technology

Automakers Drive Towards Hydrogen Cars

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Toyota and BMW have formed an alliance to work on fuel cell cars. So have Daimler, Ford, and Nissan, with hopes of having cars on the road by 2017. But why now, and what obstacles still stand in the way? Jennifer Kurtz discusses the current state of hydrogen fuel technology.

Transcript

JOE PALCA, HOST:

This is SCIENCE FRIDAY. I'm Joe Palca, sitting in for Ira Flatow. This is SCIENCE FRIDAY. I'm Joe Palca, sitting in for Ira Flatow. Later in the hours, digital privacy and dating the demise of the dinosaur,

that's a lot of D's. But first, last week, Daimler, Ford and Nisson announced an alliance to work together on hydrogen fuel-cell technology for their passenger vehicles. That follows on the heels of a similar announcement last month from Toyota and BMW. Other major automakers have signaled that they're fuel cell, too.

But where does the technology stand now, and what needs to be done to make the carmakers' hopes of getting tires on the road by 2017 a reality? What obstacles still stand in the way? That's what we're talking about first this hour. So give us a call. Our number is 1-800-989-8255, that's 1-800-989-TALK. If you're on Twitter, you can tweet us your questions by writing the @ sign followed by scifri. If you want more information about what we'll be talking about this hour, go to our website, www.sciencefriday.com, where you'll find links to our topic.

And now I'd like to introduce my guest. Jennifer Kurtz is a senior engineer and the leader of the Technology Validation Group in the NREL Fuel Cell and Hydrogen Technologies Program, part of the National Renewable Energy Laboratory in Colorado. Jennifer Kurtz, welcome to SCIENCE FRIDAY.

JENNIFER KURTZ: Thank you, Joe, and I'm happy to be on the program today.

PALCA: Oh, that's great. So you've - I mean, what have you been doing with these cars over at NREL? What's been the last few years? Have you been driving them? Have you driven them?

KURTZ: Yeah, in fact I was driving a fuel-cell vehicle this morning. We went out and got some bagels for our center to celebrate the interview today.

PALCA: So is it a different kind of experience? Do you feel like you're not driving - I mean, is it different from a normal car, You know, the cars we're used to, internal combustion?

KURTZ: Yeah, no, the car has some unique characteristics, one of them being zero tailpipe emissions. It's quite quiet. But, you know, once you start driving the vehicle, it's really easy to forget that you're driving fuel-cell vehicle. It's just like a standard, traditional driving experience.

And since we had visitors on site, we had five adults in the vehicle. It was very easy to carry a conversation. And it becomes just a standard mode of transportation.

PALCA: So do they look any different from other cars, or can you put a fuel-cell engine into any - or a fuel-cell-equipped engine into any kind of car?

KURTZ: You can use any car, actually. We have - the vehicles that we've analyzed, they range from compact sedans all the way up to SUVs.

PALCA: So what's the advantage, do you think, of using a hydrogen-powered, full-cell-driven, fuel-cell energy care over, say, you know, one that you just plug in?

KURTZ: Well, for the fuel-cell vehicle, the zero tailpipe emissions is one key aspects. These vehicles

can be filled in three to five minutes, and right now there are hydrogen stations available 24/7 and have very traditional retail-style filling capabilities. Vehicles - excuse me.

PALCA: No, go ahead. I was just going to ask, you said that there are filling stations available, but that made me wonder, you know, if I'm driving across the country, could I make it? I didn't think there were so many of those.

KURTZ: No, not across the country. The hydrogen stations, as well as the vehicle deployments, are very targeted right now, and that - so that the investments are not spread too thin. So for instance California, Hawaii, the Northeast all have focused activities in fuel cell and hydrogen deployment.

So for instances there is a pipeline station in Southern California. You can drive up and fill up. It looks very similar to a traditional gasoline pump. And fill your vehicle quickly and drive off. And with the vehicles, we validated a 250-plus-mile range on the vehicles we've analyzed. We've also participated in an on-road driving evaluation in collaboration with Toyota and Savannah River National Laboratory.

The results of that evaluation was a possible 431-mile on-road range. So range is another key aspect of fuel-cell vehicles.

PALCA: Right, so is that - I mean, we talked at the beginning, I said at the beginning about the obstacles. Is getting that kind of hydrogen infrastructure or the fueling infrastructure in place something that's one of the roadblocks to getting these cars on the road more widely?

KURTZ: Yes, that is a challenge. And one of the ways that we're working on that challenge is through highly collaborative relationships between automakers, energy industries and government, and that's state and federal government. So these activities include working groups to identify how to make the investment in stations.

It's also looking at scenario analyses so that we can understand risks with station deployment and really look at market and regulations and policies to help make sure that we're putting early stations in or the next generation of stations in key areas.

PALCA: Well, let's take a call from one of our listeners. We've got quite a few. And let's go first to Molly(ph) in Hillsboro, California. Molly, welcome to SCIENCE FRIDAY.

MOLLY: Hi, thank you. I was wondering two things. First, I'm wondering about the safety in terms of accidents on the road, it being hydrogen and all, and the second thing is I was wondering if there are plans in place to keep the manufacture and such in America.

