

Sam Rashkin 26:52 minutes, Wednesday January 14 3:00 pm, 950 L'Enfant Plaza

Kat Godlewski: Welcome to the US Environmental Protection Agency's Indoor airPLUS podcast series. This episode is being recorded at the US Department of Energy's office in Washington D.C. The Indoor airPLUS team has the privilege of speaking with Sam Rashkin today. Sam is from the US Department of Energy and will be talking about the Zero Energy Ready Home program and its relationship with the Indoor airPLUS Program and indoor air quality.

Nick Hurst: Hi, this is Nick Hurst with ICF International and I'm here with Sam Rashkin from the US Department of Energy. Sam is the Chief Architect for the Department of Energy's Building Technologies Office and he oversees the DOE Zero Energy Ready Home program. Thanks for taking the time to chat with us today.

Sam Rashkin: Good to see you Nick.

Nick Hurst: We would like to hear from you what's coming down the road with the program and any new technologies, but first could you give me a very brief background on the Zero Energy Ready Home program and how it came to be?

Sam Rashkin: Sure. Zero Energy Ready Home used to be called the Builders Challenge, and Builders Challenge (and now Zero Energy Ready Home) were developed as a way to take innovations from DOE's Building America program, which produces innovations for the housing industry for high performance homes, and deliver those innovations to the industry. Building America is a research program and develops new ideas and practices. We want to get those applied and used by the industry. Our label very much selects the best recommendations by experts in the nation, sometimes the world, on how to do high performance buildings. And for builders who work and partner with DOE, using that label, they get the recognition to the consumer, much like the ENERGY STAR label does for builders and product manufacturers that work for that program. It's a vehicle to get to the industry, innovations from Building America. And let me just say one word about Building America, which is that, the housing industry is uniquely configured differently from other industries in the US. Most industries are consolidated with a small number of manufacturers, and those manufacturers have a lot of resources and knowledge about how to innovate their products. In contrast, the housing industry has 70 to 80 thousand different builders, widely dispersed, often small organizations that are not funding new innovation or research. Building America, is this very important hub of innovation for an industry that otherwise doesn't have a way to address high performance solutions that are critical to the industry. It's a very important program, and Zero Energy Ready Home gets those to the market. And if we are successful, hopefully, or possibly, the ENERGY STAR for Homes Program will pick up our work and bring it to their more mainstream builders.

Nick Hurst: Absolutely. Seems like a great vehicle. Very important obviously for a program like this to bring innovative new technologies into the fore and obviously put them into a comprehensive package for builders, as well.

Sam Rashkin: And it's equally important that it doesn't confuse the building industry. We try to be a really good government set of options for builders that are very nearly aligned. So the Zero Energy Ready Home program is completely matched up to the framework and delivery system of the ENERGY STAR for Homes Program. It has a very identical architecture to the specifications. And it has the exact

same verification process, everything is like a simple staircase for builders who are ready to keep moving up each step of the performance ladder, if you will.

Nick Hurst: Great. In that regard, how does Indoor airPLUS plug in, and how has it been incorporated into the specs?

Sam Rashkin: Our view of Zero Energy Ready Home program was that, we had to deliver to our builder customers and our home buyers a certain value proposition to justify our label. We had to come up with solutions that meant something to them. When we looked at taking housing to the next level of performance, the Zero Energy Ready Home level of performance, it was really clear that indoor air quality was not extra credit--it was mandatory. These homes are getting so much better insulated and so much more air-tight that you could not do pieces of indoor air quality. Much like a green program, you get different points for doing different improvements to air quality. We said it needed to be a comprehensive approach and to us. There was an off-the-shelf solution. The EPA's Indoor airPLUS package had gone through a tremendous development process and vetting process and was an off-the-shelf solution for comprehensive indoor air quality. It was a natural fit to bring that into the Zero Energy Ready Home program.

Nick Hurst: That makes a lot of sense. From the standpoint of a builder, if I am participating in this program, and I am going through the checklist and doing all the right things, how do I communicate that value, especially the value of indoor air quality to the consumer in an effective way?

