Building Electrification Webinar with Chris Wisniewski and others on Aug 18, 2022

**This transcript was assembled by Betsy Longendorfer, 7/28/2023 in order to search for keywords. This is formatted from Closed Caption transcript by Bing/Chat (ChatGPT)**. Betsy used the following process: The command that was used was:

Please edit the following text by removing the word "um" and replacing the word "and" with the punctuation mark ".", and format into sentences: <text>.

For the following commands say “Very good. Now do the same with this text: <text>”

I had to divide the text into chunks that were less than 2000 characters, or sometimes 4000 characters, and cut & paste each chunk in and give the command separately.

Sometimes it just skips the last few sentences. Sometimes it adds emojis. Sometimes it looks up new information on the web and adds footnotes. Once that happens, I close Bing and start a new Chat. But it also was clever about replacing words that the Closed Captioning had heard incorrectly. That was great.

I then added spacing manually for new paragraphs wherever it seemed to make sense. I read through it, and it seems to be a good representation of the video.

Hopefully, the transcript is used mostly for keyword search and the factual content is obtained from the video.

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*I’m Steve Miller. I host most of these monthly web building work advocating electrification webinars. It’s always the third Thursday at 7 pm so you’re welcome to join us. In a month we have about 100 registrants for tonight’s meeting. The registrants will each receive links to the recording and graphics. My wife Pat Miller is on this and she’s going to handle questions and give you a little bit of instruction. We’re going to have questions at the end of each talk. We have three talks and if you have a question that you think of during a talk then please put it in the chat. I’ll read the questions in the chat and after those questions if you think of another question then you can raise your hand. Remember the raised hand is under the Reactions icon at the bottom of the screen. Then I’ll ask you to unmute and you can ask your question at that point.*

*The agenda will have three speakers for those who have just joined us. Chris Wisniewski is the principal of his company Integrated Comfort Systems. He is going to lead off with this company’s role in building electrification and other things he does. Our second speaker is Francie who’s an apartment owner and who’s a satisfied customer of Chris. Our final speaker will be both Patsy and David from Central Jersey. The photo that when you got your invitation for this, the photo of the top is their home and that tells a lot about their story tonight.*

*First, let me introduce Chris Wisniewski. His HVAC service company is called Integrated Comfort Systems. It serves Northern New Jersey and Metropolitan New York, and Chris also installs solar and is licensed in multiple states. There’s a growing movement for customers to move their house to Net Zero Energy.*

*I don’t think many people would know that term. But by installing rooftop solar and changing all their appliances including the HVAC and getting cooling to electric power, that customer can become a zero-energy building. Chris, it’s your turn to talk.*

*I’m just going to take a second here to open up a presentation so Chris Wisniewski. I’m vice president of integrate Comfort Systems. I have a background in architecture mechanical engineering and the company I’m with my father started a company. The company I’m with started doing more commercial work in the beginning. We have a 30-year history of doing specialized work around New York City. That kind of leads us into the story of us. There’s a little graphic here. 2004 ICS buys the first Daikin vrf system. Vrf is a new technology well not new anymore but in 2004 as a new technology in the United States we were the first ones to install a system here in the New York City area. That was really the introduction of what heat pumps are really capable of because heat pumps have existed for a while and then I’ll get into the heat pumps.*

*I’m quickly going to just jump through it. We the kinds of projects we do commercial residential you know churches things of that sort the huge residential projects. So we’ve had experience with everything from your standard air conditioning systems to large commercial systems to chillers to cooling towers. But the most popular thing recently is really dealing with residential customers. An overwhelming majority of customers we’re able to convert to essentially heat pumps. The word heat pump I know many people hear it and many people don’t understand it. It’s kind of a stupid name. People think of a pump every time I say heat pump they ask what’s what’s the pump for. Really a heat pump is an air conditioner that just runs in reverse that’s really it so it’s a silly name for it technically it describes what it does pretty well. Unlike your boiler or furnace which makes fire inside a house and actually creates heat heat pump just pumps heat from the outside to the inside so it’s a transfer of heat. I know we have no issues understanding that heat exists right now in a day like today but there’s in the scientific world and it’s zero degrees outside there’s still heat and you can capture that heat and bring it inside your house that’s essentially what a heat pump is. So heat pumps I mean there’s a lot of reasons why people would want to choose heat pumps over any kind of other source of heating. It’s not just about Energy Efficiency a lot of times number one thing is comfort and I’ll report but another is removing danger.*

*I know the Sierra Club’s the general out there didn’t quite electrification. But this is a segment of people that are into removing a danger from your house such as fire, carbon monoxide. And I actually have a client right now I’m working with. He just wants he got rid of everything in this house not because of environmental reasons but because a family member unfortunately had carbon monoxide accident not too long ago and he’s scared. And he wants everything that could potentially create carbon monoxide out of his house. So there are many reasons to talk about heat pumps. Electrification is one. The other is we all hate oil. Nobody likes oil, propane or electric is another way of heating but they’re expensive and of course that’s the danger I just talked about and that danger which is carbon monoxide kills about 430 people each year so it’s a real concern. You’re basically anytime you bring a fossil fuel in the house oil gas and you have furnace or boiler anything that burn makes a fire there’s a potential for carbon monoxide. You don’t have that with a heat pump. One of the crucial things when you think about getting a heat pump for your house is that the kind of heating a heat pump gives you is totally different between again a boiler, a gas boiler or a gas furnace. Gas boiler, gas furnace you inject gas in it you make a fire you have sudden heat it can heat up really fast. A heat pump works very different so sizing a heat pump is very very important there’s nuances to it so whoever is doing a project for you one of the most important things to understand is really how much heating does your house require? There’s a lot of different factors to it but in the industry it starts off with a thing called the manual J calculation and anybody that is considering doing heat pump should have a manual J calculation done on top of other things.*

*I mean if your house is drafty and old you have to consider possibly doing a thing called the blower door test and figuring out exactly how much loss of heat your house has to dial in the sizing of the heat pump. Not only is the actual sizing important but then choosing the correct piece of equipment is very important as well. Unfortunately, a lot of contractors who do heat pumps don’t understand this aspect either because they’ll look at a heat pump and they go in it’s a heat pump. Well, heat pumps have very different performances. It’s just you know if you wanted to win a marathon would you get the guy who does the 100 yard Sprint the fastest right probably not so it’s the same thing there’s heat pumps and there’s heat pumps that perform in cold weather and they’re actually called cold weather heat pumps. In our climate in New Jersey if you’re relying on a heat pump to heat your home it should be a cold weather heat pump and most manufacturers depending on a manufacturer will you know the cold weather heat pump will perform down to minus five degrees outside or minus 13 degrees outside things of that sort. So not only sizing is correct but choosing the correct equipment this kind of talks about what I just talked about and here’s a graph you know here’s a graph that represents exactly what the differences are in all kinds of equipment so we have logged here about 12 or so different manufacturers in their heat pumps.*

