

Collin Weber: Hi, good afternoon, everyone. It seems like we've had a large number of people on the line today. I want to thank you all for joining us today. I think we'll go ahead and get started here today and as people continue to trickle in that'll be fine.

So I thank you for joining us for this webinar on behalf of the DOE Better Building Alliance for Refrigeration Project Team focusing on retrofits for open medium temperature refrigerated display cases.

A little background, the purpose of this webinar, sorry, is to provide retail energy alliance members and other interested parties with the opportunity to learn about door retrofits for open medium temperature cases. ___ organized the webinar based on input from the members and also in conjunction with the release of its guide for retrofitting open refrigerated display cases.

We're lucky to have to sets of representatives to present today from REMIS America we have Erin Dolan, Sales and Marketing Coordinator and Rick Waldron who is product manager and from Target Corporation we have Paul Anderson who's Refrigeration Engineering Group Manager and KC Kolstad a Senior Mechanical Engineer.

Before we get too much further into the presentations I was just wondering Bill Goetzler if you're on the line if you would like to give any introductions or other remarks.

Bill Goetzler: Nothing, beyond what you've already said. That I just wanted to say thank you to everybody who is joining us and especially thank you to our presenters from REMIS and Target. I think it's going to be a very interesting thing and informative discussion. We've got the perspective of supplier who does these retrofits and also customers who have implemented them. So I don't think we need to talk anymore. I'd like to hear what they have to say.

Collin Weber: All right, thanks Bill. Just as a little bit of housekeeping. Each presenter will have roughly 20 or 30 minutes to present and then there'll be some time built into the schedule for question and answer. What I'm going to do as we get started is I'm going to put all lines on mute and then presenters, so REMIS will be presenting first. I ask if you could just simply hit pound six after I've muted all lines so as to un-mute your own line.

So I'm going to go ahead and mute all lines and then I will turn it over to REMIS. If you could un-mute and take it from there.

[The leader as muted your line. To un-mute your line press pound six]

Erin Dolan: Can everybody hear me?

Collin Weber: Yes.

Erin Dolan: Okay. Thank you. Collin gave a brief introduction. We are REMIS America. My name is Erin Dolan and I'm Sales and Marketing Coordinator and with me I have Rick Waldron who is our Product Manager. We offer retrofit refrigeration doors and freezer covers to grocery retailers and OEM case manufacturers. Our company has been around since 2008 and we have done retrofit all over North America. For purposes today our experience with retrofit refrigeration doors, the best way to kind of sum it up is with the word inefficiency. It encompasses a problem. It has probably the best -- there are all different ways to look at inefficiency with open refrigeration cases with cold pouring out into the aisles products spoiling rather quickly or expensive Co2 emission. But the bottom line is if you're cases are inefficient they are costing you money.

So with that we are starting off with an example of what installing doors on open cases can save you. So here we have an example of a retailer that we worked with who retrofit 164 feet of open multi___ each of their stores. They've done metering we did before we installed the doors and after the doors were on. We found that doors on cases save 1.08 kilowatt hours per day per foot. So at 164 feet that comes out to an annual savings of 64,000 kilowatt hours per year. You can multiply that by your rate that you pay your utility to figure out what the doors on cases would save you annually, but as an example we'll give the condition of somebody who installed 164 feet of doors paying at .08 kilowatt hours would save over \$5,000 annually with the doors on.

For their 155 stores they would save over 10,000,000 kilowatt hours annually which translates to about 13 million pounds of Co2 not being released into the atmosphere. That is a tremendous amount of savings especially when you take into consideration that this particular retailer was also using night curtains.

And moving on. Another way to look at the savings of door cases versus open cases is through actual published data from various original case manufacturers. Here we have three manufacturers' data comparing the BTUH per foot of their cases with and without doors. And as you can see with each manufacturer the door cases are more efficient when compared to the open version of the same exact model. And on this side I wanted to point out that there is a typo. I should just say under manufacturers C-1130 BTU per foot saved and the 995 was from the previous presentation.

