2023 Electric IRP TAC 2 Meeting Notes, 2/8/22

Introductions and Process Update, John Lyons

Thackston, Jason: And the insights that you bring to the conversation. We take we take those comments and this interaction seriously. It's not just to check the box kind of thing. We really do spend some time internally after these meetings. Going through the feedback and making adjustments as appropriate to the way that we're approaching our integrated resource plans. Thank you for your commitment to this process and for making the time to be part of it. And I look forward to what we have on the agenda today, so I'll hand it back over to John.

Lyons, John: OK, well hopefully you all are seeing the banner that says recording and transcription. If started, we have set that up. We finally got that going for Teams and hopefully that'll give us more robust meeting notes. We will have to go through and edit them because it does bring up some curious versions of what it hears. James, if you want to pull up the slides. I'm John Lyons. I work in the planning team for the integrated resource plan. Pull up the next slide, we'll do brief introductions and go over meeting guidelines. We do have a new person on the team, Mike Hermanson, and we'll see if Mike wants to pop his camera on just for a second there. So there he is. Mike came to us from Spokane County, right?

Hermanson, Mike: Correct?

Lyons, John: He is going to be doing analytical work particularly with CETA, so you're going to see him a lot on the meetings for the integrated resource plan and the CEIP meetings that will be coming up. I don’t know Mike if you want to say hello to everyone.

Hermanson, Mike: Oh yeah.

Lyons, John: Put you on the spot here so.

Hermanson, Mike: Hello, I'm glad to be involved in this work. It's interesting and dynamic works so I'm looking forward to getting involved in it.

Lyons, John: Welcome Mike and again it's another person you can reach out to if you have any questions about the IRP. Meeting guidelines – we are still working remotely. We are getting closer to going back into the office which will be nice. This is a stakeholder feedback forum, so we will share all responses at the TAC meetings. If you ask us questions between meetings, or there's something to reach out about, we will bring those back into the TAC and share it. We also will be reporting all of these significant comments in an appendix with the IRP. If it's something like when's the next meeting timing those we don't do, but if it was say more of a technical question, like wind resources in Montana. Those we would share with everyone. We are updating the website on that and we're going to try to formalize a format for submitting questions and comments that might be easier. We have the data that will be posted on the website as

it becomes available and we are going to do an updated version of descriptions and navigation because last time was the first time we put a lot of data out there. And it was tough to navigate since we had so much of it. We are going to be virtual on Teams with recording and the transcripts until we're back to being able to hold large meetings in the office, and we will still be adding the transcription and call in for people that can't travel or just want to make it to a part of the meeting. And we already talked about the recording. If you want to hit the next one, James.

Lyons, John: A couple of reminders on this. Remember to mute your mikes unless you're speaking or asking a question, unless you have something really interesting you want to share with us. You can also use the raise your hand function or the chat box for questions or comments if we don't get to him right away. Usually we're waiting for a pause, the Avista team are watching those two. Add those in there and those also get included in the notes. If you can, please state your name before commenting so it shows up on the transcript. I think it usually does a pretty good job of picking up who it is with this transcript function, but it does help for everyone since we aren't live to be able to see each other. It is a public advisory meeting and the comments and presentations are going to be documented and recorded. So just as a reminder of that. Next slide, please. This is just showing what the IRP is for those of you that are new and a refresher for those of you have been with us for a while. It's required every two years. It still is every two years in Idaho, and Washington it's now every four years with an update at two years. That's a change with CETA, the Clean Energy Transformation Act. It guides resource strategy. We traditionally have done 20 years. We've been extending that to 2045 for the last two IRPs to coincide with CETA so we can get those and effects. It's a current projected load and resource position which will be talking about a little bit later. And then we look also at resource strategies under several different future policies, so we have an idea of where things are going. There's a lot of discussion right now about natural gas and where that's going with policy and Washington. We don't ultimately know where it's going to end up, so we end up doing scenarios to be able to figure out if it goes down different paths. What will that mean for our resource selection? We also look at different resource choices. Conservation and demand response get treated as regular resources. Whatever the best resource that's the most cost-effective meets all policy guidelines. We have transmission and distribution integration and will be talking about that more in later meetings. We end up with a series of avoided cost which is important for developers and people with new energy projects, so they know what they're up against. We also do market and portfolio scenarios for those uncertain future events. So, if we have a world that becomes electrification in say 2040 or 2030 What's that going look like differently for the market?

Lyons, John: OK James. The TAC, what we're talking about here, it's the public process of the IRP. It's where we get all the input from those participating. Some people participate in the entire TAC, others just in the parts they are familiar with. Maybe it's on renewables or demand response. And then there's those of you that we appreciate that participate in the whole process, but it's where we have different ideas. We give you the

information, and then we ask for feedback to make sure what we are doing makes sense. We do have a wide range of participants. Again, there are some people involved in the whole process, some just in parts. If you have a question, just speak up and ask. Because we're used to this, so we will sling around acronyms and other things rather quickly because we're so used to it. But if you got a question just speak up on that. If you know of other people that would like to participate, we've gotten several here in the last week or so where the people sent an email saying I think this person would like to participate and just let us know. And there's no formal way to get on the TAC, you just send us an email or call us, and we'll add people that want to participate. It is an open forum, but we try to balance the needs of an open forum with getting through our agendas. You'll notice that these this is a shorter meeting than we've traditionally been having, so that was feedback we got at the end of the last IRP. We do welcome requests for additional studies and different modeling assumptions, so we have a way we set things up, but if there's something else you'd like to see or different tweaks to that just let us know. And the teams are available by email or phone. For questions or comments between meeting my name and number are on the website and email address. And you can always start with me and I can get you to the appropriate person. Next slide, please.

Lyons, John: A little bit of an update for the 2023 IRP. We sent out the draft work plan with today's presentation. We had talked a bit about that last meeting, but now you have a copy. Think about it and we will be soliciting feedback on if there's some days of the week better or worse for future meetings. You'll notice a lot of the future meetings will just have the month and year so will be able to move that around. Traditionally, it's Tuesday, Wednesday, or Thursday. We try to avoid Monday and Friday meetings, because that's bad form and it's usually tough for getting people on that, but it seems like usually it's either Tuesday or Thursday.

Lyons, John: We intend to file a 2023 IRP on June 1st, 2023, which is a few months after our initial filing time is, but that's to allow time to incorporate the results of the upcoming all source RFP. We have filed an extension with Idaho, because Washington has an update, so we filed that request and we've got the docket there, AVU-E-22-01. And hopefully I have that hot link set up correctly, and that's to file it on June 1st, 2023 instead of April 1st. Idaho staff had a recommendation on January 25th to set up a public comment deadline of February 24th and Company reply comments by March 5th. If you have comments, you can go into that docket and it explains how to comment on that. This is just giving us more time so we can get that data in there. For those of you that were participating in the last IRP, we had to do an update a month after it was published because the last RFP contract was finally signed. And in Washington there is an update instead of a full IRP with four requirements. Idaho is every two years after you publish your last one. Washington, it's going to January 1st and it'll be every four years. Actually, I do need to change that to 2023, not 2022. And the only thing we wouldn't have ready would be the preferred resource strategy because we won't have that final piece done. Next slide James.

Lyons, John: And here's some of the upcoming meetings so you can see the next one. We do have a date scheduled for March 9th. We'll have the preliminary natural gas overview and price forecast, the preliminary wholesale electric price forecast, the early results of the non-energy impact study that we're having done by DNV. So that's something that in the last CEIP and in the last IRP we had talked about measuring those non energy costs and benefits.

Lyons, John: Thanks, we're very good at figuring out what costs are for doing things, but when you come to those other issues that are a cost, but it's not one that we can't quantify through a market like say, environmental conditions, human health and comfort, things like that. This is a study that's going to be in there, so that'll be interesting to see some of the results on that. And then we'll also have an existing resource overview. So, looking at our different hydro and thermal and contract facilities. 4th TAC meeting will be in August. We've got the conservation and demand response potential assessments by AGE and the energy efficiency inclusion of the social cost of greenhouse gas. That's a Washington only issue. So, you can see these are shorter meetings, so that should be more like this one where it's two and a half, three hours. Fifth one will be in early September. We've got generation resource options for transmission planning, distribution system planning and an update on the Western Resource Adequacy program.

Lyons, John: And next slide. So, we are having a few more of these TAC meetings, but hopefully much shorter. End of September, supply side cost assumptions including distributed energy resources, ancillary and intermittent generation analysis, and update to the 2022 all source RFP to show what we've gotten for bids and where we're headed. Energy and peak forecast and balance update to show what we have and what we are projected to need in the future. 7th TAC meeting in October. Hydro impacts from global climate change study and the load impacts as well. The study scope for distributed energy resources, that is a fairly large topic to be able to get that data so we're going to be on the scoping on that. I know it may not be as quick as some people would like, but you know, we are trying. We want to do a good job on that and make sure we're getting the right information in the right study that will have an implementation plan for clean energy. That's part of CETA. The finalization of the wholesale gas and electric prices, and then we'll get into the scenario options for portfolios in different markets. Then there will be a technical modeling workshop also in October that'll be the PRiSM model overview. So, every question you wanted to ever ask James about how our model actually picks the different resources, risk assessment overview, and the Washington use of electricity modeling. So that's one where this is more of a highly technical meeting, so we may not have as many people at that, but if you want to listen to it and you're not very technically involved with it, you're still welcome to do that. I don't know James if you had anything else to share about that one.

Gall, James: Real quickly, can you hear me?

Lyons, John: Yes.

Gall, James: OK, just make sure because I can't unmute or mute myself. When we get closer to that that time, we may want to think about having a long meeting? What I mean by long is a 4-hour meeting to go over all the topics. Or do you want to split those up, so it'll be interesting to get some feedback once we get closer to that that time to see how we want to proceed. Because I don't know if everybody is going to have the same interests in those tools.

Lyons, John: Those four hours will fly by.

Gall, James: But that's what I'm scared about is 4 hours of me talking about models. That could be scary.

Lyons, John: Well, last time we actually had a really robust conversation because people were interested because you generally don't get the time to really dig into some of those issues. After that, we'll have the eighth TAC meeting in February. It's a lot more, but most of these presentations will not take that much time. Wholesale market scenario results, the update for the request for proposals for all sources, and jurisdictional allocation updates. As we've had more of a split between Washington and Idaho for their energy policies, we're finding that we may need to allocate resources differently. Traditionally it's pretty much been a 65% Washington and 35% Idaho split, but now we're getting new resources for Washington to meet CETA rather than to meet traditional load. We're going to be we're working to see the best way to set that up with the Commission Staffs. And then we'll have the draft preferred resource strategy, what we think we're going to need over the next 20 years. Resources, size of resources, and timing of them. And the location for some of the resources or rough locations at least. And then we'll have the Washington 100% Clean energy planning standard modeling and how we're going to do that. And the market risk assessment. We'll have a virtual public meeting like we did last time. It'll be either in February or March of 2023, and it'll be both natural gas and electric IRPs, so there will be a recorded presentation, and then we'll have an opportunity for daytime comments and questions and night time, and I imagine we'll do like last time where they'll be a general meeting for everyone and then we'll break out into smaller subgroups so that people can ask questions on those. James, anything else you want to include on that?

Gall, James: No, I think we're good on that. More to come. We got to figure out how this is going to work. We learned some lessons from the last time we did our public meeting and hopefully we can apply those to this next round and get better quality feedback and greater participation.

Lyons, John: It went out to quite a few people. It was a pretty big meeting for us. Ninth TAC meeting in March of next year will have the final lockdown preferred resource strategy. The results, the portfolio scenarios, and an overview of the final IRP, get comments on the plan and then the action items. Those action items are the things that we want to get to. They're important, but we either ran out of time, or if they're just not quite ripe yet. Things like laws that have been passed but the rules haven't been made

yet. Those we do the best we can getting through them, but we may not. We have to wait till they're finalized. And these are some of the key dates. All of these dates, as well as quite a few others are in the work plan, but these are the important ones for the TAC. Finalization of the work plan will be February or March and then we'll send that to the commissions. It's not a requirement anymore, but we find it is quite useful to keep us on track and to let the TAC and the Commission's know where we're going in this process.

