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## Engineering the All Electric Society

***We have a long way to go and little time. Innovative engineering and new design paradigms are the only way to get there.***

*TTI has sponsored this post.*

To combat climate change and reduce emissions, many industries are focusing more on electric power. But some companies are going even further to see what they can do to go beyond their walls and make our society full electric.

[Phoenix Contact](#) has made it their next decade's goal to produce the electronic components needed to make this idea a reality. The company calls this concept the All Electric Society.

“The idea of the All Electric Society is to electrify the different sectors that we have in our global economy and society—in terms of mobility, buildings, electric energy, energy generation and infrastructure—based on renewable energies, to combat the CO<sub>2</sub> emissions of the fossil fuel energy that we currently use,” Rüdiger Meyer, electrical engineer at Phoenix Contact and application expert for [energy storage systems](#), told engineering.com.



*The vision of an All Electric Society includes a connected global system of renewable energy, intelligent storage and affordable power for all. (Image: Phoenix Contact.)*

There's a lot of work that must go into realizing the All Electric Society, and like-minded engineering companies are dedicated to making it happen. Here's how the visionaries think about energy and, crucially, how to store it.

### Trending in the right direction

[Phoenix Contact](#) provides many components used for industrial automation and electrification. These are key elements to working towards this electric vision of our world. But Phoenix Contact is not acting alone in this mission. The company defined their next decade's goal as enabling this All Electric Society based on numerous customers asking for these types of devices.

“The market asked for this, and the requests are increasing,” Meyer says.

This trend can be most visibly seen on our roads, where cars have already been moving in the direction of a more electric world. Predictions for increases in electric vehicle (EV) adoption vary widely, but the S&P Global Mobility forecasts EV market share for new vehicles is likely to reach 40 percent by 2030. This would put the total number of EVs on the road at over 28 million units. That is a huge jump from the total of 14 percent of all new cars sold that were electric in 2022, 9 percent in 2021, and less than 5 percent in 2020, according to the International Energy Agency.

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But electricity alone is not necessarily sustainable. It must be generated somehow, and according to the Environmental and Energy Study Institute, around 80 percent of our world's power is still created by fossil fuels. A large percentage of this goes into the electricity we use in our homes and businesses.

That is why the true model of an All Electric Society must go one step further to make a major impact. It must produce all power through renewable sources.



*Solar panels and other sources of renewable energy are key to powering the All Electric Society. (Image: Phoenix Contact.)*

However, Meyer says more must be done in sectors across the board to make the true progress needed to combat climate change. Of course, these new changes will come with costs. Investing in new technologies and infrastructure is not cheap. However, Meyer argues the choice will be monetarily worthwhile in the long run.

“The additional cost to realize this kind of transformation to the All Electric Society will be compensated by the cost savings of not producing as much climate gases as we do now.”

### Storing renewable energy: Beyond batteries

If we want to reach this all-electric world, sustainable energy generation will not be the only technology requirement. We will also need efficient [energy storage](#) systems.

The sun doesn't shine all day and the wind doesn't blow around the clock, but our energy needs are 24/7. To make renewable energy reliable, we need to be able to store it.

“[Energy storage](#) technologies are developing extremely fast at the moment,” Meyer says.

Batteries are an important part of this, but they're not the only game in town. From mechanical flywheels to gravity systems, there are a lot of options to store energy. As for widespread adoption, Meyer envisions batteries being relied on in the short-term for energy storage, but hydrogen being the key for long-term [energy storage](#) and transportation.

That's because hydrogen can be stored in relatively simple tanks, and easily transported in pipelines, trucks or ships. “If you want to do that with batteries, you need a lot of batteries,” Meyer says. “If you want to transport the energy, you have to transport the batteries themselves or use large distribution grids. That makes hydrogen very suitable for the long term because storing it is relatively easy and much less expensive than batteries.”

Hydrogen technology is not yet mature enough that this could cheaply be put into place tomorrow, but engineers are working on making this storage technology affordable.

“Mass production is the thing that is missing at the moment,” Meyer says.

There are some industries that will be more difficult to switch to the all-electric model, such as steel or aviation. However, Meyer believes that even these energy-hungry industries will eventually be made fully electric.

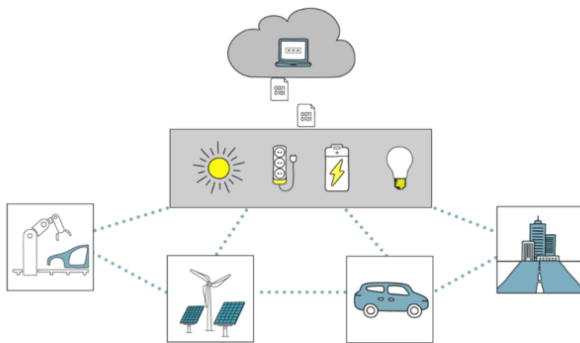
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## How to achieve the All Electric Society

In addition to [energy storage](#) technologies, other innovations will be needed to mold an All Electric Society. One is the development of a safe, reliable infrastructure surrounding the shifts in power distribution.

To effectively distribute energy and ensure that every area has power when it is needed, all industries and sectors must be connected. They must be able to exchange data on energy usage, and reallocate power as needed. This is known as sector coupling.

“We should think about not only one application at a time, but combining different applications, different sectors with each other. They should communicate with each other to make the complete system smarter than it is today,” Meyer says.



*Sector coupling is necessary to enable a smarter, more sustainable power system for the All Electric Society. (Image: Phoenix Contact.)*

To securely facilitate these data connections and shifts, new components must be created.

“The [Phoenix Contact] [PLC] controller business is to enable cloud-based control algorithms as well as hardware to realize this sector coupling, which is very important to make the All Electric Society happen,” Meyer says.

The company’s [PLCnext ecosystem](#) is a prominent example of the control algorithm hardware and collaboration that they aim to enable with this kind of approach. They also produce Single Pair Ethernet products (SPE), networking devices, ethernet switches and security devices that they see as supporting the push for the All Electric Society.

Other things that could enable getting to a fully electric world include the creation of more externalized power systems, artificial intelligence (AI), and increased use of direct current (DC) power rather than alternating current (AC) power.

“I think one important trend will be direct current technology,” Meyer says. “In the past we have mainly based everything that we are talking about on AC grids, which have certain advantages but have several disadvantages when we talk about efficiency and reliability. We would save a lot of converters, components and energy if we would only base our system on DC current.”

Designing towards this very different world in the future means keeping these changes in mind right now. Although this vision of an All Electric Society may seem far off, it may come sooner than you’d expect.

“I think to overcome these climate change issues we have to be fast. We have to realize this kind of change within the next 5 to 10 years,” Meyer says.

For engineers, that’s a challenge well worth accepting.

To learn more visit [TTI and Phoenix Contact](#).