Because of all the energy savings that we just pointed out to you there are many utilities that provide custom rebates for these projects making them even more attractive. There are ROI on

these projects that we see is typically around three years. And out from a utility incentive can drive the cost of the project as well as the pay back. These custom incentives are wide spread and you should talk to your utility to see what is available, because they may make many projects like retrofits really attractive.

There are other benefits beyond energy savings that can make retrofits attractive. We touched on it before, but you reduce your carbon footprint by covering up cases and there by increase your image of being green. Also when retrofitting there's minimal framing around many door designs. And the lights on the profile of the doors helps to showcase the product that's in the case. So you not only maintain merchandise visibility but you also help to showcase the product.

Because the cold is kept in the case and it's not spilling out into the aisles you reduce case temperature fluctuations. One spot of the case is less likely to be warmer than another, and as a result you have improved product quality and reduced spoilage. Product is able to have a longer shelf life and you aren't storing away something that has gone bad due to an inefficient case.

The flip side of that is the cold is kept in the case so that means that it's not in the aisles. And aisle temperatures are something that customers notice immediately when we do an installation. One of our customers actually saw a 15 degree difference from when we put the doors on versus before when the cases were open.

When the aisles are more comfortable customers are more likely to dwell in your store rather than rush through and only grab what is on their list. If it's warmer they will linger longer and truly take stock of everything that you have to offer and maybe even pick up something that they weren't going to buy anyway.

Europeans were the first pioneers in using glass unopened cases and our joint venture partner REMI GmbH was a big part of that. They have over 35 years of refrigeration technology experience and to give you an idea of the widespread use of glass in Europe they have their products in over 10,000 retail stores. Europe has been the trendsetters for what is being done elsewhere in covering up an entire store with glass really seems to be the big trend. Our partners refer to the current era as the decade of glass.

On the American side of things, our initial retrofits were putting doors on dairy, beverage and beer runs. Which make sense, because people are very comfortable opening a door to get to those product categories. The first wave of retrofits were located where some of the highest energy costs are in the U.S. which is mainly on the east coast. Now we see retrofits all over North America.

The second wave of retrofit applications were customers covering deli packaged meat and fresh meat or packaged produce and fresh meat. People were and are hesitant about covering these categories because shoppers like to touch and to feel those products. So you had many customers in the first wave come back and have us cover the second group of categories for them. And we are seeing more and more glass on cases throughout the entire store.

There are some exceptions however we do not recommend covering produce cases with mixed systems. For the obvious reasons of what a mess that would be. Both produce cases when mixed with packaged produce varies by retailer and how they want to handle that. But typically we don't recommend retrofitting them. I do have an example later on where we were able to retrofit both produce and packaged produce mix case later in the presentation.

Some cases may require that the ends be replaced or that extensions to the top be created and those are on a case by case basis on whether we would retrofit them. A good contractor should have someone come out and look and assess the case to determine whether or not it could be retrofit. And at this time we cannot retrofit any of those temperature multideck cases. So with that I'm going to toss it to Rick who is going to walk us through an actual installation process.

Rick Waldron:

Yes, good afternoon everybody. Again my name is Rick Waldron with REMIS America. On the slide that you see right now entitled *Installation Process*, I know it's kind of busy, but I'll just kind of walk you through this a little bit. It's -- we typically will hand out a recap of what the retrofit will be for night one, night two, night three. The majority of our retrofits are three night installs. And this is an example of an installation where we were actually retrofitting an entire line-up per night, a night one we're doing it as you can see we're actually doing a couple line-ups on night one. A 26 feet of lunch meat and 30 foot of dairy. Night two we're retrofitting 80 feet of beer. And this is a total refit where we tear it down, install our doors and frames and then put the case back together again. And night three is to finish up at the store.

We can also tailor this however the customer wants us to do it. We can also put up just the frames and lighting night one and two and then night three is when we'll hang all the doors. So this installation process can vary. But it's essentially the same items applied whatever night we do it.

Next slide please. We can go to the next slide now. Is anybody there? We seem --

Erin Dolan: Oh, there you go.

Rick Waldron: Or there we go.

Collin Weber: Yeah, you're coming through. I have everyone else muted but I'm on and you're on.

