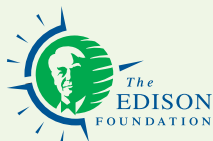


# Smart Homes, Smart Customers: A Solid Case Study and Further Thoughts

*Excerpted from **Powering the People 2011***

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INSTITUTE FOR  
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# Smart Homes, Smart Customers: A Solid Case Study and Further Thoughts

*The marriage of information technology and consumer education is enabling a new, wholesome relationship between utilities and customers. Customers – and society as a whole – will benefit if we get it right.*

**Moderator:** **Michael Yackira**, President and CEO, NV Energy;

**Panelists:** **Peter Delaney**, Chairman and CEO, OGE Energy Corp.;

**Scott Lang**, Chairman, President and CEO, Silver Spring Networks; and

**Ron Binz**, Chairman, Colorado Public Utilities Commission.

**Yackira:** We're going to be exploring what's changing with respect to technology in our industry and I thought it might be good to talk about an

*This discussion is an edited version of a Smart Homes panel discussion featured at The Edison Foundation's "Powering the People" conference, held in Washington, D.C., March 3.*

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analogy. The way we sell electricity today is kind of like driving up to a gasoline station but without knowing how much gasoline you put into the tank or how much it cost: You fill up your car, you pay with a credit card, and at the end of the month you get a bill. You wonder how you could have spent \$250 on fuel that month, but it's too late to do anything but pay it.

In the electric power industry we also have monthly billing cycles. At the end of the month the customer may have no idea which of his electricity uses are most costly, or why. We're about to change all that. The technology we're talking about today – the



**Michael Yackira**

“smart grid,” “smart meters” and the platforms and applications that will make them possible— will fundamentally change the way we interact with our customers, and how they consume electricity.

We’re going to talk about strategic partnerships between utilities and their technology counterparts – partnerships focused on making a transition to a more interactive, more transparent experience for our customers and maximizing benefits to them. We’ll first focus on a very promising approach in Oklahoma. We’ll hear from Peter Delaney, Chairman and CEO of OG&E Energy, and from Scott Lang, Chairman, President and CEO of Silver Spring Networks. After that, Ron Binz, the very knowledgeable Chairman of the Colorado Public Service Commission, will comment on the promises and potential pitfalls we face. He can even talk about some of his own experiences in that respect.

**Delaney:** I’m going to talk about customer engagement, and about AMI, the Advanced Metering Infrastructure deployment we are doing in Oklahoma. We’re about one year into a three-year period deploying the hardware. But the crucial work, laying the foundation, goes back to 2007. One of our

partners since 2007 has been Silver Spring Networks, and Silver Spring’s CEO Scott Lang is with me here today to talk about what’s happened so far and the results we’re seeing. We’ll also offer the perspective of some of our customers in a few videos that we have today.

**Lang:** Thank you, Pete. Being a networking company, we think about how to connect all of the devices that generate, consume, manage, or monitor the flow of power. We’re going to enable utilities to cross a bridge that has never been crossed – sending signals back and forth to devices making them “intelligent” – enabling utilities to interact with their customers in a whole new way. Pete will lead off with some customer stories.

**Delaney:** There are a lot of media stories – you hear about push-back from customers on smart meter deployments. But they’re not all going that way. Our surveys indicate we have a high level of customer and community support. Customer satisfaction from those customers who have actually participated in our pilots are really off-the-charts positive, and demonstrate how it’s going to change our relationship with our customers. I have a video we are going to roll. It’s the Assistant Superintendent of schools for Norman (Okla.) Public Schools. They were in our pilot and actually saved \$15,000 over four months.

[Video begins]

**Dr. Roger Brown, Assistant Superintendent, Norman Public Schools:**

“It’s very beneficial to be a part of a pilot like this, because we’re being part of something that might really change the behavior of people throughout the state. Plus, it’s a great

teaching tool for our students. As we get involved in this, and share this information with our students, the kinds of things we are doing as a district impact not only the Norman Public School District, but the community and the state. How great is that?”