*A heat pump is very much affected by the outdoor temperature. So as the outdoor temperatures start to drop the performance of a heat pump starts to drop as well. You really want to know what is that heat pump doing when it’s five degrees outside when it’s 10 degrees outside right? We rarely get those days but we do get them. We even get those days in the negatives. So if you look at this graph there’s certain units there that only go down to about five degrees or you know three two degrees outside and past that they can’t heat. So choosing the right styled heat pump should be is key. An inverter is something that can ramp up and down in performance. It basically it’s like a dimmer switch on a light so it doesn’t have just a simple on off operation and because it can modulate that up and down it can meet demand and therefore it could provide comfortable sort of heating.*

*I skipped a slide here. I think I know what I want to talk about. So there’s many ways of executing a heat pump. By the way, right? So a heat pump, if anybody has an existing air conditioning system, you could easily change it out and make that into a heat pump. The thing is that AC system and the ductwork it’s connected to is that going to be sized correctly to meet your heating demands? In New Jersey, the answer is probably not. The air conditioning size, the ductwork size is sized to meet your cooling needs. If you’re going to put a heat pump in, it’s going to provide you the same BTUs more or less as the cooling so it won’t be the only kind of heating you could use in your house. But you don’t necessarily even have to do a ducted unit. You could do ductless and there’s advantages of ducted this is ductless ductless obviously you get coverage in multiple rooms and you have control over each room in a separate temperature setting and you get a little more finite with your efficiency and you can have rooms of the house that are colder rooms of the house that are warmer. Also one of the things that you know you have to consider and I mentioned before it’s sizing is that the smallest high efficiency furnace is going to be 60 000 BTUs. The largest heat pump is going to be 60 000 BTUs so heat pumps are a lot smaller than furnaces but you know the good thing about this is that most homes don’t need it.”*

*I guarantee you everyone that’s got a furnace or a boiler in their house, I can put my money in it, it’s probably oversized. So it’s a big huge energy hog. One of the beautiful things about heat pumps is that you do that load calculation, you dial into sizing and now you get the amount of BTUs really needed. And again, you have that dimmer switch effect where you can deliver the smallest 6000 B2 heat pump can modulate 1600 BTUs. A furnace can’t do that. A furnace will just put out a lot of heat. So you gain comfort with heat pump versus a furnace.*

*A hybrid heat pump is a unique spin on a traditional all-electric heat pump system. It uses both an electric heat pump and a fossil fuel gas furnace (natural or propane gas) much like a hybrid automobile uses gasoline and electric*[*1*](https://www.acdirect.com/complete-systems/hp-gas-heat-dual-fuel-system)*. The smallest high efficiency furnace is going to be 60,000 BTUs. The largest heat pump is going to be 60,000 BTUs so heat pumps are a lot smaller than furnaces but the good thing about this is that most homes don’t need it*[*2*](https://www.fixr.com/costs/hybrid-heat-pump)*. A heat pump is very much affected by the outdoor temperature. So as the outdoor temperatures start to drop the performance of a heat pump starts to drop as well. You really want to know what is that heat pump doing when it’s five degrees outside when it’s 10 degrees outside right? We rarely get those days but we do get them. There’s certain units there that only go down to about five degrees or you know three two degrees outside and past that they can’t heat. So choosing the right styled heat pump should be key.*

So if you have your home electrified right, then next if you’re getting off the gas or at least offsetting a usage of the gas. You’re installing an electric heat pump. You’re getting that EV vehicle. You’re just adding more electric usage so the next logical step for you would be solar, right? Solar is a little bit different in terms of solar is a very clear financial investment. So what I mean by that is that usually the majority of homes we can find a way where you lower your electric bill, right? So you’re saving money, you’re obviously offsetting your carbon footprint, doing all that stuff. You’re winning from day one in terms of financial solutions. You get a brand new heat pump, anything else in your house, you’re paying for it. You’re enjoying it of course, it’s an investment in your home but financially you’re not sort of gaining on it from day one. With solar there’s definitely a possibility that you’re gaining on day one. It’s a couple of reasons. Number one there is no doubt that electric utility costs go up year after year after year after year. The utility companies don’t lower their rates, right? So when you get solar you’re pretty much imagine if you went to the gas station in 2019 and you were paying two dollars a gallon. You’re locking yourself into that price and whatever happens after 2019 with gas prices, you don’t care. That’s essentially solar. You’re locking yourself into a certain cost and you’re offsetting the fact that 10 years in the future you’re going to be paying incrementally a lot more on top of it.

*I know everybody’s probably aware of the new Ira, the Inflation Reduction Act that passed through. The tax credit went up from 26 to 30 percent which is wonderful. So whatever solar project you do, you get 30 of it back in taxes, assuming you owe tax of course. New Jersey is one of the few states that still has the program which is wonderful. So basically, the University pays you to go solar. So for every thousand kilowatts you produce, you get 90 from New Jersey. So whether you use it or you don’t use it doesn’t matter, it’s whatever you produce on your solar panels. The state still pays you and that’s kind of important because a lot of the early adapter states like California, Nevada and all those states, they had these programs in place and then once the state’s got a certain threshold of people going solar, they did away with them. So New Jersey still has them but it’s got a limited life. It’s predicted in about two years or so New Jersey will meet their threshold and this program will no longer exist for new people. It’s still grandfathered for anybody that’s getting it now. So a lot of financial reasons for people with solar. Any questions? Basically, that’s sort of the overview of heat pumps and really fast in one. If there’s any questions anybody has, I didn’t dive deep, I don’t want to blow anybody’s brain up but I’ll be happy to answer questions.*

*Michael Heller has his hand raised. I want to say I’m looking for the chat on my screen and I do not have a chat on my screen. I’ve never seen one like this but so if you have a question please do what Michael did, raise your hand and Michael can speak first and ask his question.*

*Thank you Chris, this was really amazing. I’m a homeowner who has embarked down some of the roads that you’ve talked about. We have solar on our house, we have cold weather heat pump for our second and third floors of the house but our main heating source in the winter at this point still remains a steam boiler.*

*Can you talk a little bit more about the hybrid heat pump? What is the fuel for the hybrid heat pump when it’s not just electricity? Can it be number two heating oil or is it natural gas based?*