Rick Waldron: Okay, I'm sorry. It looked to me like it wasn't -- the slide wasn't changing. Thank you. I'm going to walk through a few slides here of the retrofit process. I think we should be going back one slide. There we go. We're with the gentleman on the ladder. The first step of the retrofit process is to take off the canopy on the top of the case. As you can see by this picture to do a typical install we do need access to the top of the case. And I'll talk about that a little bit later in the presentation how that's not always possible. But we can go to the next slide there.

The next part of the process after we have removed the canopy is we will remove the light channel that is on the case from the OEM. We need to do that one hundred percent of the time, because we need the -- we need that footprint of the case, that part of the case to put in our adaptation profiles, which I'll show you later. So we are always putting in new lighting and we're not reusing the existing lighting.

Now we can -- we've done it both ways on the lighting. We can either leave it for the retailer or we can haul it away for them. Next slide please.

This slide shows the next step of the process where we will add in an adapt -- what we call an adapter profile at the bottom of the case. Typically the handrail that's on the case is not going to be wide enough or depending on the case model it may not be parallel to the floor or it may not be wide enough. We have to have a nice wide, flat surface to mount our retrofit frame to. So we typically are adding an adapter profile at the bottom of the lower front of the case. Next slide please.

This again shows mounting the lower adapter profile to give us the flat surface to mount our frame. And on the next slide please.

The next part of the process is that we will go back to the top of the case where we've already removed the canopy. I should add that we are going to reuse that canopy, but for now we've removed the canopy. Removed the OEM light channel. And we're not preparing the case to put in our top adapter profile too so that we can mount the top part of our frame. Next slide please.

This slide shows where we are mounting a U shaped, what we call an upper adapter profile to the hat channels that are sticking out of

the top of the case foam body. Each -- obviously each case manufacturer makes their case a little bit differently. This particular case has a nice hat channel sticking out of the foam body for us to stick our adapters to. And this is one of two adapters that we will put on the top. There will be another L shaped piece that goes on the front of this so that we can mount the top part of the frame. Next slide please.

The next part of the process is actually mounting the frame in place and our particular company typically uses four foot long frames in the retrofit process. That can vary from company to company depending on who is doing it. But you can see that we've already got the lighting installed on the back of the frame. And we're now mounting the frame to the adapter profiles. Next slide please.

This again shows another picture where we're mounting the bottom frame to the bottom profile. Another thing I should point out is that we try to make minimal changes to the OEM case. Whenever possible we leave the case bumper on. You can see there's a great blank at the bottom of this picture. That is the bumper that came from the OEM. So everything from the bumper down to the floor is exactly as it came from the OEM. And as I said earlier we will reinstall the canopy above our frames, so this looks -- it looks like an OEM style case after the retrofit is completed. Next slide please.

And probably this step was done actually ahead of the previous slide. We probably would level the frame ahead of screwing it down, but that's okay. The message that's what's important is that we would level the frame and then fasten it into place every four foot as I said earlier. Next slide please.

After we have the frames installed through the entire line-up then we will go back and add in the doors and our typical installation at our company is a 24-inch wide French open door system. We can provide install like doors, we can provide sliding doors, but our typical installation would be 24-inch wide French open doors. The installer on this picture is mounting the bottom hinge bracket to the frame. And on the next slide please.

Okay, there it is and next slide you see our installer is mounting the upper hinge bracket to the frame and then obviously the last step after the mounted doors is to make sure there's no saw tothing, make sure that the doors are level and we have -- we don't have a picture of it, but we also have some gaskets we use to cover up all screw heads, so it has a nice finished look when we're done with the installation.

The next slide talks to you about some of the issues that will affect

retrofits. Obviously every line-up this -- every store is not as clean as what you saw in all those pictures. Some of the things that we run into with the cases that are in the store is that there'll be a fascia above the case where we cannot easily access the top of the case. We'll also see corner cases in some line-ups. We do have the ability to put doors on inside and outside corners. We've done that many times.

Another case that's a little bit more complicated is rear load dairy. There's two styles of rear load dairy cases. One with sliding solid, rear doors and another style in the industry with the rear sliding curtains. The rear sliding door is usually typically not a problem, because the front of the case that we're retrofitting is essentially the same as the front dairy. But when we get into a rear load dairy case that has sliding curtains on the back those fronts are a little different and the throat openings are a little taller, so that does create a few complications at times. But we can do them.

