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THOUGHT LEADERSHIP SERIES

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Climate Change

The stars are aligning in climate-change fight

In this week's Thought Leadership roundtable, executives from Cummins, The AES Corporation, and Indiana University's Environmental Resilience Institute weigh in on the progress being made in the war on climate change and how federal legislation is aiding the fight.

Q: When we talk about climate change, what does that mean to you, professionally and personally?

Jennifer Rumsey: Climate change is one of the most significant challenges of our time. Our ability to deliver on Cummins' mission of making people's lives better by powering a more prosperous world is threatened by the world's climate challenges. When future generations, including my own two daughters, ask what we did about addressing climate change, I will be able to confidently say Cummins took action, and that we dedicated our resources to getting to zero-emissions and influencing others to join our efforts.

Andrés Gluski: I believe climate change is one of the most critical issues of our time, and taking collective action quickly to protect our planet is essential.

AES' strategy is based on the fundamental premise that there is a need to decarbonize and transition to greener sources of energy to combat climate change. Within the power sector, AES is well positioned to do this because of our track record of innovation and our highly international footprint, with operations in locations as diverse as Indianapolis and Santiago, Chile. We're rapidly reducing our emissions profile by shutting down or converting coal plants to gas and at the same time building a tremendous number of renewables.

> *"Cummins recognizes that our business contributes to the problem of climate change and the responsibility and opportunity to be part of the solution."*
>
> JENNIFER RUMSEY

Amy Davis: Cummins' role in combatting climate change is incredibly important to me. I'm really proud to work for a company that has made it part of its mission to introduce cleaner technologies that move the industry to zero-emissions.

Personally, I think about what the world will be like for my four kids, and how I can make a positive impact for them. The best way I can do that is by advancing cleaner products that keep the world and our economy moving. Knowing I can have a true and lasting impact for future generations is a personal passion of mine.

Gabe Filippelli: In a professional sense, climate change involves the human influences on global climate systems through our emissions of carbon from burning fossil fuels like oil, natural gas, and gasoline. These changes and impacts can be quantified, and we can use that information to model current and future climate impacts. But I care more about climate impacts on the lives of my children and grandchildren than I do about the science. This is a human-caused problem that is affecting ecosystems and societies around the world, and most of the impacts are negative.

Q: How do you make decisions about investments while balancing the competing goals of diverse stakeholders?

Gabe Filippelli: At IU's Environmental Resilience Institute, we've placed research, education, and community at the center of our mission. That has led us to collaborate with local governments, businesses, nonprofits, educators, and other leaders who share our vision for a sustainable and resilient Indiana. Everything we do is co-created—whether we are embedding students within organizations to advance climate and sustainability goals or training K-12 teachers how to effectively teach about climate change. There are so many people at IU and elsewhere who recognize the climate emergency we are facing. We simply are funneling that energy to other sectors across the state.

Andrés Gluski: Every three years, AES Indiana submits an Integrated Resource Plan to the Indiana Utility Regulatory Commission that identifies a preferred portfolio of generation that provides safe, reliable, and affordable electric service to our more than 512,000 customers. We work hard to incorporate input from a broad set of stakeholders, and we produce and publish a robust analysis across many scenarios for the future.

Over the last nine months, we've already had four public meetings, and our stakeholders have invested significant time and energy into our meetings and analysis. We plan to file our final plan with the Indiana Utilities Regulatory Commission in December 2022.

Jennifer Rumsey: Our customers have businesses to run, payrolls to meet—this is their livelihood, and they rely on our engines to meet those needs and the needs of society more broadly. We are talking about the large tractor-trailers moving goods across the United States, up and down I-65 and across I-70; pick-up and delivery trucks bringing packages to your front door; school and transit buses taking our kids to school and our neighbors to work; trains and ships moving goods around the world; and critical back-up power to hospitals, data centers and banks.