*Hybrid just means it’s a combination of two different things. So it honestly is anything. It could be your steam boiler. It doesn’t have to even be integrated. It just means that you have another source of heating, a secondary source. Your situation’s pretty common. I have a lot of clients that have steam boilers. Their house is big and the kind of AC unit/heat pump they want to put in just doesn’t have the BTUs to be the primary source of heat. But yet they still use it a good portion of the winter and then use the steam when they have to. I mean there’s always a way to get more heat pumps into your space, it just how much money do you want to spend is the question. And do those clients, if I can, do those clients have, say for example they got a four ton condenser unit, do they actually have more indoor units than the BTU rating for that four ton? And because you’re able to just designate which units are on at which time of the day essentially, I don’t want to say oversized but overdrive the condenser just not by running all of the units which have a greater BTU sum than what that condenser is rated for? Yeah, it sounds like you have a great understanding of it. Yeah, that’s pretty common. The sum of the indoor units is generally sometimes sized larger than the outdoor unit because you almost never have that perfect storm where all the units need to be on all at once at 100%. So they, you know, there’s a diversification that yes some units are not on, some others are on so there’s always BTUs delivered to the right spots. You can always kind of negate your shortcoming in BTUs with that and yeah quite honestly if you’re not meeting your full heating demand you could keep adding more heat pumps essentially. You could if you really wanted to but obviously there’s a limit to what you want to do and what your goals are.*

*Super thank you so much Chris. Okay, the next person with his hand raised is Thomas. So Thomas can you unmute?*

*Sure hi Chris, question about the solar. I’m interested in possibly going solar now. A lot of questions around that like the solar panels, who would actually own the solar panels would be like my first question? Second question is I’m also more interested in the battery backup for the home in case I lose power, especially that we have like well so our well pump we lose power we lose our water that sort of thing. Sure so there are two kinds of solar deals that everybody does out there. It’s basically one is a lease so that’s what you’re talking about at least is where you don’t own it and then the other part of it is a buy where you do buy them with finance or buy them outright. So my personal recommendation and feeling on it is basically if you’re going to generate electric power in your own house you should own it right? And owning is the only point in time where you can actually take the tax incentives right because you don’t qualify for the tax incentives if you lease and also the state SRECs so those are big huge financial gains incentives I call them right that benefit going solar and the only way you can get them is if you own them so leasing is okay in some situations usually elderly people that just want lower bills for their monthly bills.*

*A lease will achieve that for them but that’s about it, right? So if you’re planning to stay in your house and you plan to reap the benefits of the tax incentives, you should own it. The other part is battery backups. Yeah, you can do battery backups. Batteries are expensive so if you have no way of getting a generator, which some properties you just can’t, you don’t have the gas or anything like that, so battery backups of you can install battery packs as many as you want. You just have to pay for them and the batteries are good for a day or two depending on how many you get. Again for an average house they’re not, you know one misconception is that you can kind of run your house for a while. You really can’t. I mean a day or two will get you by on good battery pack investment but they’re very costly. Very few people actually get them because of the amount of money it costs. Okay because yeah I was wondering about that Tesla battery house battery. So just to give you an idea it’s about twelve thousand dollars for the first pack and about eight thousand dollars for each additional pack and an average house to fully power it probably needs two packs so that’s 20 grand. Yeah okay yeah no they’re expensive. All right thank you very much.*

*Okay thanks and Michael and well Thomas already turned his hand off so Michael could you turn yours off? The next person is Susan.*

*Hi thank you Chris, is are the heat pumps also used for cooling? My understanding was that they were dual purpose heating in the winter and cooling in the summer.*

*Yeah absolutely that’s why I said the name, the heat pump name throws people off. They stop thinking of it as an air conditioner slash heater, it’s both.*

*Thank you and Susan hi I was wondering, you mentioned a calculation for how much power you actually need. Would that be something a contractor would do for you or is*

*yes absolutely so a good contractor, I’ll stress the good part, should be doing manual J calculations as good industry practice. Now the unfortunate truth is not there’s there’s a lot of contractors who just don’t know how to do it and don’t do it but you can definitely get third-party people too that just deal in purely that analysis like an energy audit. There’s companies I can even recommend they’ll just come to your house they’ll do that kind of calculation they’ll make recommendations on insulation and things like that and it’ll give you a good perspective on what your house really needs if your house is leaky and how much how many BTUs of cooling and heating your needs so so you can get that independently as well.*

*Okay, I have a second question. You mentioned tax incentives for solar panels or heat pumps covered by this Federal bill or no? Yeah, so you know right here this address I put up, it’s very new. Rewiringamerica.org/app. So it’s a cool little calculator if you guys go to it where it will show you what the incentives of 2023 are and they’re not all clear yet. There’s a lot of details to be worked out on the state level. So there’s definitely going to be tax incentives and some other rebates and things of that sort available. Now the only thing I will say is that usually the very very high efficiency equipment ranks for this stuff, right? And it’s usually the smaller equipment so I wouldn’t go chasing the rebate. You know that’s what happens a lot of times people chase the equipment that qualifies but again the equipment that qualifies isn’t always the best for your design. So design is first, it’s just like you know if you want to run a marathon do you choose the sprinter? So the sprinter may qualify for the rebate but is it the right application for your house? So these kind of rebates are written by people who have no clue about design. They’re in the government, they just look at some SEER rating which is very hard to put a blank statement on. So some equipment will qualify, some won’t qualify. The taxes for getting a heat pump for Wednesday and you’re supposed to get the tax incentive no matter what but then there’s additional rebates for qualifying equipment. All of it is still not super clear so even if you go to this calculator like everything will depend on your income level and each state has to kind of come up with their own program for 2023 which hasn’t happened yet.*

*Okay we have one more question and then we’ll turn it back over to Steve to introduce the next speaker. So John, you have a question?*

*Yeah I do, hi Chris thanks so much for the presentation, very informative. So I’m in Southern New Jersey in Margate near the ocean and right now we don’t have any solar. We have an older home and we’re looking to upgrade the HVAC. First question and I have two, first question is how do we find someone like you that would take a whole house approach? You know I think if we go to just an HVAC guy or if we go to a solar guy they’re going to want to handle their part of it. We’re looking for an electrical engineer or someone that can talk to us and understand the whole house approach we want to take. Where can we look for and find someone like that?*

