

Earth Science Division Community Forum

May 8, 2024

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Wendy Mihm: Thank you so much for making time to join our Earth Science Division Community Forum. This meeting is being recorded. We just hit record. My name is Wendy Mihm. I am the ESD Comms lead, and I'll be serving as your MC today. So you might recall from our last Community Forum, which was in March, we focused mainly on the budget. Today we're really excited to share our ten-year strategic plan. It's called the Earth Science to Action strategy. And our first speaker today is going to be our ESD Division Director, Dr. Karen St. Germain. Karen's going to walk us through the Earth Science to Action strategy. But one thing I really wanted to point out in the very beginning is, that it's super important to note that Dr. St. Germain did not build this alone. The strategy was absolutely a collaboration. It was co-created by NASA Headquarter leadership and the Earth Science Center leads who have been strong and vocal representatives for their centers throughout the entire process. So let me just give, really quickly, a shout out to the Center leads now. Later on you'll see them come onto camera not just yet, but they'll come on camera later alongside our HQ leadership for the Q and A session at the end of the formal presentation. So later joining our headquarters leadership, you'll see: from Ames, Florian Schwandner, from Goddard, Dalia Kirschbaum. from JPL, you'll see Randy Friedl, from Langley, you'll see Trina Dyal, and from Marshall you'll see Andrew Molthan. But before then, I just wanted to get to a little bit of housekeeping. So next slide please.

Slide 1: 00:01:49.190

Alright, so a couple things here. There is closed captioning available. There's a little quote bubble icon on the very bottom left of your screen. If you would like the closed captioning, you just click on that little quote bubble. And then this is super important. If you have questions, please do not enter them into the chat. No chat, we're not using the chat feature today. We're going to be using the Q and A feature. And so that one takes a second to figure out. Look really closely at the bottom right hand corner of your screen, there's three teeny tiny little dots. You click on those and those will pop up a little thing that says Q and A. Click on that and that Q and A will become visible. So if you have a question that you want the team to address, that's where you drop it. We may not get to them all today, but we'll do our best in the time that we have. And as I mentioned, this meeting is being recorded and that recording as well as the slide deck that you're seeing here and a full transcript of today's forum is going to be made available as usual on our ESD Community Forum webpage. Give us a few weeks on that. It takes a little while to get through the transcript, as we have to edit the transcript. So, without further delay, here is Dr. Karen St. Germain.

Kate Becker: Wendy we are just going to get Karen connected back in. Just having a little technical difficulty. We will be right back with you.

Wendy Mihm: Thank you. Sorry about that. One moment, please, so I haven't asked to tell a joke. I'm trying to think of a joke. Does anyone know any dad jokes? Those seem to be maybe the least off color. Oh boy, we're trying to solve a couple of tech issues in the background. I apologize for the delay. This will just take another couple minutes.

I think another important thing to note while we are waiting to solve the technical issues is that the full Earth Science to Action strategy is available online. It will include a couple of different pdfs, the first PDF is really just a quick two-page summary. It's printed on both sides. And then, there's a full booklet of the strategy which is available to print as well. I'll ask one of my colleagues to put that in the chat, even though I mentioned we're not using the chat, that would be a good place for that. And we'll also post links to that on the Community Forum website.

Katie Baynes: Wendy, I'd just like to note there are some good dad jokes in the chat, the audience is bringing it. Well, good is subjective, but I concur. Nicely done.

Wendy Mihm: Yeah, yeah, these are not bad. Oh my goodness. What do you call a boomerang that doesn't come back? A stick. That's charming. Where does a boat go when it's sick? The dock. Wow, these are terrible. Oh my goodness. Oh, we're having some reboots. Let me see if I'll let me go grab these. These are getting worse. What's a light year? It's the same as a regular year, but with less calories. That's nice. Wow, ok, this one's actually pretty good. I'll tell a chemistry dad joke, but I'm afraid of not getting a reaction. That's pretty good. My chemistry professors. Oh, she's in, she's in. All right.

Karen St Germain: Well, I just threw Julie out of her seat. Because there's smoke coming out of my computer over there. Oh, ok. That's nice. I'm kidding, not actually, but it sort of feels that way. Alright, all you. All right. Cool. Well, thanks again everybody for joining us. I assume we got all of the, the housekeeping stuff out of the way. So we're going to jump right in.

We're really excited, as a team, to be coming to you today to talk to you about the Earth Science to Action strategy. This is a strategy we've been working on, as a team, over the last year or so. And we're pretty excited about it, pretty proud of it. We've been, over the last several weeks, introducing it to the broader community and so we're really thrilled for those of you who've made the time to join us today. Let's go ahead to the next slide.

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All right, and that's what I just said. Let's go ahead to the slide after that.

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So I just want to start by acknowledging or by addressing the why. Why are we developing a new strategy now? And the real driver for us, as a leadership team, was the fact that we believe we are at a pivotal moment. We are starting to see some, pretty severe impacts on communities associated with the changing climate, and other environmental effects. Things like; shortages of available water or water quality issues and so forth. So we're starting to see environmental considerations really impact

communities, sometimes in ways that we predicted and sometimes in ways that are still surprising us. The demand for help, the demand for insight and actionable information is increasing, it feels like daily. We think we're at a very important moment, where the decisions that get made today, will have an enormous impact on the outcomes of the change in climate. We want to make sure that, to the extent possible, science has a seat at the table, science has a place in that decision making process. So we believed that this moment really demands a strategy of our community. Let's go ahead to the next.

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This is a strategy that's really designed to go after the demands that we see today and that we see coming down the stream. And I want to make sure, and I'll say this probably multiple times, that you don't see this as a negative, in any way on the tremendous work this community has done over the last 20 years, or more, 20 to 50 years. It's just that we think that the pace of discovery and the degree to which our science has been used in the last 20 years, is not going to be enough for the 20 years that we're facing ahead of us. So this strategy is really about meeting the demands of this moment and those that we can see in the coming decade and really positioning us, by the end of the decade, to be a lot more agile than we are today. So, let's go ahead on to the next slide.

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I do want to do a little bit of stage setting here. There's some important context that you should be aware of. Let's go ahead to the next slide.