**Delaney:** When we started this AMI deployment in 2007 our number one priority was demand response. We really had four elements to our approach. *The first part* was customer education, explaining to our customers and communities the role that we hope they will play, and the opportunities for them if they do. *Secondly*, we needed a demand response approach that relied on voluntary participation of our customers as

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*In 2007 we said publicly that our goal was to not build another power plant until after the year 2020. We were very public about that goal.*

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opposed to direct load control. *Third*, we said that as we deploy the hardware in the field we need to be offering functionality to our customers, so they can see benefit and not wait until we get to the end of our three years. *The fourth thing* was that we set a vision for our customers – and for our own employees – that would get them excited about what we are trying to do, get them to buy in on our value proposition. In this case our vision was a business goal: In 2007 we said publicly that our goal was to not build another power plant until after the year 2020 – we had been

looking to build in 2015, 2016. We were very public about that goal.

**Lang:** Since we have been working on networking smart meters I think we probably have close to 7 million homes networked around the world and we’re networking tens of thousands of homes per day.

**T**here are a lot of challenges you come up against and we have learned a lot. A couple of things are important takeaways from this project. Pete and his team never underestimated the communication and outreach piece. So OG&E customers understood what this was about, why OG&E was doing it, and what the benefits would be. Pete is a little modest, but his customer satisfaction numbers are some of the best that we have seen anywhere in the world.

The second part that we knew we had to get right was the platform – it had to be open. As a consequence, the application of Internet Protocol standards in order to make this work was essential and I believe IP is now the globally accepted standard for the smart grid platform. So we looked at IP, and what IP has done for other industries around the world. I often like to think of this as a little bit like starting off at the turn of the century, coming into the 1900s. The first “killer app” then was the light bulb! And it did change everything. And then, the real “killer app” was the wall socket! The wall socket enabled millions and millions of devices to access electricity, all around the world.

Just 20 years ago or so, we saw the invention of the internet. The internet was used initially for e-mail. But look at what has happened with *that* platform in place. It has enabled

trillions of dollars in new commerce to come into the market: Google, Yahoo, Amazon and eBay and Twitter and Facebook – all applications we never could have imagined. So what we are really building with a smart grid is a platform that can offer the ability for utilities to cross this bridge with their customers, and bring on new applications and new services.

The concern around the distribution grid is about these devices communicating with each other intelligently to ensure that we're reducing demand more and more at peak. So two things – customer engagement and the critical nature of the platform – are really what have made this project successful.



**Peter Delaney**

**Delaney:** I mentioned four elements of our approach, but I want to start in reverse order and talk about the 2020 plan. We were very public about that announcement in the community and in the company – that we cannot approach the problems of today the way we approached things in the past. It just wasn't going to cut it for us.

We created a TV media campaign, a very good one. We recruited the governor, the mayors, university presidents, customers. What we found in our surveys for the 2020

plan is that it resonated with customers. We said, "We're going to empower you with these tools and if you use them, it will enable us to eliminate the need for a power plant." That was a key part of our customer engagement.

The next part was deployment: We are one year in and we have about 230,000 meters deployed as part of an 800,000 total system wide rollout by the end of 2012. A week or so after the smart meter is installed we're remote billing, remote connecting and disconnecting. That enables us to deliver \$23 million worth of savings guaranteed by the end of 2012, so it lowers the cost of deployment. Of course, we will also know when people are out of power, so they won't have to call us. We'll know when they're out, so it will help with problem resolution and faster power restoration.

There's a lot of other information. You can look up your CO<sub>2</sub> production and things of that nature. All 230,000 customers have that now and we're installing 1,000 more smart meters every day.

We're also looking at a pre-paid power pilot. We think that could be attractive as a new way to provide value to our lower income customers. The point is, we are going to be looking at continuing to roll out products over this platform.

Then there are things we'll be able to do in terms of integrating electric vehicles. We have a 6,000-customer pilot in which we're testing real-time prices, variable peak pricing, and time-of-use prices to different customer groups.

The last part of this, which we've been doing since last year, is distribution automation, with automatic re-closers and capacitor controls.

That's *not* a direct interface that involves our customers, but they will see improved reliability and lower costs as we get more efficiency out of our system. That's all part of the value proposition.

We probably have one of the more holistic deployments going on, and at this point it's on budget and on time.