There is not a one-size-fits-all solution for all of our diverse markets, which is why with Destination Zero, our strategy to reach net-zero emissions by 2050, we are investing in a broad portfolio of power solutions, leveraging our deep understanding of our customers as we work to decarbonize our industry in a way that is best for all stakeholders. We have a tremendous opportunity to motivate our employees in this important work and harness the innovation and power within our workforce. As we do this we see an opportunity to continue to grow our business and deliver strong returns to our investors.

Amy Davis: To enable the adoption of zero-carbon solutions, private companies, governments and end users all have an important role to play. We'll all win with the right infrastructure and the right technologies. Cummins is working directly with customers to optimize the technologies and put the right products in their hands at the right time. Those partnerships lead to quicker results that amplify our impact.

Q: What roles should businesses/organizations play in fighting climate change?

Andrés Gluski: I was recently asked in an interview whether I see a tradeoff between going green and shareholder value. I said, "No, there is no tradeoff." We are the best performing stock in the utilities index whether you measure it for one, three, or five years, and we have been going green more rapidly than anybody in our sector.

I see an enormous business opportunity from the once-in-a-lifetime transformation of the electricity sector driven by decarbonization, electrification and digitalization. There is a massive need for more renewable energy as well as electrifying everything from our cars to our factories. I think it's a golden age of opportunity for innovation, and businesses can lead the way.

Jennifer Rumsey: Cummins recognizes that our business has a role to play in contributing to the problem of climate change and the responsibility and opportunity to be part of the solution. We can't do it alone; it will take all of us working together to address a challenge of this

magnitude as decarbonization of our economy is critical to our way of life and a sustainable future.

To do this, we all have to start today. We need everyone to embrace the challenge and realize that there is growth and there are jobs in addressing climate change. We need governments to incentivize zero-emissions solutions to drive adoption of these products, and we need the investment to build out and decarbonize the infrastructure that is required for these zero-emission solutions as well. If all businesses begin rowing in the same direction, we can make a difference much more quickly.

Amy Davis: Companies have the ability to make large-scale changes to address climate change—in facilities and with fleets and equipment. Cummins' sustainability strategy, PLANET 2050, identifies science-based targets that allow us to live up to our mission of powering a more prosperous world. We are using actions, advocacy and partnerships to drive change for a healthy planet. We're doing that by working to lower or eliminate harmful emissions, using natural resources sustainably, and partnering with communities so they are better because we are there.

"To enable the adoption of zero-carbon solutions, private companies, governments and end users all have an important role to play."

AMY DAVIS

Gabe Filippelli: There is a strong argument that business interests have played an outsized role in delaying action on climate change, but recent developments, such as the passage of the Inflation Reduction Act, are making green investment a no-brainer for organizations. Now that climate decisions and business decisions are closer in alignment than ever before, we need businesses to scrutinize everything they do through an environmental lens and take the lead in creating a green economy. That's a big undertaking, but many organizations in Indiana are already starting to do this and have hosted IU students through ERI's McKinney Climate Fellows to help them.

Q: Creating a community where everyone is aware of their impact on climate change requires intentional collaboration between many stakeholders. Give us some current examples.

Jennifer Rumsey: We are working to address climate change across all aspects of Cummins—improving our operations, developing new products and working closely with our customers and suppliers.

In our communities, we are working to address one of the primary effects of climate change, namely water stress, through Cummins Water Works, by partnering with leading water experts and investing and engaging in sustainable, large-scale, high-impact water projects around the world.

Here in Indiana, we are working with the Nature Conservancy (TNC) to restore and protect water resources in the Mississippi River Basin. A primary focus of this program is to decrease excess nutrient runoff into the Wabash River watershed, including the White River. This will in turn benefit the Gulf of Mexico by decreasing the oxygen-depleted dead zone that currently exists where the Mississippi River empties into the Gulf, allowing for regeneration of plant and animal life that is so vital to that region. Our work with TNC to address this problem involves deploying a number of different techniques, such as the planting of filter strips between the fields and adjacent waterways and drainage ditches, the use of cover crops and no-till farming practices to maintain soil health, and education regarding proper application of fertilizers and other sources of nitrogen and phosphorus.