Slide 6: 00:11:01.949

First, I want to acknowledge that, a lot of your input has informed the strategy already. As you know, we go through a Decadal process, and we're about halfway through the period since our last Decadal. That is the major mechanism through which the community discusses and influences the guidance that comes to NASA. And in our last decadal survey, we clearly heard the message that we should be very focused on increasing the impact of Earth science in the context of climate change. There's the direct quote there and it's not the only one. The Decadal Survey actually spends a fair bit of time on this particular topic. This is one of our primary guiding documents and the strategy is a response to it. Let's go ahead to the next slide.

Slide 7: 00:12:11.249

Sorry, I see that there's a little garbling on this slide. I'm not sure how that happened there. But the period over which we're taking action here is 2024 to 2034. And, I just want to be really clear. What is a strategy for? It's not to sit on a shelf and be able to point to and tell people you built a strategy. It really is driving our thinking about our next generation of programs, missions, initiatives. It informs how we think about budget, it informs how we think about how we perform our jobs, right? So, we're trying to infuse this strategy throughout how we do work. Let's go to the next slide, please.

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We also want to be clear, and I always get really worried when we have a list here that we might have missed some key elements, but we thought it was valuable to include the list for you to explicitly see that we are not interpreting this narrowly. This strategy really is intended to include everyone in our enterprise across that full range of disciplines. So you're going to hear me reference climate a fair bit, and climate certainly is one of the drivers for the urgency. But this is an Earth Science enterprise strategy, and so we're not solely focused on those things that are very directly related to climate change, or even focused on only sciences that have a direct near-term application. This is about the full enterprise advancing the full scope of Earth science and our approaches to doing it from in situ airborne to our flight systems, our modeling, the decision support, the way we handle data, all the of the enterprise is really important and included in this strategy. Let's go ahead to the next, slide.

Slide 9: 00:14:38.819

On this slide, that we show pretty regularly, about how we are organized in our science. Of course, we have a world class technology development, flight programs, research and analysis, world class data and computation capability and a portfolio of Earth Action activities, that includes but extends beyond, our applied sciences. You've heard us talk about that, at the last Community Forum when we talked about the budget. So, it's really built on the fact that, if we go back to that last slide, one of the key things here is that NASA Earth Science is one of the few places in the world where we have this end to end scope and where we can take steps to accelerate across that whole value chain. That's particularly important if we want to respond to this moment with urgency. Let's go ahead to the next slide.

Slide 10: 00:15:43.129

Alright, next thing is what do we mean by action? Because I want to be clear that this isn't really just about things that NASA is going to do. What we're really talking about is helping enable others to take action, wherever and whenever they are. So, if that's the objective, then this involves scaling up, building bridges and being user-centered. I want to be clear. We're talking about enabling others to take action. We're not talking about telling them what action to take. We're talking about putting information in their hands that can allow others to make the best decisions possible. Essentially infusing science more deeply in our society. Let's go ahead to the next slide.

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I know that we've heard a lot of concern about, isn't this a zero sum game, and are you cutting research in order to fund other efforts? And I want to be really clear up front. This strategy is not calling for defunding some efforts to start others. This strategy cuts through all of the efforts, and of course R & A is a central part of what we do. One of the metaphors I've used before is, if we thought about the Earth Science enterprise as a human, the R & A is, in many ways, the beating heart. It is the lifeblood of the

organism. So I don't want anyone going into this, hearing about the strategy, learning about the strategy, thinking defensively about R & A. We value the research and the discovery as fundamental to the strategy, not just for what we're doing today, but also to position us to do things ten years from now that we don't even know, we'll have to do. So, let's go ahead to the next slide.

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Okay, with that framing out of the way and up front, let's start diving into the strategy itself. First, we talked a lot, as a leadership team, about the vision. What is the vision that we're trying to accomplish here? We had a lot of debate about how we should frame this vision, but ultimately, we would like to live in a world that is driven by actionable and trusted science. One of the ways I think about it, as I just said, is we would like science to be more generally infused into the decision making at all levels of our society. That's the world we want to live in. Now that doesn't mean that it is entirely NASA's job to get us there. What the strategy is about is what is the job that NASA can do? What's the role that NASA can do to drive toward such a vision? Alright, let's go ahead to the next slide.

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This is where we start to drill down a level. So if the vision is a thriving world, then let's start moving toward what's NASA's role? Well, we are compelled by the rapid changes we're seeing. We are enabled by our ability to innovate and our strong history of collaboration and our strong history of understanding and advancing the understanding of the Earth system and making discoveries. Building on all of that, we think that's part of our role to enable solutions for the benefits of all. So vision, mission, and again, how we do that is by building on the foundation that all of you have built over the last decades. So, this strategy is going to include really dialing up our innovation, our collaboration, really energizing our discovery and then delivering all the way to actionable information. Let's go ahead to the next slide.

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At this point, you might be thinking, hey, aren't we already doing this? And in some cases we really are. We've got a couple of examples that, I think, help paint the picture of what this can look like, and where we have ways to build. So, I'll just use the first example of agricultural production. Our agriculture team, has been traveling across the country and, as often as I can, I go with them because it's super informative to talk with people about the challenges that they're facing. One of the things that we've heard time and time and again from those in the agriculture sector, those producers and ranchers. One of the things we hear from them is that they are finding that the conditions that they're operating in, I'm talking about weather, precipitation, extended drought, variability all of those things are sufficiently different. That the rules that they learned to farm by, generally from their parent or grandparent, really just aren't working. And so they're in a trial and error process and they only get one data point a year on how successful their effort was, and that's the yield at the end of the season. The concern is that that isn't learning fast enough for them to be sure that there's even going to be a farm to hand off to their

children, right? So these are not theoretical problems. These are challenges that our communities are facing today.

Another example is the cascading effects of climate change. For example, we know that global warming, is increasing the risks of wildfires. But we also know that when we have the conditions that lead to wildfires and more uncontained wildfires, we also end up with more air quality problems and we end up with cascading risks like when we have precipitation after a wildfire. If the wildfire was hot enough and destroyed the roots of the vegetation, then we are very susceptible to landslides after that. So, helping to evaluate the risk of not just the, the first order changes that we're seeing but also the rippling effects. These are areas where, we are working hard today, but there's a lot more work to do. Let's go ahead to the next slide.

