGY STORAGE**

EVLO aims at accelerating the energy transition by providing fully integrated energy storage solutions. We believe innovation can power a cleaner energy future, while keeping safety top of mind.

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cytiva

RYAN WALKER |
SENIOR DIRECTOR OF SUSTAINABILITY,
CYTIVA

What brought you to lead the sustainability efforts of your company?

For me it's quite personal. In an industry focused on human health, I felt it was essential to address how we care for the planet. As we launched Cytiva, emerging from a GE Healthcare divestment, we had the chance to build a foundation of sustainability from the start. It began with volunteers—people passionate about prioritizing the planet and ethical business practices. This volunteer movement gained momentum, demonstrating the value of establishing sustainability as a dedicated function within the business, with resources focused on measuring impact and improving our practices.

Can you define sustainability in the context of the biopharma industry?

Sustainability in biopharma means operating in a way that ensures long-term viability while minimizing environmental impacts. Our industry has always been mission-driven to improve human health, but now we must also acknowledge that the environment plays a key role in that mission. If our sector were a country, it would be the fifth largest emitter of greenhouse gases (GHG). So, it's on us to embed practices that support environmental stewardship, social responsibility, and economic efficiency throughout drug development and manufacturing processes.

The challenges we face are reflected in our research from the Global Biopharma Sustainability Review, which shows that while 62 percent of companies consider sustainability a top priority for the next five years, only 17 percent feel confident in measuring scope 3 emissions, a crucial metric for sustainability.

What does the biopharma value chain look like in terms of sustainability?

The biopharma value chain includes every stage from drug discovery to distribution. At each stage, emissions are added—especially scope 3 emissions, which are the most difficult to manage because they come from sources outside our direct control. Addressing these emissions requires unprecedented collaboration across the industry.

There is an important conversation taking place between suppliers and manufacturers. Are we prepared to step out of our comfort zone to create sustainability-driven products? From the supplier perspective, the challenge lies in how aggressively we can innovate, given the complexities customers face when integrating new technologies into their processes. Our industry research highlights this challenge: the complex ecosystem demands close collaboration among stakeholders for meaningful progress. Leading biopharma companies recognize this, with 70 percent actively setting shared goals and targets with suppliers.

What advice would you give to industry leaders who are hesitant to invest in sustainability due to perceived costs or risks?

As I am conscious we likely have a diverse audience coming from different industries, I suggest starting by integrating sustainability into your core strategy rather than treating it as a separate initiative. Start small by identifying areas where sustainable practices can bring immediate value, such as reducing waste or improving energy efficiency.

We've already highlighted the importance of collaboration so for those who are perhaps earlier on in their sustainability journey, and thinking about amping up their efforts, collaborate openly and candidly with stakeholders—suppliers, partners and even competitors—to share best practices and drive industry-wide improvements. Embrace innovation by exploring new technologies and methods that support sustainability, and don't hesitate to learn from others who are further along in their journey. Finally, keep the bigger picture in mind: sustainability is not just about compliance or reducing costs; it's about building resilience and futureproofing business and industry long-term.

What role does technology play in advancing sustainability and enhancing industry resilience?

We believe data is the cornerstone of sustainability—driving visibility, ambition, and action. But managing metrics remains a challenge, especially with limited benchmarks and barriers to measuring emissions. According to our study, 68 percent cite insufficient data as a barrier to achieving sustainability targets.

AI and automation can accelerate sustainability initiatives, especially in eco-design and carbon management. To make AI effective, we first need robust data, gathered through industry-wide collaboration to fully understand emissions across value chains. With quality data, AI-driven predictive models can simulate the environmental impact of various design choices, enabling companies to optimize products and processes for lower carbon footprints. This proactive approach reduces waste and energy use from the start.

In your view, what is the single most important step industries can take today to build resilience through sustainability?

Move beyond isolated initiatives and fully integrate sustainable practices across operations—from product design and supply chain management to employee engagement and customer relations. Making sustainability a core part of decision-making helps companies reduce risks tied to environmental and social challenges while unlocking opportunities for innovation, cost savings, and long-term growth. This proactive alignment drives resilience and a competitive edge in a rapidly changing world.

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As we approach our 60th anniversary in 2025, our goal in North America is to become a leader in sustainability, innovation and aesthetics in the architectural market. We want people to immediately associate sustainability in aluminum building envelopes with Reynaers Aluminium.