Columns we also run into at the stores and there'll be a picture coming up later that shows that. And the last bullet on this slide pertains to case that is require the ___ to be extended. Many of the produce cases and three ___ of the meat cases in the industry have fronts that are about 28 to 35 inches off the floor. And the tops typically are back about 8 to ten inches back from the handrail. And for us to put doors retrofit doors on those style cases we have to bring the top forward and quite often we have to replace the hinge, which we'll talk about on a later slide. Next slide please.

We'll show an example of what I was talking about fascia above a line-up. Our typical retrofit installation -- actually this is an example of two things. It's a fascia and it's also a top that is back a little bit from the handrail. So we would have to do two things typically on this to retrofit it. We would bring the top forward about eight to ten inches to get it even flush with the front of the case end. And then the canopy we would remove that and then -- actually the customer would typically remove that. And then they would reinstall it. Or the other thing that we can do if needed -- if we have a customer that just doesn't want the fascia removed and doesn't want us to touch it, we have what we call a bottoms up install where we can actually mount the doors and frames from the bottom. The trade off on that is that you're typically going to lose a little bit of merchandising -- or I should say height on the doors and frames which will affect your merchandise -- the view of the merchandise on the top shelves. That's the trade off on doing a bottom shelf. So we try not to do that whenever possible.

The next which was there briefly it shows our doors mounted on -- this is on a 90 degree outside corner case. This particular case manufacturer makes 90 degree outside corner that has -- it's

basically three facets to the front. It's roughly about 20 inches and then 40 inches and then 20 inches across the front of the case. So we can make it fairly easy for us to mount doors, a French door section in the widest part and then smaller doors on either side. All of the doors are functioning on this picture. And then we just add in some filler pieces as needed between the door sections. Next slide please.

Okay, we're not seeing the next slide on our end. So I'll just wait a couple seconds here. Okay, there we go. The next slide is an example of a line-up that's got a column in the front of the cases. We've experienced this many times. And our typical solution for this at REMIS America would be to put a fixed glass panel behind the column. That's typically an eight to ten inch wide fixed panel. And then what we would do is on either side of the column we would put special sized doors so instead of a nominal 24-inch wide door, that door may be 20 inches or 21 inches wide on either side of the column. And then we'll get back to our typical 24 inch wide French doors for the rest the line-up. This enables the customer to put doors on front of the line-ups that have the __. The next slide.

We hand out to all of our customers a recommended case adjustments sheet for the various types of retrofits that we do. And it's divided into two categories. For the multideck cases where we're adding doors we suggest that the customer work with their refrigeration provider and have them warm the cases four to five degrees and also we recommend -- a typical open dairy case depending on the manufacturer and date of manufacture anywhere from four to six defrost per day. After we add doors we recommend that we change to one or two defrost per day. And the last thing we recommend after we add doors to multideck cases is to adjust the super heat setting on the expansion valves if they're adjustable. Or replace the expansion valves if they're not adjustable. Because typically doored cases would have a smaller orifice size requirement for the expansion valve. And we would suggest that the customer go with the recommended expansion valve sizing for each OEM. In that instance if we're going to change the expansion valve.

On island cases where we're adding covers over the top of open island cases, this could be either frozen food or ice cream typically, but we've done a handful of medium temp islands. This particular guideline is for frozen food and ice cream cases, where we would suggest that you warm the cases five to seven degrees. And on these style cases, these standard defrost setting for open cases is typically one or two per day. And we would suggest you only need two or three defrosts per week.

Again we have the recommendation to adjust the expansion valves or replace them. And we have an additional requirement on the

island cases. The typical air flow of an open island case is gonna be anywhere from 180 to 230 feet per minute. Horizontal air flow across the island at that amount of air flow when we add covers just above the airstream that's going to be sweating unless we reduce the air flow and the typical way to reduce the air flow is to modify the existing fan blade or change it to a new fan blade. For those cases that have electronic motors, you can also adjust the electronics of the motor module to slow that air flow down too.