Slide 15: 00:23:51.329

And by the way, those were only intended to serve as examples to get your thinking going about what are we talking about here? So now we've talked about the vision, the mission, the strategic goal. All right, now this is getting to the what. What are we going do? The strategic goal is- within a decade, we'll advance and integrate our science knowledge to empower humanity to create a more resilient world. Now I want to make sure you all know, when I say we debated as a leadership team, every element of this strategy, we even debated, should we be limiting this statement to humanity? Because of course, biodiversity is a key part of the change that we're dealing with here. The impacts of the changes we're seeing aren't limited to humans, but we ultimately decided that humanity was the right word here because of course, thriving humanity is closely related to thriving ecosystems and biodiversity. We thought it was sufficiently encompassing. Alright, so we're really focused this decade on integrating our Earth science knowledge and empowering humanity to make decisions. Let's break that down a little further. We've got two principle objectives and nested under each principle objective are some key results that will help us track whether or not we're effectively driving toward the outcome that we want.

So, the first objective here is holistically observing monitoring and understanding the Earth system. Key results. First one. The most advanced Earth observing system in the world. I want to emphasize here, this is about advancing capabilities, advancing the state of the art, sustaining observations. It's also about doing that in partnership with agencies around the world. We have really come to appreciate that we can do a lot more when we work with partners, coordinating, making sure where we are redundant that it is for good reason and on purpose, and in other cases, we're building complimentary capabilities. So that together we can see more of the way the Earth system works. 1.2 Cutting edge technology. This is about continuously modernizing, testing, maturing new technologies. It's a key element of enabling the future observations, but I want to highlight that that's not only cutting edge observing technologies, it's also information technologies, the many types of technologies that enable the whole enterprise and drive it forward. Integrated and trusted Earth system data. This is really focused on agility in our IT and our science infrastructure, things like facilitating data fusion, AI ML, really driving forward on enabling integration and doing so in a trusted and open way. The fourth key result is about advancing our state of knowledge. And doing so, I would argue, at a speed that is keeping pace with or getting ahead of the changes that we're seeing in the Earth system. In some areas we're doing that, and in some areas today we could still improve dramatically. The other thing I want to mention here is that this is not just in our traditional science disciplines, we're really talking about trying to advance our state of knowledge of the

complex interconnections between different components of the Earth system, including the human system. I often tell people that the physical Earth system drives and has huge impacts on life on Earth, but also life on Earth drives the physical system. It's been true for millennia, and Earth is really the only planet that we know of where this happens. It's a special, special place and really understanding all those intricacies is a pretty daunting challenge. So we're talking causes, linkages across all disciplines of Earth science. Let's go ahead to the next slide.

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The second major objective is about delivering the trusted information, again, that can enable resilience activities, decision support, all of those kinds of things. So again, another four key results supporting this objective. The first one, 2.1, is about advancing our modeling capability to capture the intricacies of the Earth system. So 2.1 is really pretty closely related to 1.4. It leverages the knowledge we advance in key result 1.4, to advance our ability to see into the future and to really understand what has happened in the past. This is, in many ways, about expanding how we think about our modeling capability. It is traditional physical models, but it can also be foundation models and other approaches to modeling. that can expand our ability to understand and predict. 2.2 is about co-designing solutions and tools that support users. This one, the real challenge here, is enhancing our scale and our speed of execution. If we develop tools that are very narrow and very specific, those can be very useful to a small set of users, but if we want to have the kind of impact we're talking about here, we've got to think hard, in advance, about, building solutions that are scalable, co-developing them, having partners that can take over operations, all of those kinds of aspects, that can allow for scaling and speed to get actionable information out into the hands of people who need it. The 2.3 is about science-based information that we can trust and act on. This is about making sure that information is fit for purpose, there's transparency, and trust, people know where it came from. As I said, in many, many cases, that's going to mean that, even if we transition to an operational partner, we stay engaged with them in the ongoing quality of that information. And then 2.4 is about building the awareness, that this information exists, it's real, it's valuable. We know it because we measure it, we know it because we understand the physics, and this is a national asset that we should be using in all aspects of our decision making. I haven't actually read it yet, but I just downloaded today a new World Economic Forum report that talks about the direct linkage between Earth observation and all sectors of the economy, all aspects of security. It's really critical that we continue to invest in getting the awareness that this information is available out there and this is to users, stakeholders, decision makers, policy makers, the general public. One of the ways that we're doing this is through the Earth Information Center. But that's not the only way, of course. Alright, let's go ahead to the next slide.

Slide 17: 00:32:50.059

I wanted to say a word here about NASA core values. We are and always have been and will be a part of NASA, and that means we stand for and represent NASA's core values. This is the slide you're looking at

here is not an Earth Science product. These core values are NASA's core values. They apply in every way to how we think about executing the strategy. And on the next slide...

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I'm going to highlight some things that really nest underneath those NASA core values, but are especially important in this particular context of this strategy. One is trustworthiness. If we want to enable people to make decisions with our information, they have to trust it. For me, this nests under the NASA core value of integrity, and transparency and how we treat the public trust. It's going to take a lot of innovation to execute this strategy. That means we'll have to accept thought-out risks, and stay at the cutting edge of science and technology, advancing the state of the art. This nests under the NASA core value of excellence. And then finally collaboration. This is a NASA strategy but embedded in every single element of the strategy is the importance of collaboration. Collaboration with other agency partners at the federal level. Collaboration, at the state, local and tribal levels, collaboration with industry partners, with non-profits, and of course, most importantly, collaboration across our community, and that's all of you. And that nests under the NASA core value of teamwork. Alright, let's go ahead to the next slide.