Sam Rashkin: That's a great question because, in fact, communicating the value is just as important--sometimes more important--than the technical solutions because if the builder is not going to be successful selling the specification and the label to the market, there's no reason to stay working with you, as it's a voluntary program. For us, we've studied how to make this value proposition work. A lot of our research (and looking out to best practices for marketing and communicating any value) led us to the realization that effective communication means absolute clarity. That clarity is often achieved by contrast. You can choose our solution and get this. If you don't choose our solution, you get that. The way that we like to work with the builders on all of our value propositions which include health, comfort, quality, technology, energy efficiency, durability and all these improvements are conveyed the same way. We developed through a very detailed quantified analysis, a set of detailed comparison bars between what you get from the Zero Energy Ready Home label, to the ENERGY STAR for Homes specification, to an existing home based on a 1993 MEC vintage home. We show comparatively how much health you get, for instance, and if you want all the health recommendations by the leading organizations and experts that should be in every new home, you get all the recommendations because the bar showing how much you get is the full width of the diagram. If you only get ENERGY STAR for Homes, you get half those recommendations--not because ENERGY STAR for Homes is a bad program, it's just focused on the building science and the energy efficient performance that is a certain increment above code. So you wind up with half the recommendations, and you go to an existing home and you get hardly any. With a lot of clarity you understand basically as a consumer, if I want all the health recommendations for myself, my family, my children, I can go Zero Energy Ready Home. If I want to go with half of those recommendations by the leading experts for health, I can go to an ENERGY STAR home, and I can go to an existing if I don't care. Or I'll have to figure out solutions after I buy the house. It becomes so much more effective, we believe, for the builder to sell health because now there is a difference. Virtually everyone who is in a green program, even the ENERGY STAR program, is touting it's

more comfortable, it's more healthy, it's more durable, it's more safe. What does that mean? Our job is to make it mean something. It means the same thing in energy efficiency. If you want the level of energy efficient performance, the best that the experts in the nation recommend, you get that with Zero Energy Ready Home. If you want about a third less you can go to ENERGY STAR for Homes labeled builder. And if you want hardly any of the recommendations for efficient performance, you can buy an existing home. Same for technology, same for durability, same for quality. All these things, in terms of the values that we are presenting, are choices people have to make and therefore compromises they have to accept if they don't choose to buy a Zero Energy Ready Home. That's how we think we create a good platform for builders to communicate value. There are lots of other things we recommend. For instance, we are hearing over and over, numerous times, that builders sell homes to buyers after they've put all the Indoor airPLUS improvements in through the Zero Energy Ready Home spec, and afterwards children who have had to use inhalers have thrown away their inhalers within 2 to 3 months. We would recommend that they share that experience with the buyers--again, clarity is the contrast. Before we had this home, we had to use inhalers--after, we didn't. Wouldn't you agree that this is something you would love to have for your children if they are using inhalers? It's a very simple choice.

Nick Hurst: Seems like builders have a great opportunity, obviously, to showcase what has happened, those great experiences that those homeowners have already recognized.

Sam Rashkin: It's a great opportunity to showcase it, but unless they introduce that clarity, that contrast, it won't have the impact. At least that's our strategy that we are looking at.

Nick Hurst: There are a lot of components that go into Zero Energy Ready Home. You've obviously mentioned, starting with energy efficiency, water efficiency, indoor air quality and moisture management are aspects there--and there are solar ready components, as well. Can you dive into the moisture management and indoor air quality pieces a little more and why you think those are substantially important for a high performance home program, especially when you are building super tight houses like these builders are?

Sam Rashkin: Maybe let me first address the overall architecture of the label specifications. The individual pieces are all important, but how they fit as a system is what really drives the effectiveness of this label as a risk management strategy for builders. The first risk we mentioned a little bit already is performance risk. Buildings today are so much better insulated and so much more air-tight that everything changes. Even if you are building a code building or a low HERS score building like hundreds of thousands of homes are doing today each year, if that's where you're at, you're already in that risk arena. With the additional insulation and airtightness, first you're building a construction assembly that can no longer dry--where in the past, it used to be able to dry. You are also building an assembly where the outside surface in cold weather is much colder because heat flow through the wall assembly or roof is reduced with the additional insulation and air tightness. If you have any weak spots where air can get through, you have a much better wetting potential. If you don't have a good comprehensive water management, that means that where the building used to be able to dry, it can't. Water management and moisture flow management are absolute risk management essentials, or you are facing a lot of potential liability that you don't want to have as a builder. That's number one in terms of the architecture. Once we go into more effectively insulated and air-sealed envelopes, we have to do moisture management. Secondly, what happens with the insulation and the air tightness and the better windows? The loads are so much reduced (heating and cooling loads), so much so that when the airflow