TOBIASZ STASZAK | AREA MANAGER, NORTH AMERICA, **REYNAERS ALUMINIUM**

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Global EV sales are expected to reach 45 percent of the market by 2030 according to Bloomberg NEF. For example, by 2027, JLR will have invested "$16 billion in our transformation to deliver fully electric models across all our brands by 2030," states Andrea Debbane, director of sustainability at JLR. The market appears ready—Range Rover's upcoming electric model has already attracted "over 41,000 sign-ups to the waiting list." These numbers show that EVs are already a constitutive element of the automotive industry.

Yet the environmental equation is more complex than it might appear. "Electrification has inherent issues, such as the significant carbon emissions associated with manufacturing EV batteries," notes José Barreiro, executive director for mobility at Repsol. According to the IEA, manufacturing an electric car produces up to 80 percent more emissions than those entailed by the construction of a conventional car, precisely due to the energy-intensive battery production Barreiro was referring to. Furthermore, the World Bank estimated that meeting 2050's EV demand will require 500 percent more cobalt and lithium production than what we are producing today, which has naturally raised concerns about resource sustainability. Another point that has to be addressed is the source of electricity, as in regions heavily dependent on coal, like parts of China and India, EVs can generate more total lifecycle emissions than gasoline cars.

These challenges are compounded by significant infrastructure gaps. "The European Commission's reports suggest that the current infrastructure is growing annually at only about 30 percent of what is needed," notes Michael Cole, president and CEO of Hyundai Motor Europe. This gap between ambition and reality has led major players to pursue diverse approaches. Volkswagen Group exemplifies doubling up on electrification: "By 2035, we plan to sell our last combustion engine in Europe," explains Dirk Voeste, CSO. "We have announced over 60 new electric models globally by 2030...and are working towards 40,000 fast charging stations worldwide by 2025." Furthermore, Solid Power, a pioneer in all-solid-state batteries, is developing technology that promises to improve EV batteries, increasing their range and therefore reducing the need for infrastructure. "Solid-state batteries have the potential to significantly improve energy density, meaning longer driving ranges for EVs or the same range with a lighter battery," explains John van Scoter, CEO of Solid Power. On the other hand, Repsol is also including alternative approaches. "Relying solely on electrification poses several challenges," argues Barreiro. This reality has driven Repsol to pursue a multi-technology approach, with "over 400 service stations offering renewable fuels" and plans to reach 2,000 by 2027. Supporting this diversified approach, Growth Energy CEO Emily Skor points out that "even under the most aggressive forecasts, around 40 percent of new vehicle sales will still involve internal combustion engines by 2050." The company's focus on bioethanol, which is already about 50 percent less carbon-intensive than gasoline, represents another pathway to reducing emissions in the existing vehicle fleet.

The role of hydrogen for heavy transport is emerging as an important complement to electrification. "Hydrogen vehicles benefit from short

refueling times and long ranges, making them ideal for commercial use where downtime needs to be minimized," explains Cole, pointing to Hyundai's Xcient heavy-duty truck already operating across Europe. This mirrors Toyota's approach, where Chief Sustainability Officer Yumi Otsuka emphasizes their commitment to developing multiple solutions through their 'mobility concept,' which "encapsulates leveraging AI, autonomous driving and hydrogen technologies." Maybe the perfect example of this holistic ambition is its "Woven City" project near Mount Fuji—a living laboratory testing that "will trial high-resolution logistics, robotics and other advanced technologies...showcasing how technology and sustainability can coexist and evolve together."

Innovation in efficiency remains critical across all technologies. In the high-stakes laboratory of Formula E racing, breakthroughs are already translating to consumer vehicles. "We've introduced cutting-edge silicon carbide technology in our Formula E inverters, and now this is being incorporated into future Jaguar and Land Rover vehicles," reveals James Barclay, managing director of JLR Motorsport. "Our cars are incredibly efficient, using less than 5 liters of fuel equivalent to complete a 45-minute race, often at speeds of up to 180 miles per hour." Dan Garlick, motorsport director at Goodwood, also tells us about their advancements in this field: "Additionally, we've transitioned all our event generators to run on HVO biodiesel, reducing emissions by about 80-90 percent, which has been a game-changer in cutting overall event emissions by a third."

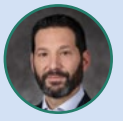
The simple reality is one of unprecedented scale: The global vehicle fleet is projected to double to 2 billion by 2050 according to the IEA, with most growth occurring in emerging economies where electrification is a distant reality. No single solution can address this massive transition.