Amy Davis: Hydrogen hubs are a great example of stakeholder collaboration. Governments offer incentives, companies like Cummins bring hydrogen products to market, and end users have applications that use hydrogen. When all stakeholders come together, it creates an ecosystem where we can produce solutions that address various needs and have an immediate impact.

Gabe Filippelli: There are so many exciting collaborations happening throughout Indiana. At ERI, we're excited about the work we've done with our Resilience Cohort communities on climate mitigation and adaptation. Carmel and Richmond are the most recent participants in this program to have adopted climate action plans, joining communities like Evansville, Zionsville, Goshen, and others. We've also worked with Clarksville and Richmond on developing community-wide plans for dealing with extreme heat, which will pose an even greater threat to Hoosiers' health in the decades to come.

Andrés Gluski: One recent example is the Spotsylvania Solar Energy Center in Virginia, the largest solar project east of the Rockies. We worked with the community to ensure that the project gained their support. We ensured the vast majority of neighbors will not be able to see the solar panels by dedicating approximately one-third of the site to undeveloped conserved land and planting native trees and vegetation. As a result of our community engagement, most county residents supported the project. During the height of construction, over 800 jobs were created in the community, where the estimated tax revenue from the project is $8.4 million—enough to help fund county services such as education, emergency response, and local infrastructure.

Q: What are the biggest barriers to making progress on climate-change goals?

Amy Davis: Some of our biggest barriers are in the sectors that use heavy equipment. Right now, zero-carbon solutions for these sectors are expensive, so Cummins is working on innovative technologies to bring costs down. At the same time, cost will be impacted dramatically by infrastructure, which is another barrier, especially for applications that operate outside of cities or over long distances. These technologies are only beneficial if they can operate on green energy.

Gabe Filippelli: The biggest barrier to achieving climate-change goals is not individual resistance or our understanding of the science—it is the legacy systems that discourage new infrastructure. The old infrastructure in this case is the pipelines, service stations, and policies that make it cheap and easy to deliver fossil fuels to your house and car. The new infrastructure includes renewable and distributed power generation sources, electricity storage, charging stations, and grid policies like net metering that would make the transition from fossil fuels straightforward.

Andrés Gluski: Electricity transmission lines, those steel structures you sometimes notice when you are driving, are not an exciting topic to many, but they are critical to making progress on climate change goals. These transmission lines take electricity from wind and solar farms where it is generated to towns and cities where it is needed to give us hot showers and cold beer.

Recent studies have shown that we need to build a lot more of these transmission lines over the next decade to realize 80% of the potential emission reductions delivered by the Inflation Reduction Act.

Another challenge to making progress on climate change goals is that we need a stable solar supply chain that includes expanded solar panel manufacturing here in the United States. With that in mind, we were part of the creation of the US Solar Buyer Consortium, to help galvanize new sources of supply and prompt expansion of all stages of the domestic solar supply chain.

Jennifer Rumsey: The rate and pace of progress in the decarbonized solutions for our industry are impacted by several key factors.

First, significant infrastructure build out; charging and refueling

See page 26A

Continued from page 25A

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capabilities are key for customer adoption and that infrastructure must be decarbonized. We have seen progress made on that recently right here in Indiana. Second, pure economics; the costs today are high, which requires both scaling up as well as advancing technology further in many cases. Third, customer acceptance; most understandably customers want assurances that these new products are able to meet their needs reliably and allow them to continue to operate their business and meet payroll for their employees. And lastly, regulations, which will drive progress across these areas, both with mandated stricter emissions regulations but also by potentially narrowing the economic gap, helping to make zero-emissions solutions more affordable for the customer and manufacturer.

Q: What impact do you think the passing of the infrastructure bill and inflation reduction act will ultimately have on climate change initiatives?

Gabe Filippelli: The recently passed Inflation Reduction Act is one example of legislation that will speed up the necessary transition away from fossil fuels toward a greener, cleaner future. Provisions in the bill are self-supporting and largely tax credit-based, such as credits for the purchase of an electric vehicle or a high-efficiency heat pump for homes. Collectively, these policy incentives are likely to get the US very close to its 2030 climate goal of reducing carbon emissions by 50% from 2005 levels. But this bill is just a primer to spur more public and private investment that could help us exceed the 50% goal.

