accenture

Energizing industry

Generating >€200 billion per year by 2030 through European industrial decarbonization

Executive summary

Energizing industry: The fourth energy transition

The world has embarked on a complex and difficult energy transition journey: from an energy system based primarily on fossil fuels to one based on renewable, CO_2-free energy sources.

On the one hand, energy transitions are not new. We've been through three of them before (to coal, to oil, and to natural gas). On the other hand, this transition is taking place in the atmosphere of urgency and even danger: the threat of global warming. It's also taking place under different economic presumptions. Previously, change was driven primarily from an economic perspective. This time, it's driven by a combination of subsidies, regulations and a willingness to accept a lower internal rate of return. Companies find themselves, for the first time, having to internalize carbon costs.

What is the impact of this energy transition on European industrials—companies from the utilities, chemicals, cement, metals and energy sectors—and how should they respond proactively? Progress is being made in decarbonization, but too slowly. Most executives are acutely aware of the impacts of the energy transition, yet many industrial decarbonization efforts are falling short in delivering rapid and impactful CO_2 reductions.

In this report, we explore the impact of decarbonization on energy-intensive industrials from a variety of perspectives, bringing it together into implications and overall calls for action for both the public and private sectors.

What do we mean by "industrials"?

We think of "industrials" as a category that goes beyond the typical "heavy industry" definition. Our broader perspective accounts for both those that provide the energy to the industrials (the energy producers like energy and utilities), and also those that are significant energy consumers (industries like chemicals, steel, metals and cement). This enables us to consider the broader emission implications of European industrial activities, including the required energy supply.

For a study group of 30 industrials we conducted interviews of industry experts, patent and investment analysis, investigation of publications from the press, and broader documentation analysis using natural language processing. For a larger group of European heavy industries, we also developed a comprehensive modeling exercise to identify the value to be unlocked by pursuing decarbonization, and the optimal value-generating pathway by industry, along with our recommendations for achieving that value.

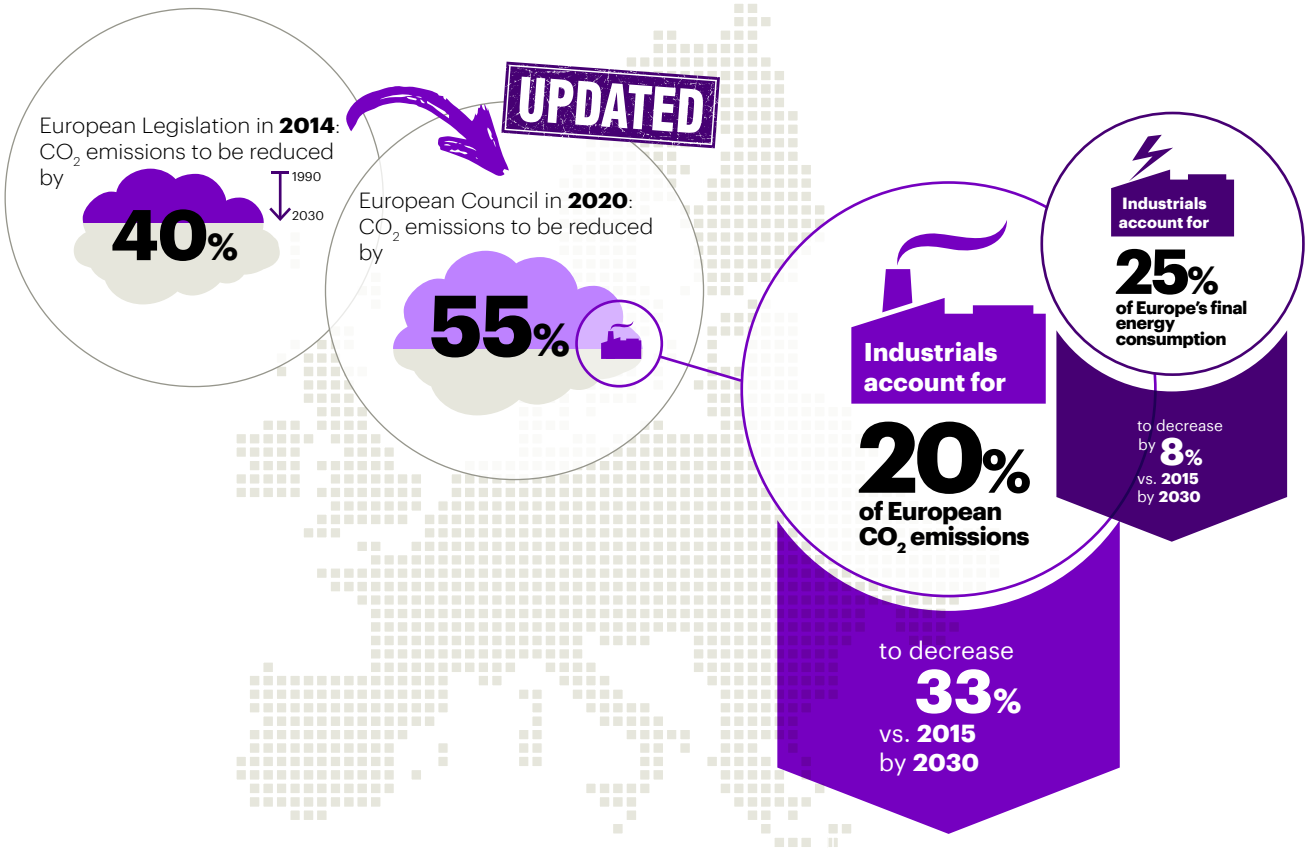
The current energy transition is inevitable and inexorable. The primary issues European industrials should consider include the speed of the transition, the impact it will have on their companies, and the effort and costs required to successfully deliver on the decarbonization imperative. As our full report clearly demonstrates, public support for an energy transition is at an all-time high.

