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Energized #LikeABosch – energy-focused innovations

to power a sustainable tomorrow

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at CES®, on January 8, 2024

Check against delivery.

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Hello everyone, and welcome to the Bosch press conference at CES 2024! We're delighted to have you here – thank you so much for joining us, either in person or via our livestream.

Today we'd like to talk to you about a topic that affects us all: energy. Did you know that over the past 50 years global energy use has doubled? Those of us who were around in the 1970s know that it was hardly the dark ages. Most of the modern comforts and conveniences we know today already existed: cars, dishwashers, air conditioning, airplane travel. But as more and more people around the globe have gained access to modern technologies and our collective use of them has intensified, our energy consumption has skyrocketed. And it hasn't peaked yet: in fact, our needs are still growing at a rate of 1 to 2 percent each year.

The problem, of course, is that we continue to meet most of these needs with fossil fuels. Fossil fuels still account for more than 80 percent of energy consumed globally, yet we must reduce our dependence on them for the sake of our climate. Clearly, returning to pre-industrial levels of consumption is not an option. Somehow, we have to find a way forward that balances our ever-growing need for energy with the health and stability of our planet. We need an approach that is sustainable from social, economic, and environmental perspectives.

This is especially true where energy is concerned. Today, you're going to hear about the wide range of technologies we're developing to help us meet our energy needs in a more sustainable way – with solutions that make our lives "Energized #LikeABosch."

When it comes to energy-focused innovation, we're pursuing a two-pronged approach:

- First, we're focusing on **optimizing** the use of traditional energy sources. Specifically, this involves continuously improving

efficiency, thus saving energy and costs, as well as driving forward electrification. Electrification in particular holds tremendous potential as a pathway to achieving net-zero goals in multiple domains, including personal and commercial transport as well as the home.

- Second, we're looking beyond traditional energy sources for more sustainable alternatives. We're focusing in particular on **hydrogen**, which we believe will be central to meeting our future climate-neutral energy needs. Here, we're active at multiple points along the H_2 value chain, from building up a production and supply infrastructure to developing innovative new hydrogen-based technologies.

So, let's start by looking in more detail at how we're enhancing the use of traditional energies. As I mentioned, a major focus of our activities here is electrification. At first glance, electrification seems to simply be a means to reducing energy consumption, since electric technologies are often far more efficient than their fossil fuel-based counterparts. But electrification offers much more: electric solutions come with the potential for climate-neutral operation "baked-in" – all they need for this is a supply of electricity generated from renewables.

Mobility in particular is already well on its way to becoming more electric, and Bosch is a leading supplier along the electromobility value chain. In fact, our diversity here is unrivaled across the globe – with technology ranging from chips to e-axles, from e-bikes to trucks, from batteries to fuel cells, and from hardware to software and services.

Over the last few years, we've seen the viability of electric cars as an everyday mode of transport increase dramatically. But a big stumbling block continues to be the charging process: drivers used to investing only a few minutes in finding a gas station and filling their tanks are suddenly confronted with the question of **where** to charge an electric

vehicle, and above all **when**. Well, we've been thinking about this too, and we have a solution: what if your car could go charge itself?

The year before last, our automated valet parking solution became the first driverless parking system officially approved for commercial use. At CES 2024, we're debuting an exciting new addition to this system, which conveniently has to do with energy – and it's a CES Innovation Award Honoree. **Automated valet charging** is essentially an automated way to charge your electric car when you're out and about. You don't have to worry about finding an empty charging spot or returning to the parking garage halfway through your shopping trip to unplug – all you have to do is press a button on your phone, and the system takes care of the rest, guiding the vehicle to the charging station and back to a parking space when it's full.

This isn't something in the pipeline – it's already available to our customers now. And by no means does it require newly built, state-of-the-art parking garages. We've designed the charging setup to work in two ways: the AVC robot can either be deployed in garages that already have automated valet parking, or in garages that are installing the required infrastructure for the first time. This combination of automated valet parking and automated valet charging is unique in the market and is already generating considerable interest among our automotive customers.