Andrés Gluski: The Inflation Reduction Act includes $369 billion of funding for climate and energy over the next decade, building on the $110 billion of funding in the infrastructure bill passed last year. This represents the largest federal investment in clean energy in U.S. history.

The Department of Energy's analysis shows that together these bills will reduce America's greenhouse gas emissions to 40% below 2005 levels. Legislation of this magnitude will have profound and lasting impacts across all sectors of the U.S. economy and will make it easier for states, cities, and companies to increase their climate ambitions.

Jennifer Rumsey: Cummins sees the climate provisions of the infrastructure bill and Inflation Reduction Act as positive moves, and we advocate across the aisle for these and other policies that further the decarbonization of our industry. A key piece of the bill is focused on starting to build out an infrastructure that we think is key for decarbonization and our country. The legislation includes substantial investment in both hydrogen and charging infrastructure and recognizes the importance of low-carbon fuels. The infrastructure bill and Inflation Reduction Act have incentives to help drive adoption and offset higher costs, which will lower the cost of technologies as they continue to advance and scale. When we think about the work ahead for our country and our world to really decarbonize some of these sectors, it requires the infrastructure to come together with the advancement in the technologies on the product side. We hope that this will be a catalyst toward driving that decarbonization path.

Amy Davis: The infrastructure bill and Inflation Reduction Act will incentivize companies to invest. Infrastructure is one of the biggest challenges to decarbonizing, so having access to funding to make the necessary investments helps companies accelerate the technology more quickly. Ultimately, it brings together a partnership of government, private companies and end users pulling in the same direction. Through purposeful and tangible investments, we can work together to make zero-carbon solutions more cost effective and attainable.

Q: Looking 10 to 20 years down the road, do you see one type of technology dominating others when it comes to powering homes, consumer vehicles, trucks, trains and other applications?

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GABE FILIPPELLI

Andrés Gluski: In 2020, solar and wind accounted for less than 10% of the world's total energy consumption, including electricity, transportation, and industry. By 2050, it's expected to be closer to 70%. That is an incredible rate of change.

However, to enable that change the entire economy must electrify. That means replacing or retrofitting anything that used to run on fossil fuels to run on electricity or electrofuels, like green hydrogen. Green hydrogen

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is created from renewable energy and water; it is a clean substitute for diesel and natural gas.

We will also see the massive deployment of battery energy storage that will charge when the sun is shining and the wind is blowing to ensure that we have round-the-clock power.

Jennifer Rumsey: The applications we serve are different than passenger cars and require a mix of solutions to get to zero. To Cummins, the best path—Destination Zero—starts lowering emissions today by focusing on improvements to existing engine-based technology including improving efficiency and reducing CO2 of diesel engines and introducing new technologies in markets and in applications where they make sense. We expect a range of zero-carbon solutions to ultimately exist in our markets including battery electric, fuel cell electric, and zero carbon fuels used in engines.

Amy Davis: One solution isn't going to get it done. A complement of technologies will be required to make it work. In homes, it might be a combination of solar and battery storage. In major utilities, fuel cells could play a role along with large-scale battery storage. In vehicles, a combination of battery, hybrid and fuel cell could be the solution—all dependent on the work the vehicle is doing. Multiple technologies will need to come together and be customized for each application. Even within one technology, like battery solutions for example, customization and tailoring will be needed to make it work for the end user.

Jennifer Rumsey: Decarbonization is a growth opportunity for Cummins and our stakeholders. Cummins has grown from a $6 billion company in 2000 to $24 billion in revenue last year. We have done this by innovating and expanding our product and service offerings as well as our partnerships across all of our business segments; growing our presence globally; and, leveraging opportunities like setting up our components business to offer products that meet increasingly stringent emission and fuel economy standards, and launching our new power business focused on innovating zero-emissions solutions. We have also done this through mergers and acquisitions to expand through the powertrain into other key technologies such as our recent acquisition of Meritor and Jacobs Vehicle Systems.