BRAD DINELEY | SVP OF SAP INTEGRATION & SUSTAINABILITY FOR THE AMERICAS, **SCHAEFFLER**

In our Stratford Aerospace location, we partnered with Ameresco, Inc. to replace an outdated, inefficient HVAC system and chiller with a state-of-the-art system. This change resulted in reducing our carbon footprint by more than 400 tons and our electricity consumption by over 800,000 kilowatt-hours.

ANDREA MONDONI | GENERAL MANAGER NA, **BEIERSDORF**

We are deeply committed to the circular economy, which guides how we design, manufacture, use, and dispose of our products.



JOSH WEINSTEIN | PRESIDENT, CEO AND CHIEF CLIMATE OFFICER, **CARNIVAL CORPORATION & PLC**

We introduced Liquified Natural Gas (LNG) in the cruise industry as the best currently available mature, scalable, and market-ready fuel to deliver GHG emission reductions.

SHAWN QU | FOUNDER, CHAIRMAN &CEO, **CANADIAN SOLAR**

While fossil fuels still account for around 60 percent of total electricity production, solar has been the leading new installation technology for the past eight to nine years. In regions like California, solar already provides more than 20 percent of electricity, and globally, it's around 4-5 percent.

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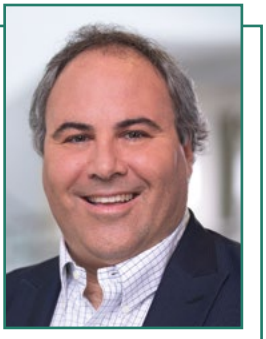
> Our plan to reach net-zero emissions across our full value chain by 2050 was approved by the Science Based Target initiative under its Corporate Net-Zero Standard in 2022. We've already reduced value chain emissions by 20 percent (baseline 2019).
>
> JASON PELZ | VP OF SUSTAINABILITY FOR U.S. AND CANADA, **TETRA PAK**



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Circular Economy and Resource Efficiency

According to the Ellen MacArthur Foundation, an efficient circular economy could potentially reduce greenhouse gas emissions by almost 40 percent by 2050. This holistic and increasingly popular term touches upon different sectors, from packaging and construction to waste management, each presenting opportunities to address the pressures on our resources while at the same time maintaining a stable growth of living standards and a healthy economy.

The packaging sector often plays an overlooked role in reducing food waste and ensuring product safety. According to the United Nations Food and Agriculture Organization, no less than 1.3 billion tonnes of food are wasted every year, contributing to 8 percent of GHGs emissions. "Food and beverage packaging plays a crucial role in feeding the world's growing population," says Jason Pelz, VP of sustainability at Tetra Pak. "By maintaining food quality and safety for longer periods of time, packaging helps nutritious products reach people across wider and even remote geographic regions." Research from the Institute of Food Technologists shows that the often demonized plastic packaging can extend the shelf life of fruits and vegetables by three to 20 days, reducing waste and hunger dramatically. In addition, studies by the Natural Resources Defense Council show that in developing countries, up to 50 percent of food is lost before reaching consumers due to inadequate packaging and preservation methods; the World Bank estimates that improved packaging could help feed an additional 1 billion people globally. It is worth mentioning that beyond packaging innovations, agricultural technologies are also contributing to food security and sustainability. For instance, BiOWiSH has developed a solution that uses natural microorganisms and enzymes to address both crop yield and environmental concerns. Rod Vautier, president, and Bill Diederich, the company's Chief Innovation Officer, explain: "Our technology improves nutrient uptake optimizing the fertilizer efficiency, resulting in less environmental harm and higher crop yields. This approach provides a practical solution for feeding the growing global population while maintaining sustainability." By combining advances in packaging with innovations in agricultural practices, we can make significant strides in reducing food waste, increasing crop yields and feeding the world's growing population more sustainably.

Advancing their sustainability operations, Pelz tells us that Tetra Pak is investing in new solutions, "committing 100 million euros annually for the following five to 10 years to develop more sustainable packaging solutions." This industry-wide trend is also evident in Nestlé's approach. The company has launched over 20 reusable and refill projects across 12 countries. "Our goal is to ensure packaging continues to protect product quality and freshness throughout its shelf life, while also supporting sustainable practices," explains Jodie Rousell, global public affairs lead for packaging and sustainability. However, Rousell acknowledges that "scaling up reusable and refill systems is challenging due to supply chains and regulations optimized for single-use packaging."