Lyons, John: Due date for study requests from the TAC members will be October 1st, 2022. If there's something that comes up a little later and it's something we can do quickly or with studies we already had, we would try to do that. But basically October 1st. If you have a list of studies, let us know as soon as you can. Because the quicker you set those up, the easier it is for us to be able to work those into the process and have time to think about them. January 1st will be the Washington IRP progress report again, will have 3 of the 4 items done except for the PRS and then we would file an update when those are done, the external draft will be released to the TAC on March 17th, so a nice Saint Patrick's Day surprise for the TAC, a draft IRP to read. And you'll be able to comment on the entire IRP or sections that are that you're interested in. They'll be due back March 12th. We tried to give as much time as we could on that, and then the final IRP submission to the Commissions and TAC will be June 1st, 2023.

Lyons, John: So for today's agenda you've gotten to listen me drone on for the introductions and the process update, and then we are going to go onto the ever-exciting demand and economic forecast from Grant Forsyth. And then James will be talking about the load and resource balance update and we plan to wrap up by 11:30.

Gall, James: Yeah, and we will try to take a break after Grant's presentation and that way we can all rest assured that we're ready for the next topic.

Lyons, John: You have to calm down from the excitement of an economic forecast. I know I'm looking forward to it.

Gall, James: Yep. I know. Alright Grant, are you ready?

Lyons, John: OK.

Demand and Economic Forecast, Grant Forsyth

Forsyth, Grant: I am ready. I will share my screen here once if I can. Make that happen just one second. Can you see my slides everybody?

Kevin Keyt: Gotcha.

Hermanson, Lori: Yep.

Forsyth, Grant: OK, and just to confirm this is the full slide, not the presenter settings, correct?

Hermanson, Lori: Yes, it looks like it.

Forsyth, Grant: OK just want to make sure I'm using two screens and sometimes that happens. So, for those of you don't know, I'm Grant Forsyth the company's economist. I focus on the load forecast. And so this is a presentation I give for essentially every IRP process, and it is essentially going to look at what's the structure of our economy, what's been happening in our economy, and then we move on to what is the current energy forecast for the IRP. And then, what is the current peak load forecast for the higher peak and keep in mind, all of this is preliminary. As we're going to talk about these forecasts are based on my regular biannual forecast that I do for the revenue model. I bootstrap off that for the IRP, and so I'm going to update that forecast in the next month and so. I may integrate that in when that's finished, and so again, these numbers are preliminary, but my suspicion is they won't change that much if and when I update my regular biannual forecast and integrate this in so again. Everything here is preliminary, but I suspect it won't change much. So what we're going to talk about today is really kind of three topic areas. We're going to review the service area economy mostly so we're all on the same page about what it looks like in a big picture sense. I'll spend a little bit of time talking about how we've recovered from the pandemic. Once that's established, will talk about the long run energy forecast. This is, you know, essentially coming up with a native load forecast for the IRP out to 2045. And then we'll move into the peak load forecast, which again is designed to be a long range forecast out to that 2045 period.

Forsyth, Grant: Now the thing to keep in mind as I work through this is, it is actually both the long run energy forecast and the peak load forecast have gone through major revisions since we finally got a break from the brutal cycle of back-to-back IRPs. I had some time to go back and review the long run energy forecast and the peak load forecast and was able to make some changes that needed to be made, and in particular on the long run energy forecast. I now have it broke out by jurisdiction, so there's a forecast for Washington. There's a forecast for Idaho. And those are combined to get the aggregate. Forecast on the peak load forecast. Since I've now been at Avista for 10 years, I have more data to work with in terms of peak load than when I first came here and I was able to do a more careful job of evaluating winter and summer and building that into the model. And you do get a noticeably different answer when you remodel that based on the longer historical series I now have available.

Forsyth, Grant: Now the one thing I just want to say is this whole process gets judged both internally and externally and I just want to remind everybody that the world is in a state of flux as we all know and this is a quote from Erica Groshen. She's the former head of the Bureau of Labor Statistics and now she's at Cornell and she was quoted in an article in the Washington Post newspaper and the title of the article is: "Here's another thing that the pandemic messed up, economic forecasts". And her quote was "models are predicting what's normal in a world that isn't normal", and I think that's just something to keep in mind as we go through this. Remember, I'm forecasting out to 2045. Literally anything could happen. And it's even harder to know whether you're

going to be in the ballpark when the current period is so in flux. It's just something to keep in mind as you go through this, and you're judging me, which I expect.

Forsyth, Grant: Let's talk about the service area economy. A great way to do this is to look at the employment structure. This is a pie chart showing non-farm employment structure for both Avista metro areas we serve in Washington and Idaho because that represents the bulk of our customers. And that's the Spokane area, the Coeur d'Alene area, and the Lewiston - Clarkston area. We compare that against the US. If we look at the top two circles for the Washington and Idaho MSA areas, we have about 70% of employment. Non-farm employment is in services. It's about the same for the US. Government about 17%, it's 15% for the US. Private goods, and this is manufacturing and construction primarily, it's 14% and it's 14% for the US. As a structure, we look a lot like the US and we're really a service-based economy as I like to remind people constantly. When we talk about economic growth if services are not growing it's going to be really hard to generate employment growth, both regionally and nationally.

Forsyth, Grant: It's also fun to talk a little bit about government because you know government gets everybody worked up. If you look at that government slice and then break out government and those are the next two pie charts below. If you just look at government, 67% of government in our service territory is local government and it's about the same for the US. And it turns out the vast majority of local government is actually education, that's the biggest driver of local government and if you look at the federal side which everybody gets worked up about, they seem to think half the country works for the federal government. It's not true. Federal employment is only about 10% locally in our service territory, 12% in the US. And this has actually been declining. State employment, about 23% for both the region and the US. And keep in mind, even within state employment, a lot of that is education. When we think about government, really most of it is local and state and most of that is connected to education.

Forsyth, Grant: Now if you look at agriculture, so this was non-farm, but if you were to integrate agriculture into this it's probably about 1 to 1 1/2 percent of employment in our service territory. The one thing to keep in mind though, it might be a small share of employment, but it is a really big generator of income in our region. In fact, most of the agricultural products that are grown in our service territory are actually exported overseas because a lot of that is wheat. It's a huge income crop, even though as a share of employment it's relatively small. It's still important to the region's economy.

Forsyth, Grant: OK, let me stop there any questions? Hearing none, let's talk about how we've recovered. This is an important discussion, because when we did the 2021 IRP, the pandemic was in full force, there was a lot of uncertainty about how this was going to impact both the economy and load, and actually we've recovered. I think more robustly than what I had expected, and as we'll talk about later, this does impact what the native load forecast is compared to the last IRP. But the good news is, the region that we serve, the Washington and Idaho metro areas – v majority of our customers has fully recovered from those lockdown effects with the pandemic. We're actually doing

better than the US as a whole, at least through December. And what this graph is showing you is the employment level in both in our service territory and the US relative to February 2020, which was the last normal month before the pandemic hit. And what you can see then is all the future employment levels index to February 2020 and where we currently stand, and you can see that we've regionally fully recovered. The US is still about 1 to 2% behind where they were in February 2020, so they have a bit more catchup to do, which is good news and does impact a little bit.

Forsyth, Grant: The native load forecast from the last IRP to the current IRP, because we've recovered in a way that is a little bit faster than I had expected. When I did the last IRP, the expectation was for a much more severe, longer term recession than we actually had. Technically the pandemic recession was only two months, which was dramatically shorter than what I had figured in the last IRP. Strong growth in Idaho in particular is one of the reasons we're back above where we were before, slightly above, thanks to Idaho which has really had exceptional growth. It was one of the first states to more than fully recover from the pandemic lockdowns. The region still is suffering some of the problems we see in the rest of the US. We have labor shortages, supply disruptions, issues with inflation and in particular one of my concerns in terms of our overall recovery is inflation pressures and our region are a little bit worse than the US as a whole because shelter costs, housing prices are rising here at a rate that's perhaps some of the fastest in the entire country. And that's exacerbating some of the inflation pressures in the region. But generally speaking, on the employment side, we have recovered. Any questions about that?

Woodward, Jim (UTC): Hey there, Grant this is Jim Woodward with the UTC staff. Can you hear me OK?

Forsyth, Grant: I can.

Woodward, Jim (UTC): Hi thanks, I just had a really quick question. When you say shelter costs, you may have actually said what that is generally. I'm used to seeing like the cost of housing costs. Is that how you are using those two terms.

Forsyth, Grant: Yep. Yeah, I'm sorry, that's economist speak and I apologize for that. So, in the index is the price indexes whereas the CPI or the personal consumption Expenditure index which the Fed uses.

Woodward, Jim (UTC): It's anonymously.

Forsyth, Grant: Shelter refers to housing costs, and it's actually a very broad measure of housing. It's both the cost of housing. It's imputed rent and actual rent on rental housing. And in the broadest sense, it also would include the things that go into a house, and so shelter as I'm using in this case, it's a pretty broad measure. But if you want to narrow it just to housing both rental housing and housing that people can buy, single family homes, there's been a lot of price pressures here in that area. So even

before the pandemic started home prices here were rising quite a bit faster than overall inflation and were some of the highest in the US pre pandemic.

Woodward, Jim (UTC): Great.

Forsyth, Grant: And it's also been the case for quite some time in the region that rental costs on actual rental housing has been rising quite a bit faster than overall inflation.

Woodward, Jim (UTC): Thanks Grant appreciate the clarification.

Forsyth, Grant: You bet. One of the reasons why we have some extraordinary home price pressures and rental pressures in the region is that our population growth is actually considerably faster than the US as a whole. And unfortunately, I can see that I left out the legend on this. The red bar is Washington - Idaho MSA population growth. So that's the population growth occurring since 2007 right in our metro service territory. The black line is what's been occurring in the US, so the black bar is the US as a whole. The red is the Avista area. I want to point out that we've been growing much faster than the US. Excluding that period from 2010 to 2013 where the region was trying to recover from the pandemic. I mean the Great Recession from the Great Recession, right. And then as we recover from that, you can see population really accelerates above the US. And what's important to point out is this is due almost entirely to in-migration. It's not that our region is producing more births over deaths than the rest of the US, that’s not what's driving our population growth significantly above the US, it is people moving here. That's the primary driver. If in-migration slows or stops, our population growth is going to look more like the US than it does now. This is important because in-migration is driving a lot of our customer growth. It's the primary driver of our customer growth and that's factored into our long run IRP forecast. One of the important or key drivers in that long run energy forecast is the assumption about population growth, because that's a big driver of residential and commercial growth.

Forsyth, Grant: Now just a couple things to point out here. You'll notice for the US and 2021 how low that is. In 2021 the US had the lowest population growth rate, probably in recorded history point 1.1%, which is essentially from a statistical point of view zero. What we've observed with the pandemic is that it's suppressed. First, that is organic family formations and accelerated deaths. That had a pretty big suppressing effect on US population growth. But it's important to point out that the US population has been declining pretty steadily since 2016. Even in our region, even though we did much better than the US as a whole in terms of population growth, it does appear to have dropped based on OFM estimates for 2021. That's the office of Financial Management in Washington. Which means we were also affected to some extent by maybe, suppression of the natural rate that is births versus deaths. In other words, births declined, deaths went up, and it may also impact people's ability to migrate as well.

Forsyth, Grant: Now, my guess is that things will rebound in 2022 as the pandemic starts to get a bit more under control and people are able to move around a bit more and maybe a bit more comfortable in family formation. That is having children, but

again, in the long run the dominant factor is going to be to what extent in-migration continues in our service territory. If you were to break out the Washington side from the Idaho side, there's no question it's growing much faster in Idaho. And as we're going to talk about later, the forecasts that I'm using in the IRP for population which comes from IHS Connect, it's a national and international forecasting service, they're showing much more population growth for a much longer period on the Idaho side of our service territory then on the Washington side. Any questions about that?

John Barber (Guest): Grant this is John Barber, what do you attribute the in-migration to? Is there a simple answer or is it just a complex series of things that are bringing people into the area?