*Sure that’s tough where are you again? We’re in Margate in Southern New Jersey. Okay so Atlantic City yeah so I could help you with solar but not HVAC now that’s that is a very tough one I suggest there is a Facebook group called Electrify AI everything there is a person on there his name is Nate Adams he started a group where he’s trying to get a bunch of contractors who are like-minded and he probably has a good database of people that are like-minded. I don’t really know of anybody similar down in South Jersey at all. It is a tough find. I mean, I’ll tell you, a lot of times it takes you as the homeowner to really pull things together, get educated enough. But if you follow that Facebook group, it’s all about educating homeowners about how to electrify and choosing the right heat pumps and a lot of what I talked about. All right, it was Electrify Everything and what was the guy’s name? Nate Adams. He is known as the House Whisperer. I think his book was called House Whisperer.*

*Okay, one other quick question if I can. You talked about battery backup. What do you know or what do you see coming being able to use an EV as battery backup? And even well, I understand some of these EVs you can plug them in and use them as the battery, right? Yeah, yeah that’s a neat little thing actually. So I mean, I don’t think every EV has it but I know some of them. I think that’s the trend that’s pretty cool but then if you use that can you drive out to work in the morning?*

*Yeah no, I get it, I understand but yeah well one thing that I probably didn’t say but the average house in the United States uses about 11,000 kilowatt hours a year and the average EV will pretty much use 5,000 kilowatt hours a year charge at home. Yeah that’s half your usage so that to consider as we move on and more of us have EVs not just one but some of us have two in a house. Yeah yeah you’re gonna double the actual usage of your electric at your house so hey do you have it and you know the other thing is how much is it going to cost you so that’s why solar is becoming more and more important.*

*Yeah all right thanks again Chris thank you and Carol got her hand raised before I turned things off so Carol will be the last one and then we if we have time at the end and we probably will we can ask more questions then so Carol*

*hi thanks Chris. I just wanted to make a comment and that is that nobody ever talks about it but it is possible to have a ground mount solar system. The leasing companies never offer it because I guess they figure it costs more money or something but if you have a shaded roof or like in my case my roof is extremely steep so it’s not really great for solar anyway. I have a ground mount system and it worked great so that’s all thanks.*

*Yeah absolutely, you just have to have the real estate to have it.*

*Okay then we’ll go back to Steve for the next person and everybody that has their hands raised please turn them off at this point and make sure you’re muted and we’ll at the end of this hopefully we’ll have time we’ll bring back all the questions thank you.*

*Chris, that was a great talk, thank you. You answered all the questions very well and you said how do we, people are asking how do we find somebody like you where we live. So well, if you’re in northern northern Jersey it sounds like you have the right person. Anyway, next speaker will be Francie who wanted an ultra clean HVAC system for her apartment and she went to Chris and Chris came up with her answer. So Francie, I’m going to turn it over to you.*

*Okay, hello everybody, thank you. Well Steve made it sound simple and it was anything but. It was a very arduous process until I found Chris and I just wanted to talk a little bit about what my learning curve was like, what were the important things that I think one must know about and keep in mind when switching over to this type of a system and how to choose the right person to do it because I think that is the most important thing. So I do have a background in healthcare and I have been an environmentalist for a long time and I suddenly started reading a lot of scientific articles about the health dangers of fossil fuel byproducts when using fossil fuels for heat and cooking and using clothes dryers and things like that in the home. The health literature is quite alarming if you start to look at it. Not only the dangers like Chris mentioned of carbon monoxide poisoning but just the everyday exposure mostly respiratory of the byproducts that circulate in your home just from using a gas stove, a furnace, a gas powered clothes dryer are really quite startling. They produce what’s called particulate matter which are very fine particles that float through the air. It also comes from any kind of combustion energy source such as cars and factories but most people get exposed to it in quite surprisingly high levels just in their own home. In fact, air quality inside most people’s homes is far worse than anything they’re going to breathe out of doors. So indoor air quality is really kind of an under advertised health risk that most people are not aware of. It does things not only for cancer but it vastly increases the rate of stroke, cardiovascular disease as well as respiratory disease. That was one part and then of course being an environmentalist you know I say you know I don’t want anything to do with fossil fuels anymore so there was a very there were there were two very compelling arguments. The other thing is is that in my apartment it’s a forced air system so that there are there’s duct work that runs through my walls and ceilings. This is quite common in many people’s homes and places of work and the either cooled air or the heated air comes out of vents that are in the wall or registers in the ceiling or floor and it always bothered me. It wasn’t something that I grew up with.*

*I grew up with old-fashioned radiators and no air conditioning but it always bothered me, like how do you keep them clean? Dust and these fossil fuel byproducts are getting blown through these vents that are distributing the air in all the places in my home. I had talked to a number of people and they said well you know there’s a lot of problems in trying to clean your ducts. It very often ends up disturbing things and only making matters worse. A deep dive into the literature on that from the Department of Energy, the Environmental Protection Agency, and other places sort of back that up. It’s not necessarily something that’s going to help and it may actually make things worse. So I started to think about it and I said you know well the fossil fuel byproducts not being healthy and duct work that can harbor mold and bacteria in the dust that’s in there and not being able to clean it.*

*I don’t really like these health risks in my home. The other part of it was what Chris mentioned, that there are some cost savings to be had with electrification and I think in the future there’ll be even more than we see now. So all in all, I said you know this is a no-brainer, I think I need to switch to a ductless system so that I am eliminating vents that can’t be cleaned and to eliminate the fossil fuel byproducts in my family home. So then became the task of well what do I get and who do I get it from? I did again a lot of reading, there’s a lot of good reading on the governmental websites from the Department of Energy in particular, also from the EPA but it was very hard to integrate it. There would be certain things that were more energy focused, certain things that are more health focused but not necessarily all integrated so that was sort of something that I found I had to kind of put together myself. Chris mentioned something that I discovered was like the most important place to start when you’re thinking of putting this into your home and that’s the manual J calculation, that’s assessing what the particular needs of your home are in terms of heating and cooling. So if you live in a home like I live in an apartment and we only have two exposures, one is Northeast and the other one is Southeast. So one part of the apartment gets a lot of sun in the middle of the day or the morning and the other one gets less. I also have very large windows so these kind of things can change our heating and cooling needs compared to someone else’s house who maybe has four exposures or maybe has two exposures, who maybe is surrounded by a lot of trees and shade, who might be in some place that is very windy. So it’s not a one-size-fits-all at all. A lot of people just look at the websites for manufacturers and they say okay well if you have so many square feet this is what you need, that’s the furthest thing from the truth. You will get into a lot of trouble if you think in simplistic terms. You need an expert and Chris was really the first person after interviewing 10 contractors who not only knew about manual J calculations but also knew how to do them and it was really quite shocking because I was working off recommendations of contractors and dealers that the manufacturers were rating as their four-star Platinum top-rated contractors in my area which meant that they had gotten training from that company on how to size and install these units. These people just didn’t know what they were talking about.*