However, the packaging industry faces very grave environmental challenges. According to the UN Environment Programme, approximately 400 million tonnes of plastic waste are produced globally each year, and only 9 percent are recycled. "Consumer

> Our products significantly reduce energy consumption in buildings, cutting energy use by up to 75 percent in some cases. This reduction accelerates integrating renewable energy, improving overall energy efficiency, and reducing emissions.
>
> MIRELLA VITALE | SVP FOR PUBLIC AFFAIRS AND SUSTAINABILITY, **ROCKWOOL GROUP**

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For us, net-zero means working on it every day.

Our ambition: achieve net-zero by 2040. We're working hard to make it happen and are investing 55 billion euros from 2024 to 2030 in offshore and onshore wind, solar, storage technologies, flexible generation and hydrogen. Or, to put it more simply, in the clean energy world of tomorrow.

Find out more at rwe.com

The green transition is a convergence of many transitions accelerated by digital: materials, technology and circularity. This is what we call digital sustainability, which is pivotal to transform into a sustainable enterprise.

DEBASHIS GHOSH | PRESIDENT - LIFESCIENCES, HEALTHCARE, ENERGY, RESOURCES, AND UTILITIES BUSINESS GROUP, **TATA CONSULTANCY SERVICES**

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confusion regarding recycling has indeed increased, partly due to the variety of packaging types and the lack of standardization in recycling collection programs, their rules and definitions," notes John Hewitt, vice president at the Consumer Brands Association. This challenge is echoed in Europe, where Francesca Stevens, president of European Packaging, points out that "while Europe is doing reasonably well in recycling, it is not excelling. Many member states are at risk of not meeting the 2025 targets."

Some major players in the area are making relevant strides to tackle this issue. Coca-Cola HBC's CEO, Zoran Bogdanovic, told us that: "Across Europe, we're supporting the introduction of well-designed, industry-led Deposit Return Schemes – a vital ingredient in a circular packaging economy. These schemes typically achieve a return rate of 90 percent and also support high quality recycling. They allow packaging material to be kept in use for much longer and, in turn, contribute to a lower carbon footprint for each pack." According to the Association of Plastic Recyclers, using rPET instead of virgin material reduces emissions by 67-79 percent. Another example of products you might be using which are adopting circularity principles is provided by Andrea Mondoni, general manager NA at Beiersdorf: "Our recent launch of Nivea Body Wash is packaged with up to 97 percent recycled plastic and has a lighter design that reduces packaging weight by 16 percent. This has led to a 32 percent reduction in CO_2 emissions."

In the construction sector, which according to the IEA represents 39 percent of global carbon emissions, material longevity and recyclability are increasingly important terms. Insulation materials, in particular, show a complex balance between environmental impact and long-term sustainability benefits—a challenge very similar to that faced by the packaging sector. ROCKWOOL demonstrates this with its own approach to insulation materials. Mirella Vitale, SVP, told us: "Tests from old construction sites show that our stone wool insulation products can last at least 65 years, significantly outlasting many of the plastic foam insulations that can deteriorate more rapidly and lose their thermal performance." According to the IEA, insulation can reduce a building's heating and cooling needs by up to 90 percent, proving that the right material can be just massive when it comes

JOANNE MURPHY | NORTH AMERICA SUSTAINABILITY LEAD, **OPELLA**

We aim to make 90 percent of our packaging from our sites recycle-ready by 2030. We recently removed plastic windows from our allergy cartons, saving 35 tons of plastic annually.

OLIVIER RIGAUD | CEO, **CORBION**

Our goal is to advance natural alternatives, ensuring that consumers can enjoy fossil-free, label-friendly products without compromising functionality—like preventing mold from growing on bread.

TAMARA LUNDGREN | CEO, **RADIUS RECYCLING**

Metal recycling plays a pivotal role in the green transition, particularly for technologies like EVs, solar and wind power.

LEIGH CURYER | CEO, **NEXGEN ENERGY**

NexGen was founded in 2011 and is currently developing the world's largest, highest-grade uranium project, which is in its final phase of approval. Once approved, construction will take about 42 months, and after that, we'll be producing approximately 25 percent of the world's uranium supply.