It sounds like a fun gimmick, right? Well, it's actually more than that. Every step we make toward increasing the convenience of electromobility will also increase its attractiveness – which in turn will drive uptake. As a matter of fact, we're working on improving the feasibility and attractiveness of electromobility on many levels. This is why we're also investing in **silicon carbide technology**. In electric vehicles, silicon carbide chips enable greater range and more efficient recharging, as they use up to 50 percent less energy than standard chips. Installed in vehicles' power electronics, they enable cars to drive

a significantly longer distance on one battery charge – on average, range is 6 percent greater.

We're currently ramping up our production capacities for silicon carbide chips globally, including a major investment here in the U.S. As we announced a few months ago, we recently acquired a California-based wafer fab, and over the next few years plan to invest more than 1.5 billion dollars in the Roseville facility, with the aim of starting production there by 2026. At our booth, we'll have a demo explaining the benefits of silicon carbide as we prepare to ramp up production of this important technology here in the United States.

In addition to the mobility sphere, we're focusing on the home as a major candidate for energy optimization.

We see huge potential for optimizing energy use in the home. For example, in the U.S., residential and commercial buildings are responsible for nearly a third of total energy use as well as total greenhouse gas emissions. This is unsurprising, considering that more than half of American homes still rely on gas or other fossil fuels as their primary heating or cooking fuel.

Around the world, we're developing technologies to make buildings and their contents more energy-efficient and to facilitate electrification. A major focal point for us is heat-pump technology. Here in North America, we're debuting a very exciting innovation at CES which is hitting the market this year – our new air-to-air **IDS Ultra Heat Pump**. Unlike most air-to-air heat pumps, it was developed for areas with harsh winters. Traditionally, air-source heat pumps have the advantage of being relatively affordable and easy to install, and like all heat pumps they can cool as well as heat. They have the disadvantage, however, of not working very well in extremely cold temperatures.

We recently conducted a survey here in the U.S. and Canada that confirmed our suspicions: while awareness of heat pumps is near universal, and more than a fifth of all respondents even currently own one, this is very geographically uneven. The highest percentage of heat pump ownership is concentrated in the Southeast, no doubt due to its mild winters. In colder places like New England and the Upper Midwest, we see ownership rates 6 to 7 times lower. And in those places, the few homeowners who do invest in a heat pump usually have to keep a backup system running that takes over when temperatures drop below freezing.

Our new cold-climate heat pump nearly eliminates this need. It provides 100 percent heating capacity down to outdoor temperatures of 5 degrees Fahrenheit, and it's operational down to minus 13. For people in northern regions, this means they can reduce their reliance on fossil fuel-based heating systems and make the switch to electric in a more affordable way, thanks to the growing number of state rebates and federal tax credits here in the U.S. And apart from electricity's superior sustainability credentials and net-zero readiness, switching to heat pumps also comes with energy and cost saving advantages. This is definitely good news for the nearly two-thirds of respondents to our survey who cited cost and efficiency as their main concerns when it comes to heating and cooling their homes!

In an announcement today, the Department of Energy confirmed that Bosch's cold climate heat pump meets the requirements to progress from lab to field testing as part of the Residential Cold Climate Heat Pump Technology Challenge. The goal of the challenge is to advance heat pump technology, allowing consumers options for electrified heating and cooling of their homes.

Heat-pump technology is so promising, in fact, that we're also putting it to use in other areas of the home. One of these is the new **hybrid electric water heater** we're showcasing here at CES. Launching in

North America later this year, this is the most energy-efficient water heater in our lineup: by combining heat-pump technology with electric elements, this ENERGY STAR-certified device achieves 3 to 4 times the efficiency of our traditional electric storage water heaters. With solutions like this, we're helping pave the way to an increasingly electrified home.

Of course, we're also focusing on appliances as a lever for energy savings. Bosch home appliances has been a frontrunner in this area for a long time – evidenced by the fact that it was named as an ENERGY STAR Partner of the Year by the U.S. Environmental Protection Agency and the Department of Energy for the third year in a row.