A really important part of what we're doing is sharing the results of our home area network pilot. We had 3,000 customers, 600 in a control group, and we had a "best bill" guarantee." over a four month period. Residential customers saved around \$100 to \$125, small commercial businesses saved \$300 to \$325.

Those results were very encouraging. If we can get 20 percent of our customers to participate in a demand response program, and if each participant reduces their consumption by 1.3 kilowatts, we can meet our goal of not needing a new power plant until 2020. We placed different technologies in the home, but the most effective technology seemed to be the programmable thermostat. In the high-income category, customers dropped their energy consumption at the peak hour, 3 p.m., by 57 percent – that's 1.9 kilowatts! It decayed pretty quickly after that, but we definitely see the potential there.

**W**e are very encouraged by the results, and they line up well with our assumptions. We have another study we're going to do this summer with another 3,000 customers so we can see the sustainability of those types of behaviors for the second summer for the first group and compare that to the new participants.

I got an e-mail recently from our head of marketing, and to quote her, "The interest in the technology is really cool and very interesting, but customer engagement is what it's all about." We certainly agree with that.



**Scott Lang**

**Lang:** The different kinds of information we've provided to customers in Oklahoma – from phone, to text, to in-home displays, to programmable thermostats, to paper – has been a great learning experience for us. And if we extrapolate our results to a national scale the results we've seen here, it would mean 150-200 fewer peaking plants that need to be built.

This kind of program is becoming a global imperative. In our travels around the world we see that other countries in both the developed and the developing world are moving very quickly, so it's imperative that we show leadership and continue to unlock the broader base of benefits we're discovering here.

**Yackira:** Thanks Scott and Pete. We can learn a lot from OG&E's experience and there's a lot of education yet to do – no doubt about that.

**R**on Binz, Chairman of Colorado Public Utilities Commission, is a very technically savvy commissioner. He's a guy who installed his own smart meter, and connected it to all the innards inside of his house to know what device is using energy. I'm sure we are going to enjoy hearing his perspectives, both as a regulator and as a customer.

**Binz:** When this conference was being put together, I imagined the big blocks of what we were going to cover. When it came to my spot I imagined it would be, "Cue the state regulator for a cold shower on everything that has preceded him." I'll try not to do that!

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*State regulators are very supportive of what the smart grid can offer. The push-back has come when a utility comes in and files a smart grid case just like every other rate case they have ever filed.*

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The regulatory concerns on smart grid are being talked about much like Civil War battles. There was the Maryland decision, the Colorado decision, and so forth. State regulators will indeed have a lot to say about this, so I'd like to give you a realistic view of where I think they are, where they can be, and some things that are essential for them. I do have my own smart meter system in my house. As a state commissioner I wanted to find out what the customer experience was going to be like with in-home devices. And so I went to the utility, Xcel Energy. I am not

in a smart grid-enabled neighborhood, and I needed a meter that could talk to my in-home network but also still be backwardly compatible with the utility's AMR truck reads. I told Xcel that I did not want to be subsidized on this – I'm their regulator and I need to look good on all of this. So the utility and I basically found a system. I also talked to Tendril about selling me their TREE system (Tendril Residential Energy Ecosystem, an in-home system). I said, I'm a regulator; I don't want any special deals. So both of them solved the issue in the same way: They overcharged me for what I ended up getting. So I'm in good shape.

Literally, sitting here, from my laptop I just switched off my home cable TV system. Imagine that. I forgot to turn it off before leaving home for four days, and I just did that remotely. Now that's not a big deal. It's about a 50 watt draw on my instantaneous load. But with 768 hours in a month times 50 watts it amounts to about 35-40 cents. But why waste the money, right?

**A**s a general matter, I think state regulators are very supportive of what the smart grid can offer. The push-back has come when utility companies come in and file a smart grid case just like every other rate case they have ever filed – a "This is what it's going to cost; pay me now or pay me later" sort of a thing – rather than selling regulators on the promise this actually holds.