Slide 19: 00:35:04.119

A few guiding principles here, and I won't dwell on this for too long. I've already mentioned the first one there focusing on enhancing partnerships, and that takes a lot of work. It takes a lot of time and effort. The second one, engaging a diverse workforce, and the wider Earth science community. We recognize that everyone in our community is not going to be engaged in every single aspect of this strategy. That isn't the expectation. But I do think that it is really important that everyone in our community have an awareness of the importance of their role in the strategy. You've heard me say it many, many times. Diversity in our workforce drives us to ask better questions in our science. It drives us to engage in a more thoughtful way with stakeholders and user communities, makes better teams and is a critical underpinning of the entirety of the strategy. A word about why we pulled these things out as guiding principles, they weren't objectives all by themselves. They have to be infused throughout the objectives and the key results. Balanced approach. Look, we know that we don't have an infinitely growing set of resources here. So we're going to have to make balanced decisions to execute this strategy. We've already, we've already talked about innovation. Robustness and resilience in our programs. I want to say a word here because we do know that we are in a rapidly changing landscape. Of course, the Earth system is changing, but what I'm really referring to here is we have a changing landscape with regard to commercial providers of data, with regard to commercial providers of tailored information products. We have our sister agencies that are likewise, adjusting their own approach to doing their work in response to the challenges that communities are seeing. We exist in a changing landscape, we have to maintain some agility in the face of those changes, and in fact turn them into opportunities. It also means we've got to deliver our missions on time. We've got to be responsible stewards of our resources because, to be honest, we lost some robustness in our program absorbing the challenges such as the COVID pandemic and the supply chain challenges following that. We've got to work hard to deliver on our commitments to so that we can build some of that robustness and resilience back in. Alright, let's go ahead to the next slide.

Slide 20:

So just a way to visualize the strategy at work. Let's go ahead to the next slide.

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This is just another way for you to see the whole strategy on one slide. Many of you have seen me or others on the team brief this slide before. With our foundational capabilities at the very base of the pyramid. That's the foundation on which everything else stands. That's our technology, our Earth observation missions, our vast holdings of data, and so forth. Building on that, we advance our Earth system science and our applied research. That's growing the understanding of the Earth system, the modeling, application tools, and so forth. Above that, we move from science into solutions and societal value. That is supporting services that often will be provided by other agencies, but what we do can be the engine behind many of those services. And then moving all the way up to the public understanding and exchange, and then you see the virtuous cycle. Which is to say, we always have to have feedback, informing our foundational work. We have one big cycle there that doesn't mean that feedback only comes at the top of the pyramid. There really are feedback cycles at almost every level of this pyramid. It would get very cluttered if we tried to draw them on there, but this is a way to think about the strategy holistically. And if you go to the next slide

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I talked a little bit about agriculture earlier. This is an example of one way to pull a thread through the pyramid. So foundational knowledge, technology missions and data, in this particular case, we're calling out Landsat satellite data. We really could be calling out here a number of other missions, for this particular application area. Over the years we've been able to develop an ensemble of satellite-driven models that map evapotranspiration. For those of you who aren't familiar with it, I think of it as the water that a field has used. The water that has been lost through evaporation or used by the plants on that field to keep cool through transpiration. There's been a lot of fundamental work here. This tool, called OpenET is essentially an ensemble of those model observations or model estimates of evapotranspiration. This is an application that a farmer can use in their field. It's openly available. It's at the field scale because it is built largely on Landsat data. Farmers are now using it. It's also being used to inform public policy in several states. Building on that, we go to where these agriculture producers are already going. We call out the example of the Commodity Classic here. This is the biggest commodity agriculture meeting in the country. Of course, there are many other agriculture meetings focused on the other crops as well. But we go to where these users are and engage with them to run workshops, to share with them this kind of information. Their needs actually cycle all the way back and have, among many other things, informed how we're moving forward with Landsat next, which will be a lot more capable than our current Landsat systems. So this is one way to think about how the strategy works. Alright, let's go ahead.

Slide 23: 00:43:04.130

I'm getting to the end game here. A few words about what we mean by collaboration and partnership. There are lots of types of entities to partner with: non-profits government, and commercial entities. In the inner layer of this arc here in the navy blue, are some examples of domestic agencies, non-profits and companies that we have active partnerships with now. This is not comprehensive, again, it's just meant to illustrate. And then in the purple layer, we have corresponding international partnerships with international non-profits, organizations, often multilateral organizations and individual international government entities. So the number of collaborations of partnerships here is vast. We included this slide to clearly indicate the magnitude or the depth to the level at which we're thinking about these partnerships and collaborations.

Slide 24: 00:44:14.910

Alright, we're now the end game. So, I am going to invite you all to read the full strategy. It's not that long a document. It has a lot more detail in the thinking behind the strategy and what we mean by the bullet points you saw in these slides. But I'll also mention that right at the front of the strategy, I wrote a note. I ended it by saying we undertake this challenge and opportunity with a sense of urgency and responsibility. And the reason that we're talking with the community broadly today is, we are inviting you to join us in the way we feel about that urgency and that responsibility and to take ownership of this strategy, to help us breathe life into it, help shape how we move forward with the implementation. Because I think it's going to take contributions from all of you. The decisions people are facing around the world don't lend themselves to a command and control model, right? We are going to need to rise to the moment globally of the climate crisis. People are going to have to lead where they are. They're going to have to make decisions where they are. And the same is true for our community. You are all going to have to lead where you are to help drive NASA and the investment that our country makes in NASA Earth Science to be as impactful as it can possibly be. Alright, so we've tried to draft a strategy to, to guide the enterprise, but we need your hands working with us to help make it happen. And that is the end of the formal presentation and I think we have an opportunity now for Q and A.

Q&A

00:46:31.478

Wendy Mihm: Excellent. Yes, thanks Karen. We're going to bring on all of our Center leads and then our Headquarter leadership as well. Can please turn on your cameras and wave hello? Excellent. And we do have a first question lined up in the Q and A section. Hi everyone. It's like a good old-school TV show. Okay, the first question that we have lined up is:

Q: How will this new strategy affect R & A and applications RFPs and programs? Will we be integrating the Earth Action approach in these proposal opportunities? And Jack, that one is for you.

00:47:14.694

Jack Kaye:

A: Alright, I'll start that and Tom may want to add. One of the first things that we're looking to do is, to reduce the barriers that may have been created in the past. If you read the ROSES now, especially at the language in A.1, there's some very specific language that Tom and I iterated on. I try to point out that within ROSES, the opportunity is there for people to think about how to maximize the synergies in areas that might have been separate in the past. It is certainly things that we've tried to do like in the FINESST activity to make sure that the solicitation really encourages those who want to work across traditional interfaces.

There's a variety of things that we did in R & A in the past, that were very supportive in enabling of Earth action and we're certainly not looking to change those. Something that I think that we are hoping that we'll be able to do a better job in is, trying to make sure that the lessons that people learn in the course of developing what historically might have been applications, now we talk about enabling action. That the lessons that are learned, on how focused research could help to provide products and services, to be able to think more directly about that and make that clear. So I think that's, what I can say and Tom may want to weigh in a little bit since the question included both R & A and Applications.