*You know, if me as a layman knew about these things and these contractors didn’t, I said you know these are totally not the right people, especially since these jobs are pricey. As Chris said, if your contractor doesn’t know how to do these calculations to figure out what equipment and what size you need, it will be essential money well spent to get an either an energy auditor or some kind of engineer to do that. I think I get the impression that the installation in many cases is really not that complicated and you see lots of do-it-yourself stuff online for that but you have to know that you’re installing the right sized unit and the right unit. And actually what I learned is that there are two kinds of units involved in these systems and you have to be careful about sizing each one of them separately. The beauty of these systems is that you can have one room in the house cool and another room in the house warmer. Everyone can pick the comfort level that they want in terms of both the temperature and how much the fan is circulating the air. So if you have certain family members maybe who are older people who don’t tolerate cool as much, they can put it on 80 if they want. You have to figure out the size of the room and the energy needs, the BTU which is a measure of heating and cooling, British Thermal Units it stands for BTU. You have to figure out what the heating and cooling needs are for each individual room and you need to put a unit if you’re using the ductless systems, you need to put the appropriate sized unit in each room. So once you have the size of what is needed in each room then you have to add all those things up and figure out what is the size of the unit that will go outside of the home, the condenser compressor that will serve as those inside units as Chris said before. I learned that it doesn’t always have to be equal because it’s rare that every single room is going to be heated or cooled at the same level simultaneously. So for example if you’re going to sleep at night, chances are you’re only going to be heating or cooling the bedrooms for the most part so that is a lesser total sum of your energy needs than if you had added up the energy requirements of all the rooms in your abode. So the outside unit doesn’t necessarily have to be as strong or as equal as the sum of all the inside units. So these are the kinds of things that I learned as I went along and this again speaks to the whole idea of you have to learn how to size the inside units according to the needs of that room and make sure that the outside unit can service the energy needs for the entire home. The manual J calculation, and Chris can speak to a little bit more of the details but generally it looks at a lot of things such as the size of the room, height of ceiling, how many windows, how big are their windows, which way do windows face? Do they face North or do they face South where they’ll be getting a lot of sun? How many exterior walls are in household?*

So for example, I live in an apartment so it’s not like a house that has four sides that are exterior walls. You know, how many doors, a lot of factors like whether it’s on the first floor or on the upper floor, for you know in my case in an apartment, whether the space above it or below it are heated or cooled. Like I live in a first floor place so underneath it’s not heated or cooled. So there’s a lot of different things that are sort of when you think about it makes a lot of sense but it took a long time until I finally spoke to enough people and learned enough about how this needs to be sized to realize that these are all the different factors that needed to be taken into consideration. So you really need an expert who knows how to look for these different factors and then there’s a scientific way of calculating how much one thing matters versus the other and that’s the manual J calculation. That’s sort of like the formula of the recipe that it all adds up. So in my case, I’m living in an apartment and I only have two exterior walls which presents the problem with installation. Generally speaking, I learned that it’s much simpler to install these units if you have exterior walls to put them on in each room. Very simple, you put it on an exterior wall, they poke a little hole through that wall and out of that comes a tube which drains the condensate fluid for the air conditioning in the summer and it also supplies energy, the power source as well as the heating and cooling supply to that unit in that particular room. But I don’t have four sides, every room did not have a wall that’s available for the placement of an exterior unit. So I learned that that’s something that changes the ball game when you’re putting it in an apartment. It doesn’t mean it’s impossible, just means you have to approach it differently which I was happy to find out. So in my case, I have a lot of my units on interior walls, walls between rooms not walls between the outside and the inside because either it was impossible to put it on the exterior wall or that wasn’t a good place in terms of comfort. So we run the lines that supply the energy and supply the heating and cooling through our ceilings because we have drop ceiling and actually they’re very small lines, it doesn’t take up a lot of space but we removed some of our sheetrock and Chris’s guys were able to drill holes through the walls that needed to have holes drilled through them so that the lines can run through our ceiling, travel to another room, join up with another line and eventually make their way to the outdoors where they both drain the condensate fluid from air conditioning in summer but also supply heat for winter months to units. So there takes some creativity and design chops to be able to figure out what’s going to make most sense and how it’s all going to fit together and work. These are really important things that I found most other contractors just didn’t know what they were talking about. It didn’t make sense to me and that’s why I kept looking because I was learning as I was going but I said this doesn’t make sense, this doesn’t feel right and then I would talk to more people or read more and then find out well yeah it didn’t make sense because it just wasn’t going to be practical, wasn’t going to work, was going to create leaks or some other kind of problem if they had gone and done it that way. You know it’s like building a house, you want to make sure you build it right so you don’t have leaks or collapses or other problems later on. You need to plan this properly, it’s not like just popping an air conditioner into your window so you need to find someone like Chris who knows what they’re doing and we’ll take it into consideration.

*The other interesting thing that I learned is that you save more money in the warm months than you do in the cold months. These units are incredibly efficient when it comes to the air conditioning part. They require much less energy to achieve the desired cooling effect that you’ll want and the air conditioning bills are much less than it was with my traditional central air in northern New Jersey. You know, we require a significant amount of heat in the winter time although with global warming that’s getting to be less and less so the savings were not as large but it wasn’t more than what I was paying for my traditional gas furnace. I was perfectly comfortable this winter, it wasn’t the most severe winter but I had no issues with the amount of heat that these units were generating for me and you know it was very customizable. Like, you know if the temperature was dropping rapidly I could ramp up the fan speed so it distributed the hot air a little bit more forcefully and warmed the room more quickly. You know that’s really great and also it’s like a remote control so if it’s the middle of the night and I’m feeling hot or cold I can just press a button and change the thermostat without getting out of bed so that’s really nice to be able to customize my comfort that way.*