The time to act is now.

The current decarbonization situation for European industrials

With industrials representing 20 percent of EU emissions and about 25 percent of final energy consumption, they are a key enabler of the energy transition and decarbonization. However, the need to deliver a required 33% decrease in CO_2 emissions by 2030 is daunting (See figure 1), and puts unprecedented pressure on industrials, driving new levels of industry convergence.

Figure 1: European industrial decarbonization



Do-nothing scenario for European climate change

13%

EU energy demand may fall by **13%** by 2100 due to reduced heating requirements (PESETA II Study, Ciscar et al. 2014)

2%

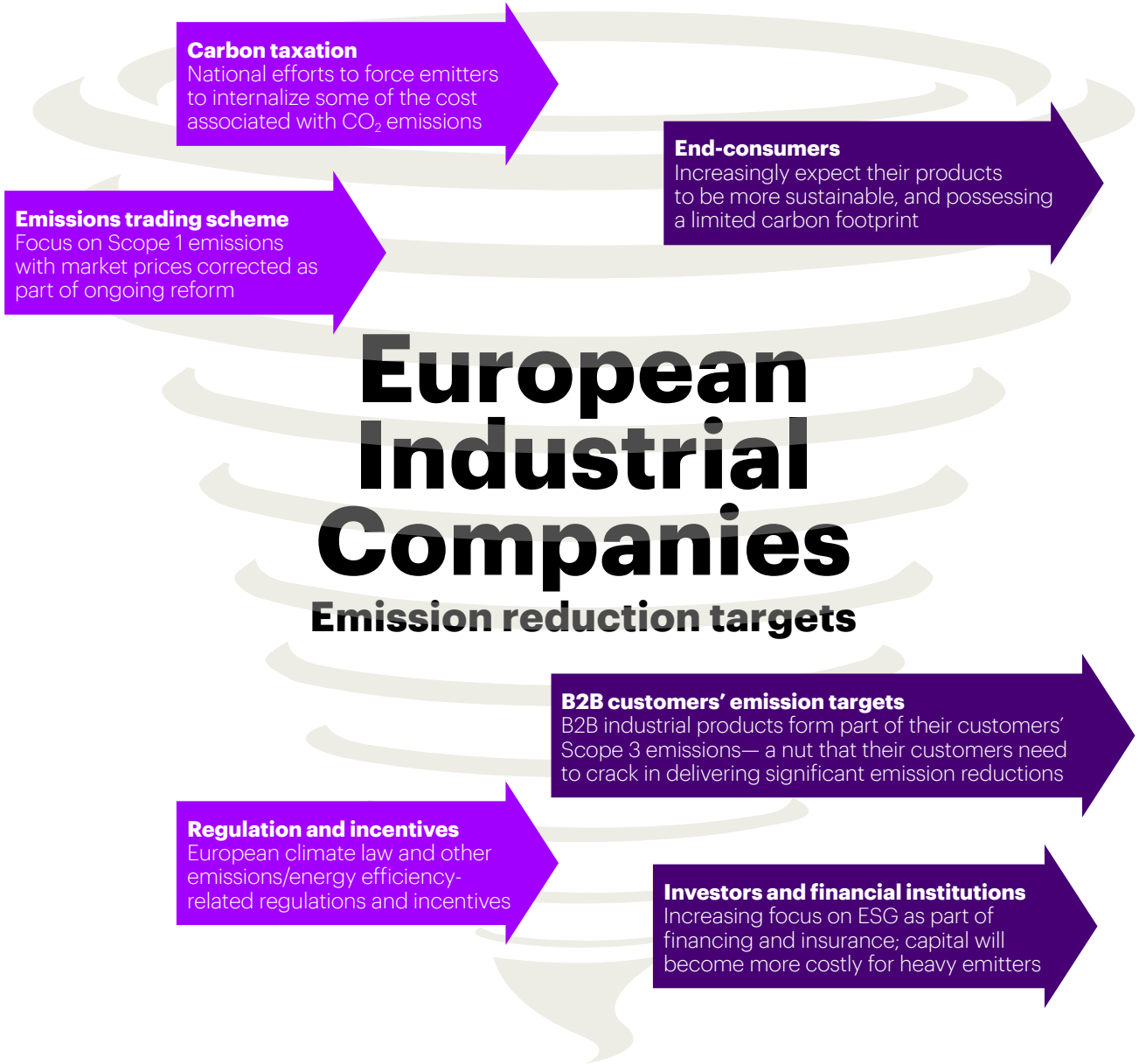
Annual total damages of at least **190bn** euro per year, eroding ca. **2%** of GDP (Ibid.)