I'm very bullish on smart grid. In Colorado we're doing a couple of things to try and move its development along. I'm involved with a smart grid privacy docket; we want to take off the table all of the issues surrounding security and use of smart grid data, and the

terms under which it may be available to other service providers. I'm also interested in a market access docket we'll be undertaking soon to figure out whether it's the utility's obligation to set up a competitive platform for the use of that data. It's one thing to have a smart grid when there is a pairing of the utility and a single provider. That's one thing. But when you have Google and Microsoft, and Tendril and others you haven't even thought of yet knocking on the utility's door saying "we want to do this," it's obvious that we are going to have to have some rules of the road. I think it's very important for the regulators to get those rules straight.

I want to say just a couple of things about Smart Grid City in Boulder. It followed the magic-curiosity-hype-crash-reality-nirvana scenario. It's probably about in the "reality" stage now – we just got past the 'crash.' Smart Grid City was one of the first major smart meter projects. It was featured on "Good Morning America" probably three years ago, as the future of the electric system. Xcel Energy and all its partners in Boulder were basking in the glow.

The reality turned out to be different, as you all know. The cost overruns were three-fold and Xcel came to the commission for recovery of those higher costs. We were not really pleased with the fact that there were cost overruns, but we might have been fine had there been some benefit overruns. But there weren't any. In fact, we had the view that Smart Grid City was not really enabled to live up to its promise, so we denied part of the cost recovery to the utility – unless and until they come back and demonstrate that this project has a promising future, and that they have a coherent plan for it.

By the way, Boulder is a curious site for a smart grid experiment. I don't know how many of you have been to Boulder. Among many things, Boulder has the lowest body mass index (BMI) in the country. These are runners, and climbers, and yoga instructors

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and all kinds of people like that. It's a very special population. My view has always been that if Smart Grid won't work in Boulder, it won't work anywhere. So we are very interested in seeing Smart Grid in Boulder live up to at least a fraction of its initial hype. In effect, we've asked the utility to "re-boot" Smart Grid City. The concept is that all of the hardware is there – it is the software systems which aren't working as we hoped they would. We fully expect Boulder to return to its status as the shining city on the hill with a Smart Grid system.

If your rates are 46 cents on-peak versus 4 cents off-peak, charging off peak certainly makes a lot of sense. But there are very few utilities that will have such a large disparity between peak and off-peak prices, and the savings for charging off-peak may not be that large compared to the capital investment in the vehicle. I'm not convinced that we're going to power up EVs through pricing alone.

**X**cel Energy is looking at something for smart vehicle charging similar to what they are doing with air

conditioning. That's an interruptible service offering that customers are subscribing to in droves in Colorado. There are 150,000 meters – not people, but meters – in the Denver-metro area that are subscribing to interruptible air conditioning service. Basically, they get 25-40 bucks a season as a rebate for allowing their A/C to be interrupted occasionally. You get about 1 kilowatt per customer, so that is more or less 150 MW of interruptible load –demand response – that's available. I believe Xcel is thinking that the same kind of system may be suitable for electric battery charging. If you send out an RF signal to the charging network, you pull those vehicles off-line temporarily. That's not quite the full benefit of EVs, because we do like the notion of an energy-sink during the nighttime hours to soak up a lot of wind generation.

You've heard that from Jon Wellinghoff, and you'll hear it from many regulators. When charging EVs, we also have to make sure that the source of the generation is relatively clean. (It turns out that electricity from a 100



**Ron Binz**

percent coal-burning utility is still cleaner to run an automobile, compared to burning gasoline in that same vehicle. So we come out

ahead immediately, and of course, we cut down on our oil imports and all that that entails.) But cleaning up our generation supply and going to a more environmentally friendly portfolio will be part of what a lot of regulators will be looking to do, especially as we get new energy load from electric vehicles.

This wasn't the cold shower that perhaps you expected, but I think we are best served if we look with some reality and understanding of what consumer response to this is really going to be, as opposed to what smart grid planners anticipated at the early stages.

I used to go to conferences where I knew everybody. Now I now go to smart grid conferences and know about 10 percent of the people. The rest of them are money guys, right? – all looking for the deal here. You know what I am talking about. You see a lot of people that you just never knew had an interest in the electric utility industry. It reminded me of line from the Tom Wolfe book, “Bonfire of the Vanities,” referring to bond traders — “The sound of young men baying for money” – which is a lot of what smart grid hype was at one point. Now we're settling into an age of reality, and I for one look forward to the future.