Forsyth, Grant: I think its multiple things and that's a reminder for me to make a couple other points about this. I would say part of it is, even though our housing prices have been rising pretty rapidly compared to other regions of the country other larger urban areas, Spokane still looks pretty attractive in terms of home prices here, relative to what the home prices are in some bigger urban areas people are moving from, which means that it still looks pretty affordable to them. They can move to an area that now has world class healthcare both on the Idaho side and on the Washington side. We've got an actually pretty diverse educational system here. Both K through 12 and college. Really, a pretty astonishingly good mixture of public and private. It's an amenity rich area in terms of outdoor activities and I also think we're going to start to pick up people who are capable of now working remotely and would like to live in a smaller urban area. Some of it also is also demographic. I've looked at some data using the IRS statistics on changes of address on tax returns. The IRS actually has a great data set on how people are migrating. They can track people through tax returns. We might also be capturing a lot of older people who maybe don't want to live in an area where there's less health care that it's more advantageous to move to a place like Spokane that isn't super huge but also has closer access to health care. And so, I think it's multiple reasons. What's interesting though, is if you look at this IRS data, everybody assumes that people moving here are coming from California, which is not really true. I mean, California is. You know if you look at where the biggest locations people are coming from. California is one of the largest, but it turns out that regionally in our service territory, we're picking up a lot of people from other places in Washington and other places in Idaho that are moving here. What we're getting is a lot of interest, state migration and so most people moving to Spokane County are actually coming from someplace else in Washington or Idaho. And then the next biggest would be California. Does that answer your question?

Hermanson, Lori: Do we have questions? I was going to see if we had any other questions because I think I missed a hand earlier which is no longer out. But anyway, if anybody has any questions, jump in.

Forsyth, Grant: OK.

Hermanson, Lori: It looks like Joni has questions.

Joni Bosh (Guest): Yeah, that was my hand before. Thanks this is Joni Bosh with the Northwest Energy Coalition. I think you've partially answered the question I had which was on the previous slide.

Forsyth, Grant: Yeah.

Joni Bosh (Guest): If you could break apart the Idaho and Washington components and create similar charts and then on the previous slide it looked like in terms of the index. We dropped and stayed about .45 index points all the way through and I was wondering, is that because of the Amazon expansion? Or what is that main driver for that steady difference?

Forsyth, Grant: Yes. Thank you for pointing that out because that's in my comment box and I forgot to mention that. So, if you broke out Idaho and Washington from this, Idaho is about four or five percent above where they were in 2020, February 2020, and that really reflects kind of a different political approach to the pandemic. Fewer lockdowns, fewer restrictions, and so forth. On the Washington side, what's interesting about this is that up until recently, when Washington Employment Security Department revised their employment numbers, Spokane looked like the US that we were about 2% below. But when they revised their numbers for Amazon and this is to make a long story short; Amazon, for reasons of confidentiality, does not report their employment by county. So that meant the Employment Security Department has to estimate it. When they did that estimation and added it into Spokane, it really shifted the numbers around so that Amazon expansion has had a material impact on where we are in terms of recovering from the pandemic and when you get those estimates into the data series, Spokane by itself is back to 100 index, meaning they're back to where we were in February 2020. So, the Amazon thing is material. It really did move the numbers.

Joni Bosh (Guest): OK thanks.

Forsyth, Grant: You bet. But it's just important to leave you with this idea that you know our customer growth is highly dependent on people moving here that we're not immune to the demographics of the country where people are delaying marriage and having fewer children. That's here as well, so that in-migration component is a primary driver of these red bars. Being above the black bars which are the US.

Hermanson, Lori: Grant, it looks like we have another question from Art.

Forsyth, Grant: You bet, Art.

Art Swannack Whitman County Commission (Guest): Grant, I'm curious if we're seeing a slowdown in that in-migration because my daughter and son in law were looking at moving over here to the Spokane area for an engineering job and the housing costs here for rent was $1,000 a month more than it was where they're at in the Lacey Olympia area? Sorry.

Forsyth, Grant: That's a good point. And yes, I think it's possible. Did the home price growth that we've had; remember, we've received national attention for this region's growth in home prices, it's again some of the highest in the US. I got a call last week from a New York Times reporter working on a story on this issue. It's garnered a lot of attention, but yes, I believe that if the greater growth in home prices don't subside, it will curtail some of the in-migration. Because what's happening is there's been a decline in affordability. And even for people coming from a larger urban area. Maybe a younger couple coming from a larger urban area that housing prices now maybe looked too rich, and so that's entirely possible and the other thing that's an unknown in terms of the housing market is the Fed is switching gears and most central banks around the world are. They're going to start raising rates that really has the potential to slow home price growth, but I don't necessarily think it's going to create that kind of giant correction we saw in the Great Recession. When you saw home prices actually declined substantially. What we may be left with in the region is permanently higher home prices. But maybe hopefully not growing as fast. But yes, that could have an impact on in-migration.

Art Swannack Whitman County Commission (Guest): They didn't act on it because the pay wasn't quite as good here and the cost was going to be significantly higher so they stayed on the West side.

Forsyth, Grant: No and I'm starting to hear that anecdotally from other people as well, and that is a possibility that in-migration will slow. The other thing affecting this potentially is how growth management is handled. We have a particular type of policy in Washington on growth management that's also potentially affecting what's happening with home prices and buildable lots as the growth management area shrinks. That's been a big topic area on the West side as well, so that’s how housing evolves. I absolutely agree. Could it impact the in-migration we've enjoyed in particular? It could cause it to start to slow. Now how I factor that in, it's a tough call. Basically, I'm relying on these long-range forecasts from IHS Connect to give me guidance, but remember those can change from one IRP to the next. Does that answer your question?

Art Swannack Whitman County Commission (Guest): Yes, it does, thank you.

Forsyth, Grant: OK, so.

Lyons, John: Grant, a question on if there's any age breakdown for the in-migration.

Forsyth, Grant: No, and that's interesting. I have not been able to get an age breakdown on the in-migration. I will say with the IRS data does you can calculate the number of exemptions, which is essentially people. You can kind of calculate an average adjusted gross income from the data, and so I would say the typical household moving here and the people moving here, it's a household of 2, roughly and their the adjusted gross income on average looks to be pretty similar to what the area median household income is, which is around $60,000. So that's the other thing I think there's a perception that everybody moving here is from California and they're rich and turns out based on the tax data I've looked at, probably isn't true. But in terms of the age

breakdown, that's harder to get at. But if you look at the demographics of our territory and the fact that it hasn't shifted dramatically. This in-migration suggests to me that you're having migration probably across a broad range of ages. Would be my guess.

Forsyth, Grant: If we look at the service area economy, one of the things connected to population growth is permitting and we have seen some interesting permitting activity that's occurred, that really started as a result of the Great Recession was an increasing share of apartments to total permits. Now the blue bar here is single family and duplexes and condos. Single family homes, duplexes, and condominiums, and there's not that many condominiums. It's mostly single-family homes and duplexes. I lump them together. That's in the blue, showing the total amount of permitting of single family and duplexes and the red is the total number of units permitted of apartments.

Forsyth, Grant: One of the things you can see in, and this is for the Spokane Kootenai area which is the biggest component of our metro area that we served. What we've seen in this expansion cycle leading up to the pandemic is a pretty good clip of apartment building. And I think what happened is that coming out of the Great Recession, it was easier for builders to get loans to build apartments than it was single family homes. And part of that reflected the ultra-low vacancy rates in apartments in the region, which incidentally are still very low, even though a lot of new apartments have been built. So that's one thing is that we are definitely seeing a lot of, either duplexes or apartments being built. Now the other interesting thing which I did not expect and this is again something that's affecting this IRP forecast compared to the previous IRP, is normally when you have a recession, there's quite a big hit to permitting activity. This did not occur. So, in 2020 I would have expected permitting to fall noticeably. In 2021 I would have also expected it to be weak because of the lingering effects of the pandemic. And you were not seeing that. We've seen really robust permitting activity all through this downturn, which is highly unusual. And you're seeing pretty steady single family and duplex building, but you're definitely seeing a lot of permitting for apartments. And what we've seen in 2020 and 2021 is a lot of that permitting activity has shifted to the Idaho side. In particular, you're seeing a lot of stuff being permitted in the Post Falls area. So, let me let me stop any questions about that?

Forsyth, Grant: What's interesting though, even with permitting holding up it, there's not enough building activity to really have an impact either on raising vacancy rates or slowing the home price growth. Some of that also reflects supply disruptions increasing the costs of duplexes and single-family homes. But they held up surprisingly well. And that also because of that, you're going to see a little bit more robust native load forecast than what we saw in the previous IRP because in the previous IRP I assumed this event, the pandemic. The recession would have a depressing effect. And we just didn't see it occur. Questions about that.

Forsyth, Grant: OK. Moving more into thinking about the forecast part of this, one of the things I need to think about when I do the forecast, both the five year forecasts that I do twice a year, but I called the medium term forecast, and the longer term forecast,

which is part of the IRP. Which in this case the longer term would be 2026, I mean 2027, to 2045. I have to make some assumptions about long run GDP growth. This graph shows what I'm assuming. Under the current medium-term forecast, which goes out to 2026, which I did in the fall of 2021. That black line is showing what the assumption is of GDP growth that in 2022 it'll be about 4% and it's going to gradually decline down to about 2% as we move out to 2026. The red thing just shows if I was to calculate that current forecast, what would that look like? What hasn't changed much? And incidentally how I calculate this forecast for GDP growth. It's an average across many different forecasters. I like to do that as a consensus forecast, and so what I'm doing is essentially measuring how this consensus forecast is changing over time. And since I did, the forecast in the fall compared to the current average across forecasters, it hasn't changed much. And so that is essentially what I'm doing for that medium-term part of the forecast. But what it's also important is what I assume about the long-term GDP growth, which in this revised long-term forecast model that I've developed, is now an explicit variable. Before it was of an implied variable, now I've made it much more explicit in the model and in the current assumption I used the Fed's projection of long-term GDP growth, which is 1.8%. This is actually lower than the previous IRP, which is, I think, closer to 2%. And so, one of the things to be aware of as we think about long term projections, is people's perception or estimate of long-term growth in the US continues to decline. And that's because long-term GDP growth is a function of two things. Population growth and labor productivity growth. US population growth is at historic lows. Many people think it might recover a bit but will remain very low, probably under half a percent. Productivity growth now is in that 1 to 1 1/2% region, so labor productivity is noticeably lower than what it was prior to the housing bubble bursting prior to the Great Recession. And so, a combination of factors, both demographic and connected to labor productivity is gradually pushing down both the Fed's and other forecasters thinking about what long term growth is in the US. A few years ago it was around 2 1/2%, then it fell to 2%, and now we're below 2% for the long run and I want to point out that's pretty important because it has important implications for the long run. Forecasts of industrial load. And what I estimate right now is for our long run industrial load to really grow in any meaningful way, long run GDP growth would probably have to be above 2.3%. We're below that, and so in the IRP now the projection for the industrial side is no, or slightly negative growth going forward, because we're just not going to have enough growth to support. Industrial production regionally compared to maybe what they need based on historic norms. Any questions about that? It's important to point out that long run assumption matters for what the industrial forecast looks like.

Woodward, Jim (UTC): Hey there, Grant this is Jim Woodward again – Washington UTC staff. Per what you just said, and I think your last note in your comment box, I'm assuming that this whole discussion currently is excluding any sector to sector change, namely like building electrification effects, things like that were just. Is that the case? We're just talking about traditional drivers of industrial load, OK?

Forsyth, Grant: That's right. Yes, excellent, exactly. And so the purpose of the model that I have is just to establish a baseline look. You can run scenarios so we can say OK, what happens if the long run GDP growth is higher than that. What does that mean? But it is based on sort of more traditional linkages. That's absolutely true.

Woodward, Jim (UTC): Great thanks Grant.

Forsyth, Grant: You bet. Any other questions about that? OK, so let's talk about the long-term energy forecast and the basic approach here. There's a major revision of this based on feedback from the last IRP. In addition to pressures associated with instructions going their own way from a policy point of view. But just kind of as a big picture though, there's two components to this. There's what I call medium term forecast, which I've already referred to. And again, the medium-term forecast is this forecasted I do on a biannual basis, twice a year for the company's revenue and earnings models. The most recent forecast, that's what I used to bootstrap off of for the long-term forecast, which covers that period 2027 to 2045. The medium term is mostly a set of econometric models. It forecast basically use per customer and customers by schedule, by customer class and so in residential, commercial, industrial and street lighting. Under each one of those classes there's a whole bunch of schedules and I have essentially anything from complicated to a simple econometric or forecasting models that forecast out to 2026. And again, it's customer and UPC (use per customer) forecasts. The idea is once I get the customer forecast and the use per customer forecast, I can multiply them together to get that load number. I assume a 20-year moving average for normal weather. That's built in, but in this new version of the model we do have the ability to change that assumption in the long-term component of the model. The economic drivers that go into the medium term, we've got GDP growth, industrial production which is connected to my assumption of GDP growth, employment growth which is connected to the population forecast. There are variables for price, natural gas penetration, and then there's an ARIMA error correction that goes into most of the models trying to take into account those variables that I can't measure directly. Now I will say on the price side. Price as a variable, it's mostly in the Idaho side, prices falling out as a significant driver at least in the medium term on the Washington side.