So these are our typical recommendations that we make to our customers. And the message is if you want to maximize your savings, you should do these changes after the doors are added to make sure you achieve those savings. And with that I'll hand it back to Erin.

Erin Dolan:

Okay, so we wanted to show you some before and after photos of doors without cases and -- cases without doors and cases with doors added. So this first photo is a before and after on a rear load dairy case and probably the best example that we have of how a retrofit can truly transform the look of your store. We had one customer, not this customer that had a bright red giant 20 plus year old case and he retrofit doors on that case. And he had customers coming in the next day saying, "I love what you've done with the place. Everything looks great. I love the new case." So it's certainly a more economical option versus an entire store remodel or buying a new case.

The next picture is a before and after on a cookie dough and cream cheese case. And this was the first install we ever did in the store that we walked through the installation with you earlier. This is actually the store that I shop at and the doors still look the same. We've done several retrofits with this retailer and their focus when they do these retrofits is getting the most out of their refrigeration equipment. Rick talked about all the things that you can do to make your cases run more efficient. But in summary, basically putting doors on your refrigeration equipment won't have to work as hard and you extend the life of that case.

The next photo is before and after of doors on a juice and yogurt run. And the photo after that is a picture of that whole produce combined with packaged produce that we described before. Here is where the retailer was able to retrofit doors onto a mixed used case. The next case is a before an after on deli and prepackaged meat. In the case -- in the example after that is before and after on prepackaged meals and then before and after on fresh meat.

So these are some examples of sensitive product categories that can really benefit from doors being on a case. Like we mentioned before, if your case is inefficient and has various temperature fluctuations your food is more likely to spoil. With doors on

you're able to extend the life of that product particularly with the categories that we just showed you.

Doors -- we wanted to mention that doors aren't the only retrofit solutions available. There are also retrofit freezer island covers and this is the solution that pushes from front to back, which is very popular in Europe. This is another example of the same model of retrofit cover.

And this last one is an all black look that's also retrofitable. So we just wanted to share that there are many options out there for door and cover retrofits. And we hope that we helped shed some light on the options and the processes for you.

Collin Weber: Good, thank you Erin. Thank you Rick. At this time I'm going to take all lines off mute, so that we can have questions.

[The leader has unmuted your line]

Collin Weber: I know I saw at least one virtual hand go up on the web deck. Erin and Rick will answer your questions at this time.

Erin Dolan: Fire away. No it does not. That is just for our doors and the LED retrofit and then an estimate for the incentive that you would receive from utility.

Rick Waldron: Yeah, Richard this is Rick. We have not seen the need for that. We have over 10,000 of these retrofits in Europe and hundreds of them in North America where we run into that question all the time. But with the expertise and the history we have had in Europe that has not been needed.

Rick Waldron: Correct, I won't deny that. We're just saying that we have not had any problems whatsoever after we do a retrofit with existing lines. I hear what you're saying and I'm just saying we've got tens of thousands where we've not had to, Richard. Maybe you can save some cost.

Erin Dolan: Yes, we do. I actually help facilitate those for our customers. The ones that request us to. We don't take a cut of that rebate. You're the one saving the energy. You're the ones that deserve the check from your utility. We have helped with about 83 different rebates at this point. We started in 2010. And we've seen rebates anywhere from about 15 percent of the cost to one that was kind of very unique with about 75 percent of the project cost. It varies from retailer. Yeah.

Rick Waldron: Yeah.