*Let me see what other kinds of things, oh, the other thing is that there’s a lot of different brands out there. I chose the company that I chose based on not only its reputation for being reliable but they happen to sell different sizes than other companies and they sold a size compressor that matched up with my interior energy needs that would be closest. It wasn’t oversized, it wasn’t undersized. So you know if a company doesn’t sell your size shoe you don’t buy shoes from them so it was the same thing. There were other choices, there were other companies but they didn’t necessarily have the size unit that was right for me. I would have had to buy either units that were too big or too small with the other companies so that’s also important. Some contractors only deal with certain companies, some only deal with Mitsubishi or some only deal with some of the Chinese brands or Carrier although I think everything’s pretty much made in Asia, I don’t think anything’s manufactured here. Also different companies have different lengths warranty on their equipment so that’s important, very big variation on that. The company I used has a 12-year warranty on their parts. I hope I never have to use it but at least it’s nice to know that it’s there. What else? You know things like reliability ratings, you know might be a great unit but I want to make sure it doesn’t break down so you might want to look at that. I mean first you have to look at what size you need and then you can look at the choices of which companies sell the sizes that you would choose from. I did get a two thousand dollar credit from the state although it was pretty expensive units so kind of only made a little bit of help but yeah I think those might be improving with the new legislation. I’m trying to think if there’s anything else I haven’t covered and then the other what’s really nice about these units is that they have filters to keep the air clean and also to keep the units themselves running efficiently. You want to keep dust out of any kind of machinery because it’s going to cause it to break down or not run efficiently so the nice thing is that every unit in my house, I can pop out the filter and just wash it with warm water and then let it dry and put it back in so I don’t have to purchase filters. I can clean them whenever I want and that gives me a sense of control over the air quality in my house, that I can keep it clean. I do have it serviced professionally by Chris’s guys twice a year where they come in and they pull it apart more to do more thorough cleaning. You can do a deep clean every so often if for some reason you need to have it where they can really just take apart the whole machine and hose it down with special chemicals and water to literally clean every part of the machinery. So that sense of being able to control the cleanliness and the efficiency of the machine and taking care of being able to take care of it myself, well more or less together with Chris and his guys, is also a big selling factor for me.*

*So again to summarize, I think their health considerations of these units are something significant to get any danger from the usage of fossil fuel byproducts and production of airborne particulate matter in your home to get out because you don’t have any of that being generated by these units. Not having dirty duct work to worry about, being able to clean the filters, being able to keep the machinery clean and operating well, not contributing to fossil fuel usage, and I’m hoping that over the long run that the cost savings will also be something that I’ll be happy with. So any questions send them my way.*

*So thank you and I’m thinking I do see one question but Steve do you think we should go on to the third speaker and then take questions? I think we should do that yes. We had scheduled till 8:15, we can go over, I mean there’s no problem with the bridge if people want to stay over but we should take questions at the end because the next people and I do at Francie, I really appreciate the information you gave us on health risks and numerous factors for consideration, that’s quite an earful. I thank you very much.*

*The next speaker is Patsy and David from Central New Jersey and all the advertising you’ve seen has their house featured as the house at the top of the advertising and it summarizes basically what they’ve done with 16 years of electrification. So Patsy and David, I would like to pass the mic to you.*

*Okay, we’re debating who’s going to talk. So we’ve lived in this house since 1988 and we started upgrading the house in about 1996 with an addition that went on the back of the house which you can’t see, which included an air source heat pump. The original house had an oil burner forced air furnace as well as an oil burner water heater. So over the years these are the improvements that we’ve made: in 2005 we replaced the windows, in 2008 we replaced the old furnace and the air source heat pump with a ground source heat pump which we’ll talk about in more detail. Let’s see, in 2018 we bought an electric car, in 2021 we put a solar roof on the house with a battery backup and also in 2021 we replaced our electric water heater which we had installed with the ground source heat pump. We replaced the electric water heater with an air source heat pump water heater and we’ll talk about that in a little more detail. And the latest upgrade is the replacement of our old gas lawnmower with a Toro electric mower. So this was the first major change that we made, again replacing an oil burner furnace and water heater and standard AC for the main house and the air source heat pump in the back for the addition. We replaced that with Climate Master systems, these are ground source heat pumps. They were sourced by our contractor, they were sized by our contractor at 3/8 tons and 2/6 tons. We have a two-zone system, each unit has an electric coil backup so this is sort of the hybrid system that Chris was talking about before. So if the heat pumps can’t keep up with extremely cold temperature, the electric coils will kick on or if the heat pumps fail you have electric coil backup. Variable speed fans to pump the air around the house at the optimum rate so when units are not running, fan speed is relatively low. If they have to make up a big discrepancy in temperature, fans will speed up. And so two ground loops, this is basis of system when you have two. The system required essentially two holes to be dug 375 feet deep each and in each of those wells goes plastic tubing that’s looped down and then grouted into place to ensure good thermal contact between loop and ground and then that’s routed into house. I’ll show you a picture of that later.*

*Okay, the alternative to digging 375 feet deep is to go down eight feet and have a horizontal loop and we decided to go 375 feet deep because we felt there was less chance of damage to the loops. The other comment I want to make is we are using the term ground source heat pump instead of geothermal heat pump which is a more popular term because our nephew who’s a mechanical engineer said you really have to go to Iceland for geothermal and so more correctly it’s ground source that we’re getting the heat and the cooling from the ground, right? Yeah. And at the same time that we did the heat pumps, we replaced the oil-fired water heater with a 9000 watt green Marathon water heater. So that was the electric water heater that we eventually replaced later. So the total cost for this system was about sixty thousand dollars. We eliminated though the use of a thousand gallons of fuel oil annually and our savings to date, we estimate to be about forty-six thousand dollars. The interesting thing, why the electric, this item is highlighted, is that our electric bill didn’t change going from the old system to the new system. I guess this always struck me as surprising because we were going from one heat pump to two heat pumps so I figured our electric bill would go up but it in fact did not. And I guess I attribute that to the higher efficiency of ground source heat pumps compared to air source heat pumps. And I think as Francie mentioned maybe there’s really no regular maintenance for these units. We’ve really done nothing to them in however long since 2008 except to clean the air filters. I clean them twice a year for the bigger unit and once a year for the smaller unit and the performance, we’ve been very satisfied with the performance and they are nearly silent in operation. All the equipment is indoors so there’s no weather damage to units. So this unit is actually sitting in our basement, this is larger one. This is what ground loop looks like when it enters house so ground loop enters at this point which is about four feet underground and fluid is circulated through both units using this pump and pump can be operated independently depending on what heat pump is calling for fluid either heating or cooling. I highlighted this point because this is a critical advantage of a ground source heat pump system in that fluid that you’re exchanging heat with remains constant at 55 degrees all year round as opposed to outside ambient air which can fluctuate as you all know between 20 degrees in winter and 90 degrees in summer so we get extremely efficient air conditioning in summer and good heating in winter.*