Most of us know that it's possible to run our appliances on a schedule that optimizes electricity costs or green energy usage; in practice, however, it's not always easy. First, we have to know what time of day to run them; then we have to remember to actually switch them on at the right time. Well, our new **MySchedule** feature can help on both counts. Included on our new generation of dishwashers, this function is operated via our Home Connect platform. In a nutshell, MySchedule allows you to automatically delay operation to hours when electricity is cheapest or when green energy is available. This means that your ability to optimize your energy use no longer depends on your ability to remember to hit the "on" button at the right moment.

Another approach to optimizing energy comes from our Power Tools business. If you work with cordless power tools, you know how much of a headache it is to keep track of your different batteries and make sure they're charged. We're looking to simplify workers' lives by reducing the number of battery solutions they need to keep track of. **AMPShare** is a shared battery platform which lets workers use the same batteries across Bosch power tools, as well as the AMPShare-compatible products of our partners. Workers have been excited about

the opportunity to simplify their battery assortment. Since AMPShare launched, we've welcomed more than 30 global partners, including 15 here in North America, 3 of which are new partners we're introducing here at CES.

Beyond welcoming new partners, we're collaborating with our partners on new product launches. In the near future we expect there will be a number of new AMPShare-compatible products hitting the market, such as the Perfect Pro radio, which is on display in the Bosch booth. In addition to making it easier for workers to manage their batteries, AMPShare's goal is to allow workers to use more tools with fewer batteries, leading to less material usage and waste production.

Beyond the home, we're also focusing on optimizing energy efficiency in the commercial sector, and here our portfolio goes beyond products to consulting and system solutions. Globally – as well as here in North America – we're investing heavily in our system integration business. As we announced a few months ago, we recently acquired Canada-based **Paladin Technologies**, which will enable us to significantly expand our activities in North America. We've already built up a very strong business in the United States through our subsidiary **Climatec,** which continues to grow and support a variety of customers with energy-focused building optimizations. For the past 7 years, for instance, Climatec has been working with the Rowland Unified School District in Rowland Heights, California. Thanks to Climatec's improvements including HVAC modernizations, building automation systems, LED lighting, and solar installations, the school district expects to see efficiency gains that will save them more than 38 million dollars in energy costs over the next few years.

The expansion of our residential and consumer goods portfolios as well as our integrator business demonstrates our focus on profitable growth in North America. Our mobility business will also be a major

part of that growth, and this in particular relates to the second prong of our energy strategy, which I'll tell you about now.

As mentioned earlier, another way we're tackling the energy challenge is by tapping into new sources of renewable energy – specifically **hydrogen**. The thing is that renewable power can be generated most efficiently in the world's sunniest and windiest regions, which is not always where it's needed. We need a storage medium to transfer that energy between regions, and chemical carriers such as hydrogen, which is produced with electricity, offer us an excellent way to do that.

At Bosch, we're convinced that hydrogen is one of the keys to decarbonizing our energy supply. As such, we're investing heavily in hydrogen technologies and developing solutions along the H_2 value chain. A major thrust of our efforts is the **hydrogen fuel-cell powertrain**, which we believe is the path to electrification for heavier vehicles. Last summer we started volume production of our fuel-cell power module in Stuttgart. We plan to supply the hydrogen powertrain system as well as important components, and we already have orders from truck makers in the U.S., Europe, and China. This week Nikola is offering rides in a truck powered by a Bosch fuel cell to experience this exciting new technology!

In addition, we're working on components for a **hydrogen engine** that uses the fuel directly, as opposed to first converting it into electricity. This technology can offer the performance of a diesel engine. On top of that, the climate benefit of the hydrogen engine increases even more when green hydrogen is used. It will be suitable for commercial vehicles in the on- and off-road segments, such as heavy-duty long-haul trucks and construction machinery. As a systems provider for hydrogen engines, we're currently developing solutions for both port and direct injection; we plan to launch our first H_2 engine later this year.