Source: Accenture Analysis

Push and pull influences on European industrials

Pressure continues to build on European industrials from two sides: Entities like regulators and governments are "pushing" for change, while groups like consumers and investors are "pulling" at companies to change by altering their buying and investment plans (See figure 2).

Figure 2: Push and pull levers for decarbonization



Push levers include:

Carbon taxation

These are national efforts to force emitters to take on some of the external cost associated with GHG emissions. Today, there is ever-growing pressure to implement a European-wide carbon taxation program as we look to deliver a more unified approach in forcing consideration of external costs into capital allocation decisions.

Emissions trading scheme

Such a scheme focuses on Scope 1 emissions with market prices corrected as part of reforms. As of late 2020, the cost for one ton of CO_2 as part of the European Emissions Trading Scheme (EU ETS) is ~4x what it was just two years ago (approximately €25/MT) with market consensus that prices must, and will, go up. It's more a question of whether they will go up sufficiently without intervention in delivering the required decarbonization.

Other regulation

This includes the European Climate Law and other emission and energy efficiency-related regulations that are mandating change in order to help deliver on the EU's climate goals for 2030 and beyond.

Pull levers include:

End consumers

Corporations are seeing where consumers are putting their money—increasingly into eco-friendly products and brands—so companies are changing practices to meet new demands. Consumers are looking for products to be more sustainable and to achieve a smaller carbon footprint. Accenture's Buyer Value study[1] conducted in May 2020 found that renewable energy is not only regarded as important by European consumers, but that consumers are willing to pay over 5 percent more for energy from renewable sources. Meanwhile, a 2020 study by the Carbon Trust found continued levels of support for carbon labeling on products across all countries, with two-thirds of consumers saying they think it is a good idea.[2] Unfortunately, European industrials are underestimating the perceived value of decarbonization at consumer-facing businesses.

B2B customers' emission targets

Industrial sellers in the chemical and metal industry overestimate their customers' perceived value for carbon dioxide utilization while underestimating it regarding carbon neutrality, GHG reduction and the use of renewable energy – up to a factor of 60 percent underestimation. Foresighted customers are engaging business-to-business customers in their efforts to reduce CO_2 emissions.

Investors and financial institutions

Industrials that wait too long to take decarbonization seriously will find that raising and accessing capital will become more challenging on both the equity and debt sides. Governments (Article 2.1 of the Paris Agreement) as well as investors are focused on allocating capital in such a way that it supports European climate goals and the broader investment portfolio environment, social and governance (ESG) enhancement targets. In fact, according to a 2019 FTSE Russell survey, 82 percent of investment firms are currently implementing or evaluating ESG considerations as part of their investment strategy.[3]

Clean-energy challenges for industrials

As companies and policymakers discuss the ongoing clean energy transition, several challenges and uncertainties must be dealt with:

1. A fragmented regulatory environment throughout the global and national economies

As we noted earlier, regulation is a key influencer. Yet, the regulatory environment in Europe is fragmented and no unifying strategy exists to incentivize investments of either large corporations or small-medium enterprises. A recent Institute of International Finance (IIF) survey[4] cites some challenges related to environmental regulations:

- Increasing concerns exist among two-thirds of the survey respondents that policy fragmentation could undermine future certainty and improvement as national regulators introduce a plethora of different accounting and measurement standards for carbon reduction.[4]
- The uncertainty around mandatory energy transition measures such as emissions tracking and reporting has led to corporations introducing "shadow" carbon pricing – a market-driven trend to compensate for uncertain future regulatory development.

2. Infrastructure challenges to cost effectively deploy and scale new technology

Some challenges are rooted not in regulation but in infrastructure challenges. Infrastructure updates can be necessary to harness efficiencies of new technologies. The infrastructure updates cannot keep up with the rapid technological updates because it can take 10 to 15 years to build out power and gas infrastructure. One example is Germany's North-South Grid expansion to supply the south with northern wind power. Costs of the project continue to increase. A major driver of long development periods is regulation and public policy.

3. Cost inhibitors and uncertain price development of key technologies

Although some industrial players are making commitments, it is unclear whether these are substantial enough to truly stimulate the required progress necessary for a large-scale energy transition. The challenge that all industrials are battling with is ascertaining where to invest their capital in cost-effectively decarbonizing, and maximizing shareholder value. Cost inhibitors currently still stand in the way of full industrialization of certain key technologies, such as green hydrogen, although costs are dramatically decreasing.