is radically less than it used to be, cubic feet per minute flowing through ducts, and the swing seasons are much longer because we don't need to start cooling and heating in buildings that are that much better insulated. Where we may not have a cooling or heating load, we still may have a moisture load because there is still a unit outside. And the system normally provides the moisture management by cooling the air flowing over the coils--that's not happening during longer swing seasons. Secondly, with less airflow, you no longer get away without designing the duct system and knowing that you're getting good mixing throughout the house. There's a whole different comparative about design and optimized comfort system. Comfort is no longer heating and cooling--it's heating, cooling, and humidity. That's number two. And the third one that we mentioned is that the house is tighter so the indoor air quality risk is much greater for builders because they have less air infiltration, and also any contaminants inside the home will accumulate at a greater rate. We have an obligation to address those. The other part of the architecture for us is this differentiation risk that you have to manage as a builder. It's more competitive. In fact, today existing homes are selling at 85% of the total number of homes sold in the marketplace. You have to compete better and provide more reasons. You can differentiate better by using more efficient components that take your loads along with the lower heating and cooling loads--now even lower, to the point where you can offset all the energy in the building with solar or renewable power. Solar ready instruction nails down that differentiation possibility because now your house can be a zero ready house, and that's a very powerful way to go to market and engage consumers with a very exciting performance level. That's what drives our spec, moisture management, optimized comfort, indoor air as comprehensive, and solar ready construction. That is the foundation of the Zero Energy Ready Home spec, all for those very practical reasons of managing risk and delivering a better solution to the marketplace.

Nick Hurst: These builders are both Zero Energy Ready and Indoor airPLUS--they have a great value proposition for the consumer--for the homebuyer--by obviously being able to manage risk. I'm curious though, what are some of the bigger challenges builders may have in hitting the target? Are there any solutions you've seen for the challenges?

Sam Rashkin: The big challenges for builders in the Zero Energy Ready Home program begin with first getting the ducts inside the conditioned space. For decades and decades, over half a century, often the primary solution has been putting ducts in unconditioned attics or unconditioned crawl spaces. There's some design or technical changes that have to be made to get those ducts in conditioned space. Lots of options, lots of solutions, all of them cost effective. But it's difficult to redo your construction business in a way that is that different. That is challenge number 1. Number 2, in hot humid markets, you will often need a separate whole house dehumidifier for all the reasons we talked about. Comfort is no longer just heating and cooling. In a low-load house, long swing seasons in a hot humid market, we are kind of coming to our senses and making that reach to realizing that you have to have a dehumidification solution. Just relying on the air conditioning system running 12 months of the year is not the solution. That could be challenge number 2. A third challenge that comes up very often is the requirement that the hot water distribution system--the way we get hot water from the heater to the fixtures, showers, sinks and so forth--that has to be done more efficiently. We often waste 3 to 6 thousand gallons a year, just waiting for hot water because the way we distribute hot water from the heater to the fixtures is so inefficient. The three options for how to do that, forcing the industry to think about something they haven't really thought about that much because it wasn't really top priority. What winds up happening is consumers love when they get instant hot water from the fixtures and once you try it, you get a have-

to-have-it mentality. That could be a challenge for builders. And maybe the next biggest challenge--and I'll leave you with four--is the ventilation system. I think there is no trouble with getting ventilation systems that meet ASHRAE 62.2, the national standard for how we provide whole house ventilation. The problem is the low-cost systems often don't provide very consistent or adequate ventilation--not nearly as much as a good balanced system. A balanced system can cost 5, 6, 7 times as much. Getting an industry to spend that much more for something that they aren't sure about how to sell--getting back to that communication question earlier--that can be a challenge. Later on, one more issue with ventilation, even with the more expensive systems and the balanced systems--if you do install them right, (which is a whole infrastructure issue), you get a whole set of professionals that know how to put these systems in correctly, which is a challenge itself within the market. Even if you put the system in incorrectly, a balanced ventilation system, it's still a different ownership responsibility for the homeowner. They have to maintain the system or its performance will drop off substantially. Often the outdoor intakes can get clogged with leaves, dust or debris. Filters may not be changed and particularly, many homeowners aren't disciplined about changing that first filter, let alone new additional pieces of equipment, the ventilation system, and its filters. Then there is other fine-tuning and maintenance that needs to be done on the ventilation system. When you have a house that has so much less tolerance for good indoor air quality, without ventilation, you have to start thinking "How to builders weigh in and create a behavior change in homeowners to maintain a new piece of equipment they are not used to?"