*And if the heat pumps can’t keep up if it’s extremely cold, then we have the coil backup as I mentioned before that will make up any deficit. So this is a key reason that we went with the ground source heat pump system because we just felt that this was a much more efficient method of transferring heat from one place to another. Okay, so this is our new water heater, it’s an air source heat pump water heater for Rheem. It also has a hybrid system so it has, in addition to the air source heat pump, a 4500 watt resistive heater backup. I put in the uniform efficiency factor for the new water heater which is four as compared to our old Rheem Marathon unit which is less than one. So there’s a four-fold factor increase in efficiency. This is kind of an expensive unit, the cost installed was about four thousand dollars. The unit itself was about half that and the installation was about half that so it’s relatively expensive I would say. But this one’s, this is what it looks like, the heat pump is up here, you can see the fan that keeps the compressor cool. The water tank is actually here and I don’t know if you can read this sticker but that’s the estimated annual energy cost for this unit of about 149 dollars. We installed this water heater as a part of an energy upgrade package which included attic insulation and because of the size of the overall package we got a two thousand dollar rebate from the state of New Jersey and a five thousand dollar interest-free loan. One thing I wanted to point out is the connection between the ground source heat pump that we use for HVAC and the water heater. So this desuperheater loop is actually able to, in summertime when unit is running in cooling mode, take heat that it has removed from house and transfer it to water heater so it assists water heater in keeping water warm. So this is a loop that runs from cold water supply through heat pump and back into water heater so that’s kind of an added advantage of this particular ground source heat pump and this is where ground loop from outside actually enters unit.*

*So the next big project that we did was the solar roof. It consists of a series, and in this case, 196 active tiles which produce 58 watts each, so the total of our system is about 11 kilowatts. We have non-active tiles in low exposure locations so this portion of the roof doesn’t have any active tiles. This portion of the roof on the garage side which faces North has no active tiles but there are active tiles on these two surfaces and this one which face mostly West. You can’t tell the difference, they’re all connected together. So the cost of this system with the roof, and I should say that we did this and same for the furnace, we made these replacements at end of life for each of those systems. So the oil burner we needed to change and the roof had reached its 25-year limit so instead of putting an asphalt shingle roof on the house with solar panels, we decided to go with this Tesla system of solar tiles and this is what it looks like. The cost of the system at fifty-five thousand dollars to be honest doesn’t seem like it would be that much more expensive than an asphalt shingle roof with solar panels but I didn’t price that out so I don’t know that for sure but as Chris indicated apparently there’s a 26 percent federal tax credit so our net cost for this roof was about forty thousand dollars. And then the state of New Jersey has what’s called a transition Renewable Energy Credit system now which pays ninety-one dollars per thousand kilowatt hours generated. So we have signed up for that system and we’re starting to receive those payments of 91 every time the system generates a thousand kilowatt hours. The other thing, our electric bill is reduced each month by whatever power we send to the grid. So this is what our bill looks like and basically this number 605 is what we imported from the grid for the month of July, the billing period of July. This number at the bottom 254 is what we sent to the grid during that period so the difference between those two numbers is what we’re actually billed on from JCPL.*

*These numbers, in case you’re wondering, are the totalizing electric net metering system. Since the system was installed in February of last year, we’ve imported about 20 megawatt hours from the grid and returned 4 megawatt hours to the grid. And in reference to an earlier question, we decided to install battery backup systems. These are Tesla batteries, obviously, they’re each 13 and a half kilowatt hours. These were fifteen thousand dollars as Chris indicated, the batteries are not cheap. The net though after the federal tax credit is eleven thousand dollars so that makes a significant reduction. We’ve had several minor grid outages during this period and you really can’t tell. The lights flicker a little bit but nothing like the computer for example doesn’t go off so there’s really a pretty seamless backup when the grid goes down. And in the summertime when we get sufficient sun, we can actually run the house overnight or when the sun is low on the batteries and that’s been very useful for us. This is just a view of the back of the house so this is the addition that we were talking about before. These are active tiles on the back of the house which is facing East and this roof is the only one that’s facing an ideal direction of South. This is what the installation looks like. I thought this would be interesting. Tesla hires a roofing crew to take off old roof and make any repairs necessary and then they install a weatherproofing underlayment that’s all this gray stuff here and then Tesla guys come out and actually install tiles and interconnect all tiles.*

*This is what the back of an active tile looks like, so you can see the interconnection leads and then these are clips that actually clip into brackets that these guys mount on the roof. So the tiles are easily removable for them if one of them fails or if they need to get under the roof for some reason, they just clip out and clip back in. I don’t know if this is a valid calculation or not but I was kind of interested in the power output of the roof tiles versus a typical solar panel that most people use. The size of this tile is about four and a half square feet and at 58 watt output, that computes to about 13 watts per square foot. I just found this solar panel online, LG Solar. They have a 380 watt panel which is 19 and a half square feet in size and that computes to about 19 and a half watts per square foot so you can see that the tiles are not quite as efficient, they’re about two-thirds as efficient, I guess if that’s the right term, as a solar panel and that’s been the characteristic since the tiles came out. Some of the results that we’ve gotten from the roof, this is from our Tesla application. I should say that the design estimate from Tesla thought that this system would offset our energy usage by about half over the year and generate almost 11 megawatt hours per year. So far our current energy offset is a little over 50 percent so we’re on target and we’ve generated a little over seven megawatt hours of solar energy so it looks like we’re on target to hit both of these numbers. The distribution of the solar energy that’s generated: 50 goes to the house, 25 goes to power walls or batteries to keep them charged, and then we end up exporting about 25 to grid. And again this is total usage for house through July. Oh yeah, and so this just gives an indication of how often or how much power goes to running in self-powered mode, again summer only because this is only time we get enough sun to actually keep power walls fully charged.*

*About 40 percent of the time we’re running or 40 percent of the power goes to a true off-grid operation. And then just more money numbers, so we’ve generated seven T-Rex to date so we’ve earned back, we’ve received back from the state 641 dollars. Our electric bill, we’ve always been on an equal payment plan so this year our electric equal payment plan was reduced from 250 dollars to about a hundred and sixty dollars or thirty-five percent reduction. So the estimate for our 2022 payments will be a little under two thousand dollars and if we get to 10 T-Rex that will compute to nine hundred and ten dollars so you can see that we can anticipate a total electric bill for 2022 of about a thousand dollars and that’s down if you multiply 250 times 12 that’s three thousand dollars so that’s a two-thirds decrease overall. And just to show you what I was talking about comparing winter performance versus summer, this is January of this year so you can see the amount of power we generated was fairly low, 450 kilowatt hours, and our usage was fairly high.*