4. Uncertainty around development of key technologies

We can learn from previous energy transitions (e.g., from coal to oil) and show that changes in demand and consumption reduce uncertainty around technology and further accelerate learning curves around technologies. In the meantime, uncertainty around the future of coal is increasing, signaling its phase out. Wind power and hydrogen are becoming established cornerstones in energy supply and uncertainty around hydrogen should be lower with cost-reduction projections on the horizon. To maintain competitive positioning in global markets, it is essential to understand current cost of technologies and the marginal abatement cost now and based on future projections.

Given the urgency of the energy transition, governments might face trade-offs in their policies such as prolonging nuclear run times while phasing out coal faster to provide cost-competitive, carbon-neutral electricity for emerging sectors such as chemical recycling, as well as large-scale hydrogen production for green steel, green cement and synthetic hydrocarbon production.

How industrials can create value from decarbonization: Key findings from Accenture's research

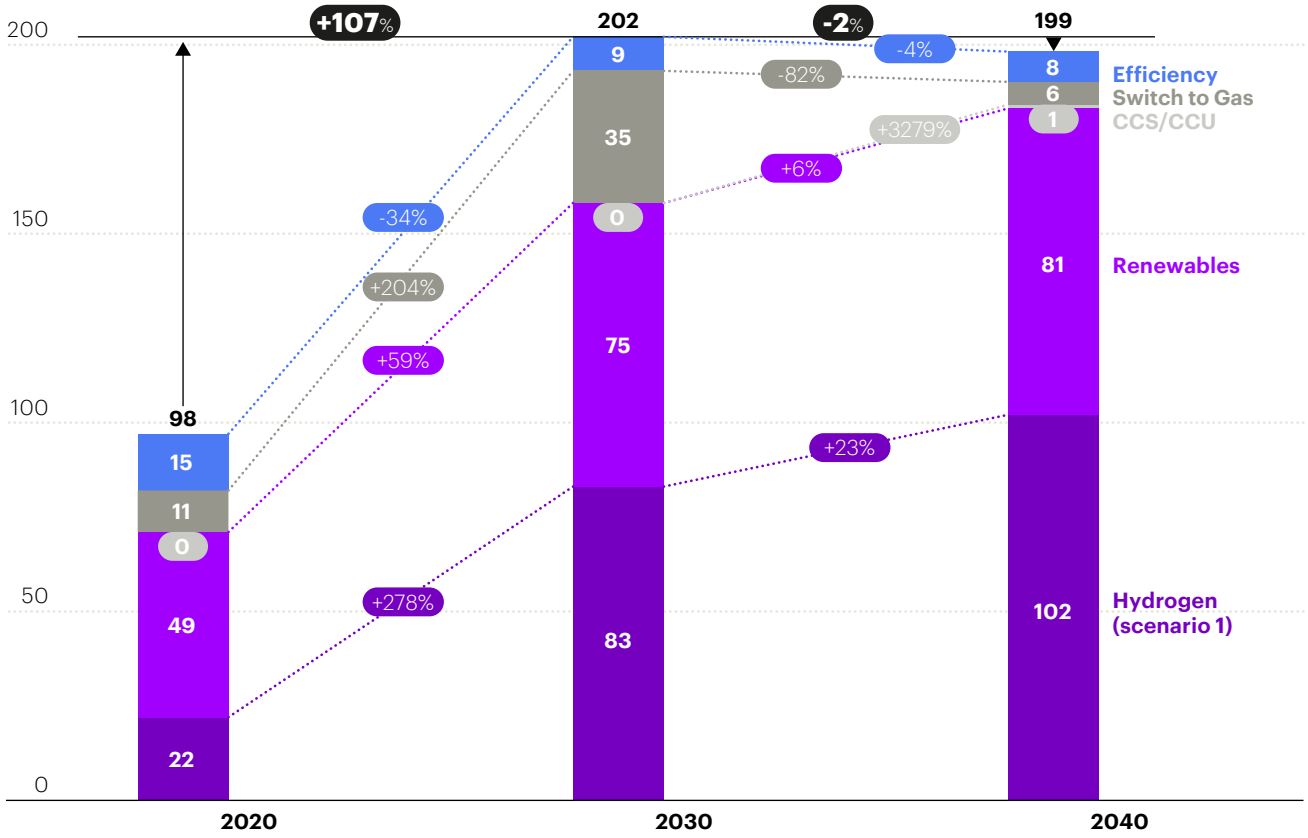
Massive value can be unlocked through decarbonizing the heavy industries in Europe. Despite the uncertainty about future prices for CO_2 emissions and green electricity, our analysis has found that the annual net value of industrial decarbonization is set to double between 2020 and 2030 (from €98BN to €202BN), then stabilizing between 2030 and 2040. (See Figure 3)

However, the value to be unlocked will strongly depend on the choice of technology options to replace existing solutions.

For definition of net value please see the following page.