Forsyth, Grant: Price is difficult to handle. I've talked to a lot of my colleagues at other utilities trying to get an estimate of elasticities specific to your utility. Turns out to be really hard to do and so we're going to talk about how I handle that later. Once I have this forecast for the revenue model, I essentially say based on historic norms, that's a retail forecast. Based on this retail forecast, what would be the equivalent native load based on historic relationships so I can at least get a native load forecast out of that, and then the current forecasts that I'm using for this medium term is fall 2021. I'm going to update this forecast next month and probably with James' permission, will integrate that as the new medium-term component. That's why this current one is called preliminary. Let me stop, any questions about that?

Art Swannack Whitman County Commission (Guest): Great. The question that was just asked a minute ago was essentially what factors haven't been put into the model that are coming at us such as this whole clean energy transformation and how that affects. Well, it'll be government, industrial and everybody is building if they're forced out of natural gas.

Forsyth, Grant: Right.

Art Swannack Whitman County Commission (Guest): And I don't know how you quantify that, but I sure see that there's going to be some difficulty in figuring out what rate you can put those changes into place and make them work.

Forsyth, Grant: Yes, and in fact this is quite a long conversation. We've had many conversations with Tom Pardee and James Gall about this, so in the simulation model for the longer-term thing I do have the ability to alter the assumption about natural gas at the residential level. I can make some assumptions about how natural gas may be treated in the future, and it primarily affects directly the residential side, but in the model. I have a correlation variable, or a correlation connection, between residential and commercial because they move very closely over time and I want to make sure that stays the case in the simulation model. By altering the assumption about how much natural gas there is on their resident residential side, it by correlation will also affect the commercial side. Although I can't say it's not a direct effect, it's sort of an assumed indirect effect. So, there is a way to think about that in terms of how natural gas might impact the load side of electricity. The one thing I would oh go ahead, sorry.

Art Swannack Whitman County Commission (Guest): I was wondering, does that include the rate with which you can realistically adopt and supply that change? Or is that something way bigger OK?

Forsyth, Grant: It's up in the air, so again there's not enough policy clarity at this point. For me to build in an absolute is what we're going to assume. This is the way policy is going to go. It just doesn't seem policy has fully formed enough to build in an absolute with confidence.

Art Swannack Whitman County Commission (Guest): Good. Wow.

Forsyth, Grant: Natural gas adjustment. But we can't say within some bounds if it turns out this way, what would it might look like if it turns out this way, what it? What might it look like in terms of electric load?

Art Swannack Whitman County Commission (Guest): So I should be able to require. OK, yeah, like you said, it's a big conversation and a lot of logistics just to get it done, let alone if it gets done, thanks.

Forsyth, Grant: You bet, and to your point about the industrial side, I don't have a good adjustment process yet for what those restrictions on natural gas would mean for industrial load. It's within the context. The model I'm using is more built into the

residential and commercial side than the industrial side. One of the things we don't know is, as this policy evolves as a matter of economic and industrial policy in the States, will industrial users be treated differently than residential or commercial users?

Art Swannack Whitman County Commission (Guest): And there's an in between group. I mean I'm going to pick the government side, but I just thinking about our courthouse that's heated by natural gas. How do you set up a system for that kind of building that will use just electricity to do the heating and cooling?

Forsyth, Grant: Right, Yep.

Art Swannack Whitman County Commission (Guest): And, I just think of all the supply chain issues we got now, and it just keeps rolling in my head and I'm going to stop before I go too far.

Forsyth, Grant: No, I agree, and this is something that, Tom Pardee, who's our gas specialist and James Gall, who's IRP manager, we've talked a lot about this. The problem is one, getting that policy clarity. And the second thing is getting the modeling right and do you have the enough data? They're not just company data, but individual user data. To really model that correctly. Now I'm going to call James out a little bit, James I think you've done some work on what would the aggregate load impacts be if we had to electrify, haven't you done some work on that?

Gall, James: Grant, we did a little bit of scenario analysis in the last IRP and one of the challenges we're seeing here now with the Climate Commitment Act in Washington is what is the price signal going to look like for that conversion and trying to estimate? You don’t know what customers are going to switch and what customers are not going to switch. Part of that challenge is we need to on a gas IRP look at what that cost forecast is for. One you know allowance purchases, but also renewable natural gas and other clean gas sources, so it's hard to know. So, until we complete the gas IRP, how much electrification is likely given the opportunities and options that the gas side of the business has to lower their emissions we're in a state of flux where we're going to need to rely on the gas IRP to inform the electric IRP as we go along. And right now, how we've situated that is the gas IRP should have a preferred resource strategy and that should inform the electric IRP. He has since the process and electric IRP has been delayed a few months, so we should have some intelligence over the end of summer or early fall on what we think could be that shift in load.

Forsyth, Grant: Yeah, and since it did come up last year, let me talk about the assumption of weather. The forecast really assumes a 20-year moving average. So, in other words, each year I update a 20-year moving average with the most recent year of weather data and that gets used as what we call normal weather. So that means in the current simulation that I'm going to show you today the long-term look. I'm assuming the most current 20-year moving average is essentially holding for that whole period. Now the way I've redesigned the simulation model, though for doing the long-term forecast is we can change that. I mean, in other words, we can assume like I did last year, some

sort of trended moving average rather than a static moving average for the whole period. But I know that there's where I think, James I think we're working with some people to figure out what's the best way to handle this so that as we think about weather changes over time, we're all handling it in a uniform way. Is that correct James?

Gall, James: Grant, sorry for the delay, can you repeat the question? I have some Teams issues to deal with.

Forsyth, Grant: OK so I want to address this. You know I'm assuming in this baseline the 20-year moving average. For that I'm currently using for the medium term that holds over the whole long term, but I would just point out that the new redesigned simulation model allows me to have a trended 20-year moving average rather than a static one.

Gall, James: Correct.

Forsyth, Grant: But right now, it's just static because we're trying to think about what's the best way to handle this uniformly across all of our work. Is that correct?

Gall, James: Correct. And one of the issues we're trying to wrestle with we are going to be studying later in the IRP process. Different climate futures and what we want to do is have this baseline and then when we look at different climate futures, we want to align those with our hydro assumptions. We're conducting a study right now where we're looking at different temperature futures and their impacts on hydro conditions and we want to make sure that the study we use for the hydro condition estimates match the temperatures who want to use in the load forecast scenarios. For right now, it's as Grant described, but we will be doing a scenario later this summer that shows some alternative looks.

Forsyth, Grant: Yeah, so I wanted to point it out because this has been a point of controversy in the past. And to let everybody know, the model I'm working with has some ability to change from a static to a more dynamic look at weather, but we're going to keep it static until we get a uniform approach which James just discussed.

Gall, James: Yep.

Forsyth, Grant: Go ahead, James, if you're going to say something.

Gall, James: No, Jim Woodward had a question, his hand is up, go ahead.

Forsyth, Grant: Oh, go ahead.

Woodward, Jim (UTC): Thanks James. Thanks Grant. I may know the answer to this question. Part of it is encapsulating the exchange I just heard. We went from a discussion of the 20-year weather dataset to getting a little bit into climate change a couple of times, but this is really just preview of coming attractions. For folks, myself and others on the line, who may have more modeling focused questions about scenarios we should probably hold our powder till those TAC sessions. Is that fair to say, versus have that discussion now?

Forsyth, Grant: It would be. I mean if you want to be kind to the Economist, you'd probably be better to compile those concerns or questions for where we can talk about it in a more detailed meeting.

Woodward, Jim (UTC): Sure, OK. Just wanted to approach it appropriately.

Forsyth, Grant: Thanks. This was a big topic of conversation last year, but again, if I think if we could just delay that a little bit until we ourselves have more information about kind of how we're going to go, that'd be great.

Woodward, Jim (UTC): Will do, thanks.

Forsyth, Grant: OK, so the long-term part, it's a bootstrap off the medium-term forecast. What I'm doing is applying long run load growth relationships, develop a simulation model and that enables me to make certain changes. We can develop high low scenarios, but it also allows us to say OK, what if rooftops solar is higher or lower than we think it's going to be? We can talk about what happens using price elasticity if prices rise a lot faster in real terms than we think, or maybe slower. The impact of ebbs, GDP growth, population growth. And so even though we live in a complicated world and there are thousands of variables impacting the load, we can take a big picture look at key variables and how they might move the load around if we changed those assumptions. The idea is that when we think about load, you can think about load as customers times use per customer. Or alternatively, we can think of load growth as being approximately equal to customer growth plus use per customer growth, and so the style of the model I've developed – that long term component is the ability to change assumptions about customer growth that's in the model. We can change assumptions about what we think about population might be to higher or lower than the IHS Connect forecasts.

Forsyth, Grant: The model is also built around what a UPC growth, so we can alter factors that might affect use per customer growth, such as price, elasticity and what's happening to the real price of energy over time. The basic structure of the model is to build around customer growth and use per customer growth for each customer class and then have the ability to make changes in factors that impact UPC or customer growth. So that's another way to think about this long-term part of the model that I'm essentially bootstrapping from the medium-term forecast to get. To show you what the model is currently generating based on inputs, here is residential customer growth. I always start with this. This is what's assumed in the model based on population growth. If I was going to pick one single large driver, it's this assumption that really has a big impact on what loads going to look like in the future is this idea of population growth and how that feeds into customer growth. What you see here is the current assumption for residential customer growth. The 2021 IRP was assumed a few years ago. And the red is what's currently assumed. You can see the outlook for customer growth is higher than in 2021, and this really reflects, I think, primarily an upward revision from IHS Connect about what population growth is going to look like in the future, in particular on the Idaho

side and they've definitely moved upward. There's a bigger than a big upward revision for their population growth in Kootenai County, and you can see this over here. If you look at the 2023 Washington, if we think of the IRP, the average annual growth rate over this time period for the current IRP it's about 0.7% for Washington, but it's about 1.2% for Idaho. That's actually a big difference, so this upward revision in what we're expecting in this IRP reflects what's really happening on the Idaho side.

Forsyth, Grant: Now the question I've got on this and it is how much growth can north Idaho take before you begin to have that decline in in-migration. That art was discussing because you simply run into housing price problems and congestion problems that maybe make the area less advantageous for people to move to. These are long term forecasts. There are factors out there that could affect this, but I have to make an assumption. This is the assumption that's currently in there and again driven by those IHS Connect forecasts. Let me know if there are any questions about that.

Forsyth, Grant: OK, I will just say that if IHS is right, north Idaho will fundamentally change in the next 20 years. It'll be almost unrecognizable if they're correct. Again, just to keep in mind the medium term, that's from that medium-term forecast that we just discussed. After 2027 on that's longer-term forecast where I'm really relying on those IHS Connect forecasts. To guide what residential customer growth is going to look like and the other thing I would point out, the reason why this residential assumption is so important, because I built into the model a direct correlation between what happens with residential customers and what happens with commercial customers because they're highly correlated over time. If you talk to developers, population growth and household formation is directly tied to commercial growth. Focusing on the residential side, one of the key things here is residential solar penetration. This has generated a tremendous amount of discussion in the past. It's speculative, it's really hard to know how solar is going to go. It depends on a combination of consumer preferences, consumer income, subsidies at the state and federal level. What we see here is the assumption that's built into the model really hasn't changed from one IRP to the next.

Forsyth, Grant: Our current penetration rate is about 0.4% of residential customers who have rooftop solar. This is projected to grow to about 2 1/2% by 2045, which incidentally by a lot of regions that's pretty high. The current system size is around 7,000 watts. I assume in the model that system size will grow to almost 9,000 watts by 2045. I'm assuming here that there's going to be some technological innovations that allow maybe more solar to be generated on rooftop installations compared to the past, but again, this is highly uncertain, and subject to all kinds of complex policy factors, pricing factors, and then what we've seen in the pandemic also supply chain issues. OK, let me stop any questions about that?