For Cummins to be successful in attracting and retaining the talent we need, it is also critical that we have a safe and welcoming workplace and communities where we embrace our difference and enable all employees to thrive. When issues arise that are contrary to this goal, we believ e it is incumbent upon us to speak up and speak out. Delivering on the stakeholder model means doing what is right, even when it might be controversial.

Amy Davis: We see it as a growth opportunity for innovators, of which we like to include ourselves. There will be new jobs available and new investment opportunities for product manufacturers. Specifically, infrastructure is going to take investment and people to do those jobs.

"We're rapidly reducing our emissions profile by shutting down or converting coal plants to gas and at the same time building a tremendous number of renewables."

ANDRÉS GULSKI

Gabe Filippelli: The transition period to non-fossil fuel energy sources will hold, like all transitions, many uncertainties. One expectation that has been foreshadowed by the auto industry is that, within this timeframe, electric vehicles will constitute the overwhelming majority of personal vehicles on the road. Additionally, I expect many homes to have begun the transition from natural gas for heating to electric sources of heat that are increasingly powered by renewable energy sources. Finally, sometime during this transition period I anticipate that hydrogen fuel cells will become much more common on heavy vehicles, such as trucks, trains, ships, and airplanes—all modes of transportation for which hydrogen is ideally suited.

Q: What will the economic and jobs impact be through the transition?

It's important to keep in mind, though, how economically disadvantaged communities will be affected. As we think about the incentives, we need to remember where investments need to be made to be equitable for our communities. It's something that we, at Cummins, are really thinking about as we pursue funding and make investments.

Gabe Filippelli: One need look no further than the infrastructure transition to understand what the economic and jobs future will hold. Fossil fuel extraction and distribution companies will begin to lose jobs and value, with some very real negative impacts for households and communities that rely on these industries. Technology firms that develop and engineer renewable power systems, those that are related to battery production and innovation, and those that accommodate the efficient recycling and reuse of critical materials will grow substantially. This will be a period of marked innovation, and the job seeker of the future needs to be nimble and adapt to these needs.

Andrés Gluski: According to a study by Princeton University, by 2030, the Inflation Reduction Act and infrastructure bill could create 1.7 million new jobs in clean energy and 950,000 additional jobs in manufacturing.

The same study found that the Inflation Reduction Act could drive over $4.1 trillion in cumulative investment in new American energy supply infrastructure over the next decade.

It will also lower annual U.S. energy spending by at least 4% by 2030, a savings of nearly $50 billion dollars per year for households, businesses and industry. That translates into hundreds of dollars in annual energy cost savings for U.S. households.

Jennifer Rumsey

A known problem solver committed to creating positive change, Jennifer Rumsey serves as the President and Chief Executive of Cummins Inc., a global technology leader with a broad portfolio of power solutions. In this role, she oversees the strategic direction, growth initiatives and global operations for the 103-year old, Indiana-based company.

Amy Davis

As Vice President and President—New Power at Cummins, Amy Davis is at the forefront of innovating for a more sustainable world. She leads the company's newest business segment, which pioneers and manufactures cutting-edge alternative power technologies. Leading more than 1,500 innovators across four continents, Amy is accelerating adoption of a broad portfolio of hydrogen and electrified power solutions.

Gabe Filippelli

Gabe Filippelli is the executive director of Indiana University's Environmental Resilience Institute and a Chancellor's Professor at Indiana University-Purdue University Indianapolis. A biogeochemist, Filippelli's research focuses on the flow and cycling of elements and chemicals in the environment. This includes his work on pollutant distribution, pollutant exposure to human populations, and engaging communities to reduce their own exposures.

Andrés Gluski

Since 2011, Andrés Gluski has served as the President and CEO of The AES Corporation, a Fortune 500 global energy company. Joining AES in 2000, Andrés previously served as CEO of AES Gener in Chile and then as AES' Chief Operating Officer. Under his leadership, AES has become a world leader in energy innovation and the adoption of new technologies, establishing AES as a world leader in energy storage.

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