Figure 3: Total net value evolution by solution

Total net value evolution by solution (best in class*) in bn EUR



0 = N/A due to e.g. negative or very small initial value

*including best-in-class solutions with positive value only

Source: Accenture Analysis

The Accenture model for quantifying net value

To compare the different new technology options—each with its own pros and cons—Accenture developed a model quantifying the net value of each new technology option in comparison to the incumbent solution. The net value consists of multiple components:

- Levelized added cost (EUR) of the new technology versus the incumbent solution (including annualized CAPEX over the asset lifetime, as well as the annual costs for material/feedstock, O&M and energy/fuel costs)
- Non-energy related CO_2 emission reduction potential (tn CO_2) compared to the incumbent solution
- Energy-related CO_2 emission reduction potential (tn CO_2) versus the incumbent solution
- CO_2 price (EUR/tn CO_2) from fuel combustion or CO_2 intensity of the generation mix behind the used electricity

As a result, we could compare the total levelized cost increases or levelized cost savings (EUR) to the avoided CO_2 costs (EUR), resulting in either positive net value in a given year (new technology more valuable than incumbent, suggesting an argument to switch), or negative net value (new technology less valuable than incumbent).

The model then ranks the new technology solutions by their net value for each of the individual incumbent solutions and selects the "best in class" by case. Finally, the best-in-class solutions are aggregated into a mutually exclusive annual total net value across the industries, to depict the total value at stake.

Methodology details

Accenture's decarbonization value modeling, based on more than 3,000 input datapoints, analyzes the cost reduction potential from applying new energy technologies in selected heavy industrial sectors in Europe. The model addresses expected changes in industrial sector supply and demand (tons of steel, cement and chemicals; tkm of industrial road freight; m^2 of building heating) and the impacts in energy consumption (coal, oil, gas, heat, electricity) while comparing selected technology solutions (e.g., hydrogen-powered iron reduction) based on the production costs, energy costs and emission costs to estimate the most attractive alternative to incumbent energy technologies (e.g., coal-fired steel production).

Multiple patterns for scale and growth

To better understand the emerging trends, Accenture categorized best-in-class technologies into solution clusters with similar characteristics, moving ahead in two steps.

Step 1: "No regrets" clusters

Today's leading clusters in industrial decarbonization, with proven financial value in multiple sectors, will continue to play a major role over the next decade.

Efficiency: Midsize and maturing. Efficiency improvements in industrial processes can make an impressive difference in both costs and emission reductions, but are likely to reach their limits in the long term, with the processes starting to reach an optimized level of efficiency. Continued focus on increasing interoperability between industrial processes and collaboration across internal functions will facilitate further unlocking of value.*

Switch to gas: Valuable but stagnating. As a fossil fuel, natural gas may not see long-term growth in comparison to zero-carbon solutions, which enjoy the advantage of decreasing technology costs while being decoupled from the increasing CO_2 prices.

Step 2 – "Next-frontier disruption"

Emerging technologies which have mostly not yet reached their break-even point of financial attractiveness, depending on multiple factors including CO_2 prices and energy prices.

Carbon capture and utilization (CCU) and carbon capture and storage (CCS): Selective technology.
Reaching positive net value by 2030, CCU/CCS are losing competitive advantage in multiple industries to renewable power and hydrogen when considering both cost and emission reduction advantage. However, relevance remains in selected areas such as cement production.

Basic electrification: Limited net value. Simply electrifying processes may reduce the direct fossil-fuel combustion, but will ultimately increase emissions without a shift to renewable power (given share and CO_2 intensity of fossil fuels within the current energy-source mix). Especially in higher process heat use-cases, the total avoided final CO_2 costs may not justify the switch to relatively cost-intensive electrification only – but will require a direct switch to fully renewable electrification.

Renewable power: Big and maturing. The sheer scale for renewable power to replace fossil-fuel-powered processes with zero-carbon electricity—also including those using CCU/CCS—can provide both absolute cost advantages and emissions reductions in the future. This represents tremendous potential.