00:49:02.434

Tom Wagner:

A: Just to build on what Jack said. Go to ROSES, read A.1. One of the things we're especially encouraging are proposals that cross the layers of the pyramid. And I also want to throw in this. A lot of what we're hearing from students and post-docs today is they're interested in doing this kind of work, right? It doesn't diminish at all the importance of the R & A programs or what were the applied programs that now are in Earth Action, but we're trying to find synergies amongst all those things. And what you'll also hear about if you go to any of our Earth Action talks is we've also brought in things like the Commercial Satellite Data program and other things to try to encourage synergies everywhere we can.

00:49:39.659

Wendy Mihm: Excellent. All right. Thank you. Alright, the next question is:

Q: Why does partnerships only include commercial providers and not the space industry who can streamline processes and find costs and schedule efficiencies that cannot be found at NASA centers? And Karen, we'll start with you on that one.

00:50:01.892

Karen St. Germain

A: First I want to say that our listing of partnerships was not intended to be exhaustive. So it does extend to our more traditional industry partners, and it shows up in a number of ways, right? In some cases we are adopting commercial best practices where previously we would have, maybe imposed NASA processes. Certainly, fundamentally the industry providers that we work with to build NASA missions,

whether they are directed or competed, are critical to multiple aspects of this of this strategy, most importantly advancing technologies, building the world class observing system and, building resilience back into our portfolio. And those are just the ones that come to me off the top of my head.

00:51:18.052

Wendy Mihm:

Okay, next question in the chat in the Q and A section is:

Q: As we strive to do Earth Action oriented engagement with our sister agency partners, is there a mechanism or an effort to coordinate this type of engagement across NASA programs?

There's a few folks on the line that can comment on that. I'm going to start with Tom to kick it off and then Karen, Jack, anyone else who would like to weigh in, please go.

00:51:46.576

Tom Wagner

A: I'll point out at the start, we work very, very closely with our federal partners. Take our disasters program, we work regularly with FEMA, right? Our fires program, we work very closely with the Forest Service. A lot of our solicitations require you to bring a partner in to actually do the work. On top of that, though, what I would say is we recognize that some of our partners are feeling oversubscribed and we're talking about ways to do a better job coordinating amongst NASA and also coordinating better with our partners. You know, in some ways we're a little bit of a victim of our own success. It's also been brought up though that there are a broader group of people to reach even at our partner agencies. So we're talking about ways to actually codify our relationships and actually just do a better job with outreach overall for them. And I'll pass it to anybody else who wants to add? If not back to Wendy.

00:52:39.052

Wendy Mihm

Okay. All right. If no further comments on that one, we'll go to the next question, which is:

Q: While I see that a lot of NASA Earth Science leadership is here and has participated in this plan, how has this plan been socialized and received at other agencies in particular NOAA, USGS and USSF with a foot in the space economy to Congress? And that Karen, we're going to flip that one to you to get started.

00:53:04.952

Karen St. Germain

A: This is in some ways related to the last question as well. So, as we were developing the strategy and before we finalized it, we actually sat down with our closest collaborators, and you listed a couple of them here, NOAA USGS, for example, to actually give them an early look and ask them if, and we're talking about at the leadership level of these agencies, ask them if they had, concerns, feedback, thoughts. And they gave us some really great, feedback that we incorporated into the strategy. So we did some early socialization, particularly with our counterparts at those agencies, and we're continuing now as part of this rollout effort to offer the opportunity to go and talk with them in their equivalent agency councils and so forth. Just keep in mind, agencies across the government are all trying to rise to these challenges. And generally speaking, the response has been positive. In some cases, people want more clarity and we sit down and we talk about those things. Overall, it's been positive so far and where people have concerns, we frankly want address those concerns and we want to work those things out. We've been taking a lot of the questions so far at the headquarters team, but, let me give our panelists, our science leads from the centers an opportunity to weigh in here because you guys also work partnerships at various levels with other agencies and so forth. Anybody want to jump in?

00:55:12.972

Tom Wagner

I just want to throw in for a second. We have a formal program to work with other agencies, right? It's, it's called the Satellite Needs Working Group. Where other agencies literally submit surveys about what they need from remote sensing. Those needs are growing exponentially. We just got 177 needs up from 140 I think it was two years ago. Also the feedback from our partners is, the more remote sensing tools we can bring them, the better. And I think Katie Baynes wanted to add something.

00:55:45.239

Katie Baynes

I'm just thinking that as part of the data systems provider, we're constantly being looked to, to provide measurements that are, near real time in nature and, and not to bleed into the next question here, but we've been listening and trying to adjust. In fact, some of those user needs that we've addressed have become the most popular products that we serve out. So people are using our data and we are collaborating with our sister agencies to produce those things.

00:56:17.155

Florian Schwandner

And from a Center perspective, several of the Earth Science centers, we have five of them across the agency, actually all of them have these partnerships with NOAA, USGS, several other federal agencies. In some case we have meetings that are weekly, we have project partnerships. And at Ames specifically where I am, we have the USGS, formerly Manno Park, staff of about 400 folks plus labs co-located with

us, enabling that type of collaboration and tight synchronization between ideas, and that that benefits the entire Earth Science enterprise I believe.

00:56:59.370

Dalia Kirschbaum:

I'll just jump in that the engagement is not just one note, right? So there's so many important engagements across agencies at the scientist to scientist or technician level, and that really forms that basis to understand, if we think about the pyramid, that investment in the basic research and the science and the missions itself. If we look at that at a broader perspective across the agency coordinating across, but I think those personal connections across the agency are also a critical piece of how we accelerate the impact and hear from stakeholders to have that two-way feedback of what's needed next.

00:57:36.132

Wendy Mihm:

Oh Excellent. All right, so we have another question I'm going to pivot to now. It's

Q: Trusted and actionable, that's stressed in the, in the question here. Trusted and actionable information is a high bar to clear especially if we are asking users to literally bet the farm on NASA data. Past missions, science data products and data systems have not always achieved the standards even while supporting truly important and meaningful scientific advances. What are some examples of metrics that the Earth Action strategy could use to ensure that future missions are increasingly responsive to this key goal of providing trusted and actionable information?