*I think this gets to what Francie was saying, the systems have to work harder in the winter to heat. And then in July, we’re almost at a net-zero operation here, we’re generating almost as much as we produce. So you can see that the amount that we’re generating is three times higher than what we get in the winter and the amount that we actually need is less than half. And just so you know that we have Mother Nature’s seal of approval, this is a great blue heron sitting on our solar roof. So as I indicated at the beginning, the other step that we’ve taken in electrification of our house was to buy an electric vehicle which we did in 2018, a Tesla Model 3. That’s not what this picture is but to compare with our previous vehicle which is a Subaru Outback. At 50,000, we drove the Model 3 about 50,000 miles before we traded it for this car and the Model 3 gets about four miles per kilowatt hour so over 50,000 miles if you multiply that out, the energy cost is about one thousand seven hundred and fifty dollars at 14 cents per kilowatt hour which I think is our current rate. So that’s the total energy that we’ve used over the three years that we had the car and this is the electric grade as compared to the Subaru Outback which typically got 25 miles per gallon and we estimated an energy cost of about six thousand dollars for two thousand gallons of gasoline at three dollars a gallon and I just sort of picked that number for that period.*

*I’m not sure that’s exactly right but it should be in the ballpark. I should say with the new vehicles, the new Tesla vehicles, they are heat pump equipped as opposed to the Model 3 which had an electric resistive heater so these should be more efficient. And then this car is more in keeping with the theme of this meeting which is heat pumps, I guess. And we can actually, during the summer, charge the car and the power wall and run the house while the sun is shining. We simply turn down the charge rate on the car so that it matches the roof output. We can charge anywhere from up to 12 kilowatts with the charger that we have in the garage but if we turn that down to about six kilowatts then that matches about the output of the roof and allows us to still run the house off the roof and charge the batteries. And for those of you who live in the Hillsborough area and want to be a Duke Farm volunteer, they are now offering recharging. Okay, so summary: since '96 we’ve gradually replaced fossil fuels with electricity. We started with an air source heat pump, we replaced our oil burner with a ground source heat pump HVAC system and electric water heater. We replaced our gas car with an electric vehicle, we conducted a whole house energy audit, we replaced our old shingle roof with solar tiles and battery backup, replaced the resistive electric water heater with an air source heat pump water heater and then lastly we bought this Toro electric mower. And JC, if you’re a customer of JCPL, they were offering these energy saver kits which included some LED bulbs and some LED night lights and crayons for your kids to actually color the box. And there are links here for additional information on any of the items that we talked about.*

*Francie appreciated the presentation and the fact that she lives in a condo and was able to do these projects. She was curious about how it worked out as far as any zoning issues and negotiating with the Condo Association. Francie had to get a permit from the town which consisted of submitting a survey of where the outdoor unit would be. She swapped out where the compressor for her old central air conditioner was located and put the outdoor heat pump condenser in exactly the same spot. There was no problem with that because they were just putting a piece of equipment in the same spot.*

*That was easy. The idea of altering the building was part of the creativity that we had to use. Since we had an outdoor air conditioner compressor, there was already a perforation in the envelope of the window through which the power and circulating refrigerant were coming. We just went through the same perforation that was there for the central air conditioning unit from before. What we did is we joined the different lines for the different interior units so that they would all converge and go out the same perforation in the envelope of the building. I also used another door, so I went through the door frame to use that as another place where we went through the perforation of the envelope of the building. But it depends, I could have just gone through the same single source, single place where the central air was coming from before. There was no substantial alteration or change from what we had before. All the work was done basically interior to go through my ceiling so we had to remove some of the sheetrock from my ceilings in order for them to do the work in the ceiling but it was really no different than what was there before compared to these essential air conditioning lines there. Also, travel through the ceiling.*

*Great, well thank you so much. It sounds like you’re very happy with the solution that was designed and implemented so that and I appreciate your sharing that with us.*

*So I mean, I think you asked a great question, I had no idea to even ask those questions when I was in the process of it so and different people contributed different ideas on how to approach it in terms of placement of units and placement of actual lines that needed to be installed. That’s why you need someone who really understands how the machines need to operate properly in terms of a supply of refrigerant, energy source, and drainage. Then you can design it to fit the needs of the machine. Air conditioning refrigerant is going to be different than what they generally use in refrigerators or any low-temperature system like that. Patsy’s name is familiar because she is part of the Rutgers environmental stewardship program. The fluid that goes in the underground system that goes down over 300 feet is mostly water, but it contains some ethanol to prevent freezing. It should never freeze because the loop is at a minimum of four feet underground where it enters the house and then it just goes down from there.*

*Patsy and David are happy with how the Tesla tiles have been working out for them so far. It’s been about 18 months and the Tesla tiles seem to work fine. The ability to run off the grid in the summer is kind of neat. The house doesn’t use too much power overnight so there’s plenty of capacity in the batteries to run the house overnight until the sun comes up. If they start at about 100 percent of capacity, they generally have 40 or 50 percent left by the end of the day depending on how much the air conditioners are running. But they limit it to not go below 35 percent just in case there’s a grid outage. In the winter, they turn off the self-powered mode essentially and set the reserve for the batteries at 100 percent because of the low solar output they get in the winter. They would never get fully charged to be useful. The only time they get charged through the grid is when the system detects a major storm that might result in a grid outage, so the system will make sure that the batteries are at 100 percent in that situation. But otherwise, they’re never charged from the grid. If you turn off the charging mode, they hold the charge for some significant period of time.*

*Thank you for your kind words. David and Patsy have done an amazing job with their home and have set a great example of what is possible with some creative thinking and investment. Francie also gave a great presentation. In response to your question, using the battery at night and depleting it to a certain level before recharging it is actually good for the battery. It’s like exercise for the battery and is what you’re supposed to do. As long as you don’t let it deplete all the way down, keeping it at a minimum of around 30 percent, it should not decrease the lifespan of the battery. It’s meant to be charged and used. Is there anything else you would like to know? 😊*

*Chris works in northern Jersey, which is generally considered to be north of Route 78. Patsy and David looked into alternatives to the Tesla solar roof, but at the time there were no alternatives. GAF is one company that has come out with a less expensive and possibly more energy efficient option since then. The jury is still out on the reliability of these new products as real roofs versus solar panels. The Tesla roof had its fair share of issues as well, but Patsy and David are happy with their choice. Chris wouldn’t recommend anything else yet because they don’t have the time trial out there. The Tesla roof is a long wait, currently 12-18 months due to backups and shortages. Patsy and David calculated that the cost of a new roof and solar panels was comparable to putting on solar tiles. They didn’t feel it was that much more expensive at the time, but they have heard that Tesla has raised their prices since then. They had 10 guys working on their roof for two weeks and only paid $55,000 for it. It sounds like a lot of money, but considering the amount of effort that went into it, they didn’t feel it was that expensive in the end.*

*Thank you for your kind words. The presentations were outstanding and it’s great to see that so many people hung in there until the end. There will be more of this every month, so hopefully, we’ll see you again on September 15th. Thank you to the presenters and organizers for putting together such an interesting event. Good night! 😊*