CHRISTOPHER GASSON | OWNER, **GLOBAL WATER INTELLIGENCE (GWI)**

Reused water is a critical resource that hasn't been fully exploited, and changing public attitudes towards it is essential.

PHIL DELLEVILLE | PRESIDENT & CEO, **MALTA**

Malta's system is a reliability asset. By incorporating turbomachinery, it provides real rotational inertia and delivers critical grid services like reactive power, frequency support, and voltage regulation.

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Just like with concert musicians playing in harmony, the idea of orchestration is to synchronize all supply chain functions in real time. The benefits are alignment and responsiveness, along with fewer delays, errors, and reduced environmental impact – all while improving overall performance.

JOHN SICARD | PRESIDENT AND CEO, **KINAXIS**

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to reducing energy expenditure. If we couple this use of sustainable materials with innovative approaches to overall building design, the results are even more impressive. Ahmed Baghoum, CEO of Masdar City, illustrates this point: "Our green building journey began from the outset. The initial buildings in Masdar City were designed to save up to 40 percent of water. We moved on to more challenging projects like the IRENA headquarters, which saves up to 60 percent of energy. At COP28 last year, we announced the NZ1 building, which incorporates solar panels and other advanced technologies to be designed for net-zero as it generates 100 percent of its energy needs on-site." This approach, combining advanced materials with cutting-edge design and technology, demonstrates the potential for reductions in the impact of buildings throughout their lifecycle.

The recycling of metals shows how the circular economy can be applied at a large and high-impact scale. The World Steel Association reports that one tonne of steel recycled can save no less than 1.5 tonnes of CO_2 emissions, rendering this type of recycling one of the most impactful circular processes globally. Within this context, Befesa has developed processes to extract maximum value from what would otherwise be nothing more than waste. Rafael Pérez, CFO, explains their particular approach: "The process involves using a 60-meter-long kiln, rotating continuously to extract zinc from steel dust. This zinc comes from steel scrap, much of which is galvanized, meaning it has a thin layer of zinc coating to prevent corrosion." The impact is substantial: "By recycling over 1.2 million tons of material each year, we prevent the need for equivalent volumes of natural resource extraction." This translates to 1.8 million tonnes of CO_2 emissions avoided annually through their recycling operations.

While the World Economic Forum estimates that circularity could potentially generate $4.5 trillion in economic benefits by 2030, significant barriers remain. As Tobiasz Staszak, area manager at Reynaers Aluminium, points out, "What's lacking is education and better coordination among different stakeholders and trades, such as facade contractors, mechanical contractors and architects." This coordination problem is complicated further by regulatory approaches that don't always align with scientific evidence. As Francesca Stevens warns, "An ideological approach to regulation often ignores scientific data and facts, focusing instead on popular demands. This can lead to misguided decisions, such as substituting one material for another without a thorough life cycle assessment." In a time where initiatives often follow trends, the success of circularity will depend on our ability to base decisions on scientific analysis rather than on popular sentiment or quick-fix solutions.

> "At Bayer, we recognize that climate change and health are inextricably linked, and that's why we're working at the nexus of these two issues, identifying the most impactful interventions to improve climate resilience and health outcomes."
>
> DANIELLA FOSTER, | GLOBAL HEAD OF PUBLIC AFFAIRS, MARKET ACCESS & SUSTAINABILITY, **BAYER CONSUMER HEALTH**

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> "Companies are often forced to choose between profitability and sustainability, but with the right data, they can achieve both. Real-time data allows organizations to adjust strategies as needed, avoid unintended consequences, and make smarter investments in sustainability initiatives."
>
> MIKE CAPONE | CEO, **QLIK**

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Data-Driven Sustainability and Decision-Making

The World Economic Forum estimates that digital technologies could help reduce global emissions by up to 20 percent by 2030. It is no wonder then that so-called data-driven solutions are gaining increasing attention.

"Where there's data, there's power," says Mike Capone, CEO of Qlik, referring to how state-of-the-art analytics can reveal several insights from environmental datasets. This has become very relevant in urban settings, where data sharing among cities has led to unexpected solutions and innovation. As Capone explains, "C40 Cities, which is now a network of over 100 cities focused on climate action, share data and best practices using Qlik's platform, allowing them to collaborate on innovative solutions like carbon-absorbing concrete or rooftop gardens to reduce CO_2 emissions."