- Erin Dolan:* Yes.
- Rick Waldron:* Eric, when we do a retrofit on a multideck case we typically do not have the product removed. We cover it up with tarp to make sure that we don't get anything on the product. And on an island case however since we do have to get to the fan motors to change out the blades, we do require that the customer remove that product before we do the retrofit on an island case.
- Erin Dolan:* The pictures we showed you of the installation were one of the earlier installations that we did and we did not talk about that to have a lot of the product show through in the photos.
- Rick Waldron:* To do a multideck retrofit? Depending on what we run into in an eight hour night we can do anywhere from 60 feet to a 100 feet of case. And that depends on how much -- basically it depends on what's on top of the case, how accessible the case is. But it's typically 60 to 100 feet per night.
- Erin Dolan:* Yes. Yes, we actually showed a couple of black options. We offer black and gray in two of our door styles. And one is gray and one is black. This is the black door right here that Collin just pulled up for us.
- Rick Waldron:* Not our company, but we go with another company that can do the re-skinning for you. You would work with them. I'm sorry. I don't know what the infiltration reduction is Wesley, but I can tell you that -- no, I know what that is, but I don't know what the number is. But I can -- but since you brought that up. I will mention that our particular -- some of our competitors will use wiper strips between the doors. Our design, we choose not to do that, mainly because when you close one door in the line-up with the wiper strip in there it kind of burps out the doors down through the line-up. And we've achieved the safe -- we've achieved the savings that we're showing without having those wiper strips there. So that gap is there by design. No. That's another good point that I should mention that we do not have any anti-sweat at all in our frames or doors with our design.
- Yes, that's correct. At the present time we only do these on medium temp. Yeah most the low temp cases it's already either been retrofit or replaced with door cases. But yes, good question.
- Collin Weber:* Anymore questions from the attendees?
- Erin Dolan:* Yes, hi Keily.
- Rick Waldron:* Actually, I think we should probably leave that to the next presenter KC Kolstad and Paul Anderson from Target. I think they've got some information to share on that, Keily.

Collin Weber: I can confirm that that's the case. That topic will be discussed. On that note any other questions before we move onto Target?

Rick Waldron: No, we haven't run into that. Again I think the Target folks are gonna touch on that a little bit too as far as HVAC at the store.

Collin Weber: So that's been some good question and answer. I want to thank the presenters from REMIS once again. At this point I'd like to move onto Target. Paul Anderson and KC Kolstad from Target will be presenting. I'm going to go ahead and put everyone back on mute and then Target if you could unmute your line afterwards.

[The leader has muted your line. To unmute your line press pound six]

KC Kolstad: Hey, Collin can you hear me?

Collin Weber: Absolutely.

KC Kolstad: Great. Thank you, Erin and Rick. Good afternoon everybody. This is KC Kolstad at Target. So Paul Anderson actually took vacation today to spend Valentine's Day with his wife. So I'll be going through the whole presentation here. So just bear with me. You can go to the next slide.

So this is our disclaimer sign. So before we get started with the review of the installation, we just want to point out that proper planning is critical to the success of a retrofit project. The Department of Energy guide is attached to this webinar invite is a good place to start. We would also recommend hiring a qualified engineering consultant to fully account for all variables and ensure a successful implementation. A good equipment vendor should also be able to offer guidance and suggestions to ensure that the project is well executed. If this store is older and existing conditions are not well known it is extremely important that a site survey is completed to fully validate existing conditions. Next slide please.

Target installed medium temperature doors on open multideck cases in several Minneapolis, one Los Angeles area store. For all of our retrofitted stores the refrigeration equipment was less than five years old and existing conditions were well documented. The length of the door installation ranged from 60 to 100 feet for each door. The open multidecks are broken into four circuits for each store. We have approximately 15 to 25 feet of open multidecks on each refrigeration circuit. In each store we added doors to all of the fresh categories. Next slide please.

Here's overview of what the market area looked like before and after the installation. Next slide.

And another overview of the entire installation. Next slide please.

The work was completed over night. 50 percent was completed on the first night and the other 50 percent on the second night. As you can see in the pictures they installed a tarp over the product as they installed the door frames and in the doors. Please make sure you try to anticipate any unforeseen conditions. For instance, in our situation the installation team was locked in the store over night. So they did not have any capability to leave the work site if they were missing a part or something was not working correctly. Next slide please.

So what changed? After the door installation the return air temperature on the open multidecks are much closer to the discharge air temperature of the case. We'll go into this in more detail later on. We were able to change a case set point to a higher value to ensure that product temperatures are maintained at the correct settings. We did not change the compressors suction point on the rack. In our situation the open multidecks were not the lowest suction temperature load. Along with the temperature set point we also changed the defrost frequency from six per day to two per day. We did not change the termination temperature for defrost. We did need to adjust the super heat for each case where we installed the doors. We did change the lighting in the cases as part of this project. The fluorescent canopy lights were replaced with LED lighting on the canopy and door mullions. The fluorescent shelf lights were left in place and not changed.