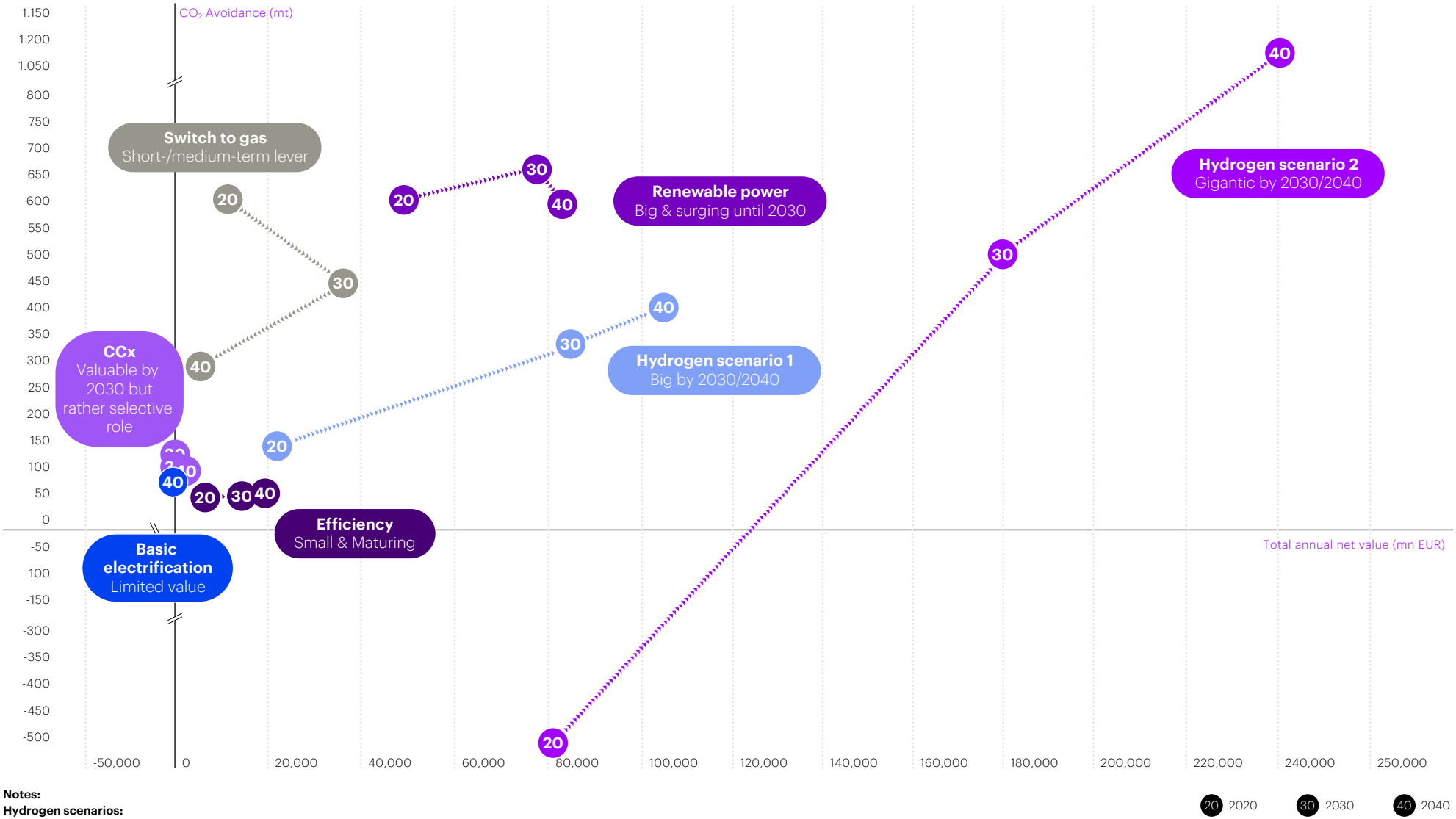
Hydrogen: The next big thing. In industrial operations alone, the move to hydrogen presents a major opportunity, with potential scale of CO_2 reduction similar to switching to gas by 2040, while providing more value in the market. Beyond the scenario 1 with focus on industrial sectors only, in an extended hydrogen scenario 2, which includes non-industrial buildings replacing 10 percent of the natural gas-based heating needs with hydrogen by 2030/2040, both value and CO_2 reduction potential are large.

Patent analysis

In investigating the evolution of decarbonization technologies, Accenture analyzed all worldwide CO_2 patent filings since 2013. We found that the growth of new technologies or applications for the mitigation or adaptation to climate change is slowing down, with patents increasingly focused on cost advantages and scale. This indicates technological maturity, and proof that we are already in the middle of the clean energy transition, progressing toward commercialization and scaling.

* Together Makes Better – How To Drive Cross-Function Collaboration" (Accenture Industry X.0, 2019/2020)

Figure 4: Overview by solution cluster (best in class)



Notes:
Hydrogen scenarios:
Scenario 1: building heating only including industrial sector (CO_2 savings from replacing natural gas)
Only best in class technology alternatives (to remain MECE), including positive business cases only