Just as in cities, the footprint of supply chains in global emissions cannot be understated. In a world where consumption is maybe the most conspicuous and prolific phenomenon, and where products we consume are made out of a plurality of materials—often coming from different corners of the globe—we can easily intuit why scope 3 emissions are a recurrent term. John Sicard, president and CEO of Kinaxis, emphasizes this: "Supply chains are foundational to sustainability because they are intrinsically linked to human existence and environmental impact. Supply chains have existed since humanity began, from sourcing and trading basic goods. Currently, about 60 percent of environmental damage is linked to supply chains, with food alone accounting for 50 percent of that damage." However, the potential for improvement is substantial, with McKinsey estimating that supply chain decarbonization could reduce global emissions by a staggering 45 percent by 2050. Such a move can be made possible earlier thanks to data-driven solutions, as the integration of AI and advanced analytics is already yielding impressive results. This impact extends to the origin of supply chains. For instance, Debashis Ghosh,

The appetite for energy is increasing rapidly, driven by technological advancements and industrial needs, however the capacity to produce clean energy through wind, solar, or hydrogen is not keeping pace.

ISHAN PALIT | COO,
TÜV SÜD

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president of the life sciences, healthcare, energy & resources at TCS, highlights a significant achievement in the oil and gas sector: "Extraction and drilling account for 10 percent of scope 1 emissions from oil and gas. TCS' industry-first digital twin platform for one of the world's largest drilling fleets, optimized all drilling plans for emissions via simulations, before actual drilling. This reduced emissions by 8 percent through efficiencies." Returning to supply chains from a more comprehensive point of view, Sicard notes that "AI can handle transactions at a scale and speed that humans cannot match, driving efficiency and reducing the burden on supply chains. This automation ensures timely and precise actions, minimizing waste and improving sustainability." Its clients have already achieved improvements, "reducing their inventories by 20-40 percent while increasing on-time deliveries."

The transformation is also evident in the energy sector. There, smart grid technologies are changing the total efficiency of power distribution. Eva Riesenhuber, global head of sustainability at Siemens, tells us that "more than 70 percent of the world's electricity consumption

PETRA DISMORR | CEO & CO-FOUNDER, **NORTHPEAK ADVISORY**
We believe that no single organization can solve the vast challenges of climate change and sustainability in isolation. That's why we partner with experts in different areas of ESG, such as GHG emissions or human rights.

JOHN BERGER | CEO, **SUNNOVA**
As costs continue to fall and AI helps optimize energy management, we're moving toward a future where solar and battery systems become an integral part of how homes and businesses manage their energy needs.

NEIL RUSSELL | CHIEF ADMINISTRATIVE OFFICER, **SYSCO**
Achieving our emissions goals also requires collaboration with our supply chain partners, as about 98 percent of our overall emissions come from this area. We're working to ensure that suppliers representing 67 percent of our scope 3 emissions commit to their own sustainability targets, which is essential for reaching our overall goals.

STEVE WILHITE | PRESIDENT OF THE SUSTAINABILITY BUSINESS DIVISION, **SCHNEIDER ELECTRIC**
Schneider Electric has committed to reducing the emissions of its top 1,000 suppliers by 50 percent by 2025. However, many of these suppliers initially lacked the expertise to achieve such ambitious goals. To address this, we developed AI-driven tools like Zygo Activate, which allows smaller enterprises to make quick and easy progress on their sustainability journeys.

PHILIPPINE DE T'SERCLAES | CHIEF SUSTAINABILITY OFFICER, **DASSAULT SYSTÈMES**
Our recent partnership with SpyGen, for instance, integrates environmental DNA technology into our platform to track and quantify biodiversity impacts, demonstrating how technology can address complex sustainability challenges.

SCOTT CHILDRESS | CSO, **UPS**
On August 2024 year-to-date basis we have increased our usage of renewable natural gas by 18.5 percent and renewable diesel by 11.7 percent compared to the same period last year.

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BiOWiSH products are proven to consistently improve yield, enhancing both economic and environmental outcomes for farmers.
This widespread applicability and ease of use drive high adoption rates among farmers, demonstrating the real-world impact of our innovations.