Around the globe, investment in hydrogen technologies is slowly starting to pick up speed. In this regard, the U.S. is setting a great example. On the public side, the federal government is driving forward the buildup of an H_2 infrastructure and has made 7 billion dollars available for establishing so-called **hydrogen hubs** across the country. Including sources of private investment, the amount of funding available has surpassed 50 billion dollars, which is kickstarting a lot of activity. At Bosch, we're committed to helping drive forward the clean-energy economy in North America, which is why we're currently engaged with multiple hubs to identify projects where we can contribute our technological expertise in both the production and provisioning of hydrogen. And as our business in the area of hydrogen production develops, we're actively exploring local manufacturing to support it.

So, on one hand we're enhancing energy efficiency and driving forward electrification. On the other we're pursuing hydrogen as a more sustainable power source.

A common theme across all our areas of business is our comprehensive use of software and digitalization to optimize existing solutions as well as create new ones. Our expertise in this area no longer represents a niche in our portfolio, but by now underpins nearly every solution in it. Bosch is one of the few high-tech innovators that is equally at home in the worlds of things and data; our global software engineering workforce currently numbers more than 44,000. Here as well, we are driven by our "Invented for life" ethos, which in practice means that we're leveraging the power of data and algorithms to enhance comfort and convenience as well as efficiency and sustainability.

In the mobility domain, software is a key enabler of achieving the goals of future mobility that is more sustainable. We're so committed to this vision of mobility that we're realigning our entire mobility business to

facilitate it – by positioning ourselves more than ever before as a software company for mobility, and by strengthening our cross-divisional collaboration. In our role as the world's largest automotive supplier, we're leading the way toward the **software-defined vehicle** – a vehicle that is electrified, automated, and connected, and can tap into a wide range of digital mobility services that enhance efficiency, performance, and convenience.

Especially when it comes to developing useful and beneficial services for the software-defined vehicle, we're firm believers in bringing as much expertise on board as possible. This is why we're working with partners across the automotive landscape to realize new and innovative solutions for our customers. A great example of this is our **collaboration with Amazon Web Services** to develop some useful cross-domain in-vehicle functions and services that repurpose driver assistance technology in new ways. I'd like to welcome Wendy Bauer, vice president and general manager of automotive and manufacturing at AWS, to join me in telling you more about what we're working on together.

Guest appearance by Wendy Bauer, vice president and general manager of automotive & manufacturing at AWS:
We are indeed working on some very exciting new functions and services and look forward to sharing the benefits of the cloud with the industry and everyday users around the world. The innovation areas are broad, ranging from vehicle technology, to logistics with the L.OS platform, and smart home devices.

Tanja Rückert:
For instance, take the **connected, fully automatic, bean-to-cup espresso machine** Bosch is debuting here at CES. It's pretty cool on its own – it was a CES Innovation Honoree in the Smart Home category – but together, we're working to connect it to driver drowsiness detection.

Wendy Bauer:
We've all been there – you're on your way home from running errands and you're exhausted. What if your car could recognize you might be tired and automatically takes action? Now, with the functions enabled by the cloud and software-defined vehicles, your car can pre-empt your needs. Before you can even think about stopping to grab some coffee, an in-vehicle voice assistance like Amazon Alexa asks if you need a caffeinated pick-me-up. Why yes, you respond, after CES… a triple-shot cappuccino would be nice. And what do you know: 10 minutes later, as you open your front door, your coffee machine is putting on the final flourish of foam.

Tanja Rückert:
And for the times when you can't make it home for refreshment, we're developing what we're calling our **point-of-interest assistant**. Here, our Bosch vehicle interior monitoring camera monitors your gaze while you're driving and automatically identifies things you look at – for example, a particular restaurant or coffee shop.

Wendy Bauer:
Thanks to the real-time power of the cloud, with technologies such as AI, generative AI, and access to a host of the leading foundational models, you can ask your voice assistant, if the place is open and how busy it is, without even needing to specify the name of the establishment you're looking at. In real time, it will let you know if it's worth a stop or if you're better off going somewhere else along your route, thus saving you time as well as unnecessary driving.

Tanja Rückert:
Now that would be useful, wouldn't it? Thanks to our collaboration, these are just a couple of the features we could see in our vehicles soon. It's clear that no one company can realize the future of mobility

on its own. This is why it's so important that we collaborate across the industry.