KURTZ: Yes, so with regard to safety, the vehicles that we've analyzed through the support of the Department of Energy Fuel Cell Technologies Office, has had a very strong safety record. Safety is a key aspect to the vehicle and station deployment. It includes things like hydrogen sensing, alarms, control strategies to make sure that if there is a situation that the systems are shut down appropriately

and quickly and safely.

Traffic accidents are common. With hundreds of fuel-cell vehicles on the road, we've actually some fuel-cell vehicles that have been in non-related hydrogen accidents. All onboard safety mechanisms reacted appropriately, and we didn't see released hydrogen.

And just from my personal perspective, I feel completely safe driving a hydrogen fuel-cell vehicle around, having my family and the people that I love in those vehicles.

PALCA: And I don't suppose you really have that much to say, Jennifer Kurtz, about whether or not these cars are built in America.

KURTZ: Well, you know, it's - you know, it's certainly an international effort. We've got the - just the OEMs that you mentioned at the beginning of the program. They're - it's international. So we do have deployments in the United States, and you're exactly right. In terms of manufacturing, that's outside of my spectrum.

PALCA: Yeah, let's take another cal now and go to Matt(ph) in Rockford, Illinois. Matt, you're on SCIENCE FRIDAY.

MATT: Hey, hello there, how are you guys doing?

PALCA: Great.

KURTZ: Great.

MATT: I have a question for you in regards to electrolysis and type of a hybrid fuel-cell vehicle. I've created a little HHO system run my whatchamacallit, my lawn mower. It seems to work. I cut the consumption in pretty much half. I've seen people on the Internet do the same things for their trucks, except they just purely run off of electrolysis, the HHO systems. Would you guys ever consider doing something like that?

Because I know the hydrogen systems that you guys are talking about, the infrastructures, you know, implement the stuff would be, you know, amazing in the cost it would take for the taxpayer to put up with the bill.

KURTZ: Well, how about we have a - there are a number of ways to produce hydrogen. And we have four fuel-cell vehicles on loan at NREL's campus fom Toyota. Our hydrogen is actually produced through electrolysis that's powered by wind and solar.

So a colleague has stated our fuel-cell vehicles are driving around today based on hydrogen produced from wind that blew last week. So that's an example of an exciting way to produce hydrogen. There's also an example a trigeneration system right now in Southern California at a wastewater treatment facility.

This facility or this system uses biogas to fuel a fuel cell, and it co-produces heat, power and hydrogen for light-duty fuel-cell vehicles. So there are a wide range of possibilities and ways to produce hydrogen right now that are being worked on.

PALCA: So I've been wondering, you were talking earlier about the safety of these systems. I heard a very interesting lecture some weeks ago about these solid-state systems, some sort of a solid material that couldn't explode, that would be recharged, and you would sort of move it in and out, not really just a gas tank of hydrogen but something a little different. Do you know about those?

KURTZ: Well, my area of expertise is looking at and validating fuel-cell vehicles that are on the road today. Those fuel-cell vehicles are using compressed gasses, as you mentioned. Most of the vehicles are at 700 bar pressure. And so we've seen very strong safety records with those tanks. I think, as I mentioned, I feel comfortable with those fuel-cell systems and that onboard hydrogen storage system.

PALCA: So is there one thing at this point that you think is a barrier to getting these cars on the road? Is there something that - I mean, what would prevent it, for example, from making it by 2017?

KURTZ: Well, I think there are challenges that are being worked on. We talked about hydrogen infrastructure. I would say cost and durability are also two challenges remaining. I think what we've seen is a progression in terms of technology development.

For instance the vehicles that we looked at very early on, so this would be approximately 2003 technology, within the last decade, the range was - we've seen improvement in range, in freeze capability, in durability. And we've also - DOE has funded projects that have seen 80 percent cost reduction in fuel-cell systems.

We think with the partnerships, the investments that are being made by private industry, as well as government, will continue to see costs come down. But we certainly need to leverage economies of scale and investments across the board.

PALCA: Well, I'm wondering: What are costs? I mean, is this car going to be - are these first cars going to be comparable to what a standard car is going to cost, or are they going to be a lot more?

KURTZ: In terms of specific costs, I don't have the answer for you.

PALCA: Of course not.

KURTZ: But we have seen with all advanced vehicle technologies that there is a price premium associated with those technologies. So I expect that to be the case. But the partnerships, the recent announcements by the automakers have identified cost as a key area for development, whether they're looking to go in terms of the production scale.

For instance Hyundai has also announced recently they've kicked off their series production of up to

1,000 fuel-cell systems. So we should see in each phase of the deployment and wide-scale commercialization, or working towards wide-scale commercialization, that those costs won't come down.

PALCA: OK, well, we'll have to leave it there. We've run out of time. Jennifer Kurtz is a senior engineer and the leader of the Technology Validation Group in the NREL Fuel Cell and Hydrogen Technologies Program, part of the National Renewable Energy Laboratory in Colorado. Thanks for joining me today.

KURTZ: Well, thank you very much for having me on.

PALCA: And when we come back, digital privacy. Do you own any of your personal data? We'll be right back after this short break.

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