ROD VAUTIER | PRESIDENT, **BIOWISH TECHNOLOGIES**

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flows through infrastructure planned or analyzed by Siemens' grid simulation portfolio." Its data-driven solutions have achieved results, with Riesenhuber noting that "our grid software allows utilities to increase the capacity of power lines by up to 30 percent, avoiding the need to build new infrastructure." This optimization is crucial as the IEA projects that renewable energy capacity will need to triple by 2030 to meet global climate goals. Edward Zhao, vice president at Univers, gave us another example on how these technologies can impact the efficiency of the grid: "As renewable energy generation grows, the grid must become more flexible to handle the fluctuating nature of energy supply from sources like wind and solar. To achieve this, data management is key. For example, we analyze large datasets that include weather forecasts, operational data from turbines and more, allowing us to optimize energy generation."

Conclusion

Many assumptions we have taken for granted are proving less viable than we would have thought. The adoption of EVs, while promising for several reasons, faces hurdles in battery production emissions and infrastructure development that make their worldwide adoption impossible at this point in time, especially in developing nations—and if this was not the case, their environmental benefits would be negated where coal is used for electricity generation. Similarly, efficiency gains in renewable and storage technologies are not sufficient to meet the energy demands of a bigger and richer global consumer population. A striking example to illustrate this point is that, out of all the energy consumed by the world in a year (175,000 terawatt hour), the capacity of all currently available batteries can store enough to power the world for 20 seconds.

Yet, the application of circular economy principles and data-driven solutions, combined with advancing technologies in storage and renewables, could offer a more realistic picture for a new energy paradigm. In other words, the limitations of renewables and storage in energy production could be covered by the increases in efficiency of AI and circularity. In the meantime, one could imagine innovation and investment improving all of these areas exponentially, with new technologies adding up to the energy mix of the future.

Supply chain decarbonization could reduce global emissions up to

45% by **2050**

Source: McKinsey

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Decoupling growth from environmental impact is critical because companies that aim for growth must also have a moral responsibility: in concrete we will make a significant effort to reduce our emissions by 55 percent while aiming to double our turnover within 2030. This means considering all stakeholders, including society and the environment.

DAVIDE BOLLATI | CHAIRMAN, **DAVINES GROUP**

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While regulations matter, many of our products are adopted because they're both sustainable and cost-effective. Global companies, particularly those with strong sustainability goals, are adopting these solutions early, often ahead of regulatory deadlines. This trend is likely to continue in the U.S.

SANJEEV RASTOGI | CEO, **ARXADA**

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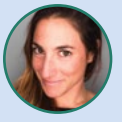
DAVID CLARK | CHIEF SUSTAINABILITY OFFICER, **AMCOR**

Our goal is not to replace plastics, but to solve the end-of-life problem while using the best material for each packaging application. By developing better recycling and waste management systems, we can retain the benefits of plastics while addressing environmental concerns.



JESSICA HYMAN | HEAD OF ESG STRATEGY & SUSTAINABILITY, **ATLASSIAN**

For scope 3, we focus on engaging our suppliers, who account for a significant portion of our emissions. We aim to have 69 percent of our suppliers set their own science-based targets, but this requires building relationships and influencing them to align with our goals.

JUAN JOSE FREIJO | CHIEF SUSTAINABILITY OFFICER, **BRAMBLES**

Digital transformation is a strategic priority at Brambles and plays a significant role in our sustainability strategy. By digitizing our pool of pallets, we illuminate the supply chain and gain valuable insights into the movement of our assets and the products they carry.

KEIKO SHIGA | GENERAL MANAGER OF ENVIRONMENT, **SONY GROUP CORPORATION**

Different consumers have varied perspectives on sustainability, influenced by factors such as region and age. However, we observe that younger consumers, in particular, are looking for trustworthy products and services that are good for both their lives and the planet.

MARK NEWTON | HEAD OF CORPORATE SUSTAINABILITY, **SAMSUNG ELECTRONICS AMERICA**

Engaging with Gen Z is crucial as many of our customers and employees are from this demographic. Programs like Climate Superstars, in collaboration with the U.S. EPA, have focused on environmental literacy among middle school students.

FREDRIK EKSTRÖM | CHAIRMAN, **NASDAQ STOCKHOLM AND PURO.EARTH**

Together with Puro.earth, we have been developing the carbon removal market, leveraging our experience in operating trusted markets, our technology capabilities, distribution capacity and corporate clients.

HENRIK SUNDBERG | CLIMATE IMPACT LEAD, **H&M GROUP**

Awareness and demand for sustainable products is indeed growing, driven by clear expectations from consumers, investors, NGOs, and governments.

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More than

50%

of biopharma organizations that are leading the way on sustainability report increased revenue and the ability to attract talent thanks to their progress.

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