**Yackira:** That was a dose of reality, Ron, despite what you said. Let me start by asking a question relating to what we heard earlier, and that is the concept of “vujá dé – looking at a familiar situation and seeing it with fresh eyes. Are we likely to see something fundamentally different in our industry? Or is smart grid just going to be a bell and a whistle, where very few people are going to take advantage of it?

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*I think utilities are going to see a lot of intermediation by other players in their traditional business. Utilities are very concerned about that, and I don't know where it's going to end up.*

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**Delaney:** We believe that you let them choose whether they want savings or comfort – we're all about the customer and letting them choose what they want. Whether they want to go on the lowered emissions path and maximize that, whether they want to maximize savings-- because they may not be the same thing. Changes are fundamental for the relationship with the customer. For any industry that gets into digitizing its information, I think there is a long history of what happens to those industries-- the dramatic change, the transformation.

**Binz:** I think utilities are going to see a lot of intermediation by other players in their traditional business. I don't know what Google Power Meter is going to grow into; Google doesn't know. We heard a presentation recently from Mike Terrell from Google, and he said they created this thing but they don't know what they want to do with it. It's pretty easy to imagine that, because people really don't understand the organization of the electric power industry, they could begin to think of Google as their electric provider. Utilities are very concerned about that, and I don't know where it's going to end up. I don't want to pick on Google, because all the other home area network

providers, all the energy service company providers – even in states where you don't have retail competition – are, I think, going to be attracted to this.

**Lang:** I expect change for two reasons. Number one is the amount of investment dollars coming into this space has truly been enormous. We all saw in the beginning of “clean tech,” ten years ago or so, it was all around generation – solar and wind and biofuels. How do we generate more, cleaner power and get off the use of fossil fuels? There are a lot of smart people coming into the smart grid space developing new technologies, and those technologies are going to become available to utilities over the next three-to-five years. I think that is going to continue to drive innovation. The dollars are there, and they are significant.

**T**he second thing I see driving change is our next generation. I have four daughters. I think the new generation of kids, having grown up with completely different technology than many of us grew up with, are going to be thinking about ways we make the world a smarter place, make it more convenient, make it more efficient, and how to get more use out of the power we produce.

**Binz:** They call them “digital natives” – people who have known nothing but the digitization of information. And they are a different breed.

**Yackira:** Pete, you talked about options that you are offering. At NV Energy during our smart grid trials we are starting a dynamic pricing trial to see what reaction we get from our customers. Do you see, sometime down the road, the end result being a default – that people will be going on dynamic pricing? Or

do you see options being offered consistently over long periods of time?

**Delaney:** No one has been down this road before, so what we think today is probably going to be a lot different 60 days from now and may be still different from 90 days from now. Right now we are just trying to get 20 percent of our customer base involved. But to answer your question, I think you will have a standard rate. One encouraging thing that I didn't say is that the savings we saw in the high income group ranked number one; the low income group was number two; and the middle group was number three. It's exciting to see that the low-income category participated and saved money.

**Yackira:** Since you are in different jurisdictions, I will throw the question to Ron, and ask whether, as a commissioner, you can see a default or different pricing options prevailing?

**Binz:** The main reason people switch is what's known as adverse selection – you are basically helping yourself out, even if the whole system is not necessarily as profitable. Time-of-use rates have been offered in Colorado for a long time and no one takes them. So my guess is that eventually we will get to a system where such rates will be mandated. My prediction for the immediate term is that we will probably not have mandated real-time pricing, but more likely time-of-use block pricing, with critical peak

pricing as part of it. To me that seems to touch all of the areas that are necessary: providing an off-peak, nighttime attractive rate for such things as vehicle charging, and providing the average on-peak rate – not the needle peak – for most of the rest of the time. Those periods where you either want to interrupt, use demand response, or send out a 46 cent signal, that would be one I can imagine eventually becoming mandatory. I don't think that people will opt into that fast enough to make it helpful.

**Yackira:**

Scott, let me ask you a question about applications. Ron has done some of his own applications inside his home. Do you see that being

*I think the number of applications – the software and the sophistication of the software – is a big part of the effort. We're asking our clients, "How do we help you to get more use out of this platform that we've put into place?"*

the next natural evolution of what a smart home is going to be?