Wendy Bauer:
At AWS we see collaboration as a key to the industry's advancement and success. By working together, we'll be able to achieve the future of mobility faster than ever before.

Tanja Rückert:
Still on the subject of vehicles and digitalization, here at CES we're also debuting two new mobility services that harness the cloud to cut costs and enhance sustainability. One is a new addition to our battery-in-the-cloud service portfolio: **Usage Certificate To Go** is a retrofit solution which draws on our extensive expertise in battery modeling. By analyzing battery data uploaded to the cloud from an OBD2 dongle, the service can determine a battery's precise state of health and help users to prolong their battery life by up to 20 percent. Our new cloud-based **Vehicle Health Services** are aimed at fleet operators: they offer tools such as predictive diagnostics to facilitate more efficient vehicle condition monitoring and preventive maintenance to avoid vehicle breakdowns and increase fleet utilization. Both these new service offerings can ultimately help prolong vehicle life and optimize resource use.

And when it comes to harnessing digitalization to optimize mobility generally, I can't leave out a mention of our **eBike business**. Across the board, we're using cloud-based connectivity to enhance the electric biking experience. For instance, over-the-air updates via our eBike Flow app enable users to keep their ebike system up to date and improve it continuously with new features and upgrades. Connectivity also underpins a whole suite of digital services, such as our eBike Lock and our eBike Alarm solution, which alerts you to any suspicious movement and also enables location tracking in case of theft. We're continuously growing our eBike portfolio, as you can see at our booth,

above all because we're committed to making eBikes a viable and attractive piece of the urban mobility puzzle.

While greater sustainability might be an add-on benefit for many of our digital service solutions, for others it's the main objective. We already told you how we're lowering energy usage in commercial buildings via our system integration solutions. We're also harnessing digitalization to achieve efficiency gains in this domain. Our Building Technologies division, for example, recently added a new energy-focused service for the European market to its suite for digital commercial building management. Modular, customizable, and compatible with old and new buildings alike, the **Nexospace Energy Manager** uses cloud-based data analytics to evaluate the efficiency of energy supply, distribution, and use. On this basis, it suggests concrete measures that can be taken to reduce consumption. One of our current clients is the German-owned international supermarket chain REWE. Based on our software's suggestions, they're seeing their energy usage slashed by up to 20 percent across more than 2,000 of their stores.

We're also leveraging digital technologies in combination with our expertise in low-emissions manufacturing to help others in the industrial sector reduce their carbon footprint. At the heart of **Decarbonize Industries,** a digital decarbonization planning service we offer together with a partner, is powerful AI-supported data analytics. At Bosch, we know from experience that traditional roadmaps to decarbonization take months or even years to draw up – our data-based approach, however, can generate a concrete plan in minutes. Available on a subscription basis, this service is already on track to help our customers in Germany significantly reduce both CO_2 emissions and costs thanks to efficiency gains, and we're currently laying the groundwork for rolling out the platform in other regions.

Our energy challenges are not going to be solved overnight, but one thing is clear: we can't afford not to act. For the sake of our planet, we

must end our reliance on fossil fuels, and we must do it quickly. At the same time, unrealistic targets will get us nowhere – we must focus on solutions that are feasible as well as affordable.

If history has taught us anything, it's that we have a seemingly unlimited appetite for energy. What is not inevitable, however, is that our carbon footprint must keep growing too. By driving forward electrification, switching to cleaner and renewable sources of power, and maximizing energy efficiency, we can meet our ever-increasing needs in a way that is sustainable for society and the planet.

Doing so, however, will require effort, investment, and the right policy framework. Another crucial piece of the puzzle is technology. Here, we're already hard at work on innovative new solutions that are helping us reduce the footprints of our vehicles, homes, and industries while we lay the foundations for a climate-neutral energy supply. At Bosch, we're committed to using technology as a tool for shaping a brighter tomorrow. Come visit our booth this week and see how our "Invented for life" solutions are helping to bring us a step closer to our vision of sustainable, unlimited energy for everyone.

Thank you!