So Randy, we're going to start with you from JPL's perspective

00:58:19.812

Randall Friedl

A: That is one big question with a lot of pieces. So I'll just start on some of the pieces and again from a center point of view. First of all, I agree with the fact that actionable information is a higher bar, in some regards. And I think that the first key is really understanding what the end users need. So, there's been a lot of activity that way and I think with the Earth Action pivot, we're going to do more of that and get better at it with all of our partnerships. I think that's number one. Number two is being an extremely transparent about the uncertainty, and there's been a big push within the NASA community to do a lot more uncertainty quantification of our data sets and our modeling results. I think we have to do a lot more of that. My observation has been that in working with various end users that, I think betting the farm is probably a little bit much, in the sense of that they have to make decisions, and my understanding of them is, they know full well that there's uncertainty in everything and they just want to make informed decisions and we have to provide them the right foundation.

00:59:50.412

Wendy Mihm

Alright, thanks Randy. I know Katie, you also wanted to comment on this.

00:59:54.254

Katie Baynes

Sure, so being from the Data Systems I can't really speak to the precision and accuracy of the data collected and I'm not sure if that's even a facet of your question. But I can talk about making sure that we have timely access to data products and that the data products that we produce are not only useful to researchers but are also interoperable or accessible and findable. Being able to distinguish between the myriad of sea surface temperature data sets that we provide, is something that we always strive to improve on. So I think that from a data systems perspective, I will double down on Randy's comment about listening to end users. We take that as feedback into that whole virtuous cycle that you saw in the pyramid. It's not something that just comes from the top and feeds back down. It's something that data systems is cognizant of all up and down. Are our data products in usable formats? Are we naming our variables correctly? Are we providing them in tools that are relevant to today's researchers? We are always asking ourselves these questions and looking to improve, so that will not change. In fact, we're actually doubling our efforts on that front especially with the Earth Science to Action strategy.

01:01:08.280

Tom Wagner

Super quickly, one of the things that's hard to understand and communicate is the full scope of our program. When we talk about something like bet the farm. Just for example, a couple of months ago, we actually released a flood warning that prevented loss of life and limb and even infrastructure in a part of South America. We routinely release a mosquito forecast in South Dakota ,where they have a terrible problem with West Nile virus, that local people use for policy updates, like where do we spray? Do we cancel after hours activities at dusk? So there's a whole bunch of places we work at small to large scales where NASA data is already being employed. The thing that we're finding is an incredible thirst for more of this data. Now with regards to specifics, we've already transitioned something like 40 NASA products fully into operations at other agencies. NOAA includes some of our algorithms in their weather reports and are already doing it. But finally, I do understand the tone of this question, and I will say this; going forward, we updated our handbook about our approaches to new missions, and we're going to be building in these kinds of applications questions right at the ground floor of missions as we design them from here on in.

01:02:22.927

Wendy Mihm

Thanks, Tom. Okay moving to our next question.

Q: How would this coordination among agencies for Earth Action be different from and learn from the experiences of the IPO, which is the Integrated Program Offices and NPOESS (National Polar-Orbiting Satellite System)?

And Karen I will toss that one to you.

01:02:52.441

Karen St. Germain

Many of you know that I was deeply involved in NPOESS, in particular during the period where we were building NPP and then the transition to JPSS, and we learned a lot of lessons during that period. That program was constructed fundamentally differently. That program said, hey, let's build one program and have all the agencies agree in advance on the requirements. Build one mission that is responsive to all of those requirements for all of the agencies. We ended up with a very complex program that had 20 instruments flying on a satellite, and so forth. Now, it was a different era, right? That construct was developed 20 years ago when the cost of launch was different. There were a lot of differences between where we are now and where we were then. But that was a model that said one mission is going to satisfy a lot of agency needs. This is a model where we're saying we're going to build missions, advance science, advance the use of the data and make it a lot more actionable for people. Very, very different model, but of course many of the people on the call today and in our community have spent their careers working in the inter-agency space and understanding those differences in culture and the differences in operational responsibilities and so forth. And that deep experience is really helpful in managing, and advancing those partnerships today. So, I think we are infusing the lessons we've learned not just in NPOESS, but in all of the missions that we've had collaborations on missions and science and applications. And I think what you're seeing is a strategy that builds on that deep wealth of experience, in a much more impactful way than we were able to do 20 years ago.

01:05:21.082

Wendy Mihm

Okay, thanks Karen. All right, so the next question is actually a combination of a couple of questions that had a big overlap in the Q and A section, so we'll combine them.

Q: To facilitate cross-agency collaboration, should we include in our budget some funding for a cooperating or a collaborating agency? Or should we assume that if those agencies agree to collaborate, they will find their own funds? And then combined with that as another question related to that. Is there a compiled public list of needs issued by other agencies or is that scattered among the different agency websites and documents? And so Tom we'll start with you.

01:05:59.580

Tom Wagner

This is a really good one that dovetails nicely to Karen's last question. We have the big picture stuff like NPOESS, but then we also have these small projects that we do with other agencies. We generally don't have a list of their needs, but what we do is, when we have our ROSES elements, we allow people to propose solutions. The hallmark of our program in Earth Action, is different than R & A, is it has to be user centered and you have to use co-development. The expectation is you bring a partner in and we fund that project in its totality. Our hope is though, at the end of the day, the partner picks up whatever was produced and uses it. And we have a lot of really good examples of that around the program. So what should you be building into your budget? The project in its totality, but also, we are relying on you to go out and work with those users and find out what they need and bring them into work with us. And I do just want to point out though overall, we have programs like the SNWG, we have all the other inter-agency meetings where we get together to hear their needs and we support those other needs in other ways.

01:07:05.280

Wendy Mihm

Alright, thanks Tom, and then Mike, I know you had some more to say on this as well.

01:07:10.082

Mike Seablom

I just wanted to say that from a technology perspective, not necessarily just an Earth Action strategy perspective, we are constantly speaking with other agencies and we have an awareness of what technologies are being developed in agencies like, within the Department of Defense, USGS and many others. Because a lot of the new technologies are expensive and we can't always do it by ourselves. In terms of funding, the development of the technologies, it's really a case by case basis. Sometimes it's better to have a joint funding and sometimes it's better to each fund a different piece. But we work with the Office of Chief Technologist in the Agency and we are constantly aware of technology development that's going on outside the Agency.