So what didn't change? We did not change the suction risers or any of the refrigerant piping. As part of our analysis we calculated the suction gas velocities and determined that we would not have any problems with oil return. After the installation we carefully monitored the compressor oil level daily for two weeks to ensure that we're not trapping oil in the evaporator coils. We determined that oil trapping was not an issue for us. Although like mentioned earlier we have relatively small circuit sizes. However you'll need to determine if this is applicable for your situation. We did not implement any measures to change a medium temperature compressor capacity such as VFB's or unloaders. Although as you will discuss in the next couple of slides it may make sense to install compressor capacity controls to reduce variability in the operation of the refrigeration system with the understanding that this will increase the cost and complexity of the project. Next slide please.

I don't want anyone to take this picture out of the context regarding the door performance. This picture is from a test we performed where we increased the humidity setting for the HVAC equipment in the market area. Fortunately for the door test, but unfortunate

for those of us that live in Minneapolis we had a very hot humid summer in 2012. We were able to test the reaction of doors at various temperature and humidity sub points in the market area. We determined that we cannot adjust our HVAC sub points from our normal settings without getting condensation on the doors. It should be understood that if you want to adjust your HVAC settings be prepared to have anti condensate heater on the doors, which will increase the energy usage and increase the complexity of the retrofit project. Next slide please.

This is very important. I've heard rumors in the industry that retrofitting doors on open multideck cases will reduce the refrigerant charge in the system. Most of the refrigerant charge in the system by weight is contained in the condenser, receiver and liquid lines. If you're not changing one of these components then you're not significantly changing the refrigerant charge. Although, there are opportunities in new construction for optimizing the size of the condenser receiver in liquid lines. Next slide please.

Here's the system performance from our refrigeration energy management system before and after the door installation. The green and brown lines at the top of the chart are the return air temperatures. The pink line is a discharge air temperature. This data was taken before we increased the case sub point. The product temperature in the case is somewhere between the discharge and return air temperatures. As you can see after the door installation the return air temperature is much closer to discharge air temperature. Therefore the product temperature will be lower after the door installation. You can increase the discharge air setting to ensure that the product inside the case stays at an optimal temperature.

The lower chart on the bottom there shows the defrost schedule before and after the installation. As we mentioned earlier we're able to change the defrost frequency from six per day to two per day. Next slide please.

So now let's look at the energy usage before and after the doors were installed. We sub metered the low temperature and medium temperature refrigeration equipment separately so that we have a good understanding of the energy consumption of each system in our store. One common mistake is a super market may only look at the entire store energy. Although if you do this it may be difficult to determine what percentage of the energy reduction is due to door inflation, what part may be due to other improvements in the store.

We'll start by looking at the energy of a store that had 60 feet of open multideck covered with doors. The open multidecks that

were covered with doors accounted for approximately 85 percent of the total refrigeration load on the medium temperature compressor graph. We graphed daily energy usage versus the average daily temperature. If everything is working correctly in the system you should see a strong correlation between these two variables.

Again this is just the energy consumption for the medium temperature compressor rack. The blue line is the energy consumption before the door installation and the red line is the energy consumption after the door installation. The area between these two curves is the energy savings. Each data point is one day. For this store there is eight points of data before the door installation and 14 months of energy data after the installation.

If you look at the data points on the right hand side of the graph, you'll notice that there's more variation in the daily energy usage after the door installation. This store would have benefitted by added compressor capacity controls to better match the compressor capacity to the new case loads understanding that this would increase the cost and complexity of the project. Next slide please.

So now what you can do is take the weather bin data from Minneapolis, which will give us a total hour that each temperature. And next slide. Then you can calculate the average total yearly energy consumption numerically and table such the one shown on this slide. When we do this we get an average annual energy usage of 58,000 kilowatt hour before the door installation and 27,000 kilowatt hours after the door installation. The net difference is 31,000 kilowatt hours or 54 percent energy reduction or one and a half kilowatt hour per foot per day. Next slide please.