Woodward, Jim (UTC): Hey there Grant, Jim Woodward again, just wondered on this slide. I guess a couple terms I see on the slide residential, solar and you've used rooftop solar a couple times. Just wondering if this forecast, namely those percentages, factor

in. You know additional vehicle or vehicles like community solar and other initiatives like that, if that question makes sense.

Forsyth, Grant: Yeah, so this is just customer owned and this is what I would consider traditional solar projects on people's rooftops. Now community solar is interesting and that is on the generation side and James is that correcting?

Gall, James: That's exactly right Grant, so we're trying to come up with what is the forecast of our customers demanding energy, so we have to take this into account from a behind the meter point of view, and then on the supply side will evaluate different options to serve those customers from a resource point of view. But you got it right.

Forsyth, Grant: OK.

Woodward, Jim (UTC): Gotcha, so from an accounting perspective, sounds like you all are tracking that that other item, but it's just not accounted for here.

Forsyth, Grant: Correct.

Woodward, Jim (UTC): Great thanks.

Forsyth, Grant: Yep.

Hermanson, Lori: Grant, it looks like we have one more question.

Forsyth, Grant: Yep.

NWR, Gavin Tenold (Guest): Grant this is Gavin Tenold and we install quite a bit of solar on this this grid. I'm wondering if you've been talking to your renewables division. I'm a little surprised by the system size there of 7,000 watts. A big part of our work now is installing these smaller systems that builders are using to meet the new Energy Code.

Forsyth, Grant: OK.

NWR, Gavin Tenold (Guest): I'm installing smaller systems. In fact, some large developers are now going to this just as standard on their homes so 3600 kilowatt.

Forsyth, Grant: That's really kind of interesting. I didn't know that.

NWR, Gavin Tenold (Guest): I'm just kind of curious. I would just encourage you to talk to your renewables division about the quantity of interconnections they've been receiving in the last calendar year since the new code went live on February 1, 2021.

Forsyth, Grant: OK.

NWR, Gavin Tenold (Guest): I suspect there's a bump. I don't know if it is in your data for 2022.

Forsyth, Grant: Yeah, that's a great question.

Forsyth, Grant: I'm establishing the baseline based on Avista's own database of customers that have installed systems. 7,000 watts is the median system size, so that's why I'm using. Now the fact that you're having these smaller systems installed, it's interesting, I'd never heard that, so I need to look into that. And because the data that I'm starting with ends in 2020, I would not have yet observed that bump.

NWR, Gavin Tenold (Guest): OK, the bump wouldn't have come until Q3 2020.

Forsyth, Grant: OK.

NWR, Gavin Tenold (Guest): But it's significant. We got a lot of purchase orders for these little 3,600 kW systems and we're out there putting them in a pretty big way.

Forsyth, Grant: OK, that's interesting. Let me ask you a question. If people start out with a smaller system, does it increase their probability of expanding the system later?

NWR, Gavin Tenold (Guest): I don't have the information for that yet, but it's doable.

Forsyth, Grant: OK. Because that's the other thing that's hard to get a handle on is, you start with a small system, but it's technology and prices change. Maybe you could add a lot more. That's a harder thing to get a sense of. And I'm thinking out loud as an economist, if you already are doing something, the probability of expanding that might be higher. If you already have experience with it so, I'm thinking out loud to myself. I will need to talk to some folks about that because the data I have will not have shown that yet. But that's good to know. Anything else? Solar is another tough one that's generated a lot of discussion in the past. Again, not a big change from the 2021 IRP, the focus is on light duty EVs because I just don't have a lot of good information about larger duty vehicles. Now we do have some electric buses and so forth on the system now through the Spokane Transit Authority. But it's still relatively small. Most of them are going to be light duty based on current estimates and I need to talk to our specialist on this, Rendall Farley. Current EVs in our service territory are light duty around 2,600. This is an estimate projected to grow to about 110,000 by 2045. Current penetration is about 0.3% of household vehicles I estimate are some kind of light duty EV and this would be projected to grow to 13% by 2045. Now here's the thing before everybody starts, you know maybe going berserk for some reason. This is a highly uncertain thing, and this is something we've talked about in every IRP.

Forsyth, Grant: There's a lot of changes going on in the EV market. You see a lot of the big car companies are expanding models they're going to have available, including pickup trucks. And I don't joke, that's important for our service territory. They're making bigger investments in the ability to produce. How that's going to develop is uncertain, but they're also being constrained by supply constraints. Even pre pandemic there were issues about who's controlling key resources, China versus US versus Russia versus other countries needed to build electric vehicles. The current assumption, just like the previous several IRP's, is that we're not going to start to see a big ramp up occur until we get to mid to later 2020s or 2030s. But again, that's just the assumption I'm making

based on what we're observing currently. There's a lot of uncertainties around this, so let me throw that open for questions.

Lyons, John: Wait, we got a question out here Grant.

Forsyth, Grant: Fire away.

Joni Bosh (Guest): I think it's me. This is Joni again from Northwest Energy Coalition. Is your projection your top estimate? The medium of, the median size of a range of adoption. Do you have a range or an assumption as well on what each EV might use annually? Is that going to be shown in a further slide?

Forsyth, Grant: Yes, that's a great question. This was another interesting topic area, and so I'm assuming right now based on my discussions with Rendall Farley something just over 3,000 kilowatts a year per vehicle. And this is light duty mostly household owned. Now, oh go ahead, I'm sorry.

Joni Bosh (Guest): One of the questions that I have is how much did you consider that people might put solar on to charge their cars and what that effect would be.

Forsyth, Grant: We're going to talk about that in just a second. Just hold on to that, and I think the next slide might help us segue into that discussion.

Joni Bosh (Guest): Perfect thank you.

Hermanson, Lori: Grant, we have a couple more questions. Phil, do you want to go?

Forsyth, Grant: I want to respond to the previous question so just give me a second. They're the National Bureau of Economic Research, which is, some of you probably know about and some of you don't know, it's nonpartisan. It produces a lot of the cutting-edge research for economics in the US. They produced a paper recently that I sent to my colleagues. They did a study of how much energy electric cars use in California. Excuse me, I've lost my professor voice that I used to have so I lose my voice easily now. This study went out and essentially got data from utilities in California and looked at households that had EVs. And what's interesting about it, is that they found that EVs we're actually using a lot less energy then what had been expected. And they think the reason for this is you have a lot of households that have not gone completely EV, and so they're substituting still with gas powered cars. And so, you get into this issue of is that 3,000 kilowatt hours a year? Is that too high? Is that too low? Is that an average over the long run? Because the current estimates from that study, which I thought was quite good, suggests it's lower than that for now, but I went ahead and again based on the expertise inside the company, the number I'm using is 3,000.

Joni Bosh (Guest): OK thanks.

Forsyth, Grant: So next question, sorry about that. I just want to clarify that.

Phil Jones: Can you hear me Grant? This Phil Jones.

Forsyth, Grant: Yes, I can. Hi Phil.

Phil Jones: Nice to talk with you again. I'm not on the Commissioner bench anymore interrogating you. This is hopefully much more informal on this one. Obviously, I talked with Rendall a lot. You're in the alliance. And just a couple of things. One, I urge you and Rendall, and I go back and forth on EV adoption rates in in your service territory. I'm a little more ambitious. When we look at announcements from GM and Ford and Rivian, to say that 50% of the vehicles will be electric in 2030 maybe 100% in 2035. You know your curves here are a little bit too conservative. I think I see a lot of the adoption, so we have the vehicle side and infrastructure side. I'm going to talk about both. On the vehicle side, I'd urge you to be a little more aggressive both on the light duty side and on the medium-heavy duty side. I think the growth rates are going to be bigger and I think you need to start planning for that both from a load and resources, but just from a flexible load management point of view. That's bigger than what you're doing right here with a long-term energy forecast. I'd be happy to go offline and talk with you and Rendall about this. The evidence is coming in faster than you think. The other thing you need to think about is battery size is getting bigger. Spokane, I grew up there, and I know that people drive light trucks so the Ford F150s, the Silverados, the Rivians are going to come in a big way and probably in Spokane you're going to have more light trucks as a class as a percentage of the registered vehicle fleet than sedans, compacts and even SUVs. So, the battery size Grant on an E Hummer, for example, is it can go up to 185 kilowatt hours. The battery on the Honda Clarity I drive now is only 17. The battery on the new SUVs coming back or 85 kilowatt hours. So, you just have to run the math. You have to make some assumptions on what percent of the fleet in Spokane is going to be trucks as EVs. And I think Rendall in your team are doing this, but I just urge you to be a little mindful. I wouldn't trust that California data. For example, I think there's going to be a lot of kWh consumption at home and in public charging. So that's point number one. Point #2 is on the infrastructure side, on the medium-heavy duty side. This is going to happen a lot faster than you think, and it's really tough for you to model as an economist because there's no data or very little data now. I agree with you on that. But there are firms like Daimler. There's a lot of emerging data right now where you can go and Rendall can talk to GM and Daimler and with the F-150 coming out fleets are electrifying all over the place. We're going to see a lot of fleets in Washington state electrify, so it's important to start modeling that a little bit more. At least get some sensitivities going where you can do a high, medium and low, because I can tell you I'm working on a project now for electrifying the West Coast corridor. Interstate 5, so we're talking about perhaps 60 to 80 sites, probably 8 in the state of Washington that will have 3.5 MW charging hubs, and that's on I-5. So just think about I-90 and with the new Amazon Service center and more service type economies you are going to have some MW level charging sites being sited in your service territory. I would project there's a high likelihood of that happening. If you could start thinking about the medium-heavy duty case a little bit more, both on the Interstate side out on I-90 and 395 as well as the fleets based in Spokane, because you have a lot of warehouses there. I think that would be a good thing, and then the final point is just think about the infrastructure. Maybe this

is more for James or your distribution engineers, but think about what kind of infrastructure and the demands that's going to make on, especially for medium-heavy duty, not so much on light duty. In the beginning, but if you get penetration rates up above what you're talking about, 13% by 45. If let's say you get a 25% penetration rate in the 2030 to 2035 period when your resource adequacy assured, what does that do? Both 2-year RA numbers and then what does that do to? Certain feeders and certain circuits that could be overloaded, so just a few thoughts.

Forsyth, Grant: I appreciate that Phil because one of the problems with the EV thing is there is a lot of uncertainty. There's also policy uncertainty and trying to get a sense of how you should model this. But I will definitely. We're keeping notes here. This is being recorded, so we can definitely sit down with the Rendall and talk about how this may need to be altered or how we need to do a scenario here, because I will tell you as we look at the energy forecast, ultimately this ramp up that we see in the later period does have a big impact on what load looks like in the future, and if it comes sooner, I think what you're suggesting is it'll come sooner, it does move things around.

Forsyth, Grant: Yep. Any other questions?

Hermanson, Lori: Grant you have another question from Art.

Art Swannack Whitman County Commission (Guest): I was going to follow on what Phil was saying. I don't necessarily agree on the heavy-duty side. I sit on the state freight board. And what we're hearing there is that Paccar doesn't have anything even on the books for an electric truck, but what they're looking at is a Hydrogen electric, some type of vehicle in that order. But the medium duty local delivery trucks, the guys that are in there in the business are saying that's coming pretty fast. And I think Phil's right on target. I think the infrastructure issue is going to be your biggest issue to do any of this, and it's going to be power generation and it's going to be what size line do you get to the house because if you want a fast charger you need a 50 amp dryer circuit. If you're going into trucks and other stuff, that's going to be a whole other animal.

Forsyth, Grant: That's good to know because what we assume about EVs and what we assume about rooftop solar also filters into the peak load forecast. Having some sense of how things are really going to materialize is going to be important for that forecast as well. Anything else?

Hermanson, Lori: Jim, do you want to go?

Woodward, Jim (UTC): Thanks Lori, thanks Grant, great discussion so far. I have a comment and follow up questions. Good discussion with Phil and Art and others on this forecast and I what I'm hearing is this seems like it's an area of further discussion of more modeling sensitivities. Granted, that's probably not yet right, as we go forward, but you know interested in seeing what scenario options your team might propose. The question I had, Art actually referred to this, briefly on the hydrogen side, and this is more of an accounting question. Any options and scenarios looking into hydrogen and

hydrogen infrastructure. Is that actually on Avista Gas IRP side are those questions better reserved for those channels since I'm kind of new to the Avista fold here?

Forsyth, Grant: Right. I will tell you there is nothing in and what I'm doing sort of generating this base for James. There's nothing on the hydrogen side and maybe he wants to talk a little bit about what he's looked at it because I know it's come up in the past, but there's nothing explicit in what I do. James, do you have any comments?