Scenario 2: building heating also including residential and commercial sectors

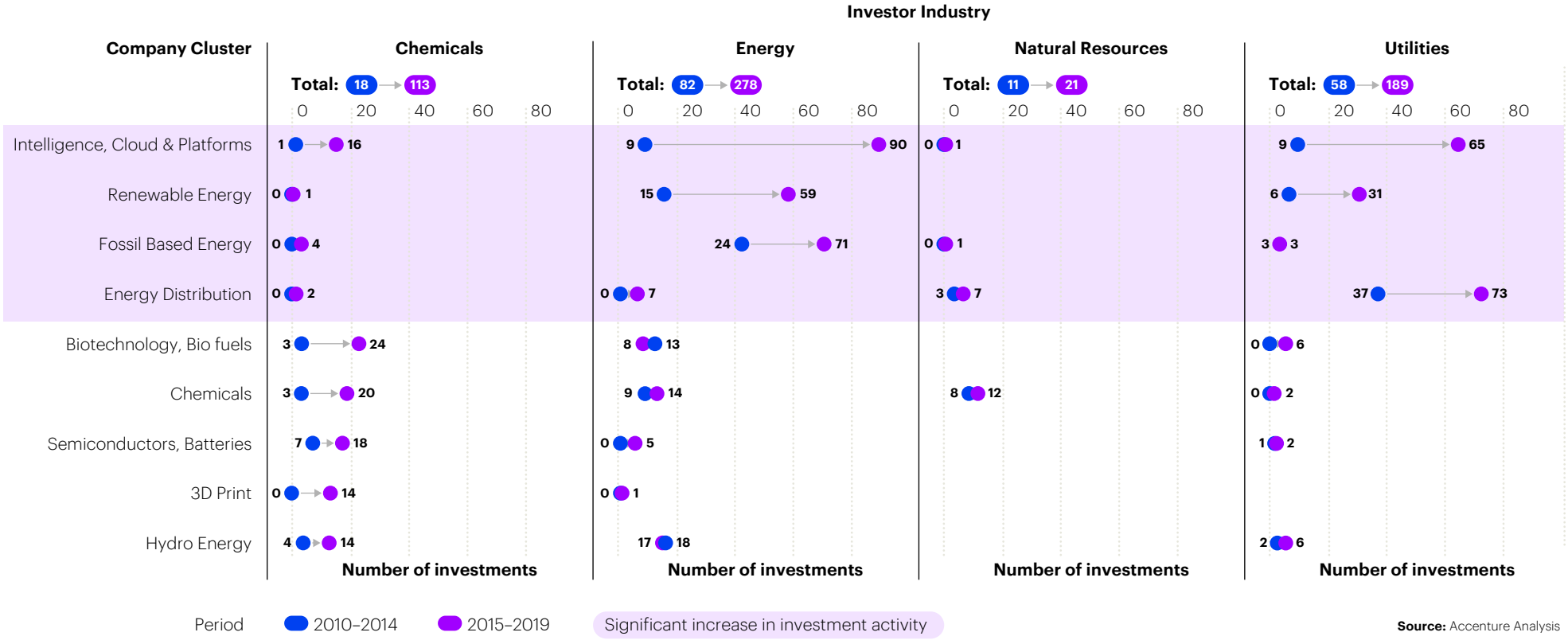
Source: Accenture Analysis

Investment analysis

We see a steadily increasing number of investments by companies in our study group across various company clusters such as 3D printing, biofuels, hydrogen, cloud & platform, renewables, and battery technology. Companies are leaving their traditional domains to move into areas that had previously been unrelated. For example:

- The chemical industry is investing heavily in all studied company clusters, including 3D printing, bio-fuels, hydrogen, and battery technology.
- Energy companies are investing in platform ecosystems and cloud, as well as renewable energy.
- Natural resources companies are focusing larger investments in energy distribution and chemicals.

Figure 5: Number of investments in company clusters by investor industry (2015-2019 vs. 2010-2014)



Source: Accenture Analysis

Recommendations

As part of our discussions with executives for this paper, numerous executives commented that they are ready and able to drive change, but that they need political actors on the team who can create an environment for success. It will be important both for the leaders of industrials and for government leaders to be in sync on this complex transition and to support the transition with required predictability around future cost developments. There is no simple or single solution to decarbonization. Innovation and collaboration between the sectors will be critical, along with a multi-faceted approach. Working in partnership, the sectors can deliver an accelerated—and value-generating—industrial decarbonization.

Actions to be taken by European industrials could include

1. Accelerate action: Take a step-wise approach and start taking immediate action today. Focus on driving efficiency within existing operations, whilst actively exploring new business models.

2. Adopt new technologies now: Many energy-intensive processes have technologies with lifecycles that will outlive the target years of climate neutrality aspired to by the European Union. To effectively decarbonize, companies must be adopting new technologies now as part of new CAPEX that offers long-term profitability.

3. Understand where you are compared to the rest of your industry: Start benchmarking against industry peers and leaders to identify areas for improvement.

4. Adopt more expansive carbon pricing initiatives: Most companies already consider carbon pricing as part of major investment decisions. However, this is only the first concrete step. Companies will next face two paths, either (a) allocating carbon costs to departments/business units based on emission generation; or (b) implementing an internal carbon fee which is to be applied to the procurement of any products or services.

Regarding carbon fees, several key principles and considerations should be kept in mind:

- Revenues will be ring-fenced for a decarbonization investment fund. Also consider a potential allocation into some form of 'strategic supplier decarbonization fund' whereby select suppliers receive reimbursement for emission reductions.
- The carbon fee may be used as a basis for negotiations with suppliers. Regardless of the contract value decrease that may be negotiated, the full carbon fee must be passed through into the decarbonization investment fund.
- Such an initiative will need to be phased in over time because prospective suppliers will need to start calculating emission footprints for their products and/or services.
- In driving pressure for adoption across existing and prospective suppliers, cross-industry leaders should commit to adopting internal carbon fees along the same timelines

5. Pursue joint investments and alliances across the value chain: Cross-value chain alliances and investments can facilitate meaningful reduction of Scope 3 end-use emissions by aligning incentives across the value chain to co-develop innovative, multi-partner solutions.