**Lang:** I do. I think the number of the applications – the software, and the sophistication of the software – is becoming a big part of the effort. With Pete and our other clients, we're getting them around a table and asking, "How do we help you to monetize and get more use out of this platform that we've put into place?" It involves learning from best practices, utility to utility.

**D**istribution automation (DA) also came up today. We've been working extensively on DA software and

applications, and I think the industry is moving in this direction very aggressively – on voltage/VAR optimization, and dealing with sags and swells. When we’ve implemented the right technology and the right communications systems across a service territory, we can help a utility pinpoint where those losses and inefficiencies are occurring. And that represents a very large percentage of savings for utilities.



I believe this entire last mile on this distribution side has not seen significant innovation for a long time, and there are a lot of devices – DA devices, gas meters, water meters, electric meters, in home devices – that will need to be networked and “intelligent.” The application side is going to be really interesting to watch over the next several years.

**Yackira:** Let me go back to something that Ron talked about – disintermediation with customers with respect to apps. Pete, is this a concern?

**Delaney:** Well, on the app side we have about 50 contractors, technology companies, and service companies working with us. As Scott said, there’s more and more technology coming in. We are embracing technology to help us achieve demand response – that’s our focus. We are also talking about cyber security concerns and maintaining reliability – these are serious concerns that we’ve got to get right. I think it’s going to come down to who the customer trusts. Our surveys show that 88 percent of our customers either agree

or strongly agree that OG&E is trying to help them use their energy more efficiently. We’ve had people come up to us and say “You know, we’re getting these calls about solar, but when is OG&E going to come out with solar?” We’ve built up a high level of trust with our customers, and I think they will continue to look for us to solve their problems.

Beyond that, we continue to try to figure it all out, and again the learning curve is very steep.

**Yackira:** Anything else you want to add?

**Binz:** Well, I think that utilities and their regulators are going to have a complicated situation when a utility decides that it wants to be an energy service company itself – an ESCO – in its own market. I predict that’s going to happen. The delivery side of the house will be one thing but because of pressure to open the platform, I think you may end up seeing utilities get back into an unregulated subsidiary for energy services. That’s my prediction. We saw something very similar to that in telecom. If you’ve been through the telecom wars, you know that’s

exactly what divestiture was all about. There was this very uninteresting app called “long distance” that’s eventually become a bunch of other things. I think we are going to see a parallel discussion in that regard.

I haven’t mentioned another thing I want to talk about, and that’s integration of distributed generation by the use of smart home networks. That could be a “killer app,” because you really can’t do it with the intelligence that’s in the network now.

The need for standards in this area, to me, is very high. This issue is before the FERC right now and Ohio Commissioner Paul Centollela is working on this on behalf of NARUC. That’s going to be very important because you want everything to be plug-and-play. And if it’s not, we are going to have a big problem. I don’t think we are headed for a problem yet, but we don’t want to take our eyes off the ball. With one hiccup we could have two parallel systems – or three or four – that customers have to keep up with. You don’t want it to be where Windows 3.1 was, where you had to find drivers for everything you did. You want plug-and-play.

**Yackira:** Ron, maybe you can’t answer this question, but if you do feel comfortable answering it, it’s this: “Do you feel that companies have done a good job explaining to you what is going on?”

**Binz:** Oh, no, they have not. Here I am going to speak for a lot of regulators – not about Colorado, not about Xcel. I think that among regulators you will find some who get it, and a lot who don’t, and it’s through no fault of their own. This is really a new way of

thinking about something we have all grown up with, and I think much more effort needs to be put into the education aspect.

I also think we need to be really careful that we don’t push the

customer side of the meter applications faster than we ought to. You can’t hang smart grid on that. From my way of thinking, you have to hang it on the utility side of the meter right now. Boulder is getting all kinds of good results with voltage send out. They’re figuring that they sent out way too much previously in order to keep that tolerance at the end of the circuit. Now they’ve avoided outages, they’ve cut down on customer complaints – all sorts of good stuff like that. That to me is the sales job that needs to be done to kind of get us off the dead center on this.

The in-home applications of this are a totally different animal in my view and need to be approached appropriately.

**Yackira:** That’s a great way to end a terrific discussion. Thank you all. ■

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