Gall, James: I'll add a couple thoughts. Hydrogen is definitely on the table when we start looking at resource options for generation. When he started getting into hydrogen for gas that's going to be talked about on the gas side of the IRP. If we're going to talk about hydrogen for other uses, vehicles for example, that's not necessarily our business. Could it be our business? I don't know but, that's where we're drawing the line we will be talking about. Those fuels for power generation or for gas service, but that's probably where that line is going to get drawn. At least in our IRP process. And for power generation, I believe this summer, we have a TAC meeting on new resource options that will include hydrogen. We're stepping beyond hydrogen and looking at ammonia as a more likely power generation source. We'll have quite a bit of discussion when we get to that topic.

Woodward, Jim (UTC): Thanks, James.

Forsyth, Grant: Anything else?

Gall, James: Grant just one other thing really quick.

Forsyth, Grant: Yep.

Gall, James: Time check we had the meeting ending at 11:30. We did reserve the meeting until 12 and I don't mind going until 12 since that's what we reserved the meeting for. Even though the agenda we were hoping we could get done by 11:30, it doesn't seem to be the case, so I just wanted to throw that out right now and keep going. And we'll have to catch up on our topics with whatever time we have remaining, this seems to be a good discussion and I don't want to end it. This is the draft and preliminary load forecast and we are going to update it. That's why we wanted to get this out early to everybody to get comments so that when we do our final load forecast later this summer, we know what the issues are ahead of time. Go ahead Grant.

Forsyth, Grant: The question came up about net effects. Now I don't think that entirely gets to it, but this is based on current assumptions. The red line is the residential baseline renewable contribution, which is essentially a load reduction, because we're looking at this in terms of traditional rooftop solar and then we have the IRP estimating annual kilowatt hours of EV load. What we're looking at here is the net effect, the difference between the red and blue line. In the mid-2030s, late 2030s you see that EV band really starts to take over in terms of offsetting that solar load. So, there is a certain point where the EV growth is growing much more rapidly than the solar component. And the net effect is that you're having load growth because of that. Now the question came

up about what about people with rooftop solar and charging their cars. That's another interesting question. It's a tough one to model precisely in this aggregate forecast, but again, going back to the National Bureau of Economic Research and looking at some research that they did several years ago about this. There is some evidence that people who get electric cars may also have a slightly higher probability of having rooftop solar. And if that's the case, that will help potentially offset some of that EV band that we're getting in the load we're going to have to generate, so let me just stop and put that back to the question again of whether or not they want to talk about that some more.

Joni Bosh (Guest): I'm sorry this is Joni and we don't need to talk about right now. I was just raising the question and I was having trouble finding my mute button. I apologize. That they're in other places where I have worked there's been an impact both on using solar to charge the EV so that the EVs end up having less impact on the grid. In triggering, as you said, more solar installations and back when the first wave of the other very small cars came out, I was talking to the PV manufacturing Arizona. Almost all the people who applied for an EV also went out and had solar installed solar.

Forsyth, Grant: Yeah, and that and that's what the research showed is that there's a propensity for those things to be, and if I can speak like an economist, complementary goods. There's some evidence that they maybe will go together over time. There's both. The evidence, some initial empirical evidence as well as theory, suggests that should be the case. I would point out and I hate to throw this out, but it is sort of an interesting thing. I watched an interesting short and I can't remember if it was on the BBC or whatever about cars. Now that have built in solar and so rather than plugging the cars in at night there are car companies now developing solar cars that the roof of the car and the hood of the car is literally solar absorbing and so that's also an interesting piece of technology that as it develops could affect how EV charging at both the commercial and residential level. Let's get to the bigger picture here. This is native load and it's for the system, so I haven't yet broken out Washington from Idaho and you can see that for the current IRP. The native load is somewhat higher, especially out to 2030, then what we saw in 2021 and again that reflects the harsher assumptions I was making about the recovery from the pandemic. During the last IRP, as I said early in the presentation, things just didn't quite materialize in the way that I had initially expected. And so that's helping to push the load up. Also, in particular that residential customer forecast, especially in Idaho is higher, and that's also pushing that up. What you see is an upward revision from the 2021 IRP, especially out to that mid 2030 period. But I also want to point out that this you can see that there's really not a lot of growth until you get to this later period. This bend up that you're seeing, that's the impact of EVs. Maybe this is going to happen sooner and more robustly. And that's again some discussions we need to have, but currently that's what it looks like, but it does, I think, highlight how powerful the impact EVs potentially are. Terms of the growth rate. It's a little bit lower overall to 2023, and actually that should be a 2021. Sorry 2021 IRP. Washington, in particular, is pretty low. Most of the growth is on the Idaho side, which is about twice as high in terms of the forecast. When we think about where our load growth is going to be coming from,

a jurisdictional point of view, under the current assumptions about EVs and solar, it's really on the Idaho side.

Hermanson, Lori: Earlier, did anybody have a question that raised their hand? Maybe you've already answered it. Oh wait, there is somebody, John do you want to go ahead?

John Barber (Guest): I see, this is John Barber again. My question earlier actually wasn't a question so much as a comment. Putting together EV ownership and rooftop solar, that's fine for people who live in their own homes. For those who live in apartments, they don't have that option. So if you're trying to look at the effect or the connection between owning an EV and having your own solar, we need to be able to somehow factor out those folks that are in apartments and don't have their own roof to put their solar on. And that complicates modeling a little bit further, I suspect Grant.

Forsyth, Grant: Yes, thank you for mentioning that. By the way, I meant to talk about this earlier. Avista basically leases me out for various policy work in Olympia. It's not really necessarily always related to energy stuff, but I sit on EIM, the chair of this tax preference Commission and we review tax preference for the legislature working with some nonpartisan staff, and this issue came up because there was a tax preference. It was expiring for solar. And the people who audited the program that nonpartisan staff in Olympia that is state auditor. Legislative auditors found that the preference really didn't do very much to increase solar usage among low income households, and so the recommendation was that they were going to review this and figure out how they want to change it because it didn't really meet that goal of the legislature. And my comment to legislators and anybody who would listen was, if you're going to encourage low income households to adopt solar you have to recognize first off, they don't have money, so they can't. Even if they do own their own home, they probably don't have the resources to get the solar necessarily. But that point that you just raised was an important one is that especially low-income households don't make that decision because they don't own the property. And I would point out that's also the case for a lot of businesses. A lot of businesses do not own the building that they're in, so it's not their decision, and so I completely agree this is a really complicated issue. I haven't figured out how to disaggregate. That is definitely an issue going forward. As we know, your policy makers trying to encourage solar adoption. There's an awful lot of people renting the business building that they're in, and there's an awful lot of people who just don't have the money to do it. It's a good point. Because of the big redesign of the model, this is what it looks like in terms of native load between the two different jurisdictions. And it’s pretty noticeable, Idaho load growth is higher because its population growth forecast is higher. And two, it's expected to have lower solar penetration compared to Washington. That's just because of the way it looks right now and projecting it out forward. That could change. Again, that's speculative. The Washington long term forecast assumes, and this was the other big difference between the two, gas penetration at the residential level as a share of residential electric customers. In other words, the share of our customers that are both gas and electric is constant over time. We're basically

assuming for now that gas penetration really starting in 2027 is constant over time, which essentially means that gas customer growth is identical to residential customer growth, whereas in the past, residential gas customer growth has always been slightly higher than residential electric growth because in any given year you have not only new residences, like newly built residences adopting gas. You also have existing residences without gas installing gas and that always gave you a little bit more growth relative to the residential electric slide. Over time, gas penetration was increasing, but for the purposes of getting the conversation started in Washington, we no longer assume that penetration is increasing after 2027, it's constant. In Idaho we do assume that penetration gradually increases over the horizon.

Hermanson, Lori: Looks like we have a question from Jim.

Woodward, Jim (UTC): Thanks Lori, Grant. I think last slide you commented on that EV bend during the latter 2030s, and this is more of an observation, but slide 27-28. I agree with you. It increases a bit at the end of the period, but these graphs are almost to me, hyperbolic where you have a greater slope in the 2020s in this leveling off in the 2030s for about seven years. With that acceleration late in the period that you commented on, just wondering what those other trends during the 10 to 15 years are largely from.

Forsyth, Grant: Right, for Washington, one of the big things affecting this difference we're assuming through here the assumption that population growth, therefore customer growth slows faster in Washington then it does in Idaho. And in fact, the forecast for Idaho really doesn't slow at all. The IHS forecast is that its population growth is pretty constant through this whole time period. A little bit of slowing, but not much. Whereas in this time period, they're predicting a notable slowing on the Washington side, and that's part of the reason it's quite a bit flatter. And so that assumption is having a big impact between the two. That means when you start to get the EV penetration, which I think currently is assumed to be higher in Washington than it is in Idaho, the EV impact is greater. You see a much sharper bend in Washington once those EVs start to impact relative to Idaho, you see a little bit there, but it's mostly here on the Washington side, because right now it appears most EVs are on the Washington side.

Woodward, Jim (UTC): Right. So, to recap, more population in-migration driven in Washington for the next 15 or so years. Still sort of that mid 2030s and then the EV effect takes over. Those were sort of broad trend wise what's going on here.

Forsyth, Grant: And it's a good point. It's directly connected and again, this goes back to the comment about EVs and solar. It's directly connected to how I'm shaping the accumulation of EVs and solar which again, it's open for discussion. But the way I've shaped it is really determining the way things look the late 2030 - 2040 period.

Woodward, Jim (UTC): Great thanks.

Forsyth, Grant: You bet. There was a whole bunch of discussion earlier about the gas side. It's possible to run some scenarios about what happens if we allow gas penetration to actually contract. It can contract not because we're losing customers because it just means that gas growth begins to be less than residential customer growth. Or we could potentially talk about what happens if the absolute number of customers declines. These are things I've talked about with both Tom Pardee and James Gall. But there is some potential to change some assumptions. The other thing I'd like to talk a little bit, just because the residential side is so important in terms of how the load forecast ultimately looks, this is use per customer or a growth in residential use per customer, and I've not broken it out. This is for system wide, so it's not broken out by jurisdiction what we see here. The blue line is the EIA current reference case. It's their measure of use per household growth, which is used per customer growth. This is the current scenario outlook for use per customer. It's the red line for our service territory. And again, you can see that this this weird sort of this band is connected to how I'm shaping in the combination of EVs and solar. We're going to see declining use per customer on average, and then we'll get to the period in the early, late mid 2040s where use per customer starts to grow again. Again, that depends on the shaping. We could see that happen sooner. In the EIA reference case, part of the reason they show positive use per customer growth sooner than I do is that part of their modeling assumes ongoing demographic shifts to warmer areas that probably require more air conditioning and so you get a little bit different shape in this case because they're taking into account shifting population within the US.

Forsyth, Grant: The other thing I'd point out is that you'll notice there's this weird little step down here. This is because I'm assuming that, and this is something we've assumed in past IRPs, it's really starting in 2030. There will be an acceleration in the real price of electricity. I've assumed an elasticity effect associated with that, and so this dropdown reflects an increase in the rate of growth of rates especially on the residential side and that increase has an elasticity effect and own price elasticity, and so you can see that pushes down use per customer as a step down. Now James and I have talked about this. We could face this. It doesn't have to be a step, but I at least have the ability in the model to alter price. Excuse me, real price growth. Real price growth and real rate growth on the residential side and how that affects usage overtime. This is also going to be affected by what you assume about gas penetration. Any questions about that? I'm going to talk a little bit about the elasticity because this came up a lot last IRP.

Hermanson, Lori: Art, do you want to go ahead?

Art Swannack Whitman County Commission (Guest): Grant is that a valid assumption anymore that people will actually reduce electricity use with price? I'm thinking with all the gadgets, electric cars and everything else is coming in. I just wonder how elastic they actually are.