01:08:04.343

Wendy Mihm

Alright, thanks Mike. And then Jack I think you had a couple of things you wanted to chime in as well.

01:08:14.563

Jack Kaye

Okay, it's about funding for cooperating collaborating agencies. We get quite a few proposals from other agencies and we do fund a number of them. In many cases where their civil servants themselves have their salaries covered, we're funding affiliated scientists to work with them. So it could be cooperative institutes associated with some of the agencies and then we'll work on things that may be related to specific activities where there's funding. So there can be a joint field work, in some cases their affiliated scientists will be supported and some things that we can do like if somebody's using a plane and they get a, what we might call the insider's rate. So I think that there's a lot of things that we do with other agencies. Look at the listing of the things that we fund in ROSES and you'll see a number of them with principal investigators at other agencies. There are mechanisms for funding has supported mutually beneficial work.

01:09:37.342

Wendy Mihm

All right. All right, thanks Jack. Next question in the queue.

Q: Earth Science to Action is an excellent strategy that considers the needs of end users in society. I'd like to know which specific areas in Earth science NASA has prioritized in this actionable strategy such as extreme weather events and wildfires. So Karen, let's go to you for that one.

01:10:12.585

Karen St. Germain

Sorry, I cannot figure out how to make a computer stop dinging, so I keep putting myself on mute. Apologies. This is part of my ongoing challenge here today. So if you go to the strategy document itself, and let me ask Kate or Wendy, have we shared the, the link where people can go to see the document?

01:10:38.364

Wendy Mihm

Yes, right after I said don't use the chat, I put the link to the document in the chat. Outstanding. Let's use it for that and then forget I said that and stay focused on the Q & A area.

01:10:50.882

Karen St. Germain

There is in the document, a list of example areas where we have significant energy right now, and I don't have the list right in front of me. The ones you mentioned here, in the chat are definitely on the list. Tom, do you have that list in front of you? Probably not.

01:11:18.584

Tom Wagner

No, I was going to say, I know they asked about some of the priorities, so I was going to mention things like, we've got a new focus on greenhouse gases, we've got an intentional focus on fires. We've got our Earth Information Center and other things going, but we haven't really de-emphasized other areas. In some cases we brought things together that were around the program.

01:11:39.020

Wendy Mihm

Alright, thank you. And then Katie, did you want to chime in on this one as well?

Katie Baynes

Wait, which one? I was going to plug in on something else.

01:11:50.136

Wendy Mihm

Ah glitch in the system, that's my mistake, I'm sorry. Alright, anyone else want to weigh in specifically on this question about Earth Action focus areas?

01:12:02.190

Mike Seablom

I just wanted to emphasize something Tom just said, that bringing together things that already existed. The wildfires was a very good example of that. We had wildfire activities in R & A and the old Applied Sciences. We ramped up wildfire technologies, back in 2022. And they were consolidated and now they're, they're in a cross-cutting program that Tom is managing. I think this is a very efficient way of focusing the effort and, putting the resources where they need to be. It's a very good example of, of how Earth Action is being implemented in the division.

01:12:44.670

Karen St. Germain

And Kate just came to my rescue because she actually laid her hands on the list that's actually called out in the strategy. I want to be really clear. I am going to tell you what's on the list, but I also want to be super clear that this is not intended to be an exclusive list, or a comprehensive list. It's intended to share the things that we are working on now. Agricultural production, water and food resources management, wildfire response and recovery, sea level change, and coastal risk and resilience, air quality, environmental health, water quality, and infectious disease, energy and sustainable infrastructure, disasters and extreme events, greenhouse gas measurement and monitoring, biodiversity and ecological conservation, national security, terrestrial carbon accounting, human-ocean interactions, stratospheric ozone monitoring, society and economic sectors that includes things like insurance, real estate infrastructure, transportation services, and policy and decision making support. So we have activities right now across this full range of areas.

01:13:54.977

Wendy Mihm

Excellent. All right, so at the moment, we don't have any additional questions in the chat. I wanted to just call out and see if anyone had anything else they wanted to throw in there before we closed, we still have a few minutes. We also had a few comments that we wanted to make as we wait for any additional questions to come in. Tom, I will throw to you and you can just talk a little bit about the specific Earth Action element, within the division.

01:14:27.805

Tom Wagner

Okay. Sure, you want me to talk about that now?

01:14:29.919

Wendy Mihm

Yeah, I think so because I don't see any questions coming. It'll give us some time to see if anything else rolls in.

01:14:39.425

Tom Wagner

While you're waiting I'll just say this. I want everybody to understand that this strategy is about you. And I mean you being the people that are really the engines of innovation in terms of finding ways to use remote sensing to help address societal challenges, and also the you's who are the users, the people who are ultimately going to use this to make decisions, change their lives. Practically speaking, what this

strategy means is that we've created this new section called Earth Action at Headquarters. Everything that was in Applied Sciences is under there now. We've added some new elements like I mentioned earlier, our commercial satellite data program, the satellite needs working group. Also our Earth Information Center to be basically a new way for the public to learn about our data and dive deeper. But we're on this new journey together and we're pulling all this information together, but we're also trying to push it out to the world as much as we can. We look forward to working with you all on it.

Wendy Mihm

Thank you Tom. I also wanted to throw it over to Jack. I know your two elements are working closely together so I thought you could make some comments about collaboration.

01:15:49.224

Jack Kaye

As I said earlier, the first thing is to try to eliminate barriers that we may have inadvertently or perhaps deliberately put up. I think it's more than that, in the sense that, we really want people to understand that they can feel that they have a home in both places. That includes for our staff, some of whom are new people we're bringing on board as matrixed employees who will really sit in both elements, and try to make sure that we learn the lessons, best practices kind of things from the things that we've done before. In the case of R & A where some of the new efforts; wildfires and greenhouse gases, started as leveraging work that had been done by R & A early on, now there's the opportunity to really be much more actionable about it with the base that's there. Things like sea level change and air quality that we've both had entities working in. I think in general the sense is that, for a lot of us, dare I say all of us that are in this business, we want to learn about the Earth. But we also want to learn about the Earth in a way that enables that information to be put to use to improve the quality of life on the Earth and inform decisions. It's a very natural thing for us. I think for a lot of us, we see the opportunities to work in ways that can enable us to do our jobs best. It's a positive thing and one thing that I do like to emphasize is that recognize that some of the things that we do are less likely to be immediately actionable than some of the other things that we do. That doesn't mean that we don't fully support and endorse those things where it's a little bit longer of a time period for that connectivity and impact to take place. But I think, everyone, wants to see the science that we help create get put to use and be part of that process in ways that make sense for us.