Now let's look at another store. This store had 100 feet of open multideck, which accounted for approximately 61 percent of the total load on the medium temperature compressor rack. For this store there is six months of data before the door installation and 14 months of energy data after the data installation. You can see that the overall levels of energy usage are higher, but the overall trend is the same. Next slide.

Performing the same sort of bin analysis on this store with a 100 feet of open multideck we can see that we saved 45,000 kilowatt hours with the door installation. This equates to 44 percent energy reduction or about 1.2 kilowatt hour per foot per day. Next slide.

So to summarize our results in Target's total cost to ownership model for up times there were no de-merchandising events. We received both positive and negative feedback from team members and guests. For capital investment, the equipment installation cost involved in the project. Also as we've discussed throughout the

presentation increases to complexity of project such as installing VFC's on the compressors or antisweat heaters on the doors can significantly increase the cost and scope of the project. Local utility rebates may offset some of the capital investment required. The maintenance and repair costs will increase. We project 1,000 per store per year.

We've covered the energy results quite extensively in the previous slide. The average energy cost is expected to decrease by \$4,000 per year. The sustainability results are directly correlated to the energy reduction. And finally for store operations we assume that there's a \$700 per year additional cost due to reduction in stocking efficiency in the store labor cost to clean the doors.

Next slide. So in conclusion there's significant energy reduction although other key performance indicators are negatively impacted. Also the required complexity of the project and installation can significantly impact the pay off. Refrigerant charge is not reduced in a retrofit application. In new stores or systems there may be more opportunities to reduce the refrigerant charge.

If you're replacing an HCFC refrigerant such as our 22 with an HFC refrigerant which has less capacity, such as R 47A adding doors to some of the open multideck cases could be a good opportunity to reduce load on the system to successfully accomplish refrigerant change out. And as we've discussed previously, understand that you may not be able to realize changes or energy savings in the HCFC equipment.

Now that's all I had for my presentation. Although, perhaps, I can preempt one of the questions. We discussed a lot of metrics over the last half hour. We didn't discuss sales due to privacy concerns. This is something that you'll have to carefully think about and measure on your own.

Collin Weber: All right. Thank you very much KC. At this time we'll go ahead and unmute all the lines and we can open up the --

[The leader has unmuted your line.]

Collin Weber: Okay, questions for KC regarding Target's experience in retrofits?

Bill Goetzler: Yeah, this is Bill Goetzler, I have a question. I noticed that the energy savings presented were electric only associated with refrigeration system. Did you consider savings associated with reduction in heating loads for the HVC system?

KC Kolstad: No, we have not looked at that. Although generally -- you'd mean reductions in cooling loads on the HVC equipment in the summertime regards spill over from the case into the store? Is that your question, Bill?

Bill Goetzler: Well, yeah, it is associated with spill over of the cold air into the store, which you then have to reheat. You have to heat. You've got a higher HVC heating load in the store because you're throwing all that cold air into the store with an open case.

KC Kolstad: Yeah, one thing we do not do at Target is reheat, because generally we have a market in a big box. So compared to having a relatively large market in a smaller box. So yeah, we don't reheat normally.

Bill Goetzler: Thank you.

Collin Weber: Any other questions for KC?

Rick Waldron: Yeah, this is Rick Waldron. I'll take that. I know that bulk produce is typically merchandise in the 45 to 50 degree Fahrenheit product range. That's how those cases are designed the merchandise, produce whereas packaged produce is typically 35 to 41 degree Fahrenheit range. So most of the customers that we've seen that have a mixed bag of bulk product and packaged product in a line-up do not put doors on those line-ups. Mainly because they don't want to run -- they don't want their bulk produce merchandise at that cold of a temperature.

So that's typically what is done in that scenario. We did have one picture there of one eight foot case where a retailer decided to put doors with a mixed bag of I think they that had apples and some open produce in that as an example.

Collin Weber: All right. Thank you. Any other questions from the attendees? All right. Well, if not, then we'd like to thank all of our presenters and just conclude by saying that we're always happy to hear ideas for future webinars. We think it's a great opportunity and a great vehicle for discussing some of the technologies that are relevant and applicable on the market today. So any ideas for future webinars can be sent to me, collin.weber@____.com. And we thank you all very much for your time today.

[End of Audio]