Forsyth, Grant: That's what I'm going to talk about the next slide, so bear with me. I think I'll answer your question because I think that's a good point. As an economist it's

hard for me to assume that there's no price response ever in the long run. And what I've assumed essentially, it's a pretty conservative long run elasticity number. Meaning it's pretty low, there's not a lot of substitution assumed in the long run. So what I did, and I'm sorry for my voice, is I went out and reviewed a whole bunch of studies on elasticity, especially on the residential side because that seems to be where most studies are and it seems to be where they're able to identify elasticities. Effects may be a little bit more clear than industrial and commercial. They're really even more all over the place than for the residential side. This graph is a boxplot essentially and looking across many different studies and doing a distribution of what those studies find in a box plot. So what box plot is showing is that the average across many different studies, for long run elasticities about minus 0.75 and it's not particularly skewed. The median is about 0.725 and then you have these outliers. Some studies show it as large as minus 1 1/2, which is huge. That's a strong price response in the long run. To something that's low is essentially no price response. You know price quantity response.

Forsyth, Grant: You can also look at the short run estimates of elasticity, and not surprising, they're lower than the long run because people have less of a chance to adjust in the short run and here you can see that the average which is the X the average across many different studies is about 0.3. I agree with you Art. I think prescriptions on natural gas growth of EVs would likely put downward pressure on elasticity. I'm not comfortable setting it to zero. I could in the model, it's possible to set it to 0. What I've chosen to do is set a pretty low one that's more consistent with the short run, because I do think you're right, it will be pretty low in the future. But I'm not comfortable setting it to 0. There we go, we can throw that out there for discussion. I'm pretty proud of this. I just want everybody to know. It took me a long time to go through a bunch of different studies to look at this distribution.

Art Swannack Whitman County Commission (Guest): Grant this is Art again.

Forsyth, Grant: Don't question, don't get hurt.

Art Swannack Whitman County Commission (Guest): In the model you've got it as a drop, but it seems to last like eight years or something on that order that you actually have an effect from that price change.

Forsyth, Grant: Well, it drops because what happens is I assume the real price, the retail residential rate, instead of growing it 1% a year in inflation adjusted terms, it rises to 1 ½% a year in inflation adjusted terms. But that drop reflects that. That change in the growth rate, but then it gets melded into a bunch of the other things that are occurring at the same time. This time path that you see after 2030 reflects not only the real residential rate rising faster than it was, but it's also melded in with a bunch of other effects that are impacting use per customer.

Art Swannack Whitman County Commission (Guest): So, this is just using gas prices. I've seen people do that for a year or two when fuel prices for vehicles go up, but

then they go back to what they were doing before. For the most part I just wondered if that kick down really is going to last that long and that's just a comment on it.

Forsyth, Grant: It's possible that will look differently than that. It's possible to reverse it at some point, so that's entirely possible. Here's the thing that vexes me a little bit, and James can weigh in on this, is that we've got this energy future we're trying to put together. And switching from gas to electric has certain costs imbedded into it and it's sort of unclear to me how you know you're going to be able to switch this future without causing real rate pressure. And so, I want to have the ability to build in rate pressure into the model, even if I'm assuming a relatively low price elasticity because I'm just curious how we're going to make this transition and not see some adjustment in rates occur so the debate becomes what's the appropriate rate of change. And as you point out, what should the time dynamics look like?

Gall, James: Grant this James, I'll add a couple thoughts, I think it's appropriate to have this elasticity because it takes into account things that we don't know on some of the uncertainty we talked about. So, if prices go up like we're kind of envisioning.

Art Swannack Whitman County Commission (Guest): OK thanks.

Gall, James: With the transition to clean energy, we may see more energy efficiency. We may see rooftop. We may see people converting to other fuel sources for heat, for example, wood or potentially propane. You could argue this helps guide some of that uncertainty. We try to be certain on energy efficiency. We tried to be certain on rooftop solar like we've shown earlier, but this can help alleviate some of the uncertainty where customers are going to choose other options, whether it's things that they control or things that we control.

Art Swannack Whitman County Commission (Guest): That makes good sense, thanks.

Forsyth, Grant: OK, this is the last slide before we get to the peak load and this is something James asks me to do each year and he'll use to help calibrate some of his own work related to conservation. And this red line, and things are a little bit skewed because of the scaling, the red line is the current baseload baseline native load forecast that we've been talking about for the entire system. The black line asked the question of, based on what we think conservation is going to look like in the future, which I estimate based on historic norms of conservation activity. If we essentially add that conservation back. In other words, if we stopped all conservation, what would load look like? And that's the difference, the black line is saying let's assume that we add that conservation back that we don't get it in the future. What does that look like? And it does fundamentally alter the time path. If you have no conservation, load growth per year is about 0.9% versus about 0.2%. But again, it's based on the assumption that conservation is going to go forward in time much in the same way it has in the past. James, do you want comment about that?

Gall, James: Sure, couple things on this. Sorry for the delay, but when we get to modeling our resource portfolio this will make a lot more sense later this summer when we start talking about estimating our future energy efficiency we have to start from a point where what if our system our customers didn't have energy efficiency and this helps us with that. That's a starting point and then there will be an iteration process to really figure out energy efficiency savings we project. I think the key message here is that Grant, when he's doing his forecast, it's net of energy efficiency forecast, not one that does not include a future with energy efficiency. I'll leave it at that, and Grant go ahead, keep going.

Forsyth, Grant: This is actually the most complicated part. Unfortunately, it comes last and everybody is exhausted here. This is about the peak load forecast, which again going back to one of my first slides talking about the forecast, models of normal forecasts in a world that's not normal. The peak load forecast has been an ongoing evolutionary thing we continue to work on. But because I did get a bit of a break between IRP's this time, I was able to spend a lot of time looking at the model. Looking at the longer series of data I now have compared to when I first came here. So, I used that time to significantly revise the peak load forecast. And in particular, the things that we did this time was we more carefully modeled in how EVs and solar would impact the peak load going forward by trying to more clearly shape those into the peak load. The way it works is the model essentially does a peak load forecast, excluding certain industrial loads, EVs and solar, and then we add those back. And what we've done is really improve the way EVs and solar are added back into the peak load forecast. There's a part of the model revision that forecasted impact the EV and solar were improved for this IRP. I think it's better in that sense, because you do a better job of shaping what peak load should look like in the future. And of course, if we do change assumptions about EVs and solar, that means if we change those assumptions in this simulation model for energy, it will impact peak load and that's the way it should be. The explanatory variables in the model are heating and cooling degree days and we have monthly and day a week dummy variables. There's the level of real GDP. Real GDP is the primary economic driver in the model, so we do have an economic driver. The higher GDP, the higher peak loads. But with the longer data series I now have available to me, I was able to go back and do a better job of analyzing what's been happening statistically between winter and summer and what I did is more finely separate those two in the model and the separation hasn't has improved the model. I think you get better diagnostics out of the model, but what it really also does is it shows that summer is now growing significantly faster than winter. I think the model, because it's doing a better job of separating those two seasons and connected to economic growth, the revised model shows that Avista is a winter peaking utility until around 2030 and then that shifts to summer peaking. And that reflects the fact that summer is growing faster than winter in the new model. The idea is that the coefficients of the model that you know. So, you take this historical data. Do you run a regression? You get these coefficients and what you do is you use those coefficients to generate a distribution of peak loads by month. Based on historical max and min temperatures since 1890,

holding other drivers like GDP constant. You're essentially running a simulation that says look if we get the same kind of temperatures we had back to 1890 with the current regression coefficients of our model, what does that generate in terms of peak load? For the 2023 IRP we changed things a little bit. The starting winter peak we used to project forward that base peak level uses data back to 1890, which is what we've done in the past. But we've shortened the summer average to a 30-year average to take into account that there are some changes going on in the summer.

Forsyth, Grant: The other side of the modeling, we can look at the long run growth rate of peak loads for summer and winter by allowing GDP to change holding other things constant and so we can get a growth rate then to generate going forward from those starting peak levels in summer and winter as previously described that came out of that distribution analysis. Now, if you if you do that, this is what the current forecast looks like. Annual winter peak, summer peak. You can see the model predicts we probably should be still winter peaking, but the growth rate in summer is roughly twice what it is in the winter. Peak growth rate is roughly twice of what it is in the winter under the current forecast. But it's important to point out that I've been looking at. I won't bore you with the details, but I've bought a book on extreme value analysis. I've been trying to do a little bit with our temperature data and the thing to realize is even though things are warming, the summers are warmer. We're getting larger peak loads in the summer than we used to. From a distributional point of view, where it's still at risk for really cold winters, and so we're at this interesting crossing point where we actually need to worry about both from a load perspective and a capacity perspective. Impacts of electrification policy still being evaluated. As we change those in the model that will definitely change peak load. And right now, there's no trended climate in the current forecast. Going back to James' early statement we're holding off on that until we have a more comprehensive approach of how to handle that. But with that model revision, we're definitely seeing a crossover point earlier between winter and summer peaking than we saw in the previous IRP.

Hermanson, Lori: Grant, we have a question from Fred Heutte.

Fred Heutte (NWEC) (Guest): Hi everybody, Fred here at Northwest Energy Coalition. You're already got to part of the question I was going to ask. I had to miss some of the earlier discussion, but I understand you're moving to a 20-year moving forecast for the temperatures and my question was going to be about forward looking, not just historical, but I also think I've been looking at the actual temperature data around the state of Washington for a little project I've been doing to dig into the details. Looking at trends for different parts of the state. And there are some interesting aspects to that, one of which is, it turns out the 70s and 80s were actually pretty cool and a little bit warmer before then, and now it's been warming up since then. And I think you know the about the terminology here, but I think climate change is happening here. But the question is also about the specific variability within both winter and summer. You already answered one question, which was the potential for still having quite cold winter periods that the winter as an average may not be as cold. In fact, winter nighttime temperatures have

been going up pretty consistently, but you might get a period of a week which is really cold, so you have to watch out for that for peak demand.

Forsyth, Grant: Exactly.

Fred Heutte (NWEC) (Guest): I'm wondering what you're also seeing for this summer period. I mean, we had the heat dome thing last year. Hopefully that doesn't come back for a real long time, but you know, it could.

Forsyth, Grant: That's right. When I looked at the longer historical series I have now since coming to Avista and working with the data it it's pretty clear, since 2004, it's pretty obvious now that you have the data available this summer is growing faster than winter. That means I have to model that more carefully in the peak load model, which I think I've done. There's no question about it, but there are some other complicating factors and James and I have talked about this. It's also been naturally occurring separate from warmer temperatures is air conditioning penetration, so even if you had held climate constant, let's say you should expect possibly that summer load peak load was growing faster than winter simply because air conditioning is becoming more common. The heat dome, it's probably accelerated the adoption of air conditioning and we're actually seeing air conditioning in apartments. One of the things that's harder to parse out is to separate out these effects of warming temperatures versus air conditioning penetration. We're trying to get better data on that so we can maybe parse that a little more carefully.

Fred Heutte (NWEC) (Guest): Yeah, and that's getting to the other point that I'm thinking about it. For one thing, I'm sort of moving away from the idea of the terminology being summer peaking, winter peaking, we’re in one mode or another. Both summer and winter are important. You can have a fair bit of difference between them or not very much at all. I live in Portland. PGE is, depending on the year, we’re summer peaking or winter peaking we’re basically dual peaking. But the real important factor here that I think is really important, is that we're seeing it starting to shift and so right now I think you're saying you're seeing a lot of air conditioning load really showing up, but in the future, if we see a move for transportation and building electrification, well the transportation is a year round thing. Although it adds to peak, you have to manage it. And we've talked about that. I heard about that before, and with building electrification, moving from gas to electric, that will build up winter load quite a lot, and then what does it mean to your summer peaking or winter peaking?

Forsyth, Grant: I'm glad you mentioned that, because that's another discussion we've had a lot inside the company, and again especially with James Gall about this issue of electrification, will it shift everything? You know gas covers a lot of heat load. It covers an enormous amount of heat load. And if that goes away, you're changing the calculations substantially on what winter will look like. I agree.

Fred Heutte (NWEC) (Guest): The last thing I've got. Basically, daily temperature, high and low data for various stations around the state going back to 1960, and if you look at the charts, they don't seem to move very much. But even a degree or two average shift

can actually make a difference over time. I'm wondering, maybe this is a separate discussion, but how you correlate?

Forsyth, Grant: Yes.

Fred Heutte (NWEC) (Guest): Alright, temperature and load realizing that you know it's not exactly a tight relationship, in a multiday hot or cold event people will shift their use and use their air conditioners or heating more. For example, it's not exactly like you can lay a rule around the line and say if this is the temperature that's going to be the load and how you're incorporating that into the demand forecast.