01:18:33.763

Wendy Mihm

Alright, thank you Jack. And then Randy, did you want to make a couple of comments on a similar topic?

01:18:39.461

Randall Friedl

Following on from a couple of the other threads here. From my point of view, I think the biggest challenge that we have as a community, if we're, we're really going to go all the way from research to Earth action, is trying to put together multiple data sets and integrating them in ways that really are more comprehensive to the end users. The community's been working on that for a long time. But I think this is an opportunity with this new strategy for us to be very innovative in coupling various data sources together with the sense of what we're trying to do in terms of resilience. To give end users a more holistic view of sort of cause and effect and solution and impact. So to me, that's the most exciting thing about where we're headed right now. And I think it's a huge opportunity for innovation.

01:19:47.939

Wendy Mihm

Alright, thanks Randy, and I'm very excited about this because there's a question about communications in the chat. Thank you for asking this question.

Q: I think communications and storytelling is critical in this work. Does the strategy address this?

A: Yes, it is. I do think it's really critical. In fact, in our 2024 communication strategy, one of the things I try to get across to the whole team and that's everyone across NASA who's producing any kind of Earth related science content, is make sure that they're telling the story through the lens of Earth Science to Action. Meaning that we're telling stories about real human beings using NASA Earth science. Using it to solve big problems and address real human challenges here on Earth. And so we're doing a lot of that in our storytelling, just making sure that that's the lens through which we're doing our storytelling. We have three major communication priorities this year. One priority is specifically about Earth science in action. So it's one, applying a lens to a lot of the stories that we tell that might not otherwise have this lens, and then there's a whole specific focus area on that. Alright, so very excited about that. Okay, and then the next question.

01:21:06.000

Karen St. Germain

Hey. Can I just pile on about that? Many of you online know I can't help but weigh in on this. You know that the storytelling and the communication, have been a focus for me and critical to our entire enterprise. I also want to share that through the Earth Information Center, and I want to in particular acknowledge the work of the folks who built this incredible capability here in NASA headquarters, a lot of those folks were from Goddard and JPL, although not exclusively, I think we had actually important contributions from every one of the five centers, to put that material together. I want you to know that I have spent hours taking people through the EIC. I have watched in real time as the experience of being in the EIC has changed hearts and minds. And I mean from little kids to foreign diplomats. A minister of Mongolia was here. We showed a story that moved him and his delegation to tears about the work that we did that helped them manage their grazing lands and helps their ranchers. I cannot say enough

about the importance of telling stories about the impact of the work we do. That actually is the way that we build support broadly for our mission.

01:23:01.042

Dalia Kirschbaum

Yeah, I couldn't agree more. I think following up on that, we've been able to entertain visitors from all different walks of life at the hyperwall, which I think many of you have seen. We start to talk about what's local. So showing a view of the Chesapeake Bay, showing where they came from downtown all the way to the beautiful ocean colors that we observed from so many different missions. Picking up on that storytelling and Randy's comment about integration, it's about data and model integration and really what is uniquely NASA and how we can help be of service and of value to our broader communities. I think that's where it starts to all connect in this first action broader view and it really starts with honing in on that personal view and connecting it to this Earth system view that we have from space.

01:23:52.838

Wendy Mihm

Okay, thanks guys. Okay, the next question is

Q: The Earth action strategy is great and very high level. Will we be seeing strategies specific to each program area?

And then for that one, I'm going to kick that over to Karen St. Germain to start and then hand that off

01:24:16.620

Karen St. Germain

What this question on the white papers, this is referring to is some really early foundational work that many members of our headquarters and center teams contributed to, in a variety of these discipline areas. So that we could start from a basis of understanding what we're doing today, what we're doing well, where we could improve. Those were thematic threads and so they informed the foundations of the strategy. I'm going to actually throw it over to, Tom who took the lead on, where we were going next with the specific mission areas and the white papers and so forth. Tom did I just surprise you?

01:25:01.758

Tom Wagner

You did. One of the things we tried to do was to try to figure out what were these really compelling next generation things? And we solicited from all the people in house their best ideas. The things that we're thinking about going forward are going to involve coastal areas, they're going to involve water and agriculture and they are going to involve health and air quality. What we expect to come out of those papers are especially things that are going to go right on our earth.gov portal, parallel to what's up there right now for greenhouse gases.

01:25:42.121

Wendy Mihm

Okay, we are getting really close to the end. So I want to flip it over to Karen St. Germain to see if you wanted to say any closing remarks.

01:25:53.918

Karen St. Germain

The first thing, and I should have said this earlier on, is I want to express my deep gratitude to the team that you see on the screen today and some folks who are not on the screen today, Can you come over and pop on screen? For those of you who don't know, when my computer melted in the room next door, I actually displaced Julie from her computer. Julie was fundamental in driving this forward. Sid Boukabara was really a driver in advancing the strategy and I'm sure there are others that I'm missing. I want you all to know out there, how much work this leadership team did and how much thought we put into, trying to develop a strategy that could bring the whole community along and really drive the impact that we can have for a better future, for our families, our citizens, citizens of the world. And the second thing I want to say is. It is really important to us, that you engage with us on this strategy and the how to breathe life into it, how to build it into our thinking, how to implement it well. It now belongs to all of us, and how it moves forward is really dependent on all of you. And so thank you for taking the time today to have the conversation with us, to learn a little bit more about the strategy itself. I invite you to go to the link in the chat that has the full document and, really don't hesitate to reach out to any of us with thoughts on how we should move forward here. And, with that, I think we're probably ready to wrap.

01:28:03.189

Wendy Mihm

Let me just add really quickly Karen, less eloquently. I want to let everyone know we'll be posting the full Powerpoint deck that you saw here and a full transcript, which for better or for worse, will include the dad jokes. That'll be on the Community Forum website. Give us a couple of weeks to do this because it is a little bit of a grind to get through the transcript and take all the uhms out that I've said. So, we'll clean that up and get it up there and thank you very much for participating.