Nick Hurst: Absolutely, and homeowner education is certainly one of those things we want to see more builders doing. Indoor airPLUS has a provision to provide homeowners with a resource guide or manual for how to run their home effectively and efficiently. I'm curious--Indoor airPLUS has focused on combustion pollutants as well. You touched a little on the ventilation and some of those nuances and sometimes challenges for builders. What do you think are some of the most important measures that should be considered by a builder to address combustion pollutants when building a high performance Zero Energy Ready Home?

Sam Rashkin: For me, the first no brainer is to start by using direct-vent equipment for the water heater and furnaces. I know there is still a preference in more mild and hot climates to still use gravity exhaust equipment. But fortunately there, the equipment isn't in the conditioned space--it may be in the garage. Anytime you have combustion, water heaters or combustion space heating equipment, you want to go direct-vent. You want to bifurcate the air needs of combustion from the house. You can very effectively and completely mitigate risk of back flow or fire issues from reverse flow of the air. It's very much a no-brainer. The harder challenge with combustion by-products is associated with cooking. From the research we know, in fact, this particulate matter that is 2.5 microns or greater, PM2.5, is in fact the most significant health hazard inside our homes. That's coupled with the other research finding that the range hoods and down drafts that we install at our cooking appliances, at our ranges, aren't very effective--often 33% or less capture efficiency. We have our most significant pollutant, and we have a technology that doesn't do a very good job in capturing it. And then we can add later on the behavior of the consumer and how often they actually use their exhaust equipment at their range to ensure they are getting rid of this very dangerous contaminant. Where we are at right now with Indoor airPLUS and linked to Zero Energy Ready Home, we are at least getting the ASHRAE 62.2 requirement that you have to have spot ventilation in the kitchen that gets rid of the exhaust from cooking to outside. We have that. I think that's one of the areas for significant improvement. We are going to introduce a lot of innovations in the future for that.

Nick Hurst: That's excellent to hear. On that note, at the Department of Energy, you guys obviously have a good glimpse into some of those cutting edge technologies that are in development. Range capture efficiency might be one of those where we see some developments down the road. What are some other things you've seen lately that are inspiring in terms of new products or technologies?

Sam Rashkin: Most of our innovations are focusing on solutions for the three primary risks that I mentioned earlier, which is moisture-managed construction assemblies due to the nature of better insulated, air-tight homes. It is on optimized comfort systems for low load homes, particularly very low-load homes that you get with Zero Energy Ready Home construction. And third is on indoor air quality solutions, particularly the smart ventilation systems and these high capture exhaust systems for kitchens. I'll go through those one at a time with a quick 10,000 foot view of where we are going. In terms of moisture-managed construction assemblies, what we hope to do is complete research in the next three years that defines clear choices for the housing industry. You can have an effect, almost like a set of guidance labels next to every choice you make that define the risk. The three risk categories we are looking at are moisture risk, cost risk, and performance risk--or consumer experience. If you want to use one type of wall where there is more risk, you'll know the risk, or you know the cost, or you know the experience. I think calibrating that will create clarity and effectiveness for communicating to buyers. We only use these assemblies because it is the least risk for you, you won't ever have a moisture problem, it's the lowest cost of ownership and will be the best experience for comfort, durability and quality of the house. It will have the comparative ability. Giving the housing industry very clear moisture-managed solutions for construction assemblies is one innovation. It is not a specific product, but it is a guidance solution that is missing and then translates for a way to go to market and be more effective. The second thing we are looking at is to develop solutions for optimized comfort that ensure the builder they know by using this type of system, they will get adequate flow and mixing throughout the house, and they will manage moisture. We define those solutions for all the different climates and help the industry make good choices. The third is with smart ventilation systems. Develop smart ventilation systems that are less energy intensive and more effective at diluting all the contaminants in the building. Then we make sure the high capture efficiency technologies and more effective exhausting of combustion products from cooking. That will also include a label on the products, much like the ENERGY STAR label that quantify that capture efficiency. Those are major innovations that will be in the market in the next three to five years.

Nick Hurst: Excellent, very exciting. Well we certainly appreciate all the work you guys do at the Department of Energy to push those things out into the industry and to set up a prime example with the Zero Energy Ready Home program that a builder can tackle and participate in--and really increase and grow their business in their market, too. Thanks again for taking the time to sit down and chat with us today, Sam. To find out more information about Sam's work at the Department of Energy and how to participate in this great program, go to ENERGY.gov and search Zero Energy Ready Homes. And be sure to check out the Indoor airPLUS website for more resources, and like Indoor airPLUS on Facebook, and follow us on Twitter at E-P-A-i-a-PLUS (@EPAiaPLUS). Thanks again for listening.