Forsyth, Grant: We have lagged so we have lag temperature in the heating and cooling degree days in the model. They're what you can actually see. Sometimes peak will come after the hottest day. It might be the next day, for example, and that's because of that buildup and the accumulation of heat, and so there is some lagged heating and cooling degree days. Then the model tries to take into account that more complex dynamic of temperature and usage.

Fred Heutte (NWEC) (Guest): OK thanks.

Hermanson, Lori: Grant, we have another question from Joni.

Forsyth, Grant: OK.

Joni Bosh (Guest): Hi I just have a quick follow up with these threads. I'm on the previous slide I think you said you were using GDP as differentiating on the impact and on the slide, we were just looking at it said there's no trend impact yet. So, I was wondering if you could expand on if there's no trended climate in the current forecast if you could expand on how you use the GDP. And maybe James is the one who needs to answer that, but are you going to be looking at various forecasting models on climate going forward?

Forsyth, Grant: Think of GDP as the trend variable inside the model so when you have economic growth, I mean, the expectation is with economic growth peak is going to grow over time. Because you have more economic activity occurring in your service territory and that can increase capacity needs. It's like the trend to the base. What I'm finding though, is the association of GDP with summer and winter is now different. Significantly different so that when you separate the GDP sensitivity in the summer from the GDP sensitivity in the winter, and you do that more carefully than what I was doing in the past, that kind of indicator variable GDP clearly is indicating that summer is growing faster than winter.

Joni Bosh (Guest): Right.

Forsyth, Grant: Right, so on the weather side, in the last IRP, I also did a peak load forecast with not only GDP changing over time but with adjusting the assumption of weather in the peak load so that it was actually changing over time, meaning getting warmer. You can change both of those assumptions. In other words, you can change

different levels of GDP in the future and how that affects growth and so forth. But you can also change what you're assuming about the evolution of weather in the peak load model. In this case I have not done that, so I'm essentially assuming a status quo on the weather side until we get a uniform approach to take. Because when we think about how we want to handle climate change, we want to make sure that we're handling it the same way across modeling. So, if I was to integrate in a trended climate kind of activity, where things are getting warmer, it would definitely shift these lines around some more. Where the summer peak and the winter pink would be pretty close to each other right now, and thats what's in simulation showed last IRP when I allowed that to happen in that peak load model.

Lyons, John: Grant, James is having problem unmuting so he had to reboot Teams so he'll be back to add his piece. We did have another question. Is there climate?

Forsyth, Grant: Here. OK.

Joni Bosh (Guest): OK.

Forsyth, Grant: So I just want to make sure Joni doesn't. I'm sorry John. Joni did that answer your question.

Joni Bosh (Guest): Yeah, I don't know if James was going to answer part of it too. I mean, we're looking at the work that, for example, PSE is doing. You guys have done work before with the climate team. I think at UW and what? And PSE is looking at the regional models for climate projections. And so I was trying to see.

Forsyth, Grant: Or

Joni Bosh (Guest): If there is a relationship there that you're incorporating on some of these forecasts or not?

Forsyth, Grant: not yet.

Lyons, John: Yeah, James is going chime in on that. He just couldn't unmute and I tried to unmute him from my end and it didn't work, so he's rebooting.

Forsyth, Grant: OK, alright.

Joni Bosh (Guest): Totally sympathetic to that, yeah.

Lyons, John: We have a question in the chat. Are climate change models chosen for the temperature assumptions and the peak forecast? Assuming that's like the Power Council took, I think it was three of them.

Forsyth, Grant: No, I. Yeah, not yet and again. Um, there's no. So they kind of like with the native load forecast. There's this status quo assumption built in right now. In that and the reason we're kind of building that status quo in at this point. Is because we don't necessarily have a uniform way yet inside the company to treat climate adjustments,

and so I think the goal is to move in that direction and until we get there, I'm sort of holding off on doing any kind of climate adjustments at this point.

Lyons, John: I understand it.

Forsyth, Grant: A lot of this climate stuff is very complicated. We did. I sat on a webinar with a climatologist from I think it was the UW. And it was extremely good, but what I realized is it's very complicated. There's a lot of stuff going on, a lot of what you read in the press. The popular press isn't exactly what the climate scientists are thinking. It's sometimes more complicated than that, and it also turns out that they're climate scientists, although there there's broad agreement about what's happening, not necessarily in some of the details that we actually need to worry about.

Lyons, John: Yeah, it's the modeling details that could be really difficult and very small changes can make huge ramifications.

Forsyth, Grant: Right, and it is huge and it's outside my expertise. I mean, that's probably an understatement. Is James back on?

Lyons, John: I haven't seen him yet. I did see there was a question. You did good. James?

Gall, James: I did make it back just now. I've had a hard day today with the software, but it seems to be working now.

Forsyth, Grant: James, Joni was asking about and it's come up a couple times and I actually had two different questions about. Again, you know how we're handling?

Gall, James: That was there a question.

Forsyth, Grant: Climate in the peak load model and my comment is that like the energy forecast, the native load forecast it's right now. The assumption is status quo until we get a uniform approach to dealing with this across the modeling inside the company.

Gall, James: Yeah, that's exactly correct, so this is your 30-year one in two somewhere and your 130 year one in two winter. Once we start to gather the data for the hydro analysis for the different climate change models.

Gall, James: What we're going try to do there is look at the temperature changes in those models to have those corresponding hydro conditions match what we want to look at from a forecast scenario point of view and look how those trend together. I can't say at this point in time we're going to be moving our expected case forecast to a specific climate change study, yet we still need to look at the studies that we have available to us on the hydro side.

Gall, James: And the challenge in the hydro side is. What we need is granular enough impacts to precipitation and snowpack to be able to forecast what our hydro system is looking like, so we're trying to keep a coordinated effort going on what those different features are. So where we might be limited, and the studies we have available to us.

But we're still working through that right now. We do plan on talking about that this summer at a future TAC meeting, so please be patient with us and we will get to it.

Forsyth, Grant: And again, just to emphasize, the scenario energy model I'm using for the native load we talked about earlier, there is the ability to make some assumptions about climate. If people are interested in seeing what might this mean. But again, the ultimate goal is to have something that's being used company wide, so everything can be an integrated appropriately. Anything else Lori, do you see any hands up?

Hermanson, Lori: You have a backlog of questions. Joni is your hand still up? I think your questions were all addressed.

Joni Bosh (Guest): Yes, sorry.

Hermanson, Lori: OK and then Fred, do you still have a question?

Fred Heutte (NWEC) (Guest): Just a quick follow up. I really appreciate the discussion the last few minutes. We think it's important to do a climate projected forward baseline, but the question is then how to do that. And I think you're already heading in the direction we're thinking about. You have to be careful about it. The Power Council has done, and I can't say enough for the work they've done, but it's not directly transferable to a situation like Avista that I'll explain in a moment. What they did was they picked out of all the global climate models, they pick three of them, relatively representative. They worked very closely with climate modelers with real experts at Bonneville and other places, the RMJOC study and so forth, and came up with a way to take the global models which have difficulty distinguishing weather in climate between east and west, of the Cascades, and downscaling it to the regional northwest level. If you take that, and I really have very high confidence in what they've done, they've done really good work. They showed a climate signal. It's already in the record back to at least the 1990s, so I think you're right to say go back at least 20 years because you need at least that much to really get a sense of what the natural variation is. But then you know then they're projecting forward. But what they're doing is a regional look and downscaling even further to a relatively compact area like Avista has. I think that requires additional work to get it right. I think our recommendation is work with the climate people at universities and the labs who are readily available. I think in a lot of ways they really haven't begun to fully connect with planning. And I think the two areas that really are the big ones are energy and electric utilities in particular. But energy broadly and agriculture. But I know there's been a lot of work thinking about agriculture about how your project forward. Given this kind of subregional projection what happens? Even your part of Eastern Washington might not be the same as other parts of Eastern Washington. I think these are really live issues, but it's really important also to make the effort and I appreciate the effort. You know the forward progress that you're making on this.

Forsyth, Grant: Appreciate that. Any questions. Next in the queue.

Hermanson, Lori: Yes Jim Woodward

Woodward, Jim (UTC): Thanks, Grant. Appreciated this discussion. Mine's really almost a process or project management question. At least to me personally, it does make sense to have, if possible, a uniform company approach to climate change in modeling. Grant you said earlier in your presentation, you were hoping to essentially finalize this load forecast during the next month. And if we're talking about greater discussion coming in the summer. Do you and your team have the ability to go back and modify based on whatever that final approach ends up being?

Forsyth, Grant: What I'm going to update is the medium-term forecast, the five year one. And that's not going to change our ability to make assumption changes in the longer run model. Because the way the model is designed for that medium-term thing, even if you trend in some climates, is not going to have a big impact on that. The real issue is how you handle the 2027 to 2045 assumptions, and that those can be changed, so it's where we're not locking in, in the way that I think you're thinking that strictly.

Woodward, Jim (UTC): OK, great, just wanted to make sure there was no apparent timing issue there.

Forsyth, Grant: Yeah no. It's really a partial update, not a full update, and it doesn't preclude us from making changes in the longer term component.

Woodward, Jim (UTC): Thanks.

Forsyth, Grant: Yep.

Hermanson, Lori: Grant we also have a question from Art. I can read it or Art did you want to just ask your question?

Art Swannack Whitman County Commission (Guest): I guess I can just ask it quick. Is there the real data where you see ups and downs? Is there a max-min variability in this forecast? Because I know from my firefighting stuff that when you get real dry weather your temperatures could swing a lot more than they can when you have wet weather and that affects both winter and summer. So, I just wondered how that's calculated in your peak demands.

Forsyth, Grant: There's a high low range that we set up. I'm just not showing that slide, but there is a method that James and I used to set up what we think the range would likely be. And it's based on historical variance.

Art Swannack Whitman County Commission (Guest): OK thanks.

Forsyth, Grant: Yep.

Hermanson, Lori: And Art shared an article. Thanks for that link and I think we have all the questions. And then there's some additional ones where somebody hasn't raised their hand yet. Grant, I think you're ready.

Forsyth, Grant: Now in truth in advertising, we did make some calculation changes in the way we're calculating things in the 2023 as part of the revision. I went back to the

2021 IRP. I used the regression model for peak load at that time, but I did make some adjustments to how we are treating solar and EVs to make forecast to forecast comparable. The 2021 IRP summer. This is essentially using the 2021 regression model but updating it with how we're now treating solar and EVs and comparing that against the 2023 IRP. The regression model which does a better job of separating winter from summer in terms of trend activity, and you can see if you do that, you get the out years look quite different. You're definitely seeing higher growth than what you saw in 2021, but again, that growth is more consistent with what we've seen in the past now that we have enough data to parse things more carefully. When you look at the winter side, and again adjusting 2021 slightly but using the same regression coefficients at that time period, you get the same shape, there's about a 20 MW shift down in the winter peak because of the refinements to the model. But notice I always like to point this out in both cases, so let me go back to the previous slide. You know you start to see this curve up over here. That's really that EV effect. And again, as we shift EVs around, if we if we want to change the assumption of how we shape that in, that's going to change the location of this bend. It goes to the same for solar. And I believe that's mercifully the end of the presentation. Do we have any other remaining questions?

Hermanson, Lori: I'm not seeing any at the moment. Anybody who wants to jump in.

Forsyth, Grant: And people would probably be getting low blood sugar at this point.

Hermanson, Lori: No, it's been interesting discussion. It's always so great topic.

Gall, James: We've missed our break and we've exceeded our time. I think it's probably appropriate given we were planning on 11:30 is to end now and will cover the L&R effects of this load forecast. We are meeting again in March and I think in just four weeks. There are slides out there and if you have immediate questions, feel free to contact us on that those slide content and we'll cover those at the next meeting, will probably try to schedule that next meeting for an extra hour just to make sure we can cover all those topics as well. I appreciate everybody's attendance. This is probably one of the best interactive TAC meetings we've had in quite a while, so I appreciate that and I just want to open up if there's any other questions or concerns before we call it a day. We will get these presentations, at least this presentation, posted on our TAC website and we'll get the recording and notes available as well. And I believe we're also going to be publishing the data for Grant’s forecast. And if you're looking for the quantity of load and peak load by state and the effects of EVs and solar, we will have all those in the spreadsheet on the on the website in the next week or so. So again, thank you everybody and have a great day and we'll see you in March.

Forsyth, Grant: Thank you everybody.

Lyons, John: Goodbye.

Woodward, Jim (UTC): Thanks everyone.