6. Review and enhance supplier pre-qualification: Supplier prequalification and contracting approaches must be reviewed to ensure that everyone is working with a decarbonization-minded supply base interested in driving down their carbon footprint as part of the supply chain.

As and when supply agreements come up for renewal or renegotiation, companies will need to:

- Add in renegotiation triggers should CO_2 prices vary outside of a pre-defined range/scale.
- Incorporate carbon footprint as part of the negotiations, agreeing upon baseline and then an annual Scope 3 CO_2 reduction target for the product that must be met.

Many companies are committing to increasing their ESG supplier audits. Rather than focusing on conducting internal audits of their suppliers, we recommend cross-industry collaboration in developing public/private sector cross-industry signaling mechanisms to avoid having each company duplicate efforts. We recommend the development and adoption of a single European-wide carbon labeling initiative with a standardized audit process.

7. Self-disrupt and think beyond adjacencies: The sale of commodity products will start to give way to a climate-neutral, usage and service-based economy. Successful navigators will be those that realize the new business models emerging out of:

- Industry convergence—e.g., the provision of syngas and H_2 for further downstream utilization and energy storage.
- Digitization of value chains and deploying increasingly sophisticated analytical capabilities to further understand and monetize data.
- Demand-side management sometimes being the less expensive decarbonization measure than investing in supply-side decarbonization. Decarbonizing through a more demand-side driven approach requires a focus on helping customers design more efficient products, materials and buildings. Naturally, this risks cannibalizing your market. However, carefully crafted business models not only delight your customers and help them with their decarbonization journey, but also deliver higher margins.

8. Ensure appropriate governance in enabling value-generating innovation: Successful players have established a strong innovative intrapreneurial culture and innovation governance, enabling them to pivot to new opportunities ahead of their industry peers.

9. Adopt a customer-centric mindset: In our work with industrials, we continue to be impressed by new product innovations. However, many European industrials are still yet to adopt a key thing – a true customer-centric mindset. We often see a focus first on the revenue and operations, with the customer as an after-thought. This must change so that customer insight drives the whole process based on conversations with real customers, understanding why customers behave in a certain way, rather than taking secondary research statistics at face value. Through this, it can be understood that the unresolved needs of customers that can be solved for, without being constrained by current research definitions or market offerings.

Public and private sector collaboration: A critical success factor in decarbonization

We have described a variety of actions that the private sector should consider on this journey toward decarbonization. For successful outcomes, the public sector's role is also critical. Without robust action from the public sector, industrials will be at competitive risk, given the twin burdens of necessary investments and the uncertainty of the pace and scope of technological innovation.

It will be important for governments and industrials to be in sync on this complex transition. At the core of the challenge: industrials need predictability on costs through thoughtful framework that will alleviate some of the transition costs and prevent "carbon leakage"—in which industrials leave the EU or lose business because the energy transition undermines their competitiveness in internationally traded goods.

Targeted public-sector intervention in the areas listed below could, on their own or in combination, help to accelerate industrial decarbonization:

- Implementing a framework that ensures companies are able to successfully internalize carbon's hidden cost;
- Designing policies that avoid penalizing first-movers;
- Setting a precise and robust carbon price mechanism with a significant base price[5], increasing predictably over time as a guide to technological innovation and investment;
- Establishing a framework for emissions reporting in all three scopes (time frames) for all industries where company revenue and/or number of employees exceeds a certain threshold;
- Exploring a European product carbon-labeling standard, akin to that run by the Carbon Trust;
- Leveling the playing field through a carbon border tax to compensate against competing imports from outside the EU—that is, incorporating any hidden costs and thereby preventing carbon leakage;
- Evaluating the potential of quotas to increase the use of low-carbon cement and steel for construction and infrastructure projects, as well as to scale up chemical recycling and circular polymers;
- Stimulating the hydrogen economy on both the supply and demand side through a broad set of measures, including quotas and tax breaks;
- Consolidating and integrating national and regional funding mechanisms into a streamlined single application process.

We believe that, working collaboratively, private and public sectors can deliver an accelerated—and value-generating—industrial decarbonization.

Looking ahead

Industrial decarbonization in Europe is a significant opportunity for both energy producers and industrial energy consumers. However, the question of how industrials can seize upon this opportunity is an item at the top of the CEO agenda. There has never been more public support—nor more urgency on the part of companies and governments—for an energy transition.

The time to act is now.

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[5] Accenture assessed the implications of a carbon tax on European industries, estimating that a carbon-price floor of about 30 EUR/MT on European industrial emissions could be an effective starting point

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